

# The Assessment of Tourist Satisfaction at the Laguna Grande



## Sponsoring Agency:

## Department of Natural and Environmental Resources

Submitted to:

Project Advisor: Robert Kinicki, WPI Professor  
Project Co-advisor: John Delorey, WPI Professor

On-Site Liaison:

Dr. Craig Lilyestrom, Director, Marine Resources Division, DNER

Submitted by:

Stefan Mrkic,  
Michael Roth,  
Joseph Spokis,  
Joseph Vanni

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## **Abstract**

The goals of this project were to gain insight into the operations at the Laguna Grande, identifying concerns, and providing recommendations to the Department of Natural and Environmental Resources (DNER). The team visited the bay to survey tourists and conduct interviews, while observing the operations in the launch area. Through twelve visits to the bay, interviews with kayak company owners and local businesses, and surveys of kayak tourists, the team was able to address a list of seven concerns with a set of specific recommendations. These recommendations included improvements to the signage leading up to the bay, parking spots, cleanliness, enforcement of permits, and construction of a new boat ramp.

## **Authorship**

The Assessment of Tourist Satisfaction at the Laguna Grande was completed through a joint effort from all group members. Each team member contributed equally throughout the project. The researching of pertinent information, writing and editing the report, analyzing project data, and creating deliverables in order to make recommendations, were divided equally amongst the members.

# Table of Contents

Abstract.....	2
Authorship .....	3
List of Tables .....	7
Acknowledgements.....	8
Executive Summary.....	9
Chapter 1: Introduction .....	13
Chapter 2: Background .....	15
2.1 How the Bioluminescent Bay Works .....	16
2.2 Ecotourism .....	17
2.3 Environment and Development .....	20
2.4 Sustainability and Sustainable Tourism .....	20
2.5 Conclusion .....	21
Chapter 3: Methodology.....	22
3.1 Permit Examination .....	23
3.2 Initial Observation .....	23
3.3 Survey Design and Data Collection.....	24
3.3.1 Tourist Surveys and Design .....	24
3.3.2 Interviews with DNER Officials.....	28
3.3.3 Interviews with Tour Companies .....	29
3.3.4 Interviews with Restaurant Employees.....	29
3.4 Data Analysis.....	29
3.5 Final Advisement .....	30
Chapter 4: Results.....	31
4.1 Interviews .....	31
4.1.1 Results from DNER Interviews.....	31
4.1.2 Results from Tour Companies Interviews .....	32
4.1.3 Results from Restaurant Interviews .....	32
4.2 Analysis of Survey Results.....	33
4.3 Demographic Questions .....	34
Q1: What is your gender? .....	34
Q2: What is your age group?.....	34

Q3: What is your country of residence? .....	34
4.4 Site Specific Questions.....	35
Q1: How did you learn of the bay? .....	35
Q2: Did you arrive with a tourist company or private transportation? .....	35
Q3: Version 1: Did you feel the signage is adequate to make your way to the launch point? .....	36
Q3: Version 2: Did you feel safe while at the bay? .....	36
Q4: Did you receive sufficient training before kayaking? .....	36
Q5: Version 1: Did you find the kayak tour was too physically challenging.....	37
Q5: Version 2: Did you find the bathroom facilities useable? .....	37
Q6: Is this your first visit or repeat visit to the bay? .....	38
Q7: How would you rate your overall experience? .....	38
Q8: Do you have any additional concerns that you would like to mention?.....	38
4.5 Correlations Drawn from Survey Results.....	39
4.5.1 Age, Gender, Sufficient Training, and Overall Experience vs. Difficulty Kayaking .....	39
4.5.2 Gender vs. Overall Experience .....	40
4.6 Estimated Numbers .....	41
4.6.1 Approximate Number of Tourists.....	41
4.6.2 Approximate Revenue.....	42
Chapter 5: Recommendations for Improvements .....	42
5.1 Road Signs.....	43
5.2 Parking spots.....	44
5.3 Enforcement .....	45
5.4 Cleanliness .....	47
5.5 The Boat Ramp .....	49
5.6 Stray Dogs .....	49
5.7 Abandoned Boats .....	50
5.8 Conclusion .....	50
Chapter 6: Conclusion .....	51
Bibliography .....	52
Appendix A: Local Businesses .....	56
Appendix B: Location of Kayak Companies.....	57
Appendix C: The Permit Contact List .....	58

Appendix D: Survey Version 1.....	59
Appendix E: Survey Version 2 .....	60
Appendix F: Coded Survey .....	61
Appendix G: Sample Permit .....	62

## List of Tables

Table 1: Gender.....	34
Table 2: Age Groups.....	34
Table 3: Country of Residence .....	35
Table 4: Knowledge of the Bay .....	35
Table 5: Methods of Arrival .....	36
Table 6: Adequate Signage.....	36
Table 7: Safety at the Bay .....	36
Table 8: Sufficient Kayak Training .....	37
Table 9: Difficulty of the Kayak Tour.....	37
Table 10: Usability of the Bathroom Facilities .....	37
Table 11: Visitation .....	38
Table 12: Overall Experience .....	38
Table 13: Comments .....	38
Table 14: Age vs. Difficulty.....	39
Table 15: Gender vs. Difficulty.....	39
Table 16: Sufficient Training vs. Difficulty.....	40
Table 17: Overall Rating vs. Difficulty .....	40
Table 18: Male vs. Overall Experience .....	41
Table 19: Female vs. Overall Experience .....	41

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## Executive Summary

This project team, sponsored by the Puerto Rican Department of Natural and Environmental Resources (DNER), analyzed tourist satisfaction at the Laguna Grande Bioluminescent Bay. The bay is located in Las Croabas which is part of Fajardo on the eastern coast of Puerto Rico. It has a recreational park and boardwalk where the kayaks launch from to get into the bay. This park has a stage, barbeque pits, and local restaurants. People from the surrounding areas visit this location to relax on the weekends.

To enter the bioluminescent bay all kayaks and boats must go through a narrow channel. This channel is one of the key elements to the survival of the bay as it controls the flow of the water at an appropriate rate which maintains the depth and temperature of the water within the bay itself. Another contributing factor to the sustainability to the bay is the mangrove forest surrounding the bay. The mangrove trees, via decaying roots and leaves, release vitamin B12, one of the food sources for the dinoflagellates into the water. The other food source is the sun, as they are able to absorb energy through photosynthesis. As the dinoflagellates are so small (approximately 1/500th of an inch in size) they cluster together in large groups. Once these groups are large enough their glow is visible to the human eye. In a single liter of water there can be millions of dinoflagellates. There are three theories as to why the dinoflagellates emit light, but the most prominent is that they emit light for protection. The predators of the dinoflagellates are small crustaceans and when they get close to the plankton, the dinoflagellates emit light and frighten off their attackers.

Laguna Grande is a magnificent natural phenomena and tourism has grown significantly in this area. The specific type of tourism is known as ecotourism, or tourism associated with some form of natural landmark, such as a park or in this case a bay. The team surveyed tourists and interviewed two tourist company owners, three DNER officials, and an employee from two different local restaurants at the bay to research actions that can be taken to improve the overall tourist experience.

The project team worked in close cooperation with the Department of Natural and Environmental Reserves (DNER), specifically with the Marine Resources Division, which is responsible for all the submerged land in the bay. The Forestry Division is responsible for the mangrove forest around the bay and distributes the permits allowing companies to take tours into the Laguna Grande.

The permits issued to each tour company designate their right of passage into the bay. The permits carry important information on the number of tourists each company can take in the bay at any given time, along with the days that they are allowed to operate.

Prior to the formulation of the study's methods, the team identified the project's goals based upon four primary research questions. These questions served as initial guides in the formulation of the study's methods. The questions are as follows:

- How many tourists visit the bio-bay per evening, maximum and on average? Approximately how many per year?
- How many companies are involved in the activities?
- Can a rough estimate of the annual economic value generated by kayak and boat tours of the Laguna Grande bio-bay tourist industry be produced?

The project methodology consisted of five phases. The first part encompasses the examination of operation permits distributed by the DNER to the kayak tour companies for the 2010-2011 fiscal years. These permits provided the team with valuable information such as the name of the ten permitted kayak tour companies, the two motorboat tour companies, and contact information for all companies in order to set up interviews. The second step involved the team making initial observations at the bio-bay to observe the kayak tour companies at the launch point, to identify where the tourists congregated after their kayak tours are over, and to understand how often the team would have to visit the bay to survey the tourists. The last three stages of the project were conducting interviews with restaurant employees, interviews with DNER officials and to survey bio-bay tourists after the completion of kayak tours. This data collection process provided a broad perspective of the state of tourism at the bio-bay. The surveys' results offered a detailed view of the tourist experience at the bay. After the interviews were conducted and the surveys collected, the data were analyzed and entered into an Excel spreadsheet.

For the project phase related to interviews of the DNER officials and representatives of service providers in the bay area, the team employed an interview technique known as an in-depth qualitative interview. These interviews utilize flexible questioning that is altered based on the responses of the interviewee. The questions are open-ended, allowing for the subject to elaborate and give detailed answers. Interview questions can be adapted between interviews based upon information obtained from previous subjects. The team conducted a total of three interviews with DNER officials directly overseeing the management of the bio-bay, two with the owners of a kayak tour company, and three with local restaurant employees near the kayak tour launch area.

As for the survey of the tourists, the team used face-to-face survey method as it was found to be effective when surveying a random population - the interviewer can clarify questions for the

interviewees. The survey sample audience consisted of tourists who had completed the bio-bay kayak tours. The selection of the interviewees was completely random.

For this survey of tourists, the team used closed-ended questions in the survey design. Closed-ended questions state the question as directly as possible and the answer options are provided for the responder. In comparison to open-ended questions, which allow responders to give a variety of answers, close-ended questions are more specific and apt to communicate the same frame of reference to all respondents allowing for an easier coding system to analyze the data. Coding is the assignment of numbers or conceptual names to the responses given to survey questions allowing the team to estimate characteristics or to look for patterns among the collected responses.

The information the team obtained from 109 surveys was entered into a spreadsheet, compiled, and the results analyzed. Utilizing the survey results, the interviews and the team's observations from twelve visits to the bio-bay, the project team developed a set of recommendations to the DNER to increase overall tourist satisfaction at the bio-bay and protect the ecosystem of the bio-bay. The team presented the findings to the DNER. The recommendations are as follows:

**1. Provide adequate signage to the launch point.**

After the survey analysis, the team noted that a majority of the people that arrive at the launch point via private transportation (around 65%). The approach to the launch point is not marked with any road signs that indicate that there is a bioluminescent bay in the area.

**2. Improve the parking situation.**

There are two parking lots at the launch area and one of them has almost completely faded parking lines. Visitors tend to park in such a way that they take up more than one spot and the team recognizes that if these lines were re-sprayed approximately ten spots could be recovered.

**3. Increase the presence of police and DNER rangers.**

The presence of the police and DNER rangers is inadequate in the Las Croabas Park. With the large volume of tourists, it would be beneficial to institute police officers in the area. The other pitfall is that the DNER rangers, which determine whether each company is abiding by its permit, do not have a good vantage point to count how many kayaks each company has in the water. The team noted that there is a beach right at the mouth of the channel where the DNER rangers can stand and easily count the kayaks entering the bay.

**4. Improve the cleanliness of the area.**

There is a problem with the design of the trashcans in the area. The current trashcans are made of stone that requires manual shoveling of the trash out of the can. The team's suggestion is to place a smaller plastic trash bin inside the current can such that the plastic bin could be easily lifted and emptied out. The bathrooms at the bay are also in dismal condition and the tour operators recommend their customers not use them. The team feels that regular maintenance of the bathrooms would help improve them dramatically.

**5. Build a new boat ramp.**

There is a boat ramp in the area, which is used both by the kayak companies and boats. Individuals have difficulty loading their boats into the water due to the boat ramp being located alongside the main road. To unload their boats in the water, they have to stop traffic as they back up down the ramp, resulting in delays and disruption of the flow of visitors. The team recommends that the boat ramp be moved to another location that is no longer directly on the main road.

The team was able to complete the project goals identified at the beginning of the study. With the information the team provided to the DNER, the DNER has a list of potential actions that can improve the overall tourist experience at the Laguna Grande Bioluminescent Bay.

## Chapter 1: Introduction

In the seventeenth century, Spaniards exploring northeastern Puerto Rico came across a lagoon surrounded by mangrove trees near what is now Las Croabas. The glowing waters were so shocking to them that they concluded it must be the work of the devil. In an effort to end this perceived sorcery, the Spanish attempted to block the bay's access to the ocean by placing large boulders in the canal. However, this reduction in outflow from the bay actually increased the bioluminescence. The Spaniards had discovered a bioluminescent bay. While rare throughout the world, Puerto Rico is unique in that it has three active bioluminescent bays: Laguna Grande, La Parguera, and Mosquito Bay. The focus of this study, Laguna Grande, is located just outside of Las Croabas, Puerto Rico. Recently, it has grown into a popular tourist attraction [Laguna Grande, 2010].

Bio-bays are a fragile ecosystem, requiring very specific conditions to survive. The phosphorescence emitted from a bio-bay is due to tiny microorganisms that live in the water. Known as dinoflagellates, these tiny creatures are a species of plankton about 1/500 of an inch in size. Millions of dinoflagellates live in a single square meter of water. Scientists speculate that the plankton glow when they are agitated or feel threatened. As a result of their dense population, the glow they emit is highly visible. The mangrove swamps that surround the bio-bays provide food for the plankton by releasing tannin through their roots, a chemical that is abundant in Vitamin B12 and the dinoflagellates main source of food. When the leaves fall off the trees, further nutrients are released as they decompose into the bay [Fitt et al., 2000].

A narrow channel leading from the Laguna Grande bay to the ocean controls the depth and temperature of the water within the bay [Seliger et al., 2000]. Alterations to the channel can significantly alter the lifespan and health of the plankton. If the channel were expanded it would allow too much water to enter the bay from the sea and would lower the bay's water temperature significantly, killing the plankton. Restricting the channel would likewise affect the water temperature and depth, harming the plankton. This bay, like all bio-bays, has a very low tolerance for change in water characteristics [Seliger et al., 2000].

Another concern for the survival of the bay is pollution from humans. Gas powered motorboats are strictly prohibited from operating and conducting tours of the bay as gasoline is harmful to the dinoflagellates and can significantly reduce the glow of the bay over time. Additionally, swimming in the bay has been recently banned for the local kayak tour companies [Hector Horta, personal conversation, March 26, 2010] in order to protect tourists because it is extremely dark when the kayak tours travel in the actual bay and not safe to swim. Most tourists visit the bay in kayaks, which enables people to

experience the phenomena of the bioluminescence without causing excessive damage to the plankton or their habitat.

While the exploration of bio-bays involves an interaction with nature that should be experienced by tourists, too many visitors can be harmful to the ecology. One example of a bio-bay that has lost some of its luminescence is the La Parguera Bay in southwestern Puerto Rico. This bay was damaged as a result of non-regulated tourism and a general misunderstanding of the ecosystem. The channel that leads to the bay was narrow and local guides pushed for it to be widened, allowing for larger tours of the bay and larger gas powered motorboats. However, this led to a disturbance of the ecosystem due to pollution and changes in water characteristics, which resulted in the bay eventually losing most of its glow [personal conversation, January 29, 2010, Dr. Lilyestrom].

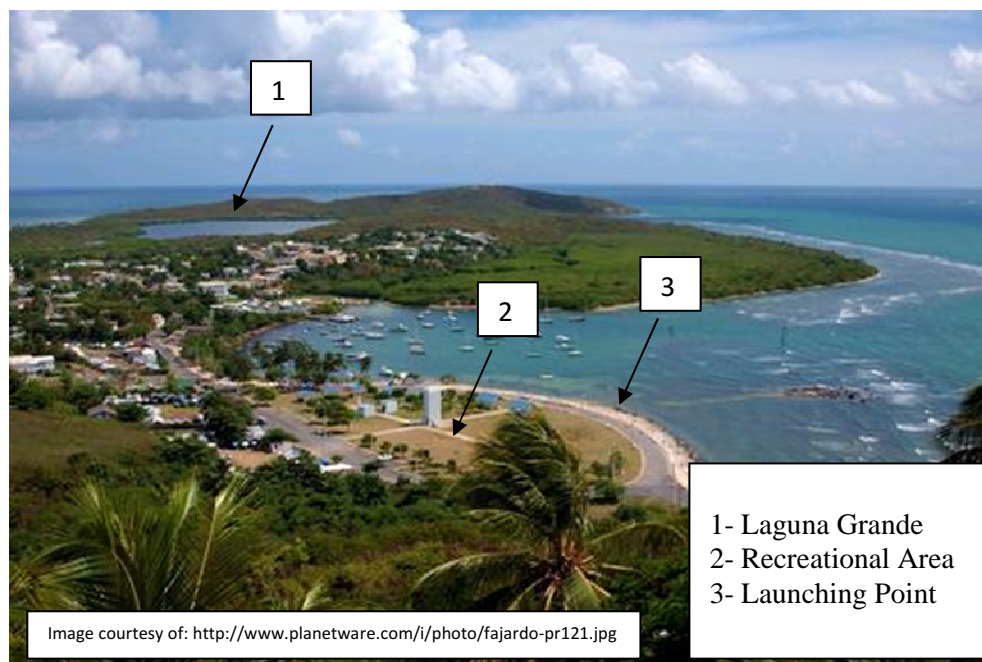
The subject of our study, Laguna Grande in Las Croabas, Puerto Rico, is an example of one the most spectacular phenomena in nature. Several businesses near the bay interact with the tourist trade, including charter fishing companies, restaurants and resorts. Although the bay is a popular tourist destination, little is known about the tourists' experience. Basic figures such as the number of annual visitors and their overall economic value were unknown at the outset of the project.

The bio-bay is overseen by Puerto Rico's Department of Natural and Environmental Resources (DNER), with the Forestry Division at the DNER issuing operating permits to kayak companies while monitoring the bay's well being to ensure a healthy population of dinoflagellates. The Marine Division of the DNER commissioned the team to conduct a study on the tourists' experience at the bio-bay. The goal of this project was to assess the impact of ecotourism on the surrounding area based on the data collected from interviews with DNER officials involved with the bay, kayak tour company owners, surrounding businesses, and surveys conducted with tourists post completion of a kayak tour of the bio-bay. The objective of this research is to provide recommendations to the DNER designed to improve the tourist experience at Laguna Grande while protecting the bio-bay's fragile ecosystem.

## Chapter 2: Background

Fajardo is a city in Puerto Rico that is located in the eastern region of the island. It was founded in 1760 by the Spanish governor Bravo de Rivera. Its local name, “La Metrópolis del Sol Naciente,” is translated to “the city that guards the sun of the Caribbean” [Rivera]. This small city is a center for recreational boating and is a busy boat launching port for vessels heading to Culebra, Vieques, and the American and British Virgin Islands.

One of the regions within Fajardo is Las Croabas. The area of Las Croabas that the project focused on is shown in Figure 1. In this area of Las Croabas, there are eleven local restaurants<sup>1</sup>. These restaurants primarily cater to the local people. There are two restaurants (Popeye’s and Ocean View) that attract business from tourists and local residents. This area is a frequent ‘hotspot’ for the local people of Fajardo. They have barbeques in the recreation area which also has a stage for outdoor concerts. During the weekends, the recreational area visited by people utilizing the beach and park area.



**Figure 1: Laguna Grande, Recreational Area, and Launch Point**

The Laguna Grande Bioluminescent Bay is one of the three bio-bays in Puerto Rico and is the second brightest bay of the three. There are ten permitted kayak companies that operate in Laguna Grande. Each company is allowed a specific number of tourists per trip into the bay, determined by the DNER Forestry Division, which is in charge of distributing the permits. The Forestry and Reserves were at

<sup>1</sup> The restaurants are Blue Bahia, Colmado Suarez, Costa Linda, Dino’s, Edy’s Restaurant, Gasolina, Ocean View Restaurant, Popeye’s, Racar Seafood, Tamburini Pizzeria and Tommy’s Place.

one time the same bureau within the DNER, but were divided into the Marine and Reserves Division and the Forestry Division. When the bureau split, the Forestry division was assigned to distribute the permits and enforce the conditions of the permits [Horta].

These permits specify not only the number of people allowed into the bay per trip, but also other critical information. One piece of information that is identified is the days of the week and the hours that the companies are allowed to operate. For example, eight of the companies are not allowed to operate on Sunday. There is also important information about the insurance policy for the customers. An example of a permit is shown in Appendix G.

The kayak tours are usually divided into two groups per evening. The first group leaves approximately at 6:30pm, and the second group leaves around 8:30pm. The companies normally stagger their entrance into the bay to reduce congestion in the channel as the channel that leads into the bay is narrow, only ten feet in width in certain areas, and it gets crowded quickly. All the companies are required to be out of the bay and back at the launching area by midnight.

## **2.1 How the Bioluminescent Bay Works**

Dinoflagellates stem from Ciliophora, which are 1/500 of an inch invertebrates that joined together naturally with cryptophyte algae and became one organism. Around 20 million years ago, fossils of this species were found and currently there are 4,000 known species of dinoflagellates. However, there is speculation that there may be another 4,000 species that have yet to be discovered, increasing the total number of dinoflagellate species to about 8,000. The Latin name for the dinoflagellates is *Pyrodinium Bahamense*. "Pyro", meaning "fire," describes this microorganism's ability to glow and "dino" is derived from the Latin for "whirling" to describe their swimming motion. "Flagellate", or "flagella" means "legs," the dinoflagellates' main mode of swimming in the bay [Gasparich, 2007].

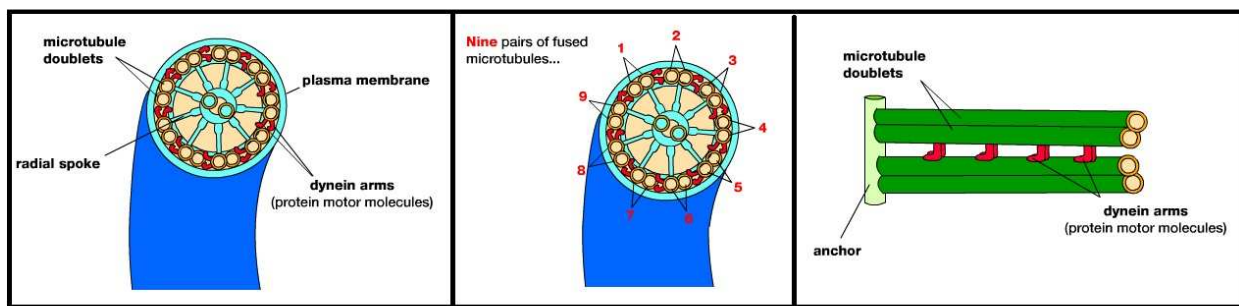
Dinoflagellates are unicellular and split evenly between autotrophs and heterotrophs [Dodge, 1984]. Autotrophs, or "self-feeders," are organisms that use photosynthesis to convert the energy of the sun and water to produce sugars that are used as food [Autotrophs, 1998] (here enter the definition of the heterotrophs. The types of dinoflagellates that exist in Laguna Grande are autotrophs.

Laguna Grande's location contributes to the sustainability of the dinoflagellates. The bay breaks up the waves from the ocean, making calm water for the plankton. Mangrove trees surrounding the bay provide a vital function to the dinoflagellates' survival. As the leaves and roots of the trees decay and fall into the water, they release vitamin B12, one of the food sources for the plankton. The



dinoflagellates move from the water's surface, where sunlight is absorbed through photosynthesis during the day, to the bottom of the bay where they absorb the nutrients [Gasparich, 2007].

The plankton move around using tail-like structures called flagella. Flagella are long structures that function much like a shark's tail, moving left to right to propel the plankton through the water. The major component for this type of movement is the existence of micro-tubes inside the flagella. When the micro-tubes are energized they cause the dynein or "arms" to move forwards and backwards. As a result they move the anchored micro-tube doublets or "legs" allowing for only a range of motion consisting of moving up and down. The final result is a wave like pattern that moves the dinoflagellates [Shockwave, 2010]. This is shown below in Figure 2.



Images courtesy of: <http://www.northland.cc.mn.us/biology/biology1111/animations/flagellum.html>

**Figure 2: The Flagellum of the Dinoflagellates**

There are several theories as to why the dinoflagellates emit light. One theory is they emit light when excited. This emission is due to an application of force to their exterior membrane which is usually triggered by the movement of water, fish swimming through the water, the hulls of boats cutting through the water, or people swimming in the water. The light produced by the dinoflagellates is blue-green with a wavelength of 474-476nm [Abrahams 258]. This specific wavelength is ideal for being seen long distances through the water. As the light is visible at long distances through the water, there is speculation that the bioluminescence may be a form of communication for this species.

## 2.2 Ecotourism

Ecotourism is described by The International Ecotourism Society (TIES) as the "responsible travel to natural areas that conserves the environment and improves the well-being of local people" [www.ecotourism.org]. According to TIES, ecotourism involves uniting conservation, communities, and sustainable travel. To implement and participate in ecotourism activities the following ecotourism principles should be utilized: minimize impact, build environmental and cultural awareness and respect, provide positive experiences for both visitors and hosts, provide direct financial benefits for conservation, provide financial benefits and empowerment for local people, and raise sensitivity to host

countries' political, environmental, and social climate [www.ecotourism.org]. These principles are important for maintaining a nature area that does not lose its beauty while being explored by humans.

The Economic and Social Council (ECOSOC) serves as the central forum for discussing international economic and social issues, and for formulating policy recommendations addressed to Member States in the United Nations system. Ecotourism gained global attention when ECOSOC declared 2002 as the International Year of Ecotourism. There have been numerous articles written about ecotourism, but due to the various forms of ecotourism activities that are offered by a variety of operators, there is little consensus on the appropriate action to be taken by tourists and tour providers. The ECOSOC admits that there is no universal definition for ecotourism, but does mention general characteristics. A majority of the definitions of ecotourism involve the ideas within most, if not all, of the characteristics mentioned below. The characteristics of ecotourism from the ECOSOC are as follows:

1. "All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.
2. It contains educational and interpretation features.
3. It is generally, but not exclusively organized for small groups by specialized and small, locally owned businesses. Foreign operators of varying sizes also organize, operate and/or market ecotourism tours, generally for small groups.
4. It minimizes negative impacts upon the natural and socio-cultural environment.
5. It supports the protection of natural areas by:
  - o generating economic benefits for host communities, organizations and authorities managing natural areas with conservation purposes,
  - o providing alternative employment and income opportunities for local communities,
  - o increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists." [un.org]

The Global Development Research Center (GDRC) defines ecotourism as travel to destinations where the flora, fauna, and cultural heritage are the primary attractions [gdrc.org Definition]. The GDRC also compared several other definitions of ecotourism from the *Centre of Ecotourism, Science and the Environment*, *Tourism Concern*, and *Western Samoa, National Ecotourism Program*. The Centre of Ecotourism lists several criteria for ecotourism.

"It is an enlightening, participatory travel experience to environments, both natural and cultural, that ensures the sustainable use, at an appropriate level, of environmental resources and, whilst producing viable economic opportunities for the tourism industry and host communities, makes the use of these resources through conservation beneficial to all tourism role players. It is not a marketing ploy, nor is it scenic or nature-based travel. It is an approach that creates a variety of quality tourism products that are: environmentally/ecologically sustainable, economically viable, socially and psychologically acceptable. The result of which reflects: an integrated and holistic approach to product development, capacity building in host communities, a sense and

uniqueness of place, commitment to the greening of the tourism industry” [gdrc.org, Center for Responsible Travel, CREST].

The National Council for Science and the Environment (NCSE) states that their objective is to preserve and promote the natural resources while accommodating the number of tourists that visit nature areas. The NCSE mentions “it is important to maintain a careful balance between preservation and promotion in order to ensure the long-term health of both the eco-systems and the tourism economies” [gdrc.org, NCSE].

The Laguna Grande is protected by the Department of Natural Environmental Resources of Puerto Rico (DNER). The International Union for Conservation Nature and Natural Resources (IUCN) defines a protected area as “an area dedicated primarily to the protection and enjoyment of natural or cultural heritage, to maintenance of biodiversity, and/or to maintenance of ecological life-support services” [Ceballos-Lascuráin 1996; Zebich-Knos 2008]. The Laguna Grande area (the bay, the channel, and the launching area) is owned and protected by three government groups. The DNER Marine and Reserve owns the submerged land on the bottom of the bay and channel, whereas the DNER Forestry Division owns the land surrounding the bay and channel. The launching area is owned and maintained by the municipality of Fajardo.

For ecotourism to be successful, tourists visiting these ecological environments should to be aware of the environment around them. Dr. Michele Zebich-Knos, professor of political sciences and international affairs at Kennesaw State University, uses the term – “responsible tourist” – to describe the preferred type of visitor for successful ecotourism. According to Dr. Zebich-Knos, a responsible tourist differs from the average tourist, in that the responsible tourist is more interested in the local culture and resources. A responsible tourist is an individual who rents rooms in modest pensions or small, locally owned hotels to see how locals live and better understand their lifestyle. They are also sensitive to local environs and seek to learn about local conditions without disrupting local community life. Another definition of a responsible tourist is a person who is respectful of the natural and cultural environments they are visiting. This tourist is aware of their influence on the local territory and contributes in an ethical manner to the local economic development [www.eveil-tourisme-responsable.org].

The Laguna Grande is a marine protected area containing valuable economic resources important to local and national economies [Dixon, 1993]. According to Dixon, Lead Environmental Economist at the World Bank Institute, the trade-offs between protection of rich ecological resources and use of the same resources for economic gain is clearly seen in the Caribbean, where "sun and sea"

tourism is an economic mainstay for a number of small countries. The Laguna Grande generates income through the kayaking and boating industry that needs to be regulated in order to sustain the environment.

### 2.3 Environment and Development

Erlet Cater, a professor in Tourism Studies at the University of Otago, states that there are four possible scenarios that link environment and development: win-win, win-lose, lose-win, and lose-lose.

- **Win-Win Scenario:** results in environmental improvement along with the enhancement of development.
  - An example of this would be decreasing the amount of gas a car consumes. This is a win-win because the car would emit less carbon dioxide and the gas costs would be less.
- **Win-Lose Scenario:** results in an environmental improvement with a lack of development.
  - An example of this would be the conservation of a national park. In terms of the environment this is a win because it will not be damaged, but the local population will be excluded in traditional activities that usually involve the park.
- **Lose-Win Scenario:** results in the deterioration of the environment but enhances the development of the area.
  - An example of this would be cutting down trees in order to build a shopping plaza.
- **Lose-Lose Scenario:** results in the degradation of the environment and development.
  - An example of this scenario would be cutting down the mangrove trees surrounding the channel to the bioluminescent bay so large motorboats would be able to enter the bay. Initially, the income would increase due to more people being able to view the bay. However, over time the dinoflagellates would die and the bay would lose the majestic glow that initially attracted the tourists.

### 2.4 Sustainability and Sustainable Tourism

The concept of sustainable tourism emerged in the early 1990s from the concept of sustainable development, bolstered by the release of the Brundtland Report in the late 1980s [World Commission on Environment and Development, 1987]. Dr. Martha Honey, United States Executive Director of the Center on Ecotourism and Sustainable Development, states that environmental, social and economic criteria are vital for sustainable development [ecoclub.com].

The topic of global warming has gained interest in countries that benefit from ecotourism as a main contributor to the countries' economy. "Concurrent concerns about relationship between tourism and climate change as well as energy price escalations have further stimulated government, corporate,

and public interest in sustainability” [Lawton, 2009]. As the climate changes, many areas that depend on the environment will be affected and could lose tourism and income. Concurrently, the increase in energy prices could steer people away from traveling and drastically cut down on tourism. Sustainability is an important aspect of government run parks and reserves. The goal is to sustain the environment as much as possible while maximizing the benefits to the environment. Hector Horta, the Management Official for the Cordillera Natural Reserve, believed it is more important to conserve the area than make any other improvements. It was mentioned that focusing on the conservation of the area is the most efficient and useful method to increase income in the area [Hector Horta, personal conversation, March 26, 2010]. Dr. D.B. Weaver (Professor of Ecotourism and Sustainable Development) makes the point that, “there is a growing recognition that sustainability incorporates an element of long-term financial viability since without this a product is unlikely to survive, and all other aspects of sustainability then become meaningless” [Weaver, 2006]. Sustainable tourism is significant in protecting the happiness of the locals, tourists, and companies. Most importantly, sustainable tourism is practiced to protect the site along with the tourism itself. As Dr. Zebich-Knos notes,

“Without a coordinated working relationship between community – business – government at all levels from grassroots, regional, national to international, most residents adjacent to, or in, protected areas will find it difficult to achieve the goal of deriving significant benefit from ecotourism” [Zebich-Knos, 2008].

## **2.5 Conclusion**

The natural aquatic phenomena of the dinoflagellates attract people to this ecotourist site at the Laguna Grande. The concepts of ecotourism and sustainable development provide us with background on the characteristics of tourists that might visit the Laguna Grande. Information gathered from tourists’ opinions and views from the experience at the Laguna Grande will enable a better assessment on possible improvements to the Laguna Grande.

## Chapter 3: Methodology

While the bioluminescent bay at Las Croabas is a popular tourist destination in Puerto Rico, there exists very little data about its popularity and visitation traffic. The local government in Fajardo and the DNER has no records concerning the number of annual visitors, peak visitation times, or the economic impact of bio-bay tourism. Furthermore, government officials are unaware of tourists' level of satisfaction. As mentioned in the executive summary, one of the goals of this study is to obtain basic tourist data and develop a sense of the tourist experience.

To reach this goal, our group identified two primary objectives. The first was to collect data that characterizes the tourist experience at the bio-bay, namely concerning the state of facilities and infrastructure owned and maintained by the DNER. The second objective was to present the results in a manner that enabled the DNER to make accurate, informed decisions about tourist visitation at the bay.

The study was comprised of five stages (shown in Figure 3). The first stage encompassed the examination of operation permits distributed by the DNER to the kayak tour companies. These permits provided the team with valuable information that enabled us to proceed with the data collection. The second stage consisted of initial observations at the Las Croabas kayak launch area. These initial observations allowed the team to witness the kayak tours in operation, where tourists congregated after the tours were over, and to determine how often the team would have to visit the bay to survey the tourists. The third phase was to collect data through interviews with restaurant employees, DNER officials and to survey the tourists after the kayak tour was completed. The interviews were employed to give the team a broad perspective of the state of tourism at the bio-bay as well as to learn how it has changed from past years. Moreover, background information on the bio-bay's management and bureaucratic idiosyncrasies was obtained from these interviews. Additionally, tourist surveys were distributed to visitors at the bio-bay. These surveys provided a clear view of the tourist experience at the bay. After the data was entered into an Excel spreadsheet and thoroughly analyzed, the team submitted to DNER recommendations to improve the tourists' experience and the surrounding launch point area. The following sections discuss these five methodology stages in detail.

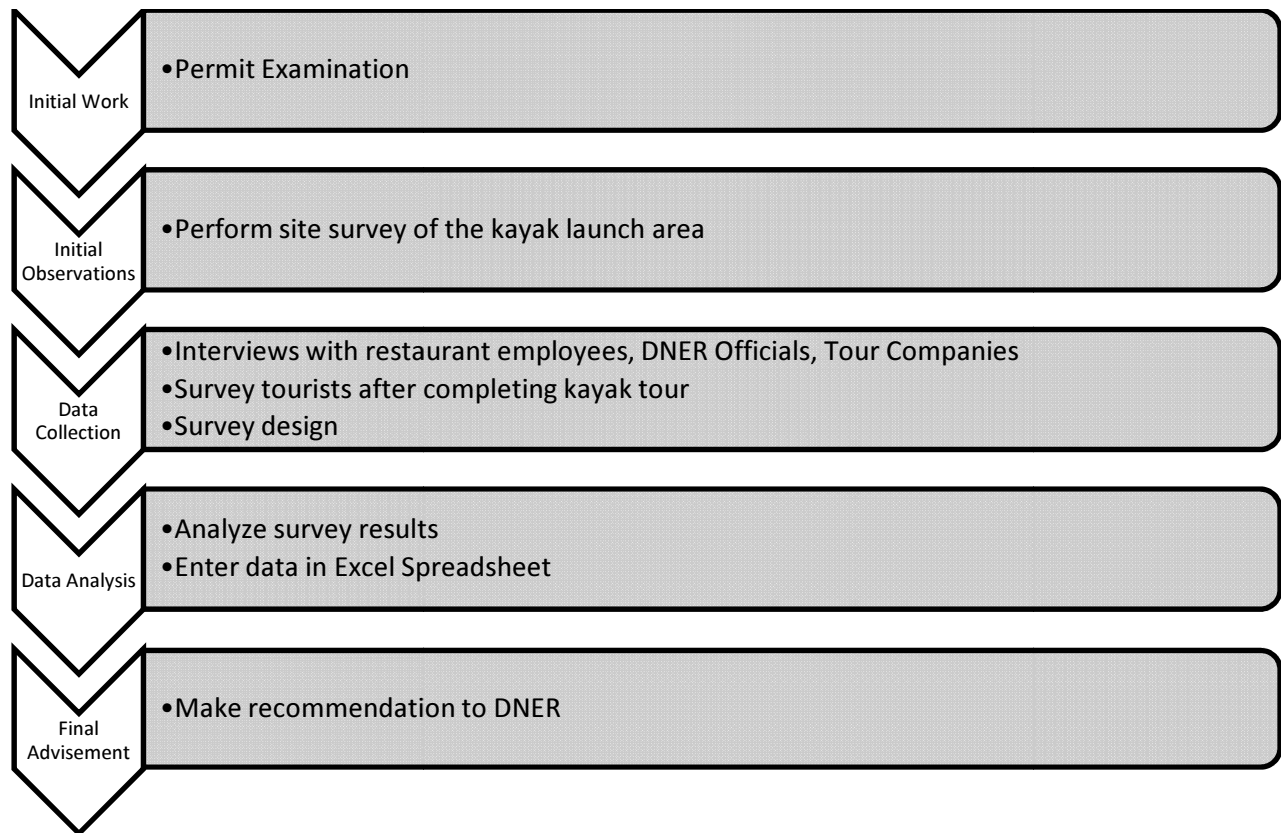


Figure 3: Main Project Stages

### 3.1 Permit Examination

Ms. Carmen Delia Rodriguez of the Forestry Department at the DNER issues operation permits to tourist companies seeking to give guided kayak tours. The team obtained copies of the operating permits from Ms. Rodriguez valid for the 2010-2011 fiscal year that documented that there are ten permitted kayak companies operating within the bay and two companies are permitted by the DNER to give motorboat tours in the bio-bay. The team also discovered through review of the permits that in order for companies to preserve their operation permits, companies needed to pay an operation fee of fifteen percent of their monthly gross income to the DNER Forestry Division. The permit also identifies that an additional seven percent of the gross goes to the municipality. Finally, the examination of the permits gave the team the contact information for each tour company enabling the team to set up interviews with two of the kayak companies.

### 3.2 Initial Observation

The team conducted a site survey on March 20 prior to any surveys being conducted with the tourists. The site survey consisted of a visit to the bio-bay to take initial observations. The observation

task was taking note of the locations used by the tour companies for dropping off and picking up the tourists. These observations gave the team a better understanding of the most appropriate strategy for approaching the tourists, how to collect survey responses, as well as the frequency of how often the team needed to go to the bio-bay to survey tourists.

### **3.3 Survey Design and Data Collection**

The team collected data for this project from several sources. First, interviews were conducted with DNER officials, tour company owners, and local restaurant employees. The information gathered from this process was recorded and stored for later analysis. Next, tourists were surveyed after the completion of their kayak tour of the bio-bay. The tourists' responses were entered into a computer database for analysis.

#### **3.3.1 Tourist Surveys and Design**

A variation of the face-to-face method was used by the team as it is effective when surveying a population with no master list compiled. There are several advantages to conducting face-to-face surveys in comparison to surveys done over the telephone or by mail. The most beneficial aspect of face-to-face surveys is that response rates are usually higher due to the fact that it can be more difficult to refuse someone face-to-face [Converse, 1985]. This method of survey also gives the questioner more control over the response situation. "This 'needs assessment survey' is used to solicit public opinion about community problems and possible solutions" [Punch 2003]. This survey style also permitted the team to collect information from those people who would not likely respond to mailed surveys or surveys conducted over the phone [Punch 2003]. Additionally, face-to-face allows for a higher complexity of questions. This method was most effective because the interviewer could clarify questions for the interviewees and watch the respondents' reactions to the questions. Thus, close-ended questions with ordered choices provided the best tool for meeting the project's objectives. The survey sample audience consisted of tourists who had completed the bio-bay kayak tours.

For this process to be successful, several precautionary steps were taken. First, the team designed their survey to limit the error in the results. The team was specific about the information they actually needed from the interviewees. Accurate and understandable questions are necessary to collect a result base with limited error. An internal testing of the questions contributed helpful input in finalizing the questionnaire.

It is good practice to cluster the demographic questions either at the end or beginning of the survey. *Designing Surveys* suggested placing the demographic questions at the end of the survey to deflect any impression that the demographic questions are not relevant to the topic. The team decided



the demographic questions would be better suited at the beginning to satisfy an unwritten rule of survey design, beginning with easy-to-answer questions. The demographic questions the team implemented for the tourist survey are shown in Figure 4 and a sample survey is included in Appendices D and E.

1) What is your gender?  
 Male  Female

2) What is your age group?  
 13-19  20-29  30-39  40-49  50-59  60+

3) What is your country of residence? \_\_\_\_\_

**Figure 4: Demographic Questions**

Beginning with easier questions keeps the respondent from immediately turning away. Although, some may find difficult questions intriguing, others find harder questions too difficult and give up on the survey [Designing Surveys, 2004]. The team's sample audience for the survey was tourists on vacation. Easier and straightforward survey questions increase the probability that the team will receive significant feedback from the respondents.

As seen above, the team did not include an age group of 1-13 years of age. This was done so because the team felt that someone of that age would be too young to survey because he or she may not fully understand the purpose of filling it out; which in turn would have skewed the data. Upon the first round of the survey and upon analyzing the response rate and quality, this decision not to include the 1-13 years of age category was proved correct, as there were no non-responses to this question which would indicate that a respondent did not find the appropriate box to indicate his/her age.

Along with the demographic questions, both versions of the survey included a final question which was there for tourists completing the survey to give any additional concerns or comments. This allowed for the respondent to specifically voice his or her opinion on the survey questions or about something the survey questions did not cover. This final question was not able to be coded with a number because it was an open-ended question. The way the team dealt with this was by putting a comment box within the Excel spreadsheet next to each individual survey result. The team could then compare the additional comments to how the respondent answered the previous, close-ended questions.

The team's goal was to make the respondent's task as easy as possible. In other words, the team had to minimize the reason for not responding [Converse, 1986]. When encountering respondents in person, it enabled the team to address any questions or concerns the respondents had while completing the survey.

The team used closed-ended questions in the survey design. Closed-ended questions state the question as directly as possible and the answer options are provided for the respondent. Opposed to closed-ended questions, open-ended questions can provide for a more difficult data collection and analysis process because respondents are allowed to answer in their own words, leaving it up to the team to interpret the meaning of the responders' answers [Designing Surveys, 2004]. Closed-ended questions are more specific and more apt to communicate the same frame of reference to all respondents [Converse, 1986] allowing for an easier coding system to analyze the data.

Coding is the assignment of numbers or conceptual names to the responses given to survey questions that allowed the team to estimate characteristics or to look for patterns among the collected responses [Designing Surveys, 2004]. The team collected 107 survey responses; each person's response was assigned a number between 001 and 107. Each answer to the closed-ended questions was assigned a number as well. A blank survey was used to assign each answer a number. The coding example is attached in the Appendix F. This system allowed the team to better monitor the results of completed surveys to ensure that no questions were being missed and that directions were being followed [Designing Surveys, 2004]. Using the coding system, the team entered the collected information into an Excel Spreadsheet.

DNER provided a list of topics to be covered by the survey process. The list was quite extensive, and it was unreasonable to place all questions on a single survey because a lengthy survey may result in a lower completion rate than a ten-question survey. Therefore, the team implemented two questionnaire designs. Each questionnaire contained the same demographic questions but the remainder varied depending on the version. There were two questions that were different in each of the two versions. In one survey the team asked the questions "Do you feel that the signage is adequate to make your way to the launch point?" and "Did you feel the kayak tour was too physically challenging?" While in the other version the questions asked "Did you feel safe while out at the bay" and "Did you find the bathroom facilities useable?" The assessment of all the questions on the questionnaire in terms of their value for the analysis indicated that these would be the most appropriate two questions to rotate. Hence, the remaining questions were placed on both versions of the survey and only the above four questions were substituted.

The team conducted the tourist surveys after it had observed activity at the bio-bay. This approach was deemed the most effective way to achieve the objectives of this study. The team approached the tourists just after they completed their tour but prior to when they were led to the tour busses. This point in time was the most appropriate to conduct our surveys because it was a point where the tourists were most inactive and had free time to answer the surveys.

Three team members approached tourists with clip boards and pens. There was no bias in which tourists were asked by the team members to complete a survey other than that her or she must have already completed the kayak tour. The selection of respondents was completely random and questionnaires were distributed until the team ran out of copies or if all of the tourists had left. Tourists were asked to participate in the study and if they agreed, they filled the surveys out themselves with a team member standing next to them to answer any questions they might have. The fourth team member collected completed surveys and placed them in a folder for safe-keeping.

The surveys were distributed on three trips. Prior to arriving at the bay, the team printed out eighty surveys per trip. There were forty of one version and forty of the second version. After printing the surveys out, one team member would take the time to shuffle the surveys. The manner in which the surveys were shuffled was that both surveys would be printed out and then placed into two separate piles. Next, one team member would take one copy from version one and start a third pile. Then one copy of version two would be placed on top of version one in the third pile. This process of alternating the stacking of both versions was continued until the first two separate piles of surveys were gone. Transportation was provided each time by the team's liaison, Dr. Craig Lilyestrom. Survey distribution occurred on April 5, April 12 and April 15. Due to heavy rain and thunderstorms on April 12, only one tour group was operating, thus requiring a third trip to the bay. On each occasion, arrival was at approximately 7:00 pm, and departure occurred at approximately 11:00 pm. On April 5, the team was barred from surveying one particular tour company by the owner. In response to this issue, the team approached that particular operator, as well as all the operators, on April 15, to explain the purpose of our study, show the surveys being distributed, and answer any questions they might have about the goals of our study. This process led to all of the companies allowing us to survey their customers on April 15<sup>th</sup>.

Overall, the team visited the bio-bay a total of ten times. This allowed for time to observe activities and behavioral patterns of the people interacting at the launch point. The team took note of patterns such as where tourists would congregate after completion of a kayak tour, which local restaurants were open and busiest, and the traffic and parking situation. Each member logged

approximately forty hours of observation time at the launch area for the kayak tours. The team went to observe on a variety of different days. This included days close to a holiday, a day in the middle of the week, and on a weekend. This way the team was able to witness the changes associated with what day during the week tourists would travel to the bay. This also allowed for the team to associate survey responses with which day he or she completed the kayak tour.

### **3.3.2 Interviews with DNER Officials**

Another part of the data collection phase involved the team interviewing the DNER bio-bay management officials. The interviews provided a broad picture of launch area operations and perspectives from officials involved in the maintenance of the bay at different levels of authority.

The type of interview style employed is known as an in-depth qualitative interview [Doyle]. These interviews by their nature employ flexible questioning that are altered based on the responses of the interviewee. The questions are open-ended, allowing for the subject to elaborate and give detailed answers. Interview questions can be adapted between interviews based upon information obtained from previous subjects. The team conducted a total of three interviews with DNER officials directly overseeing the management of the bio-bay and one with an owner of a kayak tour company. Introductions to these officials were made possible with the help of our project liaison, Dr. Craig Lilyestrom.

The interview design was based upon flexible questioning based on the subjects' responses. Interviews were divided into three stages [Doyle]. The first stage consists of background questions, designed to determine their experience managing the bio-bay. In addition, the first set of questions sought information on the history and progression of tourism at the bay from their perspective. The second stage featured questions on the present state of tourism at the bay. Questions in the second stage focused on the subjects' experiences and observations. The final phase looked to collect the subjects' own conclusions and opinions regarding tourism at the bay based on their experiences and perspective as tourism workers. In this stage of the interview, we requested the opinions of the subjects' regarding any possible improvements or changes that they believed should be made with respect to the operation of the bio-bay. The subjects were informed of the interview structure before questioning begins, and were made aware of the direction of this research during questioning.

The actual interview of the subject utilized two members of the project team. One member assumed the role of questioner while the other was responsible for taking notes. Only two members of the project team took part in the interview so as not to overwhelm the subject. The roles of questioner and recorder were rotated among the team members for each separate interview. Once the interviews

finished, results were analyzed. Notes were reviewed by the project team to reduce the volume of data the team analyzed. Each interview was summarized and stored.

Two team members interviewed Damaris Delgado, Director of the Coasts, Reserves and Refuges Bureau at the DNER on March 22. Ms. Damaris Delgado pointed the team in the right direction to interview more DNER officials who had more direct connection to the Laguna Grande bio-bay. She described her concerns involving the maintenance of the bay and the usage of funds generated from kayak tours. She suggested contacting Hector Horta, Management Official for the Cordillera Natural Reserve. Interviewing Mr. Horta was important to our data collection because he is directly responsible for overseeing the bio-bay. The next interview conducted was with his supervisor, Robert Matos, the Director of the Reserves and Refuges Division at the DNER on March 24. Speaking with both Matos and Horta was key in learning basic information on the way funds for the bay were being misused and the main concerns they had with maintaining the bay.

### **3.3.3 Interviews with Tour Companies**

Data collection also centered on interviews with tour companies operating at the bio-bay. Using the company contact information, an initial contact email was sent to each company requesting an interview. The contact email introduced the project team, outlined the study's purpose and stressed the importance of the interviews within the study. Three tour companies showed interest, however interviews with only two could be finalized.

The project team employed the same interview design and format as the interviews with the DNER officials. An interview was conducted with one tourism company on March 26<sup>th</sup> and an interview was conducted with the second company on April 12<sup>th</sup>. One tourist company would like to remain unnamed. As a result, the team used the knowledge obtained from the interview but not the company name.

### **3.3.4 Interviews with Restaurant Employees**

Interviews with employees of the restaurants surrounding the bay were conducted on April 15<sup>th</sup>. The group members interviewed employees from three restaurants. The team sought an additional three interviews however two of the restaurants were closed and one declined to be interviewed. The group employed the same interview design and format outlined previously in Section 3.2.1.

## **3.4 Data Analysis**

After completing the first three project stages, the analysis of the collected data was the next step to be taken in this study. Using the completed surveys, two team members were responsible for entering the data into an Excel spreadsheet using the coding system previously developed. One team

member would dictate the responses to each question and the other team member would fill in the spreadsheet. Having the data recorded electronically made it easy to examine the data and recognize patterns using the coding system. Once the survey results were entered into the Excel spreadsheet, graphs were produced for further analysis. These graphs made any trends in survey responses more apparent and recognizable at first glance. These graphs can be seen in the following Results chapter.

Along with the Excel data, interview notes were taken into account. Using the information the team learned from interviews with DNER officials, tour company owners, and local restaurant employees, the team could narrow the focus to areas of greatest concern. Once the data was compiled from the survey results and interviews, the team was able to move on to the final project stage and make recommendations to the DNER.

### **3.5 Final Advisement**

The final project stage to be completed was to make recommendations to the DNER. The team's recommendations were based on the interviews and survey results. Using the information stored in the Excel spreadsheet from surveys and the graphs that were produced provided the team with concrete evidence of the areas in need of the most attention. Cross referencing the survey data and notes from interviews allowed for the team to recognize the main concerns of tourists and business owners. In addition to addressing the concerns of tourists and business owners, the team also took into account the main concerns of the team's project liaison, Dr. Craig Lilyestrom. After consolidating all the information received from several different sources, the team was able to make recommendations to the DNER in order to address the concerns of each party involved and work on improving the tourist experience at the Bioluminescent Bay at Laguna Grande.

## Chapter 4: Results

The team conducted interviews with DNER officials, local restaurant employees, and kayak tour company owners. Next, the team traveled to the bay three nights to collect data where they conducted surveys with the tourists who had just finished a kayak tour of the bio-bay. The results from the survey were then analyzed. Finally, recommendations were made to the DNER based on analysis of the surveys and interviews conducted.

### 4.1 Interviews

The team conducted interviews with DNER officials, two tourist companies, and employees of two local restaurants. The interview process was helpful in collecting background information and other perspectives on the tourist industry at the Laguna Grande. The interviewees' concerns were recorded and made part of the data collected in support of the recommendations provided to the DNER in Chapter 5

#### 4.1.1 Results from DNER Interviews

On March 26, the team conducted an interview with Hector Horta, the Director of the Reserves and Refuges Division of the DNER. Mr. Horta took the team on an official DNER boat into the Laguna Grande, where he showed the team the bay as it looks during the day. He explained to the team how the funds from the permits are distributed and his goals to improve the area. He said that the amount of money received from the permits was just enough to maintain the bay and not sufficient to implement additional improvements. He would like to see a better relationship between the DNER and the municipality in charge of the Las Croabas Park. With a better relationship between the two, Mr. Horta believes that improvements could be made to the whole bio-bay experience. Some of Mr. Horta's goals include the following:

- Increase the number of people visiting the area
  - More people would help generate more income in the community. The effect of having more people kayak in the bay would not hinder the brightness of the bay due to the large volume of water in the bay.
- Create a checkpoint
  - A checkpoint would allow the DNER to get a valid count on how many kayaks enter the channel and bay. This would allow the DNER to keep statistics on use of the bay during different times of the year.
- Improve the surrounding facilities
  - The lack of communication between the DNER and the municipality makes improving the bathrooms and parking difficult.

#### **4.1.2 Results from Tour Companies Interviews**

Two tour company owners were interviewed. The first tour company owner asked to remain anonymous and that the information discussed during the interview not be published. The second tour company owner was interviewed on April 12, 2010. During the interview, the owner outlined his background as a tour operator, as well as his experience and concerns with the current state of operation at the bio-bay.

The owner, who also asked to remain anonymous but agreed to have his interview summarized in this report, stated that he was born and raised in Las Croabas, although he had only been operating tours at the bio-bay for the past five months. He noted that the busiest time of the year is between February and May.

The owner stated that he was not at all satisfied with the local infrastructure. He cited the bathrooms at the launch area as a huge problem saying the he was “ashamed” of them, as well as the lack of sufficient launch area for tours. The interviewees implied that this was a sentiment shared by all of the tour operators at Las Croabas. He clearly stated that he felt they were not seeing any sort of return on their permit operation fees.

Lastly, the interview subject pointed out several problems with the current launch area in Las Croabas. He stated that Saturday and Sundays are a major problem there, as there are large numbers of both tourists and locals. The boat ramp, according to him, is the only boat ramp in Fajardo, and as a result, it is a very popular gathering spot for local Puerto Ricans. The high influx of people on the weekends creates many traffic problems as well as large amounts of garbage left in the area.

#### **4.1.3 Results from Restaurant Interviews**

Along with the interviews conducted with DNER officials and the tour companies, the team interviewed two local restaurants near the launch area for the kayak tours, Ocean View Restaurant and Racar Seafood. For each restaurant, two team members interviewed an employee, which gave the team another perspective on how tourism is handled at the bay and more opinions on the state of the facilities.

The team had some expectations prior to these interviews as the interviews with the kayak companies provided an idea of what local restaurants might like to see improved and changed. After interviewing an employee from each restaurant, the teams’ expectations were re-enforced. Each interviewee was informative and gave exact details on the everyday activity involving the bay, kayak tours, and tourist activity.

The first restaurant interviewed was Ocean View Restaurant. The sponsor told the team that the restaurant is one of the most popular in the area. An employee from Ocean View spoke with the



team and described some of his experiences working near the kayak tour launching area, noting that most of their business was from tourists related to the kayak tours. Furthermore, the only time business dropped was during the slow tourist season, July and August, which is the rainy period in Puerto Rico. He mentioned that Friday, Saturday, and Sunday were the most popular and busiest days for business. He only had two concerns that he would like to see improved. The first was that the sidewalks had poor lighting, the second the high number of stray dogs that roam around the area. However, he did stress that the stray dogs had no effect on business.

The next restaurant interviewed was Racar Seafood. It is similar to Ocean View Restaurant, the only noticeable difference being its location, as it is located further from the kayak launching area. The employee that we spoke to remarked that tourists generated business for them, and that the kayak tour industry supplied a large number of tourists. He did make the point that their restaurant was busy seven days a week with tourists from the kayak tours. His two main issues were different from the Ocean View Restaurant employee. His first priority for improvement was the traffic and parking. He said it was chaotic and near impossible to find parking during the times that kayak tours were leaving for the tour of the bio-bay. The other complaint he had was with the cleanliness of the local facilities, namely the public bathrooms. Restaurants draw business from the kayak tourists and much of their business is reliant on the people who take the kayak tours. Lighting, parking and traffic, as well as the amount of stray dogs in the area, were some of the other grievances presented by the two restaurant employees. Interviewing the local restaurants confirmed the teams' view of how operations are conducted and maintained in Las Croabas.

#### **4.2 Analysis of Survey Results**

The team distributed surveys on the nights of April 5<sup>th</sup>, April 13<sup>th</sup>, and April 15<sup>th</sup>. On April 13<sup>th</sup>, inclement weather (thunderstorms) impacted the number of responses that the team received from the surveys, as tour companies rarely operate when there are lightning storms, and only one was operating that night. Although the team collected only four surveys on April 13<sup>th</sup>, the results from the surveys were comparable to the responses from the other two evenings. On the other two nights, the weather was slightly overcast and this prevented the moon from being visible. This is important to note because the moon affects the brightness of the bay. When the moon is full, it causes light pollution hence light emitted from the dinoflagellates will not be as visible. There was a total of 107 surveys collected.

The team will present the raw data figures first. After this data is presented the team will make correlations between the data that was collected.

### 4.3 Demographic Questions

The first part of this analysis will focus on the demographic questions of the survey. These questions were the same on both versions of the survey.

#### Q1: What is your gender?

There was an almost fifty-fifty ratio of male and female tourists that visited the bio-bay.

Table 1: Gender

What is your gender?		
Answer Options	Response Frequency	Response Count
Male	54%	58
Female	46%	49
Total	100%	107

#### Q2: What is your age group?

The majority of the tourists that completed the survey were between the ages of 30-49. The results follow a natural trend of distribution. This trend is seen in the table as at the beginning and end of the table there is the smallest response frequency.

Table 2: Age Groups

What is your age group?		
Answer Options	Response Frequency	Response Count
13-19	11%	12
20-29	18%	20
30-39	31%	33
40-49	25%	27
50-59	14%	14
60+	1%	1
Total	100%	107

#### Q3: What is your country of residence?

The team expected there to be an overwhelming majority of American tourists as a result of what the teams' sponsor, Dr. Lilyestrom, mentioned. As predicted, there were 94 (89%) tourists from the United States.

**Table 3: Country of Residence**

What is your country of residence?		
Answer Options	Response Frequency	Response Count
United States	89%	94
Other	11%	13
Total	100%	107

#### **4.4 Site Specific Questions**

This part of the analysis will consider the questions that are numbered 1-8 in the survey. Questions 3 and 5 varied have two different versions of the survey.

##### **Q1: How did you learn of the bay?**

This question received 114 responses as some respondents marked more than one of the choices. The most common selection was friend. This indicates that one third of the visitors have most likely had a friend already visit the bay. Those friends most likely had an enjoyable experience at the bay since they made a recommendation.

**Table 4: Knowledge of the Bay**

How did you learn of the bay?		
Answer Options	Response Frequency	Response Count
Website	24%	27
Article	8%	10
Friend	32%	36
Travel Agency	9%	11
School	5%	6
Hotel	11%	12
Other	11%	12
Total	100%	114

##### **Q2: Did you arrive with a tourist company or private transportation?**

Since a majority of the tourists arrived with by private transportation, they will have a more insight when answering the question regarding the signage on the way to the bay.

**Table 5: Methods of Arrival**

Did you arrive with a tourist company or private transportation?		
Answer Options	Response Frequency	Response Count
Tourist Company	35%	37
Private Transportation	65%	70
Total	100%	107

**Q3: Version 1: Did you feel the signage is adequate to make your way to the launch point?**

In a large part, the tourists that arrived to the launch point felt that the signage to make their way to the launch point was not adequate. There were a total of 55 responses to this question, since it appeared in only one version of the survey.

**Table 6: Adequate Signage**

Did you feel that the signage is adequate to make your way to the launch point?		
Answer Options	Response Frequency	Response Count
Yes	35%	19
No	65%	36
Total	100%	55

**Q3: Version 2: Did you feel safe while at the bay?**

All of the tourists felt that they were safe while kayaking at the bay.

**Table 7: Safety at the Bay**

Did feel you safe while at the bay?		
Answer Options	Response Frequency	Response Count
Yes	100%	52
No	0%	0
Total	100%	52

**Q4: Did you receive sufficient training before kayaking?**

The companies have a briefing session before letting the tourist kayak in the bay. In this session the operators are obligated to give instructions on how to kayak, as it is written in the permits.

**Table 8: Sufficient Kayak Training**

Did you receive sufficient training before kayaking?		
Answer Options	Response Frequency	Response Count
Yes	92%	98
No	8%	9
Total	100%	107

**Q5: Version 1: Did you find the kayak tour was too physically challenging**

The tourists felt that the kayak tour was not too strenuous for them to complete, as 82% of the kayakers responded with 'no'. Since this question was on the first survey version it received 55 responses.

**Table 9: Difficulty of the Kayak Tour**

Did you find the kayak tour was too physically challenging?		
Answer Options	Response Frequency	Response Count
Yes	18%	10
No	82%	45
Total	100%	55

**Q5: Version 2: Did you find the bathroom facilities useable?**

Over one-third of the tourists did not use the bathroom. The tourist companies often stop at a gas station close to reaching the launch site and let the tourists use the restroom there. When combined with the 31% that were unhappy with the restrooms, that leaves less than one-third of the tourists who had a positive impression of the bathrooms at the launch site.

**Table 10: Usability of the Bathroom Facilities**

Did you find the bathroom facilities useable?		
Answer Options	Response Frequency	Response Count
Yes	31%	16
No	31%	16
Not Applicable	38%	20
Total	100%	52

**Q6: Is this your first visit or repeat visit to the bay?**

A vast majority of the tourists are on their first visit to the bay.

**Table 11: Visitation**

Is this your first visit or repeat visit to the bay?		
Answer Options	Response Frequency	Response Count
Repeat Visit	7%	7
First Visit	93%	100
Total	100%	107

**Q7: How would you rate your overall experience?**

Almost all of the tourists felt that their experience at the bay was a 4 or 5 (5 means extremely satisfied). This indicates that the tourist companies and businesses are satisfying the tourists.

**Table 12: Overall Experience**

How would you rate your overall experience?		
Answer Options	Response Frequency	Response Count
1	1%	1
2	0%	0
3	1%	1
4	38%	41
5	60%	64
Total	100%	107

**Q8: Do you have any additional concerns that you would like to mention?**

This question gave an opportunity for the tourists to write an answer. The most frequent response in the writing section was further additions to how much they enjoyed their trip.

**Table 13: Comments**

Additional Concerns to Mention?		
Answer Options	Response Frequency	Response Count
Yes	21%	23
No	79%	84
Total	100%	107

## 4.5 Correlations Drawn from Survey Results

In this section the team ties together a few of the survey results to make connections between the results and the demographics that were collected.

### 4.5.1 Age, Gender, Sufficient Training, and Overall Experience vs. Difficulty Kayaking

Of the ten tourists that felt the kayak trip was too physically challenging the majority fell into the age group of 30-39. This group contained more than half (60%) of women.

Table 14: Age vs. Difficulty

Age vs. Difficulty		
Answer Options	Response Frequency	Response Count
13-19	10%	1
20-29	30%	3
30-39	50%	5
40-49	0%	0
50-59	10%	1
60+	0%	0
Total	100%	10

Table 15: Gender vs. Difficulty

Gender vs. Difficulty		
Answer Options	Response Frequency	Response Count
Male	40%	4
Female	60%	6
Total	100%	10

Three of the ten tourists that expressed having difficulty with the kayaking activity felt that they did not receive sufficient training (see Table 16). The kayak companies should make sure to give proper instruction to all kayakers.

**Table 16: Sufficient Training vs. Difficulty**

Sufficient Training vs. Difficulty		
Answer Options	Response Frequency	Response Count
Yes	70%	7
No	30%	3
Total	100%	10

However, all ten of the tourists that indicated having difficulty with the kayaking, rated their experience as a 4 or 5. Clearly, they still enjoyed their bio-bay experience even though they found the kayaking a challenge.

**Table 17: Overall Rating vs. Difficulty**

Overall Rating vs. Difficulty		
Answer Options	Response Frequency	Response Count
4	50%	5
5	50%	5
Total	100%	10

#### **4.5.2 Gender vs. Overall Experience**

The male population that was surveyed had an almost even distribution between a rating of 4 or 5. A majority of the female population (70%) rated the overall experience at 5. This implies that females enjoyed the bay more than the males, even though two females gave a rating of 1 and 3. With this result, an interesting point to investigate further is why the women surveyed found the bio-bay experience more enjoyable than the men..



**Table 18: Male Overall Experience**

Male Overall Experience		
Answer Options	Response Frequency	Response Count
1	0%	0
2	0%	0
3	0%	0
4	48%	28
5	52%	30
Total	100%	58

**Table 19: Female Overall Experience**

Female Overall Experience		
Answer Options	Response Frequency	Response Count
1	2%	1
2	0%	0
3	2%	1
4	25%	12
5	71%	35
Total	100%	49

## **4.6 Estimated Tourist Numbers**

After collecting and tallying the surveys the team attempted to provide informed approximations on the number of tourists that visit the La Grande Bioluminescent Bay each year and the revenue generated from tourism at the bay.

### **4.6.1 Approximate Number of Tourists**

There are 12 permitted companies operating at the bay. Ten of these companies are kayak companies which are permitted to take 60 tourists per night. Two of the companies are boat companies and they are permitted to take 18 tourists per night. On a single night there can be as many as 636 tourists based on the permit limits. The companies all operate only six days a week, as the permit states. The upper bound, if the companies operated all six days, year-round, the companies would have 198,432 tourists.

The companies do not operate year round due to weather conditions and the cyclic nature of the tourist season. The team attempted to produce a more realistic estimate of the number of tourists that visit the bay per night. Based on the teams observations and tour company interviews the team came up with a figure of 450 tourists per night. This number is significantly less than the upper bound due to kayakers either arriving late or cancelling their tour in the last minute. Note, part of the late arrivals can be attributed to the signage issue. This number is more representative of the potential tourists per year by adjusting for weather conditions that cause tours to be cancelled. With this in mind, the team estimated that the companies operate 42 of the 52 weeks which yields a rough estimate of 113,400 tourists that visit the bio-bay each year.

#### **4.6.2 Approximate Revenue**

The team then researched what the cost of a kayak and boat tour would be. The average cost per kayak and boat tour, per person, is 45 dollars. Taking the approximated number of tourists the team generated, the bay generates 5,103,000 dollars in revenue yearly from the kayak and boat tours.

Further revenues generated from the bio-bay tourist traffic come from the hotels in Fajardo and the restaurants in Las Croabas. Since staying in the hotels in Fajardo allow the tourists to visit El Yunque, Culebra, Vieques and the bio-bay more easily, a significant percentage of the tourists prefer to stay in Fajardo rather than San Juan. However, the team did not have access to the information needed to create an estimate for the amount of revenue generated from these sources.

## Chapter 5: Recommendations for Improvements

After the team had visited the bio-bay and the Las Croabas area a dozen times, analyzing surveys, and conducting interviews it was able to come up with a set of concerns. The team then posed recommended solutions to the problems which negatively impact the tourist experience.

### 5.1 Road Signs

**Concern 1:** There are several feasible routes by bus or car from San Juan to Las Croabas Park, the area from which the kayaks launch for the La Grande bio-bay tours. The most likely straightforward route is to follow Interstate 3 and Interstate 987. Figure 5 displays a key intersection where tourists' vehicles would turn left in order to get to the kayak launch area. However, as seen in Figure 5, there are no signs indicating that the bay is to the left. From this intersection the bay is about 5 miles away, so it is an appropriate distance from the launch site for a sign. The team's sponsor highlighted this concern to the team and the survey strongly indicated unhappiness with the signage. Moreover, when people with reservations get lost and miss the start of the tour, these reserved seats in the kayak may not be replaced by 'stand by' tourists. Hence, this poor signage actually costs the kayak companies revenue and indirectly cost the restaurants revenue too.



Figure 5: Important Intersection 1 (Route 3 and Route 987) on Path to the Bio-Bay

**Concern 2:** If the prospective tourists are able to get on the right route towards the bay, they will eventually reach an unmarked critical fork in the road (shown in Figure 6) that is only half a mile away from the launch point.. To reach the kayak launch point, the tourists need to take the left fork in the road.

**Recommendation:** Place a series of signs that indicate the route to the bay. In both of these cases, signs would guide the driver to take the correct route to the bio-bay. This would reduce the

number of kayaks that arrive late and miss their tour start time. Those tourists arriving early could conceivably have spare time to eat something at a local restaurant before their kayak tour.



Figure 6: Important Intersection 2 (Route 987)

## 5.2 Parking spots

**Concern 1:** There are approximately 70 spots, distributed in two lots, marked for public parking at the launch area. However, on the weekends there is a high volume of local people that come to the Las Croabas Park, and the number of available parking spots is insufficient. Furthermore, the lines that mark the spots in one of the parking areas are almost completely erased. Consequently, cars are not parked as closely as they could be and this further reduces the number of spots. One of the interviewed restaurant owners emphasized that he would like to see more parking spaces.

**Concern 2:** The kayak companies come to the launch point with a truck hauling their kayaks as shown in Figure 7. They park their trucks on the main street. As mentioned earlier, there is no specific marked spot for each company. They use the honor system and park in the same spot each time. Since each company parks alongside the curb, they effectively create a wall. Tourists coming out of the tour buses have to cross the street and walk between the trucks and trailers to make it to the walkway. A few of the kayak companies expressed this concern to the team.

**Recommendation 1:** The first step that should be taken is to re-spray all of the parking lines regularly. By doing this the parking area will gain at least ten spots, which would reduce congestion in the parking area.

**Recommendation 2:** There should be a half-hour limit on vehicles parked next to the boardwalk. This time limit should be in effect from 6:30pm to 11:00pm. Based on the teams' observations, it takes the kayak companies approximately twenty minutes to unload and load the kayaks. If, for example, a company had only one tour and wanted to depart at 8pm, then the half hour time limit would be enough for them to unload and pack up. The benefit of the time limit is that it would alleviate congestion and it would allow the tour buses a safer place to drop off the tourists next to the boardwalk.

There is a large boat yard several hundred yards from the launch point which is used infrequently. Part of the boat yard, which does not hold any boats, could be transformed into parking for the trucks and trailers, and tour busses.



**Figure 7: Truck with kayaks**

### **5.3 Enforcement**

**Concern 1:** The police presence in this area is minimal. During each visit, the team observed the number of police patrolling the area. On average, the team saw two police cars per night driving around the park, in patrols two hours apart. The team did not observe any crime in the area; however, one of the tour operators told the team that he was once held up at gunpoint. After hearing this story along

with other personal accounts, from locals, of criminal activity such as robbery and harassment, there seems to be a need for increased police presence.

**Concern 2:** The DNER rangers are responsible for ensuring that the kayak companies do not exceed their kayak limits per evening. There was one instance when the team saw rangers present at the launch point, trying to determine the number of kayaks each company had that evening. However, from the area where the rangers were standing it is difficult to accurately count the number of kayaks actually in the water. The teams' sponsor indicated this concern as one of the most important issues relative to the DNER's responsibilities.

**Recommendation 1:** Patrols by police should be increased in the area. If possible, there should be a patrol car at the entrance to the Las Croabas Park. By doing so the tourists would pass by the police vehicle and would feel safer knowing that there is a police presence in the area.

**Recommendation 2:** The DNER rangers need a place to accurately count the number of kayaks per kayak company entering the bay. Since the entrance to the bay is through the channel, all the kayaks have to go through it to get into the bay. In addition, as the channel is narrow, everyone must pass through in a single file, making it ideal for counting. There is a beach right at the entrance to the channel, shown in Figure 8. One or two rangers could wait on the beach and then count the number of kayaks going in with each company. Since most of the kayaks have an identifiable item, such as matching lifejackets, matching kayaks, or unique running lights, it is easy to distinguish one company from another and count the kayaks. The rangers could also be equipped with a light, so as to better see the kayaks entering the channel. This would not have an effect on the kayak experience, since the light would not be visible once the kayakers are inside the channel.





**Figure 8: Entrance to the channel and the beach**

#### **5.4 Cleanliness**

**Concern 1:** The restrooms at the park are effectively non-useable according to a large number of the tourists' surveys. The tour operators complained about the condition of the bathrooms. Figure 9 shows the inside of the men's restroom. The table-like object next to the stall is a urinal. The team noted that the floors were always wet and the stench inside was unbearable. The condition of the bathrooms is so poor that the companies usually stop at a gas station close to the bay to let the people use the restrooms there. The 38% in the survey that indicated N/A with respect to using the toilets bears out this situation.



Figure 9: Men's restroom

**Concern 2:** The trashcans along the boardwalk are poorly designed. There is no inner can or bag and they are made of stone. This means that cleaning them requires manually picking up the debris from the trashcan, piece by piece. The team noted that on a particularly busy day, the stone trashcans were overflowing. However, the trash cans next to the barbeque pits, which are hinged and tilt down, making them easy to clean, were empty. Pictures of the stone trashcans are shown in Figure 10.



Figure 10: Left: Outside of stone trashcan Right: Inside of stone trashcan



**Recommendation 1:** There should be regular maintenance of the bathrooms. Regular maintenance would provide a more enjoyable experience for everybody.

**Recommendation 2:** A simple modification to the design of the stone trashcans would make them much easier to clean. The plastic hinged trashcans would not look out of place on the walkway, so the stone ones could be modified. Putting a slightly smaller plastic trashcan inside the stone one would provide an easily removable trash container for easy emptying.

## 5.5 The Boat Ramp

**Concern:** There are boat ramps that are used by both the kayak companies and boat owners. The boat owners have a problem with the ramp because of its location, as it is right off the main road. In order for an individual to back up the boat into the water, all the traffic on the main street has to be stopped while the driver backs up their trailer with the boat. Figure 11 shows a boat being loaded into the water on one of the ramps. The team had gotten input through our sponsor that at least ten boat owners want the boat ramp to be improved, or moved.

**Recommendation:** There is interest within the DNER in creating a proposal to build two boat ramps away from the main road, off of a private road. This would alleviate the congestion created by the boat owners and as a result make traffic flow more easily and safely in the area.



Figure 11: Truck and boat on ramp

## 5.6 Stray Dogs

**Concern:** During an interview the team was told that there was a problem with stray dogs in the area. During the team's first night visit, they also noticed a large contingent of stray dogs near the walkway. Although the dogs did not appear threatening, some had fleas and they were all quite dirty.

These dogs could potentially injure someone or infect them with fleas or other diseases. Although the dogs had collars, they did not have any identifying tags, leading the team to believe that these dogs were abandoned.

**Recommendation:** The dogs should be either controlled by their owners with a leash or taken to the pound where they can be put up for adoption.

## 5.7 Abandoned Boats

**Concern:** There are a number of abandoned boats in this area, two of which are shown in figure 12. These abandoned boats detract from the appearance of the area, and make it appear as though there is no maintenance in the area. Additionally, some of the boats are in direct path to the channel that the kayakers take.

**Recommendation:** The boat owners should be located and charged with the removal of these boats from the area. If the owners cannot be located, the municipality should seize and remove the boats from the waters surrounding the launch area.



Figure 12: Two abandoned boats

## 5.8 Conclusion

The team was able to identify concerns in the area and provide recommendations as to how to improve upon them. These recommendations will increase the overall tourist satisfaction at the bio-bay.

## Chapter 6: Conclusion

The WPI team acquired valuable experience during this project. The team was away of its usual surroundings and put out to work in the field in an unfamiliar area. The project represented a peculiar challenge and opportunity to develop solutions to data gathering and analysis techniques.

The project was involved with developing a set of recommendations that would be eventually cost neutral within the framework of ecotourism. The team took into account preserving the habitat while enhancing the satisfaction of the tourists, thus increasing the tourist volume that would compensate the costs in implementing the recommendations. In that respect, the recommendations are designed to be straightforward, well documented and reasonably easy to implement.

The survey results indicated that an overwhelming majority of respondents (98 percent) rated the overall experience in the bay itself as very or extremely satisfied. Since there are a vast number of tourists visiting the bay it is very important to improve the signage, parking, toilet and other facilities, as well as services and safety. Reinforcing the need for implementing the recommendations are the findings of this study regarding the fact that 89 percent of respondents came from the United States expecting a certain level of services and facilities and that 65 percent of respondents used private transportation to reach the bay – only to be faced with congestion on the streets, delays, lack of parking, not to mention the lack of signage to guide them to their destination in the first place.

During the research phase of the project a number of issues were encountered by the team, for example the lack of adequate signage leading up to the Laguna Grande, the long-term sustainability of this exceptional ecosystem and its monitoring. These issues certainly require further research and elaboration not covered in this report.

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**Appendix A: Local Businesses**





## Appendix B: Location of Kayak Companies



## Appendix C: The Permit Contact List

Company Name	Contact	Email
Eco Action Tours, Inc.	Pedro Zervigin	<a href="mailto:ecoactiontours@yahoo.com">ecoactiontours@yahoo.com</a>
Bio Island	Carlos Robles Davila	<a href="mailto:bioisland1@hotmail.com">bioisland1@hotmail.com</a>
Enchanted Island Eco Tours	Michael Grasso	<a href="mailto:enchantedislandecotours@libertypr.net">enchantedislandecotours@libertypr.net</a>
Fajardo Tours, Inc.	Emilia Martinez/Antonio Morales	<a href="mailto:ARM614411@yahoo.com">ARM614411@yahoo.com</a>
Akuadventures Kayaking, Inc.	Daisa or Robert Pfister	<a href="mailto:akuadventures@gmail.com">akuadventures@gmail.com</a>
Island Kayaking Adventure Corp.	Nestor Martinez Perez	<a href="mailto:info@ikatours.com">info@ikatours.com</a>
Las Tortugas Adventures, Inc.	Gary and Evelyn Horne	<a href="mailto:info@kayak-pr.com">info@kayak-pr.com</a>
Kayaking Puerto Rico	Percy Dier/ Dalberto Arce	<a href="mailto:info@kayakingpuertorico.com">info@kayakingpuertorico.com</a>
Baby Bay Cruisers Lagoon	Miguel A. Suarez Hernandez	N/A
Yokahu Kayaks Trips, Inc.	Luis Mendez Robles	<a href="mailto:oceanicpacific@gmail.com">oceanicpacific@gmail.com</a>
The Kayak Rental Eco-Tours, Inc.	Ismael Ortega Villanueva	<a href="mailto:thekayakrental@yahoo.com">thekayakrental@yahoo.com</a>
Pure Adventure Corp.	Carlos Castro	<a href="mailto:info@pureadventurepr.com">info@pureadventurepr.com</a>

# Appendix D: Survey Version 1



## Laguna Grande Bioluminescent Bay Tourist Satisfaction

Please take a moment to help us improve your experience at the Laguna Grande Bio-Bay. When you're done, please return the questionnaire to us. Please review the confidentiality statement below. Thank you!

### General Questions

- 1) What is your gender?  
 Male  Female
- 2) What is your age group?  
 13-19  20-29  30-39  40-49  50-59  60+
- 3) What is your country of residence? \_\_\_\_\_

### Site Specific Questions

- 1) How did you learn of the bay?  
 Website  Article (News/Magazine)  Friend  Travel Agency  Other, please specify: \_\_\_\_\_
- 2) Did you arrive with a  tourist company or  private transportation?
- 3) Do you feel that the signage is adequate to make your way to the launch point?  Yes  No
- 4) Did you receive sufficient training before kayaking?  Yes  No
- 5) Did you find the kayak tour was too physically challenging?  Yes  No
- 6) Is this your  first visit or  repeat visit to the bay?  
If this is a repeat visit, how many times have you been before? \_\_\_\_\_
- 7) How would you rate your overall experience? Please rate from 1 to 5, '1' being not satisfied at all, and '5' being extremely satisfied.  
 1  2  3  4  5
- 8) Do you have additional concerns that you would like to mention?  Yes, please elaborate below  No  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you

Confidentiality Statement: The data that is collected through this survey will be kept private to the extent allowed by law. Data will be kept under a code number and all individual firm and facility information will be kept in a secured, limited access location. Results will only be presented in an aggregated form. Respondent identities will not be revealed in any publication or presentation of the results of this survey. There are no foreseeable risks by participating in this study.

Participation in the survey is voluntary. Respondents do not have to pay to participate nor will they be paid.

If you have any questions about your rights in participating in this research study, you may contact pr-bio@wpi.edu

# Appendix E: Survey Version 2



## Laguna Grande Bioluminescent Bay Tourist Satisfaction

Please take a moment to help us improve your experience at the Laguna Grande Bio-Bay. When you're done, please return the questionnaire to us. Please review the confidentiality statement below. Thank you!

### General Questions

- 1) What is your gender?  
 Male  Female
- 2) What is your age group?  
 13-19  20-29  30-39  40-49  50-59  60+
- 3) What is your country of residence? \_\_\_\_\_

### Site Specific Questions

- 1) How did you learn of the bay?  
 Website  Article (News/Magazine)  Friend  Travel Agency  Other, please specify: \_\_\_\_\_
- 2) Did you arrive with a  tourist company or  private transportation?
- 3) Did you feel safe while at the bay?  Yes  No
- 4) Did you receive sufficient training before kayaking?  Yes  No
- 5) Did you find the bathroom facilities useable?  Yes  No  N/A
- 6) Is this your  first visit or  repeat visit to the bay?  
If this is a repeat visit, how many times have you been before? \_\_\_\_\_
- 7) How would you rate your overall experience? Please rate from 1 to 5, '1' being not satisfied at all, and '5' being extremely satisfied.  
 1  2  3  4  5
- 8) Do you have additional concerns that you would like to mention?  Yes, please elaborate below  No  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you

Confidentiality Statement: The data that is collected through this survey will be kept private to the extent allowed by law. Data will be kept under a code number and all individual firm and facility information will be kept in a secured, limited access location. Results will only be presented in an aggregated form. Respondent identities will not be revealed in any publication or presentation of the results of this survey. There are no foreseeable risks by participating in this study.

Participation in the survey is voluntary. Respondents do not have to pay to participate nor will they be paid.

If you have any questions about your rights in participating in this research study, you may contact pr-bio@wpi.edu



# Appendix F: Coded Survey



## Laguna Grande Bioluminescent Bay Tourist Satisfaction

Please take a moment to help us improve your experience at the Laguna Grande Bio-Bay. When you're done, please return the questionnaire to us. Please review the confidentiality statement below. Thank you!

### General Questions

- 1) What is your gender?  
1  Male 2  Female
- 2) What is your age group?  
1  13-19 2  20-29 3  30-39 4  40-49 5  50-59 6  60+
- 3) What is your country of residence? \_\_\_\_\_

### Site Specific Questions

- 1) How did you learn of the bay?  
1  Website 2  Article (News/Magazine) 3  Friend 4  Travel Agency 5  Other, please specify: \_\_\_\_\_
- 2) Did you arrive with a 1  tourist company or 2  private transportation?
- 3) Do you feel that the signage is adequate to make your way to the launch point? 1  Yes 2  No
- 4) Did you receive sufficient training before kayaking? 1  Yes 2  No
- 5) Did you find the kayak tour was too physically challenging? 1  Yes 2  No
- 6) Is this your 1  first visit or 2  repeat visit to the bay?  
If this is a repeat visit, how many times have you been before? \_\_\_\_\_
- 7) How would you rate your overall experience? Please rate from 1 to 5, '1' being not satisfied at all, and '5' being extremely satisfied.  
1  1 2  2 3  3 4  4 5  5
- 8) Do you have additional concerns that you would like to mention? 1  Yes, please elaborate below 2  No  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you

Confidentiality Statement: The data that is collected through this survey will be kept private to the extent allowed by law. Data will be kept under a code number and all individual firm and facility information will be kept in a secured, limited access location. Results will only be presented in an aggregated form. Respondent identities will not be revealed in any publication or presentation of the results of this survey. There are no foreseeable risks by participating in this study.

Participation in the survey is voluntary. Respondents do not have to pay to participate nor will they be paid.

If you have any questions about your rights in participating in this research study, you may contact pr-bio@wpi.edu

## Appendix G: Sample Permit



PO Box 366147  
San Juan, PR 00936  
Tel. (787) 999-2200  
Fax: (787) 999-2303

Estado Libre Asociado de Puerto Rico

### Departamento de Recursos Naturales y Ambientales

#### RENOVACIÓN AUTORIZACIÓN PARA SERVICIO DE ALQUILER DE KAYAKS E INTERPRETACIÓN DEL ÁREA NATURAL LAGUNA GRANDE DE LA RESERVA NATURAL LAS CABEZAS DE SAN JUAN

El Departamento de Recursos Naturales y Ambientales, en adelante denominado "El Departamento", recibió una solicitud de renovación para el servicio de alquiler de kayaks e interpretación del Área Natural Laguna Grande de la Reserva Natural Las Cabezas de San Juan en Fajardo.

#### DESCRIPCIÓN DE LA SOLICITUD

Name of company	Peticionario:	
Company address	Dirección Postal:	
Area where the company wants to operate	Lugar de la Actividad:	Laguna Grande, Reserva Natural Las Cabezas de San Juan, Fajardo
Authorization number	Como custodio y administrador de las áreas naturales y a tenor con el Reglamento para la Administración de los Aprovechamientos Mediante Autorización y Concesión en los Bosques Estatales, Reservas Naturales y Refugios de Vida Silvestre Bajo la Jurisdicción y Administración del Departamento de Recursos Naturales y Ambientales, Reglamento Núm. 7241 de 1 de noviembre de 2006, "El Departamento" otorga esta Autorización en San Juan, Puerto Rico, bajo las siguientes condiciones y limitaciones.	
Name of company	<u>DESCRIPCIÓN DE LA AUTORIZACIÓN</u>	
Area where the company is allowed to operate in	1. Autorización Número:	DRNA-A-2009-090
Total number of passengers allowed	2. La Parte Autorizada:	
How many daily tours are allowed	3. Área de Operación:	LAGUNA GRANDE DE LA RESERVA NATURAL LAS CABEZAS DE SAN JUAN, FAJARDO
How many passengers are allowed per tour	4. Número de Pasajeros Diarios:	SESENTA (60)
Number of guides required per number of tourists	5. Número de Viajes Diarios:	DOS (2)
The days allowed for operation	6. Número de Pasajeros por Viaje:	TREINTA (30)
Day of rest	7. Número de Guías:	DOS (2) POR CADA CINCO (5) KAYAKS DOBLES; TRES (3) POR GRUPOS MAYORES DE SEIS (6) KAYAKS DOBLES
	8. Días de Operación:	SEIS (6) DE LUNES A SÁBADO
	9. Día de Descanso:	DOMINGO

Hours of operation	10. Horario de Operación:	DESDE LAS 6:00 PM HASTA LAS 12 DE LA MEDIANOCHE
How often financial information must be submitted	11. Fecha para someter informe y pago:	LOS DÍAS QUINCE (15) DE CADA MES
How long permit is active	12. Fecha de Vencimiento:	1 AÑO A PARTIR DE LA FECHA DE EXPEDICIÓN
	<b><u>CONDICIONES Y LIMITACIONES GENERALES</u></b>	
Orientation - must provide clear instructions for kayakers	1. <b><u>COORDINACIÓN:</u></b>	La actividad autorizada será coordinada con el Oficial de Manejo cinco (5) días antes del inicio de las operaciones.
Cleanliness - must clean the area where the company operates	2. <b><u>ORIENTACIÓN:</u></b>	Se orientará a todas las personas bajo su responsabilidad, que están en un cuerpo de agua donde existe un fenómeno único en su clase y será responsable de tomar todas las medidas necesarias para no alterar el ecosistema de la Reserva.
	3. <b><u>LIMPIEZA:</u></b>	El área de operación y sus alrededores se mantendrán en impecable estado y será responsable de la limpieza, mantenimiento y seguridad del área en todo momento.
	4. <b><u>CUMPLIMIENTO CON LEYES Y REGLAMENTOS:</u></b>	La Parte Autorizada cumplirá con todas las leyes y reglamentos vigentes en "El Departamento" y con todas las leyes federales, estatales y municipales aplicables.
	5. <b><u>SEGURIDAD:</u></b>	La Parte Autorizada deberá tomar todas las precauciones razonables para prevenir y suprimir fuegos en el área protegida.
	6. <b><u>SEGURIDAD MARINA:</u></b>	<p>a) La Parte Autorizada será responsable de que su personal haya completado el curso básico de navegación, según es requerido en el Reglamento Núm. 6979 de 31 de mayo de 2005, conocido como el Reglamento para la Inscripción, Navegación y la Seguridad Acuática en Puerto Rico, (Reglamento de Navegación) Cap. X, Artículo 35.11. Copia de dicha documentación deberá estar presente y disponible en todo momento para inspección por el personal de "El Departamento", entiéndase Cuerpo de Vigilantes u Oficial de Manejo de la Reserva.</p> <p>b) La Parte Autorizada deberá llevar un registro con el nombre y dirección de la persona que alquile cualquier embarcación o equipo de navegación. Deberá guardar el registro por el término de un año según es requerido en el Reglamento de Navegación Cap. X, Artículo 35.08. Copia de dicha documentación deberá estar presente y disponible en todo momento para inspección por el personal de "El Departamento", entiéndase Cuerpo de Vigilantes u Oficial de Manejo de la Reserva.</p> <p>c) La Parte Autorizada tendrá la obligación de proveerle al usuario una orientación general de las reglas de navegación y a su vez el usuario demostrará que posee el conocimiento y la habilidad para operarlo según es requerido en el Reglamento de Navegación, Cap. X, Artículo 35.12.</p>

	<ul style="list-style-type: none"> <li>d) La Parte Autorizada no permitirá que se opere el vehículo de navegación sin los debidos equipos de seguridad según es requerido en el Reglamento de Navegación, Cap. X, Artículo 35.13.</li> <li>e) La Parte Autorizada estará obligado a colocar en todo vehículo de navegación de alquiler en Laguna Grande iluminación tenue color verde en proa y color rojo en popa con el fin de identificar su movimiento. La Parte Autorizada tendrá la opción de utilizar iluminación de otro color de combinación en dirección hacia proa para que se distinga su grupo. Ésta no podrá ser de mayor deslumbrancia que la luz de proa ni de tipo intermitente de color blanca.</li> <li>f) La Parte Autorizada no podrá utilizar luces blancas deslumbrantes de alta intensidad (Spot Light) dentro del área del canal o laguna a menos que ocurra una emergencia que requiera búsqueda y rescate.</li> <li>g) “El Departamento” se reserva el derecho de detener las operaciones de La Parte Autorizada ya sea por condiciones del tiempo o por el incumplimiento de alguna cláusula de concesión que no pueda ser corregida durante la operación.</li> </ul>				
<p>Insurance policy</p>	<p>7. <b><u>PÓLIZA DE RESPONSABILIDAD:</u></b> La Parte Autorizada será responsable de cualquier daño a personas o propiedades producto de la operación aquí autorizada. A tales efectos, adquirirá una Póliza de Responsabilidad Pública una Fianza de Restauración con una compañía de seguros autorizada a negociar en Puerto Rico, por las sumas que se estipulan a continuación. <b>Esta póliza debe tener vigencia hasta un (1) año después de la fecha de vencimiento de la autorización.</b></p> <p style="text-align: center;"><b>Los límites de la póliza no serán menores de:</b></p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>a) Daños a la Propiedad</td> <td style="text-align: right;"><b>\$500,000.00</b></td> </tr> <tr> <td>b) Daños a Personas</td> <td style="text-align: right;"><b>\$1,000,000.00</b></td> </tr> </table>	a) Daños a la Propiedad	<b>\$500,000.00</b>	b) Daños a Personas	<b>\$1,000,000.00</b>
a) Daños a la Propiedad	<b>\$500,000.00</b>				
b) Daños a Personas	<b>\$1,000,000.00</b>				
	<p>8. <b><u>CANCELACIÓN:</u></b> Esta Autorización podrá ser cancelada en cualquier momento a discreción del Secretario del Departamento de Recursos Naturales y Ambientales sin que en dicha cancelación venga obligado el Estado Libre Asociado a pagar indemnización alguna, previa celebración de vista administrativa.</p> <p>9. <b><u>INSTRANSFERIBILIDAD:</u></b> Esta Autorización es intransferible.</p> <p>10. <b><u>PROHIBICIONES:</u></b></p> <ul style="list-style-type: none"> <li>a) La Parte Autorizada no podrá remover ni destruir árboles y arbustos o vegetación en las áreas de embarco y desembarco sin la previa aprobación de “El Departamento”, quien podrá exigir como condición para dicha remoción o destrucción una compensación monetaria adecuada y/o que La Parte Autorizada se comprometa a la reforestación del área afectada.</li> <li>b) Nada de lo contenido en este permiso se interpretará como una autorización implícita de construir y/o mantener edificaciones que no estén específicamente mencionadas en la autorización, o que hayan sido aprobadas por “El Departamento” mediante una nueva Autorización o enmienda a la vigente.</li> </ul>				



11. **DISPOSICIÓN DE DESPERDICIOS:** La Parte Autorizada deberá deshacerse de los desperdicios que resultaren de su operación incluyendo, la basura y deberá salvaguardar la pureza de las corrientes de agua de la forma que se indica a continuación:
- a) Los desperdicios sólidos deberán ser depositados en aquellos vertederos debidamente autorizados por ley.
  - b) No se podrá descargar desperdicios que contengan sustancias nocivas a la fauna, vida silvestre o cuerpos de agua. Las facilidades de almacenamiento de sustancias nocivas que pudiesen contaminar los cuerpos de agua serán ubicados de tal manera que en caso de derrame no se afecten dichos cuerpos
12. **ACCESIBILIDAD AL ÁREA:** La Parte Autorizada permitirá el libre e ilimitado acceso al área y a las facilidades objeto de esta autorización a cualquier persona en su carácter individual y que no esté llevando a cabo actividades comerciales.
13. **VIGENCIA:** Esta Autorización tendrá vigencia por **un (1) año** a partir de la fecha en que sea firmada por la Subsecretaría Interina.
14. **RENOVACIÓN:** La Parte Autorizada podrá presentar una solicitud de renovación con no menos de sesenta (60) días de antelación a la fecha de vencimiento de la misma bajo los mismos requisitos y condiciones de Autorización original y la misma debe estar acompañada del formulario para el fin que proveerá "El Departamento". Acompañará el documento con un cheque o giro postal a favor del Secretario de Hacienda por la cantidad de quinientos (\$500.00) dólares.
15. **INCUMPLIMIENTO, SUSPENSIÓN Y REVOCACIÓN:**
- a) El incumplimiento en más de una ocasión con las cláusulas y condiciones de esta Autorización será causa suficiente para suspender la misma por el Secretario.
  - b) El proceso de suspensión de Autorización comenzará con el envío a La Parte Autorizada de una notificación escrita del Secretario con expresión de las causas para la suspensión por correo certificado con acuse de recibo.
  - c) El Secretario podrá revocar inmediatamente una Autorización por razones de salud, seguridad pública o impactos negativos inmediatos al recurso natural o cuyo efecto acumulativo en el recurso natural sea negativo, o si el tenedor de esta Autorización tiene alguna deuda o multa pendiente de pago en "El Departamento".

#### **CONDICIONES Y LIMITACIONES ESPECIALES**

1. **RIESGOS Y DAÑOS:** La Parte Autorizada por la presente asume todos los riesgos de pérdida y/o daños y perjuicios a la propiedad y a todas las personas que resultaren afectadas como consecuencia de las operaciones aquí autorizadas, relevando así de toda clase de responsabilidad y/u obligación a "El Departamento" por cualquier daño, litigio, sentencia, costos y/o gastos en relación con tal pérdida o daño, y en caso de iniciarse cualquier reclamación en la cual, bajo los términos de esta concesión a

	<p>“El Departamento” tenga derecho a protección y retribución, La Parte Autorizada asumirá inmediatamente la defensa “El Departamento” en dicho litigio, obligándose el “Concesionario” a satisfacer cualquier sentencia.</p> <p>El hecho de que “El Departamento” no tome acción alguna contra La Parte Autorizada al momento de ocurrir cualquier violación de la autorización, no se considerará como que consiente a tal violación ni que renuncia al derecho de dar por terminado esta autorización, o aplicar multas administrativas pudiendo en cualquier momento hacer uso de todos o cualesquiera de los derechos y acciones que la ley o esta autorización le conceda.</p> <p>2. <b><u>REQUISITO INELUDIBLE:</u></b> La Parte Autorizada deberá tener copia de la Autorización otorgada en y durante el transcurso de la actividad aquí permitida.</p> <p>3. <b><u>PROHIBICIÓN:</u></b></p>
There is no smoking or consumption of alcoholic beverages in the reserve	a) La Parte Autorizada no permitirá que las personas bajo su responsabilidad fumen y/o consuman bebidas alcohólicas en los predios de la Reserva Natural.
There is no consumption of water, juices, etc. in the reserve during active hours	b) Se prohíbe el consumo de agua, jugos, gaseosas y meriendas dentro de los predios de la actividad. El Oficial de Manejo identificará un área que podrá utilizarse para estos fines.
No one is allowed to swim inside the bay	c) La Parte Autorizada no permitirá bajo ningún concepto que las personas bajo su responsabilidad realicen actividad alguna que no sea la permitida en esta autorización, por lo que evitará que las personas se sumerjan, naden, se bañen, se lancen al agua o realicen alguna actividad similar en las aguas de La Laguna.
	<p>4. <b><u>INFORME MENSUAL Y ENTREGA DE DOCUMENTOS FINANCIEROS:</u></b></p> <p>a) La Parte Autorizada entregará los días quince (15) de cada mes, copia del informe y evidencia de los pagos realizados de la operación del mes anterior a la Oficina de Recaudaciones Central o Regional del Departamento y se asegurará que copia de la misma se entregue a la Sección de Usos de Terrenos y Permisos Forestales.</p> <p>b) La Parte Autorizada obtendrá una libreta de pago en triplicado y entregará al usuario un recibo de pago, mantendrá un recibo en su bitácora y entregará copia del recibo junto con el informe mensual a “El Departamento”. Dicho recibo contendrá el nombre del usuario, teléfono de contacto y la cantidad cobrada por la actividad.</p> <p>c) La Parte Autorizada someterá un informe mensual a “El Departamento” indicando la cantidad de personas que han visitado el área bajo esta Autorización y la cantidad pagada por estas personas.</p>

<p>The company pays 15% of its gross earnings to The Department</p>	<p>d) La Parte Autorizada pagará a “El Departamento” todos los días quince (15) de cada mes, el <b>quince por ciento (15%)</b> de los ingresos obtenidos en la operación del mes anterior, por concepto de la tarifa cobrada a cada persona que haya disfrutado de la actividad autorizada.</p>
<p>If every 15 days the company does not pay, interest is charged on the amount owed</p>	<p>e) Si el pago se hiciera luego del día quince (15) del mes, pagará “El Departamento” el interés legal prevaeciente durante cada día de atraso en el pago. El “Concesionario” no podrá realizar las actividades aquí autorizadas sin tener los pagos al día.</p>
	<p><b>5. <u>APERCIBIMIENTO:</u></b></p> <p>a) Se le <b>APERCIBE a La Parte Autorizada que la cláusula 1: de las Condiciones y Limitaciones Generales</b> estipula que “El Departamento” podrá cancelar o suspender la Autorización cuando se viole alguna de las cláusulas o por razones de salud pública o impacto negativo sobre el recurso natural o integridad ecológica del área, o si el tenedor de esta Autorización tiene alguna deuda o multa pendiente de pago en “El Departamento”.</p> <p>b) Se <b>APERCIBE</b> que por virtud de la Ley Número 23 de 20 de junio de 1972, según enmendada, conocida como Ley Orgánica del El Departamento de Recursos Naturales y Ambientales, y el Reglamento Núm. 7241 de 2 de noviembre de 2006, Reglamento para la Administración de los Aprovechamientos Mediante Autorización y Concesión en los Bosques Estatales, Reservas Naturales, Refugios de Vida Silvestre y Reservas Marinas, toda persona adversamente afectada por la otorgación, denegación, suspensión o revocación de una Autorización o gestión similar al amparo de las disposiciones del presente Reglamento podrá, dentro del término de diez (10) días laborables a partir de la adjudicación, impugnar la misma ante “El Departamento”.</p> <p>La impugnación será presentada en la Oficina de Secretaría de “El Departamento”. El trámite se regirá por lo establecido en el Reglamento de Procedimientos de Adjudicación y Multas Administrativas del Departamento de Recursos Naturales y Ambientales aprobado al amparo de las disposiciones de la Ley Núm. 170 de 12 de agosto de 1988, según enmendada, Ley del Procedimiento Administrativo Uniforme.</p> <p>Esta Autorización <b>NO</b> libera al concesionario de la responsabilidad y deber de obtener cualesquiera otros permisos que puedan ser requeridos por otras agencias o instrumentalidades de gobiernos estatales, federales o municipales.</p>