

2006December 13, 2006

Mrs. Ann Henderson
Monitoring and Biodiversity Outreach Program
Smithsonian Institution
Washington, DC 20560

Dear Ann,

Enclosed is our report entitled Smithsonian Institution Biodiversity Research Outreach Initiative. It was written and completed at the Smithsonian Institution during the period October 23 through December 13, 2006. Preliminary work was completed in Worcester, Massachusetts, prior to our arrival in Washington DC. Copies of this report are being simultaneously submitted to Professor Peter Hansen and Professor David Lucht for evaluation. Upon faculty review, the original will be catalogued in the Gordon Library of Worcester Polytechnic Institute. We greatly appreciate the time that you, Jen Sevin, Alfonso Alonso, and the rest of the SI/MAB employees have devoted to us.

Sincerely,

Jennifer Castriotta

Eric Koethe

Gary Schorer



Smithsonian Institution Biodiversity Research Outreach Initiative

Report Submitted to:
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Washington DC, Project Center

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ABSTRACT

This report was compiled for the use of the Smithsonian Institution's Monitoring and Assessing of Biodiversity Program (MAB). Our project was to create a website that facilitated communication between citizens of Gabon and MAB. The report describes the process of creating the website, as well as analysis of the audience, content, and recommendations for furthering the website. The creation of this website allows MAB to communicate biodiversity research with Gabonese citizens. Inside is a manual for maintenance of the website.

EXECUTIVE SUMMARY

In November of 2000 the Smithsonian Institution's Monitoring and Assessing of Biodiversity Program (MAB) started working with Shell Gabon on a project researching, assessing, and conserving biodiversity in the Gamba Complex of Gabon, Africa (Smithsonian, 2001). The goal of this partnership was to be able to have industry and conservation operating simultaneously in this one area. The Smithsonian is focusing their studies on local animals and the influence that the presence of people and industry are having on them. This research is being conducted with the intention of disseminating it to the local population and then ultimately to the world at large. There have been several publications written by Smithsonian biologists and researchers on the topic of biodiversity, but it was later determined that another means of communication, i.e. a website, could effectively supplement traditional means to disseminate research. This project was intended to create a website that would disseminate research information, gathered by the Smithsonian Institution, to people in designated areas of Gabon. The area of Gabon that we focused on was the Gamba Complex. This is where the Smithsonian is currently doing a majority of their research. We believe our project will be a useful medium that will successfully get the Smithsonian's research to the intended audience in a fashion that will be appealing and informative.

We hoped to achieve this goal by pursuing the following four objectives:

1. Identifying and prioritizing the target audiences
2. Determining the variety and volume of the content to be conveyed
3. Building a website encompassing the Smithsonian Institution's research information
4. Recommending ways of marketing and promoting the website

We accomplished these objectives consecutively. In order to create this website we made sure we knew a significant amount about the audience that the Smithsonian hoped to communicate with and learn more about their general culture. This was done through research and expert interviews in which we discovered more about the culture, education level, and specific areas of interest of the people in Gabon.

Our findings allowed us to create a final website catered towards the designated audience with relevant and interesting content. In our research about the audience we intended to reach, we learned that there were several subpopulations that the audience could be broken down into. However, for the purposes of the website we were able to group them into two larger yet distinct groups. There was one population that had a very specific interest in the research done by the MAB biologists and was interested in the scientific reports. The other audience was interested in an overview of the results of research done and was looking for the information highlighted as being the most important. These audiences were both accommodated in the single website.

After determining the audience, we established the content. This was done by examining general biodiversity research, evaluating educational websites, and reading research done by the Smithsonian on the area of Gabon. We consulted with Smithsonian MAB biologists working in Gabon to determine an order of priority concerning which research would be the most important to get across and what information they found to be of less importance and/or relevance.

The website ultimately included an interactive map of the Gamba complex, species information, an interactive elephant tracking map, biodiversity threats, a research library, a photo gallery, and a question and answer portion. It was determined that in conjunction with research information there needed to be something to cause people to get a more personable feeling from

the website. This idea led to the creation of the interactive map of the Gamba complex. The map has stars which people can click on to learn more about the area they specified and read short testimonials from people who have lived and worked in that area.

The website concentrated on elephants with a page dedicated to useful facts and general information on African forest elephants. There is also a page for information on several species in Gabon that it was believed would be of interest to users who were using the website.

Another impressive feature is the elephant tracking map. The Smithsonian has done a great deal of research on African forest elephants with a major part of this research being the tracking of four elephants using satellite Geographic Information Systems (GIS) data. This data was used to create a map where users can choose an elephant they want to track and the map will show them where the elephant has been in a time span lasting from a few months to two years, depending on the lifespan of the desired elephant's tracking collar.

In Gabon there are several circumstances, occurring both naturally and caused by man, that threaten local biodiversity. The website takes these threats and gives a summary of those deemed most important by the MAB biologists. Documents containing these biodiversity threats as well as the research used to create species pages have been compiled into one list and are a separate research library page on the site. This will be useful for people who are looking for the more in depth analysis of the research being done by the Smithsonian.

Due to the rising level of curiosity about local biodiversity in Gabon, the team put together a photo gallery of thematically related pictures including Gabonese plants, animal, landscapes, etc. This was done with the hope of generating interest in the website and encouraging local citizens to post their own pictures and ask questions about the contents of their pictures. However if a user does not have a picture but would like to ask a question there is a frequently asked questions (FAQ) page that allows them to contact Smithsonian biologists.

The FAQ contains questions that the Smithsonian biologists feel will be most commonly asked as well as some questions they believe a user may not think to ask, but find interesting as they read through the page.

Development of the website involved researching website regulations and restrictions set forth by the Smithsonian's National Zoo website advisors. The Smithsonian template was taken into account and found to be the only template the Zoo supports. After we received the template it was possible to create a prototype for the website and evaluate it creating a cycle of prototyping and testing. Upon final completion of the website, a manual was created detailing how to maintain various aspects of the website (Appendix L). This manual contains instructions for updating each individual page. Along with leaving a manual that details how to maintain the website in its current format, the group made a recommendation that the National Zoo investigate using different templates for their website. Not all the zoo websites contain the same information and flexibility of templates would allow people to use different types of media, i.e. large graphics, videos, etc.

The team also recommended ways to the marketing of this website. Once again, these efforts are targeted at reaching the previously mentioned audiences. It was determined that the most effective form of marketing would be using tools available on the internet such as registering the website with several search engines in order to publicize the website.

In summary, we created a website the Smithsonian Institution can use to achieve its mission of increasing and diffusing knowledge. This website will be beneficial to many audiences including, but not limited to, the Smithsonian Institution, citizens of Gabon, and biologists around the world. It is our intention that this website be maintained and of use for many years to come.

Acknowledgements

- Liaisons Alfonso Alonso, Ann Henderson, and Jennifer Sevin for their time, effort, and constant support.
- Rob Madill for helping with and National Zoo Website guidelines and templates
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1 INTRODUCTION

Conservation – both of resources and wildlife – has become an increasingly pressing global issue over the years. With ever-expanding searches for natural resources, certain areas will inevitably be impinged upon, and the wide array of plants and animals that once called these regions home may no longer be able to do so. One country in particular where conservation has become a major issue is Gabon, in West-Central Africa. Gabon has some of the worlds least spoiled yet most threatened rainforests. The Gabonese government plans to preserve its country’s biodiversity and simultaneously draw more tourists by creating a chain of nature parks. The government recently announced that it has created 13 new national parks on roughly 10,000 square miles of land (see Fig 1). Logging leases on those lands would be bought out or cancelled. The Gabonese government is faced with difficult decisions on the issue - on the one hand, they want to preserve these regions and their inhabitants, but on the other hand, many of these areas contain significant natural resources which could bolster the economy.

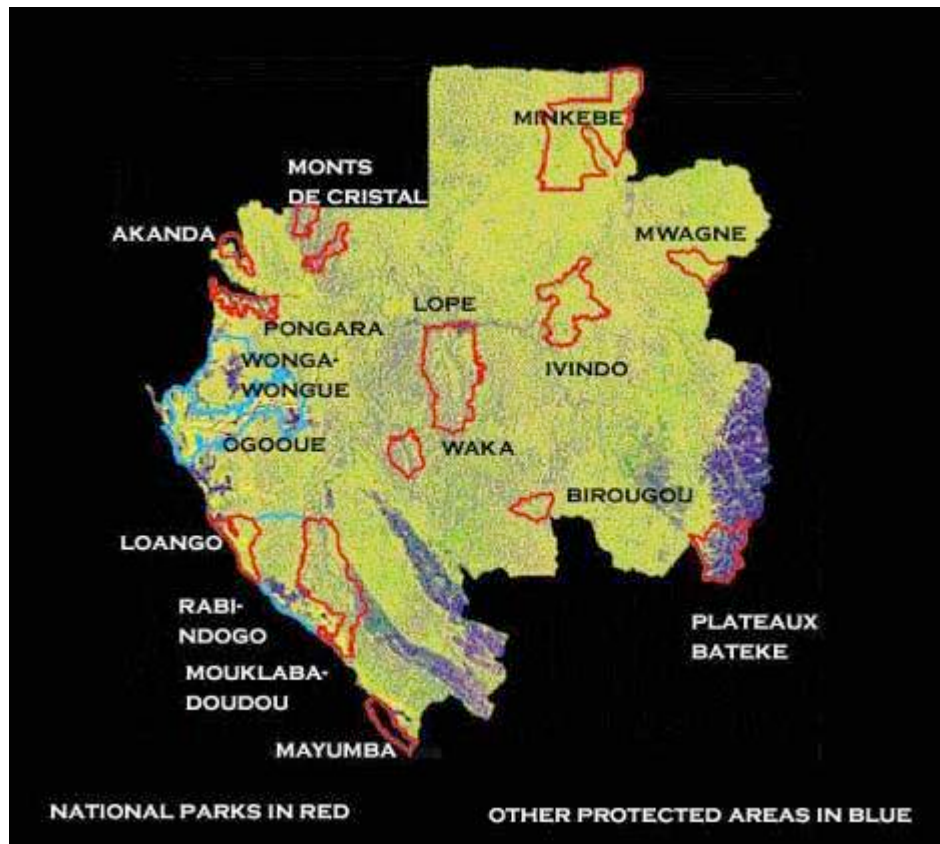


Figure 1: Map of Gabon with National Parks

The dual pressures of development and conservation are particularly visible in Gamba, a region of western Gabon (see Fig 2), where the Shell foundation and the Smithsonian Institution have collaborated on research and education. Shell has been drilling for oil in the region for decades. Realizing the need to preserve the country's environment, they enlisted the Smithsonian Institution to impartially judge the impact Shell was having on local biodiversity. The Smithsonian is studying a variety of aspects of biodiversity in the area, specifically forest elephants and their local migratory habits. The Smithsonian hopes to convey this information to people living and working in the Gamba region. Principal goals of this education effort are

to reduce poaching in national preserves as well as to reduce encroachment by farmers into these preserves. The Smithsonian determined that a website would prove to be an extremely effective means of furthering this education program. Ultimately, these initiatives will help the elephants' survival by maintaining the integrity of the biodiversity in this fragile ecosystem.

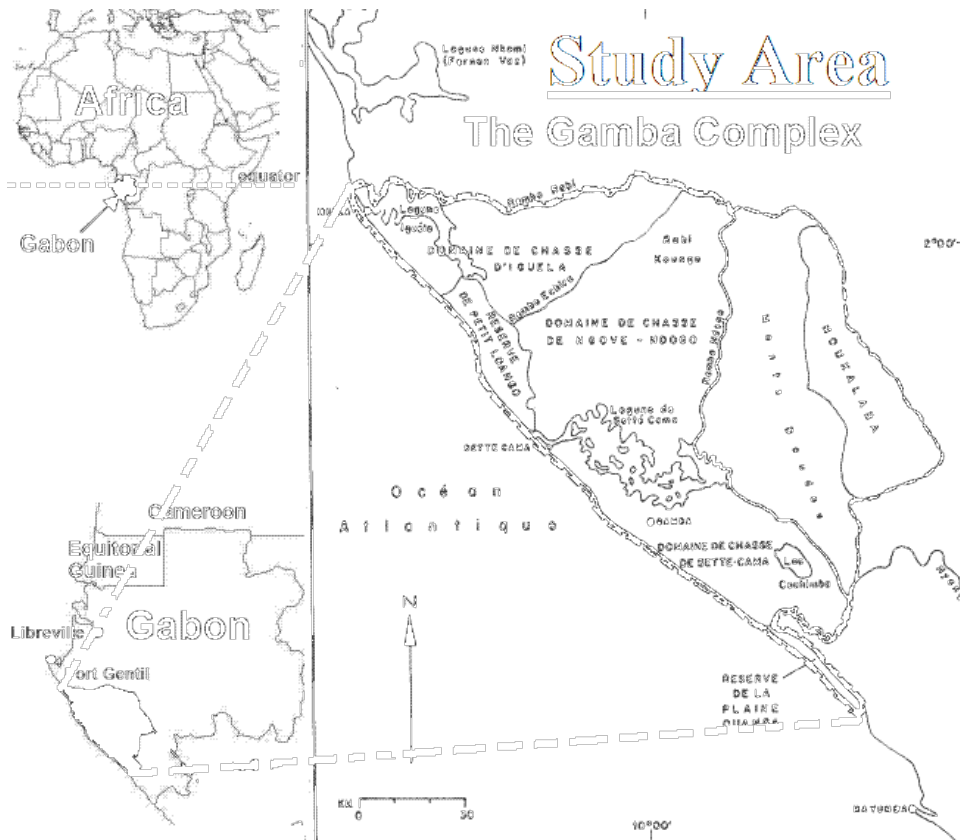


Figure 2: Map of Study Area in Gabon

The Smithsonian Institution has previously created similar websites. These websites were all candidates to be the basis on which the new site is designed. One of the websites created contained an animated map that showed a retrospective look at where a certain elephant and her herd had traveled over a span of two years.

Another site was designed that allowed people to look at a map of the area of Gabon and use a series of buttons to highlight different conservation areas, rivers, roads and oil fields. An additional aspect of the website that was researched was effective ways to display research regarding biodiversity.

A survey of these resources enabled the team to assess those components of the sites that worked particularly well and compare them to those that were less effective. The animated map proved to be a useful media that someone could look at and clearly understand. On the other hand, the topographical map that showcased different areas of Gabon was not finished, but provided a great amount of technical detail. While it was a good visual, the map was incomplete, and the pieces that were supposed to be interactive were not up and running. The Smithsonian wanted to further develop these resources by creating a website that was user friendly and would be able to effectively display the elephant tracking data from Gabon, research about the local biodiversity in and around the area, and many other features.

With this project the team created a website that disseminates research information on biodiversity research to selected populations in Gabon and a global audience. Specifically, the Smithsonian Institution wanted a website produced that would enable them to convey this information to Shell employees working in the Gamba region in Gabon. This website will greatly increase the value of the Smithsonian Institution's research in this field by making it available to a broader audience.

2 BACKGROUND

There is a wide array of critically important factors that had to be taken into account before a project of this scale could be initiated. These factors were kept in mind throughout the duration of the project. Production and thought processes were guided by the Smithsonian Institution's mission and goals. The fact that our target audience is a part of a different culture from our own is vitally important, and served as a complicating force as the project progressed. As such, it was important to educate ourselves about this other culture as much as possible. Also of importance was the fact that the field we were working in is not a new one, and that there are professional standards that have been set by other organizations. These standards have been laid out both literally – in the form of the North American Association for Environmental Education's Guidelines for Excellence – and, less directly, by example – the array of other websites sporting similar characteristics to what we planned to produce. While these were not to be taken as rules which were set in stone and would restrict the path the project would take, there was still some wisdom to be garnered by reviewing them.

2.1 Sponsor Background¹

"The Smithsonian is committed to enlarging our shared understanding of the mosaic that is our national identity by providing authoritative experiences that connect us to our history and our heritage as Americans and to promoting

¹ For more detailed information about the Smithsonian Institution, please see Appendix A.

innovation, research and discovery in science. These commitments have been central to the Smithsonian since its founding more than 155 years ago,” Lawrence M. Small, Secretary of the Smithsonian (Smithsonian, 2006).

Worcester Polytechnic Institute was asked by the Smithsonian Institution to create something that would allow people residing in Gabon to better understand their surroundings. The Smithsonian is a public, non-profit organization working in partnership with the Shell Foundation on a project that hopes to promote awareness about local biodiversity; in this case, with regards to the inhabitants’ interactions with elephants and other species in local reservations. The question asked of this project was, “How can we (the Smithsonian) effectively communicate with the people living and working in Gabon?” This posed a challenge for the Smithsonian because they wanted to be able to relay information via the internet to local people of Gabon concerning the location of elephants in their area. The goal of this team was to create a means to facilitate the communication of the Smithsonian’s elephant tracking data and other research with the target audience in Gabon. The Smithsonian has resources in Washington D.C. as well as Gabon that were accessible to use as aids in completing this project. These resources include, but are not limited to, conservation biologists and their research documents.

2.2 Gabon – History & Current Tensions

To truly understand the extent of this project, one must look first at the country of its target audience. Without proper knowledge of the land, its people and the tensions surrounding them, one cannot communicate with them effectively.

2.2.1 History and Geography

For centuries, Gabon existed as a French colony, and as such French culture has left a deep mark on the land. French remains the country's official language and connections with France are strong. Gabon managed to gain its independence after the Second World War as did much of Colonial Africa, but France retains a strong influence on Gabon both politically and culturally.

Half of the 1.4 million people of Gabon live in or around urban areas centered on the capital of Libreville and the city of Port-Gentil. This leaves rural areas sparsely populated and results in many rural residents maintaining traditional lifestyles. The population is mainly made up of four Bantu tribes: the Fang, Bapounou, Nzebi, and Obamba tribes. Each individual tribe has its own colloquial language. However, as the official national language, French forms a bond between the tribes and offers a way for them to communicate about national issues (CIA, 2006). The landscape consists mostly of rainforests and therefore very little of the land is naturally arable. These rainforests contain a mix of wetlands, foothills and other terrain which harbor one of the most diverse animal and plant populations in the world. Gabon is bordered by the Congo, Equatorial Guinea, and Cameroon, all of which contain geographical features similar to Gabon.

The area in Gabon of most concern to our project is known as the Gamba Complex. This area sits upon the southern coastline with the Atlantic Ocean. It consists of two national parks divided by an industrial corridor. This corridor is so named due to the large amount of oil drilling that has been going on in the area for

the past four decades. Ironically, the drilling in the area led to the area becoming better protected than other areas in the country. Shell Gabon, the primary driller in the area, initiated security programs early on in which general road traffic on oil concessions were restricted. They also enacted programs making it against the rules for many of their employees to enter the jungles (Smithsonian, 2005). The results of these regulations have been astounding. The Gamba Complex now possesses one of the most diverse species ranges in the world.

2.2.2 Economy

Gabon has one of the strongest economies in Africa. This is largely due to Gabon's vast natural resources, which unfortunately lie primarily in the country's rainforests. Two major industries dominate Gabon's economy today: forest products, and the oil/mining industries.

The forest industry produces a wide variety of products. The country's most significant forest products are okume (a type of softwood used in making plywood), mahogany, and ebony. This industry takes place in the jungle and is a major contributor to damage of Gabonese rainforests. The oil industry - which has only become important in the last few decades - is central to the country's wealth. A mixture of onshore and offshore oil rigs are scattered across the country, some of which impinge on fragile animal habitats.

Despite the importance of forest products and oil these industries are too small to employ the majority of Gabon's workforce. As a result subsistence farming is the occupation of most of the Gabonese, with cassava, plantains, taro and

sugarcane being the chief crops. Cocoa, coffee, and palm products are also important and are produced for export.

Unfortunately, the country's financial future may lie in question. Over the past decade oil production has plummeted (see Fig. 3) and many believe that the supply in Gabon is dwindling (Smithsonian, 2005). Gabon is enjoying wealth due to its oil resources, which may soon be depleted. Many conservationists fear that the country might turn to other methods of exploiting natural resources in order to fill the huge economic gap created by oil's demise. The most likely way to fill this gap would be with extensive logging of the country's virgin forests, or by a rapid increase in the trade of bushmeat - the hunting of indigenous species - for export. Both would have devastating effects on the biodiversity in the country (Smithsonian, 2005). Some researchers hope that the country will be able to exploit the rainforests in less destructive ways, such as ecotourism - which would provide an income but would simultaneously preserve the fabric of the local biodiversity.

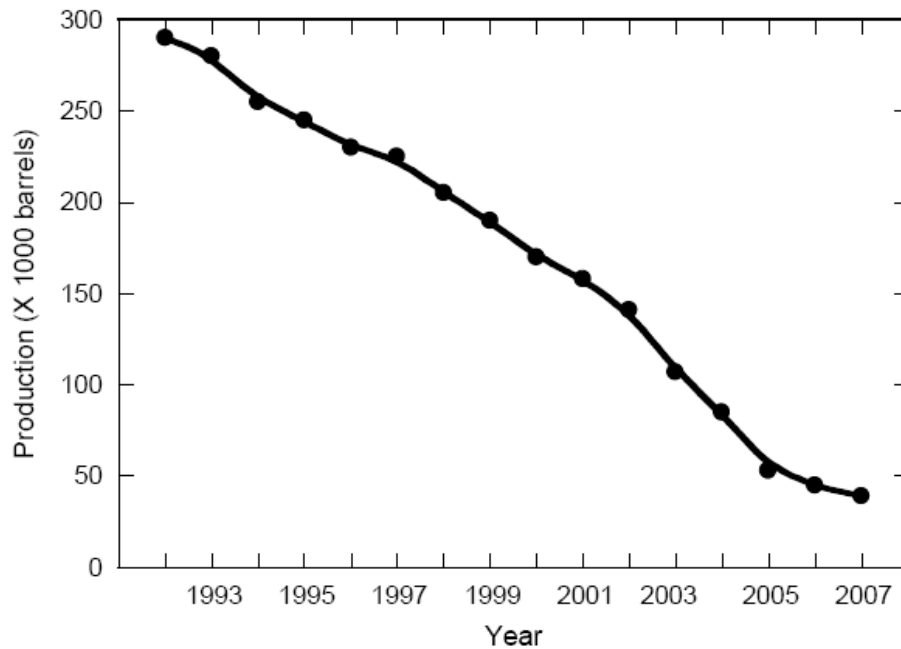


Figure 3: Oil Production Chart

2.2.3 Political and Social Tensions

With its unique history, resources and economy Gabon has been able to escape much of the tension that has ripped similar nearby countries apart. This is all in spite of leadership that at times may be considered questionable. There are two principal reasons for this stability. First, unlike many of its neighbors, Gabon's borders are drawn almost exactly upon ethnic lines. This has led to relatively few civil conflicts between tribes. Although each tribe has their own language, French acts a unifying language. This has allowed the tribes to coexist effectively. The other reason why Gabon has escaped much of the tension that is so common in Central Africa is its strong economy. Thanks to connections with France and rich natural resources, foreign investment in Gabon has flourished. Oil has brought a certain

amount of stability to the country, despite its speculative nature. Economic good fortune has allowed the country to maintain stability surrounded by adverse social climates.

Gabonese ruler Leon Mba - the country's first president - has greatly benefited from the country's relative stability. Still, social tensions threaten the country. Mba was elected in 1960 and has held office ever since. Through his reign he has been the target of criticism from both within and outside of his country (HighBeam, 2006). Despite the nation's wealth, most of the Gabonese people live in poverty, and there is a great disparity in wealth between the rich and the poor. Repressive policies have led to opposition that has waxed and waned over the years. Despite these problems, he remains firmly in control, with opposition movements divided and relatively weak. It is this stability that has allowed the government to focus on the conservation of its rainforests and protection of its biodiversity.

2.2.4 Environmental Issues

The social and political issues have a deep impact on the environment and subsequently the biodiversity and elephants of Gabon. These issues intermingle to put great pressure upon the country's Ecology. The Smithsonian has identified eight distinct environmental threats on the elephant's habitat (Smithsonian, 2005). These include

1. Habitat degradation
2. Invasive species
3. Bushmeat hunting

4. Imperiled ecological connectivity
5. Forest fragmentation
6. Coastal oil pollution
7. Aquatic system changes
8. Impact of extraction byproducts (Hydrocarbons)

All of these issues demonstrate themselves in and around the Gamba Complex. The forest elephants are of great importance to the Gamba Complex. The elephants in Gabon are a keystone species. They play prominent roles in the ecosystems they inhabit, and their actions affect a wide number of other species.

A recently discovered species, the African Forest Elephant has only just been declared a distinct species from African Savannah Elephants (Black & Hedges, 2004). Due their feral nature, as well as their habitat, it is very difficult to gauge their populations effectively. Many of today's reports are based on partial or inaccurate data from nearly two decades ago (Black & Hedges). To rectify this, new censuses are being conducted throughout Forest Elephants habitats in Africa. These censuses use methods ranging from traditional dung recording (Smithsonian, 2005) to newer more experimental methods, such as genetic tagging (Eggert et al., 2003) and seismic sensors (Wood et al., 2005) in attempts to gain more accurate data on population. The lack of knowledge about elephant populations and ranges compounds the effects of environmental pressures by making it that more difficult to protect them

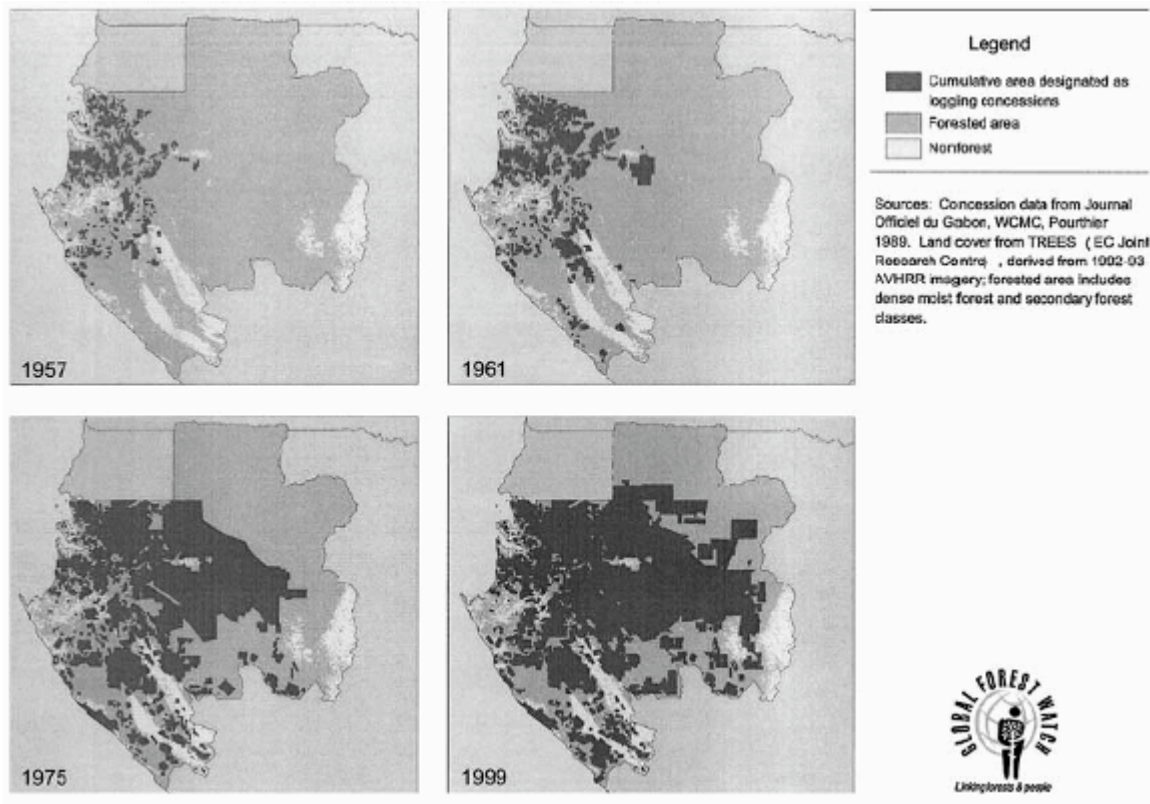


Figure 4: Cumulative Area of Logging Concessions 1957-1999 Gabon

The first pressure is habitat degradation. This is caused by a combination of oil drilling, logging, and subsistence farming, the main culprits being the latter two. Both of these destroy the elephants' habitat, leading to increased exposure to humans. These two are the most land intensive industries in the country and are becoming more and more important as oil resources dwindle. Since 1957 the amount of land in Gabon earmarked as logging concessions has gone up astronomically (see Fig. 4) (Black & Hedges, 2004). This presents real danger to all

the animals living in these areas. Unfortunately farming and logging employ the majority of workers in Gabon and therefore are very important and likely to gain importance as oil production shrinks.

A second threat to Gabon's biodiversity is that of alien invasive species. These are species not native to the area but are brought in from other parts of the world, usually by accident. These species often have no natural predators in an area, and so they thrive, throwing the biodiversity in the area into chaos. Native species will go extinct because of too much competition for food, or from the sudden existence of a foreign predator. Areas where the ecology has already been damaged by other factors such as human encroachment are particularly vulnerable. For instance in the Gamba Complex the little fire ant (*Wasmannia auropunctata*) is seen as a strong potential threat (Smithsonian, 2005). A species originally from the Americas, it has a tendency to eliminate native species of insects as well as attacking and causing damage to the eyes of sea turtles and large mammals.

Also, it is possible that local residents may turn to poaching or the bushmeat trade if other industries fail. Hunting still occurs legally in some areas of the complex where animals are used as a local source of protein. The danger exists if hunting begins supplying the export market. Hunting can quickly reach an unsustainable level and drive animals extinct. Furthermore, the closer that villages move to elephant populations the more likely poaching is to occur (Fay, 1991). Hunting even occurs because the elephants are considered nuisances in some places due to crop raiding (Barnes, 2006). Gabon currently has one of the largest elephant

populations left in Africa - numbering in the tens of thousands. This doesn't mean the population can't be decimated in a short few years if proper steps aren't taken to preserve the elephant's habitat. In the nearby country of Chad, for example, in the past few decades the native elephant population has dwindled from over 300,000 to a scant 10,000 (WCS, 2006).

Of course, human encroachment is still having an impact in Gabon. A recent study of poaching in the northeast of the country found that poaching was becoming more prevalent. The local government has worked with conservation groups to create MIKE. The MIKE Program (Monitoring of the Illegal Killing of Elephants) was created in 1997. The overall goal is to provide information needed to make appropriate management and legal decisions and to develop the institutional capacity for the long-term management of their elephant populations (WCS, 2006). These institutional capacities include educational outreaches to local populations.

Other issues affecting biodiversity in Gabon are those of ecological connectivity and fragmentation. Elephants are an important species in ecological connectivity. Elephants tend to move to and from seasonally available resources within the Gamba Complex. In their travels they spread seeds and have an important impact on the forest. Fragmentation is caused by roads, pipelines and human enclaves that cut across the forests causing divisions in habitats. These barriers vary widely in size but cause divisions in habitats due to animals who avoid them. A recent study done in the complex by analyzing animal dung and its frequency and proximity to various forms of human construction showed an

overwhelming tendency for animals to avoid even infrequently used artificial constructions. Not only does this serve to isolate animal populations but it also affects ecological connectivity preventing the spread of seeds (Smithsonian, 2006).

Shell is one of the largest oil companies operating in Gabon. They have also had one of the longest-running operations, having been drilling in the country for nearly 40 years. As one of the older companies in the country they have one of the longest legacies of disturbing the environment. Various byproducts produced by the drilling shore can deal serious damage to local biodiversity. They have launched several initiatives with the Smithsonian to study biodiversity in the areas in which they operate. This is especially important as Shell looks for ways to disassemble operations with minimal environmental impact. Together the two organizations hope that this work in the Gamba complex can be used to help build awareness of the local elephant populations. It is important to Shell that they minimize the environmental impact of their drilling.

2.3 Environmental Education Guidelines

The North American Association for Environmental Education (NAAEE) was founded in 1971 with the stated goal of “[promoting] excellence in environmental education and [serving] environmental educators for the purpose of achieving environmental literacy in order for present and future generations to benefit from a safe and healthy environment and a better quality of life.” (NAAEE Mission Statement). To this end, the organization publishes a series of peer-

reviewed guidelines for environmental educators to use as a means of evaluating potential or existing environmental education (EE) projects. In our case, we referenced “Nonformal Environmental Education Programs: Guidelines for Excellence” (NEEPG). These guidelines highlight six “key characteristics” which serve as a means of guiding EE project development. Those guidelines which are applicable have been adapted into two general principles that will guide the project:

- The needs of all involved parties are adequately met. In our case, the Smithsonian Institution’s requirements had to be satisfied, along with those of the target audience in Gabon. As the guidelines point out, “the cultural perspectives, needs, and interests of the target audience [will be] identified, understood, accommodated, and addressed...” (NEEPG, p. 9). This was of particular importance in this project given that the target audience is part of a culture that is different from our own.
- The program “is based on clearly delineated, relevant goals and objectives related to the ultimate goal of an environmentally literate citizenry...” (NEEPG, p. 12). Specifically, since we assessed the merit and drawbacks of our means of information delivery, our medium had to be able to both adequately convey the necessary information and be readily accessible by the target audience.

2.4 Existing Products

The concept of tagging animals with satellite transmitters and displaying this information on the web is far from a new. These existing websites were examined both as sources of inspiration for potential design concepts and as possible examples of what to do differently. Two examples of such websites are the Tagging of Pacific Pelagics website, produced by the Census on Marine Life (COML), and the Satellite Mallard Tracking website, produced jointly by the Arkansas Game & Fish Commission and the Mississippi Department of Wildlife, Fisheries & Parks.

A third, stand-alone program was examined along with the websites. The program was developed to teach children about the effects of various environmental factors on fish living in Lake Koronia in Greece. The system that powers the program is fuzzy logic – logic where overly complicated or indiscernible terms are replaced by approximations and relative descriptions – and it proved to be quite a useful means of relaying extremely intricate systems such as the environment.

A fourth website, CARPE (Central African Regional Program for the Environment) Mapper, was also looked at. It was created by the University of Maryland combined with the help of CARPE as well as data from WCS (Wildlife Conservation Society) and the Smithsonian. It was evaluated for its scope of data and the methods in which that data was presented.

Lastly, there is a site produced by the Smithsonian Institution itself, with a focus on Asian elephants. This site was not assessed for any of its software components or graphical interfaces, but rather solely for the kinds of information it conveys to the audience.

2.4.1 Tagging of Pacific Pelagics²

The Tagging of Pacific Pelagics website tracks various kinds of marine life as they move about the Pacific Ocean. The general tracking display concept was very straightforward and simple to understand at first glance. There were dots on the map showing where each animal currently was, and a line on the map indicating where it had traveled lately. All dots and lines were color-coded by species. Moving the mouse over a dot gave more detailed information about that particular animal. The time frame for the tracking data was displayed, as well as the species. There were also two reactive maps next to the main map which zoomed in on the animal's path when its dot was highlighted. (see Fig. 5)

² Tagging of Pacific Pelagics Website: http://las.Pfeg.Noaa.gov/TOPP_recent/index.html

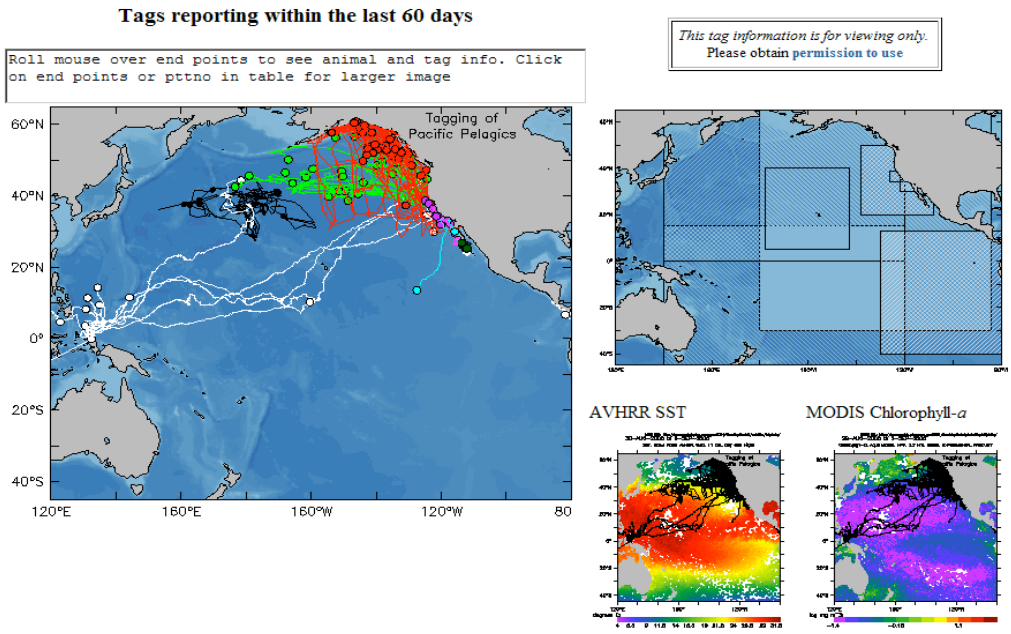


Figure 5: Tagging of Pacific Pelagics Website

The general display format – showing the current location of the animal as well as where it has been recently – seemed very well suited to this project. However, the utility of certain parts of the interface was not entirely clear at first glance. The color-coding system was resolved only by inference. Only upon moving the mouse over a series of like-colored dots did one realized that all paths of a certain color were associated with a certain species. The color-coding concept was very effective, and provided for logical grouping as well resolving the confusion that could inevitably result from having monochrome paths. However, it could have been improved by the addition of a key of some sort beside the map explaining that color X equates to animals of species Y. That would have allowed all necessary

information to be available to the user immediately, with no interaction required beyond that which is necessary to open the website in the first place. The website was also very bare, consisting of little beyond the tracking display. This was most likely by design, rather than negligence, but the website produced by this project contains more biological information about the animals being tracked.

2.4.2 Satellite Mallard Tracking³

The Satellite Mallard Tracking website took a similar approach. A large map was the central element, with small duck icons displaying the location of each duck. The ducks were color-coded by sex, with a key placed directly beside the map (see Fig. 6). By default, all that was displayed was the current location of the ducks. A series of tools above the map allowed the user to interact with it. The user could click to zoom in and out, pan the map, turn on the display of the names or identification numbers of the ducks, and turn on the display of the ducks' flight paths. The map required more interaction than the TOPP map to get the maximum amount of information, specifically in regards to the ducks' flight paths and names/identification numbers. It was also not entirely clear how the buttons at the top function. Some of the buttons were toggle buttons, but it was not immediately clear what will happen when they were pressed. Specifically, it was not immediately clear whether the state displayed in the button was the current state, or the state it would move to when pressed.

³ Satellite Mallard Tracking Website: <http://waterfowl.cast.uark.edu/default.asp>

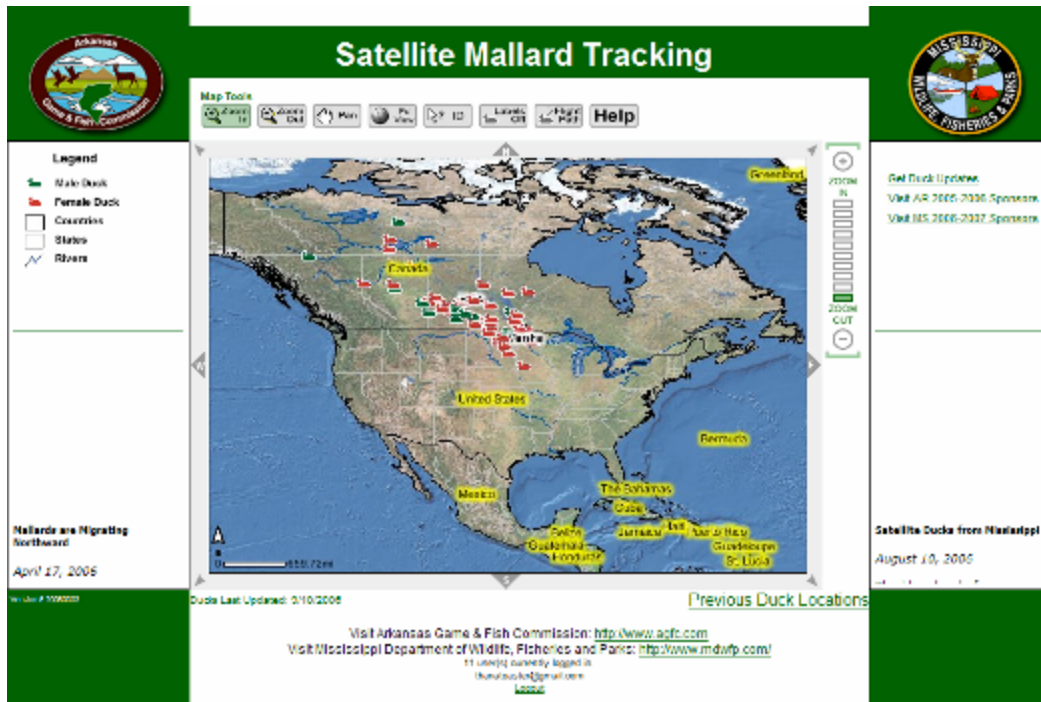


Figure 6: Satellite Mallard Tracking Website

The map aside, the site did convey some information about the ducks. Flanking the map on each side, were two small windows that display what were presumably recent updates on the ducks that the site maintainers wanted users to be aware of. They seemed to consist more of updates on these specific ducks' positions and conditions than they did of general biological information. While this was not necessarily a negative thing in and of itself, we knew our final product would need to contain such general biological information. The major downfall of the site was the manner in which this information was displayed. The text occupied a very small space and scrolled up within that space. There was no way to stop the text from

scrolling, so anyone who wished to read it in its entirety had to wait for it to start scrolling at the beginning again.

2.4.3 Lake Koronia Environmental Stress Program

Aside from satellite tracking data, which is almost always purely informative in nature, there was the potential for a more interactive element to the project as well. Biodiversity being an extremely complicated field consisting of many relationships between different entities, it is something that does not readily lend itself to interactive computer software. The concept of fuzzy logic is perfect for stripping down what would otherwise be an unmanageable system into something that is more readily understood by people who do not necessarily have a vast understanding of the biodiversity field. An example of a program that used such a fuzzy logic system was the Lake Koronia environmental stress program (see Fig. 7). The program was meant to give children a better understanding of how various stressors can affect the fish population in the lake. Its target audience notwithstanding, the program was evaluated on its utility.

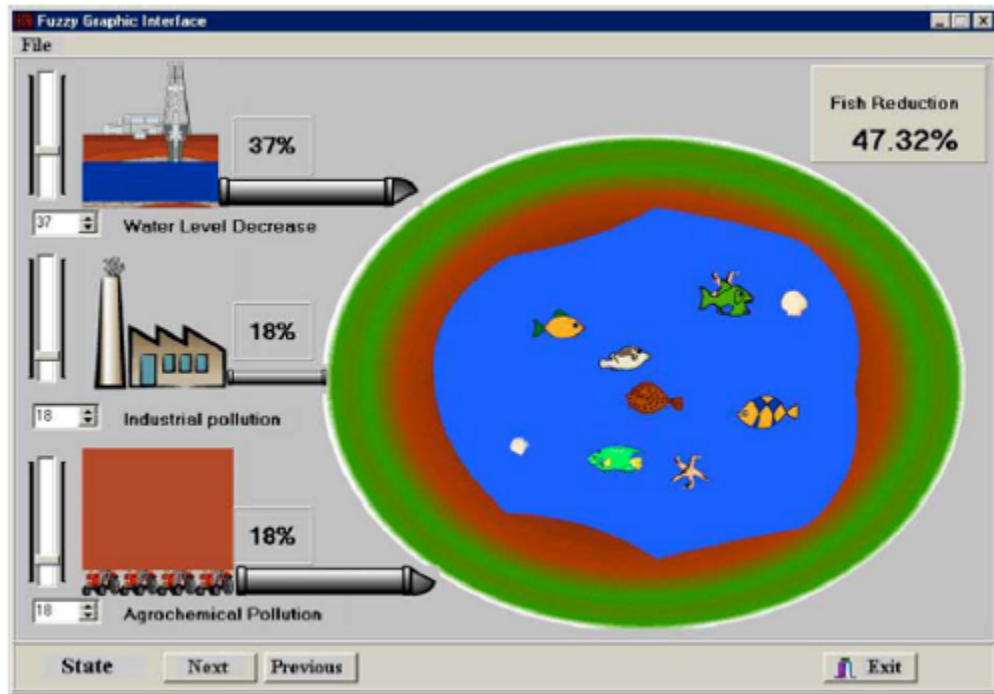


Figure 7: Lake Korinia Environmental Stress Program

The program interface was immediately intuitive and existed only on one level. There were no menus involved, and all the necessary functionality was available at the main screen. Complexity in a program task could wrongly imply complexity in the real world concept it represents, so the limited interface was something to be commended. The sliders were oriented vertically and were percent-based, making them very easy to understand and interact with. Of particular importance here was the lack of words. There were only a few labels that appeared in the program that contained actual words; by and large, everything was graphical in nature. This kind of interface was ideal for projects such as this, where the target

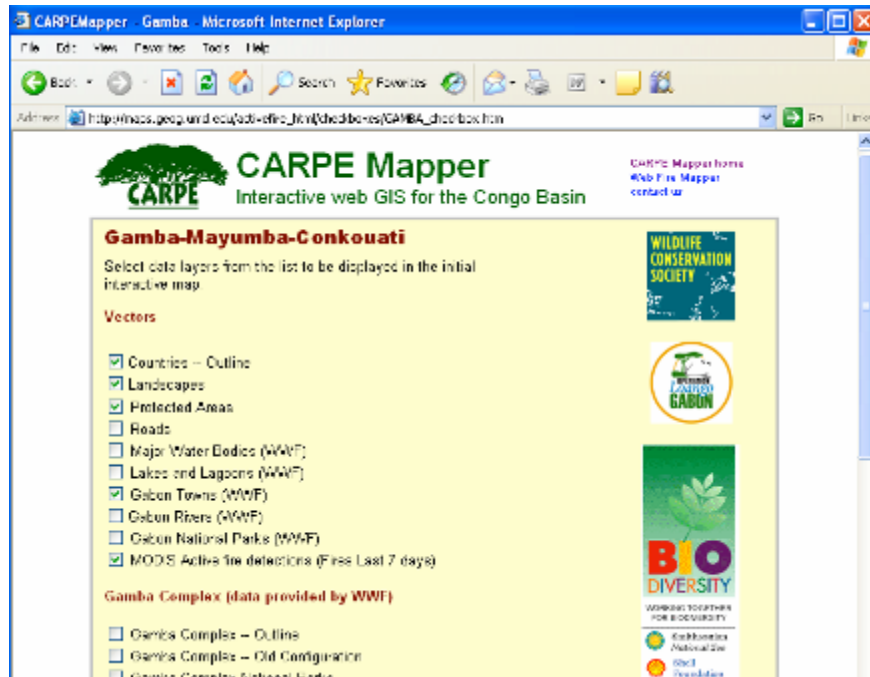


Figure 9: CARPE Mapper Configuration Page

Upon clicking on a park in the map or a link to a park, you find yourself on a configuration page (see Fig. 9). This configuration page contains a many different options including adding general features such as country borders, national park borders and roads that are available for all maps. There is also a configuration page specific to a certain park region. It contains features that may be unique to certain parks such as oil wells and pipelines. There are also pages dealing with the telemetry of elephants tracking data and the user interface allows the ability to inset a landscape mosaic.

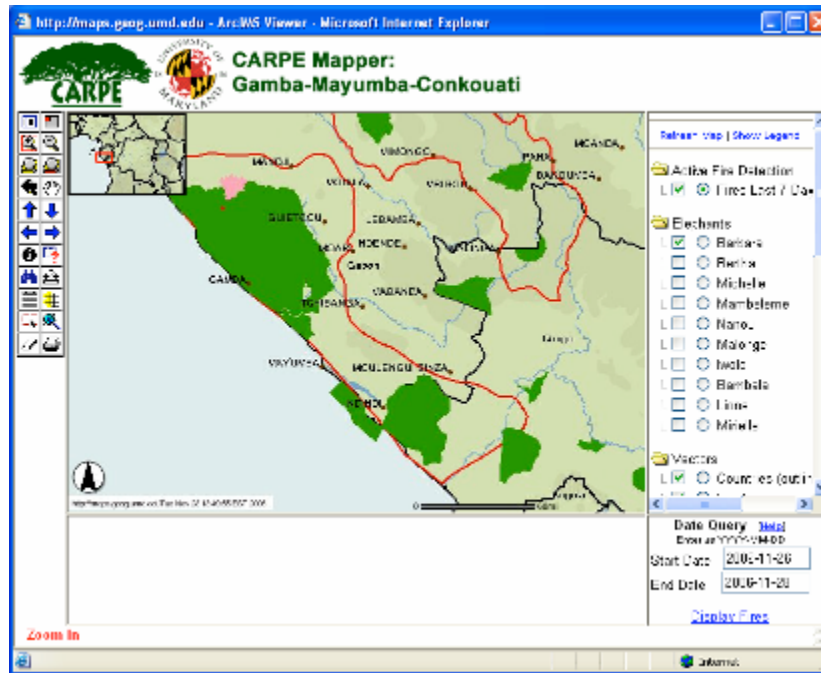


Figure 10: Map on Carpe Mapper Website

Finally upon selecting the items you would wish to see on the map you click open map which opens a map which contains all the data you requested (see Fig. 10). Using your cursor you are given the option to zoom in on an area or move around within an area surrounding the region you selected. There are also tools which allow you to measure vertical distance. Finally there is another tab that allows you to display different information on the map such as different elephant tracking data or if you want to look at logging concessions instead of oil wells.

There are many positives and negatives to be drawn from this website. One of the best features of this website was its all encompassing nature. It has a wealth

of different maps to look at, each containing numerous types of data. This data ranges from elephant tracking data, brushfires, and logging concessions to oil pipelines, roads, and more. The website also had excellent background PDF's which provided a good overview of the specific environmental status and environmental tensions in each regional mapped.

There are also some major drawbacks to this website. Although the mapper seems to have great breadth of information, it is lacking in some areas. Much of the data the maps display have little to no analysis. What little analysis there is exists in PDF's which are difficult to access from the maps. This is poor user interface. Another issue is the lack of a key describing what different sets of data appear on the map. For example, suppose a user selects to have two sets of data displayed on a map, wanting to check elephant movement patterns relative to oil wells. A user is unable to immediately tell the difference between the two on the map. Finally there are times when the site requires unnecessarily high bandwidth, something that is not ideal for slower internet connections, such as would be found in Gabon.

2.4.5 National Zoological Park – Asian Elephants⁵

The Smithsonian has a website in existence about Asian elephants. The website conveys useful information on the home page about their campaign to save the Asian elephants as well as some information regarding the specific elephants living at the National Zoo. It also has links to useful information about elephants

⁵ National Zoological Park - Asian Elephants Website:
<http://nationalzoo.si.edu/Animals/AsianElephants/>

and conservation as well as frequently asked questions about elephants. There is also an “Asian Elephant Cam” that allows people to go online and look at a live feed from the Zoo and watch the elephants. There is a photo gallery where people can see recent pictures of the elephants at the Zoo.



Figure 11: The National Zoo's Website on Asian Elephants

Clicking on the link called “Elephant Trails” sends the reader to another page with more detail about the future hopes of the “Save the Asian Elephants” campaign. On the left-hand menu users will find a link about Conservation and Science; this has information more pertinent to our project. It gives good insight into why scientists are using satellite tracking and what they hope to gain through this research.

2.4.6 Tracking Silver Moon: Animated Map⁶



Figure 12: Animated Map Tracking Silver Moon

From December 2002 to August 2004 the Smithsonian Institution was tracking an Asian elephant by the name of “Silver Moon”. For nineteen months the Smithsonian recorded the latitude and longitude of the tracking collar every few days and put it in a database. This database was later converted into a map of the Alaungdaw Kathapa National Park which shows the area covered by Silver Moon and her herd. The map shows a chronological path of where the elephants traveled.

⁶ National Zoological Park – Tracking Silver Moon:
<http://nationalzoo.si.edu/ConservationAndScience/ConservationGIS/projects/elephants/SilverMoon/animated.cfm>

Also included on this site is the research and articles discussed from the Asian Elephant site mentioned above (2.4.5 National Zoological Park – Asian Elephants). The map does not consistently display itself, but the technology used to create the map was accessible to the team. This served as a base idea for the creation of the teams own tracking map.

2.4.7 Gabon Geographic Information Systems (GIS)⁷

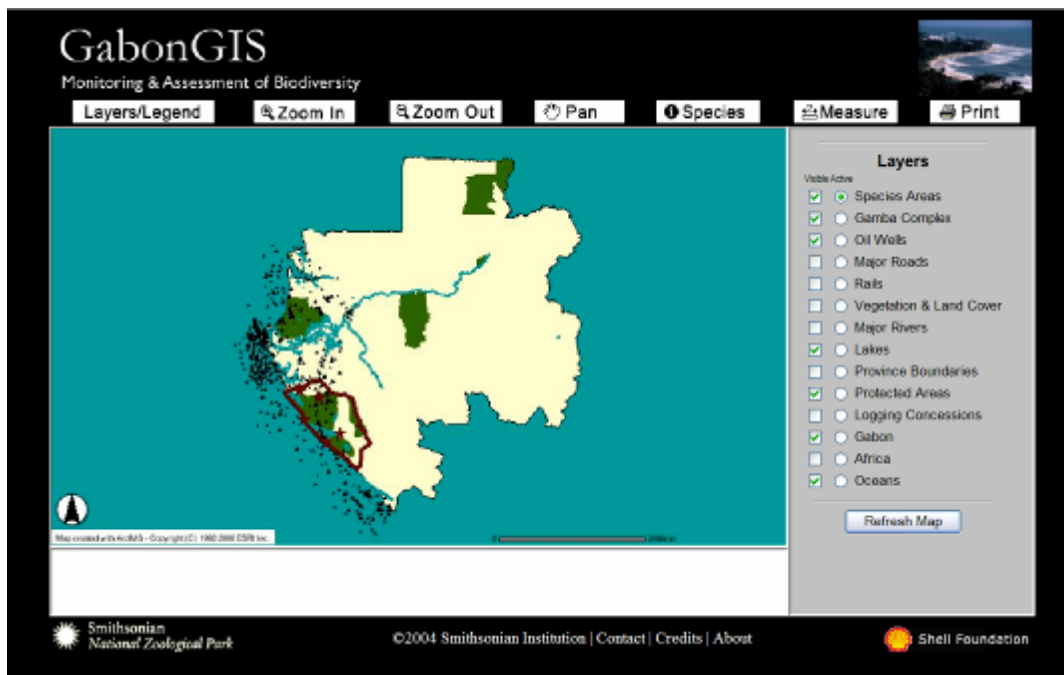


Figure 13: Gabon GIS Map

In order for people to fully understand the value of the research on the biodiversity in Gabon, they must first understand the area in which this research was

⁷ Gabon GIS Website - <http://amazongis.si.edu/website/mab/viewer.htm>

done. The Smithsonian Institution and Shell Foundation put together a website in 2004 which gave people who were curious about Gabon a chance to look at a map of the country and highlight aspects they were interested in.

Some of the areas that could be highlighted were the Gamba Complex, oil wells, major roads, railways, major rivers and lakes, province boundaries, and protected areas. Species' areas were also available to be accented. The main issue with this was that there was no specification as to what species were correlated with the different stars that appeared on the map. Users could zoom in or out on areas of particular interest to get a closer look at wherever it is they were interested in examining. The map also had a very helpful and organized legend that could be referenced when someone had a question as to what a symbol, color, or line meant. This was used as a reference when creating the interactive map of Gamba.

3 METHODOLOGY

This project was intended to create a website that would disseminate research information about biodiversity, gathered by the Smithsonian Institution, to people in designated areas of Gabon. Some of the major components of this website were displaying research done by the Smithsonian Institution on the elephants in Gabon, generating a means through which people could ask questions of the Smithsonian's conservation biologists, making an online display to show elephant tracking data, and creating a gallery where pictures from Gabon can be displayed. In order to meet this goal, we accomplished the following objectives:

1. Identify and Prioritize the Target Audiences
2. Determine the variety and volume of the content to be conveyed
3. Build a website encompassing the Smithsonian Institution's research information
4. Recommend ways of marketing and promoting the website

see Figure 14 below for a comprehensive visual:

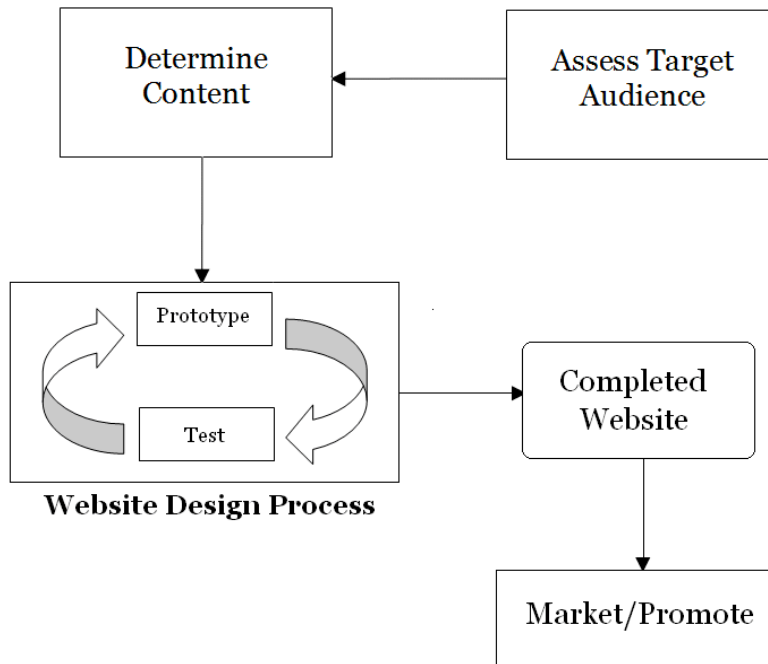


Figure 14: Methodology Flowchart

3.1 Identify and Prioritize the Target Audiences

One of the keys to our project was that we reach the desired target audience. Specifically, we needed to comprehensively understand the group of people that the Smithsonian Institution wants to communicate with. By gaining an understanding about the local culture, we were better able to communicate with them. We established information about the target audience through two main steps: identifying key characteristics of the audience and conducting expert interviews.

3.1.1 Identifying Key Characteristics

There were several main characteristics of the target audience we wanted to establish. We knew that some would play important roles in our developing an

accurate picture of the target audiences. First we took our knowledge of the audience from our preliminary research to develop what we believed would be important factors. These factors involved how well the proposed audience would be able to receive the certain kind of media which we were presenting. The lists of characteristics which we initially wanted to observe were mostly general demographics.

- Residential Location – The location of the audience would play a role in what specific aspects of biodiversity around them they were interested in and what direct impact they can have on it.
- Education – The education level was important in determining the complexity of the site with regards to the information that is most effectively and easily received by the audience
- Employment and socioeconomic status – While it was known that this website was originally intended for Shell employees it was also important to get a handle on what the different employees of Shell would be interested in. It is also important to determine whether they would be able to access the technology required to reach our website.
- Language – The audiences that we hoped to reach with this website speak different languages, mainly French and English.

These characteristics gave us a base by which we could begin investigating more in-depth population information. We conducted this further research from a variety of sources. It mostly consisted of documents describing Gabon, its politics, economy, and people. These documents gave us good information on Gabon's culture and its perspectives. This research included documents ranging from in-depth cultural analysis research papers to general statistical data.

The more research we looked at the more we realized that the audience which was originally perceived as being one unit had several sub-demographics within it. One of our first concerns became the need to learn how much of the website was geared towards the Shell employees as opposed to a more general population. Furthermore, we wanted to find out how various sections of the population felt about the environment and biodiversity. Something else which was brought to our attention was the range of educational backgrounds within the target audience. A primary factor in the different education backgrounds is the variance in the literacy levels. This was discovered after doing more research into the demographics of Gabon and the people employed by Shell. It was also important to note that that appropriateness of the content would vary based on age; we used census data and determined the mean age of the people we were trying to reach. The knowledge gained through this research led us add to the characteristics deemed important in determining the target audience. The characteristics to be added were as follows:

- Age – This became an important factor in developing the appropriateness of our website.
- Perspective –The audience’s perspective and opinion on biodiversity was essential in determining how the content would appear on the website.

We believed many of these characteristics would play conflicting roles. We knew the population could be divided up into countless different groups using these characteristics. It would be impossible to create a different kind of website for every

slight difference in demographics. In order to further condense these groups we sought further advice from a number of field experts.

3.1.2 Expert Interviews

Our next step was to find experts on Gabon and other central African cultures. These experts were people who worked with the Smithsonian and spent a significant amount of time in Gabon. Interviews were conducted via conference call in the Monitoring and Assessing Biodiversity (MAB) office as well as in person. By conducting interviews with people that have been or are presently in Gabon we came to a better understanding about the culture of the people we would be communicating with. We used our previous research to narrow down what we felt were the most important aspects of the target audience to make best use of our time.

As stated earlier we conducted two kinds of interviews: those which were via conference call to experts overseas, and those which were in person with experts at the Smithsonian. These interviews gave us unique information that could be taken in different context.

Interviews with biologists in Gabon took place over conference calls and were often difficult to arrange. These interviews could only be done early in the morning here as the people we were interviewing in Gabon were six hours ahead. Another issue was that we primarily interviewed people who spoke French making the interview process slow at points due to miscommunication. One of the people we interviewed was Annabelle Honorez, the Gamba Project's technical manager. Through inquiring more about Annabelle's personal experience living among our

audience we hoped to gain a better understanding of them. Some of the questions from our interview are below (for more see Appendix B):

- Is there anything you can tell us about the technical capacity of the Gabonese people, and what technology the Shell employees have access to?
- Anything about Internet access levels, general hardware specifications of the computers, etc.?
- How would you quantify the target audience?
- Are children of particular concern?
- Is there any specific target demographic we should be focusing on?
- How aware is each of these groups about the surrounding Biodiversity?
- More specifically, could you describe the demographic of the Shell employees?
- Are the Shell employees mostly local citizens, are they brought in from other regions?

We also talked to people who work in Washington DC in the Smithsonian's MAB department. Their perspective was different than those of researchers still in Gabon. First, we talked to them about the audiences they had originally determined they wanted to reach. Here are some of the types of questions we asked them.

- What is the average level of education of the local population in Gabon?
- How does the local population feel about elephants?
- How aware is the local population of the effects they have on elephant population?
- What is the average level of education of the Shell employees?

After completing our interviews we synthesized what we had just learned with our own research. We discussed the possibility for there to be several groups within that original audience who may be interested in different website features. We also discussed the possibility of groups outside the original audience who may be interested in the website. Believing that we had developed an accurate picture of the audience we began the process of developing content based on their needs. It is

important to note that we continued to look back conducting more bits of research as needed when we felt we had not explored certain aspects of our audience. The final characteristics we decided we were going to have to place the greatest emphasis on were employment, education, and residential location.

3.2 Determining the Content

After determining the key audiences, we determined how much information should be conveyed and how best to convey it. This is something that is taken for granted in many other situations. It is often assumed that the material a website is going to convey is known in advance, and it is simply a matter of going through the process of converting it all into a webpage. That was not the case with this particular project. The Smithsonian Institution possesses a wealth of biodiversity research information. It has been painstakingly collected over the course of many years. Just how much of this information would be used however, and the level at which we will communicate it, had to be established. This was accomplished in three steps:

- **Examining Existing Materials** – This consisted of an initial examination of materials in order to gain a familiarization with Gabon and Biodiversity.

Consulting Smithsonian Researchers – This consisted of interviews with Smithsonian researchers in order to determine the most important aspects of Biodiversity in Gabon.

Reexamining Existing Materials – Using information garnered during our interviews, our team again approached our initial resources with certain criteria of what the website should contain.

3.2.1 Examining Existing Materials

In order to make authoritative decisions about the content of the website we decided that we first must develop our own knowledge about biodiversity. Without a thorough handle on the subject matter we could not properly evaluate what is important enough to be included in the website. To this end we read biodiversity materials from a wide range of sources. Those sources can be divided up roughly into three following categories.

- **General Research Documents** - These are documents that came from a wide range of sources but were primarily from ecological journals. They are made up of information from general sources on biodiversity but include both specific and more general information depending on how thorough they are.
- **Educational Websites** - These are resources on the web which have similar missions to diffuse knowledge but have varying subject matter and intended audiences.
- **Smithsonian Research Documents** - These are papers detailing research conducted specifically by the Smithsonian.

3.2.2 Consulting Smithsonian Institution Researchers

After surveying existing websites materials, Smithsonian Institution researchers were consulted. Based on what has been done by the Smithsonian and other. Smithsonian employees ultimately had the final say in how much information was processed for the website, but left much of the content up to the project team. This information was collected either in the form of formal interviews or through informal colloquial discussions.

The input of Smithsonian Institution researchers working in the field in Gabon, specifically Annabelle Honorez, was also valuable in determining what would be displayed on the website. By consulting with researchers who have experience in Gabon, we developed a more accurate picture of what kinds of services would be most beneficial to people living and working there. For the sake of consistency, the researchers were asked the same two questions:

1. What services should the website offer visitors and what kinds of information should it convey?
2. Of the above, which do you see as the most important aspect of the website and why?

It is worth noting that the results of this particular process were modified several times over the course of the project as the target audience came into clearer focus. Once the audience education level was ascertained, for example, all materials that had qualified for the website up to that point were checked against that education level to be sure they were in compliance. This step allowed us to create

criteria by which we could filter through research papers and websites so as to break them down to only the information we required.

3.2.3 Reexamining Existing Materials

Having spoken with various experts and learned several key facts about the target audience we went about reexamining the wealth of materials we had already looked at. We were able to disregard many materials due to their complexity or lack of relevance to the subject. We outlined key features of the materials which we would use in determining how much content would go into the website:

1. **General Research Papers** - One category of materials we reexamined was classified internally as general research papers. These were research papers on related subjects that were not written by Smithsonian Institution employees. Some of the main things we looked for in these papers were the following:
 - **Recurring Themes** - Themes shared amongst a number of papers indicated importance.
 - **Pressing Information** – Recent data showing a dramatic change over the past few years.
 - **Miscellaneous Data** – Information that wasn't found in Smithsonian texts but appears pressing.

2. **Educational Websites** - Websites were evaluated through different criteria.

They were evaluated for their ease of use and methods of presenting information and the similarity of contents to ours. Websites were examined on a basis of:

- **Perceived Similarities** – Similarities between the examined website and the objectives of our proposed project website.
- **Web Formatting** – How the constraints in formatting were dealt with in regard to content.
- **Depth** – How in depth other websites went with all their information as a gauge of how internet audiences perceived information.

3. **Smithsonian Research Documents** – Smithsonian research documents were by far the most important. As they contained very thorough records of all the information which was conducted in Gabon, they were the most important to our project. We went through these on the following basis.

- **Recurring Themes** – We examined reoccurring themes in these documents assuming those that occurred in many or all the documents should be key highlights in the website.
- **Elephant Data** – Data dealing specifically with elephants, an important keystone species of Gamba, was of particular interest to us as they were to be the primary focus of the website.

By delving deeply into the source materials, learning the nature of our audience, and educating ourselves about issues of biodiversity we developed a good sense of what content should be on the site. Although this process started long before website development began, it continued well into website construction. As we came to grips with what we could and could not do, the website changed further. Also, the nature of some of the content changed as we began adding more features to the website.

3.3 Building a Website

The primary deliverable produced by the project is a website. As the first step in the construction of the website, the team had to address the various logistical and regulatory concerns that would be involved in creating the website. After this, a conceptual structure of the website and its various pages could be determined. With both of these in place, the team could begin building the individual pages.

3.3.1 Logistics and Regulations

Due to the fact that this website is not an independent undertaking, but rather something that has been contracted by the Smithsonian Institution, certain logistical and regulatory factors had to be determined before construction on any major components of the site could begin. To this end, we interviewed Rob Madill, one of the designers and maintainers of the National Zoological Park's website. The following issues were of primary concern during this meeting:

- Where would the website be physically hosted?

- What kinds of software were available for use on the website server?
- How much space was available on the server for things such as pictures?
- What kinds of limits are there on processing-intensive applications?
- Would the website have to be contained entirely within the National Zoo's site?
- What standards and regulations does the National Zoo have regarding formatting and content of web pages?

3.3.2 Conceptual Website Structure and Requirements

Knowing what regulations and restrictions would be imposed upon the website, the team could then proceed to plan out what kinds of pages would be included. The original requirements put forth by the Smithsonian were reviewed to determine what kinds of features the site would need. The team could then overlay the logistical and regulatory requirements on top of that, and thereby determine what kinds of pages would best meet the Smithsonian's requirements while staying within the boundaries put forth by the National Zoo's website department. Once each individual component has been identified and its requirements listed, the team could plan out how they would link to each other within the site, and then begin developing them.

3.3.3 Website Design Process

For the construction of the various components of this website, an iterative design process was used. The goal of an iterative design process is to force the

product – a website, in this case - to adhere closely to the initial requirements throughout development. The process moves back and forth between two stages until something has been produced which meets, as best as is physically possible, the initial requirements. The stages we used for our design process are as follows:

1. **Prototype** – First, a prototype had to be created based on the requirements and any existing prototypes. Early prototypes were simple sketches or computer generated mock-ups of what the various parts of the website might look like. Later in the process, partially and eventually fully functional prototypes were produced as the focus shifted from general site structure to actual navigation mechanics and the functionality of certain specific features.
2. **Test** – The prototype produced in step one would then be checked against the initial requirements for one or more of the site’s components. The goal of this step is to determine which of the requirements the prototype currently meets, and exactly where and how it could be improved to better meet the others. This testing and analysis informs the creation of the next prototype in the next iteration of the process.

There are two levels of concern in the testing phase. First is whether or not the website would be acceptable to a general audience. Concerns in this area are generally related to things such as page layout, and the amount of work required by the user to find a given part of the page. To aid in this

part of the process, we used as a reference the US Department of Health and Human Services' "Research-Based Web Design & Usability Guidelines."

This book provides a long list of guidelines for website developers, all of which are ranked by their importance to the finished product and the amount of research backing them up.

After the page has been deemed acceptable by very general standards, its actual content must be checked against the requirements determined from the target audience assessment. Is the level of language used in this section of the website acceptable given the education level of its intended audience? Are there any specific terms used in the website that might have connotations to the target audience that are different from our own? Will the website display properly on the kinds of computers the target audience will be using to access the page? After these questions are answered, their results can then be examined. If all of the requirements were fully met, then the prototype can be deemed successful and the process halts. However, if there is still room for improvement, then the process starts over and a new prototype is created.

3.3.4 Presenting the Website for Review

At various points throughout the construction of the website, the team presented the website to several different audiences to gather their feedback on various aspects of it. This occurred first on November 15th, when the team presented the website to members of the Center for Conservation, Education and

Sustainability. The team presented screenshots of various components of the website and discussed potential features and the presented components with members of the Center.

Later, during the week of December 3rd, Alfonso Alonso presented screenshots of every major component of the website as they would appear were the site to be live. Several presentations were given on behalf of the team to various groups of Shell employees and other people in Gabon.

After each round of presentation and feedback, the team reassessed those aspects of the website that were discussed to determine if any changes needed to be made.

3.4 Marketing the Website

After completing the website, the team began exploring ways to promote it and market it to as wide an audience as possible. The goal of this step is to ensure that all the key audiences identified in the target audience assessment are made sufficiently aware of the existence of the website. The process of promoting the website was broken down into two basic steps:

1. **Identify an Audience** – The first step in promoting the website is identifying a target audience, or a segment of an audience, to promote the website to. This was handled in a manner similar to the first step of identifying the target audience, and as such many of the results were carried

over to serve as a base for this step. Average age and education level of the group is of particular concern. Since a website's audience is often an international one, native language was also a concern.

2. **Determine a Marketing Strategy** – After learning all relevant facts about the intended audience, a marketing strategy can be devised to effectively promote the website to that particular group. Strategies could range from older methods such as radio commercials and fliers to newer ones such as email. Ultimately, the resulting marketing strategy should make use of the media the audience has the most consistent access to.

4 RESULTS AND ANALYSIS

4.1 Identify and Prioritize the Target Audience

When creating a website the most important factor to take into consideration is who the website is intended to reach. Through our background research and interviews with experts, who worked with the Smithsonian and spent a significant amount of time in Gabon, we were able to discern several important facts about our target audiences. One of the most important facts we learned about our audiences is that it contained several different demographics. It was through analysis of the audiences' education, employment, and location combined with objectives given to us by the Smithsonian that we later determined the content. The final characteristics we decided we were going to place the greatest emphasis on were employment, education, and residential location.

First we divided audiences by employment. Our sources identified Shell employees as a priority. We took the larger group of Shell employees and narrowed that group down into two smaller groups of specialists and non-specialists. This assignment was made with regards to their function within the Shell organization. The specialists are people who are more involved in the technical aspects of Shell's operations while the non-specialists make up the rest of the Shell family. Then we took into account the general population. We prioritized these audiences based on how they would be able to utilize the proposed content. Shell employees in Gabon are likely to have pictures of things they have seen and have specific questions about

those pictures. A person from the general population who has never been to Africa would not be posting pictures they have taken of African wildlife.

We then sorted the target population by their basic level of education. The Smithsonian requested that we use the site as a method to present the wealth of research data which they have accumulated. Much of this data is very technical and far beyond the comprehension of laymen. The site needed to have simple language so people who had a limited education could understand it. Yet at the same time it would need to appeal to a highly educated group of post doctorates. Through our research we were able to divide our population into 4 education levels. First are the highly educated doctorates. Next are families and friends of highly educated population, who may have a good knowledge of biodiversity but are not as interested in all the details. Then there is the average person who has a reasonably good education and is just casually interested in the wildlife. Finally, there are the school kids who are just learning about the environment and biodiversity for the first time. We attempted to reach all these levels to varying degrees with the website.

After interviewing experts in both Washington DC and Gabon and taking into account the results gathered from researching the audience, the group established that there are four distinct demographics that the website is being created for. The four key groups are: Shell employees who are specialists in the field and their spouses, Shell employees who are not biodiversity specialists, citizens in the areas of research, and finally people all over the world. Each group has different education levels as well as specific interests pertaining to the research being done.

These groups are also set apart by their location.

- **Shell's Specialists and their Spouses in Gabon:** University education or some sort of training in a specific field of study relating to biodiversity. The specialists are interested in more specific parts of the research that they may find useful for their own field and are the most likely to understand the more technical aspects of the conclusions drawn by the MAB conservation biologists. The spouses are likely to be less interested in the more technical aspects of the research; however they will be able to understand the scientific terms etc.
- **Shell Non-Specialists in Gabon:** Education levels vary most with this group. The information this group will most likely be interested in will be less technically oriented, but more broad based information.
- **Local Citizens of Gabon:** Within this group, the main audience is teenagers and children since they will be the most interested. This population is likely to have the smallest amount of scientific knowledge. The information they will be most concerned about will be how they are being affected by biodiversity and how it pertains to their everyday life. They are also likely to have the most questions for the Smithsonian's conservation biologists.

- **Worldwide Audience:** This group is the world wide audience of people who have a passing interest in biodiversity so they have looked up websites such as this. Due to their location they may not be able to utilize certain aspects of the website but may be interested in others. Their education levels will also vary with some people being able to understand the more technical aspects and not others.

Finally we sorted the audience priority by their location relative to the research. We knew that features, such as picture taking, were only useful for those who were living in Gabon. Even among those living in Gabon many of the animals they will be photographing have limited habitats. In the case of location we divided the population up into three segments. First priority was given to those who lived in the Gamba Complex and other reserves in Gabon. Secondly are those who live in Gabon in general. They may encounter interesting animals on rare occasions, then snap a picture and want to find out more about the animal and then investigate it using the website. Finally the general worldwide audience is the third group. These are the people that simply have an interest in biodiversity or a specific animal.

The determined audiences can also be visualized by the following figure:

		Employment	
		Shell	Other
Scientific Knowledge	High	Shell Specialists	Worldwide Audience
	Medium	Shell Non-Specialists	
	Low	Local Citizens	
		Gabon	Other
		Location	

Figure 15: Target Audience Chart

While trying to better understand the audience in order to make a website that would be beneficial, we came upon other issues that required consideration. The first and foremost was the need for the website to be bilingual. With the highest priority audience being in Gabon, whose primary language is French, the website needs to have French and English equivalents. The website had to be plain enough language for anyone to be able to understand while still retaining an air of scientific importance. Another area of concern included people’s access to the appropriate technologies. As implied with the project being a website, it will require people to have access to a computer that is on the internet.

4.2 Determining the Variety and Volume of Content

It was important for our project that we hone the content specifically to our audience. To that end we reviewed information from sources including research data the Smithsonian collected, independent websites and, on a wider scale, general biodiversity data. We analyzed this information in several different ways. First we reviewed information to gain a general competency in it. We then sought expert opinion on audience and sponsor needs. Finally, we went and reviewed the material we previously collected, judging it by criteria developed through the previous steps.

Using these criteria we were then able to separate a huge volume of content into far more limited but still succinct messages.

We asked the Gabon experts two main questions:

1. What services should the website offer visitors and what kinds of information should it convey?
2. Of the above, which do you see as the most important aspect of the website and why?

There were a wide range of responses given to us. All that were given though seemed to feature recurring themes. (See Appendix B, and Appendix C) First, the site must be interactive and include ways to communicate with a question and answers section, and the ability for people living in the Gamba Complex to post pictures. Second, the website must approach material of biodiversity in an understandable way. It was most important, we deduced, that we make the website interactive and serve as a tool of communication. This involved utilizing the web gallery and ability to ask questions about local diversity to their greatest effect.

4.2.1 General Biodiversity Research Documents

An important resource for us in our search for the proper website content was derived from general research documents. These are research papers on related subjects that are not written by Smithsonian Institution employees. We examined these papers based on the following criteria:

- **Recurring Themes** - Themes shared amongst a number of papers indicated importance
- **Pressing Information** – Recent data showing a dramatic change over the past few years
- **Miscellaneous Data** – Tidbits of information that weren't found in Smithsonian texts but appear pressing.

The general research papers we used were good resources but often offered data that was not always as recent as Smithsonian documents. (See Appendix F for full list) They varied greatly in type ranging from simple encyclopedia articles to lengthy biodiversity journals. (An example of the review we did for these papers is below. For more reviews see Appendix G)

Review of “An Estimate of the Numbers of Forest Elephants in Gabon” by Barnes et.al

Overview: This document outlined the lack of accurate data on forest elephant populations, many estimates of which stemmed back to unsubstantiated estimates of

the early 1980s. Early estimates guessed 300,000 a million elephants living in forest areas of equatorial Africa. The researchers used a survey method which stratified the forest according to human population distribution. Then the researchers recorded the amount of dung within each area. The study estimated that 61,800 +/- 20,000 elephants live in Gabon. This leaves it with one of the largest remaining elephant populations. Unfortunately, this document is over a decade old and therefore possesses somewhat dated information.

- **Themes-** This document presented themes of the importance of accurate population measurement in order to save the elephant populations but doesn't mention the importance of the elephants themselves to the local ecology.
- **Pressing Data-** Data such as Gabon possessing the second largest elephant population in Central Africa and one of the largest in Africa as a whole are all significant
- **Miscellaneous data-** Provided information on when previous population tracking surveys had been conducted and how they were done.

Conclusion- This document provided good background knowledge of the history of elephant tracking and how inaccurate the data has been until the last decade or so. Of course the document is rather dated leading to an inability to rely on it. It was written before forest elephants were defined as a species and also refers to the country containing the largest elephant population as Zaire, a country which no longer exists.

Recurring themes in biodiversity were much harder to pick up than in Smithsonian documents, as these papers were often ambiguous and disconnected from one another. These resources were still valuable, however. They offered general and broader data about biodiversity and species. This data was inserted as needed in the website where the Smithsonian documents fell short. They were also used to fill small holes in information that some Smithsonian documents left. Finally we scanned them for comparisons of how similar nations in the area of Gabon have either combated or succumbed to the threats of biodiversity.

4.2.2 Educational Websites

Websites were evaluated through different criteria than documents. They were evaluated by their ease of use and methods of presenting information and their contents similarity to ours. Websites were examined on a basis of:

- **Perceived Similarities** – Similarities between the examined website and the objectives of our proposed project website.
- **Web Formatting** – How the constraints in formatting were dealt with in regard to content.
- **Depth** – How in depth other websites went with all their information as a gauge of how internet audiences perceived information.

Websites were very important to our methodology but in a very different way. We examined many websites and found several that seemed to have objectives that were similar to ours. We looked at specific features that websites contained and

asked ourselves how well our information would suit them. An example of some of the websites we looked at.

- **GIS Maps** – We examined many mapping websites in order to get a grasp of the way in which to best display our data. Some of the most helpful sites were.
 - University of Maryland (2006) CARPE Mapper
<http://maps.geog.umd.edu/carpemapper/>
 - Smithsonian Silver Moon Website
<http://nationalzoo.si.edu/ConservationAndScience/ConservationGIS/projects/elephants/SilverMoon/animated.cfm>
 - Tagging of Pacific Palegics
<http://waterfowl.cast.uark.edu/default.asp>

- **FAQ** - Examples of FAQ's on other biodiversity websites giving us an idea of what to present in our FAQ
 - Smithsonian MAB FAQ
<http://nationalzoo.si.edu/ConservationAndScience/MAB/watisbio.cfm>

The team also discovered formatting constraints. We knew that we would need to reduce much of our content. Keeping it simple is important even for just the reason that the same amount of text doesn't fit on a web page as it does a normal text document. In examining these pages, we also looked at how people read web pages and tailored our content subjects so there was not too much information on a single subject. This led us to have lots of breaks in paragraphs. We discovered through examining websites that more paragraph breaks allow us to keep the reader's attention. Some of this information was also derived from the Smithsonian's own

web resources which presented us with many of these rules of thumb to apply to web pages. (An example of a web page review is below, for more see Appendix H)

Satellite Mallard Tracking by Arkansas Game & Fish Commission; Mississippi Department of Wildlife, Fisheries & Parks
"<http://waterfowl.cast.uark.edu/default.asp>"

Overview: The Satellite Mallard Tracking website was produced jointly by the Arkansas Game & Fish Commission and the Mississippi Department of Wildlife, Fisheries & Parks to help track mallard populations. A large map was the central element, with small duck icons displaying the location of each duck. The ducks were color-coded by sex, with a key placed directly beside the map. By default, all that was displayed was the current location of the ducks. A series of tools above the map allowed the user to interact with it. The user could click to zoom in and out, pan the map, turn on the display of the names or identification numbers of the ducks, and turn on the display of the ducks' flight paths. The map required more interaction than the map to get the maximum amount of information, specifically in regards to the ducks' flight paths and names/identification numbers.

- **Perceived Similarities** – The site contained not only a map as ours does but also contained limited biological information on the ducks.
- **Web Formatting** – The major downfall of the site was the manner in which this information was displayed. The text occupied a very small space and scrolled up within that space. There was no way to

stop the text from scrolling, so anyone who wished to read it in its entirety had to wait for it to start scrolling at the beginning again.

- **Depth** – The site did convey some information about the ducks. Flanking the map on each side, were two small windows that displayed what were presumably recent updates on the ducks that the site maintainers wanted users to be aware of. They seemed to consist more of updates on these specific ducks' positions and conditions than they did of general biological information. While this was not necessarily a negative thing in and of itself, we knew our final product would need to contain such general biological information.

Summary: This site was a good example of the tracking map which our website would contain. The site had several drawbacks in its lack of depth and its user interface.

4.2.3 Smithsonian Biodiversity Research Documents

Smithsonian research documents were by far the most important to the development of the content. They contained very thorough records of all the research conducted in Gabon, as such they were extremely important to our project. We developed the following criteria to review these documents:

- **Recurring Themes** – We examined recurring themes in these documents assuming those that occurred in many or all the documents should be key highlights in the website

- **Elephant Data** – Data dealing specifically with elephants was of particular interest to us as they were to be one of the primary focuses of the website.

The Smithsonian documents were without a doubt the most useful because they were so project specific. We were given access to numerous documents which focused on Gabon and research in that country. An example of a review we conducted can be found below, for more see Appendix I.

Review of “The Gamba Complex of Protected Areas: An Illustration of Gabon’s Biodiversity” by the Smithsonian Institution

Overview- Document provided an excellent background of the situation of the Gamba Complex. It identifies the various tensions which currently exist within the Complex as well as giving an overview of all the major research sites. Finally the document gives a very general outline of the research that has been conducted in Gabon. It does this by organism type and gives conclusions outlining the scope of work done and work that is to come.

- **Themes** – The need to learn more about the biodiversity of the Gamba Complex is a theme in this document. It also outlines the tremendous biodiversity that exists in the Complex. Finally it outlines the Smithsonian’s current objectives in Gamba.
- **Elephant Data** – Elephants are only given a passing reference in this general paper.

Conclusion- An excellent intro paper, this document establishes tensions and pressures of the Gamba complex with excellent authority. It outlines major players as well as defines major objectives, sites of operation and finally major areas of research. It was very helpful in developing parts of the website such as the interactive map which required general descriptions of locations in Gamba.

After reading through a large volume of those documents we began seeing one main recurring theme involving biodiversity. The more general of these papers spoke of eight environmental pressures which they referred to as Biodiversity Threats.

1. Habitat degradation
2. Alien invasive species
3. Bushmeat hunting
4. Imperiled ecological connectivity
5. Forest fragmentation
6. Coastal oil pollution
7. Aquatic system changes
8. Impact of extraction byproducts (Hydrocarbons)

These threats were a main recurring theme among the document. They were examples of things which are signs of damage to biodiversity of an ecosystem.

Nearly all the Smithsonian documents mention some or all of these threats. These were of the utmost importance as many if not all could be transferred to any

ecosystem. As a result we decided to outline them in the website and give truncated information about each one. For each indicator we included a short description of how it is affecting the Gamba complex and what is and can be done about it. (Below is an example of the information written on the site for bushmeat.)

Bushmeat

The bushmeat trade has been one of the most severe pressures on biodiversity world wide. Bushmeat is meat of any native species which is hunted from the jungle. It is a common practice and has provided the people of the Gamba Complex food for generations. Hunting of native animals can occur and pose no threat to animal communities when its scope is limited. Issues arise when native animals are hunted in a nonsustainable way. A large market for bushmeat has developed in Africa and animals such as elephants and primates are hunted to be shipped off to large cities where they can fetch high prices.

The bushmeat trade puts heavy stresses on biodiversity. In several parts of the world, some species have been hunted to local extinction. Their loss reverberates into the food chain allowing other animal populations to grow without predators or vice versa predators might lose their only food source. This can lead to a collapse in the ecosystem affecting unique species and limiting biodiversity. Bushmeat hunting is compounded by the increase access gained when roads are made with no restrictions and habitat loss.

The main ways of limiting the bushmeat trade within the Gamba Complex is awareness and monitoring. Increasing awareness among people who depend on bushmeat to supplement their diet will encourage responsible hunting. An increase in monitoring prevents poachers who live outside the region from entering the complex, ensuring the animals stay safe and protected.

Also included in the Smithsonian resources is a list of animals which exist in the complex. This set an example of the amazing biodiversity within the complex, with a short description about each species and how it interacts with others. This would help to prove that each animal is integral in the vast chain that is biodiversity. Below is an example of the information the website contains about elephants.

African Forest Elephant

Elephants are one of the most amazing species living on the planet today. They are important to their natural habitats by being a keystone species. Keystone species are species whose very presence contributes to a diversity of life and whose loss could lead to the extinction of other forms of life. Elephants can serve their habitats through the demolishing of trees which allow more undergrowth for smaller animals to feed on. They also are instrumental in the spread of seeds for many plants, making them important contributors to their dynamic environments.

Unfortunately elephants are one of the most threatened species on the planet. They are hunted in many places for their tusks (ivory), and for their meat. Their habitat has shrunk greatly as a result of humans and their numbers have been cut in half in just the past 30 years.

The numbers of each species (African and Asian) were already thought to be low, and recent genetic discoveries indicate African Elephants should be divided into two species, African Forest Elephants and African Savannah Elephants. This presents an opportunity to help these species thrive; we can now learn about how the species are different and how their habitats reflect this.

Of course information about the elephants was slightly more extensive in other places going into seasonal movements, effects of man and so on.

4.2.4 Final Content Review

Before all our final results were able to be posted onto the website they were reviewed by advisors in order to do two things. First, cut them down into exactly the scope of information the Smithsonian wanted to convey. This resulted in dropping three biodiversity threats. This limited the threats we featured on our website to.

1. Habitat degradation
2. Alien invasive Species
3. Bushmeat hunting
4. Imperiled ecological connectivity
5. Forest fragmentation

The Smithsonian felt that the other three were not as critical as the other threats. Also the Smithsonian had done less research on the three having not focused on them. The second thing the review process accomplished was to make eliminate all the statements in the site that might seem culturally offensive to either the Gabonese people or the Smithsonian's partners in their Gamba research.

It is important to note that in addition to the above results about content we also developed several aspects of the content with regard to the audience we had previously identified. Firstly most of our audience speaks if not is only able to speak French. The website would need to be done in two languages, French and English. Therefore considerations had to be made keeping the language simple so as to facilitate easy translation. A second reason to keep the language simple was to make

the website easy to understand by a relatively low education level that we determined that we might encounter. In this way the nature of the audience had a hand in what would be presented in the website.

4.3 Building the Website

4.3.1 Logistics and Regulations

After meeting with Rob Madill of the National Zoo's website department, many important logistical and regulatory concerns were settled. The team learned that, due to internal Smithsonian Institution policies, the website would have to be hosted within the National Zoo's own website. The team also learned that there were certain standardized tools they would be expected to use while developing the site – namely Adobe Dreamweaver and Adobe ColdFusion. Processing time concerns were also discussed with regard to some of the more computationally intensive features the team had wanted to include, specifically for the question and answer and picture submission parts of the site. For minutes of this interview, please see Appendix D.

As a result of this meeting, the following areas of the website design process were affected:

- **Overall Site Layout** – As a matter of policy, the Smithsonian Institution's National Zoological Park (of which the Monitoring & Assessment of Biodiversity Program is a part) strongly encourages all websites made by its

various divisions to be contained within its own website. This means that the general structure of the page itself – which encompasses things such as the navigation links at the top of the page, the color scheme and various content regulations – was determined in advance. Having such a framework available in advance allowed us to bypass the step of designing a page layout, which can be a fairly time-consuming process.

- **Tools Used in Construction** – By virtue of being hosted on the National Zoo’s website servers and using their site layout, several decisions pertaining to third-party tools were also determined in advance. Originally, we had planned to use PHP (Hypertext Preprocessor) for the server-side processing, and simply write the HTML for the website with a standard text editor such as Notepad. However, after meeting with the National Zoo’s website coordinator, Rob Madill, we realized that the use of these tools was not possible given the website server’s configuration. Instead, the team was required to use ColdFusion for server-side processing, and Dreamweaver for the development of the HTML for the individual pages.
- **Site Features** – Certain site features also had to be reworked from the team’s original plans due to the fact that the website would be hosted as a part of the larger National Zoo website and as such would share the same servers. Originally, the process of uploading pictures to the website, applying

web-friendly formatting and ultimately displaying them in a gallery on the site was intended to be largely automated. Forms would be created to allow users to upload the picture to the website, where it would await approval from Smithsonian employees. Upon approval (which would be handled through a web browser front-end) Smithsonian employees could place pictures into any number of customizable categories, and they would then automatically appear on the website. Additionally, the use of a bulletin board application for the questions and answers section of the website was planned. Both of these services had to be reworked and handled in different ways so as to not put too much stress on the website's server.

With these limitations known, the team then progressed on to finalize a conceptual structure for the website, from which each individual component would be derived.

4.3.2 Conceptual Website Structure

After reexamining the Smithsonian Institution's original requirements (see Appendix A) and meeting with Ann Henderson and Alfonso Alonso at the MAB office, the team determined the website would need two distinct halves: an informative segment, and an interactive segment. Every major component of the website falls into one of these two categories.

4.3.2.1 Informative Segment

The informative segment comprises the bulk of the raw content on the website. It is purely one-directional in nature, with the website communicating information about various aspects of biodiversity in Gabon to the user. Individual pages have been created for specific subjects related to biodiversity, such as the five major threats to biodiversity and African forest elephants. Also falling in this section of the site is the elephant satellite tracking data display, which is more interactive than some of the other purely informational pages, but given that there is no actual bi-directional communication, it is considered an informative component.

- **Elephant Satellite Tracking Data Display** – The satellite tracking data display had to contain a means of displaying points gathered from satellite tracking collars that had been placed on four elephants in Gabon. While no further requirements were given to the team by the Smithsonian, the team concluded, after examining several other tracking displays, that this particular feature should take a minimalist approach and display only as much information as is necessary to communicate the tracking points. The Gabon GIS site, for example (see section 3.4.6) had a plethora of options the user could choose from before actually displaying anything. Given that this display focuses solely on the elephant tracking data, such a comprehensive set of options was deemed unnecessary and would burden the user by forcing them to make choices about things that were not directly related to

the goal of the display.

- **Threats to Biodiversity** – The five major threats to biodiversity are a subject that is emphasized heavily in many Smithsonian research documents on Gabon. Being that so much of the information available on the threats is contained in technical research papers, the team must take special care to ensure that the language used in this particular page on the website is comprehensible by a wide audience.
- **African Forest Elephants** – A large amount of MAB's work in Gabon focuses on African Forest Elephants. This is a relatively unknown species of elephant that was only recently discovered to be a distinct species from the more widely known African Savannah Elephant. As such, this page should focus on clarifying the differences between African Forest Elephants and African Savannah Elephants, and to a lesser extent, Asian Elephants.
- **Research Library** – The research library section of the site must contain many research documents related to Gabonese biodiversity. These documents should be converted to PDF for easy viewing on virtually any computer. By its nature, this section is strongly connected to some of the general information pages – specifically the biodiversity threat and forest elephant pages. As such, there should be obvious links from these more

general pages to their associated sections in the research library, as well as a central repository page for all the research documents.

- **Interactive Map of Gamba** – The site should also contain an interactive map of the Gamba complex. The map should have some way of conveying descriptions of the four main regions where MAB is operating within the Gamba complex: the Loango and Moukalaba-Doudou National Parks, the town of Gamba, and the Rabi protected area. After meeting with Ann Henderson, it was also determined that this would be the best place in the website to integrate personal testimonials from people in Gabon about their work there.
- **Species of Gabon List** – While elephants are an important focus of the website, they are not the only one; and Gabon has a wealth of other species that should be represented on the website. This page should contain pictures and very brief descriptions of a selected group of other species in Gabon provided by Ann Henderson.

4.3.2.2 Interactive Segment

The interactive segment of the site has less in the way of raw content compared to the informative segment. Its components are bi-directional in nature, with the website serving as a medium through which Smithsonian Institution

employees can communicate back and forth with the site's users. This segment of the site has two major components:

- **Picture Gallery** – Generally speaking, picture galleries are an informative component on most websites. The people hosting the website put up pictures for the site's users to look at, and the communication ends there. In this website, however, a higher level of interaction with the users was desired. Aside from the standard feature of displaying pictures, the picture gallery developed for this website also had to have a mechanic that allowed users to submit pictures to the Smithsonian Institution which might eventually be placed on the website. After meeting with Rob Madill in the web development office, the team also realized that due to hardware restrictions, the pictures could not be uploaded directly to the server hosting the website.
- **Questions and Answers** – As with the picture gallery, many other websites have some sort of "Questions and Answers" or "Frequently Asked Questions" component. Website developers attempt to anticipate questions people visiting the site may have, and provide easy access to the answers. However, the Smithsonian Institution requested a deeper level of communication than is normally present in this sort of feature. Along with looking at current frequently asked questions, users needed to have a way to ask questions of their own if their question was unanswered. Due to the

potential time zone differences, the team decided asynchronous communication would also be required.

4.3.3 Specific Website Features

After planning out a conceptual structure for the website, the team began work on developing the mechanics of how each individual component would function, and ultimately, created them. Included here are descriptions of those elements of the website that have some level of user interaction. The team had little to no design control over pages that consisted solely of text and images – such as the African forest elephant and biodiversity threat pages – so their design is not detailed. For screenshots of the website as of December 4, 2006, see Appendix J.

4.3.3.1 Elephant Satellite Tracking Data Display

One major component of the website, as listed in the original specifications, was a means to display satellite tracking data gathered from elephants in Gabon. The required use of ColdFusion for server-side processing impacted some of the technical implementation of the tracking display, but its effects were purely syntactic. The visual structure of the display, how users would interact with it and a large amount of the implementation still remained to be determined. The ultimate goal was a display with only those elements that were required to display tracking data gathered from four elephants. See Figure 16 (page 78) for a screenshot of the display's layout as of November 27, 2006.

- **User Interaction** – The first component is the form that allows users to control which information they will see on the map. It was broken up into two categories: which elephants’ tracking data the user would like to see, and whether they would like to see the movements animated over time or simply displayed all at once. The former was accomplished by means of using four checkboxes, one for each elephant. This allows the user to select any combination of elephants to track. The latter was accomplished by means of two radio buttons, which force the user into an either/or situation where they must choose either an animated map, or a still display. These two formats were chosen because they are industry standards. The consistent and accepted connotation of checkboxes in website design is as a means of selecting multiple options from a pool, whereas the connotation of radio buttons is allowing the user to select exactly one option. After making these choices, the user then simply presses the ‘Display’ button and the map will display the desired information.
- **Display Area** – The largest component of the visual structure of the tracking display is the map itself, which is where the tracking data appears. The team decided it would be most effective to make use of the Google Maps API (Application Programming Interface)⁸ in implementing most of the display’s functionality. This decision was made for two reasons. First, it accelerated

⁸ For more information on Google Maps, see <http://www.maps.google.com> For more information on the API, see <http://www.google.com/apis/maps/>.

the development process by providing some of the basic functionality the display would need to function, such as the ability to zoom in, pan the map and display points on it. Second, it provided the potential for consistency and familiarity in the interface. Some of the website's users may have already used Google Maps before, and the display's controls would be immediately understood these people. While there is no guarantee that any user of the site will have used Google Maps and will recognize this display as being an implementation of that, we can be guaranteed that had a proprietary interface been used, none of the users would recognize it. Being that there are no known serious defects in the Google Maps interface, and there was the potential for site users to already have experience with it, the decision was made to use the Google Maps API instead of developing a proprietary interface.

- **Map Legend** – The legend is a relatively minor component in the tracking display. It contains only information that is directly related to the elephant tracking. Specifically, it has a compass indicating which direction is north, as well as a table indicating which color corresponds to which elephant on the display.

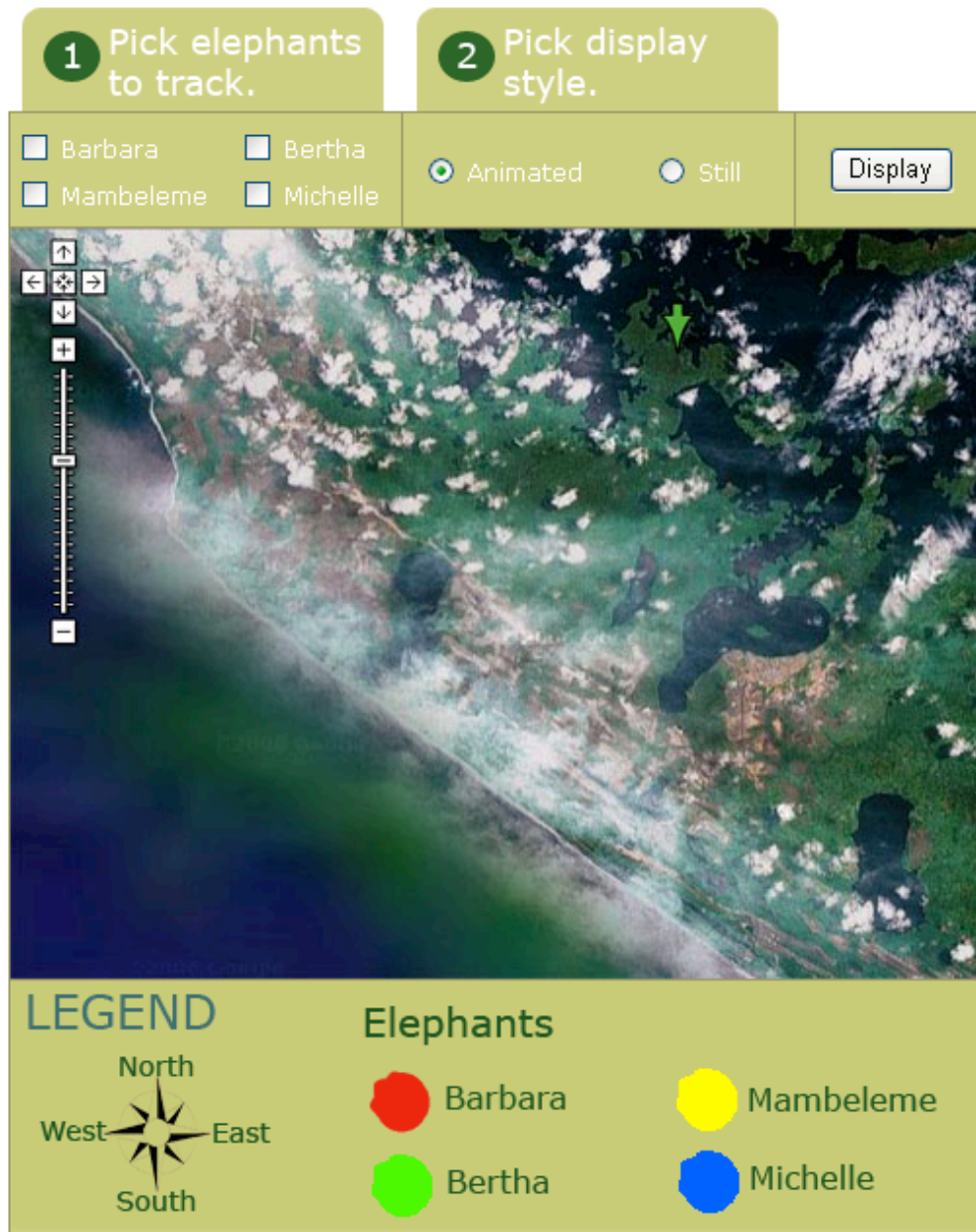


Figure 16: Elephant Satellite Tracking Data Display

The display's interface aside, the team still had to design the back-end code that would power the display and enable it to function. For storing the tracking points, the team decided to use Microsoft Access database files. Microsoft Access provided an easy way for the team to enter the data points – they were already in a format that could be imported by Access into a database. Additionally, ColdFusion interfaces quite readily with Microsoft Access databases, so the code for accessing the points was greatly simplified as well. Access also has a fairly intuitive interface for entering new points into the database, should the Smithsonian decide to add more tracking points into the database in the future.

Within the database, each elephant has their own table. This provides a more obvious logical breakdown to people looking at the database in the future and speeds up access times by ensuring that no unnecessary points are considered for display. Records in these tables are individual tracking points and have three fields: *lat* (a number representing the latitude of the point), *lon* (a number representing the longitude of the point) and *date* (a date/time representing the date on which the point was recorded).

When the page is loaded, ColdFusion examines the URL to see what elephants, if any, should be displayed. This method of encoding all the information that must be communicated to the page in the URL enables people to bookmark the display page and have the map reload that same set of data, displayed in the same style. After determining which points to load, ColdFusion iterates over those points and generates the JavaScript needed by the Google Maps API to draw the points on

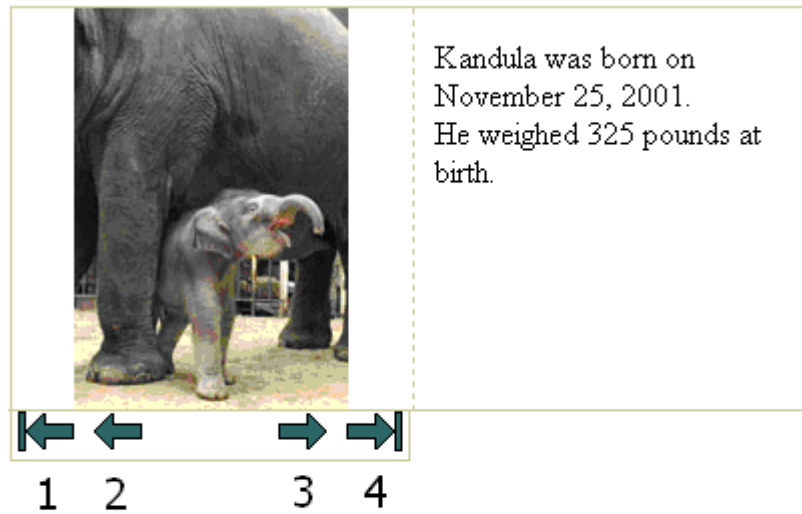
the display. Below (in Fig 17.) is a graphical representation of the process by which data points are stored and converted for display on the map.



Figure 17: Satellite Tracking Display Back-End Diagram

4.3.3.2 Picture Uploading and Display

The main picture gallery page contains a slideshow with a series of pictures, their associated descriptions, and arrows for navigating through them. See Figure 18 for a screenshot of the slideshow interface as of November 27, 2006. This slideshow draws from a set of selected pictures featuring some of the best images in the various galleries. This slideshow is meant to grab the user's attention and encourage them to delve further into the various galleries. This slideshow was designed to be modular, so it could be easily used in any page, and easy to maintain. To this end, there is a manual in Appendix L detailing how to install and configure the slideshow, and how to provide it with pictures to display.



- 1) First image in slideshow.
- 2) Previous image.
- 3) Next image.
- 4) Final image.

Figure 18: Picture Gallery Slideshow Screenshot

Aside from being able to simply display pictures, the site also had to have the capacity to allow users to upload their own photographs for inclusion in the site. As was discussed previously (see section 3.3) the team's original proposed means of allowing users to upload pictures was rendered impossible by the hardware limitations of the National Zoo website's server. Specifically, it was not possible for pictures to be directly and permanently uploaded from the website to the servers hosting it. As such, other ways of including a similar functionality had to be explored. Email provided an ideal alternative to the originally proposed direct uploading mechanism. It offloads storage of the pictures to another server until they have been approved, and is an easy way for any number of employees to access the pictures.

Consequently, a new email account was created whose sole purpose was the storage of submitted pictures. A form was added to the website that allowed users to enter their name, email address, a picture and a brief description of it. This information is then sent as an email, with the picture as an attachment, to the established address.

The purpose of this form front-end on the website was two-fold. First, it allows for the collection of uniform information from all submissions. The website can check the form to ensure that all fields have been filled out, and this cannot be done if people were to simply email pictures to a provided address on their own. Second, it hides the email address the emails are being sent to from the general public. This greatly reduces the amount of junk mail sent to the account.

Periodically, Smithsonian Institution employees will check the account and begin sorting through the pictures that have been submitted. Pictures that are acceptable for display on the website will then be put into Photoshop, where a script can be run that will resize the pictures and convert their format to make them more web-friendly. After the images have been modified for display on the web, the website must then be updated to include the new pictures. This process is also automated within Photoshop. Pictures can be put into different folders representing different sub-galleries (one specifically for elephants, one for foliage, etc.) and Photoshop can then process these folders and create the HTML needed for inclusion in the website. While this results in a level of human overhead that is higher than what was originally anticipated or desired, the setup of the website server

prevents the originally envisioned automatic uploading from taking place, and the large amount of processing power required to convert the images and dynamically generate the HTML for the galleries could not be sustained by the servers. The process was automated as much as possible within Photoshop by using scripts and their automated gallery creation tools to reduce the learning curve associated with maintaining this particular section of the site. See Appendix L for full documentation of the picture gallery maintenance process.

4.3.3.3 Questions and Answers with Smithsonian Researchers

The original concept of a using a bulletin board for the questions and answers section of the website had to be reworked after finding that such an application would require too much processor power to be effective. Due to time zone differences, asynchronous communication was required. This eliminated any sort of live chat feature as a viable option. Given this, there were two major options: a proprietary system using databases and requiring users to login to submit and check the status of questions, or a simpler email alternative. In consultation with Smithsonian employees, the decision was made to use email for submitting the questions. This removes an unnecessary level of complication from the users' perspective, since it does not require users create accounts to simply ask questions. Additionally, it allows for the Smithsonian Institution employees who have to respond to the questions to use the familiar interface of an email client instead of having to learn a new, proprietary one.

Much like with the picture uploading process, website users will be able to open a page asking them for their name, email address, the subject of their question and the actual question itself. This information will then be packaged in an email and sent to an email address dedicated to receiving such questions. This centralized format was preferred over simply sending copies of the question to several Smithsonian employees for two reasons. First, it prevents the employees responsible for answering the questions from having their personal email inboxes constantly flooded with questions. Second, it prevents multiple employees from answering the same question. Once the email is opened in the account, it can be replied to and deleted, ensuring that each question gets only one answer, and the person sending the question does not get several different replies.

The reasoning behind using a form on the website to submit the questions is very similar to that of using it for submitting pictures. It provides a certain amount of anonymity to the account that is receiving the emails, greatly reducing the amount of junk mail it will receive compared to if the email address were simply made public. It also means all of the emails will be submitted with uniform formatting and a uniform amount of information, making it easier for the Smithsonian employees responsible for answering the questions to respond to them.

4.3.3.4 Interactive Map of Gamba

After meeting with Ann Henderson, the requirement for an interactive map of the Gamba complex of protected areas was established (see Fig. 19). Ideally, the

map would provide an overview of the entire complex and allow users to click on various regions within the complex to learn more about them. The team took a stripped down map of the Gamba complex – which contained only the outlines of the parks and labels for some of the regions – and used that as a base for the interactive map. Missing labels were filled in, and stars were added to the map to indicate precisely where the user should click to learn more about the selected region.

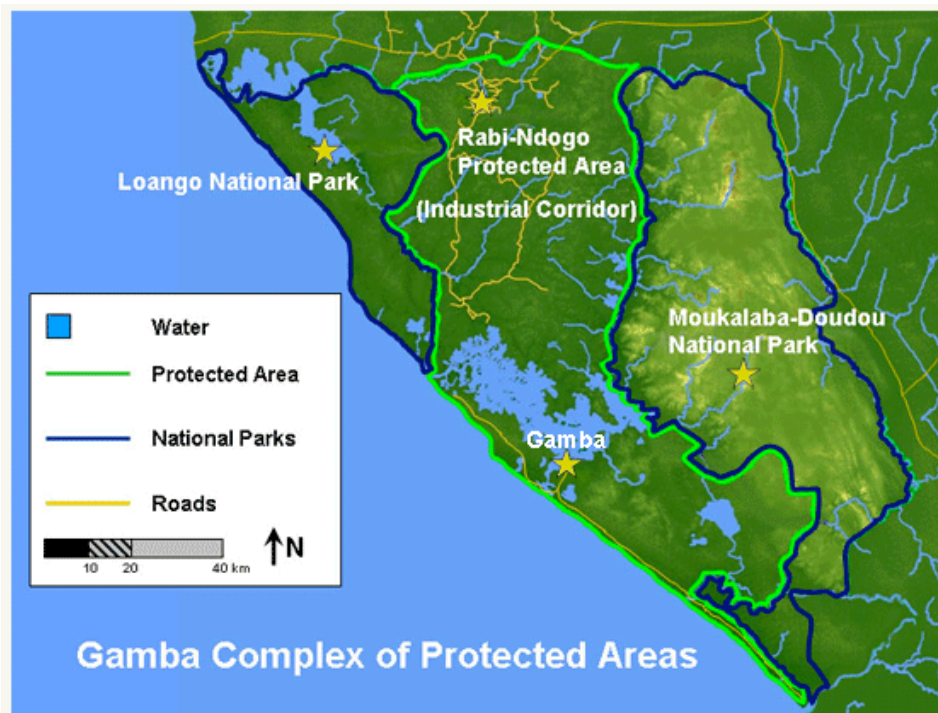


Figure 19: Screenshot of the interactive map of Gamba

There was also a more nebulous requirement for the website as a whole of bringing a more human aspect to the website by including testimonials from people working in Gabon. This was chosen as the page that would contain those testimonials. To this end, Ann Henderson contacted several Smithsonian employees

who had been in the various regions of Gabon and asked them for short testimonials about their time there, what kind of work they did and what they found particularly interesting about that region. When users click on one of the stars marking a particular region, they are taken to a new page that contains a brief description of the region as well as a testimonial from (and picture of) a Smithsonian employee who has worked in that region. While so-called “pop-up windows” were considered as a means of displaying the information without forcing the user to leave the page, many browsers today block them and users may be confused if nothing happened when they clicked on a star.

4.3.4 Presenting the Website for Review

At several occasions throughout the development process, the team had the opportunity to present the website, in its varying stages of development, to different groups of people and get their feedback on possible new features or changes that could be made to the site. The first such presentation was given by the team to some members of the Center for Conservation, Education and Sustainability on November 15th. Other presentations were given on behalf of the team by Alfonso Alonso to groups of Shell employees in Gabon during the week of December 3rd.

- **Center for Conservation, Education and Sustainability, November 15th**
 - At this phase in development, not all the components of the website had been completed and the team lacked the Dreamweaver templates required to generate the completed website files. As such, only screenshots of individual, partially completed features were available for presentation. The feedback

from this particular presentation was concentrated in two areas specifically: visibility of the website (both within the National Zoo website and outside of it) and consistently updating the site. For full minutes of the discussion that followed this presentation, please see Appendix C.

- **Presentations in Gabon, week of December 3rd** – The presentations in Gabon were given on behalf of the team by Alfonso Alonso. At this phase in development, almost all of the website’s features were in a completed state. Unfortunately, due to hardware restrictions, a functional demo site could not be sent; instead, screenshots had to be used. This meant the audience seeing the presentation could not see all the functionality of the site. The feedback from these presentations was forwarded to the team by Alfonso, and covered a wide range of topics. The most important issue raised with this feedback was that a premature launch with only an English site might discourage French-speaking users. The audience felt it would be better to delay launching the site until at least a partial French version was available.

4.4 Marketing the Website

After having completed the website, the team began to investigate different ways to promote the website to each of the target audiences identified previously. Due to time constraints, the team had to work to devise marketing schemes that

would reach as much of the audience as possible, but could also be implemented quickly. For these purposes, the audience was considered as consisting of two, instead of four, distinct groups: Shell employees, and non-Shell employees.

- **Shell Employees** – The “Shell employees” audience is the merging of the Shell specialist and Shell non-specialist groups outlined previously. These two audiences’ email addresses were all indirectly accessible by the Smithsonian. Since email is the most personal and direct way we had available to market a website, it was chosen. Fliers were created advertising the website, which could then be forwarded to Shell employee email accounts. To aid in this and other context-free advertisements in the future, the team registered a “shortcut” URL with the National Zoo website. Shorter URL’s take up less space in a flier, making it more visually appealing, and are also easier to recall in the future, when a person may not have the flier in front of them.
- **Non-Shell Employees** – The “non-Shell employees” audience is the merging of the global and non-Shell Gabonese groups outlined previously. The bare minimum that can be assumed about either audience is that they have internet access. Since this audience also spans all levels of biodiversity knowledge, no assumptions could be made about which pages in the site they might find most interesting. As such, a very broad means of marketing was

chosen. The team decided registering the site with Google and other search engines would be an effective way of promoting the site on a global scale. Search engines are accessible all around the world, and this effort would help to maximize the amount of people who find the site.

Ideally, marketing strategies would have been created that were catered to each individual section of the audience. This is something the team recommends the Smithsonian look into in the future.

5 CONCLUSIONS

This group was charged with the task of creating a website for the Smithsonian Institution's Monitoring and Assessment of Biodiversity (MAB) program with which they would disseminate research they have done in Gabon, Africa. With this website MAB has a method of getting their research to their desired audience.

5.1 Completion of the Project

After fourteen weeks of research and hard work the team produced a website that MAB will have on the National Zoo's website which they will use to convey the most interesting and up to date information they have. By hosting this website on the National Zoo's website, people in Gabon will be able to access the website as will anyone with an internet connection and an interest in Gabonese biodiversity.

The interactive functions of this website include a photo gallery a question and answer portion. These components are what take the website above the purely informational level and make it more enticing to potential users. People living and working in Gabon will use these components as a way to learn more about the area surrounding them. However, there are several informative components of the website which take the Smithsonian's research and integrate it into things such as an elephant tracking map, interactive map of the Gamba Complex, and some other interesting features.

5.1.1 Interactive Components

The picture gallery will give the local community the opportunity to show others pictures they have taken which they find interesting. There is also the option of someone taking a picture and if they would like to know more about the subject then they can submit the picture and ask the Smithsonian's biologists about the picture's contents. On the website there is also a section for asking the MAB conservation biologists questions. This option is preceded by a frequently asked question section in which users can hopefully find the answer to their question. When combined, these features allow the audience to influence the contents of the website.

5.1.2 Informative Components

One of the main attractions of the website is the elephant tracking map. It gives users a visual display of the migratory patterns of four African Elephants over the last several years. In conjunction with the page dedicated to general elephant information, the map proves to be an engaging element of the website that will potentially draw people into the website and make them want to learn more.

Explore Gamba was created to have people learn more about the area in which the Smithsonian is doing their research. This gives people factual information about the area as well as a personal look at what life is like there and what it is like to be part of the research being done. The Biodiversity Threats and Species of Gabon

pages were created with the intention of causing people in Gabon to become more aware of their surroundings.

Contained in the website is valuable documentation of research conducted by the Smithsonian in Gabon. Research done in Gabon has been compiled in a section of the website entitled the “Research Library”. The library is intended to keep the most up to date and pertinent research data on the website for users who are interested in the technical aspects of the Smithsonian’s Gabon project. This section is intended to have a minimal level of interaction.

5.2 Project Effects on Gabon

MAB's mission is to promote the conservation of biodiversity (MAB, 2006). This project was not completed for the sole advantage of the Smithsonian, but for the people of Gabon. With this project the Smithsonian hopes to increase biodiversity awareness in Gabon as well as tourism.

5.2.1 Increased Biodiversity Awareness

One of the primary reasons that the Smithsonian wanted this project completed was a lack of communication between the MAB conservation biologists and the local Gabonese population. It is our hope that in getting research the Smithsonian is doing in Gabon out to its citizens we will be able to make them more aware of their surroundings. The website also discusses some of the major threats to the local biodiversity, along with information on how people can conserve the biodiversity surrounding them. This will serve as a resource that will work in

conjunction with the other efforts that the Smithsonian and Shell foundations are currently making.

5.2.2 Tourism

Along with providing useful information for the people living and working in Gabon, the website serves to spotlight well deserved attention on Gabon. This attention will potentially attract other biologists to the area where they could do research that would benefit Gabon as well. In addition to the increased interest among biologists, there is the possibility for increased tourism in the area if people are made aware that it exists. With increased tourism, hopefully Gabon would depend less on the oil industry to keep their economy stable.

5.3 Project Benefits for the Smithsonian Institution

In conjunction with the research being done by MAB in Gabon, this project achieves the Smithsonian's ultimate goal of increasing and diffusing of knowledge. With this website the Smithsonian is able to take the research they have spent a significant of time and effort on, and broadcast it throughout the world. In addition to being a resource that affects the Smithsonian externally it can also be used as an internal resource that the Smithsonian can utilize. This site can be used as a model for the Smithsonian's future educational websites. The integration of the informative and interactive layers is an intricate part of why this website is anticipated to be successful and could potentially be replicated in websites to come

6 RECOMMENDATIONS

The following are a set of recommendations have been made with the intention of helping the Smithsonian Institution's Monitoring and Assessment of Biodiversity (MAB) program maintain and hopefully improve the website created for this project.

6.1 Manual for MAB Employees

Upon the completion of this project the group left the MAB biologists with a user manual for maintenance of the website (see Appendix L). The manual has detailed instructions on how to update the tracking data for the elephant map, how to upload new photos and questions to the website, and how to upload new research onto the webpage.

6.2 Changes to the National Zoo Template

It is the recommendation of this team that the Smithsonian also look into the possibility of either a new template or a more flexible version of the template currently in place. Having three columns in one webpage make it difficult to convey large amounts of information. It is also inconvenient if someone has a large graphic they would like to display on the webpage.

Another recommendation that would enhance the templates would be to change the way that website displays links. As it stands now, the way hyperlinks are differentiated from regular text is by a change in color; however the change is subtle

enough that if someone was colorblind they may not notice the difference. This could cause them to miss the link entirely which would make the website of no use to them consequently making the website lose a user. A potential solution for this could simply be having links underlined.

Our team realizes that the National Zoo pages are set how they are due to specific reasons such as uniformity, and that it is fairly significant task to make changes to the template. Still we simply recommend the Smithsonian keep these current drawbacks in mind next time they do a major overhaul of the National Zoo Website.

6.3 Translation

Gabon's national language is French. Due to the fact this project was completed in Washington DC, where the primary language is English, the website currently is currently in English. In order to make the website accessible to the main target audience in Gabon, we recommend that MAB creates an option that allows users to select a language upon opening the site and then have separate pages which are entirely in French.

As for the translation itself, the Smithsonian could use biologists in the field in Gabon who speak French fluently or have the option of paying someone to translate the website. The route taken on determining who translates the website would depend on how urgent MAB feels the translation of the site is needed. If they feel a more immediate translation is required we recommend they pay someone to

translate the site; conversely if they feel the need to translate the site is not as great they could have the biologists who have done the research translate it themselves.

6.4 Marketing Strategies

While the team began the process of marketing the website, due to time constraints, this is a process that must be continued by the Smithsonian. In order to assure that the website is being directed toward the desired audience, it would be useful for the Smithsonian to have a focus group look at the website. They could use the group to identify what features of the website appear to attract the most attention. Consequently these could be the features used to market the website. They could also investigate new ways of marketing the site to ensure that each segment of the audience is targeted as efficiently as possible. Specifically, we recommend they research additional ways to market the website to those people in Gabon who do not work for Shell.

Also, separate from the four target audiences originally specified, MAB could market the site to communities local to Washington, D.C. MAB could create fliers about the new website and distribute them in the National Zoo. These fliers could potentially be located at the Cheetah Conservation Station, Elephant House and Visitor Center, as well as any other exhibits that MAB feels would be appropriate.

Targeted marketing aside, there are other things the Smithsonian could do to increase the overall visibility of the site. One such suggestion arose in the presentation given to the Center for Conservation, Education and Sustainability

(CCES). It was suggested by Miles Roberts that if the website were updated on a often enough basis, roughly once a month, that the National Zoo's website coordinators would make a direct link to the MAB Gabon site off the Zoo's homepage. This would make sure that anyone visiting the Zoo's website would have the option to go straight to the site and not have to navigate all the way through Conservation and Education to get to the MAB Gabon site.

Another possibility would be for MAB to buy a domain name, i.e. www.gabonbiodiversity.com and then have it simply redirect users to the MAB Gabon website on the National Zoo's webpage. This would make the URL that user's type to access the website shorter and easier to remember.

Google offers a "Webmaster" feature on its site intended to help website creators market their website. This feature allows people to enter their website's address and a brief description about the site. This information is then used by Google to direct users who are searching for subjects contained in a website to that site. Google's address for this feature is <http://www.google.com/support/webmasters/bin/answer.py?answer=34397>.

An alternative strategy for publicizing the websites is by having other websites with similar content and agendas link to this site. Some of the organizations that MAB could look into approaching with this idea include organizations who they have done research with, Gabonese tourism companies, the Gabonese government, and Shell Gabon. We suggest that MAB create a list of the companies and

organizations that they feel have similar interests with regards to Gabon and then contact them to propose the idea of linking the MAB Gabon site to their websites.

Once the website has been finally approved and is allowed to go live, we recommend that the Smithsonian email Shell employees in Gabon to inform them that the website exists and encourages them to participate in the uploading of pictures and asking of questions. Another possibility could be to create a mailing list for people who are interested in the website. When information is updated on the website there could be an email sent out to the mailing list encouraging users to look at the website.

In order to generate interest in a more immediate community, MAB could create fliers about the new website and distribute them in the National Zoo. These fliers could potentially be located in places that have strong ties with Africa and/or elephants. Some of these could include the Cheetah Conservation Station, Elephant House, and Visitor Center as well as any other exhibits that MAB feels would be appropriate.

GLOSSARY

API	Acronym of "Application Programming Interface"
Application Programming Interface	A means by which the functions and utility provided by one program are made available for use by other programs.
Bulletin Board Application	A means of communicating over the internet in which users can leave (or 'post') messages in a public display area and other users can respond.
ColdFusion	A language used in server-side processing. See http://www.adobe.com/products/coldfusion/ for more information.
Front-End	Something which allows a user to interact with a program and cause it to perform certain operations.
HTML	Acronym of "Hypertext Markup Language"
Hypertext Markup Language	The language used in the construction of webpages.
Hypertext Preprocessor	A language used in server-side processing. See http://www.php.net for more information.
PHP	Acronym of "Hypertext Preprocessor"
Server-Side Processing	Actions that are performed on a webpage before it leaves the server to be viewed by the user. Specifically, the user's browser asks the website server for a webpage, the server applies any applicable server-side processing to change the content of the page, and then sends it to the browser.

APPENDIX A: MISSION AND ORGANIZATION OF THE SMITHSONIAN INSTITUTION

The Smithsonian Institution was founded in 1846 and since that time has been dedicated to its founding principles to increase and diffuse knowledge. The Smithsonian has played a very important role in the study and research of very many scientific discoveries in its history. Founded with a large grant from James Smithson, British scientist who had never visited the United States the Smithsonian became a center science and repository for government collections. The Smithsonian was created as a hybrid organization semi Federal and Semi-Private. Now legally a branch of the United States Government, it has its own Secretary, who is appointed by a congressional committee. This is in spite of being nominally under the control of the Chief Justice of the Supreme Court who acts as Chancellor.

In recent years, the Smithsonian has developed its energies in discoveries dealing with four main subjects. The first is the study of the origin and nature of the universe through every branch of astrophysical observation possible. The Smithsonian is also invested in research of the formation and evolution of Earth and similar planets, delving into all the chemical and physical processes that have formed and shaped our world. Dedicating itself also the study of human diversity and cultural change, Smithsonian scientists are examining the processes that shape human biological, cultural and linguistic diversity and change. Finally the Smithsonian is committed to discovering and understanding biological diversity,

amassing a huge repository of natural objects. They are also striving towards an *Encyclopedia of Life* by the end of the decade.

The Smithsonian is a huge institution which operates 19 museums 9 research centers and over 140 associate museums across the world. It also has over 5000 employees with a wide range of jobs and skills. Our group is working specifically in the Monitoring and Assessment of Biodiversity (MAB) program which is part of the National Zoological Park (for organizational structure see Figure 18 below). Our project deals the latter of the Smithsonian's themes.

Our project goal is to create a website which effectively is a catalog of research information that the Smithsonian has obtained from the wild in Gabon. The information deals with data on the nation's natural biodiversity and contains many recent discoveries. Such discoveries include DNA evidence indicating African Forest Elephants and African Savanna Elephants are different species, as well as better knowledge on the differing habits between the two. Our project also deals with the Smithsonian's greater mission of the increase and diffusion of knowledge. The website fulfills the role of providing an easy to understand accessible means of presenting the knowledge gained through the research. The website will be in a simply laid out and easy to understand for all levels of education and will contain bilingual components in order to bridge gaps between audiences.

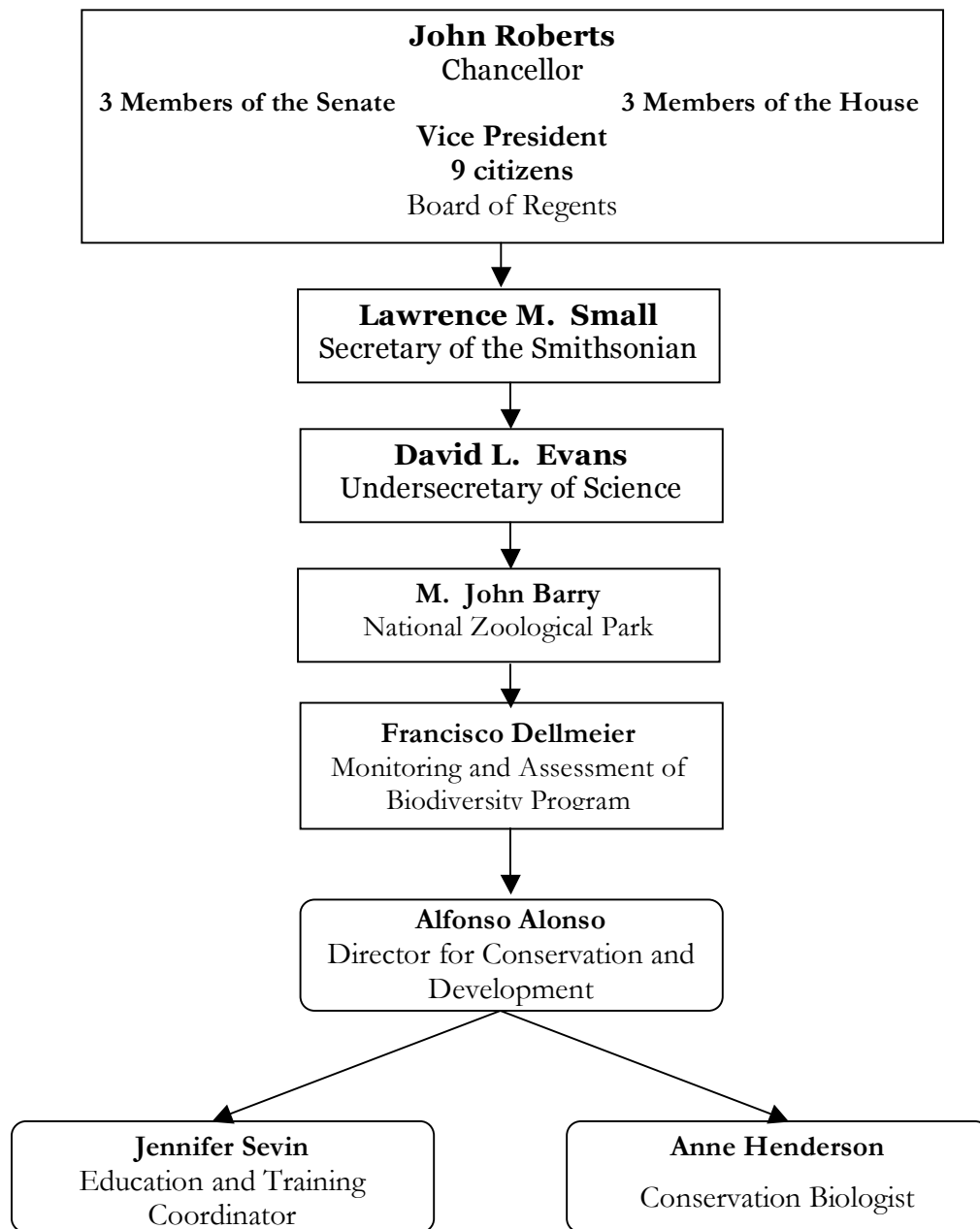


Figure 20: MAB Organizational Structure

A hybrid government institution and private organization the Smithsonian gets a portion of its budget from private partners and the rest from the U. S. Government.

**SMITHSONIAN INSTITUTION
FY 2007 BUDGET REQUEST
BY APPROPRIATION ACCOUNT**

SALARIES AND EXPENSES	FTEs	Amount
FY 2006 Appropriation (pre-rescissions)	4,601	\$524,281,000
FY 2006 0.476% Rescission		-2,496,000
FY 2006 1.0% Rescission		-5,217,000
Total FY 2006 Appropriation		516,568,000
FY 2007 Changes		
<i><u>Mandatory Increases</u></i>		
Salaries and Related Costs		10,700,000
Utilities, Postage, Communications, and Rent		6,900,000
Transit Benefits		2,000,000
Audit Costs, GSA Disposal Program, Mandatory Training		189,000
<i><u>Program Changes</u></i>		
Security Requirement	43	2,000,000
NAPA-Driven and IT Needs		
Facilities Maintenance	26	5,000,000
Enterprise Resource Planning		1,363,000
Accounting and Contract Support	2	200,000
<i><u>Non-recurring Costs</u></i>		
National Portrait Gallery/American Art Museum		-7,526,000
FY 2007 Salaries and Expenses Request	4,672	\$537,394,000
FACILITIES CAPITAL	FTEs	Amount
FTEs in Base	38	
Revitalization:		
National Zoological Park		16,000,000
National Museum of American History		13,500,000
National Museum of Natural History		25,400,000
National Air and Space Museum		10,000,000
Other Revitalization Projects		26,200,000
Construction:		
Museum Support Center, Pod 5		5,400,000
Facilities Planning and Design		10,500,000
FY 2007 Facilities Capital	38	\$107,000,000
FY 2007 REQUEST, ALL ACCOUNTS	4,710	\$644,394,000

Figure 21: Smithsonian Institution FY2007 Budget Breakdown

Smithsonian Institution Original Project Letter

This project will be part of a multi-faceted research and conservation project that is a partnership between the Smithsonian's Monitoring and Assessment of Biodiversity team and Shell Gabon, in Gabon, Africa. The project will focus on making biodiversity research results, wildlife pictures, and other information available via the web to Shell employees, local community members, school groups, and wider audiences world-wide.

One important dimension of the project is to understand the people living and working in the area of Gabon where Shell is operating. Shell employees work in one month shifts in a remote rainforest where education or entertainment opportunities are extremely restricted. Other local people and school groups will also benefit from the access the website provides to biodiversity knowledge of their area. This tool could have a great impact to provide conservation education to a wide audience.

Specifically, the team will:

- 1) Produce a website on the Smithsonian web that facilitates local people to share pictures and to ask questions of Smithsonian biologists.
- 2) Take elephant satellite tracking data and produce a website where the information is presented in a way that a general audience will find appealing. Information on elephant biology, movement patterns, and conservation needs will be researched and added to the site by the team.
- 3) Investigate other ways that research and conservation information could be disseminated to the community, many of which do not have internet access.
- 4) Explore and extend other educational and information dissemination tools that are of interest to the team.

APPENDIX B: INTERVIEW WITH ANNABEL MINUTES

Interview Methodology

The general format of the interview can be visualized as a kind of funnel. Opening questions will be relatively vague, asking the liaison about how they visualize the problem, if they have anything they want to add beyond what the project description states. Later questions will evolve mostly out of their responses to these initial, general questions and will become increasingly focused and precise. As such it is all but impossible to predict the total span of questions we will be asking later in the interview, but certain specific questions can and have been planned in advance. This reaction-based question forming allows us to move in whatever direction the liaison's answers bring us and gather as much information as possible, without binding ourselves to the initial project description we were given.

Interview Logistics

- **Where:** MAB Office
- **When:** 10 AM 10/25/06
- **Whom:** Researchers Olivier Powells (absent) and Annabel Honorez
- **How:** conference call
- **Responsibilities**
 - Note-taking: Jenn
 - Introductions: Alfonso
 - Summary (Writing): Eric
 - Summary (Reviewing): Eric
 - Lead Questioner: Gary/Eric

Interview Questions

Tier 1 – Website Questions

- What they would like to see included on the website?
 - Should include ability to display pictures sent by people in Gabon.
 - Should allow for Smithsonian researchers to ID pictured animals
 - Should be an outlet for the locals to show off their art in photography.
 - Should have an animated elephant tracking map
 - Four Elephants were tracked one collar died soon after attachment
 - Barbra – Female in the north
 - Membeleme – Male along the coast (collar lost after 3 months
 - Bertha – Female in the South
 - Michelle - Female in the North limited range of motion
 - Make similar to the Silver Moon webpage.
 - Question and answer section
- What they see as being of most critical importance to be included on the website?
 - Most important feature if the website should be the one that Shell, the Smithsonian's partner wants. This is the ability to send pictures and ask questions.

- Is there anything you can tell us about the technical capacity of the Gabonese people, and what the Shell employees have access to? Anything about Internet access levels, general hardware specifications of the computers, etc.
 - They have slow internet speed i.e. dialup
 - The computers are fairly modern the specs are roughly
 - Pentium 4,
 - 260 Mbytes
 - Microsoft Windows 2000

Tier 2 – More specific, project-aspect-level questions

- How would you quantify the target audience? Are children of particular concern? Is there any specific target demographic we should be focusing on?
 - Largely should be focused on Shell employees
 - There are a number of children and teenagers that live within the complex
- How aware is each of these demographic about the surrounding Biodiversity?
 - Shell employees knowledge is varied; the most important thing is that they want to know more.
- More generally, could you describe the demographic of the Shell employees? Are they mostly locals, are they brought in from other regions?

- There is a pretty even mix of both expatriates and Gabonese that work on the oil fields

Tier 3 – Environmental questions

- What level of detail do you have on the specific Elephants you've tracked?
I.E. how large is the group they've been traveling in where they've gone.
 - There are more than 500 position points
 - They come in varied frequency ranging from 23 a month for bertha sometimes to a few times over the course of 3-4 months
- Is there any kind of pattern that develops in their movement? Is it seasonal or random? Just to food sources?
 - Movement is limited for many of the elephants not necessarily reflective of the species migration habits
 - Membeleme displayed the greatest movement of all the elephants before his collar died
- How has the drilling in the area effected the elephant's movements? Has it limited it?
 - It's hard to tell with these specific elephants.

Tier 4 – Misc. questions

- Are there any resources at all – coworkers, people we may conceivably be working with, books, websites, etc. – that you can recommend?

Contact Obb because he is working on a similar project.

APPENDIX C: CENTER FOR CONSERVATION EDUCATION AND SUSTAINABILITY MEETING MINUTES

Logistics

- **Where:** MAB Office
- **When:** 10 AM 11/15/06
- **Whom:**
 - Mario Castellanos (Program Director)
 - Sulema Castro (Coordinator)
 - Jennifer Buff (CRC Education Program Manager)
 - Miles Roberts (Research Scientist)
 - Jennifer Sevin (Education and Training Coordinator)
 - Alfonso Alonso (Director of Conservation)
 - Ann Henderson (Conservation Biologist)
- **How:** Presentation followed by Q + A
- **Responsibilities**
 - Presenters – Gary/ Eric
 - Note Taking –Eric

We gave a short 10-15 minute long presentation. This presentation gave the basic premise of our project with mocked up screen shots of what we believed to be important features. After the presentation we took questions and comments from the audience. Important questions were

- Where will the website be hosted?
 - The website will be hosted off the main MAB site.
- How were you planning on publicizing this website?
 - There are many options available there is of course registering it with Google and other major search engines so general internet searches will find the site
 - It is also very likely that links to the site will be distributed through email lists of workers in Gabon.

- Other options of publicizing the website were to be looked into.
- What tracking data will you be presenting and how will you lay it out?
 - We will be presenting elephant tracking data through GIS coordinates
 - We will be using a modified version of Google maps in order to display the data
- Will this be worked into other education initiatives conducted by the MAB department?
 - It won't be linked to any other previous MAB education initiatives.

They also had many comments about the site and its layout. These comments included

- Miles Roberts suggestions were
 - Talk to Web control about getting your website linked up on the main page or on the one of the side tabs
 - Web control only posts things on the side bar or front page that are impressive and updated regularly
 - If you promise to update the website regularly as in once or twice a month with new content it will have a better chance of not getting lost among all the other pages and be more successful.
 - Talk to Greg Gough about the way he fixed his website so it periodically rotates pages making it look like its updated when it seldom is. Can be worked so it automatically rotates pages.

- Mario Castellanos suggestions were
 - Make the website as interactive as possible.
 - Interactive sites have more traffic and therefore get their word out to more people
 - In order to get return visitors you need to have updates frequently and also present something that no one else does
 - Link everything with species in Gabon
 - If the focus is to be for regular kids make sure that you set them up with current events make sure they know where Gabon is.
 - Include journal entries for a humanitarian aspect and to get people coming back for more.
 - Make an educational component for young audiences.
- Sulema Castro suggestions were
 - Make sure that your website is interactive.
 - Make sure that the website makes use of educational resources that are already available.
- Jennifer Sevin
 - Think about how you plan on publicizing this website.
 - It is important to publicize this site both in Gabon and in general on the internet

APPENDIX D: INTERVIEW WITH ROB MADILL MINUTES

Logistics

- **Where:** MAB Office
- **When:** 10 AM 10/31/06
- **Whom:**
 - Rob Madill (NZIP Website Developer)
 - Alfonso Alonso (Director of Conservation)
- **How:** In-person questions and answers
- **Responsibilities**
 - Lead Questioner – Gary
 - Note Taking – Eric/Jenn

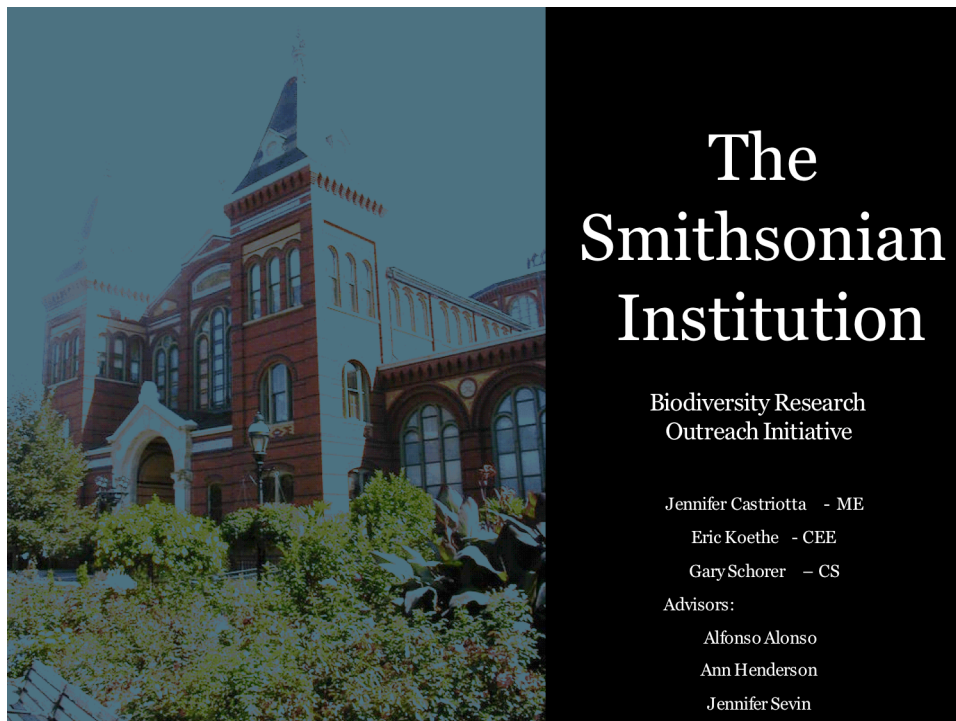
Interview Questions

- Where will the website be physically hosted?
 - The website must be hosted on the NZP web servers. Hosting in Gabon is not a realistic option.
- What kinds of software were available for use on the website server?
 - For server-side processing, the NZP servers use ColdFusion. No additional software could be installed. Databases are all handled by Microsoft SQL.
- How much space was available on the server for things such as pictures?
 - The website could have almost limitless space for pictures, as long as each individual picture was ‘web-friendly’ (small resolution, compressed to jpeg/gif/png as appropriate).
- What kinds of limits are there on processing-intensive applications?
 - Server-side processing should be as limited as possible. The picture gallery cannot find pictures for display dynamically, it must use static pages created by Photoshop’s automated web gallery feature or some other means.
- Would the website have to be contained entirely within the National Zoo’s site?
 - Yes, the website must be contained within the NZP’s site, and as such, must use its templates. However, pages with very large images, such as picture galleries, can use an alternate template with only 2 columns to make more room for content.

- What standards and regulations does the National Zoo have regarding formatting and content of web pages?
 - All standards and regulations regarding wording, color themes, image formatting, etc. are available in the NZP Site Contributor Reference Guide.

APPENDIX E: PRESENTATION GIVEN IN GABON

The following is a presentation that Alfonso Alonso took on a trip to Gabon detailing most of the website's features. It was taken to Gabon with the intention of getting feedback from the target audience. The results of the presentation can be found in section 4.3.4.





Mission Statement

This project is intended to create a website that will disperse research information gathered by the Smithsonian Institution to people in designated areas of Gabon.



Expected Outcomes

- Improved communication with people in Gabon
- Greatly increased biodiversity awareness and respect
- Increased recognition of Gabon and its ecosystems



Website Layout

Introduction Page

- ⌘ Picture Gallery
- ⌘ Species Information
- ⌘ Special Features (i.e. Tracking Map)
- ⌘ Biodiversity Indicators
- ⌘ Frequently Asked Questions/Contact MAB Biologists
- ⌘ Research Library



Website Layout

Introduction Page

- ⌘ **Picture Gallery**
- ⌘ Species Information
- ⌘ Special Features (i.e. Tracking Map)
- ⌘ Biodiversity Indicators
- ⌘ Frequently Asked Questions/Contact MAB Biologists
- ⌘ Research Library

Main Picture Gallery Page

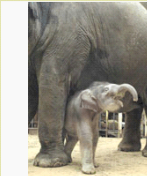
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MAB Gabon

Home
Picture Gallery
African Forest Elephants
Elephant Tracking
Biodiversity Indicators
Questions & Answers
Research Library

Gabon Picture Gallery



Kandula was born on November 25, 2001. He weighed 325 pounds at birth.

← →

For more pictures on a specific subject, select a gallery from the list below.

- Birds
- Elephants
- Fish
- Frogs
- Landscapes
- Large Mammals
- Lizards
- Small Mammals
- Snakes

Print
Send

Sample Picture Gallery

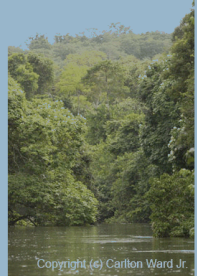

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MAB Gabon

Home
Picture Gallery
African Forest Elephants
Elephant Tracking
Biodiversity Indicators
Questions & Answers
Research Library

Landscapes



Copyright (c) Carlton Ward Jr.

Mount Doudou Expedition River Trip day 1 Photo by: Carlton Ward Jr.

← →

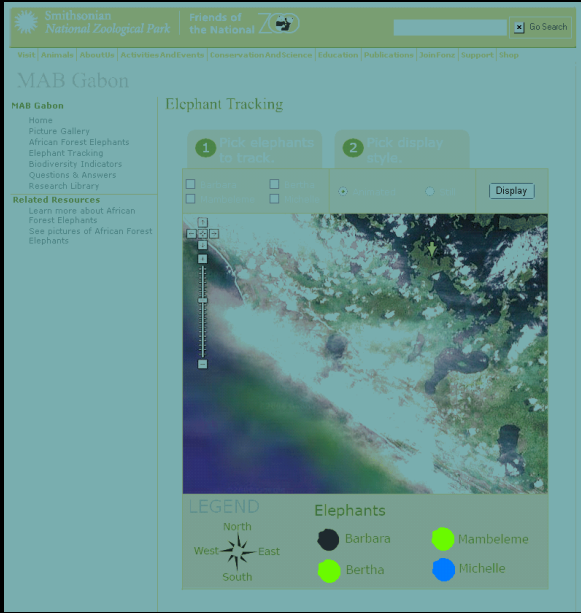




Website Layout

- Introduction Page
- Picture Gallery
- Species Information
- Special Features (i.e. Tracking Map)**
- Biodiversity Indicators
- Frequently Asked Questions/Contact MAB Biologists
- Research Library

Elephant Satellite Tracking Map



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MAB Gabon

MAB Gabon

- Home
- Picture Gallery
- African Forest Elephants
- Elephant Tracking
- Biodiversity Indicators
- Questions & Answers
- Research Library

Related Resources

Learn more about African Forest Elephants. See pictures of African Forest Elephants.

Elephant Tracking

1 Pick elephants to track.

2 Pick display style.

Barbara
 Mambeleme
 Bertha
 Michelle

Satellites
 Paths
 Tracks
 Paths
 Tracks

Display

LEGEND

North
West East
South

Elephants

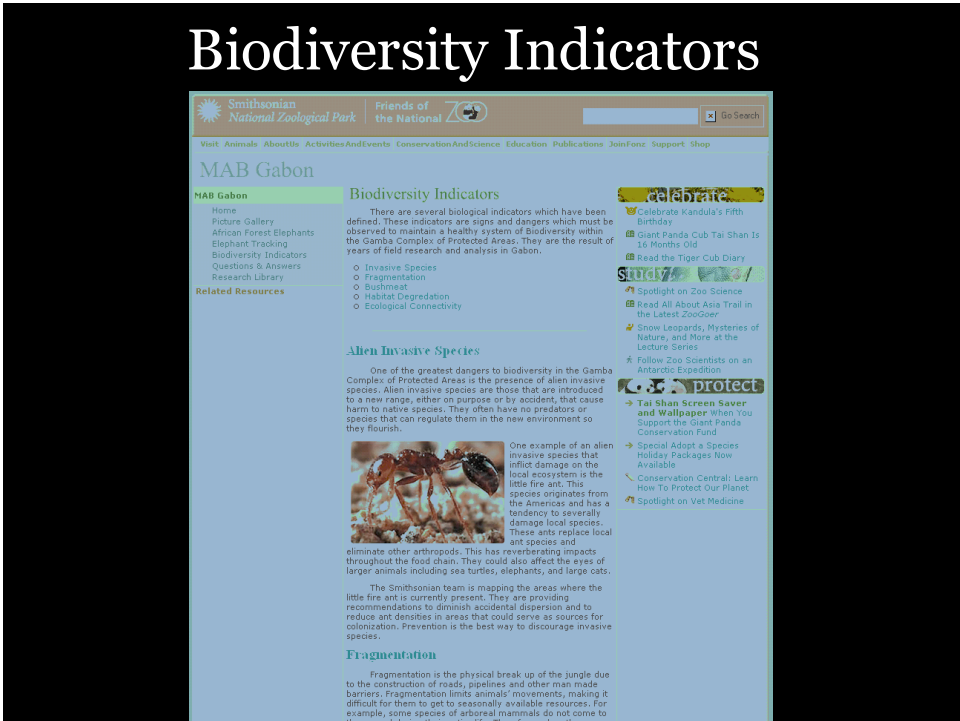
- Barbara
- Mambeleme
- Bertha
- Michelle



Website Layout

- Introduction Page
- Picture Gallery
- Species Information
- Special Features (i.e. Tracking Map)
- Biodiversity Indicators**
- Frequently Asked Questions/Contact MAB Biologists
- Research Library

Biodiversity Indicators



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MAB Gabon

MAB Gabon

- Home
- Picture Gallery
- African Forest Elephants
- Elephant Tracking
- Biodiversity Indicators
- Questions & Answers
- Research Library

Related Resources


Biodiversity Indicators

There are several biological indicators which have been defined. These indicators are signs and dangers which must be observed to maintain a healthy system of Biodiversity within the Gamba Complex of Protected Areas. They are the result of years of field research and analysis in Gabon.

- Invasive Species
- Fragmentation
- Subsistence
- Habitat Degradation
- Ecological Connectivity

Alien Invasive Species

One of the greatest dangers to biodiversity in the Gamba Complex of Protected Areas is the presence of alien invasive species. Alien invasive species are those that are introduced to a new range, either on purpose or by accident, that cause harm to native species. They often have no predators or species that can regulate them in the new environment so they flourish.



One example of an alien invasive species that inflicts damage on the local ecosystem is the little fire ant. This species originates from the Americas and has a tendency to severely damage local species. These ants replace local ant species and eliminate other arthropods. This has reverberating impacts throughout the food chain. They could also affect the eyes of larger animals including sea turtles, elephants, and large cats.

The Smithsonian team is mapping the areas where the little fire ant is currently present. They are providing recommendations to diminish accidental dispersion and to reduce ant densities in areas that could serve as sources for colonization. Prevention is the best way to discourage invasive species.

Fragmentation

Fragmentation is the physical break-up of the jungle due to the construction of roads, pipelines and other man-made barriers. Fragmentation limits animals' movements, making it difficult for them to get to seasonally available resources. For example, some species of arboreal mammals do not come to

Protect

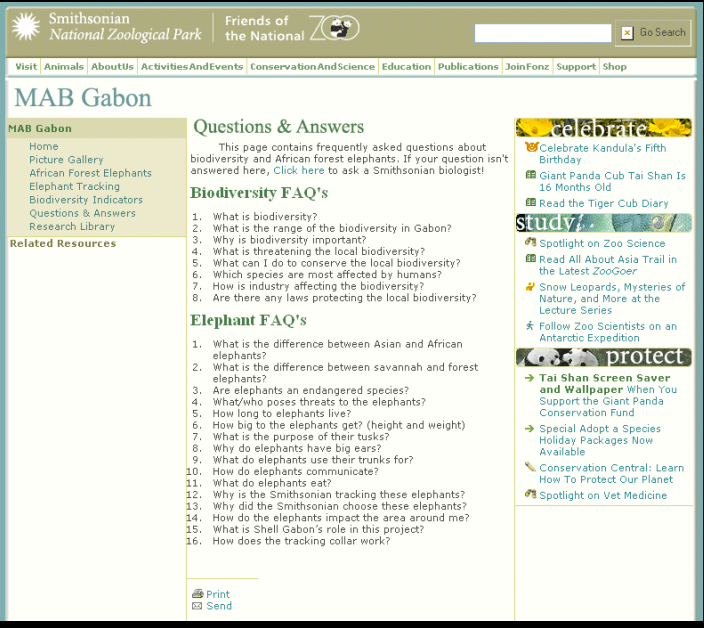
- Celebrate Kanoula's Fifth Birthday
- Giant Panda Cub Tai Shan Is 16 Months Old
- Read the Tiger Cub Diary
- Spotlight on Zoo Science
- Read All About Asia Trail in the Latest ZooGoer
- Snow Leopards, Mysteries of Nature, and More at the Lecture Series
- Follow Zoo Scientists on an Antarctic Expedition
- Tai Shan Screen Saver and Wallpaper When You Support the Giant Panda Conservation Fund
- Special Adopt a Species Holiday Packages Now Available
- Conservation Central: Learn How To Protect Our Planet
- Spotlight on Vet Medicine



Website Layout

- Introduction Page
- ↳ Picture Gallery
- ↳ Species Information
- ↳ Special Features (i.e. Tracking Map)
- ↳ Biodiversity Indicators
- ↳ Frequently Asked Questions/Contact MAB Biologists
- ↳ Research Library

Frequently Asked Questions



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MAB Gabon

- Home
- Picture Gallery
- African Forest Elephants
- Elephant Tracking
- Biodiversity Indicators
- Questions & Answers
- Research Library

Related Resources

Questions & Answers

This page contains frequently asked questions about biodiversity and African forest elephants. If your question isn't answered here, Click here to ask a Smithsonian biologist!

Biodiversity FAQ's

1. What is biodiversity?
2. What is the range of the biodiversity in Gabon?
3. Why is biodiversity important?
4. What is threatening the local biodiversity?
5. What can I do to conserve the local biodiversity?
6. Which species are most affected by humans?
7. How is industry affecting the biodiversity?
8. Are there any laws protecting the local biodiversity?

Elephant FAQ's

1. What is the difference between Asian and African elephants?
2. What is the difference between savannah and forest elephants?
3. Are elephants an endangered species?
4. What/who poses threats to the elephants?
5. How long to elephants live?
6. How big to the elephants get? (height and weight)
7. What is the purpose of their tusks?
8. Why do elephants have big ears?
9. What do elephants use their trunks for?
10. How do elephants communicate?
11. What do elephants eat?
12. Why is the Smithsonian tracking these elephants?
13. Why did the Smithsonian choose these elephants?
14. How do the elephants impact the area around me?
15. What is Shell Gabon's role in this project?
16. How does the tracking collar work?

Print Send

celebrate

- Celebrate Kandula's Fifth Birthday
- Giant Panda Cub Tai Shan Is 16 Months Old
- Read the Tiger Cub Diary

study

- Spotlight on Zoo Science
- Read All About Asia Trail in the Latest ZooGoer
- Snow Leopards, Mysteries of Nature, and More at the Lecture Series
- Follow Zoo Scientists on an Antarctic Expedition

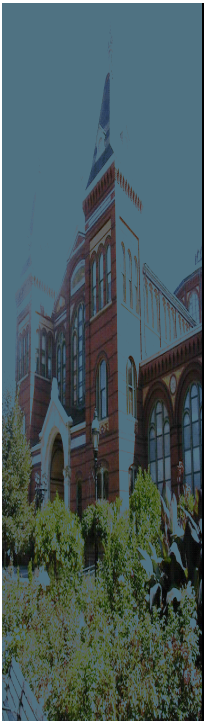
protect

- Tai Shan Screen Saver and Wallpaper When You Support the Giant Panda Conservation Fund
- Special Adopt a Species Holiday Packages Now Available
- Conservation Central: Learn How To Protect Our Planet
- Spotlight on Vet Medicine



Some FAQ

- What is biodiversity?
- What can I do to conserve the local biodiversity?
- Which species are most affected by humans?
- How is industry affecting the biodiversity?
- Are there any laws protecting the local biodiversity?



Website Layout

Introduction Page

- ∞ Picture Gallery
- ∞ Species Information
- ∞ Special Features (i.e. Tracking Map)
- ∞ Biodiversity Indicators
- ∞ Frequently Asked Questions/Contact MAB Biologists
- ∞ **Research Library**

Presentation Summary

Alfonso Alonso gave the presentation in Gabon to a number of Shell executives, and Smithsonian Researchers. He provided us with the following feedback.

Thank you for the presentation that you prepared. Everybody that saw it was very happy with the design, order of presentation and content. Great work.

In addition, there were a few questions and comments as follows:

- People wanted to see the introductory page.
- They could not see a place or link where people are encouraged to send photos (as there is for the questions).
- It was suggested to ask if the person that submits a photo is willing to share it (as part of the metadata gathered).
- There should be a category of "other" in case the photo does not fit any one there.
- People liked the idea of having a category of new photos and a date attached to it where photos will be first deposited. The date will be updated every month or so depending on the volume of photos received.
- It was suggested that the web page should not be launched until it has at least some sections already translated into French. Such that first French speaker visitors do not get discouraged. Can the team start with the translation?
- Does the National Zoo allow for links?
- Shell Gabon people would like to have the partnership more displayed. We need to ask Rob Madill if it is possible?
- For the species information: how many species are planned to be presented? (info only of elephants?)
- How long is the text for the elephants?
- Suggested title for ele tracking: Tracking Elephants in Africa
- People loved the Google base map. Two questions: Will users need to download Google earth to use it? (they are worried that the connections are so slow that it may not be too practical). Oob (IT person for Shell Gabon) would like to know more about the technical aspects of how you did it. Please contact him at: oob.nding@shell.com He is very nice and speaks perfect English.
- People asked if you have seen the CARPE elephant page (via Univ. of Maryland).
- It will be good to have a small intro paragraph to the tracking, mostly to acknowledge the partners that helped placed the collars. Something like this: "Four African Forest Elephants were studied using satellite collar technology in the Gamba Complex of Protected Areas in Gabon. By placing the satellite collars, the position of the animal is fixed at a given time. Collars were placed in collaboration with the Wildlife Conservation Society. Select below an elephant that you can follow through the jungle of the Gabon."
- Not too clear how the indicators section fitted?
- Questions and Answers. People suggested changing the menu to: "Questions? Contact us" People were also curious to know the answers to the proposed questions.
- People agreed that there should be a really good marketing strategy for individuals to be encouraged to use it.

This feedback was helpful and gave us an excellent perspective of the attitudes of those in Gabon. Despite this there were several factors that mitigated this input. Many questions people had could have been answered by us had we been there, these are questions such as whether we had seen the Maryland CARPE mapper page. Also many of the features they asked about had already been implemented but again because of the difficulties of transcontinental communication we were unable to show. We couldn't send a complete version of the website with Alfonso, therefore there were questions about the website which we had already addressed such as seeing the intro page. Finally, this feedback came too late in the IQP process to be able to implement significant changes. Therefore other than a few structural changes and textural changes it was impossible to make most of the changes given the time frame.

**APPENDIX F: DOCUMENTS USED AS SOURCES IN
WEBSITE CONTENT**

General Research Documents			
Title	Authors	Date	Source
An Estimate of the Numbers of Forest Elephants in Gabon	Barnes, R. F. W. ; Blom, A. ; Alers, M. P. T. ; Barnes, K. L.	1995	<u>Journal of Tropical Ecology</u>
Elephant (<i>Loxodonta africana</i>) Survey Using Dung Counts in the Forests of the Central African Republic	Fay, J. Michael.	1991	<u>Journal of Tropical Ecology</u>
The Feasibility of Current Options for the Management of Wild Elephant Populations	Whyte, Ian	2003	<u>Kruger National Park</u>
Sinking the Flagship: Case of the Forest Elephants in Asia and Africa.	Blake, S ; Hedges, S	<u>2004</u>	<u>Conservation Biology</u>
Crop-Raiding Elephants and the Moon	Barnes, R	<u>2006</u>	<u>Africa Journal of Ecology</u>
Using Seismic Sensors to Detect Elephants and Other Large Mammals	Wood, J.; O’Connell-Rodwell, C.; Klemperer, S	<u>2005</u>	<u>Journal of Applied Ecology</u>
Forest Elephant Genetic Tagging	Eggert, L.; Eggert, J.; Woodruff, D	<u>2003</u>	<u>Molecular Ecology</u>
Forest Elephant Fact Sheet (<i>Loxodonta cyclotis</i>)	Roca. A	<u>2003</u>	<u>Cornel University, Elephant Listening Project</u>

Educational Websites			
Title	Organization	Date	URL
“An Elephantine Tragedy”	Wildlife Conservation Society	2006	http://www.wcs.org
“Satellite Mallard Tracking”	Arkansas Game & Fish Commission; Mississippi Department of Wildlife, Fisheries & Parks	2006	http://waterfowl.cast.uark.edu/default.asp

“Tagging of Pacific Pelagics Tagging of Pacific Pelagics”	National Oceanic and Atmospheric Association	2006	http://las.pfeg.noaa.gov/TOPP_recent/index.html
“Asian Elephants”	Smithsonian National Zoological Park	2006	http://nationalzoo.si.edu/Animals/AsianElephants/
“CARPE Mapper”	University of Maryland	2006	http://maps.geog.umd.edu/carpemapper/
“Gabon GIS”	Smithsonian National Zoological Park and Shell Foundation	2004	http://amazongis.si.edu/website/mab/viewer.htm
“Tracking Silver Moon: Animated Map”	Smithsonian Institution	2004	http://nationalzoo.si.edu/ConservationAndScience/ConservationGIS/projects/elephants/SilverMoon/animated.cfm

Smithsonian Documents		
Name	Date	Author*
<i>Challenges for Forest Conservation in Gabon, Central Africa</i>	2005	<u>Smithsonian Institution</u>
<i>Gabon Biodiversity Project: Briefing Paper #1</i>	2001	
<i>Gabon Biodiversity Project: Briefing Paper #7</i>	2006	
<i>Patch-occupancy models indicate human activity as major determinant of forest elephant <i>Loxodonta cyclotis</i> seasonal distribution in an industrial corridor in Gabon</i>	2006	
<i>The Gabon Biodiversity Program 2005 Report</i>	2005	
<i>The Gamba Complex of Protected Areas: An Illustration of Gabon's Biodiversity</i>	2006	
<i>Ecological Indicators for the industrial Corridor in the Gamba Complex of Protected Areas: A zone of High Biodiversity Value and Oil Exploitation in Southwest Gabon</i>	2006	
<i>Terrestrial Mammals from the Gamba Complex of Protected Areas, Gabon: Species Composition and Comparison Sampling Techniques</i>	2006	
<i>Assessment of the Communities of Medium-sized and Large Arboreal and Terrestrial Mammals in the Rabi-Toucan Region of the Ngove-Ndogo Huntung domain and Southwestern Loango National Park</i>	2006	
<i>Large Mammals Encountered in the Gamba Complex of Protected Areas, Gabon</i>	2006	

APPENDIX G: GENERAL DOCUMENT REVIEWS

General Research Documents - These are documents that came from a wide range of sources. They are made up of information from general sources on biodiversity but include both specific and more general information depending on their thoroughness.

Review Methodology

One category of materials we reexamined was classified as general research papers. These are documents on related subjects that are not written by Smithsonian Institution employees. The methodology we used to review these papers consisted of reviewing them taking note of a number of characteristics. Some of the main things we looked for in these papers were the following:

- Recurring Themes - Themes shared amongst a number of papers indicated importance
- Pressing Information – Recent data showing a dramatic change over the past few years
- Miscellaneous Data – Tidbits of information that weren't found in Smithsonian texts but appear pressing.

Review of “An Estimate of the Numbers of Forest Elephants in Gabon” by Barnes et al.

Overview: This document outlined the lack of accurate data on Forest Elephant

populations many estimates of which stemmed back to unsubstantiated estimates of the early 1980s. Early estimates guessed 300,000- a million elephants living in forest areas of equatorial Africa. The Researchers used a survey method which stratified the forest according to human population distribution. Then the researchers recorded the amount of dung within each area. The study estimated that 61,800 +/- 20,000 elephants live in Gabon. This leaves it with one of the largest remaining elephant populations. Unfortunately this document is over a decade old and therefore possesses somewhat dated information.

- **Themes-** This document presented themes of the importance of accurate population measurement in order to save the elephant populations but doesn't mention the Importance of the Elephants themselves to the local ecology.
- **Pressing Data-** Data such as Gabon possessing the second largest elephant population in Central Africa and one of the largest in Africa as a whole are all significant
- **Miscellaneous data-** Provided information on when previous population tracking surveys had been conducted and how they were done.

Conclusion- This document provided good background knowledge of the history of elephant tracking and how inaccurate the data has been until the last decade or so. Of course the document is rather dated leading to an inability to fully trust it. It was written before Forest Elephants were defined as a species

and also refers to the country containing the largest elephant population as Zaire, A country which no longer exists.

Review of “Elephant (*Loxodonta africana*) Survey Using Dung Counts in the Forests of the Central African Republic” by Fay

Overview: This document described elephant population surveys conducted in the Central African Republic. It examines the elephant population with regard to an estimates conducted earlier that decade in which large amounts (60,000-80,000) elephants were found. A more recent survey found the elephants to have their populations decimated by nearly 70%. The losses are estimates based on elephants in open ground not forest Elephants. Therefore dung estimates were conducted to find the loss of elephants in the forest. Results found that forest elephant populations in the south-east and south-west were still relatively high while elephants in the south central region of the country had disappeared.

- **Themes-** This document presented themes of how rapid a loss of a species can occur, as well as the importance of proper population recording
- **Pressing Data-** The rapid diminishment of elephant population from around 70,000 to 21,000 in less then 5 years is significant.
- **Miscellaneous data-** Provided information on when previous population tracking surveys had been conducted and how they were done.

Conclusion- This document presented the rapid endangerment a species can face with losses occurring in the span of a few years when sustained poaching is introduced. This document is dated. It was written before Forest Elephants were defined as a species and the survey parameters seem to not take into account the difference between elephants living in the savannah and the forest.

Review of “The Feasibility of Current Options for the Management of Wild Elephant Populations” by Whyte

Overview: This document refers to an opinion which is often not as well heard as that of all the dangers facing elephants. According to the document, there is a belief by some scientists that elephants have again reached a stable population. In many parts of Africa, Elephant populations are concentrated into small areas. This can result in damage to other aspects of the ecology. The article poses methods of population control. These include translocation, contraception, and culling.

- **Themes-** This document presented themes of overpopulation caused by limited habitat and reduced predators. It claims that overpopulation too can cause damage.
- **Pressing Data-** The simple fact that elephant populations in some protected areas may be too high is shocking.
- **Miscellaneous Data-** None used.

Conclusion- This document presented the overall difficulties of maintaining a stable population in an environment where you don't understand all the conflicting demands of species. This document's data conflicts with commonly held notions of the danger facing elephants. This leads me to believe it might have been written under pressure from ivory or bushmeat hunting lobbyists.

Review of “Sinking the Flagship: Case of the Forest Elephants in Asia and Africa.” by Blake & Hedges

Overview: This document is an overview of the status of the Forest Elephants across the world. It deals with Asian and African Elephants populations. It primarily speaks of the poor population data existing for the relatively new species. It talks about how most studies were based on population assumptions which were more than 15 years old and often conducted improperly. This has led to gaps in knowledge of the species which can lead to mistakes in their management.

- **Themes-** The need to conduct more accurate and extensive population surveys is needed. This will lead to better understanding to how the elephants have interacted with their environment.
- **Pressing Data-** The fact that most elephant population surveys are more than 15 years out of date.
- **Miscellaneous Data-** Provided data tables on forest elephant populations.

Conclusion- A good general report on the status of forest elephants across the world, this report gives numerous useful examples of elephant populations. It has

known data on elephant populations across the world. It also has information on the MIKE programs. MIKE (Monitoring the Illegal Killing of Elephants) is a good program which serves to monitor poaching across Africa

Review of “Crop-Raiding Elephants and the Moon.” by Barnes

Overview: This document is an overview of Elephants and their likely tendency to Raid Crops, looking into behavioral causes for crop-raiding. The document looked into the amount of Crop Raiding Elephants did in relation to the full moon and rain. The study found that elephants are less likely to crop raid if there is a full moon, and more likely to raid in the rain.

- **Themes-** The likelihood of crop raiding is the result of environmental condition such as the moon and rain. Crop raiding is a serious problem in areas where farms and elephant habitats are close to one another.
- **Pressing Data-** Elephants are very likely to Crop Raid more than 300 times over the course of a month in the surveyed section of Ghana.
- **Miscellaneous Data-** Provided background on crop-raiding

Conclusion- Presenting the dangers that crop raiding plays both to local farmers and the elephants, this document was enlightening. Farmers have their livelihoods damaged therefore have a poor opinion of the elephants. This is bad for the elephants. The article explains that elephants don't crop raid in moonlight because

they are afraid they will be seen. They also raid in the rain because the cloud cover blocks the starlight

Review of “Using Seismic Sensors to Detect Elephants and Other Large Mammals” by Wood et al.

Overview: This article reviews alternative methods of elephant tracking other than traditional methods of dung counting. It involves using seismic sensors to detect nearby large mammal's steps. It is effective enough to identify between species large amounts of the time.

- **Themes-** The importance of accurate population surveys to effective conservation management. Importance of developing new techniques for Population Measurement.
- **Pressing Data-** Seismic techniques have 87% accuracy.
- **Miscellaneous Data-** Varying techniques of population surveys and tracking

Conclusion- This documents showed how it is important to experiment with new techniques of population surveying for elephants. By developing these new techniques we can gain a better understanding of the species. This understanding will lead to better methods of conservation. This specific technique seemed to not be the best in finding accurate numbers but with proper development it may have a promising future.

Review of “Forest Elephant Genetic Tagging” by Eggert et al.

Overview: This article reviews alternative methods of elephant tracking other than traditional methods of dung counting. It involves using Genetic indicators in the animals dung to detect individual animals. It has advantageous in that it counts individuals and can track certain characteristics such as sex relation to other animals and how far an individual has traveled.

- **Themes-** The importance of accurate population surveys to effective conservation management. Importance of developing new techniques for Population Measurement.
- **Pressing Data-** Results very close to traditional Dung Analysis
- **Miscellaneous Data-** Varying techniques of population surveys and tracking

Conclusion- This documents showed how it is important to experiment with new techniques of population surveying for elephants. By developing these new techniques we can gain a better understanding of the species. This understanding will lead to better methods of conservation. This specific technique seemed to a good complement to traditional dung counting methods but because of their similarities both may be flawed.

Review of “Forest Elephant Fact Sheet (Loxodonta cyclotis)” by Local

Overview: This is a short article which goes over some general facts about Forest Elephants and their Habitat

- **Themes-** African Forest Elephants are unique from Savannah Elephants
- **Pressing Data-**
- **Miscellaneous Data-** Provided a general source of info for Elephants

Conclusion- This Document gave good general facts about African Forest Elephants and how they differed from Savannah Elephants. It differs by being smaller than the latter with smaller ears and straighter smaller tusks.

Review Summary

As these documents were as varying in subject matter as they were authors, it was difficult to pick out generalized themes.

- **Recurring Themes –** Recurring themes shown in many documents was the lack of accurate population data. The gap in knowledge in elephant's populations made it difficult to properly manage their conservation. Other themes included the attempt to reconcile this by developing new techniques of Elephant population surveys
- **Pressing Information –** There were many tidbits of data which showed the grave importance of immediate conservation. Examples of this are the loss of 70% of the native elephant population over the course of 5 years. Others just displayed surprising data. For instance the conclusion that Elephants are overpopulated in some areas of Africa, actually harming other species
- **Miscellaneous Data –** Easily the most important use of these documents was to provide various small facts which the Smithsonian

skipped over. Such as continent data on elephant populations and their losses as well as histories of population surveys and tracking methods

APPENDIX H: EDUCATIONAL WEBSITE REVIEWS

Educational Websites - These are resources on the web which have similar missions to diffuse knowledge but have varying subject matter and intended audiences.

Website Review Methodology

Websites were evaluated through different criteria than were papers. They were evaluated by their ease of use and methods of presenting information and their contents similarity to ours. Websites were examined on a basis of:

- Perceived Similarities – Similarities between the examined website and the objectives of our proposed project website.
- Web Formatting – How the constraints in formatting were dealt with in regard to content.
- Depth – How in depth other websites went with all their information as a gauge of how internet audiences perceived information.

Review of “An Elephantine Tragedy” by Wildlife Conservation

Society <http://www.wcs.org>

Overview: This website gives information on a specific example of extreme species loss in Chad. The site goes in depth on severity of poaching and its consequences.

- **Perceived Similarities** – Like our site this site has information on biodiversity of a specific location. This website has more indepth portraits of specific events, unlike ours.
- **Web Formatting** – This website is also constrained by large margins. They deal with by the smaller size of their text.
- **Depth** – This website seems to be fairly in- depth. It has far more information on specific events then we wish to have.

Conclusion: This site was a good example for our section on general biodiversity info, as it was constrained in a way that is similar to how ours will be set up. The review of this site though took almost the same role as reviewing general documents as the site contained information that was pertinent to the report.

Review of “Satellite Mallard Tracking” by Arkansas Game & Fish Commission; Mississippi Department of Wildlife, Fisheries & Parks “<http://waterfowl.cast.uark.edu/default.asp>”

Overview: A large map was the central element, with small duck icons displaying the location of each duck. The ducks were color-coded by sex, with a key placed directly beside the map. By default, all that was displayed was the current location of the ducks. A series of tools above the map allowed the user to interact with it. The user could click to zoom in and out, pan the map, turn on the display of the names or identification numbers of the ducks, and turn on the display of the ducks’ flight

paths. The map required more interaction than the TOPP map to get the maximum amount of information, specifically in regards to the ducks' flight paths and names/identification numbers.

- **Perceived Similarities** – The site contained not only a map as ours was too but also contained limited biological information on the ducks.
- **Web Formatting** – The major downfall of the site was the manner in which this information was displayed. The text occupied a very small space and scrolled up within that space. There was no way to stop the text from scrolling, so anyone who wished to read it in its entirety had to wait for it to start scrolling at the beginning again.
- **Depth** – The site did convey some information about the ducks. Flanking the map on each side, were two small windows that display what were presumably recent updates on the ducks that the site maintainers wanted users to be aware of. They seemed to consist more of updates on these specific ducks' positions and conditions than they did of general biological information. While this was not necessarily a negative thing in and of itself, we knew our final product would need to contain such general biological information.

Conclusion: A good example of the tracking map which our website would contain. The site had several drawbacks in its lack of depth and its user interface.

APPENDIX I: SMITHSONIAN RESEARCH DOCUMENT

REVIEWS

Smithsonian Research Documents - These are papers detailing research conducted specifically by the Smithsonian and contain a wealth of knowledge

Smithsonian Research Documents Methodology

Smithsonian research documents were by far the most important. As they contained very thorough records of all the information which was conducted in Gabon, they were the most important to our project. We went through these on the following basis.

- Recurring Themes – We examined reoccurring themes in these documents assuming those that occurred in many or all the documents should be key highlights in the website
- Elephant Data – Data dealing specifically with elephants was of particular interest to us as they were to be one of the primary focuses of the website.

Review of “The Gamba Complex of Protected Areas: An Illustration of Gabon’s Biodiversity” by the Smithsonian Institution

Overview- Document provided an excellent background of the situation of the Gamba Complex. It identifies the various tensions which currently exist within the Complex as well as giving an overview of all the major research sites. Finally the document gives a very general outline of the research that has been conducted by organism type and gives conclusions outlining scope of work done and work that is to come.

- **Themes** – The need to learn more about the biodiversity of the Gamba Complex is a theme in this document. It also outlines the tremendous biodiversity that exists in the Complex. Finally it outlines the Smithsonian’s current objectives in Gamba.
- **Elephant Data** – Elephants are only given a passing reference in this general paper.

Conclusion- An excellent intro paper, this document establishes tensions and pressures of the Gamba complex with excellent authority. It outlines major player as well defines major objectives, sites of operation and finally major areas of research. It was very helpful in developing parts of the website such as the interactive map which required general descriptions of locations in Gamba

APPENDIX J: WEBSITE SCREENSHOTS

This appendix contains screenshots of the layouts of the various pages contain within the site as of December 4, 2006.

Home Page

The screenshot shows the website's header with the Smithsonian logo and navigation menu. The main content area is titled "MAB Gabon" and includes a sidebar with navigation links, a central text block with a map of Gabon, and a right-hand sidebar with promotional banners and news items.

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MAB and Gabon

Where is Gabon?

Gabon is a country in East Africa roughly the size of Colorado. The country contains large tracts of undeveloped forests. These forests have been able to remain whole because Gabon has a population density which is very low compared to the rest of Africa. Most of the countries population is also urban leaving the forests further undisturbed. Gabon's Forests have been found to contain some of the world's most biologically diverse ecosystems.

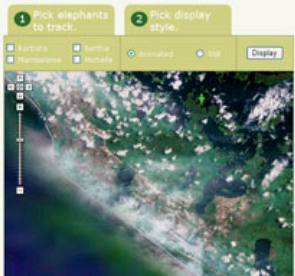


Of particular importance is the Gamba Complex. It is a coastal area in southern Gabon consisting of two national parks (Loango and Moukalaba-Doudou) and an industrial corridor between them which has restricted access. The Gamba Complex in turn, possesses some of Gabon's most biologically diverse ecosystems. As a result the Gamba Complex has become the focus of one of the Smithsonian Institution's MAB (Monitoring and Assessing Biodiversity) programs.

What is MAB doing in Gabon?

Tracking Elephants

For the past four years the Smithsonian Institution's MAB program has been tracking four elephants in the Gabon Africa. The purpose of tracking these elephants is to observe and record their migratory patterns. To get an animated view of their journey click the map on the right/left and take a walk on the wild



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Elephant Tracking Page

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Learn more about African Forest Elephants
See pictures of African Forest Elephants

Elephant Tracking

1 Pick elephants to track. **2 Pick display style.**

Barbara Bertha Animated Still

Mambeleme Michelle





LEGEND

North
West East
South

Elephants

Barbara Mambeleme
 Bertha Michelle

Question Submission Page



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Ask a Question

Do you have a question that wasn't answered on the website? Here's your chance to send it in and have it answered by a Smithsonian Institution biologist! Just fill out the form below to send in your question and you should receive a reply by email in the coming days.

Name:

Email Address:

Question Subject:

Question:



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- African Forest Elephant Satellite Tracking
- Pictures of African Forest Elephants

African Forest Elephants



Elephants are one of the most amazing species living on the planet today. They are important to their natural habitats by being a keystone species. Keystone species is a species whose very presence contributes to a diversity of life and whose loss would consequently lead to the extinction of other forms of life. This means they serve their habitats through the demolishing of trees which allow more undergrowth for smaller animals to feed off. They also are instrumental in the spread of seeds for many plants, making them important contributors to their dynamic environments.

Unfortunately Elephants are one of the most threatened species on the planet. They are hunted in most places for their tusks (ivory), and for their meat. Their habitat has shrunk greatly as a result of humans and their numbers have been cut in half in just the past 30 years.

The numbers of each species (African and Asian) were already thought to be low, but now due to recent genetic discoveries it is believed that African Elephants can really be divided into two species, African Forest Elephants and African Savannah Elephants. This presents a greater danger to each species but also presents an opportunity to help these species thrive. It also gives researchers an opportunity to learn about how species are different and how their habitats reflect this.

Not only do Forest and Savannah Elephants vary in their environments but they also vary in habitat and attributes. Forest Elephants tend to be more feral than the latter type seldom seen because of their forest habitat. Forest Elephants also tend to be smaller, having a different number of toenails, and have smaller straighter tusks as well as smaller ears. Savannah Elephants on the other hand tend to be much larger than their forest brethren. African Elephants also tend to have larger rounder ears and longer more curved tusks.

African Forest Elephants of the Gamba Complex of Protected Areas in Gabon have a seasonal migratory pattern. Typically the elephants move to resources which are only seasonally available, such as food



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Interactive Map of Gamba

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Explore Gamba

MAB has been operating in four main areas within Gabon, which are collectively known as the Gamba complex: the Loango and Moukalaba-Doudou national parks, the Rabi protected area, and the town of Gamba. Click on the stars next to each region to learn more about them, and hear stories from people who have been there.

Gamba Complex of Protected Areas

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Frequently Asked Questions Page



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Questions & Answers


This page contains frequently asked questions about biodiversity and African forest elephants. If your question isn't answered here, [Click here](#) to ask a Smithsonian biologist!

Biodiversity FAQ's

1. What is biodiversity?
2. What is the range of the biodiversity in Gabon?
3. Why is biodiversity important?
4. What is threatening the local biodiversity?
5. What can I do to conserve the local biodiversity?
6. Which species are most affected by humans?
7. How is industry affecting the biodiversity?
8. Are there any laws protecting the local biodiversity?

Elephant FAQ's

1. What is the difference between Asian and African elephants?
2. What is the difference between savannah and forest elephants?
3. Are elephants an endangered species?
4. What/who poses threats to the elephants?
5. How long do elephants live?
6. How big do the elephants get? (height and weight)
7. What is the purpose of their tusks?
8. Why do elephants have big ears?
9. What do elephants use their trunks for?
10. How do elephants communicate?
11. What do elephants eat?
12. Why is the Smithsonian tracking these elephants?
13. Why did the Smithsonian choose these elephants?
14. How do the elephants impact the area around me?
15. What is Shell Gabon's role in this project?
16. How does the tracking collar work?

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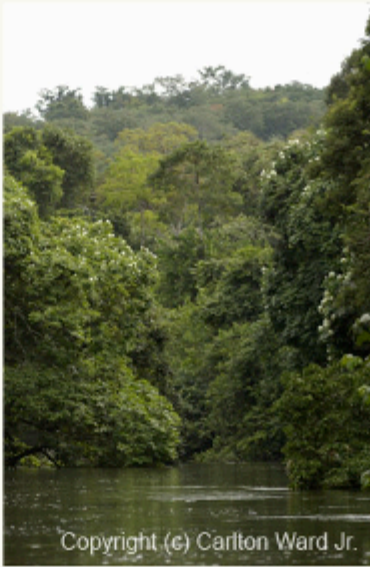

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Mount Doudou Expedition River Trip day 1 Photo by: Carlton Ward Jr.

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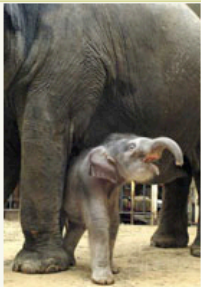
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Gabon Picture Gallery



Kandula was born on November 25, 2001. He weighed 325 pounds at birth.


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Submit a Picture

Do you have a picture of Gabon you want to share with us? If so, fill out this form and send it in, and your picture will be looked at by Smithsonian Institution employees and possibly added to one of the galleries! All pictures must be in the .jpg/jpeg format.

Name:


Email Address:

Picture Subject:

Description (Optional):

Picture:


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Threats to Biodiversity Page



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Threats to Biodiversity

There are several biological indicators which have been defined. These indicators are signs and dangers which must be observed to maintain a healthy system of Biodiversity within the Gamba Complex of Protected Areas. They are the result of years of field research and analysis in Gabon.

- Invasive Species
- Fragmentation
- Bushmeat
- Habitat Degredation
- Ecological Connectivity

Alien Invasive Species

One of the greatest dangers to biodiversity in the Gamba Complex of Protected Areas is the presence of alien invasive species. Alien invasive species are those that are introduced to a new range, either on purpose or by accident, that cause harm to native species. They often have no predators or species that can regulate them in the new environment so they flourish.



One example of an alien invasive species that inflict damage on the local ecosystem is the little fire ant. This species originates from the Americas and has a tendency to severally damage local species. These ants replace local ant species and eliminate other arthropods. This has reverberating impacts throughout the food chain. They could also affect the eyes of larger animals including sea turtles, elephants, and large cats.

The Smithsonian team is mapping the areas where the little fire ant is currently present. They are providing recommendations to diminish accidental dispersion and to reduce ant densities in areas that could serve as sources for colonization. Prevention is the best way to discourage invasive species.

Fragmentation

Fragmentation is the physical break up of the jungle due to the construction of roads, pipelines and other man made barriers. Fragmentation limits animals' movements, making it difficult for them to get to seasonally available resources. For example, some species of arboreal mammals do not come to

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APPENDIX K: WEBSITE TEXT

Elephant Page

Elephants are one of the most amazing species living on the planet today. They are important to their natural habitats by being a keystone species. Keystone species are species whose very presence contributes to a diversity of life and whose loss could lead to the extinction of other forms of life. Elephants can serve their habitats through the demolishing of trees which allow more undergrowth for smaller animals to feed on. They also are instrumental in the spread of seeds for many plants, making them important contributors to their dynamic environments.

Unfortunately elephants are one of the most threatened species on the planet. They are hunted in many places for their tusks (ivory), and for their meat. Their habitat has shrunk greatly as a result of humans and their numbers have been cut in half in just the past 30 years.

The numbers of each species (African and Asian) were already thought to be low, and recent genetic discoveries indicate African Elephants should be divided into two species, African Forest Elephants and African Savannah Elephants. This presents an opportunity to help these species thrive; we can now learn about how the species are different and how their habitats reflect this.

Not only do Forest and Savannah Elephants vary in their environments but they also vary in habitat use and attributes. Forest Elephants are seldom seen because of their forest habitat. Forest Elephants also tend to be smaller, having a different number of toenails, and have smaller straighter tusks as well as smaller ears. Savannah Elephants on the other hand are larger, and tend to have larger rounder ears and longer more curved tusks.

Some African Forest Elephants of the Gamba Complex of Protected Areas in Gabon seem to have a seasonal migratory pattern. Typically the elephants move to resources which are only seasonally available, such as food water and mineral deposits. The elephants may travel huge distances to find patches of fruit and preferred mineral deposits, such as salt which the elephants use to supplement their diet.

Biodiversity Threats Page

To help protect this biologically diverse area, researchers at the Smithsonian Institution have made thorough assessments of the animal and plant communities in order to determine potential threats to their continued health.

There are several biological threats which have been defined. These threats are signs and dangers which must be observed to maintain a healthy system of biodiversity within the Gamba Complex of Protected Areas. They are the result of years of field research and analysis in Gabon.

Alien Invasive Species

One of the greatest dangers to biodiversity in the Gamba Complex of Protected Areas is the presence of alien invasive species. Alien invasive species are those that are introduced to a new range, either on purpose or by accident, and can cause harm to native species. They often have no predators or species that can regulate them in the new environment so they flourish.

One example of an alien invasive species that inflicts damage on the local ecosystem is the little fire ant. This species originates from the Americas and has a tendency to seriously damage local species. These ants replace local ant species and eliminate other arthropods. This has reverberating impacts throughout the food chain. There are indications they may also affect the eyes of larger animals including sea turtles, elephants, and large cats, and they cause painful bites to humans

The Smithsonian team is mapping the areas where the little fire ant is currently present. They are providing recommendations to diminish accidental dispersion and to reduce ant densities in areas that could serve as sources for colonization. Prevention is the best way to discourage invasive species.

Fragmentation

Fragmentation is the physical break up of the jungle due to the construction of roads, pipelines and other man made barriers. Fragmentation limits animals' movements, making it difficult for them to get to seasonally available resources. For example, some species of mammals that are arboreal (living in trees) do not come to the ground during their entire life. Therefore, when the canopy is broken they can not cross the gap. Fragmentation often increases the border areas of environments making them more vulnerable to other hazards. It can also divide up animal populations. This reduces opportunities for them to breed and has potential to reduce population levels.

Fragmentation can be minimized by maintaining canopy connectedness even when roads are made, by reducing the width of the road. Also restricting access to roads encourages animals to cross the seldom used ones. Restricting access to roads will also allow ones that are no longer in use to be reclaimed by nature.

Bushmeat Trade

The bushmeat trade has been one of the most severe pressures on biodiversity world wide. Bushmeat is meat of any native species which is hunted

from the jungle. It is a common practice and has provided the people of the Gamba Complex food for generations. Hunting of native animals can occur and pose no threat to animal communities when its scope is limited. Issues arise when native animals are hunted in a nonsustainable way. A large market for bushmeat has developed in Africa and animals such as elephants and primates are hunted to be shipped off to large cities where they can fetch high prices.

The bush meat trade puts heavy stresses on biodiversity. In several parts of the world, some species have been hunted to local extinction. Their loss reverberates into the food chain allowing other animal populations to grow without predators or vice versa predators might lose their only food source. This can lead to a collapse in the ecosystem affecting unique species and limiting biodiversity. Bushmeat hunting is compounded by the increase access gained when roads are made with no restrictions and habitat loss.

The main ways of limiting the bushmeat trade within the Gamba Complex is awareness and monitoring. Increasing awareness among people who depend on bushmeat to supplement their diet will encourage responsible hunting. An increase in monitoring prevents poachers who live outside the region from entering the complex, ensuring the animals stay safe and protected.

Habitat Degradation

Habitat degradation is the negative alteration of the local environment and can affect local species. On a large scale, most of the habitats within the Gamba Complex have stayed intact. Areas near well sites, roads and human habitations have experienced some degradation.

Through enforcement of logging and drilling permits, habitat within the complex can be protected. By limiting access to the jungle it can be ensured that no new illegal operations can be started up. Responsible management of land is the key to preserving this valuable environment.

Ecological Connectivity

The Industrial Corridor between two national parks in Gabon serves as an ecological connector. It connects the ecology in the two parks. In this way it serves to strengthen the integrity of both parks biodiversity. For instance, elephants cross large distances to seasonally available resources. In the process, they transport plant seeds to various areas of the forest.

By analyzing the movements of large species like elephants the Smithsonian has been able to identify areas of critical importance. Continued observations of large animals such as the elephants will allow analysis of connectivity patterns, seasonal movements, and effects caused by humans.

Species Page

These are just some of the many species of animals that call Gabon home.

Manatee

Manatees, also known as Sea Cows, are large aquatic mammals that live in three regions of the world: the Gulf of Mexico, the Amazon River Basin and western Africa. They are herbivores and spend most of their time grazing in shallow water, and are known to eat up to 9% of their body weight in one day. They can weigh anywhere from 500 to 1000 kg at adulthood but weigh just 30 kg when they are born. They are docile, curious creatures, and when combined with living in shallow waters, this results in frequent run-ins with boats and fishing equipment, which can hurt or kill them.

Water Chevrotain

The Water Chevrotain, also known as the Fanged Deer, is a small mammal found in tropical Africa. It is the largest of four species of chevrotains, which are similar to deer but are barely larger than small dogs. Adults average 10-12 kg in weight and up to .80 m in length. Chevrotains feed mostly on a diet of plants, largely fruit. As their name implies, water chevrotains spend most of their time around water sources in places where they can easily run and hide. The males also have tusks, hence their other name of "Fanged Deer".

Hippopotamus

The hippopotamus is a large mammal which lives in groups, known as pods, of up to 40 animals. Hippos are very large creatures, averaging 3.5 m long and 1.5 m tall and weighing in at 1500-3200 kg. Hippos live to be up to 40-50 years old. Their eyes, ears and nostrils are on the tops of their heads, allowing them to spend most of their time of their water.

Golden Cat

The Golden Cat is a medium sized cat, weighing between 10-14 kg, standing approximately .5 m tall and reaching lengths of .75-1.5 m. Their coats can appear in two phases: red and gray. The pattern of their spots can also vary widely. They live primarily in rainforests throughout equatorial Africa. The cats live alone and hunt primarily at night. Their diet consists of rodents, tree shrews, antelope and birds.

Black Colobus Monkey

The Black Colobus Monkey lives in western Africa - specifically Cameroon and Gabon. They live in groups of 5-9 individuals, with 6 females and 1-3 males per group. Their diet is composed mostly of seeds and young leaves. The name Colobus comes from the Greek for "mutilated", referring to their extremely small thumbs. Infants are born with white fur, but it changes to the distinctive black and white pattern seen in adults after approximately 3 months.

Sitatunga

The Sitatunga, also known as the Marshbuck, is a swamp-dwelling antelope found throughout central Africa. Sitatunga stand about one and a half meters at the shoulder. Sitatunga have a water-proof coat which is dark brown in males and reddish brown in females. Males also have a mane and horns, which are twisted and can reach almost a meter in length. Sitatunga live in papyrus swamps and are very good swimmers. They may take to the water to evade predators such as leopards or wild dogs, lying submerged in pools with only their nostrils above the surface.

African Grey Parrot

African Grey Parrots are found in central Africa, primarily in the Congo and Cameroon. They typically live in dense forests, although are sometimes seen on forest edges and clearings. They are regarded as among the smartest birds in the world, and a 28-year old African Grey named Alex is the first bird in the world to demonstrate an understanding of the numerical concept of zero. They very popular pets and are sought after for both their intelligence and amiability toward humans.

Chimpanzee

There are two distinct species of Chimpanzees. The one present in Gabon is Pan troglodytes, or Common Chimpanzee. An adult male weighs from 35-70 kg and stands 0.9-1.2 m tall, while usually females weigh between 26-50 kg and stand 0.66-1m tall. Chimpanzees typically live to age 40 in the wild, but have been known to live as old as 60 in captivity. Chimpanzees are genetically very closely related to humans, sharing 99% of the same DNA.

Explore Gamba Page

MAB has been operating in four main areas within Gabon, which are collectively known as the Gamba complex: the Loango and Moukalaba-Doudou national parks, the Rabi protected area, and the town of Gamba. Click on the stars next to each region to learn more about them, and hear stories from people who have been there.

Greater Gamba

An area stretching across the coastal basin to the Nyanga River, Gamba and its surrounding areas represent not only great biodiversity but also a diverse unique community. The area is a coastal plain consisting of lightly wooded area with intermittent wetlands.

Gamba developed around an oil field built more than forty years ago. It is this field that has defined its development. Gamba has swelled to a population of more than 7000 individuals. This population is derived from a healthy mix of expatriates and

Gabonese from across the country as well as those who have traditionally resided in the area.

The community is supported by the oil production as a result there are a large number of engineers and professionals that live there. As Gamba has become such a hub there are far more tarmac, sand, and laterite tracks lending greater access to the jungle for Smithsonian researchers. Gamba also contains a Smithsonian laboratory because its proximity to such great biodiversity.

Rabi

The Rabi oil fields are very different than Gamba. It is located in the center of the Gamba Complex in the head waters of the Rabi River. Though subject to limited logging since the 1920's, oil production only began in the mid 1980's.

Occupying a relatively small developed area, this lack of other human occupation has left the area surrounding Rabi virtually undisturbed. The mixture of swamp and hill geography allowed the development of dry and wet forest in close proximity. Due to those two reasons Rabi is an excellent place to conduct biodiversity experiments.

As Rabi has no history of human habitation. The community there is limited solely to Shell employees who work there for short lengths of time and then leave.

Moukalaba-Doudou

Framing the east of the Gamba complex Moukalaba-Doudou is much larger than Loango. It contains the Doudou mountain ranges and also some savannah to the east. With forests ranging from swampy wetlands all the way to upland forests it possesses varied ecology. Very difficult to access it held one of the greatest intact areas concerning Biodiversity.

Website FAQ

What is biodiversity?

Biodiversity, short for "biological diversity," refers to the variety of life on Earth. There are many levels of diversity—from DNA and genes to species, populations, ecosystems, and communities.

Genetic diversity refers to the variety of genes within individual plants and animals and between different species. Think of the seedlings that grow from a packet of new seeds—or the variety of people within your own family.

Species diversity refers to the variety of different types of plants and animals, including bacteria, fungi, insects, mammals, plants, and everything in between. Differences occur within and between populations of species.

Ecosystem diversity refers to the variety of habitats and climates on Earth. The interactions between these ecosystems and the species that live in them

underpin all life on Earth. In fact, Earth's biodiversity helps keep our air and water clean, regulates our climate, and provides us (and other plants and animals) with food, shelter, clothing, medicine, and other useful products. What makes life on Earth so complex is this diversity and how it all interacts?

What is the range of the biodiversity in Gabon?

Although there are still many species to be discovered in Gabon, current knowledge includes about 198 species of mammals, 680 species of birds, 98 species of amphibians, an estimated 95-160 species of reptiles, and an estimated 6,000 – 10,000 species of plants. These numbers are increasing with each biodiversity research field trip as new species are found.

Why is biodiversity important?

Life on Earth as we know it would not exist if its rich biodiversity were severely altered. Species (including humans) and the ecosystems in which they live are linked together through the flows of energy and materials. A change in the life of one species—especially extinction—could ripple throughout an ecosystem, changing the life of many other species, including humans.

Harming the world's biodiversity could have serious repercussions. For instance, over logging forests causes fragmentation and destroys habitat for the animals that live in the forests. It can threaten plant species with extinction, and can take away the trees we need to clean our air and water and to keep our soils, rivers, lakes, streams, and oceans healthy. It can also lead to flooding and mudslides. Or, what if the world had no more pollinators—animals like bees, flies, butterflies, moths, birds, and bats—that pollinate flowers so that fruit can grow? Harm the habitats in which pollinators live—or harm the pollinators themselves—and you reduce the food many animal species eat every day.

What is threatening the local biodiversity?

Please see the Biodiversity Threats website <link>

What can I do to conserve the local biodiversity?

There are many things you can do to help! Here are just a few:

- Learn more. Talk to scientists. Read books and magazines about environmental topics. Surf the Web. Contact environmental organizations, universities, and government agencies. The more you learn about biodiversity, the more you can do to help protect it.
- Donate time to environmental organizations doing biodiversity conservation work.
- Buy eco-friendly products, such as paper made from recycled materials. Buy products that don't use fossil fuels or toxic chemicals. Buy locally-grown,

organic foods. Buy wood products from sustainable grown, not endangered, tree species. Don't buy exotic, non-native pets or products made from endangered species.

- Drive less. Use eco-friendly transportation like subways, bikes and carools.
- Be energy efficient. Use energy-efficient appliances and computers. Use compact fluorescent light bulbs.
- Don't use pesticides, fertilizers, and other chemicals on your lawn and garden. Plant native vegetation and flowers that bees, butterflies, hummingbirds, and other pollinators will like.
- Spread the word! Tell others what you know.
- Support our work by becoming a Friend of the National Zoo.
- See our Green Team Tips and ideas on how to think globally and act locally.

Elephant FAQ

What is the difference between Asian and African elephants?

	African Elephants	Asian Elephants
Scientific Name	Loxodonta africana	Elephas maximus
Ears	Larger	Smaller
Tusks	Males and Females	Males only
Forehead	Large	Small, two big bumps
Trunk	Two fingers	One Finger
Back Shape	Dips	Arches
Weight	Up to 6350 kg	Up to 5000 kg
Diet	Leaves, fruit, and bark	Grasses, herbs, leaves, fruit, farm crops, and bark
Links	(link African Elephants)	(link Asian Elephants)

What is the difference between African savannah and forest elephants?

Forest and Savannah elephants vary in their environments but they also vary in habitat use and attributes. Forest elephants also tend to be smaller, having a different number of toenails, and have smaller straighter tusks as well as smaller ears. There are also genetic differences between savannah and forest elephants.

Are elephants endangered?

Yes

What/who poses threats to the elephants?

African elephants once lived throughout Africa; they now inhabit no more than one-third of the continent and are gone from the Sahara. Over the past 150 years, ivory hunters have hunted them for their tusks. Between 1979 and 1989, Africa's elephant population plummeted from 1,300,000 animals to 750,000, due mostly to ivory hunting. Since the 1980s, an international ban on trade in ivory has helped many populations hold steady or rebound. However, African elephants have lost much of their habitat to ranches, farms, and desertification. The forest elephant is also under threat from logging and market hunting for its meat.

How long to elephants live?

The average lifespan of an African Elephant is 60 years

How big to the elephants get?

Male African elephants grow up to 7.5 meters long, stand up to 3 meters tall and weigh up to 6350 kilograms. Males are usually larger than females.

What is the purpose of their tusks?

Tusks are used to dig for things like salt and water, take bark from trees, to eat the bark, and to move trees and branches to clear a path.

Why do elephants have big ears?

Large, flappable ears help these huge animals to cool off, although elephants often must retreat to the shade or water during the hottest part of the day.

What do elephants use their trunks for?

The animals' trunks, unique among living mammals, are versatile, enabling elephants to manipulate tiny objects or tear down huge tree limbs.

How do elephants communicate?

African elephants communicate with rumbles, growls, bellows, and moans. Elephants use infrasound (sound below the range of human hearing) in long-distance communication which can travel a mile or more.

What do elephants eat?

A dexterous trunk and large, rasping molars allow African elephants to gather and process a wide variety of vegetation. They eat leaves, fruit, and bark from a variety of plants. Elephants supplement the sodium in their food by visiting mineral licks.

Why is the Smithsonian tracking these elephants?

Information on elephant distribution is important to acquire in order to better manage elephant habitat, protected areas and human-wildlife interactions. In 2004, two elephants were collared in Gamba and two in Rabi, to study their movements in relation to oil field activities and protected areas. Maintaining the ecological connectivity of landscapes used by large-ranging animals like elephants is important for conservation.

What is Shell Gabon's role in this project?

With the initial support of Shell Foundation's Sustainable Energy Programme and locally of Shell Gabon, the project was designed to assess and monitor biodiversity in the Gamba Complex. Shell Gabon now funds research and educational activities to further investigate the link between resource development and biodiversity in environmentally sensitive areas, and to increase awareness of environmental issues.

How does the tracking collar work?

The satellite transmitter is attached to collars that we fit to the elephants. The transmitter beams signals to satellites passing overhead. The satellites then relay these data to earth where computers calculate the elephant's locations. That information is sent to our computers to allow us to track the elephants' movements.

APPENDIX L: WEBSITE HANDBOOK

The following is the full text of the handbook given to MAB employees to facilitate future maintenance of the website. All those areas of the site that could conceivably have substantial updates preformed in the future are documented.

Specifically, the manual explains how to:

- Update the individual picture galleries and create new galleries.
- Update the slideshow included on the main picture gallery page, as well as include similar slideshows in other places if desired.
- Update the elephant tracking data.
- Install the Dreamweaver templates and configure them for use.
- Update the Questions & Answers page with new FAQ's and new categories of questions.

The manual refers to various Photoshop scripts, ColdFusion pages, installers and other files, all of which were included in a *.zip* file with the manual.

**Monitoring & Assessment of Biodiversity:
Gabon
Website Maintenance Handbook**

Author: Gary C. Schorer

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Questions & Answers Maintenance

The questions and answers page is located in the file *gabonbio/faqs/default.cfm*. This file contains all of the raw questions and answers text. The formatting is relatively simple. Each question at the top of the page links to its answer further down. At the bottom of each answer, there is a link back up to the top of the page. Both the questions and the answers are formatted as ordered lists, for easy reference later on. There are two basic things that will have to be done in this page: adding new categories of questions, and adding new questions and answers to existing categories.

Since formatting is identical across the page, both the steps of adding new categories and updating existing ones can be accomplished by copying and pasting the existing code and changing the appropriate sections. Below is an example of the formatting used by the page, and explanations of what each line means. Items that will require changing are denoted in **bold**. Everything else may simply be copied verbatim.

```
<!-- QUESTIONS SECTION -->
1. <div class="SectionTitle">Category Questions</div>
2. <ol style="padding: 7px">
3. <li><a href="default.cfm#cat1">Question # 1?</a></li>
4. <li><a href="default.cfm#cat2">Question # 2?</a></li>
5. </ol>
6. <p />
7. ...
<!-- ANSWERS SECTION -->
8. <div class="SectionTitle">Category Answers</div>
9. <ol style="padding: 7px">
10. <li><a name="cat1">Answer #1.</a><a href="default.cfm#top">Back to
    top.</li>
11. <li><a name="cat2">Answer #2.</a><a href='default.cfm#top">Back to
    top.</li>
12. </ol>
```

1. This line is a new question category heading in the page. When creating a new category, the first thing you should do is copy/paste this line at the end of the questions section, and change **Category** to whatever best describes your question category.
2. Purely formatting, no changes necessary. This line denotes the beginning of a new numbered (ordered) list. This line, along with line 5 should also be copied/pasted when creating a new category. Together, they define the beginning and end of the list of questions.
3. Lines 3 and 4 are examples of the lines that would be required to create questions that appear in the list. There are two things that must be changed in the creation of a question line:

- **cat#:** Technically, these can be any unique name containing numbers and letters (no spaces). Currently, the page is formatted with a system of **prefix#** where the prefix is shared by all questions within the same category, and # simply denotes which number the question is. This makes editing existing questions and answers far simpler.
 - **Question ##?:** This is the actual text of the question that you want to appear on the page.
4. See line 3.
 5. See line 2. This line marks the end of a category of questions.
 6. Line 6 is inserted between categories to leave space between the last question in one category, and the heading for the following category.
 7. n/a
 8. See line 1. This line serves the exact same purpose, but is a heading for the category's list of answers.
 9. See line 2. This line serves the exact same purpose, but denotes the beginning of the list of answers.
 10. Lines 10 and 11 are examples of lines that would be required to create answers that appear in the list. Just like with the answers, there are two things that must be changed.
 - **cat#:** This must exactly match the label used in creating the question line as explained in 3a. If the label *birds6* is used above in the line creating the 6th question about birds, that same label must be used in the answer line that corresponds to answer 6 about birds. This is how the page jumps from a question to its corresponding answer.
 - **Answer ##.:** This is the actual text of the answer that you want to appear on the page. Note that if you want to add a line break to the answer to start a new paragraph, press shift-enter instead of simply enter in Dreamweaver.
 11. See line 10.
 12. See line 9. This line marks the end of a category of answers.

Gallery Maintenance

This section of the handbook deals specifically with how to maintain the subject-specific galleries found in the picture gallery page. For information on the slideshow that appears on the picture gallery main page, see the following section.

Updating Existing Galleries

Updating existing galleries can be performed in a few simple steps. These steps may take some time, however, depending on the number of pictures to be included in the gallery. There are also several requirements that must be met before you can update the gallery pages.

In order to update the galleries, you must first have the template files from the NZP web office. If you do not have the template files, or have not yet configured Dreamweaver for their use, please see the section on Configuring and Using Templates. You must also have the Gabon Photo Gallery scripts and web gallery files installed. If you have not yet done so, they may be installed by simply running the included installer, *GalleryInstall.bat*. Lastly

Once the gallery files and Dreamweaver templates are installed, you may begin updating the galleries. This can be accomplished by following these steps:

1. Locate the folder containing the images for the gallery you want to update. These are all found within the gallery-base folder by default.
2. Copy any new images you want to include in the gallery to the folder. Every image in the folder will be processed. This will overwrite the old gallery files, so you must be sure that all the pictures you want included in the gallery are present, and only those pictures.
3. If necessary, add copyright and caption information to any of the images. This can be accomplished within Photoshop by opening the files, and then choosing *File Info* from the *File* menu. The 'Copyright Notice' field should contain copyright text relevant to the picture. This will be overlaid on top of the image as a watermark during processing. The 'Description' field is optional and may be left blank. If there is any text present, it will appear as a caption below the picture in the gallery.
4. From the *File* menu in Photoshop, choose *Scripts->Gabon Photo Gallery*. Photoshop will then prompt you to select two folders. The first folder will contain all of the images that will be processed to create the gallery. The second folder will be where the gallery files themselves are outputted.
5. After two folders have been chosen, the script will begin running. If you opted to not select a folder at either of the two prompts, the script will not run, and you will have to restart it. Assuming two folders were chosen, however, the script will begin processing the images. This may take some

time, depending on how many images are in the folder and how fast your computer is.

6. After the script finishes, you must apply the template to the newly created page. Locate the output folder you selected when you ran the script, and find the file `index.htm(l)`. Open this file in Dreamweaver. Click on the *Modify* menu and select *Templates->Apply Template to Page*. Click on XTRACONTENT and press the Select button. You may be prompted to choose template locations for 'Document head' and 'Document body'. If so, select 'Document body' and choose 'ContentArea' from the drop-down menu. Then select 'Document head' and choose 'HeaderContent' from the drop-down menu.
7. Save the file in the same folder, and name it *default.cfm*.
8. The new gallery files are now ready for submission. See <http://nationalzoo.si.edu/admin/reference/contributorreference/> for an explanation of how to submit the gallery to the web office.

Creating New Galleries

New galleries are created in a process identical to that of updating old galleries. After the gallery has been created, however, you must link it from the picture gallery main page. To do this, locate the file *gabonbio/gallery/default.cfm*. Open the file with Dreamweaver, and scroll down to the section of the page containing the sub-gallery links (line 230 as of writing). The `` tag signals the beginning of the list that contains the links to the galleries. To add a new entry, simply put a new line in between the `` and `` tags. Lines are of the format: `Gallery Name`. Replace 'galleryfolder' with the name of the folder containing the gallery files (the output folder you selected when running the Photoshop script). 'Gallery Name' can be any text of your choosing that describes the gallery, but it should be as concise as the others.

Slideshow Application Use and Maintenance

The slideshow application creates a simple slideshow that will automatically display any images provided to it. There are two basic modes the slideshow can run in: one where just images are displayed and one in which images and associated descriptions are displayed. The first step in setting up the slideshow is configuring it for use. In many cases, the configuration options will not need to be changed, and you can skip directly to Installing and Supplying the Slideshow.

Installing the Slideshow

The slideshow can be included in any ColdFusion page (*.cfm* file) by simply copying and pasting the code found in *slideshow.cfm* into the desired page. There are two distinctly marked sections within the file, which indicate different places the sections must be pasted to. The first section, labeled HEAD, must be pasted in between the `<head>` and `</head>` tags in the page you want to include the slideshow in. The second section, labeled BODY, actually places the slideshow within the page, and can be placed where ever you want the slideshow to appear on the page. (With current National Zoo templates, these correspond to the HeaderContent and ContentArea editable regions respectively) Additionally, the four included image files (*arrow-left.png*, *arrow-full-left.png*, *arrow-right.png*, and *arrow-full-right.png*) must be copied into the directory containing any page that has a slideshow in it.

Configuring the Slideshow

Within the slideshow application (*slideshow.cfm*), there are three options set at the top of the file: IMGDIR, USEDESC, and DESCDIR. Below is a description of the effect each of these options has on the slideshow.

- **IMGDIR** – This options represents the path, relative to the application, where the slideshow will get its images from. Note that the trailing slash (“/”) must be included. (e.g. `<cfset IMGDIR = "slideshow/images/">`, not `<cfset IMGDIR = "slideshow/images">`). Normally this option can be left alone, and the images simply put in the *slideshow/images* folder.
- **USEDESC** – This option controls whether or not to look for and display description files with each image. A setting of 1 will display descriptions, and a setting of 0 will not. If image descriptions *should* appear next to the image, this line should read: `<cfset USEDESC = 1>`. If descriptions *should not* be displayed, this line should read: `<cfset USEDESC = 0>`.
- **DESCDIR** – If descriptions are to be used, this option specifies the folder where the application should look for the description files. This must be in the same format as the IMGDIR option, and include the trailing slash (“/”).

Once the slideshow itself has been configured as desired, you may move on to the step of supplying the images (and if descriptions, if applicable) to the slideshow for it to display. Both modes (with and without descriptions) share the same method of supplying images to the slideshow, with the descriptions mode having the extra step of supplying descriptions as well.

Supplying the Slideshow: Images

Supplying the slideshow with is simply a matter of placing the desired images in the slideshow's images folder, which defaults to *slideshow\images*. This path can be changed within the application if desired, but it is not needed. The application assumes that all provided pictures will fit within a 200x200 pixel box. It will still run with images that are larger than this, but the page the slideshow appears in may be distorted. Note that file names do not have to be in a specific format or have a specific extension, but images are displayed in alphabetical order, with *aardvark.jpg* appearing before *zebra.png*. A Photoshop script is provided to automatically resize images to fit within that 200x200 pixel box. See the *Photoshop: Automated Resizing Script* for more information, including instructions on how to install and use the script.

Supplying the Slideshow: Descriptions

Supplying the slideshow with descriptions is simply a matter of placing description files in the slideshow's descriptions folder, which defaults to *slideshow/descriptions/*. This path can be changed within the application if desired, but it is not needed. Descriptions are .html files, and may contain any valid HTML tags. Unlike when supplying images, however, the names of the description files do matter. The name of the description file must exactly match the image file it is partnered with, except for the extension. For example: given *aardvark.jpg* and *zebra.png*, their matching description files would be *aardvark.html* and *zebra.html*.

Configuring and Using Templates

Dreamweaver templates are required to add new pages to the site and are recommended for modification of any existing pages. While they are not required for modifying existing pages, they do automate the process of converting a non-NZP page to one that is ready for use on the NZP site.

1. The first step in configuring and using the templates is acquiring the template files. These are distributed as *.zip* files, and can be acquired through members of the web office, whose contact information is available at <http://nationalzoo.si.edu/admin/reference/contributorreference/>.
2. After acquiring the template files, you must create a 'website root' folder, which will be the base folder that will contain all of the website files. This folder can be created wherever you choose.
3. Open the *.zip* archive containing the template files, and extract them to the website root folder you just created. After extraction, there should be a Templates folder in the root folder you created earlier. For example, if your root folder was *C:\WebsiteFiles*, you should be able to see the folder *C:\WebsiteFiles\Templates*.
4. After the template files are extracted, open Dreamweaver. You must now configure Dreamweaver to recognize the template files. Under the *Site* menu, choose *Manage Sites* and click on *New*, then choose *Site* from the drop-down menu that appears.
5. You will then be prompted for a name and address for your site. You may name the site anything; this name is only use by Dreamweaver and does not affect any of the pages you will make with the templates. You may leave the address field as-is.
6. The next screen will ask you if you want to work with a server technology. Click the *Yes* radio button and choose ColdFusion from the drop-down list.
7. The next screen will ask you about storing local files. Choose the second radio button, "Edit locally, then upload to remote testing server." In the field below this, choose where on your computer you want the website files to be stored; this is the root folder you created earlier.
8. The next screen will ask you about connecting to the remote server. Simply choose "I'll set this up later."
9. Dreamweaver is now configured to use the template files. To be sure the site you just created is being used, choose *Manage Sites* from the *Site* menu and be sure the name you gave the site in step five is selected.

With the templates installed, they can then be applied to any page you have created, regardless of whether or not it was made with an earlier version of the National Zoo templates. It is often easiest to make new pages independently, then apply the templates after the fact. To do this, take the page you wish to apply the template to, and open it in Dreamweaver. From the *Modify* menu, choose *Templates*

then *Apply Template to Page*. If the page is containing a normal amount of text and pictures, choose “GENERAL” from the template list. This is the standard 3-column layout. If the page will have a large amount of large pictures or other such items, choose “XTRACONTENT”. This will remove the CSP column on the right and make room for larger content.

Editing the Tracking Database

All the points used in the tracking display are stored in a Microsoft Access database file. Points can be added as new data come in, or they can be removed to decrease cluttering of points on the map. The database file is located at *gabonbio/tracking/gabonTrackInfo.mdb*.

Within the database, there is one table for each elephant, sharing the elephant's names. Double-clicking on a table will open it in editing mode. Each row in the table is one recorded tracking point. Each point has an associated date it was recorded (in mm/dd/yyyy format), the latitude of the point, and the longitude of the point (both in decimal format). To remove a point from the table, right-click in the box to the left of the 'Date' column in that particular row, and choose *Deleted Record*.

To add a new point to a table, scroll all the way down to the bottom of the table, and begin adding new values in the empty row at the bottom. Note that the points do not have to be entered in any particular order. Currently, all the points in the tables are sorted by date, oldest first. New points, however, can be added in any order because the tracking page sorts them by date automatically.

Photoshop: Automated Resizing Script

A script has been provided which can automatically resize images for use with the slideshow application. Run from within Photoshop, the script will automatically resize all open images, convert them to the JPEG format, and save them in the user's network share. These images are then ready to be copied into the slideshow application's images folder for immediate inclusion in the slideshow. After being installed, the script can be run with just a few clicks from within Photoshop, with no required input after it begins.

By default, all pictures will be resized to fit within a 200x200 pixel square. Images that are smaller than that will be scaled up to those dimensions, and images that are larger than that will be scaled down. The script can easily be modified to support different dimensions if necessary.

Installing the Script

While the script can be run from any location by select *Browse* from within the *File/Scripts* menu in Photoshop, installing it will allow it to be run from within the *File/Scripts* menu itself, making it easier to use. An installer is included which will automatically copy the script to the proper location. This option is the fastest and easiest way to install the script. Simply double-click on "SIResizeInstall.bat" to run the installer.

Running the Script

The script can be run from within Photoshop with just a few clicks, and requires no interaction after it begins. To run the script, perform the following steps:

1. Within Photoshop, open all the files you want to be resized.
2. Select the *File* menu, then choose *Scripts*, then click on "*SI Resize for Slideshow*".

The script will now run and automatically resize all open images. Depending on the speed of your computer and the number and size of the open images, this may take several minutes. When the script finishes, all resulting resized images will be placed in the same folder the original images were in, but will now have a *-r* immediately before the file extension. For example: *Picture1.jpg* will become *Picture1-r.jpg*.

Modifying the Script

The script can easily be modified to generate smaller or larger images as required. Once the maximum width and maximum height are known, the script can then be modified to account for them with the following steps:

1. Locate the script file: *SI Resize for Slideshow.jsx*. If it has been installed, this file will be located in your Adobe Photoshop directory, inside *Presets\Scripts*.
2. Double-clicking the script file should cause it to open in the script editor. If it does not, the file can be opened with any other text editor, such as Notepad.

At the top of the file are two lines containing *maxWidth* and *maxHeight*.

These are the maximum dimensions, measured in pixels, which the script will resize images to. Any image resized by the script will fit within a box having dimensions of *maxWidth* and *maxHeight*. Change these to whatever the desired new values are and save the file.

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