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The Clash of Heritage and Development on the Island of Roatã¡n, Honduras

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The Clash of Heritage and Development on the Island of Roatán, Honduras

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts
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Dedication

To my wife, without whom my life – and this thesis – would not be complete.
Acknowledgments

I could not have completed this thesis without the support of so many individuals, too many to mention. Without a doubt, what sanity I have left is due to the love and patience I’ve received from Whitney, my colleague, best friend, and wife. I am forever grateful to my parents for their never-ending cheers and understanding, in this and every other stage of my life.

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I wish to thank the Project Roatán 2009 field school students for their help while in the field, and I owe a debt of gratitude to USF’s Institute for the Study of Latin America and the Caribbean and the Sigma Xi Scientific Research Society, whose grants allowed me to travel to Roatán for two field seasons.
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Abstract

The present study examines the spatial relationship between archaeological sites on the island of Roatán, Honduras and their topographical and biophysical location, as well as how these relationships are and continue to be impacted by the island’s current socioeconomic context. Despite several studies and explorations conducted on the island's history, archaeology, and geography since the early twentieth century, little is known of its place and role within the larger cultural and socioeconomic spheres of interaction in this region: Mesoamerica and the Intermediate Area. Previous archaeological research has shown that hilltops on Roatán were chosen in prehispanic times for the location of the largest and most prominent sites, and several hypotheses have been put forward to explain the unique location of these sites. Despite the island’s potential for addressing questions regarding the culture and history of this poorly understood region of Honduras, Roatán’s status as Honduras’ top tourist destination has resulted in the altering of its landscape in irreversible ways, including the destruction of archaeological sites. Given this unique situation, site preservation and the study of settlement patterns on Roatán are intricately related, and they both need to be carried out simultaneously if research into the past of this island is to continue, since without immediate site preservation what little we can learn on prehispanic settlement patterns might be lost.
Using data compiled from previous archaeological research on Roatán, as well as data acquired through pedestrian survey carried out during the 2009 season of the University of South Florida (USF)’s Project Roatán, I have developed a Geographic Information Systems (GIS) geodatabase in order to provide a broader perspective on both prehispanic and modern settlement patterns. An analysis of site locations with regards to their topography shows that the majority of sites recorded on Roatán are in fact located on hilltops, an observation which, when complemented with other archaeological and ethnohistoric data from northeast Honduras, suggests a possible ritual importance of these spaces. An analysis of current settlement and urban growth patterns shows the degree to which development has encroached upon previously untouched areas of the island, which has impacted an increasing number of archaeological sites. I analyze the various factors and agents that have resulted in this situation, and highlight the need to carry out archaeological research that has heritage management and site preservation as one of its core priorities. These efforts must address the various components that define the management of archaeological heritage in Roatán and Honduras, including local socioeconomic context, national and international policy and law, as well as the various stakeholders with vested interests in cultural heritage. Due to the lack of adequate structures for managing and preserving archaeological resources on Roatán, I argue that approaches such as community participation and increased engagement from the part of researchers outside of Honduras' heritage management sphere are adequate and realistic short-term solutions to the pressing issue of protecting archaeological sites constantly in danger of being affected or destroyed.
Chapter 1 - Introduction to the Project

Basic questions regarding the political organization and cultural affiliations of the prehispanic Bay Islanders of Honduras have long remained unanswered due to a lack of sustained archaeological research in the area (Wells 2008). However, even though additional research is needed, spatial informatics tools, such as Geographic Information Systems (GIS), can help integrate and analyze available data in order to begin to answer questions regarding settlement and site planning patterns. In addition, GIS has the potential to be an extremely powerful tool for the management of archaeological heritage in areas where these resources are under constant threat, as is the case of Roatán, Honduras.

This thesis is framed within research carried out by Project Roatán of the University of South Florida (USF), specifically the work that was carried out during its initial field season in the summer of 2009. Project Roatán, a collaborative effort between USF and the Honduran Institute of Anthropology and History (IHAH), began with the inadvertent discovery of over 150 complete and partial ceramic vessels in one the laboratories of the Department of Anthropology at USF. After initial inventory and analysis (Moreno Cortés and Wells 2006), these vessels were repatriated to Honduras in August 2008 (Wells 2008). This repatriation prompted a request by the IHAH that USF carry out investigations of the archaeological site from where they came, El Antigual. In
response, USF carried out the first field season of Project Roatán in the summer of 2009, which included the excavation of El Antigual in order as well as the pedestrian survey of its immediate vicinity.

The archaeological investigation of the archaeological heritage on the island of Roatán, as well as the adequate management and protection of these non-renewable resources has remained largely unexplored and unaddressed. The island's booming economic growth and the subsequent infrastructural development and demographic expansion continue to affect archaeological sites, as well as the degree to which these archaeological remains can be interpreted. The increasing human and economic costs of managing archaeological heritage in this part of the country require approaches and solutions that are proactive, efficient, and take into account available human and technical resources. In order to contribute a solution to this major problem, I create and analyze a GIS geodatabase with the greater goal of highlighting this digital tool's usefulness for archaeological interpretation and the management of archaeological resources. Specifically, data on the archaeological sites previously identified on the island of Roatán are collected, integrated, visualized and analyzed in order to evaluate existing hypotheses concerning patterns in settlement and site planning on the island. Additionally, site impact assessment data collected in 2009 are evaluated and used to identify possible mitigation measures that take into account local socioeconomic contexts, national and international policy and law, as well as the various stakeholders with vested interests in the island's cultural heritage. GIS provides a new perspective to the analysis of prehispanic settlement patterns, revealing the presence of archaeological
materials in every point of elevation on the island, adding support to previous hypotheses regarding the predominance of these sites on the island. Visual and quantitative analyses of the impacts of modern development on sites, on the other hand, reveal a near total affectation of hilltop sites by roads, stressing the need to protect these sites in order to make possible their investigation in the near future.

The Bay Islands

The Bay Islands of Honduras have historically been an area of cultural, natural, and geophysical exception and diversity. They are located 30 km north of the Atlantic coast of Honduras, and span a total area of approximately 260.6 km$^2$. The Honduran Department of Islas de la Bahía is composed of a main group of islands: Utila, Roatán, Guanaja, Santa Elena (St. Helene), Morat and Barbareta (Figure 1.1).
The department of the Bay Islands also includes two groups of smaller islets and cays: the Cayos Cochinos (Hog Islands) and the Islas del Cisne (Swan Islands), the latter of which are located over 200 km east of the rest of the islands. There are a total of four municipalities in all of the Bay Islands, Utila, Guanaja, and two on the island of Roatán, Roatán and José Santos Guardiola. The remainder of this section refers only to the main group of islands.

Geologically, the Bay Islands are the result of an emerging narrow ridge that rises east-to-west out of the southern portion of the Bartlett Trough in the Caribbean Sea (McBirney and Bass 1969:229). Generally speaking, elevation increases as one moves eastward through the islands, though hilltops and ridges are a prominent feature of this entire landscape. There are no rivers on any of the islands, and sources of water are in the form of temporary streams or underground aquifers. Each of the islands is unique in its topography and geologic composition, a factor that has played an important role in the settlement and site planning patterns observed on each (Epstein 1975:5).

The island of Utila is characterized by low mangrove swamps and a few small, low hills on its eastern end; the soils on this island are surprisingly fertile, perhaps owing to the island's flat topography as well as volcanic tuffs and basalt lavas through coraline limestone (McBirney and Bass 1969:238). The island of St. Helene has been described as a virtual extension of Roatán (Strong 1935:3), since it is separated only by a long stretch of mangrove swamp. This island has a small elevated hill at its center, but is characterized by a large number of caves, most of which are located along a cliff on its western end. Morat is the smallest and flattest of the Bay Islands and is composed of a
single ridge with two small hilltops (Strong 1935:118), which are composed mainly of sedimentary rocks, with some serpentine intrusions (McBirney and Bass 1969:233). Barbareta, though also a small island, is nevertheless highly distinctive in that it contains several hilltops, the tallest of which reaches a height of 143 m above sea level. Barbareta also has the largest deposit of serpentine in the Bay Islands, which covers roughly one third of the island (McBirney and Bass 1969:230). Guanaja presents a mixture of the topographic and geologic features that characterize the two other islands. This island is roughly divided into three sections by a series of hilltops, the highest of which rises to over 350 m above sea level, the highest elevation of the Bay Islands. These hilltops include important deposits of granite, marble, and serpentine (McBirney and Bass 1969:236). In between these hills are moderately-sized alluvial plains that cut across these deposits, which have been densely populated since prehistory.

Roatán, the largest of the Bay Islands and the focus of this thesis, is characterized by its mountainous backbone, composed of hilltops that run west-to-east across the entire island. These hilltops are often crowned by outcrops of exposed metamorphic rocks such as marble, amphibolite, and serpentine (McBirney and Bass 1969:235). Flat, level areas are scarce throughout the central ridge of the island, and occur mainly along the coasts, though these are also limited in size. The island's southern coast has an abundance of deep ports and wide inlets, or 'bights', protected by reefs, while its northern coast is, save for a few narrow passages, largely inaccessible due to extensive coral reef growth.
Organization of the Thesis

This thesis is organized into seven chapters. Chapter 2 reviews the various theoretical as well as broader methodological approaches I employed in order to compile and analyze the GIS geodatabase, which is the database for this study. I briefly summarize the debate surrounding the traditional archaeological concept of 'site', and how this concept is used in the present thesis. Additionally, I summarize two approaches used by institutions and governments worldwide to evaluate the effectiveness of the management of archaeological resources. These approaches provide the framework under which the island's current social, political, legal and economic context are reviewed, and are also used to evaluate how this context continues to define the degree to which archaeological heritage on Roatán continues to be negatively impacted.

Chapter 3 reviews the relevant literature that deals with the two main themes of the thesis. First, I examine ethnohistoric accounts as well as previous archaeological studies that provide information and interpretations on prehistoric site planning and settlement patterns in northeast Honduras and the Bay Islands specifically, including site typologies created for the Bay Islands as well as the various hypotheses that have been developed in order to explain the unique distribution of sites across the landscape of Roatán.

In Chapter 4, I analyze sources relevant to understanding the practice of cultural heritage management in Honduras, including relevant pieces of national and international legislation, as well as the cultural heritage system and the various government bodies that comprise it. The second section of this chapter is a general overview of how GIS has
been employed in archaeology, namely for the analysis and interpretation of
archaeological data as well as for heritage management purposes. I conclude the chapter
with an historical overview of the various factors that have impacted and continue to
impact archaeological heritage on Roatán, including tourism development, development
infrastructure, and looting.

In Chapter 5, I summarize the various methods used to collect and analyze data in
the field and in the laboratory. I review the survey methods employed by Project Roatán
during its 2009 field season, as well as the methods by which data were obtained and
integrated into a GIS geodatabase. I conclude this chapter with the various methods of
spatial analysis I employed in order to better understand the distribution of sites on the
island as well as some of the major factors that negatively impact their preservation.

Chapter 6 presents the results of the various analyses performed on the data
compiled on archaeological sites and heritage management variables for Roatán. I begin
by reviewing the archaeological site inventory I developed based on data from Project
Roatán and previous archaeological research, as well as how this inventory has been
projected on a GIS and used to observe and interpret site distribution patterns. The
second section of this chapter presents the results of visual analyses conducted on a GIS
that includes both site location as well as impact data, namely roads and other major
island infrastructure. I first analyze the impacts observed and recorded in the area
surveyed by Project Roatán, and then extrapolate these findings to include all of the sites
on the island. The third and final section of this chapter presents an evaluation of the
various indicators for the effective management of archaeological heritage, and integrates
observations made by previous research on the island as well as the results obtained by my GIS analysis.

Chapter 7 presents a discussion of the various site location hypotheses with regards to both the results of my analyses as well as previous ethnographic and archaeological data. Following this evaluation I present various recommendations for future research on Roatán, namely the potential application of new technologies and methods such as GIS and intensive siteless survey in innovative ways. In this chapter I also summarize the various relationships between demographic growth, modern development, and impacts on sites in an effort to propose strategies and actions that archaeologists, local authorities, and heritage managers can employ to preserve and promote this important resource.

Chapter 8 presents my conclusions and recommendations regarding future archaeological research on Roatán, as well as the utility of GIS for both analyzing archaeological data as well as managing cultural heritage resources in areas that require instruments that are easy to share, maintain and interpret.
Chapter 2 - Evaluating Heritage Management, Preservation, and Policy

The current social, cultural, and economic context of Roatán demands archaeological research that takes into account not only the archaeological resources present on the island but also the different human and natural factors and variables that impact these resources. In order for archaeological research to be effective on Roatán, the factors that impact heritage resources on the island must be first identified, analyzed, and mitigated. Accordingly, in the theoretical framework for this thesis I first examine two approaches for the evaluation of cultural heritage management practices and their applicability to both Honduras in general and Roatán specifically. Second, given the challenges presented by the management of heritage resources, as well as the unique nature and location of archaeological sites identified on Roatán, I briefly address the theoretical discussion surrounding the archaeological concept of site.

As stated by Elia (2003), "In every country, the practice of archaeology and the preservation and management of cultural resources are grounded in law." In Honduras, the management of archaeological resources is carried out by a handful of state-funded institutions which are guided by several international pieces of legislation, primarily conventions adopted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and charters developed by the International Council on Monuments and Sites (ICOMOS), as well as national laws, policies, and guidelines. In
order to evaluate the management (or lack thereof) of archaeological resources on the Bay Islands, it is necessary to first understand these national and international structures as well as the laws, policies and guidelines that frame them, all of which is addressed in Chapter 4.

In the following paragraphs, I examine two approaches used to evaluate the effectiveness of the management protected areas (PAs). Several evaluation models have been used in the past in Latin America alone (see Cifuentes et al. 2000:13-20 for an excellent summary of these); here I examine two that have been developed under the aegis of the International Union for Conservation of Nature (IUCN) in order to evaluate the management of PAs, defined by the IUCN (IUCN 2008:8) as:

A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Although archaeological resources in the Bay Islands are not protected areas in the legal and formal sense of the word, they do adhere, at least in principle, to the above definition. Moreover, previous research on the Bay Islands has shown that the natural and cultural landscape of this region of Honduras unquestionably meets the criteria of a Category V PA, defined as, "a protected area where the interaction of people and nature
over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value..." (IUCN 2008:20).

Despite the above, a drawback of using these or any other models for evaluating the effectiveness of management of cultural heritage is the fact that they are designed to be a self-reporting and inclusive process, where teams of technical, administrative, and research staff as well as key stakeholders take an active role throughout the entire evaluation process. I, on the other hand, am applying these instruments as someone unrelated to the management of archaeological resources on the Bay Islands. However, adequate and effective management of archaeological resources begins with a baseline from which to improve management strategies, and this is what the present thesis aims to provide.

Model 1: Cyclical Management Framework

The first approach I examine here is the Management Effectiveness Evaluation Framework developed by the IUCN's World Commission on Protected Areas (WCPA) in 2000 and revised in 2006 (Hockings et al. 2006). The WCPA has developed a framework rather than a model in order to ensure its adaptability to PAs worldwide, allowing me to adapt it to the context of the management of archaeological resources on Roatán. This particular framework defines the evaluation of management as an adaptive, cyclical process that is divided into six stages: context, planning, inputs, process, outputs and outcomes, reflecting three major themes of management: design and planning, adequacy and delivery (Figure 2.1, Table 2.1) (Hockings et al. 2006:11).
Figure 2.1. Diagram of the IUCN-WCPA Management Evaluation Framework (from Hockings et al. 2006:12).

Table 2.1. Framework for Assessing Management Effectiveness
(from Hockings et al. 2006:13).

<table>
<thead>
<tr>
<th>Theme</th>
<th>Design</th>
<th>Appropriateness/ Adequacy</th>
<th>Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td>Context</td>
<td>Planning</td>
<td>Inputs</td>
</tr>
<tr>
<td>Focus of stage</td>
<td>Assessment of importance, threats and policy environment</td>
<td>Assessment of cultural resource design and planning</td>
<td>Assessment of resources needed to carry out management</td>
</tr>
<tr>
<td>Criteria assessed</td>
<td>Significance/values</td>
<td>Legislation Policy Management planning</td>
<td>Resources available</td>
</tr>
</tbody>
</table>
This framework begins the process of evaluation with a review of the PA's context, defined as the current status of the resources being managed, including their value and significance, the threats they face, as well as their external influences, including relevant stakeholders and communities. The values and significance of a resource are ascribed either by specific documents such as management plans or, more broadly, through legislation, guidelines and policies. The existing as well as potential threats to a particular resource or resources also need to be identified. Lastly, the external factors that influence the resources in question need to be identified, most importantly land uses surrounding the managed resources, as well as the national context, "including the priority accorded to conservation and the legislative and policy environment." (Hockings et al. 2006:17). External factors also include key stakeholders and communities, who influence or depend on these resources.

The planning stage of the IUCN-WCPA framework evaluates the design of PA systems, specifically how a PA's size, shape, location, boundaries, connectivity and integrity affect its management. Evaluating this element in the context of Roatán's archaeological resources is especially useful since it provides suggestions for the definition of archaeological sites in a way that takes into account their surrounding natural and sociocultural contexts. The third stage of this approach, the assessment of resources or inputs, evaluates whether or not the level, availability, and whether the degree of application of resources is adequate for the management of a particular PA. This stage first requires the ranking of these resources according to their value and/or
significance, and then the definition of resource quality and allocation standards according to each rank.

The fourth stage of this framework assesses existing management practices by comparing them against clear and adequate 'best practices' or benchmarks. This process is qualitative, and current processes are given a score or rating, thus giving an idea of how much these standards and benchmarks are being met and implemented (Hockings et al. 2006:24). This stage is closely related to the fifth stage of this framework, which assesses the specific products or services produced by management efforts as well as the extent to which various strategies, activities and tasks were implemented.

The fifth and final stage of the IUCN-WCPA framework assesses management outcomes, defined as long-term impacts based on the values being conserved for a particular PA. In order to evaluate the status of values, an 'acceptable range of variation' needs to be defined and the evaluation can rate, based on a numerical score, whether conservation objectives have been achieved. This framework introduces a hierarchical procedure for monitoring the status of a value based on three levels: attributes to be considered, indicators of these attributes to be measured, and methods to be used in this assessment. Table 2.1, below, summarizes the foci and criteria assessed by each stage of the evaluation.

**Model 2: Assessment Through Indicators**

The second approach I examine and apply in this thesis is the management evaluation model developed by Cifuentes and colleagues (2000), which has been widely
used in Central and South America. In particular, and the main reason I employed this
model in this thesis, this approach was used in the evaluation and revision of the
Management Plan for the Copán Archaeological Park in Honduras (IHAH 2005). This
model defines management as, "the combination of actions with a legal, political,
administrative, research, planning, protective, coordinating, interpretative or educational
character, that results in the better use and permanence of a PA, and the accomplishment
of its objectives." (Cifuentes et al. 2000:11).

This approach is based on the evaluation of the effectiveness of management
through the rating of a series of indicators, which are placed on a matrix and assigned a
rating level (0-4), which is linked to a quantitative level of management associated with a
percentage, ranging from unsatisfactory (<35 percent) to very satisfactory (91-100
percent) (Table 2.2). These indicators are then grouped according to four hierarchical
levels: fields, variables, subvariables and parameters (Cifuentes et al. 2000:16) (Table
2.2). These indicators

Table 2.2. Rating and Weighing Scale (from Cifuentes et al. 2000:33).

<table>
<thead>
<tr>
<th>RATING</th>
<th>% OF OPTIMUM</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&lt;35</td>
<td>Unsatisfactory</td>
</tr>
<tr>
<td>1</td>
<td>36-50</td>
<td>Minimally satisfactory</td>
</tr>
<tr>
<td>2</td>
<td>51-75</td>
<td>Moderately satisfactory</td>
</tr>
<tr>
<td>3</td>
<td>76-90</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>4</td>
<td>91-100</td>
<td>Very satisfactory</td>
</tr>
</tbody>
</table>
Table 2.3. Basic Management Evaluation Indicators Applicable to Roatán.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>Personnel, Finances, Organization, Infrastructure</td>
</tr>
<tr>
<td>Policy</td>
<td>Community support and participation, Intra-institutional support, Inter-institutional support, External support</td>
</tr>
<tr>
<td>Legal</td>
<td>Land tenure, Laws and regulations</td>
</tr>
<tr>
<td>Planning</td>
<td>Management plan, Zoning and boundaries</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Socio-economic information, Biophysical information, Ethnohistorical Information, Archaeological information, Legal information, Research, Monitoring and feedback</td>
</tr>
<tr>
<td>Illegal uses and Threats</td>
<td>Building of infrastructure, Tourism, Extraction of natural resources, Looting, Agriculture, Cattle grazing, Visitor impact, Pollution, Advance of human settlements, Migration, Natural disasters, Development infrastructure, Conflict of interests</td>
</tr>
</tbody>
</table>

Though not all elements of this model apply to the management of cultural resources on Roatán, the model is applicable to the evaluation of the management of archaeological resources on the island of Roatán for a variety of reasons. First, it adheres to and expands the IUCN-WCPA management assessment framework summarized above, providing an operational instrument that can be applied in the assessment of
process and outcomes. Second, it was developed based on management and evaluation experiences in Latin America and for its application in this region. Lastly, it is an extremely flexible instrument, allowing its users to modify and incorporate indicators at all hierarchical levels according to the local context, including areas not administered by the state, without sacrificing its structured and systematic nature (Cifuentes et al. 2000:22).

Unfortunately, the management of archaeological resources is often seen as "a branch of archaeology constituted entirely by practice and therefore essentially non-theoretical." (Carman 1995:19). However, the form and degree to which cultural resources are managed directly affects the resources themselves since management mechanisms, such as laws and policies, usually dictate what has an archaeological value, and this in turn influences our perception of what is 'archaeological' (Carman 1995:30). Given this premise, understanding how archaeological resources on Roatán and in Honduras as a whole are defined, managed, and valued is essential if we are to continue research on this rapidly diminishing non-renewable resource.

*The Archaeological Concept of Site*

The most basic and essential component of archaeological research and the management of archaeological heritage in Honduras is the archaeological "site", which in the context of this thesis is an issue that impacts archaeological interpretations made regarding past human activities on Roatán and the policies and management practices in place to protect their material manifestations. The implications of the concept of site to
both archaeological research and cultural heritage management, as well as the challenges and contradictions that result from each, are summarized below.

Unfortunately, the concept of site has never been defined or discussed by archaeological research undertaken in the Bay Islands and, like most archaeological research elsewhere in the world, its meaning and use have been taken for granted (Dunnell and Dancey 1983:271). Research has shown that the indiscriminate use of the concept of site has its drawbacks when applied to archaeological areas and regions whose artifact spatial patterns do not easily correspond to standard or customary definitions of 'sites', whether due to original deposition patterns or as a result of post-depositional processes (Barton et al. 1999; Caraher et al. 2006; Dunnell 1992; Dunnell and Dancey 1983; Foley 1981; Gallant 1986; Kantner 2008; Peterson and Drennan 2005; Plog et al. 1978; Stafford 1995; Tartaron et al. 2006; Thomas 1975; Wells et al. 2004). Gallant (1986:408) has divided the ways in which archaeologists approach the definition of sites into three categories, stating that archaeologists either don't define sites explicitly ("benign neglect"), provide only vague definitions ("correct but vague"), or base site definitions on rigid criteria such as artifact density or extension ("formalized approach"). Gallant (1986) as well as other before him (Dunnell and Dancey 1983:271) have noted that sites and their boundaries are defined according to decisions and not observations, and that using site definitions based on rigid criteria results in a systematic exclusion of sites that do not adhere to these rigid definitions from archaeological analyses, skewing any interpretations that result from these (Plog et al. 1978:387).
Critics of the site concept have proposed two different solutions for obtaining a more accurate picture of the continuous rather than discriminate distribution of material culture across a landscape. The first group of researchers (Caraher et al. 2006; Dunnell 1992; Dunnell and Dancey 1983; Tartaron et al. 2006; Thomas 1975) have argued for changing archaeology's basic units of measurement from sites to artifacts, stating that, "the archaeological record is most useful conceived as a more or less continuous distribution of artifacts over the land surface with highly variable density characteristics." (Dunnell and Dancey 1983:272) Other researchers (Gallant 1986; Plog et al. 1978:387; Wells et al. 2004) have instead argued for more localized definitions for sites, and suggest that sites should be defined based on their relationship to overall artifact densities. In an attempt to operationalize this method, Gallant (1986:409,416) states that sites can be defined only after all the data have been collected, adding that it is only when archaeologists look at the broader distribution of artifacts across a landscape that higher levels of density or continuity are observed and can be thus called 'sites'.

Because archaeology aims to interpret and understand past human culture and its relationship with the broader natural and biophysical landscape, the above solutions are highly attractive. Additionally, it is important for archaeologists to be aware of the various biases they perpetuate through the uncritical application of concepts and definitions, and it is equally important for archaeologists to be explicit in the decisions made in the field regarding the concepts and methods they employ (Gallant 1986:417). However, despite the advantages of 'non-site' (Dunnell and Dancey 1983), 'siteless' (Dunnell 1983), and 'off-site' (Foley 1981) approaches, several limitations exist which
have resulted in their lack of acceptance and application in the field (Kantner 2008). Kantner (2008:45-46) notes that non-site approaches do not take into account the fact that archaeological interpretations need to be based on associations between groups of materials, not on individual artifacts, which are meaningless outside of their broader context and associations. Additionally, non-site approaches that focus on the artifact as the basic unit of measurement and analysis are excessively time-consuming and, "the additional effort may seem excessive when the results are comparable to traditional site-focused archaeology." (Kantner 2008:46) The second criticism to this approach is that archaeological theory, specifically the various concepts and approaches espoused by processual or 'new' archaeology, have permeated the policies, laws, and methods used to manage archaeological heritage (Carman 1999; Kantner 2008; Smith 2004). Specifically, the processual concept of 'site' is the major archaeological entity recognized by management structures and policy bodies, including in Honduras, whose Law for the Protection of the Cultural Heritage of the Nation (Honduras 1997:Article 2) defines sites as, "those abandoned areas or places that present evidence of human activity in the form of artifacts, features and/or alterations product of this activity, be these of the precolombian, colonial or republican era, of anthropological and historical interest and including the evidences that are found in the jurisdictional waters on and below the surface." (translation by author). Aside from the fact that laws and policies often require the definition and delimitation of 'sites' in order to manage and protect them, "continuous distributions of material culture are much more difficult to work with for making
management or policy decisions about the recording and preservation of cultural heritage." (Kantner 2008:46)

Summary

The management of archaeological heritage is framed within legal, social, and political structures defined and guided by specific and often rigid laws, policies, and methods. In addition, the management and protection of archaeological heritage is determined by more than just the laws, policies, and institutions created to safeguard it, including these resources' social, cultural, and economic contexts. In order to propose effective, relevant, and operational ways to manage archaeological heritage on the island of Roatán, an evaluation of the current heritage management structure needs to be undertaken which takes into account the various factors that influence this management. The IUCN-WCPA Management Effectiveness Evaluation Framework (Hockings et al. 2006) is a very practical approach because it calls for a systematic evaluation of the management of Protected Areas according to various stages of management design, adequacy and delivery. The evaluation model proposed by Cifuentes and colleagues (2000) operationalizes several aspects of the IUCN-WCPA framework by suggesting fields and indicators by which the management of cultural heritage in a certain area can be evaluated using a quantitative rating scale. Of importance to any form of management of archaeological heritage is a clear definition and delimitation of the resources being managed and protected, which both of the frameworks reviewed above include (Cifuentes et al. 2000; Hockings et al. 2006). Traditional definitions of the archaeological concept of
site have been contested only in select parts of the world, and remain anchored solely in the academic realm. As a result, rigid definitions of sites are found embedded in legislation, policies and, consequently, management models. Future archaeological research as well as management efforts on Roatán will have to balance the need to obtained a more nuanced understanding of the island's landscape, which different approaches such as site-less or artifact-based surveys might be able to provide, with providing heritage managers and other key stakeholders defined and delimited entities so that appropriate measures might be taken to ensure their adequate protection. With these challenges and frameworks in mind, the following chapter presents a summary of the evidence that contributes to our understanding of archaeological heritage on the island of Roatán, as well as the various actors and factors that influence the preservation and management of these resources.
Chapter 3 - Literature Review

In order to address the prehispanic settlement patterns on the island of Roatán, archaeological data from previous projects and studies in both the island and the northeast Honduras region have been reviewed. Additionally, and in order to provide a complementary perspective to these data, ethnohistoric documents as well as ethnographies of current indigenous groups in this region have also been reviewed. I employ Cuddy's (2007:6) delimitation for this region:

...an area around the Bay Islands off the Caribbean coast, stretching inland as far as the town of Juticalpa, and extending as far eastward as the Patuca River, almost to the boundary of Honduras and Nicaragua. (Figure 3.1)

Figure 3.1. The northeast cultural interaction Zone (after Cuddy 2007:6).
Ethnohistoric Documents Concerning Northeast Honduras

Several authors have already reviewed and analyzed the rich ethnohistoric data available for the northeastern region of Honduras (Bancroft 1886; Chapman 1958; Conzemius 1927, 1928; Davidson 1974, 1991, 2009; Lara Pinto 1991; Lara Pinto and Hasemann 1988; Samson 1997; Squier 1858; Stone 1941; Strong 1935), and it would be redundant to repeat all of their findings and interpretations here. Instead, I review only those ethnohistoric accounts that shed light on possible prehispanic settlement and site planning patterns in this region, particularly with regards to the spatial patterning of archaeological materials on Roatán.

One of the first and most important pieces of ethnohistoric information available on the Bay Islands comes from a report ordered in 1527 by Governor Diego López de Salcedo on the customs and religion of the indigenous groups in northeastern Honduras (Herrera y Tordesillas 1944:12). This report found that there existed in this region three main idols which were worshipped inside temples:

...one four leagues from Trujillo, the other in a town thirty leagues away, and the third on an island fifteen leagues from this city. They were shaped like a woman and were carved from a greenish marble-like stone. To these they gave all of their devotion and entrusted their affairs and duties, so that they would guard them from bad weather and adversities. And they also had other idols and places of worship where they made their sacrifices. Each of the three main temples had a person called a Papa, who could not
marry, and had hair so long that it reached his waist, and had with him the sons of gentlemen to indoctrinate them. [Herrera y Tordesillas 1944:13, translation mine]

Unfortunately, no additional information is given on these idols or temples, save for the fact that Hernando de Saavedra burned the idol located closest to Trujillo in an effort to challenge the idol's power (Strong 1935:15).

A second historic document that provides important details on indigenous settlements, specifically on the Bay Islands, is a report requested by Governor and Captain General of Honduras Don Francisco de Avila y Lugo in 1639 on the 'Guanaja Islands,' or Bay Islands (Squier 1858:609). This report lists four major indigenous settlements on the Bay Islands, one on Guanaja, one on Utila, one on Santa Elena called Masa and one on the eastern edge of Roatán, near the border with Santa Elena, called Roata (Squier 1858:609). At the time this report was written, these four towns had approximately 400 "indians," including tributaries, women, and children.

Besides the two brief accounts summarized above, most other ethnohistoric and ethnographic observations deal either with indigenous groups only on the mainland, or with the whole of the northeast region. Even though the cultural affiliations of the indigenous groups of northeast Honduras are still very much debated and discussed today, ethnohistoric and ethnographic data on the material culture and practices of the Pech (also referred to as the 'Paya') indigenous group seems to provide the closest parallel
to the archaeological material observed on Roatán, especially with regards to site and settlement patterns (Begley 1999; Cuddy 2007; Davidson 1974, 1991, 2009; Stone 1941).

Of specific interest to the issue of settlement and site planning patterns are observations made about the Pech during the end of the 19th and first half of the 20th centuries. Ephraim G. Squier, writing on his travels through the 'Mosquito Shore' under the pseudonym of Samuel A. Bard (1855:293-294), describes a Pech village as being composed of a single 'longhouse'; a large pole-and-thatch structure located on a small rise and composed of many rooms, no walls, and built on top of a foot-high earthen platform contained within a single row of stones (Figure 3.2).

Writing in the early 1940s, and trying to find connections between the archaeological material and indigenous groups in northeast Honduras, Doris Stone (1941:19) observed that "a feature of the present-day Paya [Pech] is their adherence to certain ancient spots which they associate with definite religious rites." She cites an account written in 1807 by a Spanish friar that confirms this present-day practice going back further in time (Stone 1941:19). This observation is corroborated by Anne Chapman (1958) in her study on the indigenous tribes of northeastern Honduras, who notes that habitation sites, referred to as 'hamlets,' were relocated once the natural resources of a particular area were exhausted. Shrines, which were not at the core of these settlements but were instead used more like pilgrimage sites by a number of hamlets, were more permanent in nature (Chapman 1958:85, 97).
Chapman (1958) notes that shrines were in most respects similar to dwellings, in that they were perishable structures with no walls, though shrines were usually constructed on top of a stone or earthen platform or mound. She cites an ethnohistoric source that sheds more light on the composition of these shrines:

...they found a great many shrines and houses of idols and among them one more pretentious, in which, on a mound formed of stone and clay there was a devil the size of a man stretched out at length and round about there encircled him over 200 others, made of straw faced with native paper. [Chapman 1958:94]

Another account describes a shrine as a large house with no walls, elevated approximately 20 Spanish yards (approximately 17 m) from the surface and located atop a hill that has a singular and extraordinary view (Chapman 1958:95). These two accounts,
however, conflict somewhat with others that describe houses and dwellings as being constructed on top of platforms or mounds, such as Squier's description of a longhouse described above.

Chapman also makes very interesting observations regarding burial customs among indigenous groups in northeast Honduras. She cites several historical accounts which note that indigenous groups of this region placed burials in one of two locations: the floor of a dwelling which is subsequently abandoned, or in cemeteries that resemble "cities of the dead," because a dwelling has been erected on top of a grave (Chapman 1958:132). Additionally, bodies were buried inside a canoe with their personal belongings and, at least in contact and possible pre-contact times, all of the possessions of a person, including his cultivated fields and fruit trees, were destroyed upon his or her death in an effort to prevent the deceased person's spirit from lingering among the living and ease his or her passage into the underworld (Chapman 1958:133). These same observations were made by Conzemius while working among the Paya in the early 1920s (Conzemius 1927:300). Of particular interest to Roatán, Chapman briefly cites the account of Spanish missionary Fernando Espino, who noted that a Pech woman under his care was buried "…in a sepulcher, which they have on the mountain in a very large house that is kept very clean and that has a cross, and there are many buried there; instead of a coffin they place a canoe upside down as a tomb..." (Chapman 1958:133, translation mine).

Recently, William Davidson and Gloria Lara Pinto have analyzed a number of ethnohistoric documents related to the indigenous groups of northeast Honduras at the
time of contact (Davidson 1974, 1991, 2009; Lara Pinto 1991; Lara Pinto and Hasemann 1988). Of note is a document cited by Lara Pinto (1991:236) regarding the *papas*, or religious leaders, who, "were provided with elaborate dwellings in the mountains...In one case, a Spanish observer found a papa in a large house at the hub of paved walkways."

Also worthy of mention is the debate between these two researchers regarding the presence of a Nahua enclave in northeast Honduras, which is believed to have been located somewhere in the Aguán Valley, and which is used to interpret the cultural affiliations of the indigenous groups in this region as either being Mesoamerican (Lara Pinto 1991) or South American in nature (Davidson 1991, 2009).

To summarize, ethnohistoric sources provide two important observations regarding settlement and site planning patterns among the indigenous groups of northeast Honduras, which might provide parallels to understanding the spatial patterning of archaeological materials on Roatán: (1) unlike in Mesoamerica, where structures and buildings reserved for ritual or religious purposes were at the core of sites and settlements, ritual structures or 'shrines' in northeast Honduras are structures that, though little different from habitation ones, are isolated and shared by many settlements, which are usually temporary; (2) burials are placed in two locations with similar constructive patterns, namely under an abandoned dwelling built out of perishable materials, and include material items representative of a person's personal possessions. It is important to note that these accounts do not clarify whether these settlement and site planning patterns are the continuation of long-standing traditions or simply the result of colonial and post-
colonial pressures, and as such should only be used to guide future research directions, instead of to provide unfounded answers.

Chronology of Northeastern Honduras

As stated by Cuddy (2007:50), "The cultural chronology of northeast Honduras is marked in the archaeological record by ceramic horizons that are diagnostic of specific cultural periods," this due to the fact that only a handful of radiocarbon samples have been analyzed for this entire region (Begley 1999; Healy 1984c). The chronological sequence employed in this thesis follows that which has thus far been employed in this region (Begley 1999; Cuddy 2007; Dennett 2007; Healy 1993) (Figure 3.3).

![Figure 3.3. Chronological periods of northeast Honduras and nearby regions (modified from Cuddy 2007:51).](image-url)
The first survey of northeast Honduras was carried out by Herbert Spinden (1925) of Harvard University between the city of La Ceiba and the Bluefields region of northeastern Nicaragua, including the Department of Colón, as well as a brief visit to the Bay Islands. Spinden visited and made observations on several sites, some of which contained mounds of different heights and sizes, shell heaps, earthen walls, ditches (sometimes referred to as 'moats') and/or stone slabs placed upright. Of special importance to the present study is the observation made by Spinden (1925:534) at the site of Maloa, where he noted several large mounds located on the summit of a hill, "one of which is faced with some rough slabs set on end."

During 1933, William Duncan Strong (1933), working under the aegis of the Smithsonian Institution, carried out a project that surveyed and excavated sites along the railroad tracks that led to and from Trujillo. Unfortunately, Strong never published a report of these investigations on the mainland (Cuddy 2007:29). However, his field journals and the collections he obtained while in northeast Honduras have been examined by Thomas Cuddy (2007), who states that the site planning and settlement patterns in this region, "suggest a level of complexity analogous to that of complex chiefdoms," (Cuddy 2007:142) this based on Strong's observations of large complexes of mounds sometimes surrounded by moats and located on natural rises or terraces near rivers and other major waterways (Strong 1933:43).

The next major investigation of this region was undertaken by Doris Stone (1941:10), who visited and carried out excavations on several sites in what she called the
'Paya region,' namely the Aguán and Agalta valleys. Based on her survey, Stone (1941:50) states that Paya village sites generally consist of three different types of mounds, "shell mounds resembling kitchen middens and in reality refuse heaps, (2) common earth mounds, sometimes with shell mixed in, or occasionally with stone; and (3) ceremonial mounds of plain, light-colored earth, with seldom any stone." Interestingly, her description of the dwelling mounds as being long and rectangular, mostly of only earthen construction but sometimes with a few retaining stones, is quite similar to Squier's ethnographic description of a Paya longhouse made nearly a century earlier (see above). Ceremonial mounds, on the other hand, are described as circular, generally isolated and located at least some distance from dwelling mounds (Stone 1941:52).

The first systematic and long-term project carried out in northeast Honduras began as a small research program led by Gordon Willey and Paul Healy of Harvard University's Peabody Museum of Archaeology (Healy 1975:62). This effort was later expanded into the Colón Project and was directed by Paul Healy of Trent University. In the course of a decade, Healy identified over 16 archaeological sites, conducted 25 excavations on five sites, and analyzed the first radiocarbon samples in this region (Healy 1975, 1976a, 1976b, 1978a, 1978b, 1978c, 1983, 1984a, 1984b, 1984c, 1993). Healy's investigations have provided a wealth of information regarding this region's architectural patterns, namely the absence of architectural features such as plaster floors, stone facing or rigidly controlled site planning, as is the case in sites across Mesoamerica (Healy 1975:65).
His excavations at the site of Selin Farm (Figure 3.4 above) also suggest that mound superstructures were round in shape and constructed of perishable materials, a pattern that seems to be the norm in sites across this region (Healy 1978a:59). The one exception to this rule is the site of Rio Claro, which consists of over 50 rectangular mounds organized around two large open areas or plazas. The site is circled by a deep depression or moat, and appears to have had at least three stone causeways. Additionally, Rio Claro is described as a site, "where space seems to have been at a premium: the placement of the house mound-temple (?) and the shape and size of the mounds are far more rigidly controlled." (Dennett 2007:88; Healy 1978b:26) (Figure 3.5)
Chronologically, Healy's investigations revealed a complete absence of archaeological data between 400 B.C. and A.D. 300, which is explained more as a consequence of limited research in the area as opposed to actual cultural patterns (Healy 1984a:231). During the Selin period (A.D. 600-900), data suggest that settlements are small and irregularly arranged, while subsistence patterns are broad and encompass maize agriculture as well as exploitation of marine and riverine environments. The Cocal period (A.D. 900-1500), however, is characterized by an increase in settlement size and complexity, as well as an increase in the diversity of animal species being exploited, particularly from marine environments (Healy 1983:45).

In 1984, a brief survey project titled Proyecto Costa Norte (PCN), was carried out by Robert Sharer, David Sedat and Alessandro Pezzati of the University of Pennsylvania.
in the Departments of Atlántida and Colón (Sharer et al. 2009). In the course of four months, they recorded 17 sites, including several possible sources/workshops for stone tools consisting of large granite or diorite boulders with grooves on their surface (Sharer et al. 2009:79-80, 87-88). These have interesting parallels to similar features found on Roatán, which are described in the following section.

Beginning in 1991, Christopher Begley of the University of Chicago began the seven-year Proyecto Rio Platano (PRP) under the auspices of the IHAH in the Culmí Valley of Olancho, in what could be considered the southeastern limit of our region of study (Begley 1999). Begley recorded a total of 87 sites, of which 77 had visible (mound) architecture, while only eight of these consisted of low density sherd scatters located on ridgecrests (Begley 1999:192). After conducting test excavations and surveys of some of these sites, Begley concluded that site planning in eastern Honduras is extensively diverse and included sites that are formally and informally organized with structures that also vary in size and shape, from small square platforms to linear longhouse-like structures, all with superstructures composed of perishable materials, including bajareque (Begley 1999:206).

Using radiocarbon dating as well as ceramic chronologies, Begley (1999:198,206) estimates that the majority of the sites in the Culmí Valley date to the Selin period, with very few Cocal period sites. Additionally, the largest sites and most extensive components of sites all date to the Selin period, a fact that stands in contrast to Healy's finds near the coast, suggesting that northeast Honduras experienced its greatest period of development during the Selin, not the Cocal (Begley 1999:223).
Two main observations can be made regarding the site planning and settlement patterns thus far observed in mainland northeastern Honduras, which can then be used to interpret sites on Roatán. First, archaeological sites on the mainland are characterized by three types of mounds; shell middens or refuse mounds; habitation mounds, which are usually elongated, rectangular and of earthen construction, with some of these having a single course of stones for retaining purposes and appear to have had perishable superstructures; and, mounds for ritual or religious purposes, which are smaller than habitation mounds, usually circular or oval-shaped, and are sometimes found some distance away from main settlement areas. Lastly, sites in mainland northeast Honduras are in their vast majority located near major rivers and their tributaries in alluvial valleys, often on the tops of natural rises that protect them from the threat of flooding.

Research and Exploration of the Bay Islands

Research and exploration of the Bay Islands’ prehistoric and historic archaeological heritage has often been embedded in or carried out as a component of broader projects working in the northeastern region of the country and can be grouped into the broad periods that are common in archaeological sites and areas across the globe. The following section begins by summarizing the observations of early explorations of the Bay Islands as well as those of the first archaeological projects of the 1930s and continues with a summary of ‘modern' investigations in chronological order, concluding with some of the hypotheses that have been posited for the function of archaeological sites on Roatán.
**Tales, Explorations, and Early Archaeological Projects**

Among the first observations of archaeological materials on the Bay Islands are a brief report from a visit to the islands by Thomas Young in the 1840s (Young 1847) and some observations on some of the larger sites found on Utila by a longtime resident of this island (Rose 1904). The main value of these early documents are the insights they provide on archaeological features no longer observable today; Young describes niches containing "peculiarly cut three-legged stone chairs" located along the stone wall that circles the site of Plan Grande in Guanaja, suggesting a ritual rather than defensive purpose for this feature (Young 1847:48); Rose (1904:41-42), on the other hand, observed and recorded various "cobbled roads and causeways" that led to the top of Stuart's Hill, located near the center of Utila, which resembles the description of the dwelling of a *papa* or Pech religious leader (Lara Pinto 1991:236).

While reporting on his travels along northeast Honduras, Spinden made a brief but important observation on the Bay Islands: that their shores have shell heaps similar to those he observed at sites near Trujillo on the mainland (Spiden 1925:539). Eduard Conzemius also visited the Bay Islands in the late 1920s and was impressed by the presence of cobbled roads observed on Utila as well as the large site of Plan Grande in Guanaja, concluding that "these aborigines were not savages, but enjoyed a comparatively high degree of civilization" (Conzemius 1928:66).

Following Spinden's visit, various explorations of “primitive” and “indian” sites, including claims to the discovery of lost sunken cities (Houlson 1934; Mitchell-Hedges 1954), were undertaken in the 1930s by the renowned Heye Foundation (Houlson 1934;
Mitchell-Hedges 1954) as well as wealthy private individuals (Moyne 1938). As is explained later in this chapter, these very first explorations would have very deep and irreversible consequences for the preservation of archaeological resources on the Bay Islands for years to come.

The earliest formal archaeological investigations on the Bay Islands were carried out by William Duncan Strong, A.W. Payne, and Norman A. Haskell as part of their broader northeastern Honduras project (Strong 1935:2). Strong visited and excavated various sites on each of the main islands; in Utila, he found urn and bundle burials associated with artifact offerings arrayed in very distinct patterns (Strong 1935:20-28). During a longer stay on Roatán, he found rich and extensive deposits of material on the summits of several hilltops, including the largest undisturbed cache or "offertory" found so far in this region, though this was not associated with any human remains (Strong 1935:52). On Santa Elena, Strong (1935:75) found two caves that, though they had previously been looted by Mitchell-Hedges, still yielded considerable amounts of material. While on Barbareta, he excavated two sites located on a hilltop and was informed of a larger site located on the summit of the highest hill on this island, which he did not have an opportunity to visit (Strong 1935:117); in Morat, he took a small surface collection from another hilltop site and; in Guanaja, he mapped the site of Plan Grande using a plane table (Figure 3.6) and visited several other sites, including Stanley Hill, where he suggests the possibility of its summit being terraced (Strong 1935:120).
Figure 3.6. Map of Plan Grande strong drawn by Strong and Haskell (from Strong 1935:130).
Shortly after Strong left the Bay Islands, R.W. Feacham from Cambridge University briefly visited the Bay Islands, sponsored in part by Lord Moyne, who had extensively looted the Bay Islands only two years before (Moyne 1938). Feacham explored sites in the major Bay Islands and made a small surface collection in the Hog Islands (Feacham 1940:186-187). Of interest is his description of a "very extensive ancient settlement site" located on the northeast tip of Roatán near Santa Elena but which had already been extensively looted (Feacham 1940:182). Also worth mentioning are Feacham's observations on two large boulders, one near Pulpit on the northeastern end of the island and the other near Fiddler's Bight on the southern shore of the central part of the island, which present several holes on their surface averaging 4 inches in depth and 6 inches in diameter (Feacham 1940:182). Their description, as well as Feacham's note that they might be artifacts, resemble the descriptions of lithic sources and workshops found by Sharer and colleagues on the north coast (see section above).

Modern Archaeological Research

After an intensive period of exploration and early research, the Bay Islands disappeared from the archaeological radar until the 1970s and 1980s, when the most formal archaeological surveys of the islands to date were carried out. Methodologically, these projects continuously grappled with the fact that site planning and settlement patterns on the island are unique and, it can be argued, exclusive to this region of Honduras (Begley 1999:206, Davidson 1974:30, Epstein 1975:7, Horton 1985:3). In order to begin addressing this issue, these projects each utilized their own functional and
qualitative definitions for determining what constitutes a site, often implicitly. Only one project explicitly defined an archaeological site as, "a coherent locus of the remains of past human activity, however small" (Horton 1985:3). Additionally, and in order to elucidate the relationships between sites and between sites and the landscapes they are embedded in, some of these projects have also developed site typologies.

*Previous Site Typologies*

The first typology of archaeological sites documented on Roatán was proposed by a geographic historian, William Davidson (1974:20), who reviewed ethnohistoric documents and previous archaeological investigations on the Bay Islands as part of a study on their historical geography. He classified sites into four categories according to function: residential, offertory, burial, and unknown (Davidson 1974:20), the latter of which includes sites such as caves, rock art sites, and pottery sherd scatters.

During the summer of 1975, a brief six-week survey sponsored by the University of Texas at Austin and carried out by Jeremiah Epstein, Herman Smith and George Hasemann recorded a total of 33 archaeological sites on the island of Roatán (Epstein 1975; Epstein and Véliz 1977). Although the main goal of this project was the identification of coastal sites on the island, the majority of sites (25 sites) were located on the summits and slopes of hilltops (Epstein and Véliz 1977:34). Based on the results of their project, Epstein's team refined and expanded Davidson's typology to include the following site types: coastal, piedmont, summit, village, and offertory/burial (Epstein and Véliz 1977:30). Although the authors agree that these categories are overly simplistic and
based on very little excavation data, they define a village as “an area that covers enough
terrain to accommodate at least 4 or 5 houses” (Epstein and Véliz 1977:32). They define
offertory/burial sites the same as Strong and later on by Davidson, while the rest of the
categories are based solely on the sites’ topographical locations.

A lesser known project, Proyecto Operación Raleigh, was carried out in 1985 and
was directed by archaeologists Mark Horton of Oxford University and Fiona Wilmot of
Cambridge University in coordination with the IHAH (Horton 1985). This project carried
out the most extensive survey to date of the entire Honduran Atlantic island chain,
including the Bay Islands as well as the Cayos Cochinos (Hog Islands). A total of 246
sites was identified and recorded, and previous typologies were expanded to include
seven categories: ceremonial centers - of which there is only one, the site of Plan Grande
in Guanaja; upland settlement sites, or sites located on hilltops and ridges; lowland
settlement sites, such as 80 Acre on Utila; coastal sites; natural feature sites, such as
caves, springs, or cliff faces; colonial sites and; underwater sites (Horton 1985:5-6).

The last and most recent period of archaeological investigations includes
Christopher Begley’s (1999) excavations at the site of Difficulty Hill on Roatán and Plan
Grande in Guanaja, as well as several smaller projects carried out by IHAH personnel,
mostly in response to or to prevent site destruction by construction and development
activities (Cruz Castillo 1999; Cruz Castillo and Orellana 2000). Begley (1999:116) notes
possible terraces on the southern slope of Difficulty Hill, an observation that had also
been made by Epstein (1975:29). However, during his short visit and excavation at
Difficulty Hill, Begley (1999:116) did not find any additional evidence of surface
features, including a cobble terrace retaining wall that had previously been observed by Epstein at this site (1975:29). While working at the site of Charley Brown, Cruz Castillo and Orellana (2000:13) also noted the presence of terraces, which once excavated yielded several human burials as well as ceramic materials. Excavation of these terraces also revealed some evidence as to their construction, and Cruz Castillo and Orellana (2000:7) noted that these were built of soil compacted together with karstic rocks, which provided a solid fill for these features and were also used to build retaining walls (Figures 3.7 and 3.8).

Figure 3.7. Construction fill of one of the terraces on the Charley Brown site (from Cruz Castillo 2000:8, used with permission of the author).

Figure 3.8. One of the terraces excavated at the Charley Brown site, note retaining wall on the left (from Cruz Castillo 2000:10, used with permission of the author).
These projects as well as Project Roatán abide by the Site Categorization Guide developed by the Honduran Institute of Anthropology and History (IHAH), which was originally created to be utilized by archaeological projects nationwide in an effort to standardize site recording procedures and thus help in the creation of a national inventory of sites (IHAH n.d.). This typology is based on site size as opposed to function, and includes five categories of sites; ranging from Category 1 sites, defined as “sites with little archaeological presence both on the surface as well as below the surface, with no presence of architectural structures on the surface;” to Category 5 sites, defined as “…the largest sites in a region of study, which are supposed to have functioned as „core centers” for a specific region, and are defined by its highest structure being between 5-12m in height…,” etc. There is a sixth category for „special sites,” which includes rock art sites, shell middens, lithic workshops, historic sites, among others (IHAH n.d.).

*Previous Hypotheses Concerning Site and Settlement Patterns*

As stated by Epstein (1975:5), “A major problem [in Bay Islands Research] is to define as specifically as possible the nature of the various kinds of sites on the islands and determine how they are related to each other and to the different topographical features that characterize each island”. Over the past 40 years, several hypotheses have been presented in order to explain the settlement and site planning patterns present in this region. These hypotheses will be summarized in the following paragraphs and will be tested in Chapter 7 against the site data gathered by previous archaeological research on the island of Roatán, which has been compiled and integrated into a GIS database.
Hypothesis 1: Defensive Sites. Towards the end of the 1970s, the few formal archaeological projects that had thus far been carried out on the Bay Islands had determined that the majority of large sites on Roatán were located on the summits of hilltops (Epstein 1975; Epstein and Véliz 1977; Strong 1935; Véliz et al. 1977). This observation led to several hypotheses to explain the distinctive location of these sites, including the possibility that defense was a major concern during Period IV (A.D. 1000-1500), also known as the Postclassic or Cocal Phase. This hypothesis was first raised by Véliz, Willey and Healy (1977:15), and was based on the fact that hilltop sites often provide an uninterrupted view of the coast, as well as the belief of modern island inhabitants that these sites were built by the indigenous people of Roatán to protect themselves from British privates and buccaneers (Epstein and Véliz 1977:37). Unfortunately, and as has already been acknowledged by the authors of this hypothesis, there is currently little archaeological evidence and no ethnohistoric records to support this idea.

Hypothesis 2: Avoidance of Insect Pests. This second hypothesis was first proposed by Davidson (1974:20), who states that hilltops are areas relatively free of insects, adding that "Winds on this higher ground seem to help keep mosquitos away and the pesty sandfly never ranges far from his sand beach home". As has already been stated by Epstein and Véliz (1977:37), this hypothesis is interesting in its simplicity, though it is contradicted by the several coastal sites that have been recorded on the island.

Hypothesis 3: Off-Shore Ceremonial Center/Island. This hypothesis has thus far dominated the discourse on settlement patterns in the Bay Islands in general, particularly
regarding sites on Roatán. This idea was first posited by Strong, who likened "making offerings at certain traditionally or scenically significant places" to sites such as the Bay of Chetumal in the Maya area (Strong 1935:152). However, he presents this comparison with the important caveat that observations on the predominance of ceremonial sites in the archaeological record in both the Maya area and the Bay Islands, "may be more of a commentary on archaeologists than on native customs" (Strong 1935:152). Davidson seems to support this hypothesis with both archaeological as well as ethnohistoric evidence, specifically with a brief note by colonial historian Salcedo that there was a major religious shrine for mainland Indians somewhere in the Bay Islands at the time of the European encounter (Davidson 1974:30).

Epstein and Véliz (1977:36) also offer support for this hypothesis after observing and recording several important hilltop sites on Roatán, stating that aesthetically, hilltop summits offer a "truly magnificent" view of the islands. In practical terms, they note that hilltops on Roatán are the only ones on the Bay Islands that contain abundant rocky outcrops, from which they believe indigenous groups obtained the stone slabs that are characteristic of both burials and offertories (Epstein and Véliz 1977:36). However, they also present evidence that challenges this proposal, including the possibility that the terraces they observed on nearly every large archaeological site appear to have had an agricultural purpose, and the fact that the rich and deep middens they excavated in the western portion of the island are composed mainly of utilitarian rather than ritual artifacts and materials (Epstein and Véliz 1977:37). Epstein (1975:5) refines this hypothesis by stating that residential sites are often found on hilltops with gentle slopes (which allowed
for terracing) and sufficient flat areas, while hilltops with steeper slopes and small summits appear to have been used as shrines, offertories, or for burials.

This hypothesis was refined temporally by Véliz et al. (1977: 16), who suggested that the Bay Islands were used as sacred areas for offertories and burials during the Selin Period (A.D. 600-900), but that after the decline of the Maya city-states during the Postclassic/Cocal Period (A.D. 900-1500), the islands were no longer considered sacred ground and were densely inhabited, a fact that was observed and recorded by the Spanish at the beginning of the 16th century. Epstein (1975:4) agrees with this idea in part, noting that the largest sites recorded in the course of his survey appear to have been occupied since at least the Selin Period, thus suggesting that the island was never exclusively utilized for a single purpose.

_Hypothesis 4: Dual-Subsistence Postclassic Settlement._ Project Operation Raleigh offered the most recent hypothesis regarding settlement patterns in this area, which focuses solely on the Cocal Period. Horton hypothesizes that, "substantial population expansion can be noted in the Post Classic [Cocal] by two different economic groups, one relying on coastal resources and the other on slope agriculture" (Horton 1985:7). This hypothesis is based on two important factors: first, the vast majority of the materials recovered by Operation Raleigh were from the Cocal Period; and second, the project recorded over 30 coastal sites on Roatán alone, the largest number of coastal sites thus far recorded on the island (Horton 1985:6). The latter is important given that it challenges all previous hypotheses based on the large majority of sites being located on hilltops and ridges.
Summary

The hypotheses regarding the function of archaeological sites on Roatán are all limited by the dearth of data available, a fact stated by the authors of the hypotheses themselves. Although more than 130 archaeological sites have since been observed and recorded on Roatán alone, only a handful of these have been excavated, a factor that continues to limit our understanding of the spatial and temporal extent of cultural activity on the island. It is important to mention the brief cautionary remark made by Strong in the 1930s, which rings true to this day:

The fact that far more ceremonial sites than habitation sites are known in the Maya area, as is true in the Bay Islands, may be more of a commentary on archaeology than on native customs. (Strong 1935:152).

Even though the recent survey carried out by Project Roatán does not present enough data to either support or contest these hypotheses, the integration of our survey data with data from previous archaeological projects does allow us to test some of these approaches and make recommendations for new avenues of research on the Bay Islands and on Roatán that take into account not only previous archaeological research but also the modern social, economic and political context of the Bay Islands.
Chapter 4 - The Legal and Historical Framework of Cultural Heritage

Management in Roatán

The effective management of cultural heritage on the island of Roatán must take into account the trajectory of heritage management efforts both at the national and local levels, whether these have positively or negatively affected these resources. At the national level, the research and management of cultural heritage in Honduras is framed by perhaps one of the strictest cultural heritage laws in Latin America and has been guided, at least in part, by a host of international conventions and charters. Additionally, several pieces of national legislation mention the importance of preserving and protecting the country's cultural heritage. At the local level, archaeological heritage on Roatán has continuously crossed the border between fascination and neglect, being the object of intense looting and suffering the effects of uncontrolled development and urban expansion. Advances in technology, such as those provided by GIS, may aid in not only visualizing the extent and variety of these resources, but also in effectively implementing national and international laws and policies to protect and preserve them.

In this chapter I first review sources pertinent to the management of archaeological resources in Honduras, namely the major pieces of international legislation of which Honduras is a supporter or signatory, as well as the national laws, guidelines and policies that govern and regulate the definition, research, protection,
preservation and promotion of the nation's cultural heritage. In the second section of this chapter I briefly summarize the uses and applications of GIS in archaeology. First, I review the literature that has used its scale-independent nature to carry out archaeological analyses at the site, intra-site and regional level, among many others. I then conclude with a summary of projects and efforts that have applied GIS to the management of archaeological heritage, highlighting the potential use of GIS for developing and managing integrated and multi-component site inventories, as well as the value of this tool in the evaluation of the impacts of modern development on archaeological heritage in this region and in Honduras as a whole. I conclude this chapter with a review of the history of modern human occupation of Roatán, including the occasional treasure-seeking visitor, and how this occupation has negatively impacted the preservation of archaeological heritage on the island.

*International Legislation*

As defined by the UNESCO (2011), conventions are, "formal multilateral treaties with a broad number of parties...normally open for participation by the international community as a whole, or by a large number of states." In essence, these documents are official commitments by state governments to abide by certain rules and standards -- in this case concerning cultural heritage in its various forms and manifestations. Enforcement of conventions rests on international pressure placed on the Honduran state to continually report on the state of the various resources it has vowed to protect, preserve or promote, according to the various conventions it has signed. Doing so promotes
transparency as well as an increased use of monitoring, evaluation and reporting instruments.

Charters, in the context of this thesis, are defined as formal instruments that recommend principles, techniques as well as operational guidelines for the conservation of cultural heritage. Charters are first developed in the context of the General Assembly of the ICOMOS, one of the three formal advisory bodies to the World Heritage Committee. The ICOMOS consequently adopts these charters and in many cases makes a formal recommendation to the UNESCO that they be turned into an international convention.

*UNESCO Conventions*

The state of Honduras has ratified and acceded various key international charters and conventions concerning the protection and management of cultural heritage. Though the complete list is extensive, only three are worth mentioning given the forms of archaeological heritage observed and recorded on the Bay Islands. The first convention ratified by Honduras was the Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, which was adopted by the United Nations in 1970 but was not ratified by Honduras until March of 1979. This convention allows each state party to define what it considers 'cultural property,' and commits each state party to create an institution in charge of promoting the protection of cultural heritage by creating laws, developing and continually updating cultural property inventories, and ensuring the protection of the country's cultural heritage from illegal
import, export, and transfer (UNESCO 1970). The ratification of this convention and the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage fostered the development of the first piece of national legislation concerning cultural heritage in Honduras, the Law for the Protection of the Nation's Cultural Heritage.

The second convention of relevance to the cultural material observed on the Bay Islands is the Convention on the Protection of the Underwater Cultural Heritage, adopted by UNESCO in 2001 and ratified by Honduras in 2010. This convention highlights the special and fragile nature of underwater cultural remains, recommending principles for their proper recording, recovery, analysis and preservation (UNESCO 2001). Most importantly, the main principle advocated by this convention is that in situ observation and documentation is to be considered the first option before allowing any other activities to be carried out on remains of this type.

**ICOMOS Charters**

Various international charters adopted by ICOMOS have guided the management of archaeological resources in Honduras for the past several decades, specifically the policies and practices of the IHAH. Table 4.1 presents the charters Honduras has in some degree or another applied or taken into account in plans, laws and policies related to the archaeological heritage of the nation (Agurcia Fasquelle 1984; IHAH 2005; Lara Pinto 2006; Mejia 2004):
### Table 4.1. ICOMOS Charters Supported or Implemented by Honduran Legislation.

<table>
<thead>
<tr>
<th>Charter</th>
<th>Major/Relevant points</th>
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| **International Charter for the Conservation and Restoration of Monuments and Sites**<br>Venice Charter, 1964 | • Monuments and sites should be conserved in situ, with no modification to them or their landscape  
• Excavations of sites should follow scientific standards  
• All work undertaken in sites of historic and cultural importance needs to be documented and published |
| **Charter for the Protection and Management of the Archaeological Heritage**<br>Lausanne Charter, 1990 | • The protection of archaeological heritage is an interdisciplinary as well as collaborative activity between government, researchers, and the community  
• Policies for the protection of the archaeological heritage should constitute an integral component of policies relating to land use, development, and planning as well as of cultural, environmental and educational policies  
• Any development project must take into account and minimize the impact it will cause on archaeological resources  
• Archaeological survey and site inventories are a basic obligation in the protection and management of the archaeological heritage  
• Excavation should be carried out on sites and monuments threatened by development, land-use change, looting, or natural deterioration |
| **Guidelines for Education and Training in the Conservation of Monuments, Ensembles and Sites**<br>Colombo Charter, 1993 | • The conservation and management of cultural heritage needs to be undertaken by adequately and continuously trained personnel with adequate resources |
| **Charter on the Protection and Management of Underwater Cultural Heritage**<br>Sofia Charter, 1996 | • Outlines the minimal requirements of professionals and projects that wish to investigate, analyze and conserve underwater cultural heritage  
• This charter was adopted by UNESCO as a convention (see above) |
| **Charter for the Conservation of Places of Cultural Significance**<br>Burra Charter, 1999 | • Cultural significance defined as heritage having aesthetic, historic, scientific or social value, and management, protection and conservation must take these values into account |
| **International Cultural Tourism Charter**<br>Mexico Charter, 1999 | • Tourism can be a positive force for cultural conservation  
• Heritage places and collections need to be ensured a sustainable future by the tourism industry through policies  
• Before a place is developed for tourism limits of acceptable change must be defined with regards to the integrity of its values |
National Legislation

The history of Honduran legislation concerning archaeological resources goes back to the second half of the 19th century, when it was focused exclusively on the protection of the archaeological monuments and materials of the famous Maya site of Copán (Agurcia Fasquelle 1984: 90). In 1946 a Decree was made to create an organization in charge of the exploration and protection of the country's cultural heritage, but it was not until 1952 that the IHAH was founded through a brief but important piece of legislation, Decree No. 245, and subsequently issued its first organic law in 1956, which was reformed in 1968, 1973, 1976, and 1991 (IHAH 1991). From its inception, however, the IHAH had a daunting task, "the exploration, restoration, conservation and vigilance of archaeological monuments, as well as all of the objects found therein" (Honduras 1952, translation mine).

The 1968 reform transformed the IHAH into an autonomous legal entity, thus providing it with the administrative independence necessary for it to operate more efficiently and thus better achieve its mission (Agurcia Fasquelle 1984:90). In the years following this reform, IHAH's activities continued to focus primarily on Copán, culminating with its declaration as a World Heritage Site in 1980 (Lara Pinto 2006:12).

An important turn of events for the management of archaeological resources in Honduras came with the appointment of the first democratically elected Constitutional Government in January of 1982. Cultural heritage legislation was tremendously enhanced by the inclusion of two articles in the new Honduran Constitution, the first of which declared that, "all anthropological, archaeological, historical and artistic wealth of
Honduras is part of the cultural heritage of the Nation" (Honduras 1982:Article 172, translation mine).

Two years later, Decree 81-84, better known as the Law for the Protection of the Cultural Heritage of the Nation, was enacted by Congress. This law declared that all of the cultural heritage of the nation, as defined by the Constitution, whether in the possession of the State, municipal or district governments or private individuals, and with or without having been declared a National Monument or Archaeological Zone, was property of the State. In sum, all archaeological sites located in Honduras became property of the State, and damage to these properties was henceforth considered a crime punishable by law (Honduras 1984). Overnight, the IHAH's jurisdiction became very far reaching.

This law was reformed in 1997 with Decree 220-97 and is now commonly referred to as Law 220-97 (Honduras 1997). Though several reforms were made to the 1984 law, of particular importance is the fact that this new law expanded the different manifestations of cultural heritage to include more specific definitions for archaeological sites, zones and collections (Honduras 1997:Article 2). Also important is Article 12, which instructs all private collectors to register their collections with the IHAH no later than 30 days after the date of enactment of the law, or January 17, 1998. According to the Law, collections not registered by this date are to be considered illegal possessions and are to be recovered and administered by the IHAH (Honduras 1997:Article 13). Another article worth mentioning is Article 14, which states that:
All natural and legal persons in legitimate possession of national cultural goods of public use protected under this Law is considered a temporary repository and is responsible for its conservation and custody, and must notify the IHAH within six months from the date of enactment of the present Law, said possession and any circumstance that alters or influences the conservation of this protected resource, unless this has already been done. During this time, the IHAH must make three informative publications to the public. [Honduras 1997:Article 14, translation mine]

Related to the article above, all persons are required report any archaeological materials found accidentally in the course of a project or activity (Honduras 1997:Article 19). Additionally, groups or individuals intent on carrying out projects or activities that might impact archaeological resources need to request permission to proceed from the IHAH, in which case the party is to incur the costs of any salvage or mitigation activities (Honduras 1997:Article 20). Following the first enactment of this law in 1984 and even more so after its reform in 1997, archaeological resources figured prominently in other important pieces of legislation related to their management and protection, namely the Law of Municipalities (Honduras 1990), the General Law of the Environment (Honduras 1993), the Law of Land-Use Planning (Honduras 2003) and the Property Law (Honduras 2004).
Two recent pieces of policy concerning archaeological heritage in Honduras have defined their management in the last five years. The first is a list of 10 "Strategic Goals for the IHAY for the 2006-2010 period," developed in conjunction with the Ministry of Culture, Arts and Sports in an effort to provide concrete goals to be achieved during this period (IHAY 2006). Of specific importance to the management of archaeological heritage is Goal 3, which calls for the participation of communities in the preservation of the nation's cultural heritage; and Goal 5, which calls for the development of management and development plans for several archaeological sites in the country, including Plan Grande in Guanaja.

The second and most important piece of recent cultural policy are the Guidelines for Archaeological Research in Honduras, first published as Decree 001-2005 and reformed in 2006 under Decree 001-2006, which outline the conditions under which archaeological research is to be carried out in Honduras (IHAY 2007). Of important mention here is Article 9, which for the first time gives the IHAY's Board of Directors the power to allow non-profit private and public institutions to develop archaeological parks and museums, as well as carry out archaeological research and conservation (IHAY 2007:16).

*Cultural Heritage Bodies in Honduras*

The management of cultural heritage in Honduras is an extremely complex political and bureaucratic universe, whose practices are based on an hierarchical structure of institutions with overlapping interests, jurisdictions and responsibilities (Figure 4.1).
At the highest level of political and legal authority is the Ministry of Culture, Arts and Sports (SCAD), first created in 1975, whose minister is directly appointed by the president (Euraque 2010; Mejia 2004). The Minister acts as President of the Board of Directors of the IHAH, which oversees IHAH's budget and affairs, and is in charge of appointing IHAH's Director.

The second government institution with responsibilities and functions in the cultural heritage realm is the Special Prosecutor for Indigenous Groups and Cultural Heritage, which is attached to the Public Ministry and has been in operation since the mid-1990s (Lara Pinto 2006:13). The Prosecutor's main responsibility is law enforcement, and this office is currently the only policy body that has the power to arrest individuals who have violated the law. In the past several years, this Special Prosecutor has taken active part in the confiscation of private collections that have violated the
period established for their registry with the IHAH, as well as following up reports of
destruction of archaeological sites and the theft of historic and archaeological materials.

The third and final institution charged with the protection and management of
cultural heritage in Honduras is the IHAH, whose main mission and responsibilities were
summarized above. The IHAH's main directive body is its Board of Directors, whose
president is the current Minister of Culture. The other members of the Board include the
IHAH's director, who acts as Secretary, and representatives from the Ministries of
Governance and Justice, Education, Tourism and Public Works and Housing, the
National Autonomous University (UNAH), the Honduran Institute of Tourism (IHT), the
Honduran Private Industry Council (COHEP), the National Chamber for Tourism and the
Honduran Academy of Geography and History (Euraque 2010:30).

In 2006, the IHAH underwent through several organizational overhauls, intended
to improve its operation and efficiency, which was the first of 2006-2010 Strategic Goals
summarized above (IHAH 2006). The latest 'reengineering' of the IHAH took place in
2007, and resulted in the creation of Subdirectorates (Subgerencias), themselves divided
into different units (Euraque 2010:130) (Figure 4.2). This latest institutional
development was carried out in order to support the IHAH in adequately achieving its
legal mission and accomplishing its short-term strategic goals (Euraque 2010:130).
Specifically, positions were moved, changed, and created in order to provide the IHAH
with an Informatics, Public Relations, and Publications Units, as well as the
strengthening of its historical and ethnological research units.
Figure 4.2. IHAH organizational structure (after Euraque 2007, used with permission of the author).

In terms of the management of archaeological resources, the IHAH has four essential functions: (1) regulate archaeological research in the country by revising and authorizing the various foreign research projects that take place throughout the year; (2) respond to reports of site destruction and impact and carrying out salvage archaeology projects, which result in a legal ruling that either instructs a project/activity to proceed as planned, modify its planned actions or cease completely; (3) carry out very specific short-term research projects, if funding permits, and; (4) act as a technical advisory body to the State regarding matters of policy, conservation, research and protection.

An essential though largely underfunded and overlooked function of the IHAH is the inventory of archaeological sites, which is overseen and managed by the Institute's Archaeology Unit through the Program for the National Inventory of Archaeological and
Historic Sites of Honduras (INSAHH). The INSAHH was formally begun in the 1970s, and proposals were made in 1996, 2006 and 2007 to expand and modernize the INSAHH, given the increased pressures of development and demographic growth on archaeological resources, as well as a continuous increase in archaeological investigations being carried out in the country, mostly by foreign researchers (Hasemann 1994; DIA-IHAH 2006, 2007). A result of the first of these proposals was the creation in 1996 of the Key Sites Survey Project as a permanent project within the Archaeology Unit's Annual Operations Plan (Hasemann 1994), a project that is carried out when IHAH's increasing budgetary restrictions permit. Honduras' current INSAHH consists of a physical archive of extensive paper records and an outdated, incomplete and non-standardized Microsoft Excel database. Recent advances in the methods and technologies available for the management of archaeological data, such as GIS, might be able to provide a solution to the IHAH's lack of an adequate and up-to-date site inventory.

Applications of Geographic Information Systems in Archaeology

Archaeological science, in essence, is a science of extrapolation, extrapolation being one of the key methodological pillars of our practice by which we infer the organization and life history of past societies from the analysis of pieces - samples - of their material culture. It is therefore not surprising that GIS, another science whose methods are based on extrapolation, and whose aim is to represent, integrate, analyze, and model an infinitely complex world through a specific sample of spatial and non-spatial elements (Wheatley and Gillings 2002:16), goes hand-in-hand with archaeology.
Despite worldwide acceptance of the application of GIS to archaeological issues and phenomena (e.g., Bevan and Conolly 2004; Conolly and Lake 2006; Gaffney and Stancic 1991; Kantner 2008; Mehrer and Wescott 2006; Peterson and Drennan 2005; Stark and Ossa 2007; Uphus et al. 2006; Westcott and Brandon 2000; Wheatley and Gillings 2002; Williams and Nash 2006), to date, very little has been done in terms of integrating GIS into archaeological projects in Honduras. This, however, is due to a general lack of adequate spatial and geo-referenced data concerning Honduras and, as I discuss below, the Bay Islands in particular. Because of the lack of archaeological applications of GIS in Honduras, particularly regarding cultural resource management, my literature review summarizes studies conducted elsewhere in the world.

GIS has been used by archaeologists for five major purposes: (1) management of regional data, most important of which are national site inventories as mandated by law; (2) management of remote sensing data; (3) regional environmental analyses; (4) models and simulations, such as to predict site locations and; (5) spatial modeling of human behavior, a practice which has focused almost exclusively on the prediction of where archaeological sites might be located on a landscape (Aldenderfer and Maschner1996:9).

As stated by Connolly and Lake (2006:10), "In some cases simply organizing our data more efficiently is enough to prompt new ideas about the past." Given the ability of GIS to structure and organize vast amounts of spatial and non-spatial data, it has been recognized as the "natural successor, or partner, to existing database management systems." (Wheatley and Gillings 2002:217) For example, GIS allows for the integration of archaeological data with spatially relevant natural data, allowing archaeologists to
explore human-environmental relationships from a holistic point of view and that, depending on the data available, can allow for analyses to be carried out at various scales (Gaffney et al. 1996:135).

Despite its many applications and advantages, GIS has been used by archaeologists almost exclusively to address and analyze issues of interest to New Archaeology, namely to analyze and interpret subsistence, economy and settlement patterns, at the expense of symbolic and ritual/religious interpretations (Gaffney et al. 1996:134). In order to redress this, recent research has assigned cultural values to variables in order to, "explore values or belief systems through spatially structured phenomena, natural and archaeological." (Gaffney et al. 1996:136) One such study, carried out in the island of Hvar in the northern Mediterranean, has integrated both anthropological and archaeological data to analyze unique material patterns present on the island, specifically the lack of burials and the presence of utilitarian wares and other refuse within mounds. After traditional and environmentally deterministic GIS analyses of the relationships between settlement, economy and society proved unsatisfactory, the authors found that symbolic interpretations that took into account broader natural and ritual sets of data were more compelling to explain the unique artifact disposal patterns observed (Gaffney et al. 1996:140-141).

_geographic information systems in cultural heritage management_

Managers of cultural heritage worldwide continuously acknowledge the fact that inventories of archaeological sites are central to any and all preservation efforts (García
Sanjuán and Wheatley 1999; ICOMOS 1990). As stated by García Sanjuán and Wheatley, "it is not possible to protect what is not known," (García Sanjuán and Wheatley 1999:202) and one solution to this problem is the creation of national or regional site inventories, which are the information base from which preservation and management efforts part from.

Because GIS are tools designed for the management, monitoring and assessment of data (Gunasekera 2004:37), they have been used extensively in the development and management of national site inventories in Europe, the US and most developed countries (Constantinidis 2009; García Sanjuán and Wheatley 1999; Gunasekera 2004; Uphus et al. 2006; Wheatley and Gillings 2002). Despite its utility, the authors cited above warn about the indiscriminate and inadequate use of GIS for this purpose, noting that GIS should always be considered one instrument among many used as part of broader heritage management structures and policies.

Three basic principles that must be taken into account when developing a GIS database for heritage management purposes include: (1) availability and accuracy of the spatial data; (2) standardization and normalization of data collection, integration and analysis policies and procedures and; (3) adequate and continuous training of human resources (Constantinidis 2009; Dunn et al. 1997). An additional issue that must be taken into account is whether archaeological sites will be represented by points or polygons, which has been discussed by archaeologists and heritage managers for some time (García Sanjuán and Wheatley 1999:214; Mink et al. 2006). Point representations sometimes over-simplify the extent and complexity of a site, but are easier and less costly to
manage, while polygon representations are more accurate representations of sites but are conversely more expensive and time-consuming to create, update and maintain. Unfortunately, early archaeological research only had access to cartographic instruments not nearly as accurate as those available today and, as a result, point data are often the only data available for archaeological sites in several countries, including Honduras.

In the past several years, GIS have also been used to evaluate the degree and extent to which natural and human factors impact archaeological heritage, and have been used to improve the efficiency and value of environmental impact studies (EIAs) conducted on archaeological sites. Naunapper (2006:287), however, recommends that any implementation of GIS in the management of archaeological resources needs to undergo constant design, revision, and maintenance, and recommends that this instrument be made available to researchers in the early stages of the impact evaluation process.

In Honduras, heritage management is inherently and legally linked to the process of development planning and as such, a GIS database that includes archaeological, historical, environmental, and socioeconomic data is essential if cultural heritage bodies such as the IHAH are to effectively and efficiently achieve their mission. To date such a database does not exist, though efforts have been made in the past (DIA-IHAH 2006, 2007) and continue to be made today (Rodríguez Rivera 2009) to modernize heritage management practices in the country.
Tracing the History of Impacts on Roatán's Cultural and Natural Landscape

As stated by Dunn et al. (1997: 3), "no GIS can be separated from its social context." Similarly, the management of cultural heritage must always take into account not only those physical factors that impact it but also the social, political, economic and institutional contexts within which such impacts are embedded (Dunn et al. 1997:5). In the following paragraphs I summarize the different human activities and actions that have resulted in the deterioration of the landscape of Roatán, focusing particularly on tourism, the island's most important economic activity for the past several decades.

Tourism is by no means a new activity in the Bay Islands. What is new is the pace at which it has grown and expanded over the last 20 years, including new strategies of construction and development implemented in the last decade. Even though the appeal of the Bay Islands has drawn visitors and enthusiasts since historical times, evidenced by the various expeditions and explorations summarized above, it was the continuous passing of national legislation, growing foreign and local elite interests, and the assistance of international funding agencies, including the International Monetary Fund (IMF) and Inter-American Development Bank (IDB), that has contributed to an almost uninterrupted growth of the tourism industry on Roatán.

In 1965, the Bay Islands were chosen as one of five areas of Honduras to be developed intensely for tourism (Ritchie 1965:120, quoted in Davidson 1974:122). Initial efforts to develop the islands following this ruling failed, and it was not until the decline of military dictatorships in the 1980s and the subsequent economic crisis that the Honduran government decided to implement more strenuous legislation, including the
creation of 'tourism zones' and 'tourism free zones'. Such zones provided several incentives for local and foreign investors to participate in Honduras’ open tourism economy, which focused primarily on the Bay Islands (Stonich 1998:26, 2000:64–66; Stonich et al. 1998). As a consequence of this legislation, the main Roatán highway was constructed, an international runway was added to Roatán’s airport, and several new resorts and hotels were constructed (Stonich 2000:66). In the early 1990s, „El Mundo Maya” was established as a joint attempt by the governments of Belize, El Salvador, Guatemala, Honduras, and Mexico to promote tourism throughout Central America. Outside of Copán, the two areas promoted as part of the Honduran portion of the tour were Roatán and La Mosquitia, neither of which have any demonstrable connection to the Maya, past or present (Stonich 2000:9–10).

A third and much more recent, wave of legislation has been brought about by the National Strategy for Sustainable Tourism (ENTS), created by the Ministry of Tourism (SETUR) and the Honduran Institute of Tourism (IHT), and backed by the IDB. The Bay Islands, and especially Roatán, have been designated as primary short-term priorities by the ENTS, which has aided the construction of two new cruise ship terminals on the island that are projected to bring in 200 cruise ships and over half a million tourists each year by 2011 (Carnival News 2010; IHT 2005:89). What is most surprising about the growth rate of Roatán’s tourism industry is its resilience, particularly in the face of the ongoing global economic crisis and the ousting of now-former President Manuel Zelaya during a military coup in July of 2009.
One document that sheds important light on the socioeconomic and environmental consequences of tourism on Roatán is the municipal development plan for one of Roatán's two municipalities, Roatán, whose main points and recommendations are summarized below (SGJ 2003). As explained in Chapter 1, Roatán is divided into two municipalities, Roatán and Jose Santos Guardiola (Figure 4.3). Given the accessibility of the beaches present on the municipality of Roatán, as well as the history of modern settlement on the island, tourism has favored this side of the island, resulting in unrestricted economic growth. Unfortunately, this growth has come at the expense of environmental conservation and sustainability.

Figure 4.3. Map showing Roatán's two municipalities.
According to Roatán municipal officials (SGJ 2003:7), between 1988 and 2000, approximately 32 percent of the primary forests of Roatán have been cut down, a process that has reduced sources of water by almost 90 percent. Deforestation has taken place mostly along the central mountainous ridge of the island, and is a consequence of the unsuitable and non-sustainable use of the land, namely through cattle grazing, urban and tourism development and road construction. Table 4.2, below, summarizes the degree to which the land in this municipality was being over- or under-used for several activities in 1993, according to its capacity.

Surveys conducted by government representatives have revealed that the island's carrying capacity for demographic growth has been significantly exceeded (SGJ 2003:33). It is estimated that between 40 and 50 people migrate to the island from mainland Honduras every month, which has resulted in the creation and extension of urban areas. Most impressive is the fact that the modern settlement of Los Fuertes, currently the largest community on the island with 5,000 inhabitants and composed mostly of mainland migrants, did not exist 10 years ago (SGJ 2003:33).

Table 4.2. Land use on Roatán (from SGJ 2003:31).

<table>
<thead>
<tr>
<th>Land use</th>
<th>Optimal Level of Use</th>
<th>Level of Use (1993)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>7.1%</td>
<td>1%</td>
<td>6.1% underused</td>
</tr>
<tr>
<td>Cattle grazing</td>
<td>9.1%</td>
<td>38.9%</td>
<td>29.8% overused</td>
</tr>
<tr>
<td>Forest</td>
<td>81.1%</td>
<td>46.9%</td>
<td>34.2% changed</td>
</tr>
<tr>
<td>Other (urban areas)</td>
<td>2.7%</td>
<td>4.4%</td>
<td>1.7% overused</td>
</tr>
</tbody>
</table>
The large increase in migration from the mainland is a result of a general belief held by these groups that economic conditions on Roatán are much better than on the mainland, namely because of the wealth brought in by tourism and its associated activities. Indeed, these beliefs have certain factual truth; in 2003, over 12,000 tourists visited the island, a number that is expected to increase by over a quarter million visitors beginning in 2009, due to the arrival of cruise ships to two recently constructed cruise ship terminals on this municipality (Figure 4.4).

Figure 4.4. Cruise ship docking at Coxen Hole port.
Roatán's municipal development plan is plagued with dire warnings regarding the future and sustainability of the tourism industry on the island, as well as its consequences for the sustainability of the island's environment as a whole. Two major problems are identified that explain the lack of monitoring and control of the degree to which land is used on the island. First, even though solid and strong laws and policies to regulate construction and environmental impact assessments exist, these are either breached, side-stepped, or plainly ignored by Roatán's municipal authorities (SGJ 2003:34). Second, stark conflicts of interest exist among Roatán's municipal authorities, which perhaps helps to explain their ambiguity in applying the law. The authors of this report state that,

Economic interests on Roatán are so widespread that the majority of individuals in high positions, including those on the municipal government, have a conflict of interests with regards to environmental affairs. Theses interests can be businesses in the fishing fleet, the fish processing industry, construction companies, goods transportation industries, passenger transportation industries, touristic complexes, etc. [SGJ 2003:58, translation mine]

Adding,

These interests are an insurmountable obstacle to making the changes necessary to preserve Roatán's natural resources. In order to take another
course, that of sustainable development, leadership cannot not be prejudiced and decisions should be made based solely on the interests of Roatán as a whole. It is likely that only those individuals not linked to the economy of the island are fit to have a position of this kind. [SGJ 2003:59, translation mine]

To conclude, the clearing of vegetation for agricultural and construction purposes, the indiscriminate and poor placement of water delivery and sewage systems, and the lack of geological and geomechanical studies, among other factors, have contributed to increased levels of deforestation and erosion on the island, as well as the virtual destruction of all permanent water streams (SGJ 2003:7; Stonich et al. 1998: 275).

"What's Yours is Mine": A Brief History of Looting on Roatán

Looting on the island of Roatán is an established economic practice that dates to the beginning of the 20th century. Ironically, the roots of this practice began with a visit to the island by the world-famous explorer and adventurer F.A. Mitchell-Hedges. Funded by the Heye Foundation (now known as the Museum of the American Indian and part of the Smithsonian Institution), Mitchell-Hedges (1954:213) visited and looted sites on all three of the major islands with the goal of establishing a rich collection of artifacts for the foundation. During a period of three weeks, Mitchell-Hedges amassed thousands of artifacts (Figure 4.5).
Even though this practice is a product of its time and was common among similar institutions (Agurcia Fasquelle 1984), its application on Roatán had particularly dire consequences. First, Mitchell-Hedges did not obtain these collections by himself, but rather taught local Bay Islanders how to locate large sites as well as retrieve whole vessels without breaking them (Moyne 1938:92). Second, Mitchell-Hedges never requested formal permission from the Honduran government to retrieve these items and take them to the U.S., even though this was a legal requirement at the time (Agurcia Fasquelle 1984).

Figure 4.5. Mitchell-Hedges (left) showing off his collection at the Heye Foundation. (Mitchell-Hedges 1954:208).
Following Mitchell-Hedges' footsteps, Walter Edward Guiness, Lord Moyne, visited the Bay Islands in 1937, having heard of the rich collections which might be procured on these (Moyne 1938:78). Immediately upon his arrival on Roatán, Moyne was approached by locals trying to sell him ceramic vessels (Moyne 1938:89). They informed Moyne that they had located several new sites, "which they had located since the departure of the American expedition [Mitchell-Hedges]." (Moyne 1938:92). After only a few days on the islands, Moyne had acquired over three thousand whole ceramic vessels, as well as hundreds of stone, shell and metal artifacts, which he later donated to the Archaeology Museum of Cambridge University and the British Museum. Even after being told by local authorities that they did not have permission to excavate on the islands, Moyne heard that nobody had objected to Mitchell-Hedges taking objects to the U.S., and so he did the exact same (Moyne 1938:96-97).

The various archaeological projects that followed this early period of exploration all report the extent to which sites were looted on Roatán. The only project to systematically record which sites had or had not been looted was that of Epstein (1975), who found that every large site they recorded had been looted to some extent or another, leading him to state the following ominous prediction, "unless serious archaeological studies are carried out on the Bay Islands within the next decade, the site destruction caused by modern relic hunters will soon make it impossible to answer any of the questions raised in this paper" (Epstein 1975: 8).
Chapter 5 - Methods

In order to evaluate the relationships between and among archaeological sites on Roatán, as well as trends in human impact and site management, two main methods of data collection were utilized. First, during the 2009 field season of project Roatán a pedestrian survey of a section of the island was carried out with the goal of identifying recording all sites as well as the extent of human impact on these sites. Second, the data collected in the field and from previous research on the island, as well as data on some of the modern island infrastructure was compiled into a GIS geodatabase in order to allow for a cross comparison of both archaeological and site management data. The analysis of these data allowed me to: (1) evaluate previous hypotheses concerning the patterns of settlement on the island, and; (2) identify the degree to which certain forms of infrastructure, namely roads, have affected and might be affecting archaeological sites, which provided the basis for proposing measures for mitigating and predicting future impacts from these and other factors.

Systematic Pedestrian Survey

Project Roatán's survey component had as its main objective a further exploration of the distribution and composition of archaeological sites in the vicinity of El Antigual, as well as to evaluate how archaeological sites, particularly hilltop sites, have been
affected by human actions in the form of recent economic development and urban
growth. Given Roatán's uneven and hilly topography as well as extremely dense
vegetation in this area of the island, survey methods, such as parallel transects, were
largely impossible. Project Roatán's survey area was limited to the southwest by the
paved road that leads to Evertine Bight and to the southeast by the dirt road that leads to
the community of La Punta. To the northwest, the survey area stops at the road that leads
to the western end of Milton Bight, and to the northeast it stops at the main road that
leads into the settlement of Pollytilly Bight (Figure 5.1).
Given the unusual settlement patterns thus far observed on Roatán, and despite
the topographic and biological constraints described above, survey was carried out as
systematically as possible by following terrain topography. Particular attention was given
to cuts in the topography made by construction, roads, and surface runoff. Given the time
constraints imposed by this intensive survey method, only 7 km\(^2\) were covered in a period
of five weeks. A total of 10 archaeological sites were recorded, seven of which had never
before been reported. In the field, Project Roatán applied the following definition for an
archaeological site:

More than 10 artifacts of a single artifact type within an area 15 m (50
feet) in diameter (except when all pieces appear to originate from a single
source, such as one ceramic pot or one glass bottle), 20 or more artifacts
that include at least two different artifact types (e.g., ceramic sherds and
chipped or ground stone) within an area 15 m in diameter, one or more
anthropogenic features temporally associated with any number of artifacts,
or two or more anthropogenic features not associated with artifacts. Areas
separated by greater than 100 m of intervening space (with an absence of
cultural features or deposits) that meet these criteria should be recorded as
separate sites. (Wells and Davis Salazar 2009:33)
Project Roatán also used the following definition for site loci:

Areas with cultural residues spaced less than 100 m apart...Loci (designated with letters consecutively across a site) are defined as spatially and/or temporally discrete clusters of features (represented by numbers consecutively across a site), artifacts, or combinations of features and artifacts. (Wells and Davis Salazar 2009: 33)

Once a site was found, it was assigned a unique site number, beginning with the projects initials, PR. An initial walkthrough was carried out in order to determine site extension, and once the site's extent was determined, GPS coordinates were taken at each of the cardinal directions in an effort to create a rough polygon for the site. GPS coordinates as well as other basic site information were recorded both on field notebooks as well as on a standardized site form (Appendix A). Given the complete lack of architecture visible on the surface at all sites visited, only rough sketches were drawn to indicate the location of each site in relation to surrounding natural and artificial features. Lastly, photographs were taken of each site with a digital camera and assigned numbers, which were recorded on site forms.

In conjunction with the standard site recording procedures summarized above, a field assessment of the impact of modern development on these sites was carried out using a Site Impact Assessment Form (Appendix B). This instrument was aimed at standardizing the recording of impact factors and their effects, and was developed using
procedures employed by the IHAH (IHAH 2007), the National Park Service (NPS 2007) and the Ministry of Tourism, Culture and the Arts of British Columbia, Canada (Province of British Columbia 2007).

Due to a lack of a high-precision GPS device with which to more accurately obtain coordinates for sites and other features (our average GPS error was 6.4 m) as well as time constraints, identification and recording of the various factors that negatively impact archaeological sites was limited to the site impact forms complemented by digital photography.

Spatial Data Mining and Feature Digitizing

The most recent GIS data on Roatán was found in the online portal of Honduras’ National System for Territorial Information (SINIT), part of the Technical Ministry for Planning and External Cooperation. Unfortunately, these data were not geo-referenced and most of the data were last updated in the 1980s. The most useful piece of data obtained is a digital elevation model (DEM) for the Bay Islands, which was provided by a joint project between the government of Japan and NASA, and released in the summer of 2009.

Accurate and up-to-date environmental, land use and socioeconomic data for the Bay Islands is scarce and, in most instances, nonexistent. One method available to address this limitation is commonly known as heads-up or on-screen digitizing, whereby features on scanned paper maps or images are digitally traced (Connolly and Lake 2006:80). These features, however, need to be placed within a specified coordinate
system in order to be related to other features (i.e., archaeological sites) whose coordinates are known. Although this method is time consuming, it was carried out on roads and major works of infrastructure. Land-use practices, however, require much more detailed sets of data currently unavailable for the study area.

Even though topographic maps exist for the Bay Islands, Google Earth images provide more updated data useful for this project, namely roads and major infrastructure such as the airport and cruise ship ports. The digitization and georeferencing of data for Roatán began with the capture of Google Earth images in .JPEG files, which were then georeferenced using the ESRI ArcMap 9.3.1 software package. Once these images were georeferenced, the main paved highway on the island, as well as major secondary dirt roads were manually traced and labeled. Whenever possible, secondary roads were named according to the nearest community. I also traced the island's main forms of transportation infrastructure, including the international airport, ferry port, and both cruise ship terminals.

*Spatial Data Analysis*

Various methods are available to analyze the spatial relationship between archaeological sites as well as between sites and the various natural and human factors that impact them. One of the most widely used spatial analyses is a distance or buffering query, described as, "the selection of a dataset based on its distance to a defined point, line or polygon feature" (Conolly and Lake 2006:118). The application of this method
has been criticized by some as a form of 'technological determinism' if used without discretion (Wheatley and Gillings 2002:237).

Uphus and colleagues (2006) have applied this method imaginatively to predict how and where sites would be affected in the Upper Basin of northern Arizona by camping, hunting and woodcutting. They evaluate the degree to which sites might be impacted based on their proximity to various types of roads as well as by taking into account the specific behavior of people carrying out those activities, obtained through on-the-spot interviews (Uphus et al. 2006: 338). Another important method applied by these authors is the concept of 'impact halos,' buffers created for known sites by averaging the area of the largest site or artifact scatter and adding to it the average GPS error. This procedure has two advantages; first, it allows sites for which there are only point data to be represented as polygons; second, "it is preferable, for management purposes, to err on the side of overestimating the magnitude of at-risk heritage resources" (Uphus et al. 2006:334).

On Roatán, roads have impacted and continue to impact archaeological sites and their environmental context in predictable ways. Observations made in the field have resulted in the creation of five impact intervals for paved roads and three intervals for unpaved or dirt roads (Table 5.1). Given this consistency of impact, I find buffer analysis a valuable method for evaluating the degree to which they affect sites. Following Uphus and colleagues (2006), I use the maximum degree of impact of a road as the baseline to define each of these intervals.
The second most common type of impact on archaeological sites on Roatán is looting, which takes the form of looter's pits and, in one extreme case, the use of dynamite (Epstein 1975:78). Given the fact that every site recorded by Project Roatán and nearly every site (63 percent) identified by Epstein's survey was found to have been looted to some extent, looting behavior on Roatán seems to be independent of ease of access to sites as well as their proximity to roads or modern populations. Given that looting is a widespread activity that we can assume has already occurred or will occur on the entire island, it will be considered a constant variable and a possible threat to every archaeological site.

Another method applied in this thesis is the creation of a 'safety index' for sites, which is determined by the number of factors that threaten its preservation and integrity. Sites are assigned a rating from 1-10, with 10 meaning a site under extreme threat and 1 that the site is under minimal threat (Constantinidis 2009) (Figure 5.2).
In the case of Roatán, the threat index is based on the most common threats observed in the field. This method allows cultural heritage managers to implement a triage system for managing sites when resources are not available to manage them all, thus allowing them to implement protective measures to those sites with higher threat levels first, before doing so for other sites (Constantinidis 2009:118).

Summary

The methods described in this chapter have been implemented with two specific objectives: (1) to test previous hypotheses regarding site planning and settlement patterns on Roatán, and; (2) to evaluate the impacts of modern development and urban growth on archaeological sites on the island, in an attempt to define a policy for their adequate protection and management. The following chapter presents the result of these analyses in an effort to better guide and assist future archaeological research on this island as well.
as to ensure the sustainability of potential research through the improvement of the management of archaeological heritage.
Chapter 6 - Data and Analysis

This chapter details the results of the analyses conducted on the data collected using the methods outlined in Chapter 5 above. For this thesis I compiled the available data on archaeological sites recorded on Roatán for three major purposes. First, I use the data to assist in the evaluation of previous hypotheses concerning the unique location and function of sites on the island. Second, given this is the first time these data have been compiled and visualized on the island's landscape at this scale, I believe new observations will arise which in turn might yield fresh interpretations as well as new hypotheses to be tested in the future. Lastly, I believe this geodatabase can serve as the start of an official site inventory for Roatán and become the baseline for future efforts at managing and protecting the island's archaeological heritage, efforts which can be easily replicated elsewhere in Honduras.

The second section of the chapter includes an analysis of the impacts of modern development and urban growth on archaeological sites on Roatán presented in several stages, representing various levels of analysis according to data availability. I first look at how the sites recorded by Project Roatán in 2009 are and will be affected by the construction of roads, given that accurate data are available regarding site extension. I then look at the impact of roads as well as other major island infrastructure on sites across the island using the impact halo concept defined by Uphus and colleagues (2006). I
conclude the chapter by presenting the results of a brief evaluation of how the various elements of heritage management are being executed on Roatan, following a methodology of assessment through indicators, developed by Cifuentes and colleagues (2000).

**Creation of a Site Inventory for Roatán**

In its 2009 field season, Project Roatán recorded a total of 10 archaeological sites in an area of approximately 7 km². Each site is designated by the letters 'PR' followed by a two-digit number, given in the order in which it was recorded. Site PR02 was eliminated from the inventory since after additional survey it was observed to be merely a section of site PR06. All sites consisted of sherd scatters located either on the summits of hilltops (n = 9), with one site consisting of a sherd scatter found on the surface of a rock shelter. With the exception of small fragments of bajareque found during excavation at the site of El Antigual, evidence of visible architecture was not found on any of these sites. It was found that sites located on the highest and largest hills in the survey area had the richest and, as has been determined through laboratory analysis, most varied surface artifact deposits (Goodwin n.d.).

A database of archaeological sites was created for the island of Roatán using the data collected through pedestrian survey as well through a review of the relevant literature (Appendix C). This database contains all of the sites recorded by Epstein and colleagues (Epstein 1975; Epstein and Véliz 1977), Project Operation Raleigh (Horton 1985), and Project Roatán. Several sites were recorded by more than one project and, in
some instances, by all three. Fields in the database include site name, UTM coordinates, tentative time period (if possible), project name, project site number, coordinate type (i.e., level of precision), and observed disturbance or impact, if any.

Visual Analysis of Site Distribution on Roatán

A visual analysis of the maps produced by the Roatán site geodatabase yields several observations on the distribution of archaeological sites on the island. Sites for these maps have been represented as points in order to facilitate interpretation. First, the majority of sites (n = 65, or 49.6 percent) are located on the summits of hills, an observation that has been made since at least the late 19th century (Figures 6.1-6.2). Second, 34 coastal sites have been identified on the island, an observation that questions previous assumptions that sites were located primarily on hilltops, from which several hypotheses were developed in order to explain this unique phenomenon (Epstein 1975; Epstein and Véliz 1977).

A brief visual analysis of site density and distribution throughout the island also yields some interesting observations. First, over 60 percent of coastal sites (n = 21) are located on the western end of the island, specifically west of the modern settlement of Coxen Hole (Figure 6.3). Additionally, the central third of the island, particularly the area between Coxen Hole and Brick Bay, is generally lacking in sites compared to the eastern and western portions of the island (Figure 6.4).
Figure 6.1. Recorded sites on western half of the island.

Figure 6.2. Recorded sites on eastern half of the island.
Figure 6.3. Coastal sites identified on the west end of the island.

Figure 6.4. Central area of the island.
Impact Analysis of the Project Roatán Survey Area

In this section, I analyze the area of the island surveyed by Project Roatán during its 2009 field season in order to provide a starting point towards understanding the relationship between archaeological sites and their surrounding biophysical and human environment. Sites are represented by polygons, since their limits were defined in the field by the extent to which cultural materials were scattered on the surface. Additionally, and following the methodology employed by Uphus and colleagues (2006), impact halos were created for archaeological sites, in this case by adding the average error obtained by GPS coordinates (approximately 6.4 m) as a buffer (Figure 6.5).

At this stage of our research and given our data limitations, only the spatial analysis of the impact of roads on archaeological sites is possible. As discussed in Chapter 4, roads were assigned various buffers according to field observations.

Figure 6.5. Site PR06 with impact halo and impacts of roads at various intervals.
In order to make a more educated assessment of the extent to which sites across the island have been or will be affected by roads, sites for which we only have point data (i.e., sites not recorded by our project) were converted into polygons by means of impact halos. Because the size of sites found by our project appears to be representative of the sizes of sites recorded elsewhere, impact halos for sites identified elsewhere on the island were obtained by adding the average GPS error (6.4 m) to the radius of the average surface area of sites found in the course of our survey (approximately 151 m) for a final radius of 157.4 m. Lastly, the clip analysis function was applied to these impact halos so that they would be limited to the island's shoreline (Figure 6.6).

Figure 6.6. Map showing sites on the West End of the island with impact halos.
A visual analysis of the maps produced shows that, despite the accelerated expansion of the tourism industry in Roatán, most development still remains anchored in the western end of the island, though this scenario is rapidly changing. The number of dirt roads observed shows how development is continually growing in the western and central portions of the island, as well as how it is slowly spreading towards the island's eastern end (Figures 6.7-6.9).

Figure 6.7. Distribution of roads and their impacts, west end of the island.
Figure 6.8. Distribution of roads and their impacts, central portion of the island.

Figure 6.9. Distribution of roads and their impacts, east end of the island.
In terms of site impacts, we can observe that only 46 out of a total of 131 recorded sites (35 percent) are not being affected to some degree by the construction of roads. If we take into account the number of smaller roads and paths that were not digitized, as well as the various forms of construction and development that these roads lead to, it is likely that all archaeological sites on Roatán are being impacted to some degree or another. Using GIS, I was able to quantify the degree to which certain features, in this case roads, can impact archaeological sites. Using the Intersect Analysis function, shapefiles were created that show 'impact surface's, or the areas where roads and their buffers overlap with sites and their respective impact halos (Figure 6.10).

Figure 6.10. Map showing road impact surface for the Project Roatán survey area.
Using the Calculate Geometry function of ArcMap, I calculated the total surface area of all the archaeological sites on the geodatabase (10 km²) and the total surface area of the impact surface (0.8 km²). At the island level, 7.9 percent of the total surface area of known archaeological sites is being impacted by roads. Sites recorded by Project Roatán, for which we have more accurate surface areas, had 8.9 percent of their surface areas impacted by roads. A final visual analysis conducted on the data collected by Project Roatán during its pilot field season was the application of the 'threat index' approach (Constantinidis 2009:118). Sites were assigned a threat index according to the chart presented on Figure 4.2 and color coded accordingly (Figure 6.11).

Figure 6.11. Map showing threat index for the Project Roatán survey sites.
Of the archaeological sites identified and evaluated by Project Roatán, those located near modern populations and other infrastructure, including the main island highway, a resort hotel, and a luxury seaside village, were the most affected and the ones affected by a greater variety of factors (Table 6.1).

Table 6.1. Major Impacts Recorded on Sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Looting</th>
<th>Road</th>
<th>Trail(s)</th>
<th>Tower</th>
<th>Erosion</th>
<th>Other Construction</th>
<th>Burning</th>
<th>Cattle</th>
<th>Trash</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR01</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>PR03</td>
<td></td>
<td></td>
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<td>X</td>
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<td>X</td>
<td>X</td>
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<td>PR11</td>
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</tbody>
</table>
Evaluation of the Management of Archaeological Heritage on Roatán

This section describes the results of an evaluation conducted on the management of archaeological heritage on Roatán through the application of the WCPA framework (Hockings et al. 2006) and the model developed by Cifuentes and colleagues (2000), which are described in Chapter 2. At this time there is not enough data to conduct a full and detailed evaluation of every indicator suggested by both of these approaches and, as a result, quantitative application of these approaches is not possible. Still, several observations can be made which that lead to the proposal of an effective management and protection plan for archaeological sites on Roatán. I primarily use the model proposed by Cifuentes and colleagues (2000), which, as stated before, has more applicability to Latin American contexts and has been employed in Honduras previously (IHAH 2005).

1. Administrative Field

The institutional capacity for the management of archaeological heritage on Roatán is virtually nonexistent. In terms of personnel, the IHAH only has two archaeologists and five technical assistants to cover the entire country; in addition, the IHAH's closest regional office is located in the city of La Lima, located two hours away by bus and a one-hour trip by ferry from Roatán, making this not only a very difficult but also expensive trip. The island's two municipal governments only have a few individuals who are in charge of evaluating environmental impact assessments, and who have no experience with identifying or protecting cultural heritage. Additionally, while there are a few NGOs on the island that look after the protection of the island's environment, their
actions are focused solely on environmental sustainability and the protection of coral reef environments (SGJ 2003:37).

In terms of financial resources, the IHAH has historically been strapped for money (Euraque 2007, 2010). What little funds the IHAH receives from the central government and revenues from the various parks and museums it manages is used primarily on salaries and administrative expenses (85 percent), while the remaining 15 percent is used for various research projects and other priorities nationwide. On the other hand, the budgets of Roatán's two municipal governments are destined solely to bring public utilities to the island's growing population as well as the maintenance of its ailing public infrastructure (AFOINPUH 2005:32-35; SGJ 2003:67).

2. Political Field

Internal IHAH policies dictate that, in the event archaeologists are summoned to conduct a salvage archaeology project, they are to first request the direct cooperation of municipal authorities, who are, by law, required to protect the archaeological resources in their jurisdiction (Honduras 1990). At this time, however, there is no formal agreement between the IHAH and Roatán's municipal governments, despite the 2006 Strategic Goals calling for citizen/local participation in the preservation of the country's cultural heritage (IHAH 2006), as well as Article 50 of the Guidelines for Archaeological Research in Honduras, which states, "the IHAH Director's office will promote the collaboration with local communities through the establishment of Reciprocal Cooperation Agreements with Municipalities, among other local associations and
organizations, with the goal of protecting, researching, promoting and preserving the archaeological heritage of the country" (IHAH 2007, translation mine).

3. Legal Field

As reviewed in Chapter 3, the necessary laws have been created and conventions have been signed that require the preservation of all archaeological remains in Honduras. Unfortunately, these important pieces of legislation are not being implemented on Roatán. Due to the lack of application of the law on the island, development and urban growth are largely unmonitored, which has resulted in the constant deterioration and in many cases complete destruction of the island's archaeological heritage. Additionally, broader land tenure legislation is also not being implemented on the island, resulting in an over-use of the island's carrying and land use capacity, as summarized in Table 3.2 in Chapter 4. In short, current regulations are not being enforced in a correct, timely nor rapid fashion.

4. Planning Field

To date the government of Honduras only has management plans for some of the larger archaeological sites managed as archaeological parks, the most comprehensive one being Copán (IHAH 2005). In 2005 and 2006, management plans were developed for several archaeological sites as part of the Copán Valley Regional Development Project (PDRVC), including the proposal for an archaeological park at the site of Plan Grande in the Bay Island of Guanaja (ELAP 2006).
In terms of zoning and the definition of site boundaries, several of the country's largest archaeological sites have been mapped and delimited by the IHAH (i.e., DIA-IHAH 2005). Though it is both unrealistic as well as impractical to expect the same of all archaeological sites across the country, the delimitation of archaeological sites using digital tools such as GIS is an essential step towards achieving the adequate zoning of sites, a first step towards their protection. As summarized above, I present a method for the digital delimitation of archaeological sites on Roatán based on the creation of impact buffer zones or 'impact halos.'

5. Knowledge Field

Although our knowledge of the composition and function of archaeological sites so far recorded on Roatán is poor, the island enjoys a fortunate position when compared to most of northeast Honduras, which has not yet been surveyed. In addition, and as presented in Chapter 3, we have rich ethnohistoric and historical records concerning the Bay Islands, allowing us to trace its history far back in time. However, knowledge of the biological, geological and socioeconomic context in which these sites are embedded, however, is still lacking for Roatán. As stated by Cifuentes and colleagues (2000:28), "the greatest availability of information would make it possible for administrators to best meet management challenges." Most importantly, I recommend that additional spatial data be collected in the field as opposed to being digitized, thus giving any geodatabase greater accuracy and an increased monitoring capability.
6. Current Illegal Uses and Threats Field

The present thesis has listed the various factors that currently impact archaeological sites in the area surveyed during 2009, and has evaluated the various impacts that these have on heritage resources. Of importance to this field is Table 3.2, which lists the degree to which various activities on Roatán have exceeded the island's carrying capacity. A more nuanced understanding of these various impacts will aid in their prediction and mitigation in the future.

Summary

Visual and spatial analyses of the data obtained during field survey as well as by previous archaeological projects carried out on Roatán have revealed interesting patterns regarding the prehistoric use of the island, as well modern human impacts and site management directly related to an increase and change in development activities on the eastern and central portions of the island. These findings, as well as results of the analysis of several important documents related to the management of archaeological heritage on Roatán highlight the urgency of creating local plans and policies that aim to foster the sustainability of these resources.
Chapter 7 - Discussion

The Settlement and Utilization of Roatán in Prehistory

GIS technology has allowed me to collect, integrate, visualize, and analyze the data available on the archaeological sites previously identified on the island of Roatán. This, in turn, permits the evaluation of previous hypotheses regarding patterns in settlement and site planning on the island from a wider regional perspective. What remains clear to date is the fact that the island of Roatán presents a unique settlement pattern compared to mainland Honduras that requires further investigation through both intensive survey and sampling.

The three hypotheses proposed by Epstein and colleagues in the 1970s are based on the fact that the majority of the archaeological sites they recorded were located on the summits of hilltops (Epstein 1975; Epstein and Vélez 1977). The first of these hypotheses, that hilltop locations were chosen for defensive purposes, can be evaluated against new archaeological and ethnohistoric data. First and most obvious is the fact that hilltops do lend themselves to be defensible positions, evidence of which are the various hilltops used in colonial times as canon emplacements (Davidson 1974; McBride 2006; Strong 1935). Second, several archaeological sites on the mainland have been shown to include clearly defensive features, such as ditches or moats and walls, which might suggest defense was an important consideration at some point, particularly during the
Cocal period (A.D. 1000-1502). Evidence against this point is the stone wall that surrounds the site of Plan Grande in Guanaja, whose function appears to have been ritual rather than defensive, given its low height as well as the presence of holes or niches, which early accounts report contained stone idols (Young 1847:48). Additionally, previous research in northeast Honduras has suggested that corporate strategies of inclusion and group identity and cohesion, rather than strategies of exclusion or conflict, defined this region (Begley 1999; Goodwin n.d.).

The second hypothesis, that hilltops were chosen in order to avoid sand flies, mosquitoes and other insect pests, is contradicted by both early observations of shell middens on the coasts (Spiden 1925:539) as well as by the identification of several coastal sites on the island by Project Operation Raleigh (Horton 1985), which are areas known to have this problem (Davidson 1974).

The third hypothesis posed by Epstein and colleagues (1977), that the use of hilltops denotes ritual or religious practices, as well as the possibility that the island was a pilgrimage site, continues to be supported by our research as well as by several ethnohistoric accounts that have thus far not been included in previous interpretations. Of special interest to this hypothesis are the various ethnohistoric accounts and ethnographic observations on burial customs of the indigenous groups of northeast Honduras, specifically the fact that burials in this region might have the material appearance of a house or dwelling, including domestic material assemblages (Chapman 1958: 132; Conzemius 1927:300).
The use of hilltops for burials might help to answer some of the contradictions observed on hilltops sites on Roatán, namely; (1) the identification of terraces (Cruz Castillo and Orellana 2000; Epstein 1975; Epstein and Véliz 1977); (2) the excavation of some of which has yielded burials (Cruz Castillo and Orellana 2000: 13); (3) the dominance of seemingly midden-like or domestic assemblages on most sites, specifically plain ceramic wares as well as seashells (Epstein 1975; Epstein and Véliz 1977; Healy 1993; Véliz et al. 1977); the discovery of very rich caches with artifacts made from a wide variety of materials but not associated to human remains (Strong 1935). An observation made regarding sites on the island of Hvar in the northern Mediterranean might be of importance here (Gaffney et al. 1996). The authors note that sites of particular topographic significance are composed of mounds, usually associated with burials, that contain not the expected human remains and associated grave goods but domestic assemblages of plain ceramics, fragments of wattle-and-daub, and shell (Gaffney et al. 1996:141). The authors note that this might suggest, "rituals concerned with cleansing and purity associated with monuments related to the dead." (Gaffney et al. 1996:141) A fourth hypothesis, based on the findings by Project Operation Raleigh (Horton 1985), suggests the possibility that previous prehispanic inhabitants of the island were divided into two groups, one whose subsistence was based on slope agriculture and a second group whose subsistence was based on the exploitation of marine sources. It is important to note that this project's findings, and by consequence their hypothesis, are based solely on data from the Cocal period.
Paleoecological research undertaken by Healy (1983:45) in mainland Honduras has shown that groups in this area subsisted heavily on marine resources, particularly during later time periods. In addition, our survey, as well as previous surveys of the island, have identified marine shell in various contexts, including on hilltops. Further support for this hypothesis comes from ethnohistoric accounts that mention the islands as being heavily populated at the time of contact (Herrera y Tordesillas 1944:16), as well as archaeological data that shows an increase in population size and sociopolitical complexity during later time periods (Begley 1999; Cuddy 2007; Healy 1984c). The fact that burials have been found within terraces (Cruz Castillo and Orellana 2000) may not support this hypothesis, since the presence of human remains suggest a ritual purpose for these constructions.

Recommendations for Future Research on Roatán

The benefits of applying GIS to archaeology rest upon the fact that we can observe phenomena at new scales and perspectives, allowing us to better understand the role and position of each element within its natural, cultural, and spatial systems, thus helping us to better understand the totality of past human cultures and landscapes. Initial analyses of most of the data available on recorded sites suggest very interesting and in some cases new ideas on settlement and site distribution patterns, which need to be complemented by analyses of the distribution of sites in terms of their tentative chronology and artifact content.
One problem that needs to be addressed is the effective and efficient recording of prehispanic patterns of land use on Roatán. Current and past research has demonstrated the need for sites to be conceptualized differently if we are to understand the various human actions that took place on Roatán's prehispanic landscape. As stated by Tartaron and colleagues (2006: 485):

Surface artifact scatters must be seen as modern phenomena affected by complex, long-term postdepositional processes that have obscured or obliterated behavioral patterning in possibly unknowable ways. The challenge for survey archaeologists is to untangle the complex interactions of geological and cultural structuring that result in these scatters, and to interpret them in the context of the overall landscape rather than from a strictly site-based perspective.

Moreover, archaeological research has reinforced the notion that, "the archaeological record is most useful when conceived as a more or less continuous distribution of artifacts over the land surface with highly variable density characteristics" (Dunnell and Dancey 1983:272). An understanding of these nuances present on prehistoric settings can only be achieved through more intensive survey and excavation methods that commit to studying landscapes as opposed to the more ontologically limited concept of sites. The application of a siteless survey methodology, which would focus on the distribution of both diagnostic and non-diagnostic artifacts across the landscape,
would be of great utility on Roatán. A survey of this type would reveal the relative over- and under-representation of these materials, with the goal of possibly detecting 'hidden landscapes' that might challenge preconceptions in our interpretations rather than reinforcing them (Caraher et al. 2006:34). To conclude, and taking into account the degree of impact likely present on the surface of all sites, future surveys carried out on Roatán must also include a sample excavation component (Hasemann 1975:26; Wells 2008:78). Test excavations and the analysis of soil samples would be an effective as well as efficient way of understanding the subsurface composition of artifact distribution.

*Steps Towards the Effective Management of Archaeological Heritage on Roatán*

We experienced the pace of development on Roatán first hand during the 2009 field season, when the eastern section of the largest site identified through survey (PR06) was razed in order to make room for an access road to a complex of newly built luxury condominiums. Heavy machinery was used during the course of two days to clear the area and various cultural materials were left exposed (Figures 7.1 and 7.2).

Figures 7.1-7.2. Eastern portion of the site PR06 (Tatus Hill) before and after bulldozing.
Additionally, a brief visit to the island in the summer of 2010 also showed that another large site, Difficulty Hill, had been partially destroyed since 2009. This site is located near the west end of the island was the focus of two salvage archaeology projects, one carried out by Begley (1999) and the other carried out by the IHAH in response to the construction of a cell phone tower (Cruz Castillo 2000) (Figures 7.3 and 7.4).

Figures 7.3-7.4. Cell phone tower construction on the site of Difficulty Hill in 2000 (Cruz Castillo 2000:2, used with permission of the author).
We first visited Difficulty Hill during the 2009 field season of Project Roatán and observed that summit of the hill on top of which cultural material were found still had the cellphone tower that had been constructed in 2001, as well as heavily overgrown vegetation (Figures 7.5 and 7.7). We visited the site again in 2010, and noted that the cellphone tower had been completely removed and the rest of the summit had been recently cleared and bulldozed to make way for some form of construction (Figures 7.6 and 7.8). Cultural materials, including ceramics and fragments of obsidian, were observed throughout the affected area.

Figure 7.5. Cell phone tower on Difficulty Hill in 2009.
Figure 7.6. Cell phone tower on Difficulty Hill in 2010.

Figure 7.7. Summit of Difficulty Hill in 2009.
The impacts observed on site PR06 and Difficulty Hill highlight the speed and degree to which archaeological sites are being affected on Roatán, and short- and long-term solutions are needed to begin addressing the proper management and protection of archaeological heritage on the island (Wells 2008:78). The process of data mining and integration as well as the spatial analyses carried out in this thesis serve as an important starting point for a cross comparison of both archaeological and site management data, and highlight some of the challenges and difficulties inherent in applying GIS to archaeological research in Honduras. Specifically, the application of programmatic methods and approaches such as impact halos, buffers, and threat indexes provides operational solutions by which we can evaluate the significance and degree to which
archaeological sites are or could be threatened by various activities, thus helping heritage managers and local development authorities guide their decisions in a way that mitigates and minimizes damage to these resources.

I hope to have also shown the value of representing features and phenomena as polygons rather than points, a fact which has been noted by researchers elsewhere (Mink et al. 2006). Features that need to undergo this transformation and/or digitization include archaeological sites (where data are available), major towns and communities, and other forms of construction and infrastructure such as telecommunications towers, hotels, resorts, and restaurants. The inclusion of these spatial features will allow for a more precise definition and thus measurement of their relationships, which in turn will aid us in better understanding the degree and types of impacts modern development in all its forms has on archaeological heritage.

In terms of specific GIS work that still needs to be undertaken on Roatán, Google Earth's Historical Imagery Function should be used to track the rate of development and urban expansion in Roatán, allowing for longitudinal analyses of impacts of sites, which can then be used to model and predict where archaeological sites are more to be affected in the island. Google Earth has satellite imagery for the Bay Islands for following dates: March 14, 2004 (west end only); September 13, 2005; and April 8, 2009. Additionally, I have only applied basic vector analyses to the data, while much more powerful raster analyses need to be conducted, including a density analysis of archaeological sites and degree of development, which I believe would allow for much clearer interpretations of where the majority of archaeological sites are located (according to size), and where most
of the development is taking place on the island. Finally, a multivariate model that integrates longitudinal development data, archaeological data, as well as natural, geologic, and socioeconomic data, needs to be created and applied in order to define the most vulnerable areas of the island, an essential step if we wish to define cultural heritage management policies and measures to be used by Honduras’ relevant policy bodies, including the IHAH and the Special Prosecutor’s Office for Cultural Heritage and Ethnic Groups (Fiscalía Especial de las Etnias y Patrimonio Cultural).

In addition, and in order to be truly relevant as well as successful, both future archaeological research and the management of archaeological heritage on the island of Roatán need to take into account the rapid and radical changes taking place on the island, which have a direct impact on the preservation of these resources. The emphasis being given to the development of tourism on the island has allowed its associated impacts, most importantly the migration of people from the mainland seeking to improve their economic conditions, to remain completely unmonitored and unrestricted. Whereas in the past, development and its impacts were restricted to the coast and the island's western portion, demographic pressure has driven populations farther inland and uphill. As a result, and as can be gleaned from the rampant spread of roads across the entirety of the island, population growth has and continues to redefine the landscape of Roatán. This redefinition of the physical landscape also comes with a redefinition of the political and social landscapes, a fact that has been noted and is in fact lamented by local government officials (SGJ 2003:6). A new group of stakeholders continues to define itself as the majority on the island, and with them come new patterns of land use and social and
political organization, all of which must also be taken into account by management policies and plans.

In Honduras, one does not often hear or read the word “community” in the context of archaeological research, other than as a reference to past communities under study. All the proper factors exist for community-based projects to stem: there is a wide body of overlapping legislation that reflects the national importance of cultural heritage in all its forms; many local authorities are ever more conscious of the social and economic value of cultural heritage; and, there is increasing willingness from the part of researchers to work closely with communities. What has been missing? I believe that in the case of Roatán we are simply missing a point of departure.

Roatán's inhabitants, even the newest arrivals, are aware of the archaeological resources present on the island but lack a sense of connection to this heritage, and at the same time view development of the island, which often provides their only source of income, as government official's main priority. In sum, populations on the island demand basic infrastructure and wish that the island continues being Honduras' top tourist destination. What the island's current inhabitants do not see but which some of their leaders must constantly deal with are the contradictions inherently present in the development of a nation. On the one hand, the island needs to maintain its image as a major tourist destination, which prompts the construction of cruise ship ports and other facilities that will greatly increase the number of people who visit the island. On the other hand, the island is quickly reaching its carrying capacity for both permanent and temporary residents, and even basic commodities such as water will soon need to be
imported from the mainland in order to sustain the island's needs (SGJ 2003). To begin to address this situation, Roatán's authorities and inhabitants need to be made aware of the impacts and consequences of their actions on their natural and cultural surroundings. In particular, they need to be made aware of the value of the heritage, both cultural and natural, that is being destroyed. Though they might lack a sense of connection to this heritage, the touristic potential for Roatán's rich history and prehistory might be a strong incentive for them to preserve it.

In terms of the broader future of heritage management in Honduras, it remains evident that a national repository of GIS data for Honduras is needed, and this repository needs to be constantly updated, revised, and made available to researchers in various disciplines and fields (Naunapper 2006). Despite the urgency of creating a national site inventory, the IHAH currently has neither the human and economic resources nor infrastructure necessary to develop this country-wide geodatabase. Additionally, despite the various positive changes that were brought about to improve and expand the research, management, and protection of archaeological heritage in Honduras in recent years, rising political tension and instability in the country culminated with a political coup on June 28, 2009 which ousted then-president Manuel Zelaya, most of the members of his cabinet, as well as other heads of decentralized government institutions, including the IHAH. A direct consequence of this event was the severing of all foreign aid to Honduras, which included several grants and funds which the IHAH was using to support its various projects throughout the country. Euraque (2010) presents a detailed review of the consequences of this event on the management of cultural heritage in Honduras and
highlights the fragile nature of the IHAH in the face of political pressures from more powerful institutions and individuals.

When confronted with the challenges of lack of adequate resources and constantly shifting political agendas, where does the future hold for the management of archaeological heritage in Honduras? I believe that researchers working from outside of Honduras, legally recognized by the IHAH (2007) as 'Associate Researchers', are the best suited to contribute to the management of archaeological heritage throughout the country in the short term since they have the knowledge, training, and technical resources necessary to carry out activities the IHAH is unable to do, such as the survey and mapping of archaeological areas in various parts of the country, which they are permitted to do as part of Honduran Law (Honduras 1997; IHAH 2007). While researchers are required by law to present preliminary and final reports of their research to the IHAH, time and data volume constraints rarely permit IHAH technical personnel to take these into account when carrying out salvage and mitigation activities in areas that have been or are the subject archaeological research. I suggest that a possible solution to this problem is the creation of a third party site registry or inventory, which researchers can use to enter and share their data, and which the IHAH can use and manage. In order for this effort to become a reality and so that it remains a useful and sustainable tool, IHAH personnel would need to be trained in the creation and management of digital databases. The seeds of this project have already been planted by the previous IHAH administration, through the creation of an Informatics Unit and the hiring of an individual trained in computer information systems and GIS (Euraque 2010:115). An additional factor that
would make such an effort a reality is the upcoming career in anthropology at the National Autonomous University (UNAH 2010), through which an internship program can be created that would allow Honduran and non-Honduran students to contribute to this repository by digitizing and georeferencing the existing INSAHH inventory as well as other data available in Honduras and elsewhere. What remains clear is that despite the several setbacks, challenges, and limitations archaeological heritage management faces in Honduras, resources outside the country's legal and political structures are available and need to be used to contribute to the protection of these non-renewable resources.
Chapter 8 - Conclusions

It has been a long standing principle that research, even emergency salvage archaeology, should be carried out only as a last resort, and that, "sites not immediately threatened with destruction should be excavated only when the data needs of a problem cannot be met from the available pool of sites requiring salvage." (Lipe 1974) What can researchers and heritage managers do, however, when nearly every single site in a particular geographic area faces the imminent threat of destruction? In the case of Roatán, fundamental changes need to be made in the way archaeological heritage is recorded, interpreted, and managed. Archaeologists need to accept the fact that research on the island is salvage by its nature, and modify their methods accordingly. Heritage managers and local authorities, leaders and inhabitants on the other hand, need to realize the value of the archaeological materials that surround them, and through this process be made aware of the various actions they can take to ensure the preservation of archaeological heritage and the sustainability of overall land use on the island.

Throughout this thesis I have aimed to examine previous hypotheses concerning the unique location of archaeological sites on the island of Roatán, evaluate the various human and natural factors that negatively impact archaeological heritage on Roatán, and develop a GIS geodatabase that integrates archaeological and basic infrastructure data in order to evaluate both of these issues. In order to evaluate previous site location
hypotheses I integrated archaeological data with ethnohistorical accounts and compared these to the distribution of previously recorded archaeological sites on the island using a GIS geodatabase. My findings support those of Epstein and colleagues (Epstein 1975; Epstein and Veliz 1977) in that the location of offertories and rich artifact assemblages on hilltops might denote the use of this island for ritual or religious practices, particularly during the Selin period (A.D. 600-900) (Wells 2008:76). In addition, my findings support the hypothesis that there was a marked increase in population during the Cocal period (A.D. 900-1500), and that island inhabitants at this time might have relied on both agriculture as well as on marine resources for subsistence (Horton 1985). Despite these findings, much more research needs to be undertaken on Roatán in order to fully support these hypotheses, specifically surface surveys that apply methods and approaches that examine the distribution of artifacts across the landscape.

In terms of the management of archaeological heritage on Roatán, I have shown that archaeological sites across the island are being constantly impacted by the various activities that result from the ongoing development of the island into a top tourist destination. Moreover, there is currently no structure in place to monitor, control, and respond to the impacts of this development on archaeological resources and, like in much of Honduras, existing heritage management bodies are largely unable to comply with legislation. Despite these limitations, I have shown that GIS is a valuable tool for evaluating and quantifying the degree to which certain human factors impact archaeological sites. Given the findings of the spatial analyses I conducted on data from Roatán, I argue that GIS is the most viable solution for addressing the lack of a national
inventory of archaeological sites. To conclude, I suggest that the future of archaeological heritage management in Honduras can part from a digital data repository that is maintained by researchers from both within and outside the IHAH, taking into consideration the strengths and limitations of these and other relevant parties.

Although archaeological heritage is under threat in most areas of Honduras, it is hoped that the work conducted in this thesis can serve to highlight the alarming degree to which archaeological sites on the island of Roatán are being impacted due to a degree and pace of development and urban expansion unparalleled in the rest of the country. Being the most important tourist destination in Honduras has clearly had and continues to have its advantages. Increasingly, however, local communities, organizations and governments are beginning to take a look at their surroundings and realize that if tourism is to continue being the island's most important economic activity, preservation of the island's cultural landscape needs to become a top priority.
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United Nations Educational, Scientific and Cultural Organization (UNESCO)


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2010 Informe del plan de estudios de la carrera de antropología. Manuscript on file, UNAH, Tegucigalpa, Honduras.

Uphus, Patrick M., Alan P. Sullivan, and Philip B. Mink  

Véliz, Vito, Gordon R. Willey, and Paul F. Healy  

Wells, E. Christian  

Wells, E. Christian, Glen E. Rice, and John C. Ravesloot  

Wells, E. Christian and Karla L. Davis-Salazar  
2009 Project Roatán Archaeology Fieldschool Manual. Manuscript on file, Department of Anthropology, University of South Florida.

Westcott, Konnie L. and R. Joe Brandon, eds.  

Wheatley, David, and Mark Gillings  

Williams, Patrick Ryan and Donna J. Nash  
Young, Thomas
1847 *Narrative of a residence on the Mosquito Shore, with an account of Truxillo, and the adjacent islands of Bonacca and Roatán, and a vocabulary of the Mosquitian language*. Smith, Elder, and Co., London.
Appendix A: Project Roatán Site Form

### PROJECT ROATAN SITE FORM

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<td>Site #:</td>
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<td>Previous #:</td>
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<tr>
<td>Site name(s):</td>
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<tr>
<td>Field date:</td>
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<td>Recorded by:</td>
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#### LOCATION & SETTING

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<td>N:</td>
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<td>N:</td>
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<thead>
<tr>
<th>Address/route:</th>
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<table>
<thead>
<tr>
<th>Ownership</th>
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<td>private/org</td>
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<table>
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<tr>
<th>Current owner(s):</th>
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<table>
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<th>Neighboring owners:</th>
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<th>Present land use:</th>
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<td>cliff</td>
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<th>Vegetation:</th>
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<th>Nearest water source:</th>
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#### SITE CONTENT

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<th>Site type (HIAH):</th>
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<td>cemetery/ burial</td>
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<th>Approx. site extension(m):</th>
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<th>Site detection strategy:</th>
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<td>test unit(s)</td>
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<th>Visible features:</th>
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| Has site been excavated? | Yes | No | Explain: | |
|--------------------------|-----|----|---------| |

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<th>Artifacts collected:</th>
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<td>ceramics-prehistoric</td>
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<td>brick</td>
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<th>Collection strategy:</th>
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<td>low (0-25%)</td>
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<th>Estimated subsurface artifact density (per m²):</th>
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<td>low (0-25%)</td>
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<tr>
<th>Observations/comments:</th>
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Appendix B: Project Roatán Site Impact Assessment Form

PROJECT ROATAN SITE IMPACT ASSESSMENT FORM

Site #: ___________ Previous #: ___________ Site name(s): _______________________
Field date: ___________ Recorded by: ______________________________

DAMAGE ASSESSMENT

Feature: □ mound □ platform □ wall □ midden □ scatter □ rock art □ none □ other: ________________________
Cause of damage: □ looting □ construction-large □ construction-small □ agriculture □ vandalism □ other: ________________________
Describe damage: __________________________________________________________

Extent of damage: □ 0-25% □ 26-50% □ 51-75% □ 76-100%
Size/volume of damage: □ Length: ___________ □ Width: ___________ □ Height/Depth: ___________
Duration of impact: □ temporary □ short-term □ mid-term □ long-term □ permanent □ Unknown
Indirect impacts: __________________________________________________________

Evidence of previous visitation: □ garbage □ tools □ fire pit □ construction remains □ other: ________________________
Other observations: _________________________________________________________

__________________________________________________________________________

ATTACH APPROPRIATE DRAWINGS (E.G. PLAN, PROFILE, ETC.) AND/OR PHOTOGRAPHS SHOWING
EXTENT OF DAMAGE AND EXPOSED MATERIALS AND/OR FEATURES.
## Appendix C: Inventory of Archaeological Sites on Roatán

<table>
<thead>
<tr>
<th>Site name</th>
<th>F/N</th>
<th>Site Type</th>
<th>Project</th>
<th>Proj Site Num</th>
<th>Coord type</th>
<th>Disturbance</th>
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<tr>
<td>Hong Kong Hill</td>
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<td>PR 2009</td>
<td>PR06 UTM</td>
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<td>El Antiguall</td>
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<td>PR01 UTM</td>
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<td>PR03 UTM</td>
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<td>Hilltop, hard-packed floor</td>
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<td>Hilltop, cliffs</td>
<td>Raleigh 69</td>
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