



WPI



BOSQUE ETERNO
DE LOS NIÑOS
CHILDREN'S ETERNAL
RAINFOREST

Designing a Master Plan for the *Bajo del Tigre* Reserve

An Interactive Qualifying Project Report Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the Degree of Bachelor of Science

Submitted by:

Tyler Dubuke, Alyssa Nicollela, Paul Rivera, and Seneca Warren

Submitted on:

March 2, 2019

Submitted to:

Professor Melissa Belz, Worcester Polytechnic Institute
Professor Courtney Kurlanska, Worcester Polytechnic Institute

Sponsoring Agency:

Lindsay Stallcup, The Bajo del Tigre Reserve, Monteverde, Costa Rica

This report represents the work of four WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see: <http://www.wpi.edu/Academics/Projects>.

Abstract

There is an ever-growing divide between children and nature; the Monteverde Conservation League (MCL) seeks to bridge this gap. This project aimed to provide *Bajo del Tigre*, an MCL reserve, with a plan to create a more attractive and educational experience for children and families. To do so, we observed the current offerings at the reserve, analyzed offerings at other family friendly attractions, interviewed employees of the reserve to understand their vision, and developed a multiphase plan they can implement to achieve this goal. We determined that in order to provide the most positive results, our plan needed to have minimal impact on nature while also creating an interpretive educational experience for all visitors regardless of age, learning style or physical ability.

Executive Summary

Getting outside and experiencing nature is extremely beneficial, especially for children, as physical activity in nature leads to a stronger immune system and reduced stress levels in children. Our sponsor, the Monteverde Conservation League (MCL), aims to encourage children to enjoy their time in nature while learning about the importance of preserving the natural world. The MCL wishes to make their reserve, *Bajo del Tigre*, a place where children, families, tourists, and locals can learn about, explore, and enjoy nature. Our team identified the areas of improvement of the reserve's current offerings and created a master plan for future development.

Many studies have determined that being in and around nature is beneficial for children. Nature has a marked benefit on cognitive and physical ability (Koynova, et al., 2018). Since nature has such a beneficial impact on children's development, it is important to design spaces that encourage them to get excited about nature. There are many ways to do this, but the most common are natural education centers (Louv, 2011). Such centers provide children with many different forms of activities such as natural play spaces, discovery yards and teaching gardens. These spaces offer areas where children can develop their motor skills while also engaging with nature (White, 2004, p.5).

Nature reserves often include different attractions such as interpretive visitors' centers, interpretive trail systems, all access trails, and workshops. Interpretive trail materials provide the visitor with information while they are experiencing nature. They often include easy to comprehend signage and information that makes the reader think about the subject. Interpretive visitors' centers create a similar experience, providing those who cannot access the trails the same information as those who can (Nez Perce People, 1999). Visitors' centers, with easily comprehensible displays, provide visitors with the tools to understand the environment and get them excited to learn (Allen, 2004). For those who prefer to learn in a classroom setting, workshops provide a more structured way of learning that is beneficial to some (Self-Directed Learning: A Four-Step Process, 2018). Finally, all access trails ensure that people of all physical capabilities have access to nature and the environment. By combining all of these aspects, a reserve ensures that people of all ages, learning styles and physical abilities will have a fun and educational nature experience.

In order to develop a more successful reserve, all aspects must be addressed. This can be done by developing a strategic plan with a phased implementation. This is the case for *Bajo del Tigre*, a nature reserve in Monteverde, Costa Rica that seeks to improve its visitation from children and families. To do this, the management has requested that we design a master plan that encompasses all aspects of the best family friendly nature reserves.

Objectives

Objective 1: Observe the current offerings and daily operations of the *Bajo del Tigre* reserve

Objective 2: Understand the strengths and weaknesses of other similar family-oriented attractions

Objective 3: Gain employee perspectives on the reserve's current state and what they want to improve in the future.

Objective 4: Develop a multiphase master plan with employees of Bajo del Tigre

Upon arrival in Monteverde, our team used observation to gain understanding of the overall situation at the reserve. Through a soft systems analysis, we identified aspects of the reserve that pertained to our project. After analyzing *Bajo del Tigre*, we toured the reserve accompanied by our sponsor and a naturalist guide to identify different landmarks. The team used a drone to take pictures of the landmarks for cataloging and later digitized mockups. From this objective, we learned that the reserve's main goal is the preservation of the natural environment, but they have the desire to improve and create more educational materials for children and adults.

Our team then observed other nature reserves in the area to understand what they may be doing differently from *Bajo del Tigre*. Through the use of a standardized investigation sheet, we noted common features, notable exhibits or activities, and additional features that were not expected. Our team analyzed our investigation sheets in order to identify the best improvements to propose to *Bajo del Tigre*. From this objective the team learned that it is important to have the parking lot adjacent to the visitor's center, there is a lack of interpretive materials in Monteverde, and the importance of accurate trail maps denoting features in the park.

Next, we interviewed employees, board members, and naturalist guides through semi-structured interviews to gain their perspectives on the current state of the reserve and their vision for its future. The information was coded to highlight common themes that arose during the interviews. The team learned that employees, board members, and naturalist guides were not interested in changing the trails. However, they were excited to make improvements to their marketing and community outreach, educational offerings, and the layout of the reserve.

Lastly, we separated our data into six potential areas for improvement, and conducted a workshop with two employees, and three board members to gauge their opinions on the priority of the different recommendations. In this workshop the employees ranked each potential area for improvement as well as each specific improvement within an area based on what they believed the reserve could realistically accomplish. We found that while employees were passionate about the long-term projects, they understood that the short-term improvements were more realistic in order to have an immediate impact. We determined five phases for the park development and digitized the layout using aerial footage and GPS. This was paired with mockups, sketches and a conceptual layout to guide the employees in the implementation of the recommendations for future growth.

Phase 1, to be completed in 3-6 months, is comprised of the simplest and lowest cost improvements that can have an immediate positive impact on visitation to *Bajo del Tigre*. We suggest placing more flowering plants around the visitor's center in order to attract more butterflies and hummingbirds. This ensures that visitors can see wildlife as soon as they arrive, which will help to increase the appeal of the reserve. We recommend cleaning up around the strangler fig on the Children's Trail (*Sendero de los Niños*) as it has the potential to be a fun climbing structure for children. Cleaning up the small pond and greywater system near the visitor's center could create an educational experience for visitors as well as provide a place to view many bird species. The *Bajo del Tigre* reserve is in need of a new trail map including the most current trail routes, trail distances and difficulty levels, as well as icons indicating rest areas and viewpoints. We anticipate that this map will need to be updated upon the completion of each phase. The last improvement for Phase 1 is to invite local schools to *Bajo del Tigre* for field trips. This will cost the reserve no money and help to promote visitation by the local community.

The recommendations within Phase 2, to be completed in one year, are also relatively low cost but require more time to accomplish. Our first suggestion is to develop new interpretive signage for the Children's Trail. Next, we recommend making the parking lot safer by grading it to ensure that cars do not get stuck and adding security cameras to discourage car break-ins.

Phase 3 recommendations, to be completed in three years, will take longer to complete, because they require more money and *Bajo del Tigre* does not know when they would receive donations. Our first suggestion is to clear out small plants in an open area on the Arboretum Trail to provide a new rest area. This could be a costly improvement, unless the reserve is willing to enlist the help of volunteers. The next recommendation is to begin scheduling monthly workshops and talks. This could appeal to both locals and tourists, and potentially have a significant positive impact on visitation. Our final suggestion is to begin working on an interpretive layout in the current visitor center. The back room of the visitor center is not being used, and has plenty of space for interpretive materials as well as other displays regarding the history of the BEN. The goal of this space within the interpretive center is to help visitors gain a deeper appreciation for the reserve, and potentially encourage donations to help support its mission.

Phase 4, to be completed in five years, includes a high cost improvement. This phase includes the most recommended improvement, to build a new visitor center adjacent to the parking lot in order to create a more pleasant visitor admission process. The current visitor center is located about 150 meters from the parking lot, which enables visitors to enter the reserve's trails without paying. The other problem with the current location is that visitors are often confused when they arrive and do not see where to pay so they can begin their hike. The new visitor center would include a ticket desk, bathroom facilities, office space for employees, an adaptive screen showing photos of children who have donated, as well as maps and other informational materials.

The improvements suggested in Phase 5 are also high cost, and cannot be completed until Phase 4 had been completed. Once the new visitor center is built, the front room of the old visitor center could be revamped so that the building could become the new interpretive center. This would include auditory exhibits that could teach families which sounds to listen for in the forest. After this is completed, we suggest that *Bajo del Tigre* next create an all access trail. This would be located in the small portion of forest between the parking lot and the interpretive center, making the reserve more inclusive to people of all physical abilities. Finally, we suggest developing new trailhead signage that includes a map of the trail system. This will help make the reserve easier for families to navigate.

After analyzing *Bajo del Tigre*, observing similar reserves, and speaking with employees, we discovered which types of improvements needed to be included in our master plan for the reserve. We learned that the reserve's top two priorities are wildlife conservation, and creating an interpretive educational experience respectively; these priorities were influential in our decision-making process when designing the phases for the master plan. We believe the recommendations we included in the master plan are the best way to help move the *Bajo del Tigre* reserve toward its goals.

Acknowledgements

We would like to thank *Bajo del Tigre* and the Monteverde Conservation League for their accommodation on our project. We would also like to thank our advisors, Melissa Belz and Courtney Kurlanska, and our sponsor, Lindsay Stallcup for assisting us in our research. Lastly, we would like to thank all of the individuals that helped us in the research that led to the design of our master plan for *Bajo del Tigre* in Monteverde, Costa Rica.

Contents

Abstract	i
Executive Summary	ii
Acknowledgements	v
Contents	vi
Table of Figures	ix
Table of Tables	ix
Authorship	x
Chapter 1: Introduction and Background	1
1.1 Why Children Need Nature	1
1.2 How to Motivate Children to go Outside	2
1.3 Components of a Family-Friendly Attraction	2
1.3.1 Interpretive Trail Materials	2
1.3.2 Interpretive Visitors Center	3
1.3.3 Workshops	4
1.3.4 All Access Trails	4
1.4 Developing a Successful Interpretive Reserve	5
1.5 Our Project	5
Chapter 2: Methodology	7
2.1 Objective 1: Observe the current offerings and daily operations of the Bajo del Tigre reserve	7
2.1.1 Observe Daily Operations	7
2.1.2 Land Surveying	8
2.2 Objective 2: Understand the strengths and weaknesses of similar family-oriented attractions	8
2.3 Objective 3: Gain employee perspectives on the reserve’s current state and what they want to improve in the future	9
2.4 Objective 4: Develop a multiphase master plan with employees of Bajo del Tigre	10
2.4.1 Analyze Information from Objectives 1 through 3	10
2.4.2 Getting feedback from employees	10
2.4.3 Digital Layout of Improvements	11
2.5 Conclusion	11
Chapter 3: Finding and Results Chapter	12
	vi

3.1 The current offerings and daily operations of the <i>Bajo del Tigre</i> reserve.	12
3.1.1 Visitor’s Center	12
3.1.2 Trails	13
3.1.3 Parking Lot	16
3.1.4 Visitor Demographics	16
3.2 The strengths and weaknesses of similar family-oriented attractions.	18
3.2.1 Layout of Similar Reserves	18
3.2.2 Interpretive and Informational Materials	19
3.2.3 Trail Features and Maps	19
3.2.4 Discussion	20
3.3 Employee perspectives on <i>Bajo del Tigre</i> ’s current state and future improvements	20
3.3.1 Marketing and Community Outreach	20
3.3.2 Educational Offerings	21
3.3.3 Reserve Layout	22
3.4 A multiphase master plan with employees of <i>Bajo del Tigre</i> .	22
3.4.1 Analysis of Employee Feedback	22
3.4.2 Discussion	23
Chapter 4: Recommendations Chapter	24
4.1 Phase 1: 3-6 months after start	24
4.1.1 Add sweet flowers around the Visitor’s Center to attract butterflies and hummingbirds	25
4.1.2 Cleanup around the strangler fig and small pond/greywater filtration system	25
4.1.3 New trail map and additional copies of trail brochure	27
4.1.4 Invite local schools for field trips	27
4.2 Phase 2: 1 year after start	28
4.2.1 Develop new interpretive signage for the Sendero de los Niños	28
4.2.2 Improve parking lot	28
4.3 Phase 3: 3 years after start	29
4.3.1 Clear out the open area on the Arboretum Trail	29
4.3.2 Monthly workshops	31
4.3.3 Begin interpretive layout in the current visitor’s center	32
4.4 Phase 4: 5 years after start	33
4.4.1 Building a new visitor’s center	33
4.5 Phase 5: 5+ years	34

4.5.1 Complete the interpretive layout in the old visitor's center	34
4.5.2 All access trail	35
4.5.3 Develop new trail signage	35
4.6 Conclusion	36
References	37
Appendix A: Reserve State Analysis	42
Appendix B: Observational Questions	43
Appendix C: Locations of Similar Family Friendly Attractions	44
Appendix D: Employee and Board Member Interviews	45
Appendix E: Naturalist Guide Interview	47
Appendix F: Interview Notes Comparison Table	49
Appendix G: Employee Feedback Sheet	51
Appendix H: Inventory of Informational Material	53
Appendix I: Inventory of Souvenirs	54
Appendix J: Reasonings for Recommendations	57

Table of Figures

Figure 1: Interpretive Signage	12
Figure 2: Map of Missing Landmarks	14
Figure 3: Greywater Filtration Sign	15
Figure 4: Parking Lot Ground View	16
Figure 5: Parking Lot Aerial View	16
Figure 6: Visitor Demographics	17
Figure 7: Workshop Priority Results	23
Figure 8: Map of Phase 1 Improvement Locations	24
Figure 9: Location for adding sweet flowers	25
Figure 10: The strangler fig	25
Figure 11: The small pond’s current condition	26
Figure 12: Greywater system informational poster	26
Figure 13: Informational booklet	27
Figure 14: Children at the <i>Casita de los Niños</i>	27
Figure 15: Current parking lot conditions	28
Figure 16: Locations for placing security cameras	28
Figure 17: Open area on <i>Arboretum</i> location	29
Figure 18: Open area on <i>Arboretum</i>	30
Figure 19: Open area on <i>Arboretum</i> panorama	30
Figure 20: <i>Casita de los Niños</i>	31
Figure 21: The classroom	31
Figure 22: Current back room of the Visitor’s Center	32
Figure 23: Rendering of the interpretive layout	32
Figure 24: Site map of the new visitor’s center	33
Figure 25: Rendering of the interpretive layout	33
Figure 26: Rendering of the interpretive layout	34
Figure 27: Potential floor plan of the interpretive center	34
Figure 28: Proposed location of the all access trail	35
Figure 29: Mockup of new trail signage	35

Table of Tables

Table 1: Trail Difficulty Analysis.....	14
Table 2: Reserve Attractions.....	18

Authorship

Section	Author	Editor(s)
Abstract	Alyssa Nicolella & Tyler Dubuke	All
Executive Summary	All	All
1.0 Introduction	Seneca Warren & Alyssa Nicolella	All
1.1 Why children need nature	Seneca Warren & Alyssa Nicolella	All
1.2 How to motivate children to go outside	Alyssa Nicolella	All
1.3 Family Friendly Attractions	Tyler Dubuke	All
1.3.1 Interpretive Trail Materials	Tyler Dubuke & Paul Rivera	All
1.3.2 Interpretive Visitors Center	Seneca Warren & Tyler Dubuke & Paul Rivera	All
1.3.3 Workshops	Tyler Dubuke	All
1.3.4 All Access Trails	Paul Rivera & Alyssa Nicolella	All
1.4 Developing a Successful Interpretive Reserve	Paul Rivera	All
1.5 Our Project	Tyler Dubuke & Paul Rivera	All
2.0 Introduction	Tyler Dubuke & Alyssa Nicolella	All
2.1 Objective 1: Objective 1: Observe the current offerings and daily operations of the Bajo del Tigre Reserve	Tyler Dubuke & Alyssa Nicolella	All
2.2 Objective 2: Understand the strengths and weaknesses of other similar family-oriented attractions	Seneca Warren	All

2.3 Objective 3: Gain employee perspectives on the reserves current state and what they want to improve in the future	Alyssa Nicolella	All
2.4 Objective 4: Objective 4: Develop a multiphase master plan with employees of Bajo del Tigre	Paul Rivera	All
2.5 Conclusion	Alyssa Nicolella & Paul Rivera	All
3.1 The current offerings and daily operations of the Bajo del Tigre Reserve	Tyler Dubuke	All
3.2 The strengths and weaknesses of other similar family-oriented attractions	Seneca Warren	All
3.3 Employee perspectives on the reserves current state and what they want to improve in the future	Alyssa Nicolella	All
3.4 A multiphase master plan with employees of Bajo del Tigre	Paul Rivera	All
4.1 Phase 1	Alyssa Nicolella	All
4.2 Phase 2	Tyler Dubuke	All
4.3 Phase 3	Paul Rivera	All
4.4 Phase 4	Seneca Warren	All
4.5 Phase 5	Alyssa Nicolella	All

Chapter 1: Introduction and Background

Over the past couple decades, the average amount of time we spend inside has increased considerably. A large portion of people across the globe have lost touch with the sense of importance for balancing time spent using electronics and time outdoors - so much so that many children have lost interest in playing outside (Louv, 2005). According to the World Health Organization, a healthy lifestyle “should begin early in life, and should involve the development and maintenance of lifelong healthy eating and physical activity patterns” (World Health Organization, 2000, p.247).

The Monteverde Conservation League (MCL) is an organization located in Costa Rica that aims to close the divide between children and nature while preserving the natural world. The MCL is a non-profit organization that oversees the *Bajo del Tigre* reserve in Monteverde, Costa Rica. Their mission is to “conserve, preserve, and rehabilitate tropical ecosystems and their biodiversity” (Burlingame, 2016).

In collaboration with the *Bajo del Tigre* reserve, we will be designing a master plan to further this mission. The intent of this master plan is to make the reserve a place where children, families, tourists and locals can come to learn, explore, and enjoy nature. This report identifies potential areas of growth for the *Bajo del Tigre* reserve to develop a strategic plan for future development. Chapter one discusses the broad topics of the impacts of nature on children’s development, how to design natural spaces for children and families, the benefits of interpretive educational materials on nature trails and visitors’ centers, the benefits of all access trails and how this is important for *Bajo del Tigre*. In chapter two, we explain the methods used to gather the necessary information to recommend a strategic plan for *Bajo del Tigre* which will increase their visitation from children and families. Chapter three discusses the findings identified from our data gathered while conducting our methodology. Finally, chapter four encompasses our master plan of recommendations for the *Bajo del Tigre* reserve.

1.1 Why Children Need Nature

There are numerous mental and physical health benefits associated with increased involvement in outdoor activities (Koynova, et al., 2018). A study conducted on children whose families moved from poor urban areas to greener locations revealed that children whose home environments had increased amounts of vegetation post-move showed the highest increases in cognitive function (Wells, 2000). Other studies corroborate Wells’ argument showing a direct correlation between tree coverage near schools, higher standardized test scores, and academic achievements (Tuen Veronica Leung, W., et al., 2018). Additionally, a study by Wallner and Kundi (2018) found that students taking a break from school in an outdoor setting increased their cognitive function. Studies concerning physical development have also shown that physical activity in nature leads to a stronger immune system and reduced stress levels in children (Louv, 2011). Furthermore, these studies found that overall well-being was improved after pupils spent time in nature.

1.2 How to Motivate Children to go Outside

Since interacting with nature is so beneficial for childhood development, it is important to design spaces that encourage children to be excited about nature. A child's innate desire to explore the world around them stems from intrinsic motivation. Pintrich and Schunk define intrinsic motivation as "the desire to participate in an activity merely for the pleasure derived from that activity" (Carlton, Winsler, 1998, p.159). Instilling this form of motivation about nature and the environment will inspire children to choose to play outside out of pure enjoyment. Family support and encouragement is a powerful strategy for developing this attitude. There are three broad categories of initiatives that encourage families to get outside and experience nature: traditionally funded programs, volunteer work, and social networking (Louv, 2011).

Traditionally funded programs are places such as environmental education centers that are funded by private or state organizations. Environmental education centers provide visitors, especially children, with "active, engaging places to explore and discover the natural world" (*Nature play and learning places*, 2018, p.6). They achieve this through many forms of outdoor activities, such as natural play spaces, discovery yards, and teaching gardens. These simple activities typically incorporate natural materials and elements from the surrounding environment, such as streams, logs, and boulders. The simplicity of natural play spaces stimulates a child's intrinsic motivation by providing a heightened level of creative and interpretive freedom. A well-designed natural space also helps children develop their motor skills while fulfilling their need to interact with nature (White, 2004). These activities are often specifically designed according to experiential education theories which argue that early and middle childhood cognitive learning may be boosted through free play, exploration, and personal experiences in nature. These first-hand interactions also stimulate a life-long connection with the environment which is more personal than that achieved through secondary sources such as books or documentaries.

1.3 Components of a Family-Friendly Attraction

Although it is important to bring children back into nature, it is also important to make sure that everyone that visits a natural space has a positive experience. Family-friendly attractions extend far beyond their benefits to children, they also provide benefits to all those that visit them. Interactive and interpretive nature experiences help a broad audience experience and learn about nature in a fun and engaging way. Components such as an interpretive visitors center, interpretive trail signage, all access trails and workshops create a well-rounded, engaging experience for the whole family. These types of attractions appeal to different types of interests and learning styles which is imperative to the best experience possible.

1.3.1 Interpretive Trail Materials

Interpretive materials are a way of displaying information that is relevant to the surrounding environment, while also making the participant think about their own life and experiences (Hague, 2013). This is different from the traditional didactic manner of teaching because it requires the reader to interpret the experience in their own way (Travel Wayfinding, 2011). Interpretive trail materials provide a better understanding and lasting appreciation of the environment, as well as the conservation of knowledge (Ardoin, 2015). Interpretive signs are

more beneficial than informational signage because informational signage usually displays large amounts of information that is hard to remember and does not pertain to the surrounding environment in a direct way (Wells, 2008). Interpretive signs often include diagrams and images which are relatable to a large crowd and have information that is easy to comprehend. They may also have activities for the users such as looking closely at a type of plant and smelling its distinct aroma. Information and visuals displayed on interpretive trails add an educational component to a hiker's experience, teaching them about topics which they would not have learned on their own. A system of well-planned interpretive signage "can help to promote inquiry and to stimulate constructive science discussions among [hiking] participants" (Wandersee, 2007, p.16). This adds depth to a hiking experience and promotes interest in topics that might be otherwise overlooked. This highlights the benefits of an extensive recreational trail design that incorporates interpretive materials to increase visitation and interest in the environment (Miller, Hobbes, 2002).

1.3.2 Interpretive Visitors Center

In addition to interpretive materials on the trails, interpretive information at trailheads and in visitor centers enhance the overall educational experience. The information provided in a visitor center enhances intellectual and emotional connections with natural environments. To achieve this "visitor centers often feature elaborate museum exhibits [and] audio-visual programs" providing a place of intellectual and physical access for people that may not be able to enjoy the trails in their entirety (Nez Perce People, 1999). Such people might include those who have physical limitations or do not want to go on a hike. This is important because it ensures that everyone who visits a nature reserve will have a fun and educational experience, regardless of physical ability. By providing a wide variety of historical and interpretive exhibits, it is possible to create an attraction with central concepts that allow for connections between the material and the person's own life experiences. This enables families and children to have the freedom to choose how and what they want to learn (Hague, 2013).

A cohesive visitor center layout is also vital to the success of interpretive exhibits. The visitor center should have an easily comprehensible layout so that upon entrance, families can quickly and easily locate the ticket desk and other necessary facilities. Allen explains how an immediately understood flow to the building is "a particularly important quality for the early or framing stages of an experience, because it lessens distracting stimuli and helps to put visitors within a comfortable framework from which to be curious" (Allen, 2004, p.23). Not only is it important to make the layout easily understood, but it is also necessary to design any immediately visible information and exhibits in a way that piques visitors' curiosity without overwhelming them. Allen states that "to be effective as teaching tools, exhibits need to be highly intrinsically motivating at every step of an interaction in order to sustain involvement by an audience who views their visit primarily as a leisure activity" (Allen, 2004, p.17).

Every person that visits an interpretive visitor center will have a different level of knowledge and interest. It is important to interact with children and families in a way that gives them the tools they need to get more out of their experience. When visitors feel comfortably oriented within a learning environment, they become more open and able to absorb new information (Falk, Balling, 1977). Allen built upon this idea, emphasizing the importance of "giving visitors direct experience with natural, physical, and technological phenomena, on the assumption that this would allow them to build the confidence and skills to understand the world

around them” (Allen, 2004, p.20). An example of this is showing unique examples of rare flora and fauna that are abundant on a reserve to generate excitement among the visitors and give them a reason to explore the vast trail systems on their own (Ayers, 2001).

1.3.3 Workshops

Interpretive materials are a successful way of giving people a fun and informative way to learn new information. However, independent learning can be challenging and ineffective for some (Self-Directed Learning: A Four-Step Process, 2018). Workshops provide a well-rounded experience that informs a wider audience about the necessity of wildlife conservation. They provide a more structured way of learning that is often beneficial to participants of all ages. According to Tilden’s six principles, educational materials “addressed to children should not be a dilution of interpretation for adults, but should follow a fundamentally different approach” (6 principles of heritage interpretation, 2011). This means that information and extrapolation is fundamentally different for children and adults. This makes it necessary for adult and child workshops to be separate and follow different approaches to achieve the same goal. For adults, it is necessary that the content of a workshop be relatable to their own lives and be of immediate use (University of Washington School of Public Health, 2012). In contrast, children’s workshops should focus more on fun, hands-on activities that engage them. This allows the information to be learned naturally and without force. Since these two learning styles are so fundamentally different, it is important to make sure that any workshops where both adults and children are present cater to many learning styles and needs. Even though the learning styles of children and adults are fundamentally different, it can be beneficial to the family structure to have combined workshops. According to the department of health and human services, family engagement has many benefits for childhood development and a sense of belonging within a family (U.S. Department of Health and Human Services, 2018). Therefore, if the goal of the workshop is the retention of knowledge, it might be beneficial to provide separate workshops for children and adults. However, if the goal of the workshops are to build family relationships, while also learning new information, then workshops for the whole family are also beneficial.

1.3.4 All Access Trails

Accessibility is another important factor in designing an inclusive, family friendly reserve because families bring members of varying levels of physical capabilities. For example, families with young children may require a stroller while older individuals may have difficulty getting around on their own. Providing the proper infrastructure that enables those with physical limitations will allow them to enjoy recreational excursions and the natural world independently (Burns, Graefe, 2007). Accessible outdoor recreational spaces provide a unique opportunity for exploration and socialization for those with physical limitations (Goodwin et al, 2009). An all access trail will likely be used by people of varying physical capabilities, allowing for shared appreciation of the environment among visitors of many different life experiences. Studies have shown that as a result of interaction with others in a natural setting, those with physical limitations achieve social benefits such as an increased sense of comfort when meeting new people (Zhang et al, 2017). Along with social benefits there are also many mental benefits

associated with experiencing an accessible nature trail. These benefits include a sense of freedom and renewal, improvement of personality and better self confidence. (Zhang et al, 2017)

1.4 Developing a Successful Interpretive Reserve

Combining the four elements of family friendly attractions: natural play spaces, interpretive materials on the trails and in the visitor's center, workshops for children and adults and an all access trail creates the most well-rounded experience for all ages. The key steps in order to achieve this are beginning with a feasibility study that looks at the available options that will best suit the area. A strategic framework should then be created in order to gather baseline information on the current state of the area. This framework then leads into the design and layout of a master plan so that further recommendations can be made (The World Bank, n.d.). The master plan is developed "through the process by which planners determine the most appropriate informational or educational prescriptions for the sites and situations" (Wells, 2008, p.283). This is especially helpful when planning educational and informative material that gives the visitor a deeper understanding of the goals of an organization, and is otherwise known as interpretive planning. Due to the large quantity of data, it is important to break down all the planned changes into small, manageable steps over a period of time (Project Management Institute, 2018). In order to break down the steps over a period of time it is necessary to create a long-term plan that will incorporate the future vision of the organization, as well as short term plans that can be implemented within the year to provide immediate results. The long-term plan should have a specific planning goal that can represent the overall theme of the organization's growth in order to achieve a desired educational goal. The short-term plans seek to improve the current state along the lines of the overall theme, but are much more rational and logical in order to immediately impact the organization in many facets (Wells, 2008). Master planning can improve large scale developments such as a visitor's center, especially when following an interpretive planning process as it allows for the educational material to be reflective of the goals of the organization. Because the plan is broken into phases, it allows the organization the ability to grow into their final version in their own timeframe.

1.5 Our Project

Bajo del Tigre is a small reserve that is part of the large landholding known as the Children's Eternal Rainforest (*Bosque Eterno de los Niños*, or "BEN") in Costa Rica. It is overseen by the Monteverde Conservation League (MCL), a non-profit civil organization founded in 1986, that is dedicated to the conservation of Costa Rica's tropical biodiversity. Being a part of the ecotourism industry in Monteverde, *Bajo del Tigre* wants to make their reserve the best family friendly option in the area. Their mission is to share the importance of nature conservation and environmental education worldwide, as shown throughout their history. Each year 250,000 tourists visit Monteverde, but only 6,000 of them visit this reserve specifically (Monteverde Area Maps, Facts and Links, 2018). That is a mere 3% of all the visitors to Monteverde. On top of this, only about 7% of these visitors are under the age of 12. Through the creation of a well-rounded interpretive reserve, *Bajo del Tigre* will be able to showcase the many natural splendors that tourists from around the globe come to explore every year in Monteverde (Báez, 2002). It will also be able to better spread its message about the benefit of nature conservation to families and children.

The goal of our project is to plan a more attractive and educational experience for children and families at *Bajo del Tigre* that increases visitor awareness of wildlife conservation. A master plan will allow *Bajo del Tigre* to uphold the MCL's mission of "conserve, preserve, and rehabilitate tropical ecosystems and their biodiversity". This plan includes items such as child activities that appeal to intrinsic motivation, interpretive trails that stimulate everyone's sense of wonder and adventure, and an interpretive visitor center that excites guests about nature and what they could possibly learn. Through these ideas *Bajo del Tigre* may achieve their goals of providing a family friendly option for the Monteverde community that is a hub for the conservation of knowledge, repairing the divide between children and nature. In the coming chapters, we will discuss our methods to accomplish this, what we found, and what we recommend to improve the reserve.

Chapter 2: Methodology

The goal of our project is to plan a more attractive and educational experience for children and families at *Bajo del Tigre* that increases visitor awareness of wildlife conservation. In order to accomplish this goal, we developed four objectives.

Objective 1: Observe the current offerings and daily operations of the *Bajo del Tigre* reserve.

Objective 2: Understand the strengths and weaknesses of similar family-oriented attractions.

Objective 3: Gain employee perspectives on the reserve's current state and what they want to improve in the future.

Objective 4: Develop a multiphase master plan with employees of *Bajo del Tigre*.

In this chapter, we discuss these objectives as well as the research methods used in order to achieve our goal. Each of the objectives moved us toward creating a cohesive master plan that will be presented to *Bajo del Tigre* in order to improve their annual visitation from children and families.

2.1 Objective 1: Observe the current offerings and daily operations of the Bajo del Tigre reserve

2.1.1 Observe Daily Operations

In order to create the most effective plan for *Bajo del Tigre*, we first considered how the reserve was currently operating. This was our first objective because it provided us with a unique outsider's perspective that is vital to understanding the reserve. This would later allow us to compare *Bajo del Tigre* to other attractions in the region and determine what they could do to increase their visitation. We used observation over the course of a week to gain understanding of the overall situation at the reserve. Through a soft systems analysis, we identified parts of the reserve that pertain to our project. Specifically, we walked around the reserve and took note of all attractions they had available. Attractions such as interpretive and informational materials, conditions of trails and how day to day operations were conducted. The team broke into two groups of two. Each group walked around all of the trails, taking note of conditions such as the slope of the trails and the number of large rocks that might make the path harder for some demographics. We also noted if the difficulty rating on the trail was accurate based on our perceptions. In our ranking, any trail with a steep gradient for a long stretch of trail and also contained large rocks (larger than 10cm) would be considered difficult. Any trail that had large rocks and contained short stretches of steep gradient would be considered medium. And all other trails would be considered easy. All trails were ranked relative to each other and only to other trails in *Bajo del Tigre*. This was necessary because there is no universal ranking for trails and the only metric available is other trails in the reserve. This information was then condensed into a spreadsheet that allowed for the comparison of different trails. If interpretive materials were found, a picture was taken and the content was noted. We then observed how visitors interacted

with specific parts of the reserve, such as the visitor's center and interpretive materials on the trails as well as what caught their attention (Beebe, 2014). Some of the criteria that was specifically noted includes how long they stayed in the visitor center and what they looked at. A full set of items that we noted can be found in Appendix A.

After each section of the reserve had been analyzed and noted, we compiled all of this information into an excel document describing the day to day activities of the reserve as well as what they had to offer visitors. Since this was the first objective in our methodology, we did not have any information from other attractions to compare it to. As a result, the data was stored for later comparison with other attractions. Once we had collected the data from Objective 2, we would revisit this data and do a strategic comparison between *Bajo del Tigre* and the other attractions.

2.1.2 Land Surveying

We next examined the reserve, accompanied by our sponsor, Lindsay Stallcup, and a naturalist guide, to identify landmarks that may be difficult to identify using satellite imaging. This category of landmarks includes things such as notable foliage and areas of the reserve that particular wildlife frequently visits. Once we visited and noted the locations of potential attractions highlighted by our sponsor and the naturalist guide, we took photographs of these locations on the ground as well as photographs from an aerial drone. Taking photographs from the drone provided a high-resolution view of potential sites so that computer generated mockups could be created when we digitized the layout.

2.2 Objective 2: Understand the strengths and weaknesses of similar family-oriented attractions

Next, we needed to determine which types of activities and experiences are fun and engaging for a child and family-oriented attraction. By observing other local reserves, we were able to gain the knowledge base needed to evaluate what *Bajo del Tigre* offers in relation to other local attractions. We observed these locations using a standardized investigation sheet, found in Appendix B. This sheet helped us to code our data based on common features we expected to see, such as a description of notable exhibits or activities, and additional feature types we were not anticipating (Beebe, 2014). There is also a relatively small section of this sheet to note any weaknesses or drawbacks of each location; this helped us to identify what to avoid when creating our master plan. We also noted factors, such as the date, time of day and weather, directly on this observation sheet in order to identify external forces that affected attendance or visitor experience. In total we visited seven locations, including the Brooklyn Children's Museum in New York and Curi Cancha in Monteverde, Costa Rica. The full set of locations we visited can be found in Appendix C.

After each team member completed their observation sheets for each location, we analyzed our notes and condensed the information into an excel document to get a clear idea of which exhibits and activities worked well and which did not, based on how visitors interacted with them. We identified the most frequently encountered types of features from the checklist found on our observation sheet and the specific characteristics that made these features stand out.

We also noted common themes in detrimental features of the observed exhibits. An example of a detrimental feature would be if an interactive exhibit included lengthy instructions, as a visitor might skip over it in favor of a simpler and more exciting one. This information helped us to identify trends and commonalities that we categorized into ideas we want to emulate and things we want to avoid when designing our master plan. Ultimately, by comparing these findings with the results from the first objective, we intend to pinpoint the best possible improvements to propose.

2.3 Objective 3: Gain employee perspectives on the reserve's current state and what they want to improve in the future

Bajo del Tigre employees and board members are essential in the process of determining which facets of the reserve need to be improved, so it was important that we understand their opinions and visions for the future of the reserve when conducting our research. We conducted individual, semi-structured interviews of *Bajo del Tigre* employees and board members at the MCL office or at *Bajo del Tigre* itself to gain their perspectives on the reserve's current operations and potential room for improvement (Berg, 2007, p.110). The full list of questions used in these interviews may be found in Appendix D. We interviewed three employees and two board members, with each interview lasting about 30 minutes, to shed light on employee and board member opinions of the current conditions and areas for improvement at *Bajo del Tigre*.

Bajo del Tigre also employs naturalist guides that run guided tours to get visitors excited about the natural environment and teach them how to identify wildlife on their own. The guides provided insight into the current efforts to educate visiting families in an engaging way. This helped us to understand the necessary baseline information from the insider perspective needed to develop our ideas for potential improvements. We individually interviewed three naturalist guides using a semi-structured format for about 30 minutes each at *Bajo del Tigre* using the questions found in Appendix E (Berg, 2007, p.110).

Each interview was conducted in either Spanish or English, based on the comfort level of the person being interviewed. All interviews were recorded if permission was given by the interviewee. Any information that was missed in note taking during the Spanish interviews was added after the completion of the interview using the recordings as a reference. Notes were taken during the English interviews and cross referenced with the recordings at a later date. The data table found in Appendix F was updated after each interview using notes and recordings to display side-by-side results. We used data coding to highlight common themes or ideas that arose in multiple interviews. We then synthesized and summarized this information for later brainstorming of possible improvements to the reserve (Beebe, 2014). The key concepts identified in this interview data analysis were then utilized to provide a focus in the next objective.

2.4 Objective 4: Develop a multiphase master plan with employees of Bajo del Tigre

2.4.1 Analyze Information from Objectives 1 through 3

After the completion of Objective 1 we understood the current offerings and areas for improvement at *Bajo del Tigre*. Objective 2 gave us a better understanding of which aspects of family-friendly attractions are the most popular among children and adults and what attractions received poor visitor engagement. Drawing on data collected in Objective 3 we created a list of all recommended changes to the reserve based on the opinions of those interviewed. All of the recommendations were then split into six broad categories based on the context of the idea. Similar ideas were lumped together if they would affect the same portion of the reserve. Some of the central ideas that are covered in this recommendation list are community involvement, public education, new building sites with revamped parking, reuse of existing buildings, a potential all access trail and signage.

2.4.2 Getting feedback from employees

Upon completion of the list of actions for future improvements, it was important to obtain employee feedback on the proposed activities for the master plan to ensure that the finalized plan was the best fit for the BEN. This feedback was done through a workshop that was held at the *Bajo del Tigre* visitor's center, and was based on all of the recommendations from the interviews in Objective 3. We wanted to receive employee feedback prior to creating the plan to make sure that the vision aligned with the people who would be working with it. This meeting highlighted the categories of the action items and took place with three board members and two employees, and lasted approximately 30 minutes. We went through each list item individually with the employees that were present to understand their opinions on all proposed improvements. Since the list of action items included every improvement that the employees recommended, we wanted to see if any of the ideas that were part of the plan were unrealistic and therefore could be removed. As the employees were already asked about their personal opinions, they had the ability to further expand on their ideas as a group which provided a more detailed conceptual plan for the future improvements that will be incorporated in the plan. In order to ensure that no information during the discussions was lost, the workshop was recorded. Lastly, we asked the employees to rank the broad categories of improvements and the specific items in each category based on what they were most passionate about, and also on what is realistic for the reserve. This sheet can be found in Appendix G. The rankings of the groups were based on a numerical value of one to six. The individual activities were also ranked numerically with one being the highest priority and the lowest number being least priority depending on the amount of items within the grouping. Based on their preference, we created the final priority scheme for the master plan.

2.4.3 Digital Layout of Improvements

After receiving feedback, we developed phasing for the final design as well as conceptual plans for the improvement of the reserve. At this point, we created digital maps of the reserve in order to provide a clearer layout. Drone and satellite images were used for the maps of *Bajo del Tigre*. These images were converted into a digital layout identifying locations to highlight the proposed improvements through the use of Photoshop, a photo editing software. Additional photographs were taken from the ground to show specific details of the areas to improve. The digital display along with the phases of future growth is crucial for the MCL because it will allow them to visualize the plan in its entirety. There were conceptual plans created, along with the maps, that would help guide the employees through the specifics of each part of the plan. The conceptual plans were created to help guide the employees in the uses of the different recommendations and were combined with sketches and mockups to provide visuals of the spaces.

2.5 Conclusion

The MCL believes that a master plan can make *Bajo del Tigre* a more family-friendly location for locals and tourists alike. The first three objectives, which took approximately four weeks to execute, allowed us to find the best methods for creating an interpretive nature experience for the reserve. With the information gathered, we utilized our remaining time in Monteverde to produce a master plan proposal that will set *Bajo del Tigre* apart from the other attractions in Monteverde.

Chapter 3: Finding and Results Chapter

The following chapter outlines the results from our four objectives that contributed to the deliverables found in Chapter 4.

3.1 The current offerings and daily operations of the *Bajo del Tigre* reserve.

In the first objective of our methodology, we took note of and analyzed all the different offerings and day to day operations of the reserve. There were many parts of the reserve that we noted. Upon entering the reserve, you come a small, dirt parking lot with few spaces for cars. There is then a long path through the forest which brings you to a clearing where you can see the visitor's center and *Casita de los Niños* on your right. Upon entering the visitor's center, you are greeted by a receptionist who sells you your ticket, hands you a map, and gives you a brief overview of the reserve and the trails. You then see some informational material that you can read before beginning your hike. You exit the visitor's center and enter the trails at a nearby trail head.

3.1.1 Visitor's Center

We looked at three different aspects of the visitor's center: informational materials, souvenirs and child activities. The visitor's center contained seven books of informational material, none of which was interpretive. A full inventory of informational material available for visitors can be found in Appendix H. There is also a whiteboard in the front office that documents the times and locations of animals spotted on the trails. This provides visitors with a reference of what they might see as well as showing the emergence of patterns of certain wildlife. In addition to this, there is also a grey water filtration system in place for the facilities at the reserve. This system is hidden in the back, by the facilities, but there is an informational sign that can be seen in Figure 3. This system provides a large amount of educational material, but is only highlighted if a visitor goes to the back of the visitor's center. The visitor's center also provides a trail booklet which corresponds to the numbered markers

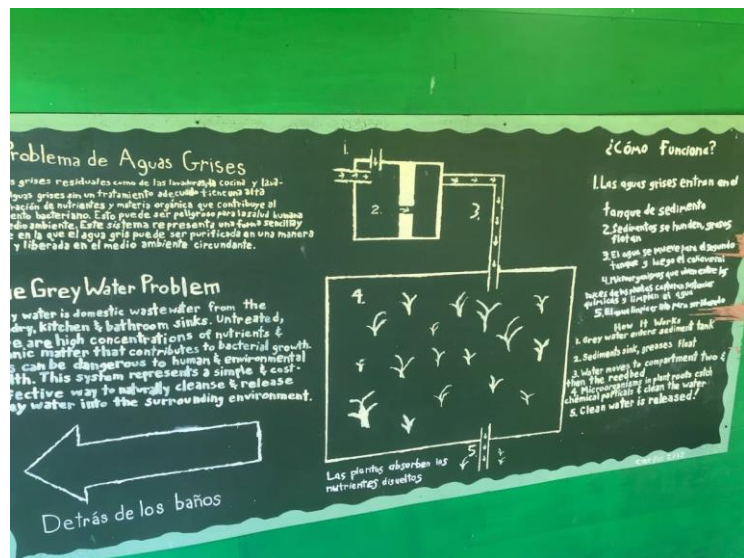


Figure 1: Greywater Filtration Sign

discussed in our analysis of the trail systems. These booklets contained useful information on flora and fauna present on the trails. However, they are seldom offered to visitors because they are in poor condition. What was not present in the visitor's center is any information on the history of the BEN. The reserve has a rich history that often encourages people to donate money to their cause.

Souvenirs offered in the visitor's center include T-shirts, hats, mugs, books, keychains, magnets, ponchos, local chocolates, small paintings, pens, playing cards, and wildlife guides. A full inventory of souvenirs can be found in Appendix I. All profits of sales go towards preserving the reserve. Although this is an extensive list, only 1.8% of the annual revenue from 2017 was from souvenirs. One aspect that may contribute to this is that there is only one shirt specific to the BEN and the colors are very limited. These souvenirs are also not well displayed or marketed. There is also not a diverse selection of book genres, and they are kept in a display case so visitors cannot view their content.

Since nature is an important part of child development, it is important that children have a fun and educational experience to get them excited about nature. The visitor's center currently provides a bingo game of different wildlife that children can see on the trails. This engages children and provides something for them to do when they are hiking. In addition to this, *Bajo del Tigre* has an entire Children's House (*Casita de Los Niños*). It is painted beautifully with plants and flowers, but many of the toys and activities are damaged or are missing parts. For example, there is a pile sorting game that is missing pieces. Additionally, there is a lot of space in the Children's House that is not being utilized. The small fraction of space that is being used contains games and educational material such as a book in Spanish/English/Japanese, a seed activity in Spanish/English, a magnetized jigsaw puzzle, a table with word searches and scavenger hunts, plaster casts of animal tracks with date and Spanish description, and stone animal tracks in Spanish/English to be used with a pin art toy. These are provided to entertain children and teach them about different wildlife in the process. Aside from this physical space, the reserve advertises educational programs on the *Bajo del Tigre* website, however, they no longer have these programs at the reserve.

3.1.2 Trails

While observing the trail system at *Bajo del Tigre*, we analyzed trail conditions, trail signage and interpretive signage. Overall, the trail systems were in better shape than originally anticipated. They were well maintained and could be navigated with relative ease. Some trails were harder to navigate, but this is a function of the steep gradient throughout the reserve and cannot be changed. Some locations could be confusing to some visitors, but most of them were easy to navigate and well laid out.

Trail maps provided to visitors include a ranking system that is associated with each of the trails. Trails are ranked on a three-point scale: easy, medium and difficult. Of the seven trails in *Bajo del Tigre*, five were ranked properly based on our ranking scale discussed in Objective 1. The different rankings of the trails, as well as our analysis can be found in Table 1. For example, easy trails, such as the *Sendero de los Niños* are well maintained with limited to no large rocks. This provided a pleasant experience for hikers of various abilities. In contrast, trails such as the Jaguar trail have very steep sections with loose terrain and sharp turns which can be hard to navigate. This is a trail that would be most enjoyable for hikers of higher abilities but may be dangerous for those who are inexperienced.

Trail Name	Marked Difficulty	Our Analysis	Reason
Sendero de los Niños	Easy	Easy	Small gradient with limited large rocks
Sendero Murciélago	Easy	Easy	Small gradient with limited large rocks
Sendero Calandria	Moderate	Moderate	Steep gradient for short distances with some large rocks
Sendero del Mono	Easy	Moderate	Steeper gradient for short distances with some large rocks which made it harder to navigate than an easy trail
Sendero Arboretum	Moderate	Easy	Small gradient with limited large rocks making it easier to navigate than the trails marked moderate
Sendero Mirador	Hard	Hard	Steep gradient for long distances with large rocks and turns
Sendero Jaguar	Hard	Hard	Steep gradient for long distances with large rocks and turns

Table 1: Trail Difficulty Analysis

For ease of use, trails should be properly marked on maps and at trail intersections. Trail signage is used minimally at *Bajo del Tigre*, including any signage that denotes trail heads or intersections of trails. Of the 11 intersections in *Bajo del Tigre's* trail system, four needed a map to navigate. It was brought to our attention, by the director of the reserve, that there is a suggested route to take through the reserve. This means that if this specific route was not taken, it might be hard to navigate through some intersections without a trail map.

Thirdly, we analyzed interpretive materials. *Bajo del Tigre* has begun implementing this, but it is not extensive. Interpretive signage is only included on the Children's Trail (*Sendero de los Niños*). The reserve did not deem it necessary to include this type of signage on all trails

because doing so would create a large intrusion on nature that they did not want. This trail includes 12 of these signs; they are small, unobtrusive, green, and contain a question in Spanish and English as pictured in Figure 1. Once a visitor has thought about the answer, they can flip the sign and find the correct answer. Although a good addition to this trail, some of the signs are becoming worn. Additionally, there are some non-interpretive materials present on the trails. On the Arboretum Trail (*Sendero Arboretum*), there were some plants and trees that have tags that display their Latin name.



Figure 2: Interpretive Signage

There are numbered markers throughout the trails providing reference points on the map and denoting different parts of a guide book that can be taken from the visitor's center. With this book, those who go through the trails can read different informational material when they pass a numbered marker. This is not interpretive, but provides information for those who want it. This also has a limited impact on the environment because instead of a large informational sign, there is only a numbered sign which corresponds to

information in a booklet. These booklets will be discussed more in the analysis of the visitor’s center.

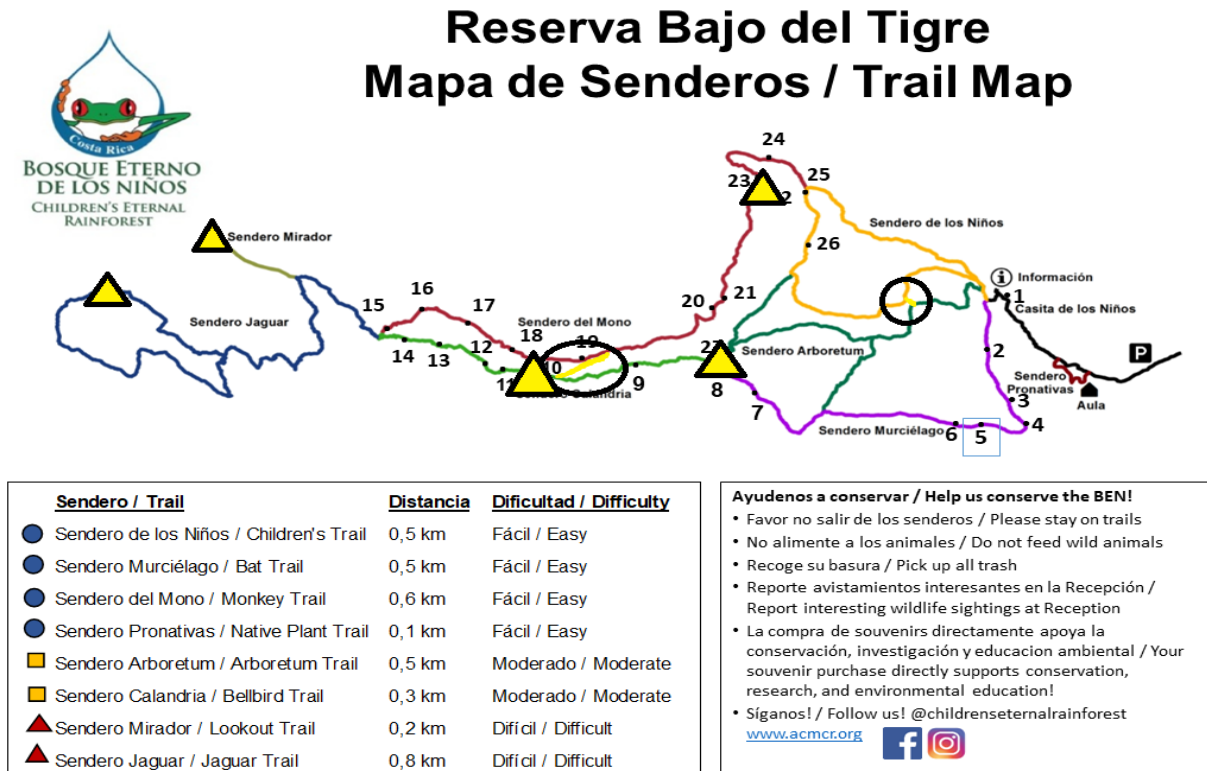


Figure 3: Map of Missing Landmarks

Additionally, we analyzed the trail maps themselves, which need to be updated. The current maps are inconsistent and missing key information. The website contains a different trail map than the one available at the visitor’s center. Additionally, the trail map at the visitor’s center does not contain four rest areas and one lookout point that are located on the trails. These areas are denoted by yellow triangles on Figure 2. This is a problem for many people because points of interest are often goals for hikers. In addition to the unlabeled rest areas, there are points of interest along the trails, such as a fallen strangler fig, that are not highlighted on the map. There are also trails that are not currently noted on the most recent map. On the trail map seen in Figure 2, there are two connector trails that we have added, which are denoted by circles with the trail path outlined in yellow. To our knowledge, these connector trails have not been included on any of the recent maps.

3.1.3 Parking Lot

Conditions of a parking lot are an important aspect of a successful reserve. Without a properly maintained parking lot, it is often hard for people to access the reserve and have an enjoyable experience. The main observation made was that the parking lot is not well maintained. The parking lot has a thin curved shape, as seen in Figure 4. Because of this, cars can only park along one side of the parking lot. Most of the parking area consists of rough terrain with large rocks and bumps as seen in Figure 5. The parking spaces were also not delineated and have no specific locations for cars in the parking lot. It also only has the ability to hold about 15 cars. This, in combination with the lack of delineated parking spots, makes it impossible for the reserve to accommodate a large number of vehicles simultaneously. There is also a large distance between the parking lot and visitors center without much signage directing visitors where to go. After parking, visitors have to walk approximately 150 meters down a path to access the visitor's center and buy their tickets. This is only evident by a small sign at the beginning of this trail.

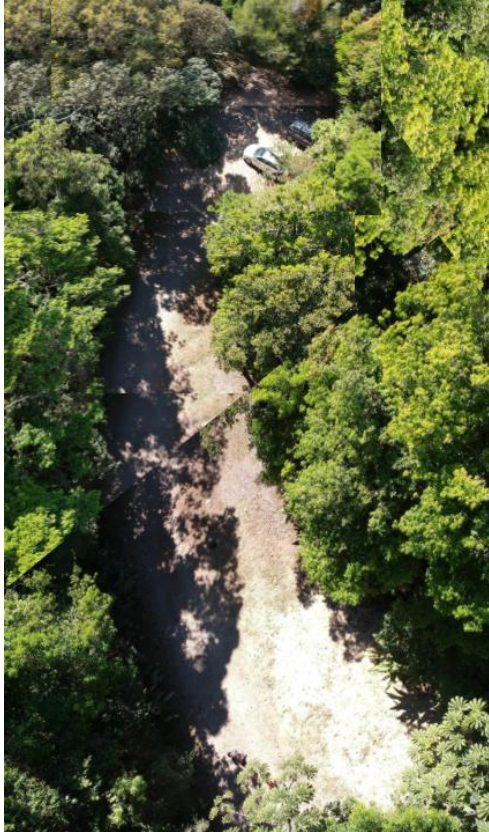


Figure 4: Parking Lot Aerial View



Figure 5: Parking Lot Ground View

3.1.4 Visitor Demographics

The last section of *Bajo del Tigre* that we observed was the yearly user demographics. From our analysis of their 2017 and 2018 annual report, we can see that most of the visitation to the reserve consists of general admission for international adults (people over the age of 12). The second largest demographic, for both 2017 and 2018, was adults who went on the night hike. Only 10.5% of visitors for 2017 were under the age of 12 as seen in Figure 6. It is necessary that we provide more family friendly attractions to *Bajo del Tigre* to ensure that their visitation from the younger demographic increases.

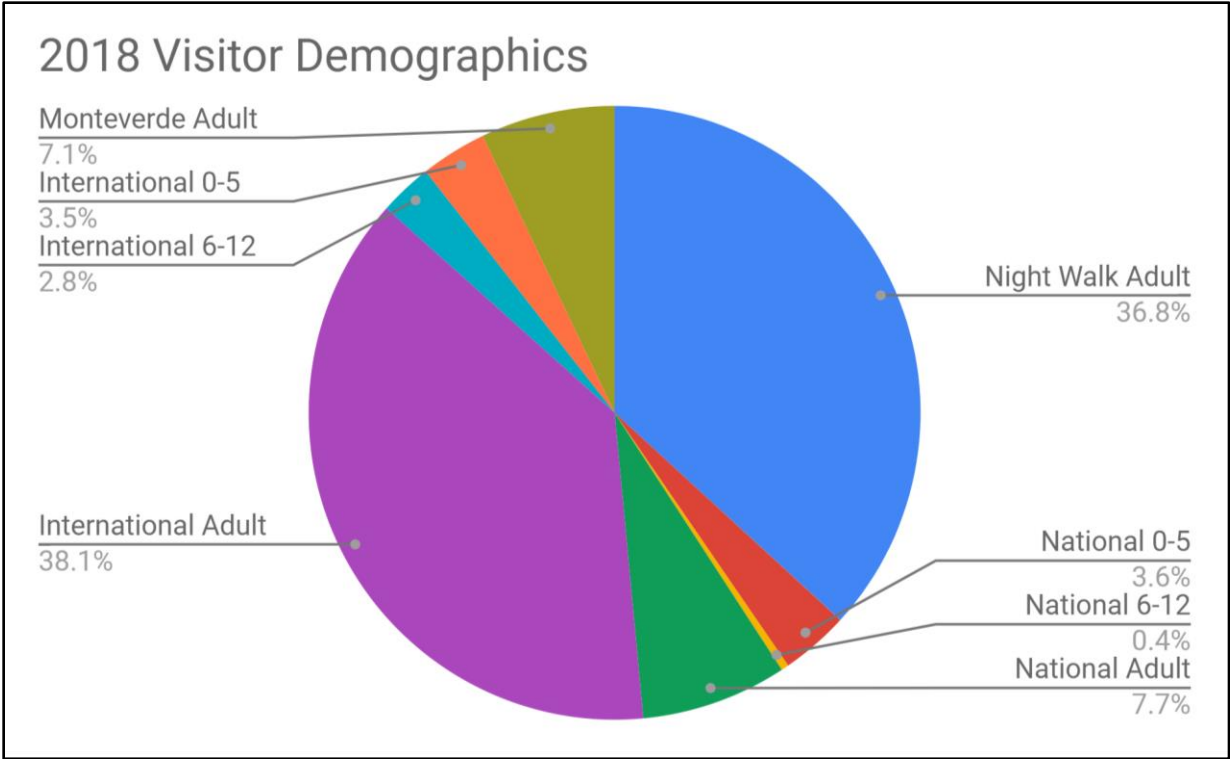


Figure 6: Visitor Demographics

3.2 The strengths and weaknesses of similar family-oriented attractions.

		Valle Escondido	Manuel Antonio	Monteverde Butterfly Gardens	Curi-Cancha	Ecological Sanctuary	Monteverde Cloud Forest
Visitor's Center	Exhibits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Interpretive materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Informational materials	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Souvenirs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Ticket desk	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Guided hikes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Facilities	In the VC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Along the trails?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Parking	Located next to VC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Condition:	Good	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Fair	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Poor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rest Areas	Sweet flowers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Hammocks	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Benches/Picnic tables	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Natural play spaces	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trail Maps	Benches indicated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	View Points indicated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	Points of interest	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Table 2: Reserve Attractions

We visited and collected data on five nature reserves and attractions in Monteverde and one in Manuel Antonio in order to determine common trends among their respective features and layouts (see Appendix B for full list). Prior to our arrival in Monteverde we also visited the Brooklyn Children’s Museum in New York, to give ourselves context in family friendly attractions with a high degree of interaction and interpretation for children. From these visits we found that most reserves have a minimal layout, featuring only a reception area and trails. Conservation and maintenance of the forest’s innate beauty was a common theme among reserves, which indicated that they rely solely on the beauty of the trails to attract visitors.

3.2.1 Layout of Similar Reserves

After analyzing our observations on local reserves, commonalities among the layout of similar reserves began to emerge. For example, the parking lot at Curi-Cancha was very spacious and located adjacent to the visitor center. There were signs indicating the main parking

lot, as well as one indicating where to go for overflow parking. There were also painted stones set into the ground to delineate parking spaces, further simplifying the visitor experience. Upon entrance to the visitor center, barriers guided visitors in a line toward the ticket desk. The building was very spacious; it included a large seating area with several tables, as well as a small display with a few souvenirs. The Monteverde Butterfly Gardens and Valle Escondido had similar layouts to Curi-Cancha. The Butterfly Gardens also had an extensive gift shop which was run by a local artist. It was strategically placed at the end of the paths, which encouraged visitors to walk through it in order to exit. Another reserve with a high level of visitation was the Monteverde Cloud Forest Reserve, even though it had a smaller reception area. Visitors had to cram into the small room, and once they completed their transaction, they had to walk back through the line of people to exit. Aside from the ticket desk, the entrance area was well laid out and included a large building with a restaurant and souvenir shop, and another building with many bathrooms. However, at the Ecological Sanctuary, a less popular reserve, the parking lot was poorly laid out, with no delineations and it was difficult to figure out where to park. This helped put into perspective how a visitor's experience is affected by how easy (or not) it is to orient oneself upon arrival at a reserve.

3.2.2 Interpretive and Informational Materials

After observing all six nature reserves in Monteverde, it became clear that the majority did not include any sort of exhibits or interpretive materials. As shown in Table 2, several reserves did have some informational signs posted along their trails, which typically included a block of text with an image. They did not seem to receive much attention from visitors however, as most people would only take a couple seconds to glance at the pictures before losing interest. One exception to this trend was the Monteverde Butterfly Gardens. They had an insect room attached to their visitor center, where visitors could view live insects in tanks and many other displays. They had a lot of information posted around the room, as well as books, pamphlets, a microscope, and magnifying glasses for visitors to borrow. To help ensure that visitors got the most out of their visit, the receptionist highly encouraged taking a guided tour for no additional cost. Guides were specifically trained on how to engage children and present information in a way that was informative and fun for the entire family. In case the family declined a guided tour, they also offered a laminated bingo sheet to families in order to help incentivize children to stay engaged and try to find all the butterflies, insects, and plants on the sheet.

Despite being an outlier, the Brooklyn Children's museum included several types of exhibits that could potentially be applicable to the *Bajo del Tigre's* interpretive center in the future. One example was a simple auditory exhibit which had images of animals, and a button under each one which played the sound of the animal. Due to the lack of exhibits and child-friendly attractions in Monteverde, the implementation of such exhibits could help set *Bajo del Tigre* apart from the other reserves.

3.2.3 Trail Features and Maps

After walking through all of the reserves, we found some common types of trail maps, as well as certain features along the trails. One of the most effective trail maps we saw was at Valle Escondido. Visitors were given a trail map which included trail names, distances, and icons

indicating rest areas, viewpoints, and a hammock garden. This was especially helpful for visitors because they could personalize their experience based on difficulty and time, and they could easily locate a rest area to take a break if needed. The icons indicating viewpoints enhanced the map because it gave visitors incentive to visit certain points along the trail, and was very rewarding. The hammock garden also included a rest area as well as a natural play space for children, which made it an ideal location for families to stop and take a break from their hike. This added to the family-friendly appeal of the reserve, but would have been better if it was more centrally located. At the Monteverde Cloud Forest Reserve we saw that instead of handing out maps to visitors, there was a large map posted in the visitor center, as well as maps at every trail intersection indicating your location. This was convenient for visitors because they did not need to carry a map with them and made it easier to know exactly where they were. We also observed plantings that attracted birds and butterflies at two different reserves, shown in Table 2. This enhanced the visitor's experience because it guaranteed that they would be able to see some form of wildlife.

3.2.4 Discussion

From our observations of the reserves in Monteverde, we were able to find certain types of features and improvements that would be ideal to suggest for the *Bajo del Tigre* reserve. We observed that when the visitor center was adjacent to the parking lot, the visitor admission process ran more smoothly. Parking lots that had signage or delineation of parking spaces also helped eliminate confusion. Including exciting posters, pamphlets and other informational materials in the visitor's center also helped to increase the appeal of nature reserves. Another improvement that could help make the reserve more family friendly is giving out the bingo sheet to families. This would be simple to implement since they already have them, and was shown to be an effective teaching tool by the Monteverde Butterfly Gardens. Trail maps that used icons to indicate rest areas and viewpoints were also helpful, and enhanced the visitor's experience.

3.3 Employee perspectives on *Bajo del Tigre*'s current state and future improvements

We analyzed data from semi-structured interviews with three employees, two board members, and three naturalist guides to identify trends in desired improvements to the reserve. From these interviews, we determined that employees are aware that *Bajo del Tigre* has similar offerings to those of other reserves, identified in Objective 2. Most employees are not interested in drastically changing the minimalism of their trails, however, they are excited about making improvements to marketing and community outreach, educational offerings, and their reserve layout that will help them stand out from competing organizations.

3.3.1 Marketing and Community Outreach

After analyzing interview data, one of the most common themes of improvement that arose was the reserve's lack of emphasis on the importance of marketing and community

outreach. The BEN has a rich, child-oriented history which could be a huge selling point if properly communicated to visitors. Many families may be inspired to donate due to the BEN's initial major philanthropic support from children around the world. This message may be communicated through social media and the reserve's website before they reach *Bajo del Tigre*. The communication of this message could also use improvement at the reserve. From our observations conducted in Objective 1, we noted that there is currently little to no written materials regarding the history of the BEN present in the reserve's visitor's center. However, one of the employees we interviewed indicated that he personally gives visitors a brief overview of the history of the BEN as he sells them entry tickets (Employee Interview, 2019). This verbal communication is a good starting point for spreading the history of the BEN and may be adopted and expanded upon by other employees.

Despite being one, if not the only, free reserve experience for locals, *Bajo del Tigre* especially struggles with attracting residents of Monteverde. As seen in Figure 1, only 7.1% of last year's visitors were local adults, while the percentage of visitation attributed to children was not even reported. When put into the context of the overall population of the Monteverde area, only 8.9% of the 6,750 permanent residents of the area have visited *Bajo del Tigre* (Monteverde Area Maps, Facts and Links, 2018). Two employees that we interviewed mentioned that they believe that local's underappreciation of *Bajo del Tigre* may be attributed to the lack of proper community outreach. One of the board members that we interviewed noted that many locals do not even realize that *Bajo del Tigre* houses a drier, lower elevation forest than other reserves in the area, such as the Monteverde Cloud Forest Reserve. This could discourage locals to visit because they believe that they may have the same type of experience at *Bajo del Tigre* as they would at a larger, cloud forest reserve. The same board member also informed us that the reserve used to hold monthly open houses to attract local families to the reserve and he is not sure why these events have not taken place for many years. The potential for bringing local children to the reserve through field trips was also recommended by one of the employees. Overall, staff believe that an increased focus on attracting locals to the reserve will "create more of a bond with nature and the community". All of this feedback provides evidence that there is a need and room for growth in the reserve's community outreach that will encourage locals to visit the reserve more frequently.

3.3.2 Educational Offerings

Employees also expressed interest in expanding upon their current educational program offerings. This includes the open houses and field trips mentioned in the previous section, as well as workshops. One employee recommended that some workshops be strictly informational while others are more interactive.

Employees also confirmed our observations from Objective 1 that many of the reserve's buildings are not currently being utilized to their full potential. For example, while the Children's House currently holds a few games and activities for children, there is still space that is not being used for interactive educational experiences, such as workshops or book readings. Additionally, the current visitor's center has a back room where guests used to have the ability to listen to various local bird calls on a computer, but this activity is no longer being utilized. A board member also mentioned that a small pond is located just outside the visitor's center. This pond could be a great location for visitors to see and learn about many species of birds, but it is not properly maintained. This feedback shows that there is room for the reimagination of how

spaces may be used for educational purposes, potentially for interactive activities or exhibits on the history of the BEN, which may help *Bajo del Tigre* to stand out from other reserves in the area.

3.3.3 Reserve Layout

By far, improvements to the reserve's layout were the most commonly mentioned theme identified through our interview data analysis, with every person that we interviewed expressing frustrations about the logistics of the current reserve layout. Three out of eight employees, board members, and naturalist guides informed us that the large distance between the parking lot and visitor's center often results in guests becoming confused about where to purchase their tickets. This gap also allows naturalist guides from external travel agencies to bring tour groups into the reserve without paying an entry fee. Both situations are worrisome as they both can result in lost profits through ticket sales and donations. Employees also asserted that the distance between the parking lot and visitor's center has raised concerns among visitors about the safety of leaving valuables in their cars. An employee stated that they currently inform visitors that their cars should be safe in the parking lot, but to not leave valuables in their cars. However, two out of eight staff members recommended that having a visitor's center that puts the parking lot in eyesight of the receptionist may increase safety levels, thereby decreasing these concerns.

3.4 A multiphase master plan with employees of *Bajo del Tigre*.

Upon finishing Objective 4, we developed a prioritized list of items in conjunction with several employees and board members. The results of this objective allowed us to develop our deliverable and phases based on their desires for the future of the reserve.

3.4.1 Analysis of Employee Feedback

Based on the employee interviews in Objective 3, we took all of the recommendations for future growth and put them into six broad categories. The specific ranking of the broad categories based on what they believed the reserve could accomplish from most important to least important was; trail improvement, general cleanup, parking lot, education, interpretive center, and reception. Of the five people in our workshop, only two people split the broad categories into what they were passionate about versus what was realistic. Within that data long term categories such as reception and education were ranked highest. Within the higher ranked categories of what was realistic, low cost, low time frame items such as planting flowers to attract wildlife, inviting schools to come for field trips, and a new trail map were items that were ranked highest within their specific broad category. Within lower priority categories items such as a new visitor's center and interpretive layout in the current visitor's center were ranked highest within their broad category as they are necessary for the reserve, but would be of higher cost and longer time frame. The extended ranking list of the specific recommendations can be seen in Figure 7 below.

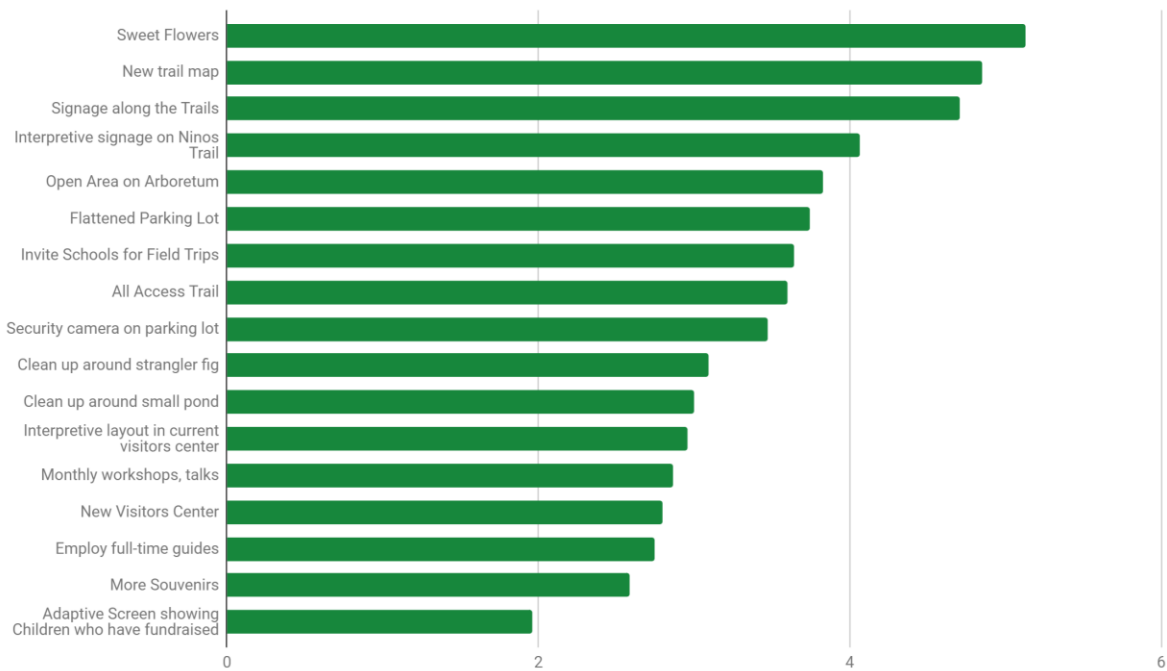


Figure 7: Workshop Priority Results

3.4.2 Discussion

As a result of the data that was generated based on the feedback, we were able to see that while employees are passionate about long term projects, they understand that the short-term improvements are more realistic in order to have an immediate impact. Based on our conversation during the workshop, we learned that *Bajo del Tigre* is unsure when they will receive donations in order to begin major projects. This is a critical reason for looking into smaller, less costly improvements that can be immediately implemented to improve the reserve. Employees preferred prioritizing improvements that could be accomplished quickly, as low-cost categories were ranked above high cost categories.

Chapter 4: Recommendations Chapter

Over the course of the next chapter, we discuss our recommendations for future expansion for the *Bajo del Tigre* reserve. We present a five phased master plan based on employees' priorities of the viable and important features that were discussed in Objectives 1-4. Based on the data collected regarding employees' preference we analyzed all of the options in order to create the best possible phases to impact the future of the reserve. All time periods labeled on phases represent their estimated completion from the beginning of the master plan implementation. Phase 1 begins with the short term, low cost items. These items become more costly and time consuming as it transitions to Phase 4 where the long term, high cost items happen. Finally Phase 5 is the finishing touches that cannot occur until after Phase 4. Full justifications for each improvement may be seen in appendix J.

4.1 Phase 1: 3-6 months after start

The goal of this short-term phase is to make immediate changes to the reserve. Phase 1 improvements include less expensive and easier alterations and improvements to *Bajo del Tigre*. These recommendations are generally small additions, adjustments, or repairs that will have a fast turnaround.



Figure 8: Map of Phase 1 improvement locations

4.1.1 Add sweet flowers around the Visitor's Center to attract butterflies and hummingbirds

The addition of sweet flowers at the location shown in Figures 8 and 9, will attract butterflies and hummingbirds, guaranteeing that visitors will see wildlife near the visitor's center. These flowers are inexpensive and would only take about a day to plant. Additionally, these flowers will have minimal to no up-keep.



Figure 9: Location for adding sweet flowers

4.1.2 Cleanup around the strangler fig and small pond/greywater filtration system

Strangler Fig

Figure 10 displays a large downed strangler fig on the Niños trail that is a fun spot for kids to play while walking on the trails. Its location is marked by a star in Figure 8. Minimal brush cleanup is needed around the tree. A sign prompting visitors that they may climb on the tree can also be added.



Figure 10: The strangler fig

Small pond and greywater system

The small pond located near the visitor's center is not currently given much attention and is not regularly maintained as shown in Figure 11. The greywater system near the visitor's center has also been broken for a while without repair. However, both of these features, which can be seen as a triangle in Figure 1 have easy, inexpensive fixes. One of the greywater system pipes needs to be fixed in order to restore the system. The pond needs to be cleaned and should be regularly maintained. If possible, the two features should be linked so that the greywater system acts as a water supply for the pond. Figure 12 shows signage explaining the greywater system's function that is already present outside the Visitor's Center. When the overall system is improved, this area will provide a space for visitors to see various species of birds as well as an opportunity to learn about greywater treatment.



Figure 11: The small pond's current condition

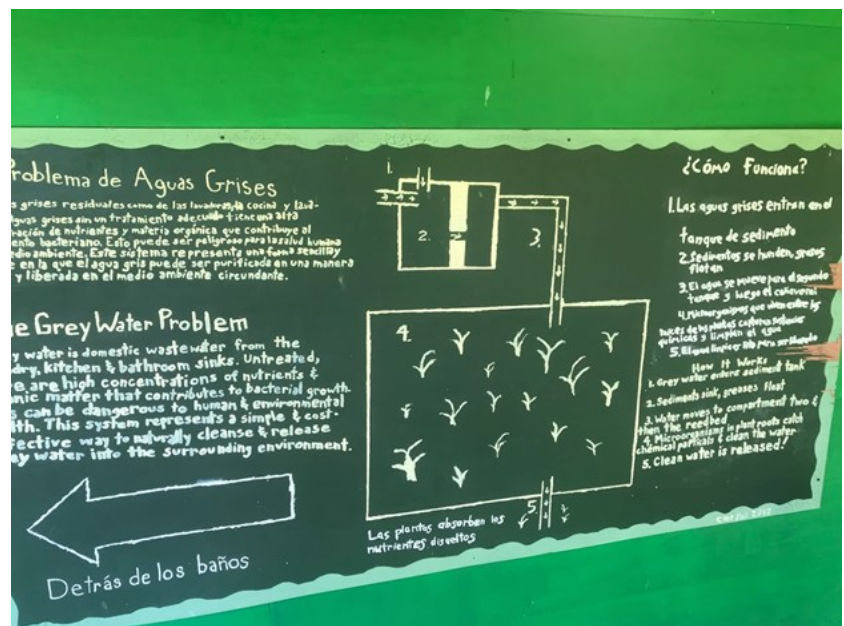


Figure 12: Greywater system informational poster

4.1.3 Update trail map and print additional copies of Informational booklet

The current trail map is missing some features and needs some general updating. Trail connections and icons indicating the locations of rest areas and viewpoints should be added to the maps. Additionally, more copies of the informational booklet shown in Figure 13 need to be printed to replace damaged copies.

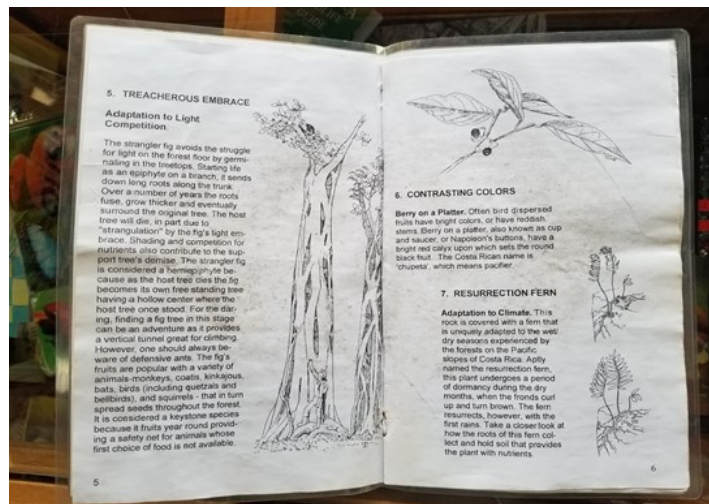


Figure 13: Informational booklet

4.1.4 Invite local schools for field trips

Field trips will reinforce the environmental education that local children are receiving in school. This may also encourage local students to bring their families back for future visits. Because local children already experience environmental education programs in school, visits will likely include hands-on activities rather than lectures. A brief history of the BEN may be discussed in the classroom or in the *Casita de los Niños*, shown in Figure 14, then groups may enter the trails to hike. Field trips may be organized as community service trips where older children help staff to do general maintenance of the trails, such as raking.



Figure 14: Children at the *Casita de los Niños*

4.2 Phase 2: 1 year after start

The goal of this phase was to suggest improvements that will improve the visitation to the reserve in the short-term, but require more time and money than those in Phase 1. These recommendations are general improvements that will improve the educational materials and overall visitor experience.

4.2.1 Develop new interpretive signage for the *Sendero de los Niños*

For this improvement, we propose new locations and material for the interpretive signage on the Children's Trail (*Sendero de Los Niños*). It is suggested that specific locations are found based on the knowledge of the naturalist guides. These locations should be noted and new signage developed in the style of the old interpretive signage. The signage should then be made using sustainable materials such as recycled plastic in order to maintain the sustainable style of the trails.

4.2.2 Improve parking lot

As seen from Figure 15, the parking lot has many potholes and areas where cars can be caught. To remedy this, we suggest grading the parking lot, making it more uniform and friendlier to all types of vehicles.

We also recommend putting security cameras in the strategic locations shown in Figure 16. These cameras should be wireless, so that it is not necessary to run video cables back to the visitor's center. These two locations will provide full coverage of the parking lot so that all cars will be protected. This will provide more security for those who use the parking lot and make visitors feel safer leaving their valuables in their cars.



Figure 15: Current parking lot conditions

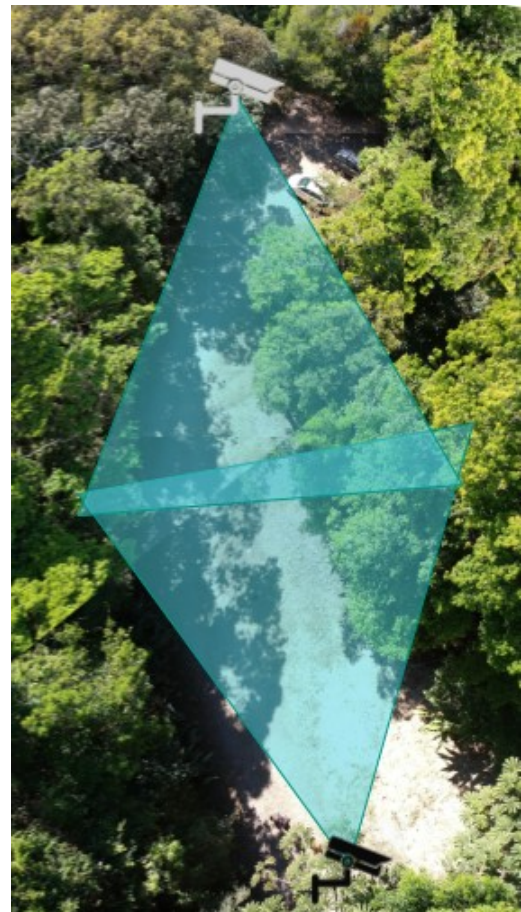


Figure 16: Locations for placing security cameras

Phase 3: 3 years after start

The goal of this phase is to make large changes to the reserve that will take three years to complete after the start of the plan. Phase 3 includes improvements that range from low to high cost, but are of low to medium time required. These improvements will create a more family-friendly atmosphere that will affect all who visit.

4.3.1 Clear out the open area on the Arboretum Trail



Figure 17: Open area on *Arboretum* location

On the Arboretum Trail there is an opening that is just slightly off the trail. This opening consists of tall grass and a few banana plants which are not indigenous to the natural environment of Bajo del Tigre. Figure 17 highlights the location of the open area.

Figure 18 and Figure 19 are specific pictures of the open area on the trail in its current state. This space could be a potential rest area that includes benches, picnic tables, sweet flowers and/or a natural playground for children. Lastly, it is necessary to update the trail map in order to highlight this open area.



Figure 18: Open area on *Arboretum*



Figure 19: Open area on *Arboretum* panorama

4.3.2 Monthly workshops

These workshops could be informational or interpretive. Informational workshops could be lectures that are given by field experts. Interpretive workshops would involve a hands-on approach of teaching through the use of demonstrations or activities. Several examples of workshops that could be implemented are how to identify plants or animals, how to plant an organic garden, and teaching about recycling through creating art. These workshops could be geared toward children, adults, and families as a way to provide an educational component to the reserve. Workshops for children could be held in the *Casita de los Niños* and this space is shown in Figure 20. Workshops for adults and families could be held in the classroom and this space is shown in Figure 21.



Figure 20: *Casita de los Niños* (Masters, 2018)



Figure 21: The classroom

4.3.3 Begin interpretive layout in the current visitor's center

The interpretive layout in the current visitor's center will be broken into two separate phases. The first phase will remodel the back room of the existing visitor's center where the table is currently located, as seen in Figure 22. This area will have a full wall exhibit explaining the history of the BEN and *Bajo del Tigre*. This exhibit will allow all visitors to immerse themselves in the history and gain a deeper appreciation for the BEN and *Bajo del Tigre*. Learning the history of the BEN may encourage people to donate to the reserve. Families may feel especially encouraged to donate because their children may have an emotional connection to the history. Figure 23 is a rendering of what this space may look like when it is transformed. The second phase will not occur until the new visitor's center is created and the employees are fully moved out. As such, it will be discussed in Phase 5.



Figure 22: Current back room of the Visitor's Center



Figure 23: Rendering of the interpretive layout

4.4 Phase 4: 5 years after start

This phase encompasses the most highly suggested and largest goal of the *Bajo del Tigre* reserve -- building a new visitor's center. This will happen sometime within a five-year time period from the start date of the master plan because the reserve cannot predict when they will receive a donation large enough to begin the project. Relocation of the visitor's center will also help to alleviate the concerns of visitors entering without paying, and parking lot security.

4.4.1 Build a new visitor's center

Figure 24 is a sitemap showing the new location of the visitor's center, adjacent to the parking lot. The new visitor's center will be located adjacent to the parking lot. It will be a two-story building with a ticket desk, seating area, and bathroom facilities on the first floor, and offices for *Bajo del Tigre* employees on the second floor. The reception area will feature an adaptive screen displaying photos of children who have donated to the reserve in the past, which may inspire children and families to donate during their visit. There will be maps, pamphlets, and other informational materials for visitors to look at while purchasing tickets. The first floor of the visitor's center will also include a large selection of souvenirs, which will increase their visibility and appeal. Additional souvenirs may include new shirt designs, or jewelry/mementos created by local artists. Building this new space will open up the old visitor's center to become the new interpretive center, thereby creating innumerable learning opportunities for all who visit.

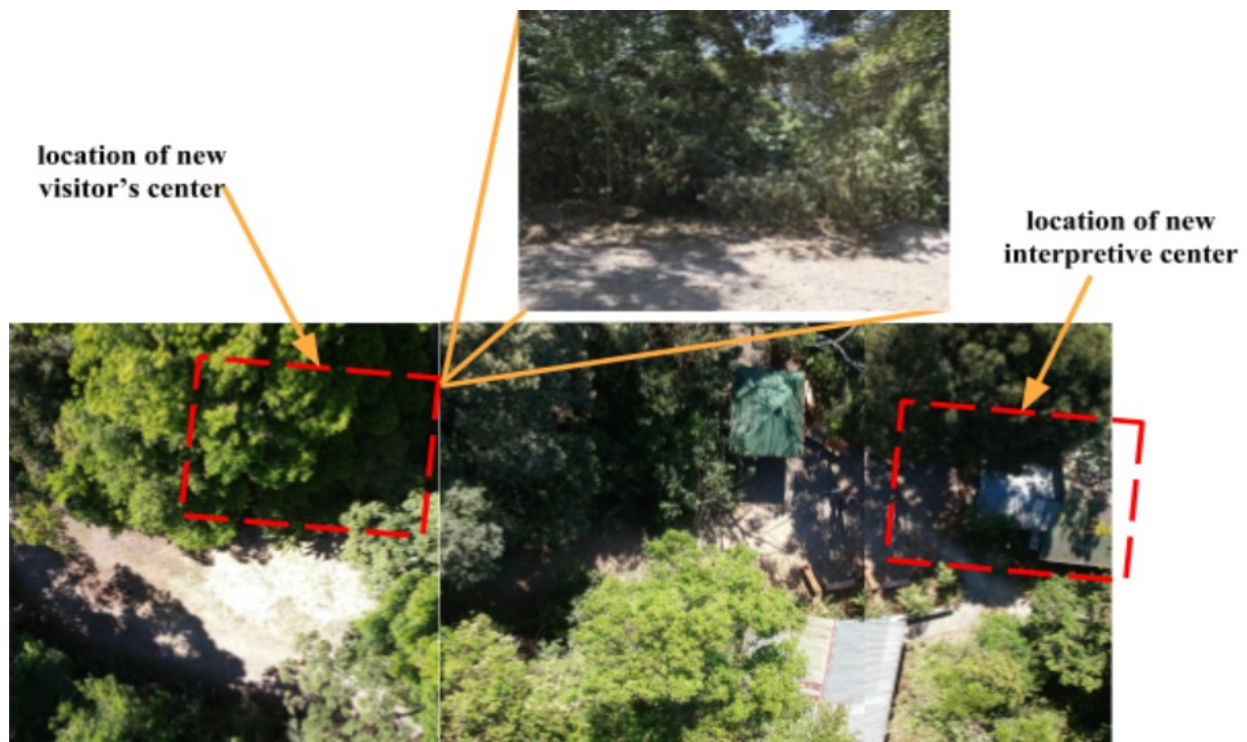


Figure 24: Site map of the new visitor's center

Phase 5: 5+ years after start

The goal of this phase is to complete the layout of the old visitor's center, now the interpretive center, and make the reserve more accessible. Phase 5 improvements include elements that need to be started after the completion of the new visitor's center as well as finishing touches to the reserve. These recommendations also include developing an all access trail, and creating an updated trail map.

4.5.1 Complete the interpretive layout in the old visitor's center

The second phase of the interpretive layout will be placed in the existing visitor's center where the tickets and souvenirs are currently sold, as seen in Figures 25 and 26. A more open and cohesive floor plan may be created by knocking down the wall separating the two main rooms of the building. This new space will include audio exhibits and other types of displays. Audio exhibits may include sounds of different animals that are on the trails, so that visitors can identify them while hiking. Displays can include animal tracks or bones that have been found on the trails, which could potentially spark visitors' interest in learning about the different animals that are located in the reserve. Another form of display could include different types of pottery that have been found on the trails, allowing visitors to see the local culture that was at *Bajo del Tigre* prior to its creation as a private reserve. This activity may also inspire visitors to read more about the history of the BEN and *Bajo del Tigre*, as they will be able to see that the land was previously used as farmland. Figure 27 displays the floor plan of the interpretive center, showing where the exhibits and displays can be placed in the front room.

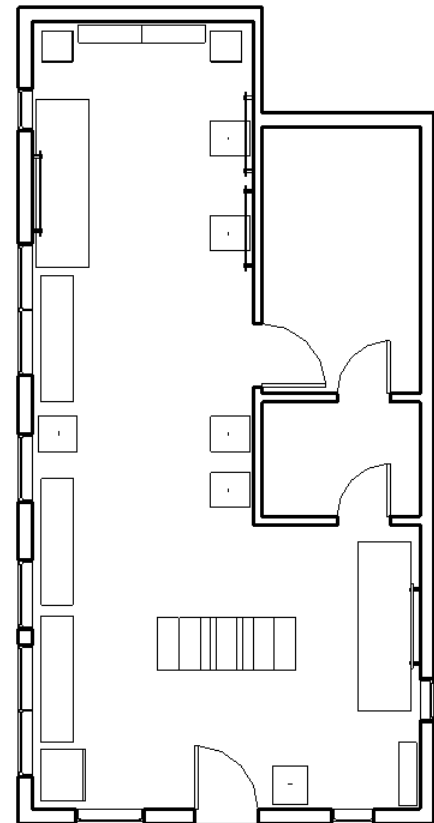


Figure 27: Potential floor plan of the interpretive center



Figure 25: Rendering of the interpretive layout



Figure 26: Rendering of the interpretive layout

4.5.2 All access trail

An all access trail will allow people of varying physical abilities to experience the wildlife of the BEN, including families with small children as well as individuals with disabilities. This is an experience that is not currently offered at similar reserves in Monteverde and will likely draw more guests. We propose that the trail should be added in the general area displayed in Figure 28, but the exact trail path should be chosen by identifying the flattest route possible. Additionally, this trail will likely need to be paved to ensure that those with mobility issues or strollers do not have issues maneuvering the trail.



Figure 28: proposed location of the all access trail

4.5.3 Develop new trail signage

A rendering of the new trail signage that we recommend is displayed in Figure 29, this signage will be constructed out of recycled plastic and will include a map with location markings to display where you are in the trail system. This should eliminate the need for paper signs.

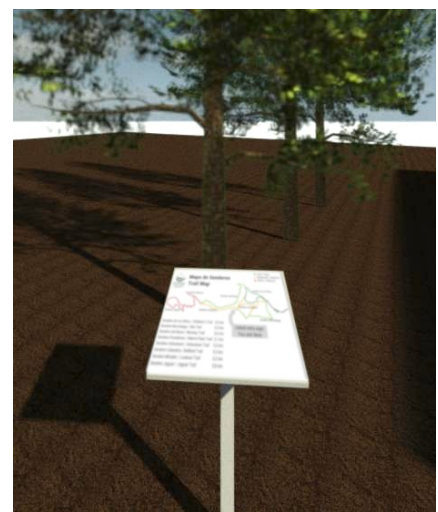


Figure 29: Mockup of new trail signage

4.6 Conclusion

The goal of this project was to plan a more attractive and educational experience for children and families at *Bajo del Tigre* that increases visitor awareness of wildlife conservation. By evaluating the current offerings at the reserve, analyzing the offerings at other family friendly attractions and interviewing employees of the reserve to understand their vision, we were able to understand what needed to be addressed in a master plan for the reserve. The results of this research suggested that our plan needed to have minimal impact on nature while also creating an interpretive educational experience for all visitors regardless of age, learning style or physical ability. It is necessary to remember that as of 2019, these are the recommendations that will be the most effective for the reserve. Since the master plan will take approximately 5 years to implement, there may be unforeseen problems and obstacles. Because of this, the plan is not rigid, and is flexible to the unforeseen needs and resources of the reserve.

References

- ACMCR. (n.d.). Children's Eternal Rainforest, Costa Rica's largest private reserve. Retrieved from <https://www.acmcr.org/content/>
- Allen, S. (2004). Designs for learning: Studying science museum exhibits that do more than entertain. *Science Education*, 88(S1). doi:10.1002/sce.20016
- Ardoin, N. M., Wheaton, M., Bowers, A. W., Hunt, C. A., & Durham, W. H. (2015). Nature-based tourism's impact on environmental knowledge, attitudes, and behavior: A review and analysis of the literature and potential future research. *Journal of Sustainable Tourism*, 23(6), 838-858. doi:10.1080/09669582.2015.1024258
- Ayers, E. (2001). Civil War Visitor Center at Tredegar Iron Works. *The Journal of American History*, 88(1), 166-168. doi:10.2307/2674928
- Báez, A. (2002). Sky Walk-Sky Trek: A Successful Community Project in the Mountains of Monteverde, Costa Rica. *Mountain Research and Development*, 22(2), 128-131.
- Beebe, J. (2014). Chapter Three Data Collection - Multiple Data Sources and Triangulation In *Rapid qualitative inquiry: A field guide to team-based assessment*. Lanham, MD: Roman and Littlefield.
- Berg, Bruce L. (2007). *Qualitative Research Methods for the Social Sciences* (pp. 106-127). Pearson/Allyn & Bacon.
- Black, S. (2006). Landscape Learning: Some of the world's best classrooms are out of doors. *American School Board Journal*, 193(03)
- Bowker, J.M., Bergstrom, J.C., Gill, J., and Lemanski, U. 2004. The Washington & Old Dominion trail: An assessment of user demographics, preferences, and economics (Final Report). Virginia Department of Conservation.
- Burlingame, L. (2016). History. Retrieved from <https://www.acmcr.org/content/about-us/history/>

- Burns, R. C., & Graefe, A. R. (2007). Constraints to outdoor recreation: Exploring the effects of disabilities on perceptions and participation. *Journal of Leisure Research*, 39(1), 156-181. Retrieved from <https://doi.org/10.1080/00222216.2007.11950102>
- Carlton, M. P., & Winsler, A. (1998). Fostering intrinsic motivation in early childhood classrooms. *Early Childhood Education Journal*, 25(3), 159-166.
- Catherine E. Dorwart, Roger L. Moore & Yu-Fai Leung (2009) Visitors' Perceptions of a Trail Environment and Effects on Experiences: A Model for Nature-Based Recreation Experiences, *Leisure Sciences*, 32:1, 33-54, DOI: [10.1080/01490400903430863](https://doi.org/10.1080/01490400903430863)
- Falk, J., & Balling, J. (1977). An investigation of the effect of field trips on science learning. Final report grant number SED77-18913. Washington, DC: National Science Foundation.
- Goodwin, D., Peco, J., & Ginther, N. (2009). Hiking excursions for persons with disabilities: experiences of interdependence. *Therapeutic Recreation Journal*, 43(1), 42.
- GSTC. (2018). GSTC Criteria. Retrieved from <https://www.gstcouncil.org/gstc-criteria/>
- Haar, C. (1955). The Master Plan: An Impermanent Constitution. *Law and Contemporary Problems*, 20(3), 353-418. doi:10.2307/1190476.
- Hague, S. (2013). How to Plan and Implement Interpretation. *History News*, 68(2), 1-8.
- Hitchcock Center (2018). Nature play and learning places: master plan. Retrieved from https://www.hitchcockcenter.org/wp/wp-content/uploads/2018/03/Nature_Play_Learning_Places_MP_2-1-18-short-version-.pdf
- International Ecotourism Society. (2018). Ecotourism Definition. Retrieved from <http://www.ecotourism.org/book/ecotourism-definition>
- Koynova, T., Koleva, V., Dragoeva, A. P., & Natchev, N. (2019). Peri-urban national parks as green spaces for recreation: A case study of nature park shumen plateau. *International Journal of Social Ecology and Sustainable Development*, 10(1), 46-58. doi:10.4018/IJSESD.2019010104

- Louv, R. (2006). *Last child in the woods*. North Carolina, USA: Algonquin Books of Chapel Hill.
- Louv, R. (2007). *Leave No Child Inside*. Testimony before the Interior and Environmental Subcommittee, United States House of Representatives.
- Louv, R. (2011). Reconnecting to nature in the age of technology. *The Futurist*, 45(6), 41-45.
- Masters, K. (2018). Environmental education at Bajo del Tigre. Retrieved from <http://www.ciee.org/go-abroad/college-study-abroad/blog/environmental-education-bajo-del-tigre>
- Miller, J.R., and Hobbes, R.J. 2002. Conservation where people live and work. *Conservation Biology* 16(2):330–337.
- Monteverde Area Maps, Facts And Links. (2018). Retrieved from <https://www.monteverdeinfo.com/monteverde-area-maps-facts-and-links>
- National Wildlife Federation. (n.d.). Nature Play Spaces. Retrieved from <https://www.nwf.org/en/Kids-and-Family/Connecting-Kids-and-Nature/Nature-Play-Spaces>
- Nez Perce People. (1999). *Interpretive Strategy*. USDA Forest Service, National Park Service, Bureau of Land Management. Retrieved from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_055551.pdf
- Rossman, G., Rallis, S. (2003). *Learning in the Field: An Introduction to Qualitative Research*. Sage, 181.
- Self-Directed Learning: A Four-Step Process. (2018, February 28). Retrieved from <https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/tips-students/self-directed-learning/self-directed-learning-four-step-process>
- Swanston, B. (2018, April 24). Positive & Negative Effects of Ecotourism. Retrieved from <https://traveltips.usatoday.com/positive-negative-effects-ecotourism-63682.html>

- The World Bank. (n.d.). Master Planning. Retrieved from <https://urban-regeneration.worldbank.org/node/51>
- Travel Wayfinding. (2011, January 24). 6 principles of heritage interpretation. Retrieved from <https://thesciencepresenter.wordpress.com/2011/01/24/6-principles-of-heritage-interpretation/>
- Tuen Veronica Leung, W., Yee Tiffany Tam, T., Pan, W. -, Wu, C. -, Candice Lung, S. -, & Spengler, J. D. (2018). How is environmental greenness related to students' academic performance in english and mathematics? *Landscape and Urban Planning*, 181, 118-124. doi:10.1016/j.landurbplan.2018.09.021
- University of Washington School of Public Health. (2012). Effective Adult Learning, A Toolkit For Teaching Adults. Retrieved from https://humanservices.ucdavis.edu/sites/default/files/Adult-Education-Toolkit_Updated_022814.pdf
- U.S Department of Health and Human Services. (2018). Family Engagement Inventory. Retrieved from <https://www.childwelfare.gov/FEI/benefits/>
- Wallner, P., Kundi, M., Arnberger, A., Eder, R., Alex, B., Weitensfelder, L., & Hutter, H. -. (2018). Reloading pupils' batteries: Impact of green spaces on cognition and wellbeing. *International Journal of Environmental Research and Public Health*, 15(6) doi:10.3390/ijerph15061205
- Wandersee, J., & Renee M. Clary. (2007). Learning on the Trail: A Content Analysis of a University Arboretum's Exemplary Interpretive, Science Signage System. *The American Biology Teacher*, 69(1), 16-23.
- Wells, M. (2008). An Evaluation of the Effectiveness of National Park Service Interpretive Planning. *The Journal of Museum Education*, 33(3), 283-291.
- Wells, N. M. (2000). At Home with Nature. *Environment and Behavior*, 32(6), 775-795. doi:10.1177/00139160021972793

White R. (2004). Young Children's Relationship with Nature: Its importance to Children's Development & the Earth's Future. *White Hutchinson Leisure & Learning Group*. Retrieved from <https://www.whitehutchinson.com/children/articles/childrennature.shtml>

World Health Organization. (2000). *Obesity: preventing and managing the global epidemic* (No. 894). World Health Organization.

Zhang, G., Poulsen, D. V., Lygum, V. L., Corazon, S. S., Gramkow, M. C., & Stigsdotter, U. K. (2017). Health-promoting nature access for people with mobility impairments: a systematic review. *International journal of environmental research and public health*, 14(7), 703. doi:10.3390/ijerph14070703

6 principles of heritage interpretation. (2011, January 24). Retrieved from <https://thesciencepresenter.wordpress.com/2011/01/24/6-principles-of-heritage-interpretation/>

Appendix A: Reserve State Analysis

1. Trails
 - a. State of Trails
 - i. Are they clear
 - ii. Slope of trail
 - iii. Are they clearly marked
 - iv. Is the difficulty rating accurate
 - b. Interesting Landmarks (from an outside observational perspective)
 - c. Interpretive materials
 - i. Condition
 - ii. Content
 - iii. Purpose
2. Visitors Center
 - a. What kind of informational material is present
 - i. Pamphlets
 - ii. Booklets
 - iii. Nature guides
 - b. Souvenirs
 - i. What kind
 1. Child souvenirs
 2. Adult souvenirs
 - c. Child Activities
3. Facilities
 - a. Are they accessible
 - b. How many are there
4. Parking Lot
 - a. How many spaces are there
 - b. Condition
5. Ticket Booth
 - a. How many people come every year
 - i. % 12+
 - ii. % 5-12
 - iii. % 0-5
 - b. Is it easy to find it?
6. Casa de Los Niños
 - a. How many activities happen there on a weekly basis
 - b. What child friendly activities are there

Appendix B: Observational Questions

<i>Exhibit Checklist: Analyzing Other Family-Friendly Attractions</i>	
Location:	
Date:	
Time:	
Weather:	
Any other important notes about the place as a whole?	
Exhibit Specifics:	
Features	Hands-on activities
	Climbing structures
	Video integration
	Audio integration
User Demographics	Children 1-5
	Children 6-13
	Teens
	Adults
<u>Description of notable popular exhibits/activities:</u>	
<u>Features we did not anticipate (liked it? why or why not? etc...):</u>	

Appendix C: Locations of Similar Family Friendly Attractions

1. Brooklyn Children Museum - New York, New York
2. Ecological Sanctuary - Monteverde, Costa Rica
3. Curi Cancha - Monteverde, Costa Rica
4. Monteverde Butterfly Gardens - Monteverde, Costa Rica
5. Manuel Antonio National Park - Manuel Antonio, Costa Rica
6. Monteverde Cloud Forest Reserve - Monteverde, Costa Rica
7. Valle Escondido - Monteverde, Costa Rica

Appendix D: Employee and Board Member Interviews

We are a group of students from Worcester Polytechnic Institute (WPI) in Massachusetts. This interview is part of a research project that aims to improve visitation to the *Bajo del Tigre* reserve through the design of a Master Plan. We are hoping to gain insight into your opinions regarding the current status of the reserve as well as any improvements you think should be considered as part of our final design. This interview will take approximately 30 minutes and your participation is completely voluntary and you may withdraw at any time. Please remember that your answers will remain confidential. No names or identifying information will appear on the questionnaires or in any of the project reports or publications but we may use anonymous direct quotes. If you have any questions before or during this interview, please feel free to ask them. This is a collaborative project between the *Bajo del Tigre* reserve and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study. If you have specific questions about this research please feel free to contact us at: gr-Bosque-MV19@wpi.edu

Somos un grupo de estudiantes de una universidad en los EE.UU. Esta entrevista es parte de un proyecto de investigación para ayudar a aumentar visitas al *Bajo del Tigre* con un Master Plan. Queremos ganar percepción entre sus opiniones sobre el estado de la reserva natural, y posiblemente algunas mejoras que podemos considerar para este proyecto. La entrevista tomará treinta minutos más o menos, y su participación es completamente voluntario. Puede terminarla en cualquier momento si quiere. Por favor recuerda que sus respuestas permanecerán confidenciales. No usaremos su nombre o otra información que puede identificarse en nuestro proyecto, pero es posible que usaremos citas anónimas. Esto es un proyecto colaborativo entre *Bajo del Tigre* y nuestra universidad, y su participación es muy valorado. Si esta interesada, podemos mandar una copia de los resultados al fin del estudio. Si tiene preguntas específicas sobre este investigación, puede contactar a nosotros con este correo electrónico: gr-Bosque-MV19@wpi.edu

You may also contact our WPI project advisors, Courtney Kurlanska and Melissa Belz, at cbkurlanska@wpi.edu and mbez@wpi.edu

También puede contactar a nuestros asesores, Courtney Kurlanska y Melissa Belz, con estos correos electrónicos: cbkurlanska@wpi.edu y mbez@wpi.edu

Interview Questions

1. What brought you to *Bajo del Tigre*? ¿Cómo empezó a trabajar usted con *Bajo del Tigre* en primer lugar?
2. What is your favorite portion of *Bajo del Tigre*? ¿Cuál es su parte favorita de *Bajo del Tigre*?
3. Is there a section of *Bajo del Tigre* that you believe is underappreciated or unnoticed by visitors? ¿Hay alguna parte de *Bajo del Tigre* que usted cree que esta desapercibida por los visitantes?
4. Is there anything that frustrates you about the current setup? ¿Hay algo en la configuración actual de *Bajo del Tigre* que le causa frustración?
 - a. Visitor's Center Centro de Visita
 - b. Activities Actividades
 - c. Trail Layout and Signage Plano de los Senderos y Señales
 - d. Workshops Talleres
5. Can you think of any improvements to the reserve structure that could make your jobs easier? ¿Hay alguna mejora en la estructura de *Bajo del Tigre* que facilitaría su trabajo?
6. What types of activities for children would you like to see at *Bajo del Tigre*? ¿Qué tipo de actividades para niños le gustaría ver en *Bajo del Tigre*?
7. What types of activities for adults would you like to see at *Bajo del Tigre*? ¿Qué tipo de actividades para adultos le gustaría ver en *Bajo del Tigre*?

Additional questions for employees only

1. What do you think families enjoy most during their visits to *Bajo del Tigre*? ¿En su opinión, qué parte de *Bajo del Tigre* es disfrutado más por las familias que visitan?
2. What improvements do visitors frequently suggest? ¿Cuáles mejoramientos o cambios sugieren los visitantes?

Appendix E: Naturalist Guide Interview

We are a group of students from Worcester Polytechnic Institute (WPI) in Massachusetts. This interview is part of a research project that aims to improve visitation to the *Bajo del Tigre* reserve through the design of a Master Plan. We are hoping to gain insight into your opinions regarding the current status of the reserve as well as any improvements you think should be considered as part of our final design. This interview will take approximately 30 minutes and your participation is completely voluntary and you may withdraw at any time. Please remember that your answers will remain confidential. No names or identifying information will appear on the questionnaires or in any of the project reports or publications but we may use anonymous direct quotes. If you have any questions before or during this interview, please feel free to ask them. This is a collaborative project between the *Bajo del Tigre* reserve and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study. If you have specific questions about this research please feel free to contact us at: gr-Bosque-MV19@wpi.edu

Somos un grupo de estudiantes de una universidad en los EE.UU. Esta entrevista es parte de un proyecto de investigación para ayudar a aumentar visitas al *Bajo del Tigre* con un Master Plan. Queremos ganar percepción entre sus opiniones sobre el estado de la reserva natural, y posiblemente algunas mejoras que podemos considerar para este proyecto. La entrevista tomará treinta minutos más o menos, y su participación es completamente voluntario. Puede terminarla en cualquier momento si quiere. Por favor recuerda que sus respuestas permanecerán confidenciales. No usaremos su nombre o otro información que puede identificarse en nuestro proyecto, pero es posible que usaremos citas anónimas. Esto es un proyecto colaborativo entre *Bajo del Tigre* y nuestra universidad, y su participación es muy valorado. Si esta interesada, podemos mandar una copia de los resultados al fin del estudio. Si tiene preguntas específicas sobre este investigación, puede contactar a nosotros con este correo electrónico: gr-Bosque-MV19@wpi.edu

You may also contact our WPI project advisors, Courtney Kurlanska and Melissa Belz, at cbkurlanska@wpi.edu and mbez@wpi.edu

También puede contactar a nuestros asesores, Courtney Kurlanska y Melissa Belz, con estos correos electrónicos: cbkurlanska@wpi.edu y mbez@wpi.edu

Interview Questions

1. What brought you to *Bajo del Tigre*? ¿Cómo llegó usted a Bajo del Tigre en primer lugar?
2. How long have you been a guide at *Bajo del Tigre*? ¿Por cuánto tiempo ha sido guía en Bajo del Tigre?
3. What changes to the setup would allow you to do a better job at the reserve? ¿Cuáles cambios en la configuración le permitirían hacer un mejor trabajo en Bajo del Tigre?
4. What supplies and resources would allow you to do a better job at *Bajo del Tigre*? ¿Cuáles suministros o recursos le permitirían hacer un mejor trabajo en Bajo del Tigre?
5. What landmarks do you think should be highlighted along the trails? [Flora and fauna...]
¿Cuáles puntos de referencia crees que deberían destacarse a lo largo de los senderos?
[Flora y fauna...]
6. What types of activities for children would you like to see at *Bajo del Tigre*? ¿Qué tipo de actividades para niños le gustaría ver en Bajo del Tigre?
7. What types of activities for adults would you like to see at *Bajo del Tigre*? ¿Qué tipo de actividades para adultos te gustaría ver en Bajo del Tigre?
8. What research do you believe should be done at *Bajo del Tigre*? ¿Qué tipo de investigación(es) cree usted que se debería realizar en Bajo del Tigre?

Appendix F: Interview Notes Comparison Table

Date and Time		
Location		
Person Being Interviewed	Interview A	Interview B
1. What brought you to Bajo del Tigre?		
<i>Additional related info:</i>		
2. What is your favorite portion of the Bajo del Tigre?		
<i>Additional related info:</i>		
3. Is there a section of Bajo del Tigre that you believe is underappreciated or unnoticed by visitors?		
<i>Additional related info:</i>		
4. Is there anything that frustrates you about the current setup? -Visitor's Center -Activities -Trail Layout and Signage -Workshops		
<i>Additional related info:</i>		
5. Can you think of any improvements to the reserve structure that could make your jobs easier?		
<i>Additional related info:</i>		
6. What types of activities for children would you like to see at Bajo del Tigre?		
<i>Additional related info:</i>		

7. What types of activities for adults would you like to see at Bajo del Tigre?		
<i>Additional related info:</i>		
☐☐ questions for employees only ☐☐		
8. What do you think families enjoy most during their visits to Bajo del Tigre?		
<i>Additional related info:</i>		
9. What improvements do visitors frequently suggest?		
<i>Additional related info:</i>		
<i>Any additional unanticipated insight/information given?</i>		

Appendix G: Employee Feedback Sheet

Feedback

Tuesday, 2/12/19

—

1. Categories for Improvement

Within each category, how would you rank the importance of each improvement? Please number the improvements, with 1 being the most important.

Education

- Monthly workshops and talks
- Local school field trips
- Employ full-time naturalist guides

General Cleanup

- New trail map
- Cleanup around strangler fig tree
- Cleanup around small pond

Trail Improvements

- Signage along the trails
- More sweet flowers to attract butterflies/hummingbirds
- Renovate the open area on Arboretum
- Interpretive signage on Niños Trail
- All access trail
- Clearing out the bottom part of the Jaguar Trail

Parking Lot

- Security camera on parking lot
- Flattened parking lot

Reception

- New Visitor's Center
- More Souvenirs
- Restaurant

Interpretive Center

- Interpretive layout in current visitor's center
- Adaptive Screen Displaying Images of Children that have Donated

2. How would you rank the importance each overall category?

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Thank you for your feedback! Please include any additional thoughts or ideas in the space provided below.

Appendix H: Inventory of Informational Material

Informational Material			
Title	Content	Condition	Language
A guide to Tropical Plants of Costa Rica	Discusses every plant in Costa Rica with Latin name, family name, and common name with a description of flowering/fruiting, distribution, related species, and comments	Fair Condition	English
The Mammals of Costa Rica	Discusses mammals with their location, tracks, skulls, history of names, range size, similar species, natural history, sounds, and conservation	Good Condition	English
The Birds of Costa Rica	Discusses all birds in Costa Rica with a description and their habitat	Good Condition	English
Aves de Costa Rica	Discusses all birds in Costa Rica with a description and their habitat	Excellent Condition	Spanish
Amphibians and Reptiles of Costa Rica	Discusses all amphibians and reptiles with a description of their habitat	Good Condition	English/Spanish
Birds of <i>Bajo del Tigre</i>	Discusses birds of Bajo with size, habitat, food, and behavior	Fair Condition	English/Spanish
Mammals of <i>Bajo del Tigre</i>	Discusses size, time of day awake, diet type, group dynamic	Fair Condition	English/Spanish
<i>Bosque Eterno de los Niños</i>	General information about the BEN, reserves and field station	Excellent Condition	English

Appendix I: Inventory of Souvenirs

Shirts	Color	Sizes									
		XXL	XL	L	M	S	14	12	10	6	4
		Frog Shirt	White	1	22	5	0	0	9	27	10
Frog Shirt	Green	0	8	3	2	2	5	9	10	22	0
Frog Shirt	Red	7	16	5	8	12	11	11	5	6	4
Frog Shirt	Grey	0	0	0	0	0	0	0	3	8	0
Frog Shirt	Beige	0	0	0	0	0	0	0	0	12	6
Frog Shirt	Black	0	3	0	0	0	1	0	5	13	15
Womens Frog Shirt	Grey	0	9	9	8	9	0	0	0	0	0
Womens Frog Shirt	Red	0	9	9	10	9	0	0	0	0	0
Womens Frog Shirt	Blue	0	6	8	5	7	0	0	0	0	0
Jaguar Shirt	Grey	0	3	3	3	3	0	0	0	0	0
Sloth Shirt	Grey	0	3	3	2	3	0	0	0	0	0
Tucan Shirt	Grey	0	0	0	3	3	0	0	0	0	0
Monkey Shirt	Grey	0	1	4	3	3	0	0	0	0	0
Other Souvenirs		Amount									
ACM Hat	Black	2									
Tropical Zone Keychains		28									
Magnets		20									

Playing Cards		8								
Pens		3								
Poncho		1								
Mugs		7								
Pictures		13								
Coasters		3								
Books										
Guia de anfibios y reptiles		4								
Guia de Costa Rican Spanish		2								
Field Guide to Plants of CR		2								
Mapa Costa Rica		3								
Arboles Tropicales de Costa Rica		3								
Birds of Costa Rica 2nd Edition		5								
Flores Tropicales de Costa Rica		3								
Frutas Tropicales de CR/Fruits of the Tropics		2								
Gallo Pinto: Traditional Recipes from Costa Rica		3								
Mammals of Costa Rica		2								
Osa, Where the Rainforest Meets the Sea		1								
Medicinal Plants of Costa Rica		2								
Tropical Plants of Costa Rica		2								
Tropical Trees of Costa Rica		2								
The wildlife of Costa Rica		5								
Cuentos para Colorear con lápiz		10								

National Parks of Costa Rica		2																				
Amphibians of Costa Rica		2																				
COSTA RICA A LITTLE RHINO		3																				
Parque Nacionales/National Parks		1																				
Costa Rica a Journey Through Nature		1																				
Costa Rica Wow		3																				
El mar Azucarado		3																				
El mono Paparazi		3																				
Una tortuga sale del nido		3																				
Narilu y Rubi		3																				
Zari y Marinita		3																				
El Tucán y El Arcoiris		3																				
Hidden Kingdom the Insect Life		2																				
En busca del sapito dorado		3																				
Grande Espectáculos Naturales		1																				
Nature of the Rainforest CR		2																				
Photo Guide Birds of Costa Rica		3																				
Café de Costa Rica 3er edición		1																				
Aves de Costa Rica Segundo Edición Español		3																				
Birds of Nicaragua		1																				

Appendix J: Reasonings for Recommendations

Recommendation	Justification
Phase 1	
Add sweet flowers around Visitor's Center	The addition of sweet flowers will attract butterflies and hummingbirds, ensuring that visitors will see wildlife when they arrive at the reserve. This was recommended to us in interviews with a board member and a naturalist guide.
Cleanup strangler fig/small pond/greywater system	These cleanup jobs are simple, but will add to the overall experience of visitors by providing a more diverse set of attractions. These improvements were collectively suggested to us by a board member and a naturalist guide.
New trail map/print additional copies of brochure	We observed the current maps in Objective 1 and learned that the current maps do not include all attractions of the reserve.
Invite local schools for field trips	An employee suggested in an interview that local schools be invited to the reserve to increase their hands-on understanding of the environmental education they receive in school.
Phase 2	
Develop new interpretive signage for Niños	It was observed during Objective 1 that the Niños trail contains interpretive signage, but the content is not specific to the environment and the signs are wearing down. It was also stated by the naturalist guides that the signs do not correspond to the environment and can be done better. We propose making new signage based on environmental factors on this trail and out of recycled materials that will last longer.
Improve parking lot	It was observed during Objective 1 and noted during employee interviews that the parking lot has a lot of potholes and divots that make cars

	get stuck. It was also stated during interviews that people are sometimes uncomfortable with the lack of safety in the parking lot, so security cameras would remedy this problem.
Phase 3	
Clear out open area on Arboretum	This was observed in Objective 1 and confirmed during an interview a board member specifically mentioned that he believed that this area should be cleared out to provide a rest area for visitors that are on the trail system.
Monthly workshops	Seven out of eight employees suggested to include these at the reserve. They currently have buildings that could house these workshops.
Begin interpretive layout in current visitor's center	Currently there is no signage describing the history of the BEN or <i>Bajo del Tigre</i> and as this is a huge selling point of the reserve it is crucial to market this to all visitors. This needs to occur in 2 phases as they will still be using the front area of the visitor's center to sell tickets and souvenirs.
Phase 4	
Building a new visitor's center	Building a new visitor center adjacent to the parking lot will help to eliminate confusion for visitors, prevent tour groups from entering the reserve without paying, and improve the security of the parking lot. Additionally, a larger and more enticing display for souvenirs will help to improve sales, which in turn will help the reserve to gain publicity.
Phase 5	

<p>Complete the interpretive layout in the old visitor's center</p>	<p>This improvement is the first recommendation in Phase 5 because the new visitor's center will have to be created before this can occur. Since the first part of this layout has already been created it will be important to finish it as soon as possible to have a complete interpretive center.</p>
<p>All access trail</p>	<p>The creation of an all access trail was suggested to us by our sponsor. This was an idea that was supported in our Employee Workshop, held in Objective 4.</p>
<p>Develop new trail signage</p>	<p>It was observed during Objective 1 that some intersections lack proper signage on the trail system. We are proposing a new style of sign that will not require a physical map to navigate the trails.</p>