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Caguas Botanical & Cultural Garden

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Chapter 1 Introduction

Puerto Rico has not seen true independence since the early 1500's, at the height of the Taínos civilization. The Taínos, the first indigenous tribe of Puerto Rico, developed a simple fishing and farming community, and lived there peacefully for hundreds of years. The Western world's first knowledge of Puerto Rico was when Spanish explorers discovered the island and began to settle. Spain acquired Puerto Rico as a territory and brought African slaves in order to develop both the sugar cane plantations, and the central port of San Juan.

Throughout Puerto Rico's history, each group of settlers has brought with them a separate identity. These distinct identities have now blended into one unique culture known as the Creole. The Taínos, Spanish, and Africans all contributed to the traditions, religion, laws, and social infrastructure that are now present on the island. Puerto Rico has undergone changes and development in the years following its discovery by the western world. However, Puerto Ricans still maintain a strong pride in their connection to the three original cultural groups.

Puerto Rico is a culturally diverse place with a rich history. In an effort to preserve its history and landscape, the island is following the global movement towards region-specific environmental education. This education is focused on teaching individuals to be aware of the environmental impacts of their actions, and how to live sustainably. This movement is particularly important in Puerto Rico, where the plant population is as diverse as the people, and preserving the natural environment takes the effort of every Puerto Rican.

Situated in the interior of Puerto Rico, the Caguas Botanical and Culture Garden (CBCG) is just 30 minutes south of San Juan. The garden was once a sugarcane processing center but was opened as a botanical garden in 2007. The garden itself contains 60 acres of controlled gardens with an additional 600 acres of uncultivated forest. The CBCG is home to over 250 species of plants and trees as well as several archeological sites, some as recent as recent as the ruins of a

19th century sugarcane mill while others date back to the stone carvings of the Taínos people. The plants found in the garden are used by the CBCG to facilitate learning about the local natural heritage. Throughout eight distinct groves and a hiking trail, the visitor sees many indigenous tree species used by the Taínos, and trees that came in later years from Africa and Asia. On their website, the CBCG states that the garden is "designed to educate the public about Puerto Rican culture in relation to nature and tropical agriculture" [Jardin Botanico & Cultural, n.d.]. Therefore, this project will pursue the mission of the CBCG closely to enhance the visitors' experience at the garden.

The goal of our project is to bring environmental education to life through stories of the Taíno people. We will be designing interpretive panels displaying the stories and a guided brochure. Specifically, our project focuses on gathering information for the still developing Ethno-Ecological Trail System. This new trail, accessible to hikers, mountain bikers and horseback riders, consists of multiple plant species and archeological sites. The trail includes many remnants of the Taíno culture such as petroglyphs, stone carvings, and caves. Our interpretive stories incorporate the trees within the trail system and the archeological sites to tell the story of Taíno lifestyle, culture, and legends. This will be accomplished by explaining the Taíno relationship with different trees to show their importance within their society. Our goal is that visitors of the CBCG will leave the garden with information on the environment of Puerto Rico, and feel inspired to live sustainably by the stories of the Taínos. To accomplish our objectives, we aim to conduct interviews with local experts, go on field expeditions within the botanical gardens, and compile archival research. It is our sincere hope that this project will enhance environmental literacy, and inspire the Puerto Rican people to live more harmoniously with nature.

Chapter 2: Literature Review

To prepare for the project at the Caguas Botanical & Cultural Garden (CBCG) we began with the history of Puerto Rico. We specifically looked at the social history of the island and the development of its modern culture. We then investigated the cultural importance of the trees found in Puerto Rico, specifically looking at their significance to the Taíno tribe. This information will enhance the environmental literacy of the visitors by engaging them in the natural settings of the CBCG and the historical background of the area. We investigated the best standards and strategies for creating a guided brochure and panels.

2.1 History of Puerto Rico as a Settlement

The island of Puerto Rico is around 14,000 sq km in size. Despite its small size it is home to nearly 4 million people of mixed race, culture, and personal histories ["Welcome", 2009]. The culture that exists on the island today is often referred to as Creole. Creole is a blend of the three early settlers, who made Puerto Rice their home. First, the Taínos Indians settled in Puerto Rico and lived peacefully for hundreds of years, before the arrival of the Spanish, and the African slaves. The Spaniards and the Africans restructured the island to make it more useful for trade and agriculture. All three groups have contributed to what Puerto Rico is today and they are of great importance to the Puerto Rican identity, as many residents find that they have ancestors of multiple ethnicities.

The Taínos tribe was the first permanent resident on the island of Puerto Rico. They originated from the Arawark tribe who were native to present day Venezuela and the Guianas region, which includes Guyana, Suriname, and French Guiana [Figueroa, 1996]. The Taínos named the island "Boriquen" meaning "the land of the brave men" [De Leon, 1974, p.3]. This indigenous group consisted of peaceful people, who focused on farming, fishing, and hunting.

They did have one enemy, the Caribe Indians, but the Taínos were rarely people to seek out war [De Leon, 1974, p.4].

The Taínos lived in villages called yucayeques [De Leon, 1974, p.3]. The structure of these villages seemed customary with the community based around a central plaza and the exterior of the town surrounded by tall walls and watchtowers. The yucayeques were usually built near a water source with a road leading directly from the center of town to the water supply [Figueroa, 1996]. The primary furniture in each household was a hammock, which was made primarily from cotton. Cord, made from palm branches, was used to make baskets that were utilized at home or around the community. One interesting use of these baskets was the preservation of ancestors' bones in the household. They preserve them because they believed that the soul remained in the bones of dead [Figueroa, 1996]. As we can see from their respect for the dead, the Taínos were people that had a great appreciation for their family and the community.

Figure 1: Yucayeques in Caguas Botanical Garden
http://portalesp.caguas.gov.pr/jardin_botanico/galeria_3/index.html

The social structure of Taínos consisted of two classes. The Nitaínos were the noble ruling class, and the Naborias were the lower working class. The distinction between the classes could be seen in the length of an individual's Naguas, a frontal apron worn by married woman, which was the only clothing worn by the Taínos. The greater the length of the Naguas worn, the higher the ranking in society. The Caciques, or the chief, came from the Nitaínos class. This position was inherited and could be held by either a man or a woman. Class and ranking was passed down through the maternal line rather than paternal, as it is in many cultures. Due to this

lineage on the maternal side, male chiefs would often have multiple wives to gain a higher social status or to create alliances [Figueroa, 1996].

Similarly the gender roles of the Taínos were well established. The main role of the males was to provide as fisherman and hunters for the rest of the tribe. The men would often fish using canoes and nets. However, they also put poison in the water that would paralyze the fish and allow them to be captured by hand. The men hunted what was available on the island, capturing small prey such as iguana, wild birds, and small rodents. The woman's role, meanwhile, was based closer to the yucayeques, where they would cultivate the crops, care for the family, and make the pottery and baskets [Figueroa, 1996].

Figure 2: Petroglyph in Caguas Botanical Garden
http://portalesp.caguas.gov.pr/jardin_botanico/galeria_3/index.html

The primary crops of the Taíno people were cotton, yucca, and peanuts [De Leon, 1974, p.4]. The pottery of the Taínos was sculpted by hand and baked in large ovens. It was both elaborate and unique using red pottery with white details. The pottery is a good example of classic Taínos art, though little still remains on the island. Another example of art can be found in the petroglyphs, which still can be seen on rocks throughout Puerto Rico. The petroglyphs were carved into the stone to communicate in the Taínos' only written language [Figueroa, 1996].

The Taíno tribe conducted sophisticated celebrations that included dance, music and feasts [Figueroa, 1996]. These celebrations were often of a religious manner and were called Areytos. There were a variety of different occasions for such ceremonies from a death to the visit of an important guest. During these ceremonies the Taínos would cover themselves with colorful body paints and parrot feathers. The Areytos would often last days and would include "…tribal

histories, genealogies, tales of great conquests and battles. Mock battles and ball games [were also present]" [Figueroa, 1996]. The Taínos also used hallucinogenics, which were inhaled through the nose for "communication with various gods" [Figueroa, 1996]. Another part of these ceremonies was a ball game called "batey". The game was played using a rubber ball made from the gum of tree bark. This was the first time that Europeans had encountered rubber when they first arrived in the early 1500's [De Leon, 1974, p.4].

Christopher Columbus, on his second trip to the new word, discovered Puerto Rico on November 19, 1493. The Spanish began to settle the island in the early 1500's. As more settlers moved onto the island the Taíno natives suffered. Most Taínos were either dying of European illnesses or being enslaved. The few that escaped the misery fled inland to the mountains. The Taíno blood-line did survive, however, because the Spanish settlers who inhabited the island brought no women with them and eventually married a number of the Taíno woman [De Leon, 1974, p. 3].

Figure 3: El Moro: San Juan, Puerto Rico
http://images.leonardo.com/imgs/2/241628/241628_OTHER_01_J.jpg

In 1509, the King of Spain appointed Ponce De Leon as the first governor of Puerto Rico. Around this time the name of the island was changed to "The Island of San Juan Bautista" [De Leon, 1974, p.4]. This change in name was just one of the many impacts that the Spanish made on the small island's culture and language. There was a shift in the language to Spanish, as well as a shift in religion towards Catholicism. As a result of the influx of Spanish influences, churches and plazas became the center of the towns, moving away from the yucayeques system of the Taínos [De Leon, 1974, p. 7].

The Spanish first noticed a supply of gold on the island in some of the ceremonial jewelry of the Taíno tribe. The tribe used the gold that they picked from shallow streams to make jewelry, but they also pounded the gold and used it as a foil to cover other artifacts [Figueroa, 1996]. The Spanish exported gold from the island until the resource was exhausted. The island still remained as an important part of the Spanish empire because it was a strategic position that connected their territories. In response to defend such position of power, the Spanish built the elaborate walls of El Moro and San Cristobal to protect its main port of San Juan [De Leon, 1974, p. 7].

As the Spanish began further development on Puerto Rico, the Spanish settlers were separated into two distinct classes, similar to the ones seen in the Taíno tribe. The plantation owners were both rich and powerful, while the Jibaros were poor, less influential, and usually lived on farms [De Leon, 1974, p. 8]. Although poor, the Jibaros were still a very proud group of people and judged a man's worth not on his wealth, but rather on "the spiritual qualities of personal honor and family respect" [De Leon, 1974, p.10].

African slaves first came to the island in 1509 with Ponce De Leon. As the plantations developed in Puerto Rico so did the number of slaves required. The African population grew as a result of the slave trade but there were also smaller migrations, such as in 1791 after the Haiti slave revolt [De Leon, 1974, p.7]. The movement to end slavery started in 1664 and lasted a staggering 209 years, until slavery was completely abolished in 1873 [De Leon, 1974, p.7].

As these three cultures collided they merged to create one culture, the Creoles. The Taínos assimilated easily into the Spanish customs and created a lasting impact on the language and the traditions of the island. Similarly, the Africans readily contributed along with the other two cultures, leaving an enduring effect on the island and its people. In fact, little racism was experienced on the island until it was learned from prolonged exposure to North America [De

Leon, 1974, p.6]. Although Puerto Rico, which is a territory of the United States as of 1898, hasn't seen independence since before the 1500's, it amazingly maintains an appreciation for its unique population and culture.

2.2 The Use of Tree Species by Taínos

Puerto Rico is not only comprised of a multicultural population, but is also home to an assortment of plant life. This U.S. territory is a rich and luscious place for plants to grow, so the wide variety of plant species on the island comes as no surprise. As a result of this prosperous environment, botanical gardens have been opened though out Puerto Rico to inform the public about these assets and how to care for their preservation. One botanical garden in particular is the CBCG, a lush garden located in central Puerto Rico in the town of Caguas.

In the CBCG, there are eight educational tree groves: fruit orchards, timber trees, native trees for landscaping, artisan trees, palms, Taíno trees, African trees, and bamboos, all of which are linked to the three cultural traditions that make up Puerto Rico. Overall, about 500 species of indigenous trees can be found on the island. Many of the trees, important to Taíno culture, were indigenous to the West Indies or Central America. However, they were first brought to Puerto Rico from the Dominican Republic [Liogier &

Figure 4 Image of CBCG
http://portalesp.caguas.gov.pr/jardin_botanico/galeria_1_jardin/index.html

Martorell, 2000]. Some of these trees that relate to the Taínos include anacagüita, caimito, ceiba, and guayabo [Liogier 2000]. The Taínos used many of these trees along with other indigenous species for a variety of purposes. In fact, from the records of the CBCG, about 50 percent of the trees that are grown in the garden were used by the Taínos.

Various tree species are an important food source for the Taínos. For instance, chili peppers, which are very common in Taíno cooking, come from the Malagueta tree [Austin & Honychurch, 2004]. Due to the tropical climate of Puerto Rico, many tree orchards are able to flourish. Such species include avocado, caimito, corazón, guayabo, mamey, and papaya. The fruits of these trees can be eaten directly, but they are also used in various dishes.

The Taínos also found many different uses for other tree species. For example, they used the higüero, a type of gourd, for hunting, fishing, holding food, and creating utensils. Similarly, Taínos used this tree to make certain drinks for ceremonial offerings to the gods [Austin & Honychurch, 2004]. Similarly, Taíno children played games using parts of different trees. For example, ball games were played using the resin of cupey trees ["Taíno cave", n.d.]. Guamajico was played by children, using the seeds of the algarrobo tree. The game was played in a small circle in which children had their own guamajico on a rope. One child would go out of the circle and try to smash his or her competitor's seed and the last person to have his or her seed broken became the winner ["History", 2004]. The Taíno people had a variety of other uses for each of the trees that surrounded them in their everyday life.

Another Taíno use of the trees was for construction. For example, the Taínos used the palma real tree for the building of their houses. This tree was used for the walls and floors of the houses ["Taíno Borincano", n.d.]. Ceiba trees, on the other hand, were hollowed out and made into canoes. This tree is particularly useful because it can grow up to 100 ft tall, so it could be made into a canoe large enough to hold up to 100 men. This tree was used for canoe building

because of its light weight [“Silk”, n.d.]. The roble blanco tree was also used by the Taínos to build boats [“Caribbean”, n.d.].

Medicinal use of the trees was also prevalent in Taíno culture. Some examples of such trees are the tártago emético, almácigo, and cojóbana trees. The tártago emético tree was used as a laxative [Allsworth-Jones, 2008]. While the almácigo was used to alleviate stomachache pain and diarrhea by drinking a broth that was concocted from the tree’s leaves, bark, and/or resin [Rodríguez & Robineau-Germosén, 2009]. On the other hand, the cojóbana tree’s seeds were often used as general medicine. Taínos would also grind up the seeds from the cojóbana tree to make hallucinogenic powder, which would be used during religious ceremonies to talk to the gods [“Cojóbana”, n.d.].

As we can see, Taínos used the trees extensively in every aspect of their lives, from food to construction. The Taínos were completely dependent on the environment around them, as a result the Taínos learned to live in a harmonious relationship with the environment. This link is still important to the modern people of Puerto Rico. In order to educate the visitors of the CBCG about the Taínos, we studied theories of environmental education to best design public outreach.

2.3 Importance of the Natural Setting for Environmental Education

Environmental literacy is important for understanding our surroundings and applying ourselves to protecting the natural world. Therefore, this project will work with the CBCG to increase the environmental literacy of the visitors. Environmental literacy can be defined in many different ways. One simple definition is to better educate the public about the environment. However, the true goal to achieve an environmentally literate society is to not only recognize the ecological system as the whole, but to practice the preservation of the system as part of one’s everyday habits. As a result, the environmentally literate populace “will have the knowledge,

tools, and sensitivity to properly address an environmental problem in their professional capacity, and to routinely include the environment as one of the considerations in their work and daily living"[Nair, Jones, Flavin, Deal & Bajzek, n.d.].

When dealing with environmental literacy in the context of creating interpretive stories for the CBCG, several points have to be kept in mind. As David Orr argues, environmental literacy can be difficult for several reasons. First, the common educational system is more likely to be specialized than generalized [1992, p.87]. As a result, people have a hard time connecting the relationships between disciplines that are necessary to be environmentally savvy. Therefore, a goal of the project for the CBCG will be to engage the visitor to think beyond the information in front of them and connect their own knowledge to the world around them.

Another reason, as David Orr argues, that environmental literacy can be difficult in modern society is the fact that education has been mostly isolated from the natural world [1992, p.87]. The newer generation has less contact with nature in their education as well as in other aspects of their life. The lives of children age 8-18 are being pulled away from nature by modern technologies [Driessnack, 2009, p. 73]. This phenomenon is not due to a lack of interest about the outside world. The decrease in outdoor activities is due in part to parents' fears for safety, society's emphasis on technical knowledge for future jobs, and the busy lifestyle of the newer generation [Louv, 2005, p.13]. Of course, children can ignore their parents and the society if curiosity is strong enough to take them out to explore the natural world. However, they have less access to nature as more regulations from private organizations, the government, and the general effort to protect the environment, reduces the amount natural space accessible to the public [Louv, 2005, p.28-29]. What is sacrificed from the lack of outdoor interaction is not just environmental education, but also the children's imagination.

Modern technologies restrict children's imagination to that of video games [Louv, 2005, p.28]. As David Orr mentioned, "without rich and meaningful opportunities to bond with nature, young children may develop an aversion to, rather than infinity for their natural surrounds." (Wells & Zeece, 2007, p.286) Therefore, without imaginative play in the natural environment, children lose the opportunity to learn how to interact with the environment and never learn to appreciate the true beauty of the world. As P.H. Kahn argues, "It is not enough, however, to provide urban children with good environmental education. We must also provide urban children with a good environment" [Kahn, 1999, p.225]. What the CBCG can provide to children as well as to parents is not just environmental education, but also a safe natural environment in which to interact with the outdoors. The hopes are to inspire learning that is driven by curiosity rather than pressure to succeed in future careers.

The CBCG's campaign is not purely directed to the children; adults are the target of environmental education as well. A Carnegie Mellon University 1998 study indicates that "people who spend even a few hours on the Internet each week suffer higher levels of depression and loneliness than people who use the Net infrequently" [Louv, 2005, p.65]. Physical touch is lacking in the world of the internet. Since learning "comes from doing, from making, from feeling with our hands" [Louv, 2005,p.66], this project will provide visitor of all ages the opportunity to see, feel, and even interact with nature if possible and thus increase the educational potential.

The CBCG has the capacity to improve place-based education. As Knapp stated, the natural environment of the garden can "complement and expand classroom instruction" [Wells, 2007, p.286]. Interpretive stories will further enhance the experience of the visitors since "stories can serve as an effective tool for …exploration of science-related topics that connect directly to a child's life" [Wells, 2007, p.286]. As Monhardt and Monhardt argued, stories can help children

understand the relation between themselves and the real world [Wells, 2007, p.286]. In placing such interpretive stories in the corridor of the CBCG, children and adults will be able to observe firsthand the relationship between the Taíno culture and the environment.

Interaction with nature is vital to increasing the potential of environmental education. The CBCG, with the vast array of plant species and historical artifacts, offers the natural setting that many have argued is necessary for the population to not only learn about nature, but also understand how it applies to their own sense of place. As such, the brochure must be incorporated in and interact with the layout of the garden to increase the education potential of such literature.

2.4 Designing an Interpretive Program

How do you create an interpretive program for visitors at the CBCG so that they will remember and be able to apply what they have learned once they go home? John Veverka makes an interesting point on the subject, "taking part in interpretive programs or activity is NOT a main reason for the visit. Remember that the visitor is in a 'vacation frame of mind' and wants to have fun …Thus, any learning activity should also be a recreational activity" [Veverka, 1998, p. 2]. In order for the visitors to retain the knowledge they gain at the gardens, they must be actively involved in a fun and participation based activity. So what factors enable the visitor to retain the most information? Dr. Bill Lewis did a study on park visitors and how they retained information, below are his results.

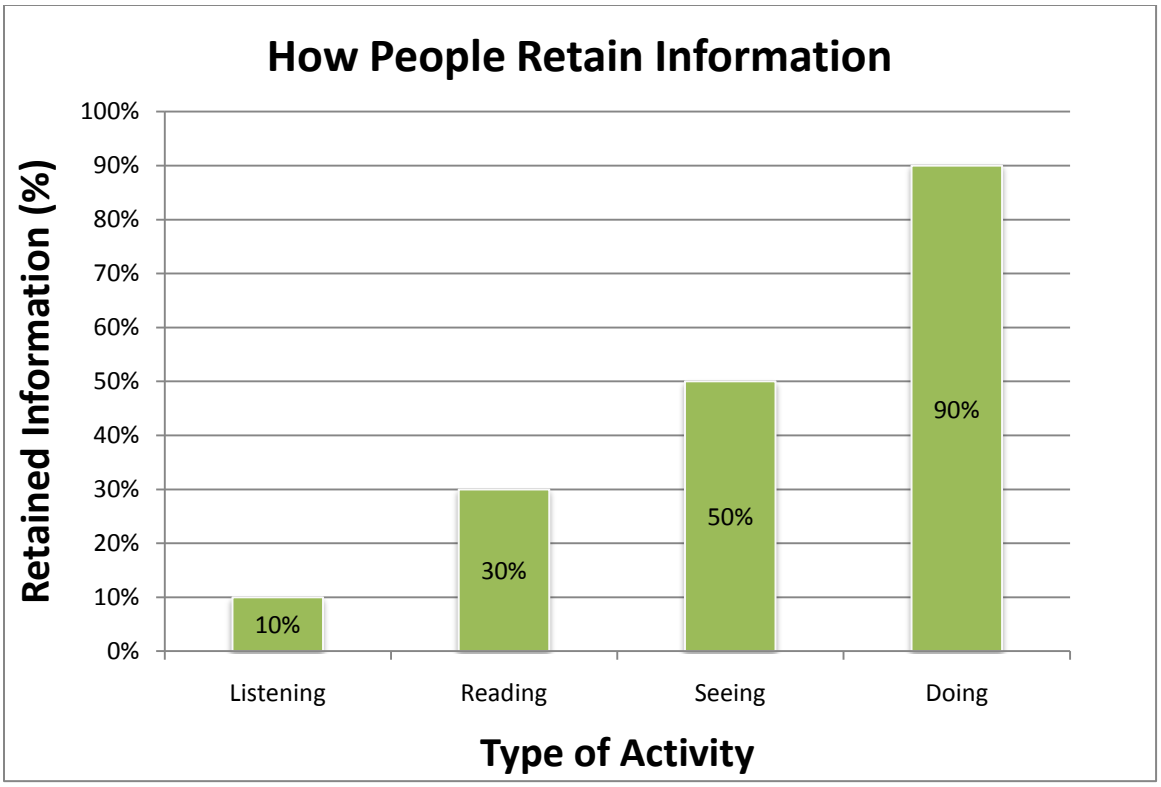

Table 1: Lewiz, 1988

Based on these results the best way for educators to inform visitors is to get them involved with hands on activities. Therefore, it is essential that the information presented to the visitors be complimented by interactive activities. By making the guided brochure interactive, we will create the best learning environment for the visitor and will allow the CBCG to teach the visitors what they find important.

Professionals' opinion is not the only important factor in designing a brochure. Data gathered from a study, entitled *Recommendations for Royal Botanical Gardens Educational Services*, indicates that teachers believe that getting students hands on experience is essential to learning. As the study states "…hands-on activities allow the students to get 'in-tune' with the topics and learn through involvement with the activity" [Jeanne, Donovan & Thompson, 2005, p. 23]. From this study, ninety-five percent of teachers said that hands-on activities were effective [Jeanne et. al., 2005, pp. 21-22]. From these finding we have learned that it is essential that

hands on activities are incorporated into the guided brochure to enhance the learning process of the visitors.

From these studies it is easy to see that in order to have a successful display element, the guided brochure and panels need to follow certain criteria. These include; hands on activities, recommended paths for the visitors, suggested panel locations and content, and a complimentary guided brochure. If all these ideas can be incorporated into a guided brochure and panels, then the CBCG will be able to ensure the visitors leave with a greater understanding of the environment around them and how it relates to their personal history and their future interactions with nature.

The panels are an essential tool for ensuring the visitor gains as much information about the park as possible. Strategically placed panels can be very similar to having a tour guide. Important information is shown to the visitor in appropriate locations at the park. A set of panels can be used to supplement a guided tour. While on a self-guided tour, the panels will allow the visitor to move at their own pace and explore the information that interests them.

Since interpretive panels are so important to the visitors' experience it is essential to know how to design them to make them user friendly. A good panel should follow the "3-30-3 rule" as explained in the Guadalupe-Nipomo Dunes Draft Interpretive Master Plan. The "3-30-3 rule" simply states that a visitor should gain increasing knowledge after reading the sign for 3 seconds, 30 seconds and 3 minutes [*Guadalupe*, 2004, p. 41]. Interpretive panels should include visuals to tell a story about the place [Scottish National Heritage [SNH], p. 1]. However, easy to read words on the panels are also essential. It is important to use short sentences, no more than twenty words and to use short paragraphs [*Guadalupe*, 2004, p. 4]. Using short sentences and short paragraphs ensures that the visitor will not get lost and bored reading. Each panel should

also try to keep the amount of words to less than 200 [SNH, n.d., p.2]. A panel designed using these guidelines will insure that the visitor is not overwhelmed by the information presented.

The main text of the panel is usually the last thing a reader looks at. A typical reader will read the panel in the following way; the headline, the main picture, sub headings, bullet points, further illustrations, and then the main text [SNH, n.d., p. 2]. It is important to make the panel captivating, so the visitor will stay and read the panel. Additionally, the headline and main picture should be able to tell the reader what the panel is about at a quick glance.

The ergonomics of the panel are also important to whether or not the visitor will stay and read the whole panel. If the panel is parallel with the ground it can cause strain on the visitors neck, over a period of time and will cause the visitor to stop reading and move on. A completely vertical sign will make it hard for the visitor to see anything behind the panel. Therefore it is recommended that the panel be positioned between 30 and 45 degrees [*Guadalupe*, 2004, p. 41]. It is important to know the heights of the potential visitors to gauge the height of the panel. In the United States the typical male height is 5 ft 9 ½ inches and a females typical height is 5 ft 4 inches [McDowell, Fryar, Ogden & Flegal, 2008, p. 13]. Hikers will not be the only visitors at the CBCG. Since bikers and horseback riders are also potential visitors to CBCG, one should consider their heights as well.

Generally, a biker will be around the same average height as a hiker. A horseback rider, however, is not the same height as the other two groups of viewers. A typical horse stands at 56 to 64 inches, plus the height of the person sitting on the horse [Bongianni, 1987, pp. 1, 68-9]. Since their heights are different an ergonomic panel will differ between the horseback riders and the rest of the audience. Therefore, research on accommodating the two groups of visitors will be considered.

A goal of any park is to retain visitors. This is why it is important to have some panels be interchangeable to increase the visitors' desire to revisit the park. If all panels are permanent, regular visitors will have nothing new to look at and will not want to return. Having a mixture of permanent and temporary panels is one way to maintain visitors [*Guadalupe*, 2004, Pg. 42]. Interpretive panels are important to a visitor's experience, which is why much our effort should go into making them as user-friendly and interesting as possible.

2.5 Case Study

We considered two brochures from Plimoth Plantation including the Voice of the Land- The Path to the Wampanoag Home site and the Guide to the Museum: Wampanoag Home site, 1627 English Village, Mayflower II. The Voice of the Land brochure displayed a journey to the Wampanoag Home site through the local geography. At each major point of interest, there was a brief story of the Wampanoag relationship with that area. We found the brochure easy to read and aesthetically pleasing. The story is broken down into steps, which take you through a journey, similar to the product we hope to deliver. Though the brochure was of high-quality, the thick paper and colorful graphics may get expensive to produce.

The second brochure, a Guide to the Museum, included more information on three different historical sites. They included a map of the settlement and home site, and a map of the Mayflower. Both maps were very easy to read, effectively conveying large amounts of information in limited space. It also includes useful information for the visitor such as driving directions, handicap access, and a common questions and answer section. Similar to our project, this brochure was intended to facilitate a self guided tour. Though it was printed on thinner paper with far less color we concluded that it would be much more cost efficient to produce.

From the case studies above we have decided to create a hybrid brochure using positive aspects of both brochures. We would like to include a map similar to the map found in the Guide to the Museum brochure. From this brochure we have learned that it is important for the map to be easy to understand. It is also important that we include limited text so that the brochure is not overwhelming the visitor with information. Other aspects that we want to include are driving directions, a common question and answer section, and a section on "how to get the most out of your visit". Through these case studies we have also taken into consideration the cost of printing and the amount of graphics we want to include. As we continue to develop our guided brochure we will reference these brochures as needed.

2.6 Conclusion

The information presented in this literature review has broadened our understanding of the goals of this project. We covered the history of Puerto Rico including its social and cultural history, specifically looking at the Taíno people. Additionally, tree species located on the island were research, specifically those pertaining to the Taínos life style. Finally, we presented information about guided brochures and interpretive panels, which will be used in designing our final product. The final product will increase environmental literacy of visitors and will help the CBCG to design a standard for teaching about the environment.

Chapter 3 Methodology

The central goal of this project is to increase the visitors' knowledge of the Taínos, as well as a basic comprehension about the environment in the Caguas Botanical & Cultural Garden (CBCG). In order to achieve this goal, we are creating interpretive stories of the Taíno indigenous tribe throughout the Ethno-Ecological Trail System in the CBCG. To best display these stories to the visitors, we are designing interpretive panels and a guided brochure. These stories are being told through interpretive elements displaying the Taíno lifestyle, culture, and legends in relation to the use of the indigenous tree species. We are outlining both panels and a guided brochure to facilitate the display of these stories. These will be accessible to mountain bikers, horseback riders, and hikers through a series of panels along the Ethno-Ecological Trail System in the corridor connecting to the garden. Additionally, petroglyphs are located throughout the trail and are incorporated into the interpretive stories. A guided brochure, consisting of a map of the corridor, will also be created to mark the locations of panels and any relevant information to the interpretive stories. To accomplish our goals, we will use the following methods to make the interpretive stories accessible to the visitors.

Methods that this project will use to collect relevant data consist of field expeditions and site analyses, expert interviews, and archival research. Field expeditions, consisting of on-site research, are the most important part of our research, helping us identify relevant tree species and landmarks in the garden and corridor. Expert interviews will be conducted in earlier stages of the project to gather information needed to create the interpretive stories. For any information we cannot obtain through interviews, initial research, or field expeditions, we will visit the University of Puerto Rico archives and libraries.

3.1 Site Analysis

Field expeditions will be an integral part of the data collection at the CBCG. These are used to identify: tree species and their locations along the trail; historic landmarks and natural formations; and site layout and existing tours. We will determine strategic locations for interpretive panels by surveying the trail and filling out site analysis surveys. A checklist will mark the location of pertinent tree species, historic landmarks, and petroglyphs of the Taínos. We are evaluating the attractions accessibility from the trail as well as their potential usage in the interpretive stories. Notes similar to the following will be recorded during the field expedition:

Type of Landmark/ Tree name	Location	Relation to Taínos	Accessibility from trail	Notes

Table 2: Site Analysis Surveys

We will focus the first three weeks on field expeditions and site analysis in the Ethno-Ecological Trail System. The expeditions will take place in two groups of two; this allows us to break the trail into four and a half mile segments. This division allows for us to efficiently assess the land in a timely manner. We are taking photographs to use as reference points for further development of the project, to record location and to increase the graphical value of the guided brochure. To further our site analysis we will visit the garden during normal business days to record information on visitor's behavior and observe other points of interest.

The panels will be located in the Ethno-Ecological Trail System as shown in the figure below.

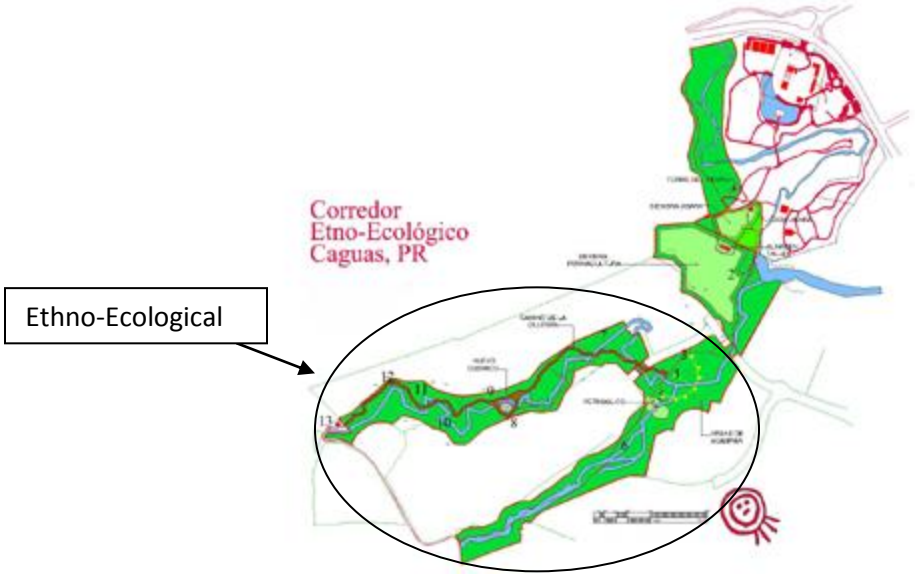

Figure 5: Map of Garden and Ethno-Ecological Trail System

[Jeffrey Glogiewicz, personal communication, February 12, 2010]

A simple map of the corridor will be created for our own purposes to identify the locations of the attractions. After the initial concepts of the panels are created, we will conduct field expeditions to assess the best of the locations of the panels, as they relate to visibility and accessibly for visitors. A table similar to the following will be created during field expeditions:

Panel #/ description	Applicable attractions	Location proposed	Locations attributes and challenges	Notes

Table 3: Potential Layout of Panels

Field expeditions are the best way to assess where panels are most helpful to visitors. Additionally it is the best way for us to incorporate the sites of significance into our interpretive story.

3.2 Expert Interviews

We will conduct semi-structured interviews with the anthropologist working at the CBCG to gather information on the details of the lifestyle, legends, and petroglyphs of the

Taínos. The goal of the interviews will be to obtain knowledge pertinent to creating interpretive stories of the Taíno people. Information relevant to the interview will be researched ahead of time to ensure a more rewarding discussion. See sample interview question in appendix B for more information. This may consist of only one or multiple interviews until we receive adequate information to create detailed interpretive stories. Interviews will be conducted by two team members, with one team member asking questions and the other taking notes. To ensure accuracy the interviews are recorded with a tape recorder and referenced as needed.

3.3 Archival Research

We are supplementing our site work with archival research when necessary. This research includes educational materials belonging to the garden as well as other relevant sources at the University of Puerto Rico. Archival research is being used to fill in any gaps of information that exist in our project.

3.4 Compilation of Information

The actual creation of our final deliverables will depend heavily on interviews, site analysis, and archival research. The following diagram illustrates the process of our project. It is broken down into three segments: research, acquired information, and final deliverables.

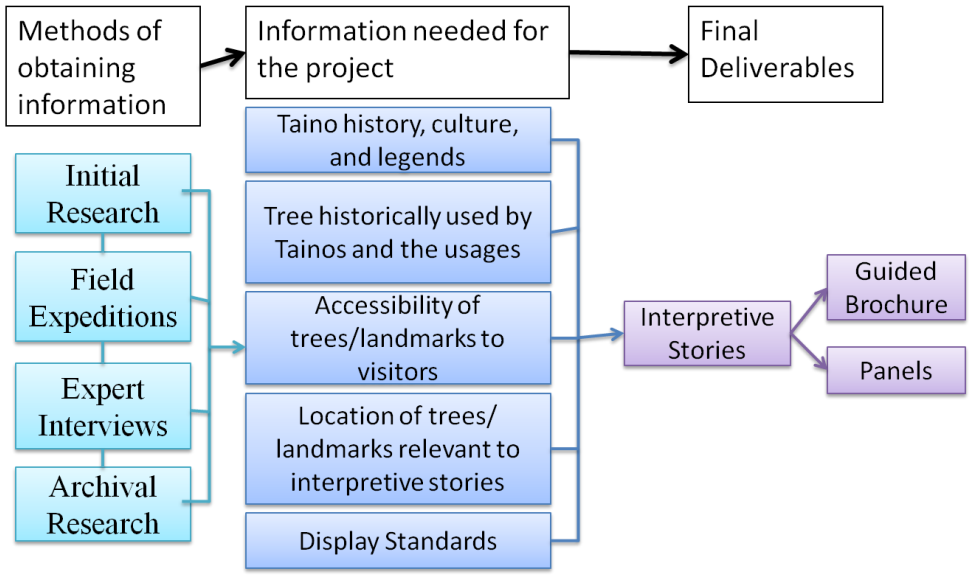

Figure 6: The Proposed Flow of the Project

Following the above project flow chart we have developed a timeline for which each section is going to be completed.

	PQP	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Initial Research	■							
Field Expedition		■	■	■	■	■	■	
Expert Interviews			■	■	■	■	■	
Archival Research				■	■	■	■	
Creation of Interpretive Stories			■	■	■	■	■	
Design of Display Elements					■	■	■	
Write Report	■	■	■	■	■	■	■	■

Table 4: Proposed Timeline

3.5 Design

The design of the panels and guided brochure is the final part of this methodology. Using the case study from Plimoth Plantation, the positive attributes will be used when designing the panels and guided brochure. This case study is an integral part of our design as well as previous and future archival research. Additionally, we have taken into consideration the desired ergonomics and display guidelines before being to develop our deliverables.

Chapter 4 Conclusion

We proposed to create interpretive stories based on the Taíno lifestyle presented via informative panels and an interactive guidebook. The interpretive stories will include the tree species found on the nine mile trail to exhibit the Taínos' relationship with nature. These will include maps describing the location and history of the petroglyphs and other archeological landmarks along the trail, to enhance the interpretive stories. In order to display these stories to the visitors, we will create successive panels that will be installed along the Ethno-Ecological Trail System. Similarly, the guidebook will include a map of the trail, in conjunction with the panels, and will include in-depth information and recommended interactive activities.

After evaluating the history and context of the CBCG, we have acquired a basic understanding of the Taíno history and culture. We have also uncovered some evidence of the kinds of interactions Taínos had with their environment, specifically with local tree species. Furthermore, we have investigated the theory behind environmental literacy and have noticed that the natural setting of the CBCG is vital to the development of environmental literacy of the visitors. In order to complete our project, we have also researched studies that examined the behavior of visitors when they encounter panels and signage. From these studies, we have acquired a basic understanding of necessary guidelines to ensure visitors' full interest in the information.

We will conduct expert interviews with anthropologists on site. Additionally, we will conduct multiple field expeditions through the Ethno-Ecological Trail System to understand the location of each landmark and tree species, to better create interpretive stories and situate each panel.

We are excited about this opportunity to work with the Caguas Botanical & Cultural Garden. We hope that the results of our proposed project will be able to help the CBCG to entertain the visitors while educating them more about the environment around them, as well as the history of the Taínos.

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Appendix

Appendix A: Tree Classifications

Common Name (Spanish)	Scientific Name
Aguacate	*Persea Americana*
Algarrobo	*Hymenea courbaril*
Almácigo	*Bursera simaruba*
Caimito	*Chrysophyllum cainito*
Ceiba	*Ceiba pentandra*
Cojóbana	*Piptadenia peregrine*
Cupey	*Clusia rosea*
Guayabo	*Psidium guajava*
Higüero	*Crescentia cujete*
Malagueta	*Pimenta racemosa*
Mamey	*Mammea Americana*
Palma real	*Roystonea borinquena*
Papaya	*Carica papaya*
Roble blanco	*Tabebuia heterophylla*
Tártago emético	*Jatropha multifida*

Appendix B: Interview Questions

1. Medicine

    1.1 What plants were used for medicine?

    1.2 What kinds of ailments did these treat?

2. Food

    2.1 What type of food was eaten by the Taínos?

    2.2 What plants were important to the Taínos cooking?

3. Religion and Traditions

    3.1How many gods did the Taínos believe in?

    3.2 Does their religion resemble any other more familiar religions?

    3.3What kinds of rituals were associated with their religion?

    3.4 How did they worship?

4. Legends

    4.1What kinds of legends were told?

    4.2 Under what conditions did these legends develop?

    4.3 What were some of the most popular legends?

5. Plants

    5.1 What kinds of things did the Taínos make from the indigenous trees?

    5.2How were plants used in Taínos worship?

6. War

    6.1 Did the Taínos ever have to fight?

    6.2 Did they possess weapons?

7. Petroglyphs

    7.1 What kinds of things were petroglyphs used for?

    7.2 What are some of the most commonly seen symbols?

7.3 Where can we find petroglyphs with in CBCG and what do they depict?

8. Caves

8.1 What were the caves used for by the Taínos?

8.2 What were the caves that are in the Ethno-Ecological Trail System used for?

9. Everyday life

9.1 What were the men's roles each day?

9.1.1 What did they do for fun?

9.2 What were the woman's roles each day?

9.2.1 What did they do for fun?

9.3 What were the children's roles each day?

9.3.1 What did the children do for fun?

9.3.4 Did the roles of the male children differ from that of the female children?

10. Existing exhibits in the garden

10.1 What displays already exist in the garden?

10.2 What is shown in the Taínos village?