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This research explored the evolution of the sugar industry in Belize, including examining its influence on the country's economy and its cultural and historical heritage. As part of this exploration, it situated the information in the context of a heritage tourist application. There has been a dearth of historical lineage establishing how sugar evolved from being a 'non-native' crop to becoming a major source of income in Belize. This study has added to this lineage by connecting the transference of plants with parallel changes in migration and labor patterns, including those of British colonists, expatriate Confederates, East Indians and Belizeans. It also assessed relative group influences with the industries' transformation through the use of archival sources, GPS and ArcGIS mapping applications and technological advancements.

Results identified the locations of some important sugar mills and their associated communities, their histories and the role of various groups, which set the stage for sugar's influence in the modern economy including heritage and industrial tourism in Belize. It shows how the use of technological advances play a vital role in ecotourism through the endorsement of the history of sugar in the country's past and present culture.

One major product is an overview of the growth, development and economic impact of sugar in Belize. A second product is the development of a strategy for improving heritage and industrial tourism of these historic sites. The final product is a database showing sugar-related heritage site locations and their histories along with maps

as well as a downloadable application that is available for transfer to a Personal Digital Assistant (PDA) to access history, maps and directions for the culturally inclined visitor in Belize.

Key Words: Belize, sugar, ex-Confederates, slavery, migration, heritage sites, tourism, PDA's, mobile application

TRANSFORMATIONS IN THE BELIZE SUGAR INDUSTRY:
FROM COLONIAL PLANTATIONS TO A
VITAL TOURIST INDUSTRY

by

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Approved by

Dr. Roy Stine
Committee Chair

DEDICATION

I dedicate this dissertation to my parents, Merle and Peter Campbell, for their continued support and faith in me that propelled me forward throughout my college life.

I also dedicate this dissertation to God for providing the opportunity, knowledge and ability to accomplish and complete this doctoral program.

APPROVAL PAGE

This dissertation written by RACHEL MARISSA CAMPBELL has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

The first Europeans landed in Belize in 1511 after being shipwrecked. It was not until the 1670's, however, that the British were drawn to the forest for wood-cutting logwood and mahogany (Simmons 2001, Bolland 2003) because of its profitable export value. By the 1860s, the British were trying their hand at sugar production in the colony, adapting methods from their other Crown holdings.

The New World sugar industry has a long and varied colonial history and its effect on settlement patterns, political economics, food ways and other cultural traits reverberate today. At present, there is a successful sugar cane industry in Belize. The country relies heavily on its sugar and rum exports and the development of the sugar industry has played a pivotal role in Belize. This industry has evolved significantly since its early development in terms of ownership, labor and methods of production. Because the primary economic activity throughout most of the post-1492 period has been agriculture, several previous industrial sites have been protected, especially some of the old sugar mills, boiling houses and the distilleries.

Much of this rich history of Belize is still buried physically - many of these sugar mill remnants are either midden and/or buried architectural features. Some historic mills (mill sites or mills with historic machinery), however, are still standing and can be investigated through "above ground" and archaeological work. Combining the previously

completed archaeological work and currently available spatial data, even deeper insights can be revealed. There is a treasure of archival data awaiting analysis to provide a glimpse into the collective history for different time periods in Belize, specifically related to the evolution of the sugar industry and comprising major factors such as migration, labor, technology and tourism.

This study provides a glimpse into how this particular plant, sugar cane, has influenced the political, economic, geographical and cultural landscapes of Belize. This sugar history is similar in many ways yet so unique when compared to many Caribbean islands such as Trinidad and Tobago, my homeland, which is why I took interest in this particular study area and country. It also demonstrates how the colonization and plantation history of the country has been incorporated today through technological advances to promote the tourism industry and encourage not just the leisure seekers, but the more culturally-inclined tourist to Belize.

Problem Statement

There is a lack of historical lineage establishing how sugar has evolved from being a “non-native” crop to becoming a major source of income in Belize. The transference of plants and the role of migration, slavery and indentureship in establishing the current sugar industry, especially in Belize, and its full contributions to the tourism industry need to be intensively researched.

There are also regions within the tourism industry that are not being fully developed in Belize that could benefit culturally inclined tourists if they were able to identify and access less popular heritage site locations such as old sugar mills and this would also boost the local economy. There is a wealth of available tourist information about the beautiful beaches and the Maya and their surviving archeological structures, but very little is offered regarding other historic sites, also with rich historic backgrounds and the significant role they have played on the past and present in Belize.

This research focused on mitigating these problems by filling out the history of the sugar plant, the people involved with it and by developing a heritage tourism application for a personal digital assistant (PDA) as way of highlighting some of the less renowned history of Belize. This prototype application targets visitors and tourists who otherwise may not have known that these sites and their historical backgrounds existed and provides relevant information about the sites to interested individuals.

Objectives

This dissertation researched the initial production of Belizean sugar and the sugar industry and identified who subsequently capitalized on the sugar industry after taking over from those who failed. Sugar is a labor-intensive industry and the evolution of the composition of the labor force was also of interest in this study.

Sugar, a plant transfer, was embedded in the economic and social system and used as a tool of colonialism and/or imperialism during that period to maintain control and

authority over the workers. During the periods of sugar production and export by the expatriates from the American South after the Civil War, imported labor and indentured laborers for planting, harvesting and exporting the crop were used. This was complicated by the fact that Great Britain had freed the country's enslaved Africans and they were part of the society of British Honduras, now Belize. For Americans who sided with the Confederacy and fled after its collapse, now entering a world where slavery had been abolished, one asks how would they handle the free African population and maintain their perceptions of control and authority? Also, how would subsequent East Indian migrants to Belize regard their relationship to sugar, labor patterns and slavery? Their roles, behaviors and beliefs were also observed and analyzed.

The four initial research objectives were:

- 1) Collection of GPS points at historic sugar sites in Belize
- 2) Creation of maps and a database showing where the historic sugar sites related to the American expatriates and East Indians were located
- 3) Creation of a narrative and a history of the sites
- 4) Production of a downloadable application of Location-related information for Personal Digital Assistants (PDAs) to allow a visitor or tourist to download historical and locational information on historic sugar sites to their personal device and use it for navigation and educational instruction.

The implementation and use of this application demonstrates to its users how the impact of colonial history and sugar has played a role in the past and present of Belize. A focus on historic industrial sites such as sugar mills and plantations can be an added draw for tourists and visitors to Belize and by incorporating technology in a visitors' app with the historical sites and history, the tourism experience is enriched. Elements of free and forced immigration and sugar history are of interest to many modern-day tourists who find satisfaction visiting historical sites and enjoy being a part of places rich in cultural heritage. Many countries are dependent on tourism, which generates a major part of their income; thus, are constantly seeking new ways to entice more visitors. By catering to the more culturally inclined tourist, Belize can include aspects of their sugar history that are unique, such as the American and East Indian influence on the development of the sugar industry, to generate even more attention and economic success.

This research was geared toward solving the problem of identifying these areas of cultural interest and showing how to get there. It has provided an outlet for the interested parties, whether they are descendents of former sugar mill owners or laborers, local Belizeans, or tourists generally interested in historic areas, to derive the necessary information to locate, learn about and visit these historical sugar sites. These collected data, combined with analysis of the historical documentation, were subsequently used in this dissertation to pose answers to these questions:

- 1) How has slavery, indentured labor and plant transfer played a role in the sugar industry in Belize and what are the physical and economic connections between humans and sugar?

Sugar cultivation is a labor-intensive industry and much of the work was coerced. There is an abundance of literature available about slavery and indentured labor in many of the Caribbean countries. However, Belize is somewhat unique because of the addition of the Americans from the south who migrated there after the American Civil War and their subsequent role in the sugar industry and its patterns of labor and growth. East Indian indentured workers also had to adapt to Belize's environment and the hardships related to the sugar cultivation system. The sugar industry proved viable for some but not others. Today it provides an important part of the Belize economy.

- 2) Why did so many mills initiated by American expatriates not survive and who became owners of these mills that failed? Who occupied the land before they arrived?

Establishing the historical influence of the Americans and East Indians and their role in the sugar industry in Belize shows the intertwining of history that involves India, America, the United Kingdom, Belize and Africa. This history forges deeper connections between local and foreign visitors who are able to identify with or are intrigued by this narrative prompting them to visit and explore sugar related historical sites such as the old sugar mill sites and others associated with this sugar history.

3) How has the development of the sugar industry played a pivotal role in transforming the political, economic, geographical or cultural landscapes of Belize and how have non-indigenous farmers and/or businessmen played a role in the sugar history of Belize during the 1800s?

The role of the sugar industry in Belize has evolved over the years from its introduction by the Yucatan immigrants where it was being grown on a small scale, to becoming a main source of income via export. Sugar is a crop that has become an integral part of the economy of Belize and political decisions associated with land and labor have played a huge role in the crop's history. As a result, sugar has imprinted the country's landscape both physically and culturally and is a welcome draw for tourists to experience the related history.

4) How can technology and GIS be incorporated to advance the country's tourism industry through revealing its cultural benefits, specifically related to its historical plantation and sugar histories?

As in many other countries where sugar, slavery and indentured laborers play a large historical role, there are lasting memoirs of the past, whether visible on the landscape, found in written or audio form, or in stories and distant memories passed down through generations. All of these mediums, tangible or not, are elements of historical interest. If this history is made more accessible through literature, educational systems and technology, then local Belizeans, as well as foreigners, will be privy to more accessible information, maps, and other technological mediums through which they can

read, learn and explore the country of Belize, and interested tourists will be more apt to want to visit and see it for themselves.

5) How does this knowledge enhance our understanding of Belizean culture?

Bringing the importance of sugar to the forefront and highlighting the role of the various ethnic groups in Belize's historical journey is a major step toward the education and understanding process for both locals and foreigners. By intertwining this rich history with technological advancements, it increases the likelihood of it reaching an even wider audience. With more interest in the country's history, artifacts and historical sugar sites being generated, through the availability of more data and literature for learning, there are enhanced opportunities to promote additional research, education and heritage tourism in the country.

Study Area

The country of Belize is located off the Caribbean coast of Central America and is bordered by Mexico in the north, Guatemala in the west and south, and by the Caribbean Sea in the east as shown in Figure 1. It is geographically located at 17°15' north of the equator and 88°45' west of the Prime Meridian on the Yucatán Peninsula. The country is approximately 22,966 square km (8,867 square miles), of which 22,800 km² is land and 160 km² is water. The terrain is generally flat with swampy coastal plains and low mountains in the south. Belize's lowest elevation is at sea level and its highest point is at Doyle's Delight at 1,124 m (3,688 ft).

The climate is characterized as being tropical with dry and wet seasons, with the dry season normally spanning February to May and the rainy season from June to November. It is hot and humid, and rainfall ranges from 60 inches in the north to 200 inches in the south annually. Average temperatures in coastal regions normally range from 24 °C (74.1 °F) in January to 27 °C (81.4 °F) in August with the temperatures slightly higher toward the inland. It is more common to identify the seasons through differences in humidity and rainfall than by temperature variations. Main natural hazards in Belize include hurricanes, mainly during the hurricane season of September to December, and coastal flooding, which occurs mainly in the south of the country (Bushong 1978, Pearce 1984).

The country's natural resources consist of arable land, timber, seafood, and minerals. Primary sectors of the economic revenue are in agriculture, forestry, fishing, and mining, whereas secondary sectors include manufacturing, electricity and water supply, and construction. Tertiary sectors are invested in hotels and restaurants, financial intermediation, trade, and transport and communication, but major export revenue is received from sugar cane, citrus concentrate, marine products, bananas, clothing, molasses, and crude oil, mainly exported to the United States, United Kingdom and other CARICOM (Caribbean Community and Common Market) countries. Their main imports are food, consumer goods, machinery and transportation equipment, chemicals, pharmaceuticals, tobacco, mineral fuels, and lubricants from the United States, Central America, Mexico, and China (Bushong 1978, Pearce 1984).

The country has a population of 312,698 as of 2010 based on census data from the Central Statistical Office, 2010, with the official language being English. Belize is the only English-speaking country in Central America. Spanish is also commonly spoken. Belize is the most sparsely populated nation in Central America. Although it is no longer the capital, Belize City remains the nation's largest city and port. Slightly more than half of the population lives in rural areas. About one-fourth live in Belize City, the principal port, commercial center, and former capital.

The current capital is Belmopan, a shift that occurred after Belize City was demolished by Hurricane Hattie in 1961 (Bushong 1978, Pearce 1984, CIA World Factbook 2012). British Honduras had been a British settlement for about 200 years before becoming a colony in 1862. The official name of the territory was changed from British Honduras to Belize in 1973, believed to be derived from the Maya word *belix*, meaning “muddy water.”, and full independence was granted from the United Kingdom in 1981 (Woods, 1997).



Figure 1. Map of Belize.
 Source: <http://www.belize.com/images/maps/belize-map-relief>

CHAPTER II

REVIEW OF THE LITERATURE

The literature review begins with an overview of the theory of migration, how migration played a role in the Caribbean then specifically in Belize and its relationship to colonialism and eventually sugar transference. It identifies who migrated and why. This is followed by an outline of sugar as a system, its introduction to the region and study area, labor arrangements and agricultural practices as it relates to demand for the product.

Next is a look at the labor involved in the production of sugar and how slavery and indentured labor became synonymous with the sugar plantation and how Belize was similar or different from the Caribbean islands in this regard. This leads to a theoretical discussion of tourism, specifically highlighting heritage, historical and cultural tourism and how these relate to the history of migration and the introduction of sugar in the Caribbean and Belize. Finally, there is a link presented between that tourism literature and the use of technology, such as GIS, GPS, mobile and handheld devices, and how these can be implemented within the tourism industry to benefit countries like Belize.

Section One: Historical Background

Migration

To understand the history of sugar and the people affected by it, some attention needs to be paid to migration theory. Migration is the movement of people from one place to another. There are different types of migration, with the main ones consisting of immigration - moving into another country, emigration - moving out of a country, internal migration - moving within the same country. The one being focused on presently in this research is immigration - moving to another country (Martin et al. 2008, Nurse 2004).

Motives to migrate can be either incentives attracting people away, known as *pull* factors, or circumstances encouraging a person to leave, known as *push* factors. These forces can be economic, political, cultural or environmental. Major push factors that drive people to leave their homes include such conditions such as land scarcity in the home country, political and/or religious persecution, revolutions and/or poverty and of course being abducted into slavery. On the other hand, main pull factors that can attract individuals to a new area include promise of freedom (religious and political), hope for a new life, industry, jobs and land (Massey et al. 1993, Martin et al. 2008, Nurse 2004).

One major reason for migration to a new region or country is the difference in wage earnings that can be attained especially if wages are higher elsewhere. Also, the lack of demand for labor supply or specific skills in a home country may leave many

without employment and drive them to migrate to seek a job meeting their skill level or to attain a higher wage to provide for themselves and their families (Stark et al., 1989).

More recently, according to Jennissen (2007), international migration has been categorized into four groups: economic, political, social and 'linkages' which can result in causality chains, where one event is responsible for another. Slavery is an example of international migration linking all of the aforementioned categories. The trade of people and capital between countries take place within certain guidelines. International migration is specifically divided into two theories that explicate the initiation of migration – why people leave in the first place, and continuation of migration – why they continue to migrate (Jennissen 2007, Roopnarine 2003).

A continuous flow of migrants to a particular country will result in migrant networks and linkages to the home country, making it easier for more migrants to come and settle, resulting in chain migration patterns (Jennissen, 2007). Chain migration occurs when original migrants set up home in a new country, then send positive information back to their home country encouraging others to come, leading to further migration of family or other locals. These linkages can be cultural, historical, colonial similarities, and technological, like airports and harbors where migrants arrive and are welcomed and not refused entry. Cultural linkages can include the sharing of the same language, religion or colonial history, whereas, material linkages are more related to the actual physical distance between the home and host country and what it costs to relocate. Differences in

culture and language may lead to migrants being very cohesive and not assimilating themselves by learning the culture and language of their new host (Chiswick et al., 1996).

According to Massey et al. (1993) “international migration is conceptualized as a form of investment in human capital” (434). Investments include health care, education and job-training. If migrants are able to work hard and save and the conditions in their home country improve, there is the possibility of returning to their home country to retire, especially if they still have family ties at home.

Other reasons that may promote or hinder migration to a particular country include the openness of the receiving country to foreigners, social unrest, comparable education systems, climate and landscape. Even more important is the political situation and immigration agreements and policies existing between the countries, which may either limit migration from certain countries or maintain varying policies regarding the migrants they will accept (Martin, 1994). As migration researchers have long known, decadal censuses do a poor job of tracking in- and out-migration, hiding what can be a very dynamic rate of turnover, seasonal migration, short-term migration, and circular migration (Moran, 2010).

The international migration that occurred in most European colonial economies in the Americas through the 16th to 19th centuries was a direct response to European commercial and colonial expansion in the New World. More than 10 million African slaves were shipped to the American continent and Caribbean islands during the infamous slave trade era. European colonial officials claimed that the abundant land they

had 'discovered' in the Americas was worthless without adequate labor to utilize it. Most Europeans and indigenous workers did not have the stamina to provide the necessary agrarian force; as a result, slavery systems became the preferred alternative after proving themselves in Europe and on nascent sugar plantations on the Madeira and Canary Islands off the coast of Africa (The Schomburg Center for Research in Black Culture 2003, Roopnarine 2003, Beckford 1969, Beckford 1972, Bolland 1981, Deerr 1949, Darcel 1954, Grant 1976, Green 1984, Mintz 1985, Young 1976).

Sugar as a System

Plants have always played an essential role in world history, as shown by the linkages between the domestication of plants and animals and human demographic growth and especially through plant transfers of domesticated plants and animals from their native growing areas to new parts of the world. These species transfers were linked with expansive, mercantile European social formations, and the migrations, markets, technologies and sciences that developed to fit its existing needs, resulting in plant prevalence and success in various parts of the world (Beinart et al., 2004).

Plant transfers have been particularly instrumental in the development of the sugar industry, transporting the crop through the transference of seeds or plants by ocean currents, rivers, wind, or by animals and through human movement or migration to different parts of the world. Reasons for intentional plant transfers can range from attempting to 'try something new' to necessity for food or a change in taste or food

preferences. The latter played a role in the demand for sugar, as a change in western tastes influenced the success of the sugar industry in many parts of the world, including Belize (Beinart et al., 2004).

The development of cash crops helped to solidify the adage that wealth can be measured through ownership and control of land. With increasing populations across the world, international competition for the best soils and land, often for food production, grew. This increase in colonization resulted in 'exotic' vegetation, like sugar, being accepted and integrated into their western diet. Sugar cane is a good example of what was regarded as food, fodder and cash crop (Gleason, 1926).

Gleason (1926) argues that, instead of there being fixed vegetation types as suggested by notions of climate, the presence of a species was determined by (a) whether a species could get there, and (b) if it did, whether it could grow under current conditions. The idea that some organisms are good colonizers, but that they are later replaced by other species that thrive better in a given place, is the fundamental idea of the pattern of succession. Succession refers to the tendency of plant communities to change through time in a somewhat predictable pattern (Luken, 1990). Since they are good colonizers, early successional species may also be better able to keep up with climate change via movement and facilitate the passage and adaptation of late successional species (Moran, 2010). Some argue that "The tropical American empires took their shape not simply because of capitalism, sea power and the dismal development of the Atlantic slave trade,

but because of the opportunities and constraints inherent in the botanical characteristics of sugar-cane” (Beinart et al., 2004:4).

Sugar cane was first produced in New Guinea by very primitive means. These plants then found their way to the Philippines and years later, to India, and then slowly spread to many other countries through colonial processes. Sugar cane is mainly a subtropical and tropical crop, so required growing conditions and means of production limits its range considerably. It needs sufficient rain to provide it with enough water and consistently warm temperatures to flourish (Mintz 1985, Ford 2009).

In 1493, on Columbus’ second voyage, sugar cane was first introduced to the New World from the Spanish Canary Islands. Spain was responsible for the establishment of sugar cane agriculture and its sugar, molasses and rum products, as well as the African slave labor and plantation formations in the Americas. About 1650, Europeans became aware of sucrose and sugar and it came to play a vital role in their diet and medicine and its acquisition and consumption was seen as a measure of status. Growing European demand for sugar led to the establishment of sugar cane plantations on Atlantic islands, which became operational through the labor of African slaves (Mintz, 1985). The Caribbean subsequently played a role in the production of sugar in the form of crystals or liquid and its by-products like rum as well as minerals such as bauxite, asphalt and oil; of agricultural products like spices and dyes; beverage products like coffee and chocolate; starches like cassava; and fruits like bananas (Mintz, 1985).

Along with other cultural markers such as language, Mintz (1985) identifies food preferences and eating habits as one of the ways that people identify with their culture. These preferences are also shaped by the availability and access to these foods, which varies across barriers of class, race and economic status. The increased production of sugar in Belize was driven in part by the growing desire of both foreigners and locals for the sweetener. This is evidenced by the inclusion of sugar in drinks such as tea, coffee, juices and soda and in foods for flavor. The two main sources of sugar have been sugar beets and sugar cane. The most common form of sugar used in food and drink is sucrose, which can originate from either sugar cane or sugar beet (Hugill, 1978).

Available sugar depends on the type of fruit or source, and its degree of ripeness. Since sugar is soluble in water, it travels from other parts of the plant to the parts where it can be stored. For example, in the sugar cane the sugar is stored in the stem, and for sugar beet storage occurs in the roots. Other sources of sugar include the maple tree, some palm trees and the carob tree, but the world's major sources are still the sugar cane and sugar beet, with roughly a 60 percent and 40 percent contribution, respectively (Hugill, 1978). According to Hugill (1978), to derive sugar, it has to be extracted from its host plants or fruits and then processed before use; these processes include manpower, science, technology and capital investments. The next section takes a look at the manpower and labor used for successful sugar production in different parts of the world.

Sugar and Labor in the Caribbean

Sugar was considered an intensive crop because it usually required a sufficient amount of labor and land. During the slavery period, roughly a quarter of the capital investment was in the sugar mill, a quarter in land and half in the slaves. In the Caribbean, the core of slavery was the sugar plantation, so the geographical distribution of the slaves spanned that of sugar cultivation. The preservation of slavery required the transformation of the whole social and political system of a country into one dedicated to maintaining coercive class relations (Stinchcombe 1995, Galloway 1968, Higman 2000, Roopnarine 2003, Beckford 1969, Beckford 1972, Bolland 1981, Deerr 1949, Darcel 1954, Grant 1976, Green 1984, Mintz 1985, Young 1976).

One million Asians were shipped to the Americas and the Caribbean sugar islands to labor as indentured servants after various European powers abolished slavery. Of those, about 500,000 were East Indians. Their arrival in the Caribbean corresponded with a scarcity of labor resulting from the gradual departure of freed Africans from plantation labor and the extension of world capitalism. The importation of foreign labor, especially during the early post emancipation period, was ideologically and psychologically necessary to the planters' survival (Roopnarine 2003, Galloway 1968, Higman 2000, Bolland 1981, Deerr 1949, Darcel 1954, Mintz 1985).

During the 17th century, there were many British and French owned plantations in the Caribbean on which slaves (usually of African origin) and indentured laborers worked to plant sugar cane and make sugar. British control and production in Caribbean islands

like Barbados and Jamaica allowed for sugar to be exported or exchanged profitably. Their profit margins, however, faced a major impediment when slavery began to be frowned upon and was eventually abolished, since a large portion of their early nineteenth century labor force consisted of slave labor. The importation and transportation of slaves came to a halt, officially, in 1807 and slavery was abolished between 1834-1838 in places like the Caribbean and Europe (Mintz 1985, Bolland 2003, Simmons 2001). It was ended in the West Indies in 1834, some thirty years before Emancipation in the United States after the thirteenth amendment was passed in 1865 (Donohoe, 1946). This end to the availability of enslaved laborers also affected countries like Belize where slavery played a huge role in sugar production, exports and profit.

Labor in British Honduras

Slavery in the Caribbean and other ‘New World’ countries is most commonly associated with working on cotton or sugar plantations. Jones (1968), states that “A plantation is an economic unit producing agricultural commodities for sale and employing a relatively large number of unskilled laborers whose activities are closely supervised that usually specialize in the production of only one or two marketable products” (322). They differ from other types of farms by their combination of factors of production, primarily management and labor. Plantation production is undertaken not solely ‘for sale’ purposes, but more specifically for sale in overseas markets – export (Beckford 1969, Galloway 1968, Higman 2000).

Plantation agriculture has been widespread throughout the tropical world as a prevailing type of enterprise because the economies of tropical areas were transformed by European colonizers. According to Young (1976), “Plantation agriculture has been characterized as a ‘total institution’ that has controlled the political structure, established a rigid social class structure, and maintained a stranglehold on the entire economy of nations where it prevails” (425). The labor supply consisted sometimes of slaves, but more often of a distinct ethnic group that made later maintenance of a caste system easy. Most plantations have great need for unskilled hand labor for cultivation and harvesting of a particular crop. Although slavery was practiced in many other times and places, the extent to which the plantation economy depended on slave labor made it unique (Young 1976, Galloway 1968, Higman 2000, Roopnarine 2003, Beckford 1969, Beckford 1972, Bolland 1981, Deerr 1949, Darcel 1954, Grant 1976, Green 1984, Mintz 1985). Plantations and slavery have played a major role in the Caribbean sugar history and in other colonized countries.

In British Honduras, however, the concept of slavery initially differed because slaves were primarily needed to extract timber from logwood and mahogany. Hence, there are differences between slave systems and their legal, agricultural and other cultural traditions (Bolland 2003, Leslie 2002). Belize’s colonial existence was predicated on the extraction of forestry products using slave and indentured labor under the control of a European minority. The British first came to Belize mainly because of the promising logwood and woodcutting opportunities. They were engaged in a Transatlantic mercantile

system demanding a positive balance of trade; the assumption was that based on the economy of scarcity, the growth of one nation came at the expense of another. Therefore, their migration to Belize was mainly for economic gain, intending to forge the necessary relationships needed with the locals to achieve these goals through acquiring sufficient labor for their logwood endeavors. The British stayed in Belize because of the abundance of logwood and woodcutting opportunities and the availability of cheap imported slave labor that allowed them to be successful without seeking out the assistance of the natives who avoided them (Babcock et al. 2000, Bolland 1977, Bolland 2003, Simmons 2001).

When the British arrived in Belize in the 17th century, their initial ‘jobs’ were that of pirates, buccaneers and adventurers, with their main intentions being to raid Spanish ships that ventured nearby. The Treaty of Madrid, in 1670, ended piracy and provided the option for the British settlers (called Baymen) to earn an honest and rewarding living by cutting logwood. Logwood is a tree from which a valuable dye used to color woolen cloth was made and became the economic basis for the British settlement in Belize for over 100 years.

These ‘Baymen’ did not encounter any of the native Maya until during the 18th century, when they began to move further inland to expand their wood-cutting endeavors (Leslie 2002, Bolland 2003). The Maya, however, retreated toward the interior of Belize upon their arrival, leaving a lack of local labor which led them to seek labor from slaves of Africa to assist in their wood-cutting activities. Many of these slaves, however,

although of African descent, lived and worked in the West Indies or were even born there before coming to Belize. Those directly from Africa were referred to as 'African-born', with those coming from the West Indian Islands known as Creoles.

According to Bolland (2003), African-born slaves were obtained through the West Indies and brought to British Honduras; they were used in the mahogany industry by British settlers to extract the timber and get it to the river and to 'man' the river crafts for exportation purposes. The Jamaican slave market was a major source of these slaves who had been 'seasoned' in the West Indies after being brought from Africa. However, records do not accurately quantify how many slaves came directly from Africa and how many through the West Indies 'seasoning' or 'creolization' process. Unlike in most other places where slaves were owned, in Belize, someone of 'color' was assumed to be free unless otherwise proven. Slaves could be manumitted through self-purchase, purchase by someone else, or by their owner (Roopnarine 2003, Woods 1997, Bolland 2003).

Although Belize had a comparatively open manumission policy, cultural practices towards the slaves and the freedmen could be harsh. Even after slavery was abolished the former masters already knew how to maintain their hold on former slaves. Therefore, when the mahogany trade was in full swing around 1838, freed slaves were contracted to work, with strict 'slave-like' criminal penalties if contracts were not fulfilled. However, as the mahogany resources declined, the labor supply began to exceed the demand (Bolland, 2003). The need for this kind of intensive labor did not arise again until the

mid-nineteenth century migration of Americans who shared the dream of carving out plantations in Belize, predicated on cotton and sugar manufacturing.

Labor in America

During the United States' colonial period, the principal commodity produced by slaves was tobacco, mainly concentrated in Virginia and Maryland. Tobacco also utilized the largest percentage of slaves before the American Revolution. In South Carolina slaves were used on rice and indigo plantations. In the Mississippi delta enslaved individuals were often found laboring in the numerous sugar fields. Slavery was threatened after the Revolution with fluctuations in the commodities markets such as tobacco in Virginia and Maryland and the abolishment of that peculiar institution in most Northern states. However, slavery was reinvigorated partially due to the invention of the cotton gin in 1793 and subsequently, from 1800 and 1860, slave-produced cotton extended from South Carolina and Georgia to recently colonized areas west of the Mississippi (The Schomburg Center for Research in Black Culture 2003, Simmons 2001, Harter 1985, Hill 1936, Donohue 1946).

According to the Schomburg Center for Research in Black Culture (2003), by 1850, 1.8 million of the 2.5 million enslaved Africans engaged in agriculture in the United States were working on cotton plantations. Plantation economies in the United States were components of a larger national and international political economy. Enslaved Africans in the United States became a fundamental source of political and

economic capital, being an inexpensive source of labor and legally viewed as a form of property that could be used as collateral in business transactions or traded for goods and services.

The Arrival of the American Southern Expatriates to British Honduras

According to Simmons (2001), the main initial draws or “push” for the expatriated Americans from the southern states to Belize (then British Honduras) were cultural - the commonality of language, history and material - as well as their proximity in distance. Many of the immigrants were planters with experience in managing crop systems such as cotton and sugar. Eventually, as other Southerners travelled to Belize and returned to the United States, they were able to acquire more first-hand information regarding the agricultural prospects, land type and uses, weather and knowledge of the culture and lifestyles of the locals, before they made their decision to migrate. The Toledo, Young and Co. land owning company, for example, offered 100 acres of land to every adult male. There was also the possibility of finding a cheaper labor source after their traditional way of life, including plantations, was uprooted following the Civil War (Grant 1976, Darcel 1954, Simmons 2001).

The end of the American Civil War in 1865 marked a period when many former Confederate soldiers and politicians abandoned the United States in search of a new life. These people were dissatisfied with the change in political economy and their way of life in the American South. The former Confederates were previous members of the military,

often political leaders and supporters of the Confederate States of America. Groups of soldiers and politicians eventually left unsettling conditions in the southern states of Georgia, Virginia, Alabama, Maryland, Texas, and Tennessee, but primarily from Louisiana and Mississippi, and attempted to create a new life for themselves in different Latin American countries, such as Brazil, Mexico and British Honduras. Many of the migrants previously held high-ranking positions in the Confederate army and government (Donohoe 1946, Hill 1936, Camille 1986).

The draw or pull of so many American southerners to migrate to the colony of British Honduras was partially a result of the utopian image this community developed through advertising in some states like Louisiana and Mississippi. Another draw was the establishment of steamship service in New Orleans, which made it easier to travel between Louisiana and British Honduras (Simmons 2001, Hill 1936, Rosenberger 1958).

There is very little information available regarding the exact dates of initial arrival into the colony of British Honduras, however there is an estimate that there were already some migrants from the South as early as 1861 (Hill, 1936). The estimated time period of the greatest migration to British Honduras was between 1867 and 1869. During the 1860s, the colony became a haven and welcome escape for these disgruntled Americans (Camille, 1986).

These immigrants contributed significantly to Belizean history, playing key roles in the cultural and financial evolution of the country, specifically in the evolution of the sugar industry. Sugar cane was already grown in small measures locally. Sugar cane was

introduced into the Corozal district in 1848 by Yucatan immigrants and was grown in small amounts and produced by animal-powered mills. The British arrived and were initially more concerned with wood cutting than with growing crops, but eventually, sugar cane became the crop of choice for immigrants to Belize. This was the case of the Southern Americans who fled the United States after feeling disenfranchised at the end of the Civil War. (Deerr 1949, Darcel 1954, Woods 1997, Clegern 1967, Bolland 1977, Grant 1976). To the British colonists it was mainly identified as a viable crop due to its compatibility with the hot and rainy climate and its ability to grow for a few years without being replanted (Darcel 1954, Simmons 2001, Rosenberger 1958, Camille 1986). The American immigrants eventually became more inventive in their sugar and eventual rum processing techniques and began exporting their products to other countries for a profit (Deerr 1949, Camille 1986, Bolland, 2003).

Approximately 200-300 Southerners eventually came to British Honduras to establish themselves in the Toledo District where they acquired land grants. For example, the Toledo District was owned by Toledo, Young and Company and they made their lands available to settlers coming in from the United States for 'reasonable' prices (Bolland 1977, Camille 1986, Thomson 2004). Reverend Levi Pearce and his family, of the Wesleyan Methodist Church, came from Mississippi and were reportedly one of the first 'on record' to arrive around 1867, making this district their new home. By 1868, even more settlers had arrived, the majority of them being of Methodist faith.

The Toledo district received an abundance of annual rainfall (150 inches a year). It possessed naturally fertile soil that was well drained and therefore less prone to high mosquito populations (Simmons 2001, Holdridge 1940). One of the major issues facing the new inhabitants was clearing of the tropical rainforest to grow their crops and the lack of labor or finances to recruit labor (Simmons 2001, Camille 1986). This particular group of settlers was not successful, possibly due to insects and disease, unwelcoming native residents or internal rivalries. Most eventually returned to the United States after a subsequent outbreak of malaria and cholera (Darcel 1954, Simmons 2001, Camille 1986).

The area was not free from biological challenges to agriculture. Ticks, termites and a local leaf-cutting ant called the 'wee-wee', belonging to the two genera: *Atta* and *Acromyrmex* presented a danger to crops and agricultural workers. Severe weather represented another natural hazard of the area, one that has directly contributed to our limited historical knowledge. Records of the settlement patterns of the district maintained by the local Wesleyan Church were destroyed in a hurricane in 1931 (Simmons 2001, Holdridge 1940).

Around 1869, there was more of a reversed flow in direction of southerners elsewhere back to the United States due to similar circumstances. However, some of the Americans from the Toledo district were encouraged to stay and make British Honduras their new home through local incentives. When these southerners found that the British Honduras climate and topography were inhospitable for growing cotton, often their crop of choice in the United States, they attempted to grow bananas and other crops such as

coconuts, tomatoes, cabbage, peas and beans, as well as the apples and pineapples to which they previously were accustomed (Simmons 2001, Camille 1986, Thomson 2004, Darcel 1954, Hill 1936, Holdridge 1940, Donahoe 1946). Even with this new land they had acquired, however, it appeared that most of the crops attempted were not conducive to the new tropical climate, and according to Holdridge (1940), many became disheartened and returned to the United States. Many, however, were also still leaving the United States and coming into British Honduras at that time.

After leaving the United States, southern expatriates, in the main, were striving to maintain the social constructs of slavery, still viewing former slaves and people of African descent as second class citizens. Now they were faced with a new concept of living, in which all races were considered equal and someone of any race could hold a senior position in society. The British had outlawed slavery much earlier in 1834, but many American southerners refused to have anything to do with people of color, still considering themselves to be superior in every way (Simmons, 2002).

Upon their arrival in British Honduras, the Americans desired to remain 'racially exclusive' and to maintain racial purity even amid their multi-racial surroundings. These racial tensions began to be a cause of concern and apprehension between the locals and the new immigrants. This desire for separation drove them to send their children to school in the United States. Many of the children chose to remain in the United States creating a reverse migration out of Belize (Darcel 1954, Donohoe 1946, Holdridge 1940).

This decreased the expatriate population size and meant that there was no descendent to take over the plantation.

Even though they relied heavily on the local labor source and eventually indentured laborers to ensure the success of the sugar cane growing, production and exportation processes, these immigrants tried their best to avoid any unnecessary contact or relationships with many of the locals, especially those who were former slaves or considered a different racial group. Therefore some immigrants failed to successfully adapt to life in Belize due to their inability to labor in the climate on their own or to assimilate cultural attitudes against forced labor and people of African descent in this former British colony (Simmons, 2001).

Simmons (2001) discusses some of these arrival patterns into the country after the American Civil War and the immigrants' experiences and struggles as they tried to establish a new life, based on the limited historical documentation available to him. He discovers that in Belize, there is evidence of the existence of this particular period and people, such as some place names and surnames. However, one of the most significant reminders is the remnants of a thriving sugar industry that evolved through the expertise and experience of some of the country's immigrants from the American South.

Northern Belize, around Corozal and Orange Walk, as shown in Figure 2, possess most of the sugar cane growing areas in the country. Here, rainfall is more moderate, while it is much heavier in the southern areas. After realizing that cotton was not conducive to the climate of their new home, particularly as a profitable endeavor, they

began to grow sugar cane around 1867 to have a productive crop and compete in the market. They eventually produced sugar cane in larger amounts and exported it and related sugar cane products. Bananas were successful for local consumption, but due to their perishability and susceptibility to diseases and extreme weather conditions like strong winds, were not able to function as an economic export (Simmons 2001, Holdridge 1940, Camille 1986, Thomson 2004, Bolland 1977).



Figure 2. Map showing the Corozal and Orange Walk District in Northern Belize.
 Map source: <http://www.belize.com/images/maps/belize-map-relief>

Sugar, Labor and the East Indians in British Honduras

In southeast Toledo, there were sixty-six American settlers in 1868. Their estates required local labor, which was supplied by the indigenous inhabitants. By 1869, ten mills were established by the American immigrants after sugar cane increased in popularity and success, with three of these mills being steam-driven. After the second wave of immigrants from the United States, struggles with the labor force continued, and in 1872, estate owners began to import East Indians (from India via Jamaica) to work on the sugar plantations (Darcel 1954, Grant 1976, Rosenberger 1958, Camille 1986). Although brought as indentured laborers, they were forced to work for minimum wages and worked under slave-like conditions, unable to leave without permission from their employer.

The expatriates worked alongside their indentured workers to ensure the prosperity of the estates, even though they still struggled to accept non-whites as equals (Holdridge, 1940). By 1891 there were twelve mills with five using steam for power in the Toledo district and eventually by the 1900s there were forty sugar mills and twenty rum stills operating in Corozal and Toledo, however, insufficiently operated mills and low world sugar prices resulted in lower outputs for export (Darcel 1954, Deerr 1949, Camille 1986, Rosenberger 1958, Bushong 1978).

In 1890, the Wesleyan Methodist Church, led by Reverend Levi Pearce, became a very influential part of the Toledo settlement. One of the economic consequences of the Methodist settlers, based on their religious principles, was their refusal to participate in

the manufacturing or selling of alcohol such as rum, derived from the cane. Incidentally, this would have been a good source of alternate income (Camille 1986, Holdridge 1940, Darcel 1954, Rosenberger 1958).

Sugar beet production began to flourish in Europe in 1874 and sugar cane profitability began to experience a rapid decline as imported sugar beets could be sold at lower prices. The Southern expatriates also experienced labor shortages when sugar beets, followed by mahogany, began to play a huge competitive role in the market and the local sugar industry was crippled (Darcel 1954, Holdridge 1940). This collapse in market prices proved to be a push factor for many families, creating a return migration to the United States due to poor economic conditions (Simmons 2001, Holdridge 1940, Donohoe 1946, Camille 1986). Many left for the mahogany industry, then returned to the United States with their profits (Simmons, 2001).

In the early 1900s, with sugar exports still negatively affected by the competition from European sugar beets, many descendents of the remaining American settlers left British Honduras, leaving behind the East Indian indentured laborers who came to work in the sugar cane industry. This transition occurred gradually, converting the Toledo settlement from being controlled by the American immigrants into an East Indian settlement. After serving their indentureship requirements, many of the East Indians laborers brought to Belize as laborers in the 1870s made it their permanent home, and today their offspring dominate the settlement (Simmons 2001, Bushong 1978, (Darcel 1954).

The East Indians were eventually able to make their own contracts for their labor, or to secure their own land for growing crops. Many were unable to afford to purchase land so they leased the land from the official owners, many of whom were absentee landlords and now living in another country, such as the United States. It was many years later when actual transfers of ownership and land holdings were granted to the current residents in the settlement (Camille 1986, Rosenberger 1958, Grant 1976). The government of Belize introduced the Rural Land Utilization Tax in 1966 in an effort to reduce absentee land ownership and give current occupants a better chance to own and utilize land that was currently undeveloped. This tax was applied to properties of 100 acres or more that were not being permanently developed, encouraging land owners to either develop the property or sell it (Camille 1986, Rosenberger 1958, Grant 1976). Since the early 1950s, the sugar industry in the Toledo District has been operated by the East Indians, who not only grow the sugar cane but also produce rum. Eventually, as the production of sugar cane and related products declined, they shifted to rice cultivation (Camille 1986, Rosenberger 1958).

The sugar industry survived, however, and today it is a major part of the economy of the country of Belize. The country maintains the climate and suitable conditions for the successful growing of the sugar cane crop. Also, mechanical and technological advances allow for more efficient growing, cutting and processing of the cane into sugar and sugar products for local use and export. Belize currently has the infrastructure to transport sugar products with the Tower Hill Sugar Factory in Orange Walk being the

sole operating sugar mill currently in the country. It is owned by Belize Sugar Industries, Ltd. and is supplied with cane by more than 4,000 farmers, reaping an estimated 40,000 acres each year. Currently, small farms in Northern Belize generate most of the sugarcane. In the early 1990s, the coordination of the agricultural aspects of sugar production and the organization of cane delivery were the responsibilities of the Cane Farmers' Association. The industrial segment of the sugar-production process was controlled by Belize Sugar Industries Limited (BSIL). Overall coordination of the industry was exercised by the Belize Sugar Board (Merrill, 1992).

As a result, sugar cane is a principal crop and is used for sugar production and as a feed stock for ethanol production (The Library of Congress Country Studies; CIA World Factbook, 2012). Sugar continues to be in high demand around the world and it accounts for 60% of Belize's agricultural exports. Figures 3, 4, 5 and 6 below show the trend of sugar exports in tons and value from 1961 to 2010. Its history and those who played a major role in its development and successes should be acknowledged and given a rightful place in the country's history. Also, this rich heritage and cultural history can be an invaluable tool for use within the tourism industry to attract tourists to explore and learn about the sugar history in countries like Belize.

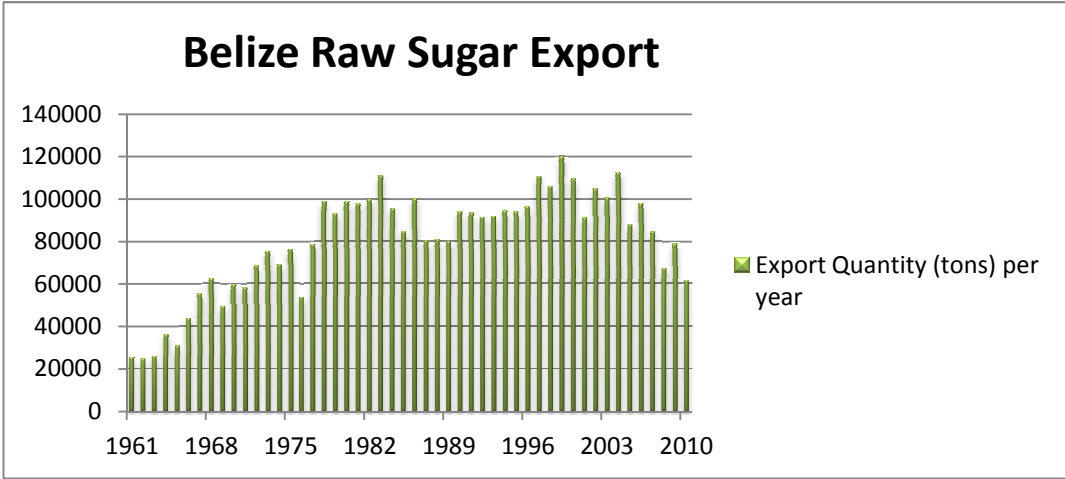


Figure 3. Bar Graph showing Raw Sugar Exports in Belize from 1961-2010
 Source: Food and Agriculture Organization of the United Nations (FAOSTAT)
 Downloaded on 4/29/2013

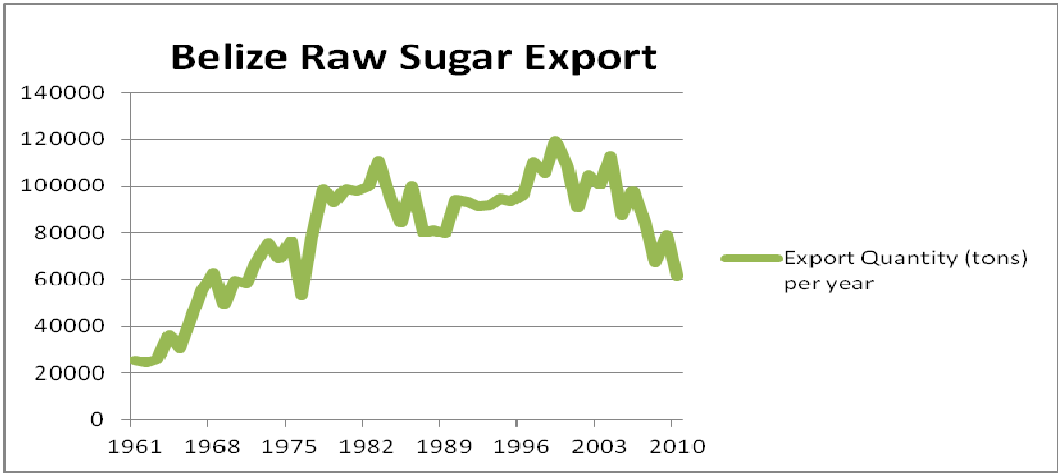


Figure 4. Line Graph showing Raw Sugar Exports in Belize from 1961-2010
 Source: Food and Agriculture Organization of the United Nations (FAOSTAT)
 Downloaded on 4/29/2013

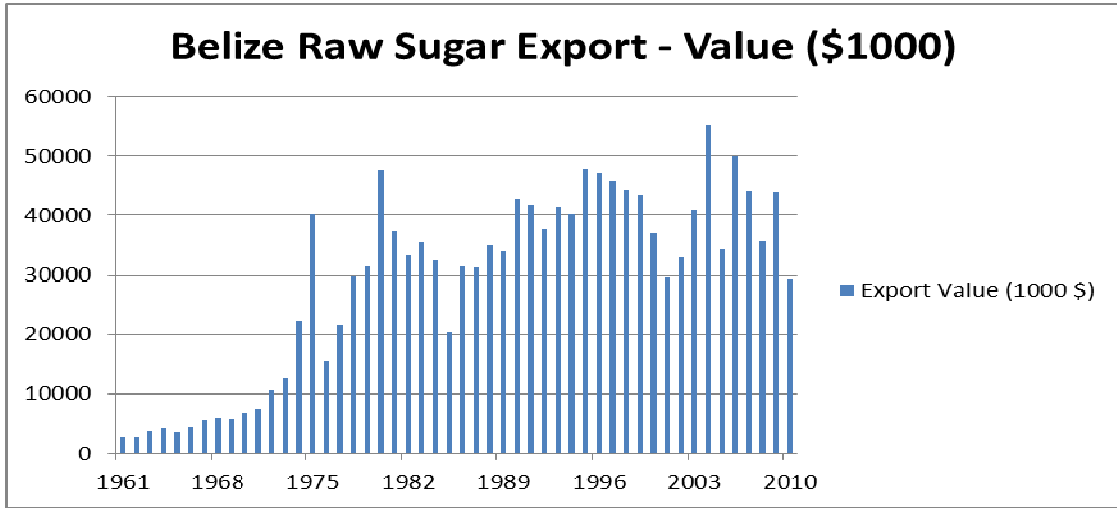


Figure 5. Bar Graph showing Raw Sugar Export Values in Belize from 1961-2010
 Source: Food and Agriculture Organization of the United Nations (FAOSTAT)
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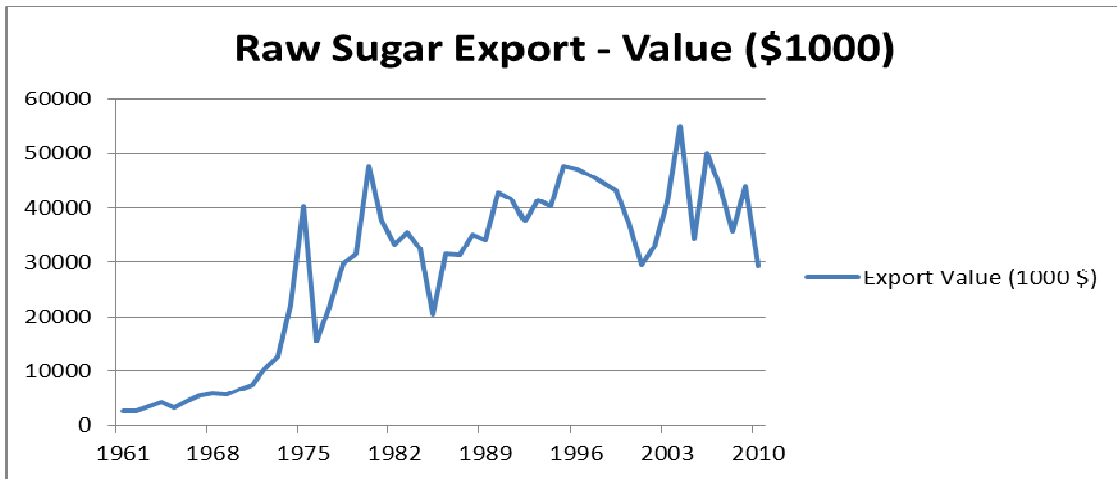


Figure 6. Line Graph showing Raw Sugar Export Values in Belize from 1961-2010
 Source: Food and Agriculture Organization of the United Nations (FAOSTAT)
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Section Two: Heritage Tourism

Tourism

According to Hall et al. (2006), tourism is recognized as being the world's largest industry; however, tourism, tourists and their impacts are not equally distributed. It has produced one of the largest population movements in history and has allowed access to many less renowned parts of the world, turning them into travel destinations. Tourism is also highly dynamic and is greatly influenced by elements of economic, political, social, environmental and technological change, while contributing to the exploration of the historical, natural and cultural heritage of a place, thus improving the individual cultural understanding of residents and outsider's alike (Kushwaha et al. 2011, Birgül et al. 2001, Hall 2006). Through its links between its originating areas, destinations and travel routes or paths, tourism is perhaps a phenomenon that depends more than most not only on transport, service and trading networks, but also on social, political and environmental relationships between the consumers and producers of the tourist experience (Hall et al. 2006, Carlson 1980).

Tourism, once part of the lifestyle of only wealthy people, has progressively become accessible to people of varying incomes, thus increasing the extent and power of the industry. Places serving as tourist destinations play a significant role in the expansion of tourism through welcoming of tourists, advertising their attractions and providing satisfactory accommodations. Countries may seek tourists to generate income, as well as to create employment opportunities for the local people (AlSayyad 2001, Carlson 1980, Cameron et al. 2008, Guerron 2011, Cave et al. 2012, Fotiou et al. 2002).

According to Gottdiener (2000), it is estimated that between 400 million and 500 million registered tourists travel every year and that more than 250 million people are employed in the tourist industry. Tourism is a form of consumption and “the ‘naturalness’ of tourist sites is neutralized by commercial overdevelopment. Transforming the tourist experience into a conveyor belt for making money renders the experience unsatisfying and ultimately dehumanizing” (Gottdiener, 2000:56). A way of reintroducing some of the benefits of tourism other than its obvious economic profits is seeing it as a medium of attaining geographic knowledge and experience.

Tourism and Geographic Knowledge

Due to the usually uncontrolled growth of tourism in destination countries, geographers and non-geographers have united within the planning aspect of the tourism industry to achieve success (Carlson, 1980). Geographers have not been used to their full potential within the tourism industry resulting in a deficiency in spatial perspective within tourism planning. Another field of study that can be incorporated to reap rewards within the tourism industry, is cognitive geography wherein lies the element of the geographic experience. The geographic experience entails a combination of reasoning, memory, perception, problem solving, behavioral geography and communication involving earth phenomenon and generally accesses the behavior of individuals within space (Pearce 1984, Montello et al. 2005).

Kuipers (1983) suggests that movement through geographic space results in the recognition of points in common along paths which create 'network models of place connections' cumulating in spatial knowledge acquisition. Tourists are involved in decision-making processes and geographic knowledge acquisition when they move around in space, ranging from local travel and commuting to external migration, and use spatial knowledge to achieve a valuable tourist experience (Lloyd, 1997). Experiences are derived both en-route to a destination as well as on-site. Golledge and Stimson (1997) define human spatial behavior as "any sequence of consciously or subconsciously directed life processes that result in any changes of location through time" (155). These changes in location are experienced by tourists as they move and visit different places and spaces.

According to Siegel and White (1975), geographic learning involves three stages. These include landmark knowledge, route knowledge and survey knowledge. These stages range from the ability to identify and recognize specific landmarks and locations to being able to form routes and eventually making sense of the groups of landmarks and the locations. Geographic knowledge is attained as people move through space displaying different types of geographic behavior. Tussyadiah et al. (2012) state that a relationship between geographic behavior and an emotional connection to places leads to place attachment. Many tourists, especially cultural tourists may want to have an experience that is authentic when they are able to experience a different custom and culture and a sense of place attachment as well as acquire new geographic knowledge.

Heritage and Cultural Tourism

Identity plays a role in the decisions made by a tourist and where they chose to travel, and all travel encompasses a cultural element. Activities such as visiting cultural landmarks and historic sites, visiting museums or attending festivals are a part of the cultural experience (Novelli 2005, McKercher et al. 2002, McKercher 2002). According to Urry (1990), a major aspect of the tourist experience is “to gaze upon or view a set of different scenes of landscapes or townscapes which are out of the ordinary” and “there is no universal experience which is true for all tourists at all times” (1). Crouch (2005) proposes that being a tourist “is essentially the process of making meaning of spaces and cultures” (28) and seeking to gain value from the places, spaces and landscapes they encounter or ‘consume’.

Many tourists tend to seek out a new experience and have their own way of experiencing the signs and symbols related to the places they visit. This has contributed to the increase in more specialized travel packages within the tourism industry, with more emphasis on landscapes, nature, historical and heritage sites and museums, and a search for the authentic (Urry 1990, Uriely 1997, Munt 1994). Stine (1997) expresses landscape as being “shaped by the land within a dynamic cultural and natural context” (xi) and that “members of culture interact with the natural environment” (190). This interest in the environmental and historical aspect of places by the tourist has given rise to the popularity and focus on heritage and cultural tourism (Prentice, 1993).

The recognition of cultural/heritage tourism as a distinct product came to light in the 1970s. Individuals marketing tourism realized that many people traveled with the expressed purpose of experiencing and understanding the area's heritage and culture. In fact, "Depending on the source and the destination, between 35% and 70% of international travelers are now considered cultural tourists" (McKercher et al., 2002:1). As a result, many tourism initiatives are being specialized to accommodate increasing volumes of tourists and achieve higher competitiveness and growth. The growth of cultural tourism has coincided with the emergence of a broader appreciation of the need to protect and conserve dwindling cultural and heritage assets (Fusco 2009, McKercher 2002, Chambers 2000).

Collison et al. (2010) state that cultural and heritage authenticity denotes something that is real, original, pristine or veritable. The authenticity of a tourist's experience relies on the originality and uniqueness of the historical and cultural experiences at a destination and contributes to overall satisfaction. The 'modern' tourist is more interested in the emotional experiences of a vacation: the destination's history, people and traditions. These offer a more 'authentic' experience through intangible cultural history which includes social practices, oral traditions and expressions, rituals and festive events (Giudici, 2013). As modern Western culture searches for authenticity in their travels, they follow a trend of shifting from abundance to authenticity.

Within the heritage industry, cultural traditions and heritage can be regarded as a form of property, which can lead to culture being packaged or sold as heritage, and

cultural tourism is observed as an economic tool by governments and private businesses (Bennett 2005, Fullerton et al. 2010). This drives the need to market and “sell” its precious assets and history to encourage more tourists to visit, thus increasing the income generated from the industry.

Large numbers of tourists can have a significant impact on local elements on a cultural, social and environmental level. As a result, these tourist destinations need to specify what they are offering to tourists to appeal to a more specific sustainable number of people. Establishing a unique cultural heritage tourism can assist in distinguishing one place from the next. Intangible cultural heritage stems from the collaboration of nature and history and cultural differentiation can be the answer to ‘substitutability’ by offering uniqueness. A competitive product is essential in tourist development and can be sold as a destination on the market (Giudici 2013, Chernela 2011, Scher 2011).

A shift toward more cultural aspects of tourism has brought more postmodern views of tourism to the forefront. Postmodernism tends to reject the modernist generic view that has been implemented where tourists are treated as homogenous, and highlights the individual differences of the tourist and their cultural diversity. This came about as a result of consumer reaction to being treated as a totality or a mass (Walle 1998, Urry 1990, Uriely 1997, Poon 1993). Uriely (2005) discusses the ‘pluralization’ of tourists, the variety and diversity of the tourist’s experience and its shift from just observing ‘objects of display’ to attributing meaning and understanding. Poon (1993) argues that the transition from Fordism to flexible production in manufacturing is mirrored by equivalent

shifts in travel and tourism and that major technological innovations accompanied by new trends in consumer behavior, allow rigid mass-oriented, standardized package tourism to be replaced by more flexible travel forms emphasizing individuality and autonomy. This has become a problem in countries of the Caribbean and Belize where they focus mainly on their 'island' characteristics to attract tourists even though they possess many other draws unique to each country or to the region.

Caribbean and Island Tourism

Tourism may act as a homogenizing agent in its attempts to present a certain image to attract tourists, but also can strive to be unique to gain a competitive edge on the market. After the Second World War, a shift from colonial territories to more independent economies resulted in many Caribbean island states becoming popular mass tourism destinations, with resort hotels gradually replacing the plantation as primary sources of economic production. Because many countries in the Caribbean region rely on marine and other primary industries, tourism has opened a door to more economic development opportunities. To attain success there should be more focus on the competitive marketing of tourist packages, niche positioning and unique selling propositions (Guerrón 2011, Cave et al. 2012).

Most of these 'sun-beach' tourism destinations possess unique flora and fauna and attractive landscapes and people with historically preserved traditions and living cultures. Promotion of cultural heritage or 'island culture', through festivals and events can be

effectively incorporated into the advancement of the tourism industry (Fotiou et al., 2002).

For many Caribbean islands and other tropical destinations, most of the tourists hail from the United States, Britain, Germany, France and Japan. The Caribbean is considered as the most tourism dependent region in the world, with the Hispanic Caribbean claiming the bulk of the influx, followed by countries like Jamaica, Trinidad, St. Lucia, Barbados and Guyana (Boxill, 2004).

According to Found (2004), the Caribbean and Central America possess an abundance of historic sites and material culture that has become progressively trendy for tourists and visitors. Heritage sites and artifacts play a vital role in the tourism industry due to their association with different population groups and anthropological, historical and archaeological interpretations (Found 2004, AlSayyad 2001). Many islands and countries within the Caribbean region have normally been generating their tourism industry based on sun, sand and sea. At many of these “warm water destinations”, there is a utopic vision of paradise presented to tourists – sunny, clear waters and green vegetation.

However, there is also an unrealistic view that pre-modern is authentic and modern is inauthentic because cultures continually evolve and are constantly vulnerable to change (Keith et al. 2010, Nelson 2007). With many having an estimated “500 years of colonial history, architecturally and historically significant buildings and sites, and vibrant expressive forms beyond the stereotypical hotel reviews to present to tourists - it

is curious that much of the Caribbean has opted mostly for the narrow niche of tropical hedonism” (Cameron et al., 2008:56).

In "Caribbean Culture: Future Trends" (1997) Hall identifies that the natural tendency of decolonized peoples is to practice culture as a resistance to globalization. He highlights the Caribbean as being a product of globalization manufactured through processes of colonial exploration, conquest, and forced transportation of indigenous peoples around the globe, contributing to the fashioning of a world market.

The Caribbean islands were once a very valuable commodity to the European powers and were some of their first colonial conquests. During the post-Columbian history, elements of colonization, trade and settlement resulted in unrest and war with struggles for land ownership and the sugar economy. Eventually, the British were able to maintain the strongest hold in the region, importing and overseeing slaves to work in the cane fields. As slavery came to an end along with a decline in the sugar industry, the interest in the Caribbean changed into that of a tourist destination which became more popular with improvements in transatlantic transportation.

The first steamship arrived in the West Indies on 1826. At first these ships were used for trading purposes, and then eventually led to new tourism networks. Popularity of Caribbean islands as tourist destinations increased during the late 18th and early 19th centuries with increased stability, improved infrastructure and availability of information about the destinations. Many 19th century travelers kept travel narratives which served to vividly illustrate their experiences and encounters and elements of landscape and nature

became more alluring to the visiting tourist. More recently representations of tourism can be found in various forms of media such as the television and the internet (McKercher et al. 2002, Ramsey et al. 2002, Nelson 2007, Chang et al. 2011, Buhalis et al. 2006).

Boxill (2004), shows how a country like Jamaica has the potential to develop an alternative tourism to the sun, sand and sea product being marketed and use some of its other heritage and cultural assets to attract and engage tourists to the island. Some of these lures include Port Royal, Spanish Town – the first city, and Trench Town – the home of reggae, associated with Bob Marley.

Guerrón (2011) states that in Carriacou, a dependency of Grenada, there are descendants of French, English and Scottish settlers and slaves from West Africa. Sugar has played a huge role in the history of the island which operated large-scale sugar operations introduced by the British and run by slaves. The island is rich with heritage and culture derived from its plantation and colonization history. Tourism is the main industry of Grenada and the government has used the history, diversity, culture and historical and archaeological sites to market Carriacou.

Before slavery was abolished, Carnival in Trinidad and Tobago consisted of lavish masquerade balls at the homes of the wealthy. After the emancipation of slavery, however, everyone was free to partake in the celebrations which were influenced by the arrival of indentured laborers from India as well as the Chinese, Portuguese, Syrians and Lebanese immigrants (Scher, 2011). Until the country gained its independence in 1962, Carnival was also used to challenge the British colonial presence on the twin island, as

well as a voice of protest against unfair laws, a source of praise for deserving individuals, and a way of expression through costume and music. Carnival has provided a means of distinction through its expression of the Trinidadian culture and ties to its national identity and warrants preservation and protection as it is promoted and marketed for this 'living tradition' to be experienced by the rest of the world (Scher, 2011). Because the selling of culture has become an economic necessity in much of the Caribbean, Carnival in Trinidad and Tobago has become yet another of the culture and heritage traditions being regarded as valuable resources to be sold as a marketing product along with other commodities such as oil, natural gas or sugar cane. The commodification of Trinidad and Tobago Carnival has produced a 'privatization of nationalism', where its uniqueness is being used as the drive for tourist attraction (Guerrón 2011, Scher 2011).

Modern tourism assumes that a location is deemed a tourist 'attraction' stemming only from customer demand, however, effective tourism is being undertaken in places like San Blas Islands in Panama. Here the Kuna indigenous people are managing their own heritage resources and indigenous cultural land while minimizing negative impacts on the environment and their resources, but maximizing community benefit (Chernela, 2011).

Like many Caribbean countries, Malta's tourism industry is also marketed by its historic ties with Britain as well as its marketing of the sun and sea experience. Malta is another example of a country that shifted toward cultural heritage tourism to escape the mass-market tourism that was causing negative environmental impacts on the country

(Foxell, 2010). The country possesses a rich cultural history stemming from its foreign rulers and invaders which include historic sites like coastal towers built by the Knights of Malta as well as other historic and prehistoric monuments. There are also many cultural festivals. The government is now actively playing a role in promoting and safeguarding the cultural history and natural environments of the country (Foxell, 2010). Belize is also a prime example of where cultural and heritage tourism can play a greater role within the tourism industry.

Tourism in Belize

Schmitt (2002) presents five dimensions of experience that can be focused on within the marketing of tourism. They include sensory, affective, cognitive, physical and relational which all tie into the way that tourists experience and interact with the places they visit, the people they meet and the artifacts they see. Modern tourism is identified as being a result of both prevalent global forces and the unique nature of specific people and places. According to Chambers (2000:90),

Belize has been noted as a major site of ecotourism development, aided in this respect by its large and diversified forest reserves, Mayan archaeological sites and the second largest barrier reef in the world. Belize's proximity to the United States, relatively small population and political stability has added to the country's appeal. In 1984, tourism revenue represented approximately 7.6% of the country's GDP. Only 8 years later, it accounted for more than half of the GDP.

From 1987 to 1999 stay-over tourist arrivals to Belize increased by more than 200 percent, from 99,300 to 326,600 according to the *Caribbean Tourism Statistical Report* of 1999-2000 (2000). Belize's natural beauty, ecology, location and diverse culture grant it unique gifts allowing it to differentiate itself from the rest of the region. Cultural and historical tourism can glean from the country's multi-faceted past: Amerindian history, European colonization, slavery and subsequent East Indian indentureship, which have all left their marks on the landscape (Boxill, 2003). These features as well as its official language of English, political stability and its close proximity to the United States, give Belize a distinct comparative advantage in attracting ecotourists (McMinn, 1998).

The Government of Belize has been making efforts to tap into the global tourism market by making tourism their economic focus. Belize's early potential for establishing a successful tourism industry was enhanced by its location, primary language, climate and natural features. Tourism is being boosted as the government continues to put the necessary infrastructure in place like hotels, tourist facilities and transportation services and tourism figures have been on a steady rise since 1970 (Pearce, 1984).

The notion of gateways play an essential role in the tourism industry because gateways serve as the main points of entry and exit and should be welcoming and informational (Pearce, 1984). They should be equipped to provide the tourist with a range of available options of things to do and see while in the country. For example in Belize, the main gateway is the airport at Belize City which should house even more information about hotels, food, organized tours, facilities, attractions and cultural sites. This would

support the promotion of many lesser known locations like smaller Mayan centers or the sugar heritage sites and increase visitor interest in them (Pearce, 1984). More recently, the government is marketing through the cruise ship industry to get more cruise ships to come to Belize and through their Mayan heritage sites (Ramseya et al., 2000). The sugar history of Belize has also played a huge role in influencing the people and the landscape and this history can be used to promote the tourism industry.

Tourism and Sugar

Found (2004) states “Human occupation in the Caribbean has been synonymous with mobility and population movements” (136). Whether modern tourists, initial indigenous inhabitants or later colonists, the inhabitants and visitors to the Caribbean have seen a rich diversity of natural and cultural environments. Due to historical and environmental circumstances plantations emerged with the colonial conquests of many islands and countries, which led to the establishment of sugar factories and distilleries, labored on by slaves then by the indentured laborers who were imported after the emancipation of slaves in 1834 (Bolland 2003, Young 1976, Roopnarine 2003). After slavery was abolished, there was a huge effect on the available labor in the Caribbean and other countries where sugar was being grown in a plantation setting. In some places, sugarcane growth and sugar production on plantations continued unabated as freedmen and in some cases indentured workers were now able to receive wages, whereas in others,

there was a significant decline after the loss of slave labor (Found 2004, Roopnarine 2003, Mintz 1985, Simmons 2001).

Throughout the 20th century, there were many changes in the viewsapes of countries like Belize. The landscapes were transformed as the cultivation of large-scale sugar was deserted, leaving the decaying remnants of the previous plantation sites. Even today, most of the sugar cane growing areas are consolidated in Northern Belize, around the Corozal and Orange Walk regions. These ruins now offer a blurred glimpse of an important industry and its powerful cultural forces.

The decline of the sugar plantation system just predicated the growth in Belize's ecotourism and heritage tourism towards the end of the 20th century. In Belize these sugar-related heritage sites are not traditionally tourist draws as are the Mayan or sun and fun locations. According to Found (2004), one main form of this preservation is through the establishment of museums, which can incorporate public viewing and conservation services. He states that "one of the most significant artifacts from the past and the largest in scale has not received the recognition it deserves – the rural landscape" (143). The country's continued focus remained on the numerous Mayan ruins as opposed to the historical properties. As a result, the historic sugar mill industrial sites and concomitant rural farming landscapes were ignored. Because Belize now recognizes that the primary economic activity throughout most of the post-1492 period has been based on plantation agriculture, a few of the old sugar mills, boiling houses and distilleries have been

protected such as the Serpon and Lamanai historical sugar sites (Pearce 1984, Found 2004, Cameron et al. 2008).

All of Belize's past legacies can be incorporated into enticing tourism. Their interesting historic and prehistoric artifacts, landscapes, buildings and museum content can feed on the increasing tourism trends focusing on more historic, cultural or heritage sites and the growth of ecotourism, which "includes an appreciation for authentic culture and involves the movement of tourists well into the rich context of local life and exposure to historic landscapes and material cultures" (Weaver 1995:148, Found 2004).

According to Pearce (1984:295), "With the exception of the Mayan sites, the interior of Belize has limited possibilities to market for international tourism" and "The flora and the fauna of the country may attract a small number of visitors, but urban areas, whether Belize City or the district centers, have limited appeal to international tourists". Because one of the largest groups of visitors to Belize consists of Americans, there is a connection between their history and that of Belize. This can lead to the tracing of ancestors through genealogy, linking the past and present of the United States and Belize. The Lamanai sugar mill heritage location is also in close proximity to the Mayan temples ideal for stronger historical and cultural relationships within Belize. Given the rich sugar history and heritage sites that still occupy the landscape, with adequate marketing, advertisement and accessible information and knowledge, these historic sugar sites can prove to be a significant addition to the country's tourism industry and further disseminated to the rest of the world through technological and geographic advances.

Technology in Tourism

Simplified, uniform images of places like the Caribbean contribute to its unchanging, timeless ideal held by the tourist. These tropical paradise imageries changed over time from the 16th and 17th centuries to include plantations and slavery along with agricultural production during the 18th century. All of this rich history remains a part of the Caribbean landscape and scenery and is used to fascinate and entice the tourist through fantasy representations of periods of slavery, colonialism, globalization and migration (Guerrón, 2011). Heritage interpretation is an important factor in the interpretation of a site within heritage tourism. It assists in telling the story, increasing participation and showing relevance to the tourist at heritage sites, encouraging a more emotional experience. However, because tourists visit a historic or heritage site for different reasons and also perceive it differently they should also be marketed differently (Fullerton et al., 2010).

The World Wide Web is an important tool for tourism destinations to showcase their appeal with the tourism market. It can inform visitors of what is available at a particular site location. Marketing of tourism can also involve demarcating interventions which can influence tourist behaviors and change their focus to less popular heritage sites. Tourists may research and seek information from others who have visited a destination, as well as seek out existing historical and location information about a point of interest (POI) both in the planning stages as well as during the vacation itself. As a

result, the internet and wireless access assist in disseminating information to the technology-oriented public (Keith et al. 2010, Kenteris et al. 2011, Schwinger 2002).

Increasing location-aware technologies are making it easier for tourists to access relevant geographic information even before they decide on a travel destination and also assist in their decision making processes while on vacation. They can therefore play a valuable role in their experiences with a particular place. Through the use of geographic information, and other more common technologies such as mobile devices, decisions can be made and problems solved through access to the internet, dynamic maps or navigational assistance such as GPS. This access to geo-based technology contributes to the increase in geographic and spatial knowledge about a tourist destination and ultimately to authentic experiences and place attachment (Tussyadiah et al. 2012, Cheverst et al. 2002, Schwinger et al. 2002).

For example in the study conducted by Tussyadiah et al. (2012), it was confirmed that geo-based technology enables tourists to be more knowledgeable about places and to make more meaningful spatial-related decisions through increased interaction with people at the destination and with the destination itself. As a result, using geo-based technology can make tourists aware of information on lesser known sites they can visit at their destination and also identify routes and spatial networks to that cultural resource. Mobile technologies assist a traveler while they are on the road and allow constant access to information if all of the necessary factors are available such as signal strength for internet or GPS connections. Shifting from the traditional printed maps, mapping

products are now becoming a popular medium for geographic communication. According to Birgül et al. (2001), a GIS is a useful tool within the tourism industry and the further establishment of a tourism-focused information system (as they proposed in Turkey for example), would be beneficial in the promotion of tourism.

As mobile devices become more popularly used within cultural multimedia applications, cultural and tourist applications are becoming more advanced in the services offered. For example, audio-guides used to connect artifacts to information, and hand held computers like those used at the Smithsonian allow a visitor to access a variety of information through text, audio and multimedia while touring a site. PDA's are able to provide a more personalized and interactive experience along with its navigational capabilities and wireless access allowing the convergence of IT and communications technologies and ubiquitous access (Economou 2008, Kenteris 2011).

A Multi-Platform Tourist Guide system in Mytilene, Greece was designed to empower tourists to navigate and learn about the city without a guided tour through a mobile application downloaded to their PDA. Tourists are able to locate accommodation, restaurants and sites of interest in the area (Kenteris, 2011). The Yehliu Geopark mGuiding application (*mGuiding*), is another example of a mobile tour guiding system integrating GIS and GPS technologies to offer tourists a means to identifying and locating scenic points-of-interest in natural and cultural landscapes. It also provides street and picture maps (Chu et al., 2012).

Other mobile tourism guides that can be useful for knowledge and guidance toward historical, cultural or lesser known sites include *COMPASS* (Context-aware Mobile Personal Assistant), which delivers context-aware recommendations and services to tourists such as restaurants and museums. *CRUMPET* allows its user to request and access information on tourist attractions through its interactive maps and alerts when the user gets near a site of interest. The *GUIDE* system also provides context-aware information through a PDA regarding site information in the nearby vicinity of the user (Schwinger, 2002).

Another system is *Gulliver's Genie* which uses the tourist's current location to present an updated map of the nearby points of interest through a wireless connection. On arrival to a point of interest, the tourist receives images and audio information on the site. *PinPoint* operates similarly to *Gulliver's Genie* by offering navigational support and updating information on points of interest, as well as *MobiDENK* used particularly for monuments (Schwinger, 2002).

Two of the more specialized location-based mobile applications include the *LoL* for Local Location assistant, which provides information to tourists in Vienna regarding points of interest and *Sightseeing4U* in Oldenburg, Germany. *Sightseeing4U* also offers mobile navigation, street maps and points of interests via text, video and audio (Schwinger, 2002).

MTSR (Mobile Tourist Service Recommender System) was developed at a Norwegian University and provides personalized mobile tourism service for Android

phone users. It uses a map interface, while providing point of interest recommendations and information. It is customized to the tourist's personal interests and uses a Google map and can issue a travel plan so that the tourist can learn about and navigate to a point of interest (Gao, 2012).

These devices and applications all serve to provide the tourist with more knowledge about their locations and potential sites of interest and allow them to make better decisions on their trip by providing information and navigational assistance. However, as with all aspects of technology, there can be glitches or a lapse in operation such as loss of a wireless signal or internet access, ownership or availability of a PDA or even the ability to use the PDA correctly to achieve the desired results. Also, the built-in points-of-interest suggestions on some applications may exclude some of the less popular site locations that tourists may be interested if they knew it existed and its location. All of these technological applications rely on the use of GIS and GPS technology for their location-based services and technical efficiency. My application will be geared specifically for the tourist interested in the history, heritage and cultural aspects of the country of Belize.

GPS and GIS Technology

Geographic Information Systems (GIS) have become a valuable tool for managing, analyzing and displaying diverse data and assisting in the decision making processes associated with various local and regional planning activities. It is ideal for use

within the tourism industry because of its role in the management and study of spatial phenomena and its ability to work along with other technologies such as GPS (Global Positioning System) and remote sensing, all of which play a key role in sustainable tourism planning and decision making. One problem facing the optimum use of GIS is the lack of tourism databases and inconsistencies in available data, making some of its applications limited. As a result, it is necessary to continually update and maintain databases to ensure a secure, viable, reliable, and useful database (Avdimiotis et al. 2006, Kushwaha 2011).

Because GIS deals with spatial phenomena and tourism is an activity that involves a geographical dimension, GIS is ideal to facilitate data storage, display and analysis for tourists, tourist providers and planners. Tourism planning can be enhanced by GIS applications and used to achieve sustainable tourism promotion and development by integrating tourism information, visualizing complex scenarios and deriving effective solutions (Avdimiotis et al. 2006, Kushwaha 2011). However, it is important to note that although GIS may influence the analytical process within tourism and recreation planning, it is not a decision-making tool and may not necessarily influence the final decisions or improve outcomes (Avdimiotis et al. 2006, Giles 2003).

Global Positioning Systems (GPS) equipment was used to physically locate the geographical coordinates of the sugar mill locations in this project, which were subsequently used to create maps. The collaboration of GPS and GIS technology has opened doors for gathering, recording and interpreting data as used in archaeological investigations for analysis and protection (Matev 2009, Constantinidis 2009). According

to Arroyo (2009:506), GIS is being utilized in archeology “as a technique to improve the understanding of spatial organization and the relationships among finds within specific areas.” This use of technology is also mirrored by Ford et al. (2009), who used it to locate, map and model Maya settlements in Belize and other Central American countries.

The use of GPS and GIS technologies in previous research endeavors are similar to how this particular project utilized GPS equipment. Addresses for the sugar mills were obtained and then the locations were physically visited and the exact coordinate locations were recorded. The beneficial use of these technologies is highlighted by Stine (2000:62) stating “archaeologists are still reconstructing sites, however today computers have replaced the use of stone and mortar.”

This research culminated in a database of the historical sugar locations identified and their related histories. The data were then used to produce a knowledge base and visual results of the findings through maps, developed for use on Personal Digital Assistants for visitors. Different elements of Information and Communications Technology (ICT) in collaboration with geographical technologies of GIS and GPS have led to the establishment of various applications, some mobile, that can be used by tourists to enhance their experience in a new place.

Information and Communications Technology (ICT)

Information and Communications Technology (ICT), and specifically internet access and wireless communication technologies, have revolutionized the manner in

which the average tourist plans a vacation. They can have a substantial geographic impact through the incorporating of GIS and GPS within the tourist experience (Curry, 1998). ICTs propose innovative avenues for World Heritage Sites (WHS) to improve their current visitor market. They are capable of supporting site management, adding to interpretation approaches and promoting site conservation where they are implemented. Ultimately, the purpose of conservation in heritage management is to preserve cultural heritage resources for current and future generations to enjoy (Buhalis et al. 2006, Nielsen et al. 2008).

For centuries, maps have been a main source of tourist information and guidance before, during and even after their vacation. Most of these maps have been static and ‘view only’, providing limited benefit. Maps play an important role, not only in the illustration of where things happened, but also in evoking images and sentiments in the mental construction of past landscapes. A level of interactivity within the maps can improve and add value to a visitor’s experience. Many new web-based geographic information systems (WebGIS) like Google Maps, GlobeXplore and Yahoo Maps are changing the ways that map and navigational information can be displayed and accessed for use, especially of significance within the travel and tourism industry (Chang et al., 2011).

The evolution of the tourism industry has led to new ways of communicating with the public, and while still maintaining traditional methods of using brochures, publications, radio announcements, television advertising and word of mouth, the use of

technological advances such as WebGIS can play a key role in the promotion of tourism. WebGIS can be a powerful tool in tourism marketing by offering integrated platforms with the ability to satisfy information needs (Chang et al., 2011).

According to Weaver (1995) and Nielsen et al. (2008), '*neogeography*', meaning "new geography", is the unifying concept for the expansive tools and techniques falling outside the realm of 'traditional' GIS. A new field of devices called '*geoware*' is emerging that consists of devices with integrated awareness of location used to enhance performance or provide new information. *Geoware* devices are often referred to as location-based services and lead to interactivity and user involvement in activities (Nielsen et al., 2008).

Tourists have differing interests and will not all be equally interested in the cultural and historical legacy and landscapes of their chosen destination, but earlier research shows that history plays a central role to key visitor segments to places like the U.S. Virgin Islands and in particular St. Croix (Liburd, 1999). However, being at a historical location can be a powerful feeling and is even more potent if adequate tools and information are readily available.

According to (Setlur, 2010), mobile devices are the platform for a new generation of map-based services, and designers are striving to overcome current obstacles, such as its limited screen size, processing power, and memory resources that hinder its optimal functionality. For example, remote sensing images can be difficult to store, transfer or display on a mobile device due to their large size, even though their high-resolution

images are more attractive and detailed. Technological advances are allowing for different types of data sources to be adequately incorporated into mobile devices to ensure a map interface that is efficient and effective (Liu 2008, Setlur 2010).

The development of a “living museum”, a virtual museum that could be accessed directly from a website or a Personal Digital Assistant (PDA), can utilize georeferenced historical maps and aerial photographs to show different elements of the landscape in the area. Geographical and historical data about the site can also be available for download to an in-car navigation system, enabling the tourist to undertake self-guided tours. Therefore, the development of new geoware and location-based services can play a vital role in imparting knowledge about a particular area of interest (Nielsen et al., 2008).

For example, the ARCHEOGUIDE system is an “advanced processing and mobile guiding system addressing the needs of cultural sites”. Its purpose is to provide navigation information, 3D virtual reconstructions of ruined monuments and re-enactment of ancient life with synchronized narration and on-line access to digital cultural collections. The system was originally developed and used at the archaeological site of Olympia, in Greece, the birthplace of the Olympic Games and one of the most important World Heritage Sites (Buhalis et al., 2006).

This study combines the history of sugar and its people: from the forced migrations of Africans to indentured labor, to the migration in search of a better life by the disenfranchised Americans of the Southern United States. They have all left their traces behind on the country of Belize. Today, heritage tourism and technology can work

together contributing to the study, research, and experience of locals and tourists alike. It can allow them to learn and share in a lesser known aspect of the rich cultural heritage of Belize – its sugar history. The study demonstrates the huge role technology, and specifically geo-based technology plays not only in identification or navigation to a site of interest, but how it plays a role in the decision making processes, emotional connections and the total tourist experience.

CHAPTER III

METHODS

Collection of GPS Points at Sugar Mill and Cemetery Locations in Belize

To obtain some of the qualitative data, field work was conducted in Belize to collect primary and secondary documentation from the archives in the capital city – Belmopan, and Belize City. Visits were made to two of the country’s major archaeological site locations of sugar mills and associated settlements. These were the Serpon Sugar Mill and the Lamanai Sugar mill. There, the handheld Global Positioning System (GPS) was used to record their location points and also to take numerous photographs around the site and mill remnants to assess the remaining standing structures for their integrity and potential for later mapping at heritage preservation standards. Visits were also made to the cemeteries where there are remnants of the known settlements of the American expatriates in the country. The GPS unit used in this research is a Garmin Oregon 300 with a barometrical altimeter for precise elevation recording, resolution of 240 x 400 and the ability to load base maps and store favorite waypoints and routes.

Field Research - Belize Field Work

Before embarking on the journey to Belize, a map was obtained which was input into the handheld Garmin Oregon 300 GPS, with a barometrical altimeter for precise

elevation recording, to be used in the field. Field work was conducted in Belize between Monday 27th June, 2011 and Thursday 7th July, 2011. The home base for the trip was San Ignacio in Cayo County. Arrival into Belize was opportune to being a part of the annual Belize Archaeology Symposium (BAS 2011), which focused on Trade and Exchange in the Eastern Mayan Lowlands. This Symposium enlisted speakers and researchers from various countries and backgrounds who were doing research in Belize.

On Monday, July 4th 2011, a letter from Dr. John Morris (Associate Director of Research) granted through Dr. Jaime Awe (Director of the Archaeological Institute), gave permission to visit any sugar mills or archaeological sites in Belize associated with the research. The first official undertakings were at the Institute's Library and the Belize Archives and Records Service to seek any available data and information on the sugar mills and their origins. The documents were also reviewed for anything related to the Americans who came from the southern United States and the East Indians who eventually became a part of the currently successful sugar industry in the country.

The Archaeological Institute's in-house library in Belmopan did not provide any fruitful information related to sugar mills specifically, but housed mainly documents about the country's Mayan heritage. At the Belize Archives and Records Service, more relevant information was recovered that related to the sugar industry and its history. It is not generally permitted to take pictures of documents without special permission, but working under the authorization of the Archaeological Institute, permission was granted to take photographs instead of photocopying all the information considered worthy of

further examination. However, for some of the more weathered documents that did not photograph well, photocopies were made.

Serpon Sugar Mill

On Monday afternoon of July 4th 2011, with the accompaniment of UNCG alumna Lauren Philips and newly acquired companions Becky Shelton, an American project archaeologist working in Belize, and Gonzalo Pleitez, a local Senior Expeditions Guide, we embarked on an approximate three hour road trip to the southern end of the country toward Toledo.

Along the southern journey was one of the previous major sugar mills – Serpon, located near the Sittee River in Stann Creek County shown in Figure 7. This mill is no longer in use but its remnants are visible. It was one of the older sugar mills that once helped produce enough sugar to contribute to the country’s economy. It was established in 1863, after being bought and run by William Bowman, and there was also the mill located on the other side of the river which was owned by Young, Toledo and Company between 1868 and 1874. They were steam-powered mills and both were abandoned in 1910 when sugar became a more profitable venture in the Corozal and Orange Walk districts. Due to its previous huge economic contributions, this sugar mill has played a role in putting Belize on the map in terms of sugar production and exports (“Institute of Archaeology,” n.d., Archaeology of Serpon Sugar Mill section, para. 2). A picture of the welcome sign and pictures of the mills remnants are shown in Figures 8, 9 and 10.

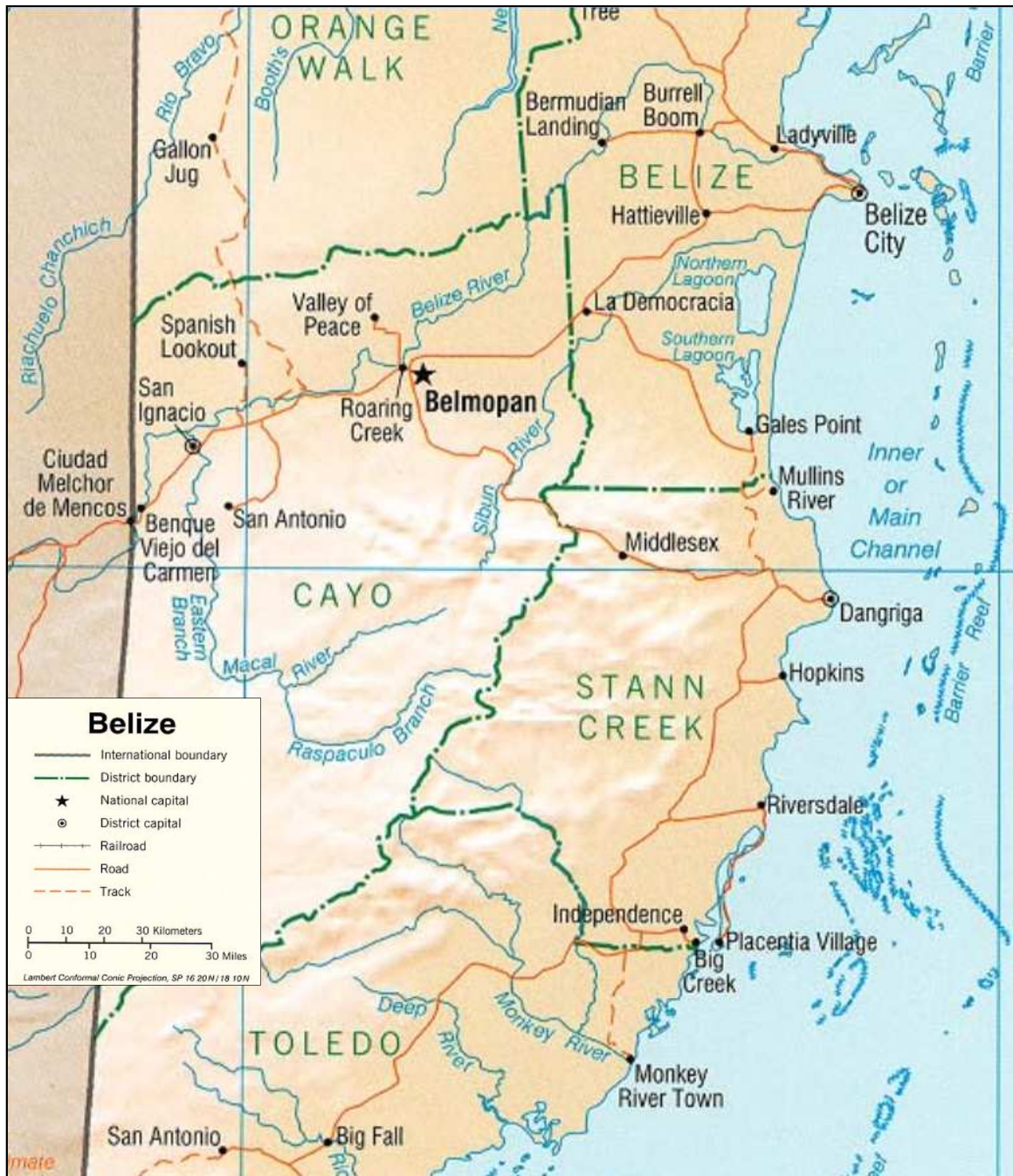


Figure 7. Map showing Stann Creek County where the Serpon Sugar Mill is located.
Map Source: <http://www.belize.com/images/maps/belize-map-relief>



Figure 8. The Welcome Sign at the Serpon Sugar Mill.

Photos taken by:
Rachel Campbell

Figure 9. Sugar Mill machinery at Serpon Sugar Mill



Figure 10. Sugar Mill equipment at Serpon Sugar Mill

At the Serpon Sugar Mill, GPS points were taken using the Garmin handheld GPS unit with the downloaded Belize map by walking around to various points of interest on the site where remnants of the original sugar mill equipment was located, and recording their location points using the GPS unit. Several pictures were also taken of the site and of elements of the sugar mill that remained. The location appeared to be well cared for with cut grass and a small hut that contained pictures and some history of the sugar mill on the inside along its walls. It was all cleared out and was very close to the road so it was clearly seen. However, it was located on one of the less popular roads in the country so a visitor will have to know what they are looking for to find it and is unlikely to be stumbled upon by accident. After collecting enough GPS points and photographs at the Serpon Sugar Mill site, the journey continued to the southern end of the country toward Punta Gorda in Toledo County shown in Figure 11, which was the area where the immigrant Americans settled and where many died and were buried.

Presently, the Tower Hill Sugar Factory in Orange Walk is the only operating sugar mill in Belize. It is owned by Belize Sugar Industries, Ltd. and is supplied with cane by more than 4000 farmers, from an estimated 40,000 acres each year.

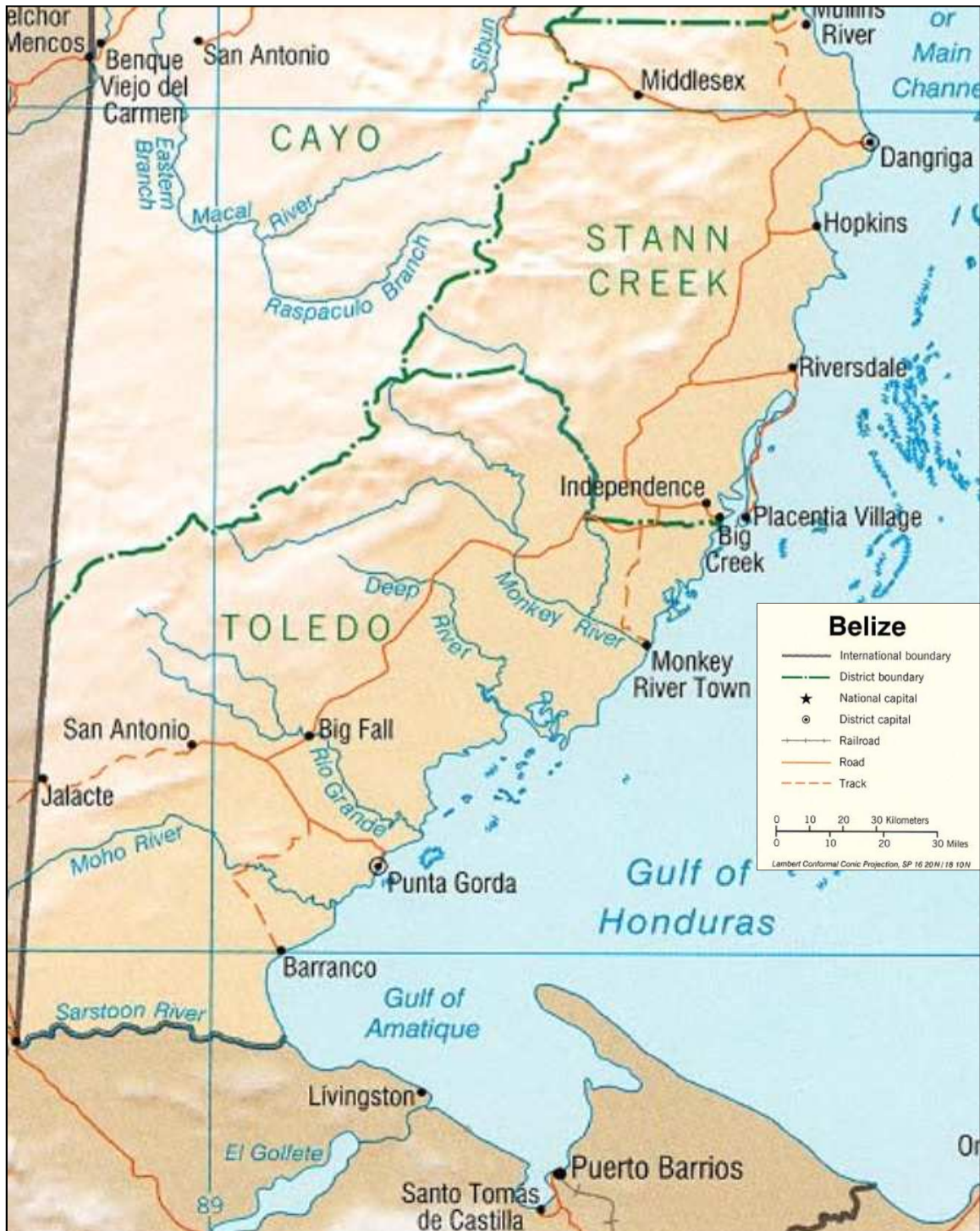


Figure 11. Map showing the Toledo District where the Punta Gorda town is located.
 Map Source: <http://www.belize.com/images/maps/belize-map-relief>

Lamanai Archaeological Site

On Wednesday 6th July, 2011, travel led to the northern end of Belize to Orange Walk County, shown in Figure 12, to the Lamanai Archaeological site. Lamanai, meaning “submerged crocodile,” is located on the banks of the New River Lagoon in the village of Indian Church and is famous for its Maya temples and ceremonial centers. However, a twelve-minute walk from these magnificent sites reveals the remnants of an old British sugar mill location that also originated in the American/East Indian migration era dating back to AD 1860-1875. This mill location was selected for sugar production in the nineteenth century because it was close to the New River. There was also a cheap source of Mayan labor nearby, however, the Maya eventually rebelled and then when diseases began to affect the mill workers and owners they eventually abandoned the mill (Meierhoff, 2008).

There is a road traveled by car after getting off the highway to get to the Lamanai center and it is also accessible by boat via the New River. Here, information is distributed about the Maya temples and their histories. However, the old Lamanai sugar mill, a short walk away along a dirt road, is not readily advertised unless specifically inquired about.

Remaining elements include the boiler and boiling house and evaporation tank amongst others (Pendergast, 1982). According to Pendergast (1982), the mill was probably in operation for only fifteen years because of its unstable brick foundation being unable to handle the amount of friction stemming from the iron operations of the mill. Some of the mill remnants are shown in Figures 13, 14 and 15.



Figure 12. Map showing the Orange Walk District where the Lamanai Archaeological Site and Sugar Mill is located.

Map source: <http://www.belize.com/images/maps/belize-map-relief>



Figure 13. Photo of the Welcome Sign at the Lamanai Sugar Mill

Photos taken by:
Rachel Campbell

Figure 14. Photo of machinery at the Lamanai Sugar Mill

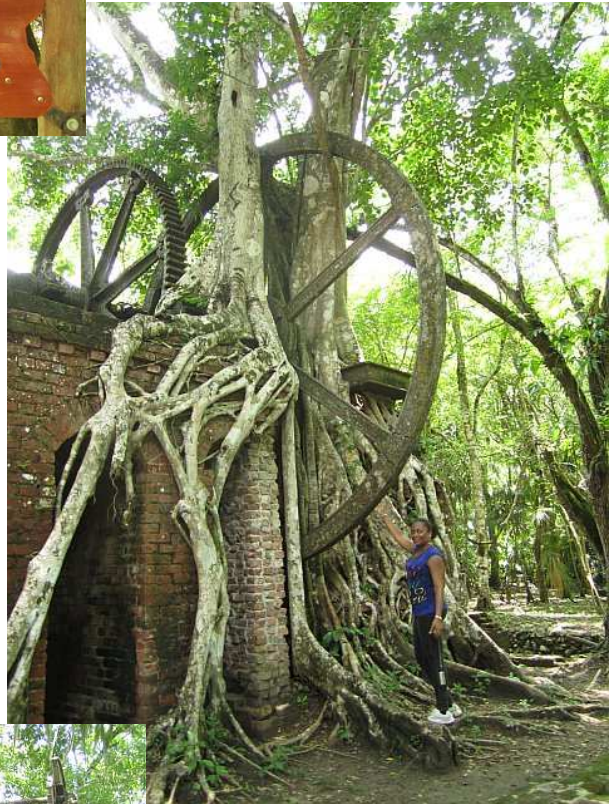


Figure 15. Photo of some Machinery at the Lamanai Sugar Mill

Creation of Maps

Maps of the historic sugar mills, the present sugar factory, the cemeteries that contain Americans from the southern part of the United States and the local rum factories were created using ArcGIS 10 software, ESRI World Basemap data and the collected GPS coordinates. These were used to display and identify some of the important features of the country of Belize, such as the capital of Belmopan, counties, major cities, roads, historic sugar mill sites, the current sugar factory, current rum factories and southern American related cemeteries.

Figure 16 shows a map of Belize identifying its counties, capital and main cities, and then in Figure 17, the main roads and cities are shown. In Figure 18 the historical sites of interest related to the sugar industry and the Americans and their East Indian workers: Serpon Sugar Mill, Lamanai Sugar Mill, the currently operating sugar factory – Tower Hill Factory, L&R Liquors Rum Factory, Travellers Liquors Limited Rum Factory, PG Cemetery and Forest Home Cemetery, along with the counties and main cities of Belize.

The rum factories are included because they contribute to the economic and historical influence and tradition of sugar in Belize. The rum industry is based on the use of sugarcane byproducts; from the 1800s when the Methodist American immigrants refused to be involved in rum-making to the present, rum has come a long way in its role in the Belize sugar industry. Sugar cane connects the field to the sugar mills/factories and the rum factories.

Figure 19 shows only the historical sugar mills – both the Serpon Sugar Mill and the Lamanai Sugar Mill, along with the major cities. A large-scaled view of Serpon Sugar Mill site and surrounding cities is presented in Figure 20 and Figure 21 shows a larger-scaled view of the Lamanai Sugar Mill, along with currently operating Tower Hill Sugar Factory in the county of Orange Walk.

The Forest Home Cemetery is the main burial ground where many of the southern Americans that fought for the Confederacy are buried; because they preferred to “keep to themselves”, they had their own separate burial areas in the Toledo District. The cemetery is remaining evidence of the community that founded Forest Home (Camille, 1986). Others are also buried at the PG cemetery in Punta Gorda, Belize according to local belief by residents. The cemetery locations are shown in Figure 22.

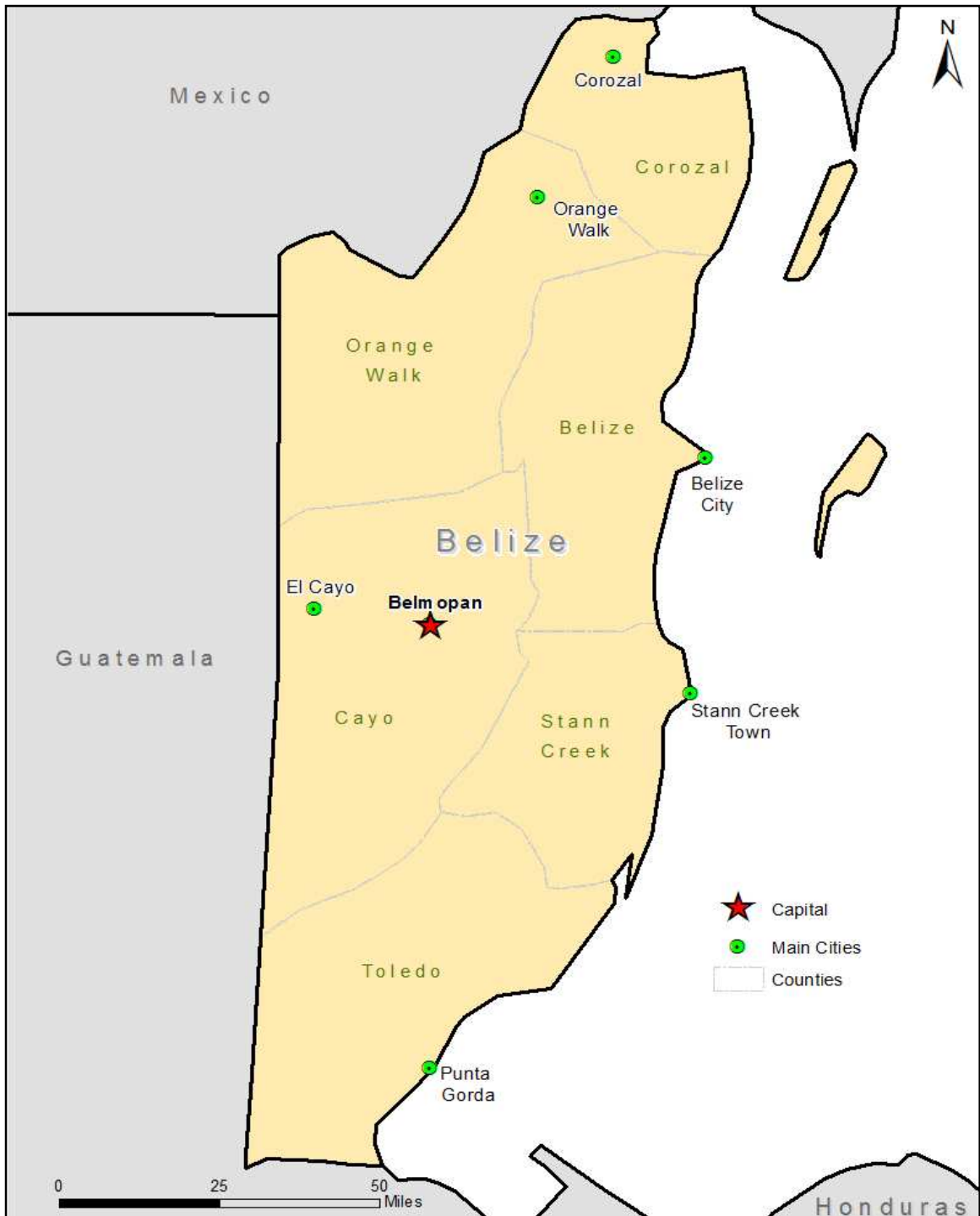


Figure 16. Map of Belize showing Counties, Capital and Main Cities

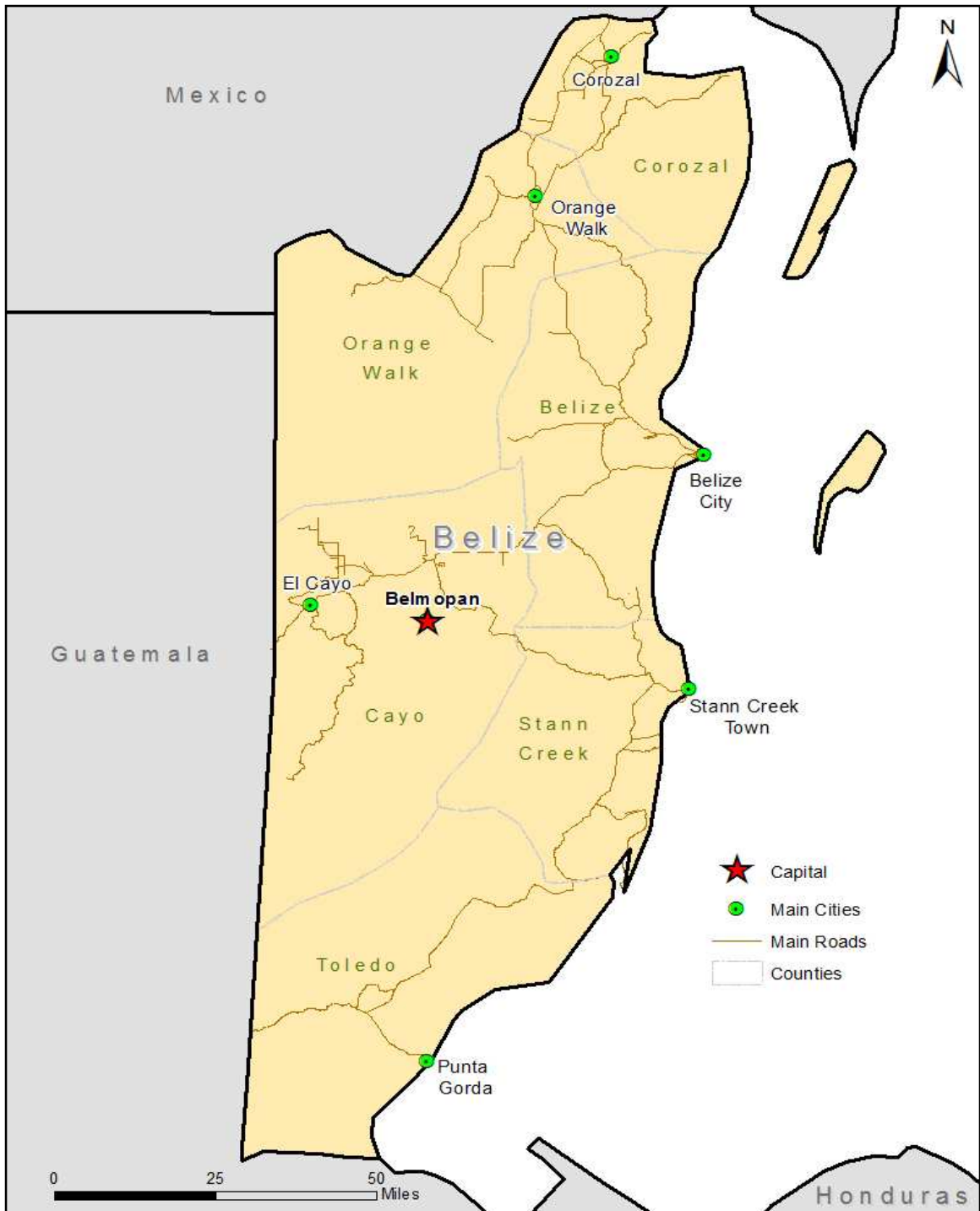


Figure 17. Map of Belize showing the Main Roads and Cities

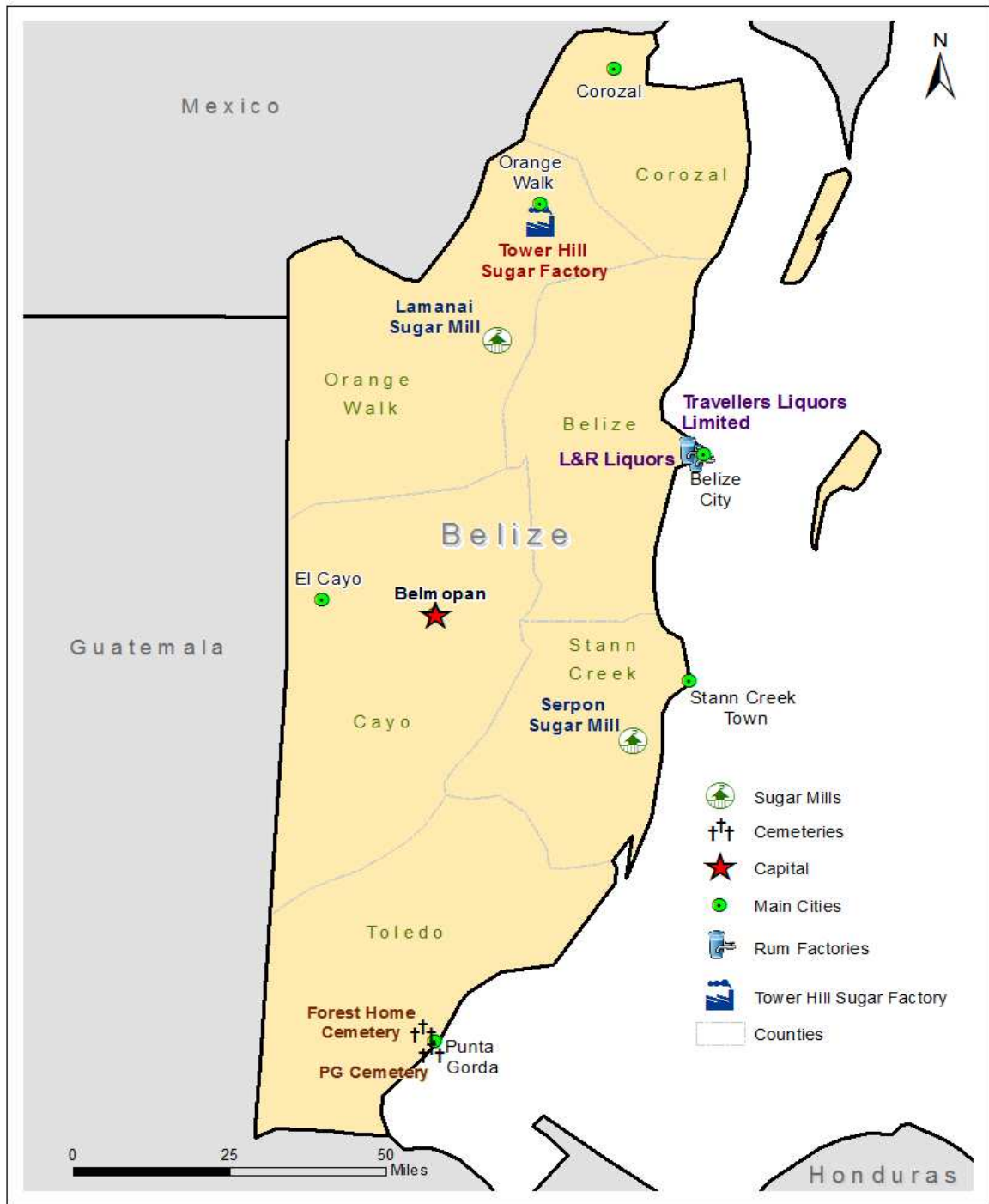


Figure 18. Map of Belize showing Historical Sites of Interest and Rum Factories

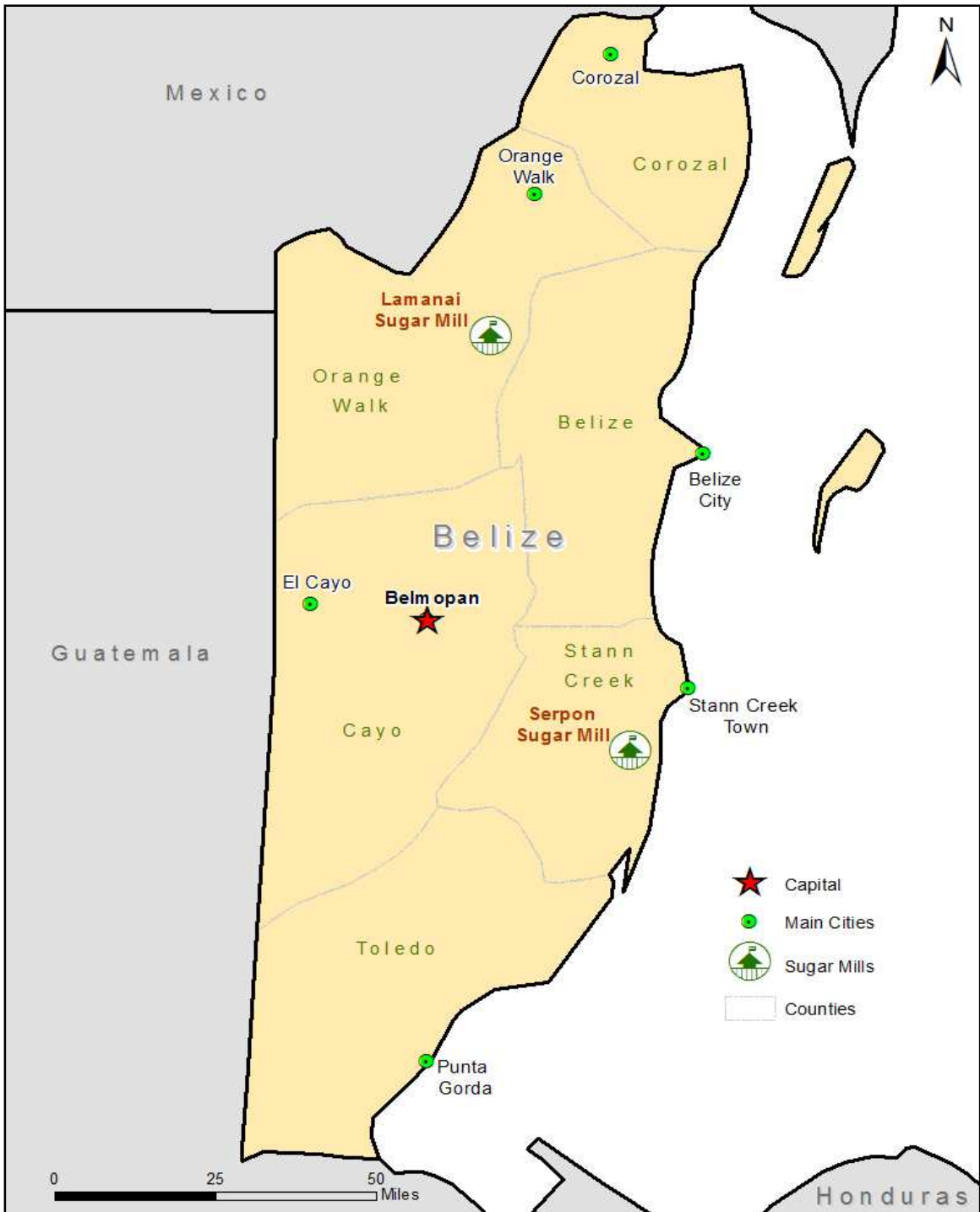


Figure 19. Map of Belize showing Historical Sugar Mill Sites (Serpon and Lamanai Sugar Mills)

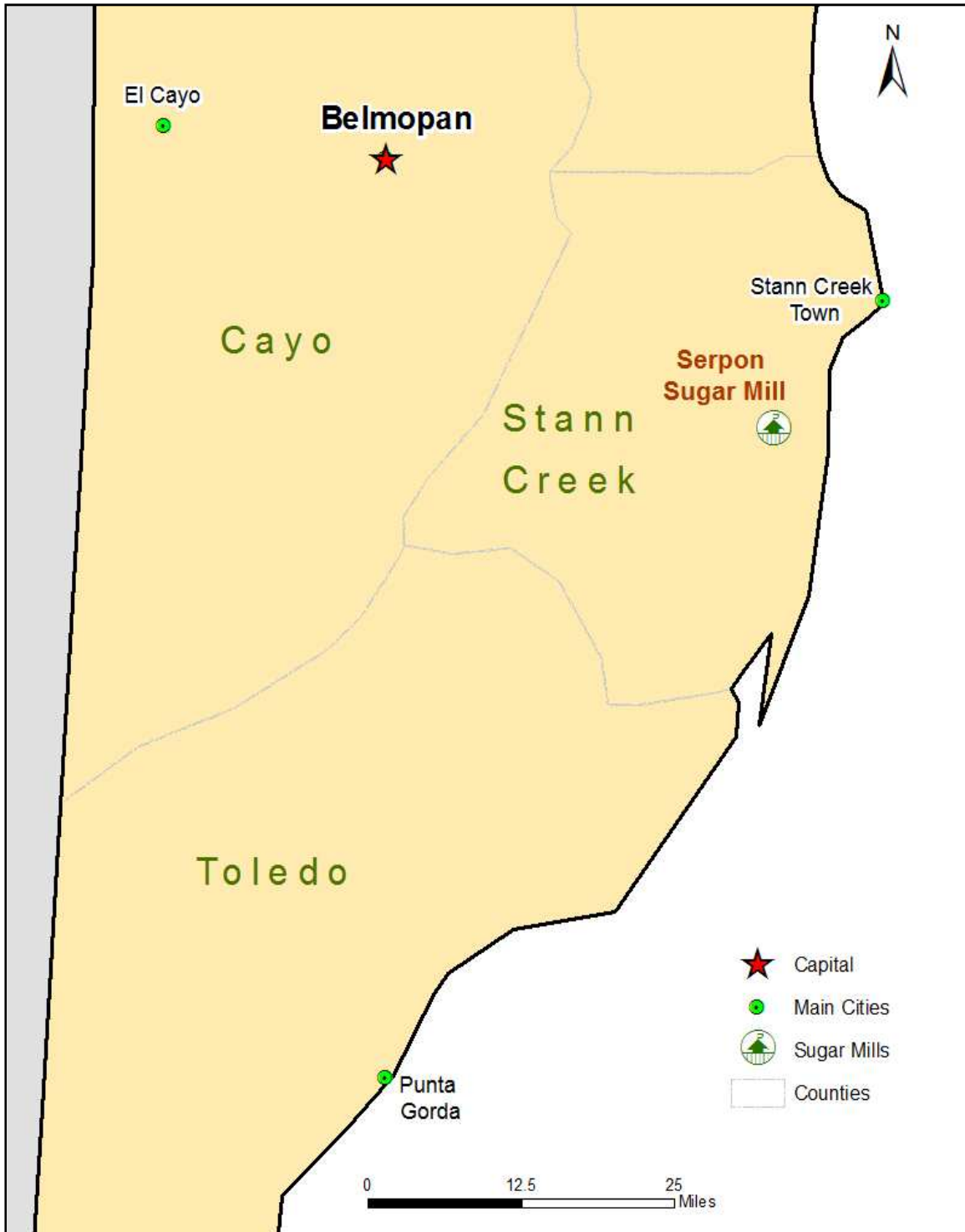


Figure 20. Map of Belize showing the location of the Serpon Sugar Mill



Figure 21. Map showing the Lamanai Sugar Mill, Tower Hill Sugar Factory and Rum Factories

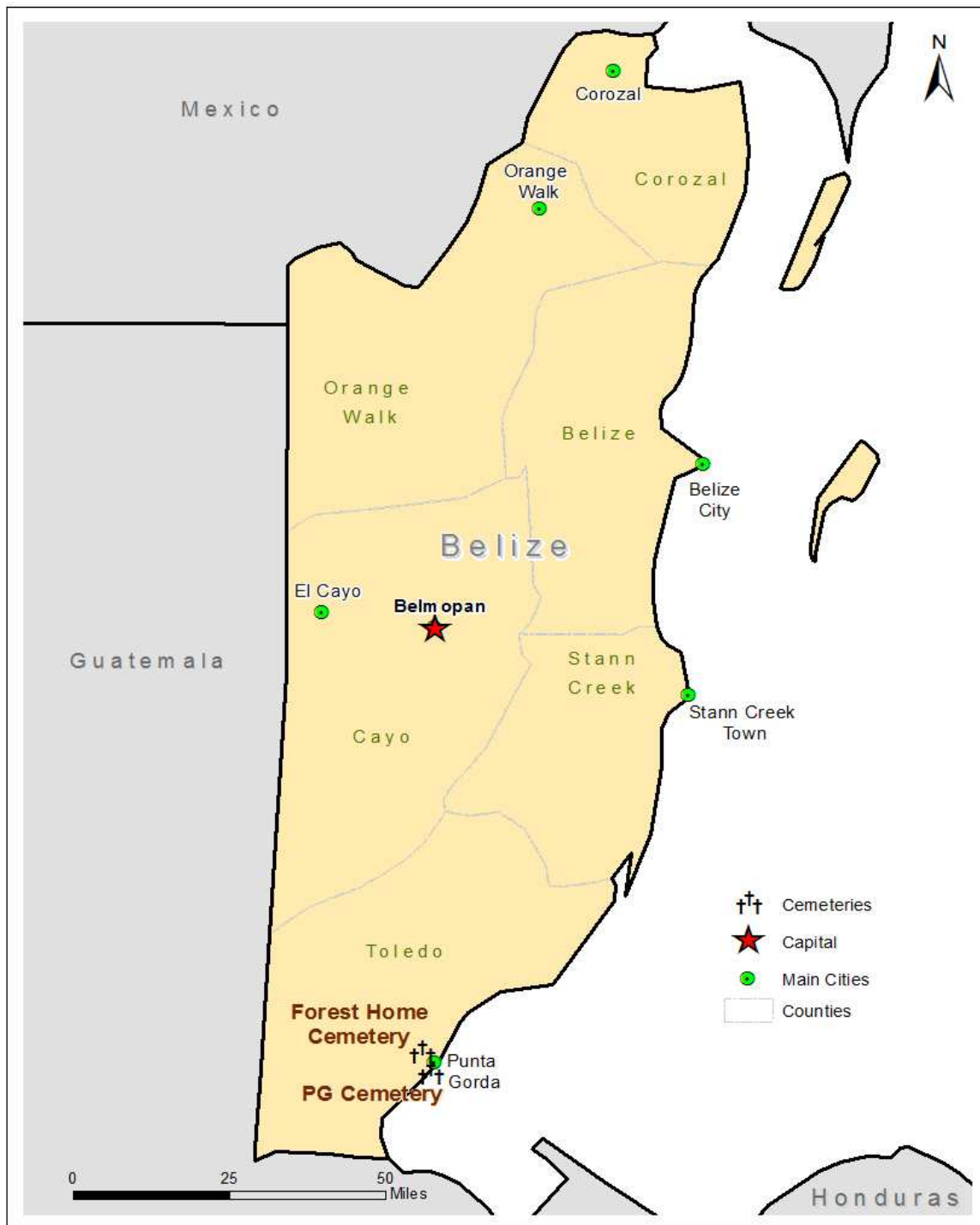


Figure 22. Map of Belize showing the location of the Forest Home and PG Cemeteries

Creation of a Database

The geospatial database provided information regarding the locations, and histories of the sugar related sites, and was created using ESRI's ArcGIS 10 and Microsoft Excel. This database will be made available and researchable by the public to contribute to the knowledge base and available historical data of Belize, for Belize and the rest of the world.

Databases can be viewed as repositories for storing cultural heritage information. Traditionally, collected data were stored in many different places: on paper, in books, journals and other mediums. Databases have the capability of storing collections information in a variety of formats such as images, movies, audio etc. Therefore, all the information about collections can be stored in one place to facilitate easy access for researchers, historians and interested visitors or even access over the internet. Databases can also be used to keep records and statistics of tourists and visitors for each historic site.

This database, along with the maps, will contribute to the visual aspect of the sites of interest and provide relevant information. It can also be easily updated when necessary to add more sites, history and any other information that may be relevant to its users. The database was constructed using the GPS acquired location points for the sugar mill locations and their associated historical data along with the current sugar factory and rum factories, as well as cemeteries associated with the American expatriates. An example of the database content, containing information regarding Site Location, Longitude,

Latitude, Address, Contact Number/Email, Background Information and a small map is shown in Figures 23, 24, 25 and 26.

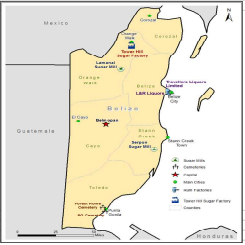

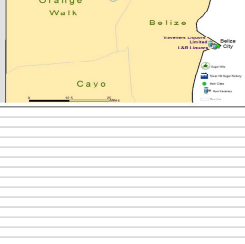
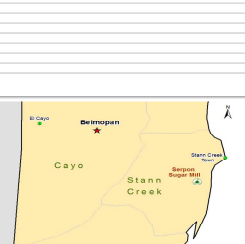
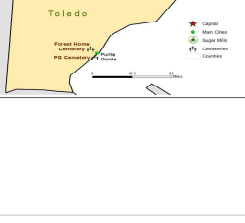
Site Location	Long X	Lat Y	Address	Contact Number	Background Information	Map
BELIZE				http://www.belize.gov.bz/	The country of Belize is located off the Caribbean coast of Central America and is bordered by Mexico to the north, Guatemala to the west and south, and by the Caribbean Sea to the east. It is geographically located at 17°15' north of the equator and 88°45' west of the Prime Meridian on the Yucatan Peninsula. The climate is characterized as being tropical with dry and wet seasons, with the dry season normally spanning February to May and the rainy season from June to November. It is hot and humid, and rainfall ranges from 60 inches in the north to 200 inches in the south annually. Average temperatures in coastal regions normally range from 24 °C (74.1 °F) in January to 27 °C (81.4 °F) in August. The country's natural resources consist of arable land, timber, seafood, and minerals. Primary sectors of the economic revenue are in agriculture, forestry, fishing, and mining. Major export revenues is received from sugar cane, citrus concentrate, marine products, bananas, clothing, molasses, and crude oil. The country had a population of approximately 312,971 people in May 2010 with the official language being English. Belize is the only English-speaking country in Central America. Spanish is also commonly spoken. Belize is the most sparsely populated nation in Central America. Although it is no longer the capital, Belize City remains the nation's largest city and port. The current capital is Belmopan. The official name of the territory was changed from British Honduras to Belize in 1973, and full independence was granted in 1981.	
LAMANAI SUGAR MILL	-88.657817	17.763633	Near Indian Church Village, Orange Walk District, Lamanai, Belize	Institute of Archaeology (501)822-2106 (501)822-2227 www.nichbelize.org	http://www.nichbelize.org/ba-archaeological-sites-parks/lamanai.html	
TOWER HILL SUGAR FACTORY	-88.557787	18.041963	Belize Sugar Industries, PO Box 29, Orange Walk Town, Belize	msdsec@btl.net	Presently, the Tower Hill Sugar Factory in Orange Walk is the only operating sugar mill in Belize. It is owned by Belize Sugar Industries, Ltd. and is supplied with cane by more than 4000 farmers, harvesting an estimated 40 000 acres each year. Currently, small farms in Northern Belize generate most of the sugarcane. In the early 1990s, the coordination of the agricultural aspects of sugar production and the organization of cane delivery were the responsibilities of the Cane Farmers' Association. The industrial segment of the sugar production process was controlled by Belize Sugar Industries Limited (BSL). Overall coordination of the industry was exercised by the Belize Sugar Board.	
L&R LIQUORS	-88.191817	17.492258	46 Euphrates Avenue, Belize City, Belize	(501)-227-0658		
TRAVELLERS LIQUORS LIMITED	-88.211698	17.510534	2.5 Northern Highway, Belize City, Belize	(501)223-2855 info@bmsbarretum.com	http://www.omebarretum.com/	
SERPON SUGAR MILL	-88.344467	16.826467	Sittee River Road, Stann Creek, Belize	Institute of Archaeology (501)822-2106 (501)822-2227 www.nichbelize.org	http://www.nichbelize.org/ba-archaeological-sites-parks/serpon-sugar-mill.html	
PG CEMETERY	-88.80833	16.092233	Off Main Street, Punta Gorda Town, Punta Gorda, Belize		Due to the fact that the Confederates preferred to "keep to themselves", they had their own separate burial areas in the Toledo District. A visit to these cemeteries can provide a physical realization of their previous existence and physical presence in the area. The town of Punta Gorda is located on the west coast of the Caribbean Sea in Southern Belize. According to residents, some of the plots toward the back of the PG Cemetery on the brink of the ocean were the older ones that may be of interest. There are also reports in the area of crypts being washed out to sea due to the erosion of the land occurring toward the back end of the cemetery.	
FOREST HOME CEMETERY	-88.829367	16.140917	Off Southern Highway, Punta Gorda (PG), Belize		The Confederate Cemetery is the remaining evidence of the Confederate community that founded Forest Home. The small settlement of Forest Home has an interesting history because after the U.S. Civil War, eight ex-Confederate families migrated there from southern states of Texas, Louisiana and Alabama. Forest Home was settled by those intending to grow sugarcane to produce sugar successfully, however, but the settlement only lasted for about a generation. After realizing that cotton was not conducive to the new climate as a profitable endeavor, the ex-confederates eventually began to grow sugar cane around 1867, to be able to have a productive crop and compete in the market. Most eventually returned to the United States after a subsequent outbreak of malaria and cholera and also when it appeared that most of the crops attempted were still not conducive to the new tropical climate as they expected. As sugar beet production began to flourish in Europe in 1874, sugar cane profitability began to experience a rapid decline as imported sugar beet was being sold at lower prices. As a result, this was also a push factor for some ex-Confederates to return to the United States due to poor economic conditions during the late 1870's.	

Figure 23. Belize Historical Sugar Sites and American Expatriates Cemeteries Database

Site Location	Long X	Lat Y	Address	Contact Number	Background Information	Map
BELIZE				http://www.belize.gov.bz/	<p>The country of Belize is located off the Caribbean coast of Central America and is bordered by Mexico in the north, Guatemala in the west and south, and by the Caribbean Sea in the east. It is geographically located at 17°15' north of the equator and 88°45' west of the Prime Meridian on the Yucatán Peninsula. The climate is characterized as being tropical with dry and wet seasons, with the dry season normally spanning February to May and the rainy season from June to November. It is hot and humid, and rainfall ranges from 60 inches in the north to 200 inches in the south annually. Average temperatures in coastal regions normally range from 24 °C (74.1 °F) in January to 27 °C (81.4 °F) in August. The country's natural resources consist of arable land, timber, seafood, and minerals. Primary sectors of the economic revenue are in agriculture, forestry, fishing, and mining, major export revenue is received from sugar cane, citrus concentrate, marine products, bananas, clothing, molasses, and crude oil. The country had a population of approximately 312,971 people in May 2010 with the official language being English. Belize is the only English-speaking country in Central America. Spanish is also commonly spoken. Belize is the most sparsely populated nation in Central America. Although it is no longer the capital, Belize City remains the nation's largest city and port. The current capital is Belmopan. The official name of the territory was changed from British Honduras to Belize in 1973, and full independence was granted in 1981.</p>	

Figure 24. Belize Historical Sugar Sites Database

Site Location	Long X	Lat Y	Address	Contact Number	Background Information	Map
LAMANAI SUGAR MILL	-88.65782	17.76363	Near Indian Church Village, Orange Walk District, Lamanai, Belize	Institute of Archaeology [501]822-2106 [501]822-2227 www.nichbelize.org	http://www.nichbelize.org/ia-archaeological-sites-parks/lamanai.html	
					<p>Lamanai, meaning "submerged crocodile," is located on the banks of the New River Lagoon in the village of Indian Church and is famous for its Maya temples and ceremonial centers. However, a twelve minute walk from these magnificent sites reveals the remnants of an old British sugar mill location that also originated in the ex-Confederate migration era dating back to AD 1860-1875. This site was chosen for sugar production in the 19th century due to its location along the New River, as well as a cheap exploitable work force of rural Maya still living nearby. However, the Maya soon rebelled against poor treatment and low wages, the English owners were ravaged by jungle diseases, and the mill was abandoned. Remaining elements include the boiler and boiling house and evaporation tank amongst others. The mill is believed to have been in operation for only 15 years because of its unstable brick foundation being unable to handle the amount of friction stemming from the iron operations of the mill.</p>	
TOWER HILL SUGAR FACTORY	-88.55779	18.04196	Belize Sugar Industries, PO Box 29, Orange Walk Town, Belize	mdsec@bti.net	<p>Presently, the Tower Hill Sugar Factory in Orange Walk is the only operating sugar mill in Belize. It is owned by Belize Sugar Industries, Ltd. and is supplied with cane by more than 4000 farmers, reaping an estimated 40 000 acres each year. Currently, small farms in Northern Belize generate most of the sugarcane. In the early 1990s, the coordination of the agricultural aspects of sugar production and the organization of cane delivery were the responsibilities of the Cane Farmers' Association. The industrial segment of the sugar-production process was controlled by Belize Sugar Industries Limited (BSIL). Overall coordination of the industry was exercised by the Belize Sugar Board.</p>	
L&R LIQUORS	-88.19182	17.49226	46 Euphrates Avenue, Belize City, Belize	[501]-227-0658		
TRAVELLERS LIQUORS LIMITED	-88.2117	17.51053	2.5 Northern Highway, Belize City, Belize	[501]223-2855 info@onebarrelrum.com	http://www.onebarrelrum.com/	

Figure 25. Belize Historical Sugar Sites and Rum Factories Database

Site Location	Long X	Lat Y	Address	Contact Number	Background Information	Map
SERPON SUGAR MILL	-88.34447	16.82647	Sittee River Road, Stann Creek, Belize	Institute of Archaeology (501)822-2106 (501)822-2227 www.nichbelize.org	http://www.nichbelize.org/ia-archaeological-sites-parks/serpon-sugar-mill.html Serpon, located near the Sittee River in Stann Creek County. This mill is no longer in use but its remnants are visible. It was one of the earlier sugar mills that helped produce enough sugar to contribute to the country's economy. It was established in 1865, after being bought and run by an American named William Bowman, who also bought a neighboring mill named Regalla located on the other side of the river. Due to its previous huge economic contributions, this sugar mill has played a role in putting Belize on	
PG CEMETERY	-88.80833	16.09223	Off Main Street, Punta Gorda Town, Punta Gorda, Belize		Due to the fact that the Confederates preferred to "keep to themselves", they had their own separate burial areas in the Toledo District. A visit to these cemeteries can provide a physical realization of their previous existence and physical presence in the area. The town of Punta Gorda is located on the west coast of the Caribbean Sea in Southern Belize. According to residents, some of the plots toward the back of the PG Cemetery on the brink of the ocean were the older ones that may be of interest. There are also reports in the area of crypts being washed out to sea due to the erosion of the land occurring	
FOREST HOME CEMETERY	-88.82937	16.14092	Off Southern Highway, Punta Gorda (PG), Belize		The Confederate Cemetery is the remaining evidence of the Confederate community that founded Forest Home. The small settlement of Forest Home has an interesting history because after the U.S. Civil War, eight ex-Confederate families migrated there from southern states of Texas, Louisiana and Alabama. Forest Home was settled by those intending to grow sugarcane to produce sugar successfully, however, but the settlement only lasted for about a generation. After realizing that cotton was not conducive to the new climate as a profitable endeavor, the ex-confederates eventually began to grow sugar cane around 1867, to be able to have a productive crop and compete in the market. Most eventually returned to the United States after a subsequent outbreak of malaria and cholera and also when it appeared that most of the crops attempted were still not conducive to the new tropical climate as they expected. As sugar beet production began to flourish in Europe in 1874, sugar cane profitability began to experience a rapid decline as imported sugar beet was being sold at lower prices. As a result, this was also a push factor for some ex-Confederates to return to the United States	

Figure 26. Belize Historical Sugar-related Sites and Cemeteries Database

Creation of a Downloadable Application of Location-Related Information for Personal Digital Assistants (PDAs)

The use of ArcGIS, GPS and internet technologies play a vital role in creating visual elements and enabling a wider dissemination of knowledge. Through the incorporation of the history of sugar in Belize, using such tools can help to draw more tourists to the country. Location-related information is a significant part in the tourists' decision-making processes, regarding their destination choice and also what they do on arrival at that destination. It also plays a role in their evaluation and communication of their vacation experiences after they return home.

Technological advances resulting in devices that combine GPS, mobile communication and the internet are ideal tools for assisting in the enticing, navigating, and educating of a tourist on their visit to Belize, specifically related to the more historical and cultural parts of the country, resulting in a more optimal experience. This technology can be used to promote the rich sugar industry of the country including its past and present sugar mills and factories, previous plantations sites, burial sites and other significant landmarks relating to the sugar history of the country.

A mobile multimedia guide is essentially a handheld device, such as a Personal Digital Assistants (PDA), or a cell phone, which visitors carry around the site and use to access information on the exhibits. These can assist in site interpretation by guiding visitors according to their needs, available time, cultural background, linguistic ability and cultural segments, with the appropriate geographical and historical data downloads.

The multimedia capability of these devices can allow movies, direct links to the website and other interpretation methods and relevant information to be sent wirelessly to the visitor according to their location at a site. Visitors can also access information manually by pressing the appropriate buttons. The multimedia device assists the user in orientation and navigation around the site, while providing additional information and interrelationships with other sites or locations.

The App Inventor, used to create a downloadable mobile application for visitors and tourists to the sugar heritage sites in this project, is originally a Google-based program that allows the user to develop a customized application for an android phone through the use of a web browser and either an emulator, which emulates cell phone activity on a computer, or a connected cell phone. Its existing coding can be adjusted to adapt to the user's needs and requirements. It is now maintained and managed by the Massachusetts Institute of Technology (MIT) under the name of MIT App Inventor (MIT App Inventor, 2012).

The MIT App Inventor development environment is supported for Mac OS X, GNU/Linux, and Windows operating systems, along with the Java and Kawa Scheme programming languages. Software for the App Inventor is downloaded from the MIT App Inventor website and installed on the computer from the App Inventor setup package and then the necessary requirements are also set up on the phone to be used to access the application upon completion. The applications created with MIT App Inventor can be installed on most Android phones and upon design completion it can

be packaged and shared as a stand-alone application to install as was done for the historical sugar sites in Belize in this project (MIT App Inventor, 2012).

This section of the project entailed the creation of an application that can be available to a tourist or visitor to Belize for download to their cell phone or personal digital assistant (PDA). It provides a brief history on some of the lesser known cultural heritage sites in the country such as the old sugar mills as well as a link to maps of the area, which can be accessible using Google Maps and the phone's built-in GPS for navigation to the sites. The Google-based App Inventor program was used to create and package the Belize Historic Sites Application. The main elements of the MIT App Inventor Program include:

- 1) The App Inventor Designer, which allows the user to select the components, format, text and appearance of the program.
- 2) The App Inventor Blocks Editor comprises of a series of blocks that fit together like a puzzle, using the Open Blocks Java library to create the relevant visual blocks programming languages required for the application (mainly Java and Kawa Scheme). This dictates the behavior and actions of the components selected in the App Designer.
- 3) The Android Emulator is software that runs on the computer emulating the behavior of the application as it would appear on an android cell phone. When the application is complete it can then be downloaded to the cell phone for use.

The MIT App Inventor process is shown in Figure 27:

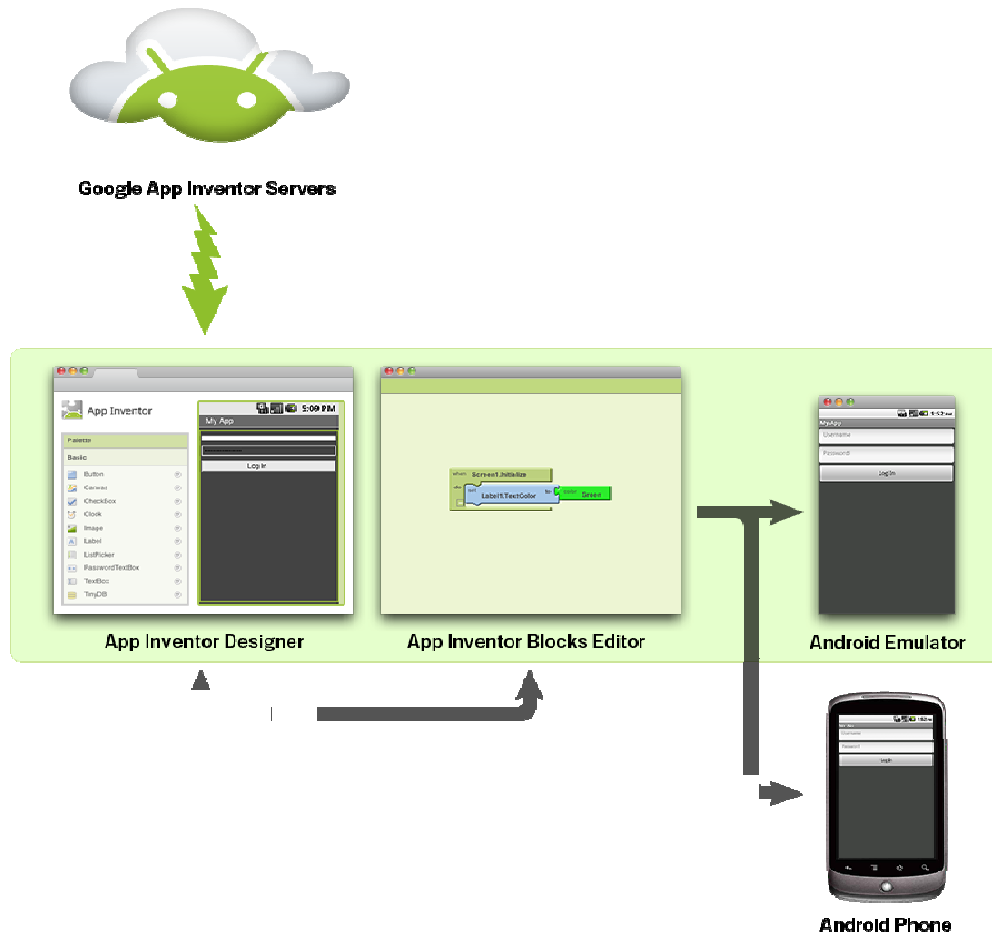


Figure 27. How the Google App Inventor Program works.
©2012 Massachusetts Institute of Technology

Developing the Belize Downloadable Application

For the downloadable application customized for use in Belize, the MIT App Inventor Designer and App Inventor Blocks had to be manipulated to reflect the historical and locational information about the historical sugar sites. This included information on the people who owned and work the farms and their influence on the country of Belize and its sugar history and industry. Within the App Inventor Designer, the necessary labels, buttons, texts and images were selected and applied, indicating how they would appear on the emulator or cell phone when the program was ready for use. An example of the view in the App Inventor Designer window is shown in Figure 28.

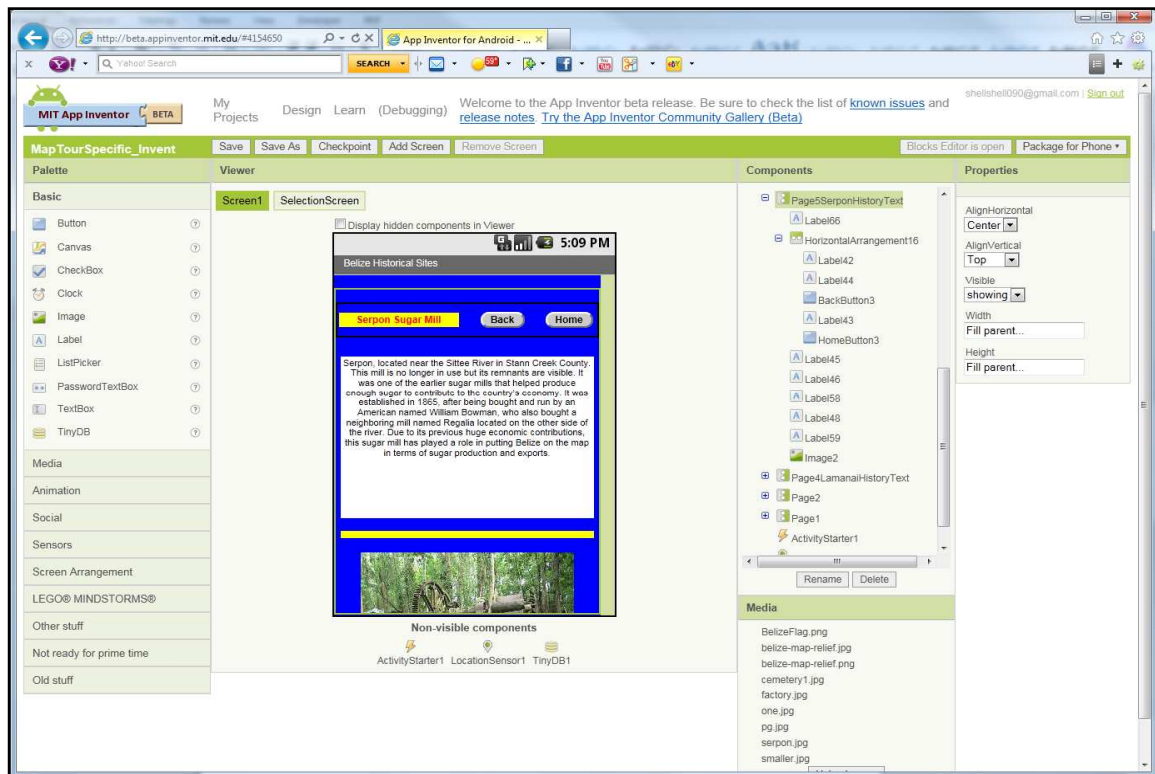


Figure 28. The App Inventor Designer window

Within the App Inventor Blocks window, the components selected within the Designer are used, as well as built-in blocks to establish the actions associated with those elements within the program. For example, it will dictate what happens when the “Home” button is clicked within the program and is set up to take the user back to the “Home” page of the application when the respective button is clicked or selected. An example of the App Blocks Inventor window is shown in Figure 29.

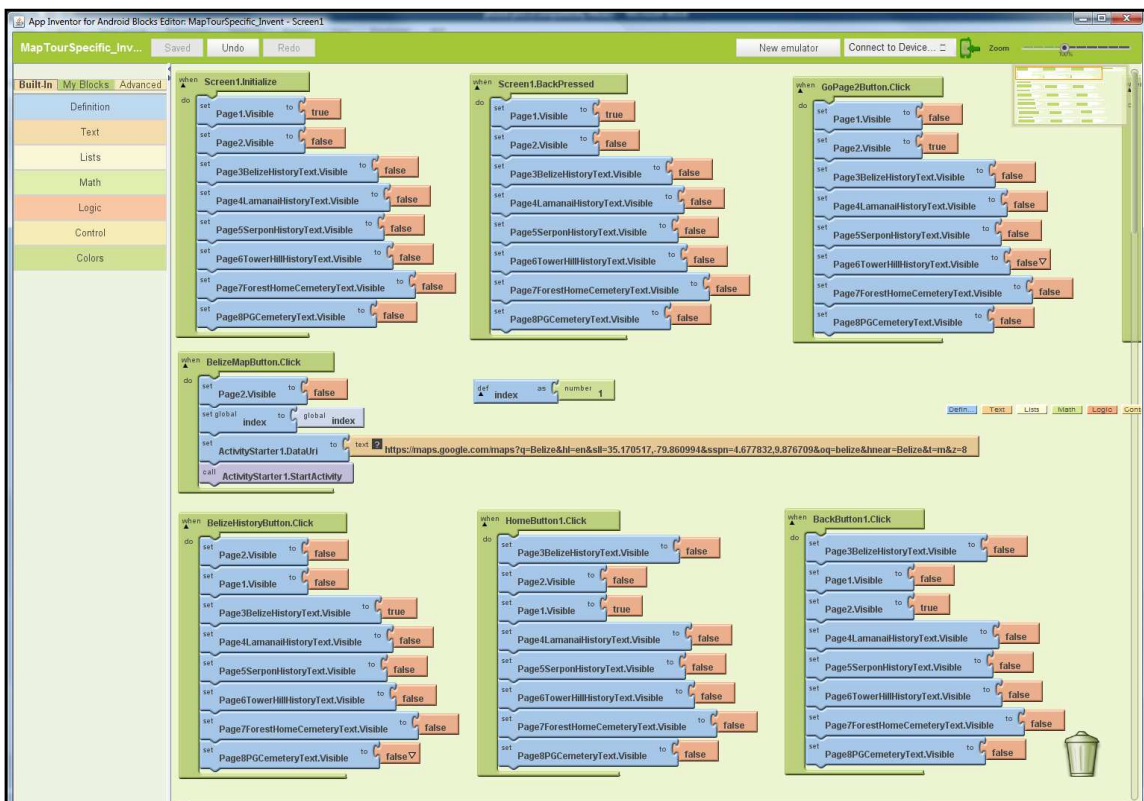


Figure 29. The App Blocks Inventor window

By incorporating all of the necessary information into the design formats, an application was developed that is available for download to PDA's for personal use by locals, visitors or within the tourism industry to assist in boosting interest and raising awareness of some of the less popular historical sites in Belize.

CHAPTER IV

RESULTS

The four main GIS/Technical objectives for this dissertation were:

- 1) Collection of GPS points at historic sugar sites in Belize
- 2) Creation of maps showing where the historic sugar sites related to the American expatriates and the East Indians were located
- 3) Creation of a database showing location of the sites and history of sites
- 4) Creation of a downloadable application of location-related information for Personal Digital Assistants (PDA) to allow a visitor or tourist to download

These objectives were met by a combination of field work in Belize, GPS and GIS analysis and the creation of an application in a PDA. Developing technology in the form of mobile applications and handheld devices that can be linked to the world wide web and GPS have opened new doors for the tourism industry as shown in the examples presented and can be a major benefit to the country of Belize if this mobile application is implemented. Visitors and tourists can download this application for use on their visit to heritage sites like the historical sugar sites in the country. Through this application, the rich history of sugar including the rise and fall of slavery to the influx of expatriated Americans and East Indians to understanding its present role in the economy of the country can all be revealed to visitors who would otherwise not know of its existence.

This application can serve as an invaluable tool and a gateway of knowledge for Belizeans and the rest of the world into the migratory and sugar history of Belize.

Below are visual examples of the appearance of the downloadable application on a mobile device and directions on how to use it and what information it entails for the user. The packaged application will be made available online for download and can be sent via an email or a website onto a PDA for use. It can also be accessed even before a visitor decides to go to a site, providing them with information and options to assist in their decisions.

After the relevant components and blocks are selected and personalized to suit the purposes of the Belize application, the emulator is used to manipulate and adjust the application to achieve the desired appearance and results, as shown in Figure 30.

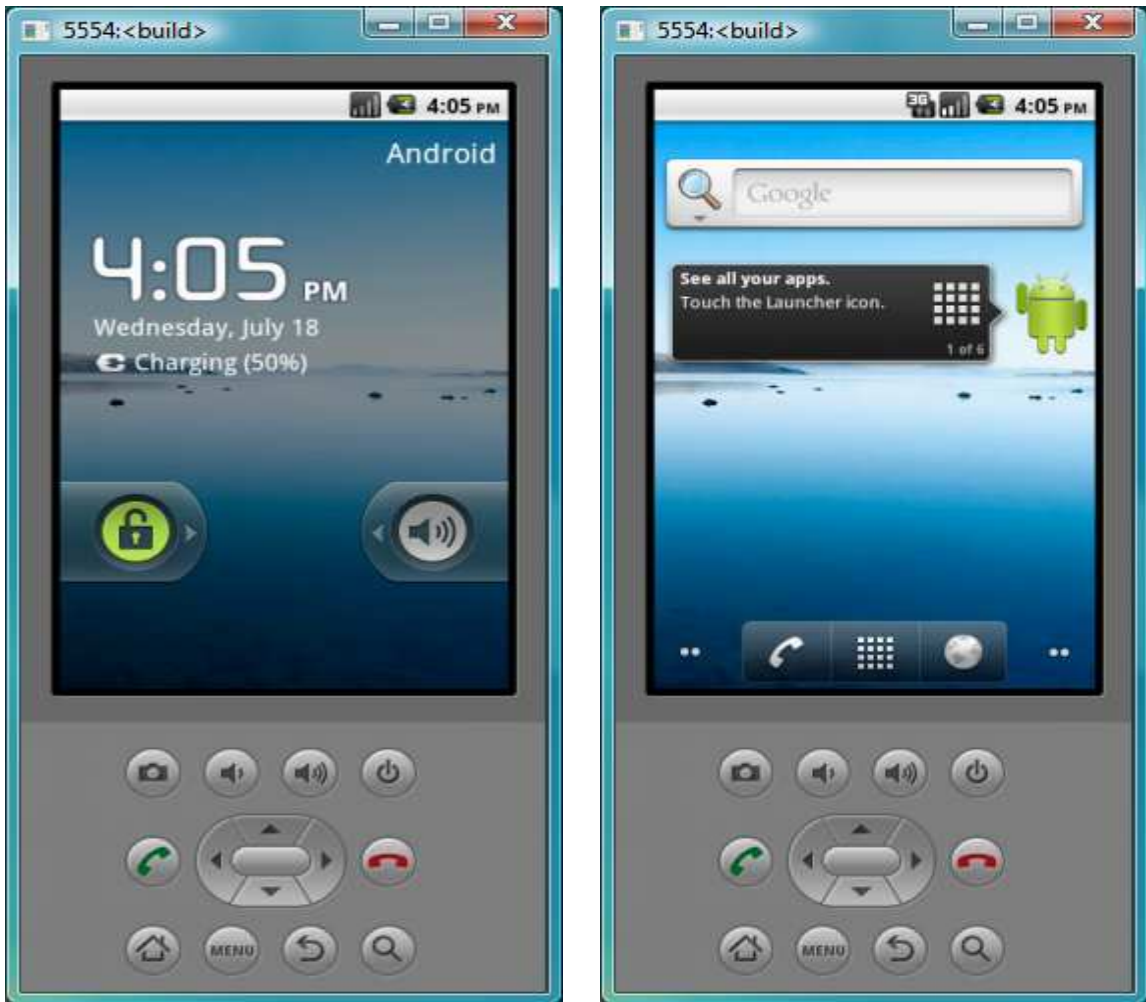


Figure 30. App Inventor Emulator before it is connected to the Belize application

The components were customized within the App Designer and the Apps Blocks windows. A home screen was created which allowed the user to select the button “Where would you like to go?” Upon selection, the application then connects to another screen with selectable options of the different historical sites that the tourist can visit. For each site, a short history is provided, as well as a link to a Google map that shows its location in Belize and provides directions to get there by linking the application to the cell phone’s GPS navigational system. An example of the selection process is show in Figure 31 and Figure 32.

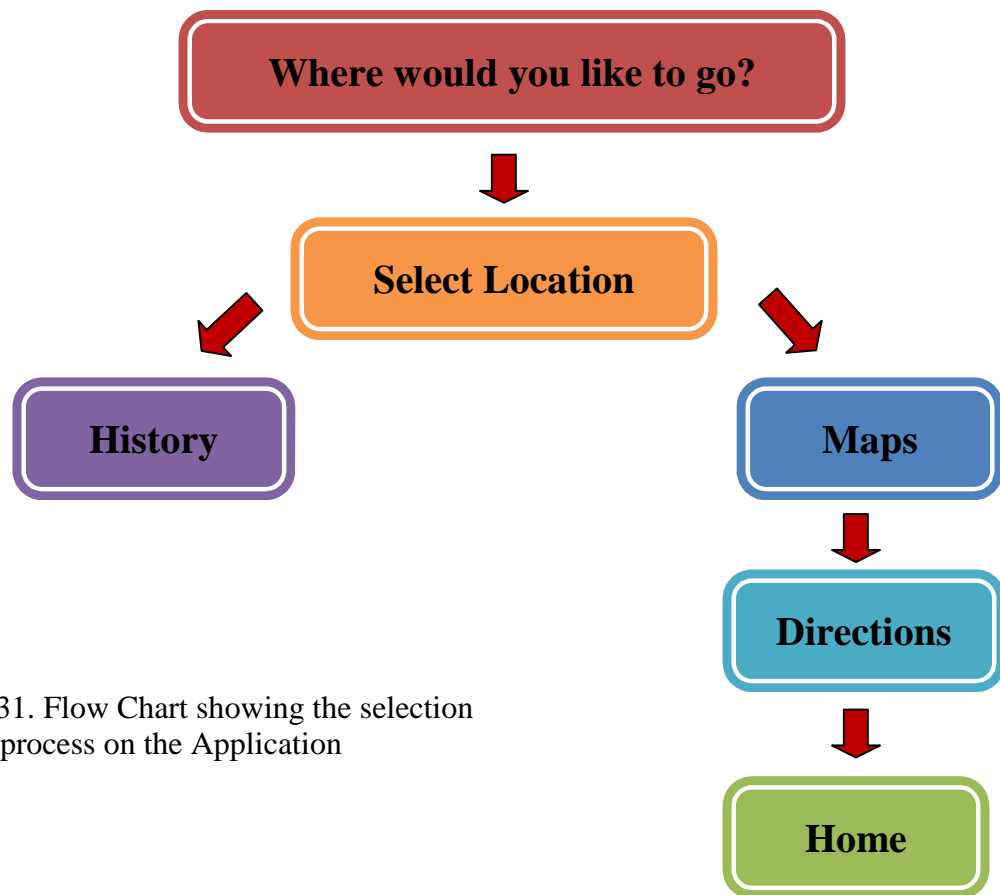


Figure 31. Flow Chart showing the selection process on the Application

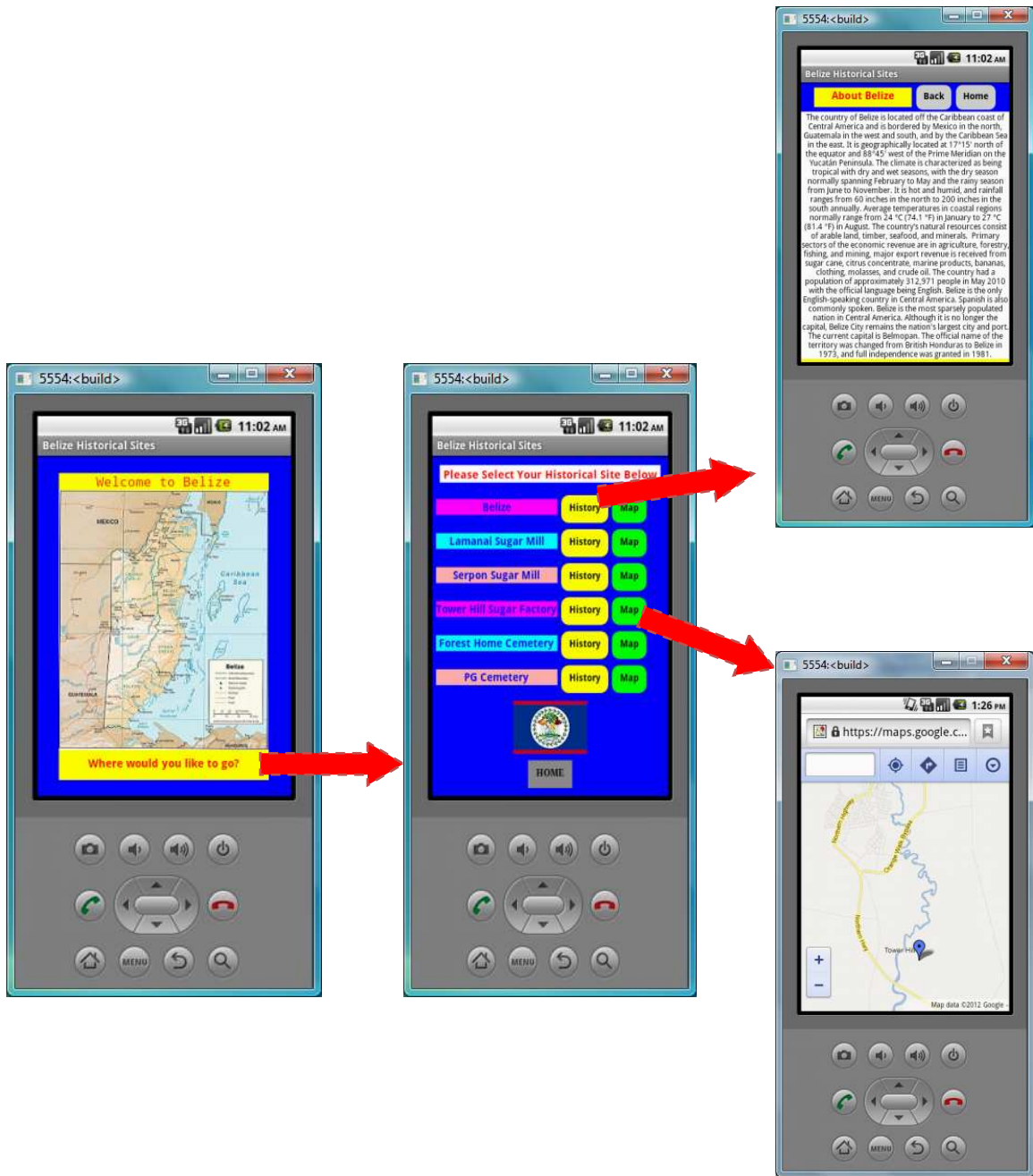


Figure 32. Selection process on the Mobile Application

The first button provides a general history of the country of Belize with an accompanying map of the country. Next, is a button linking to information about the Lamanai Sugar Mill as well as to a map showing its location, and also one connecting to the Serpon Sugar Mill. Following that are Tower Hill Sugar Factory history and map/location buttons, then those that connect the user to the historical sites of the Forest Home Cemetery and then finally the PG Cemetery where some of the country's former American expatriates are believed to be buried.

When the "History" button is selected for a particular site it leads to a brief history on that site and when the "Map" button is selected it connects to Google maps to show the location of the site and allows the GPS to provide directions to the location. The appearance of the "home" and "site selection" emulator screens in the application process is shown in Figure 33, demonstrating their appearance when the application is downloaded to an android phone.



Figure 33. Belize Historical Sites Application - Home Page and Site Selection Page

When the map button is selected for a particular historical site, the drop down menu across the top can lead to the “My Places” option where the maps for the sugar mill sites, the Tower Hill Sugar factory and the cemeteries where some of the former Confederate soldiers and politicians are buried available for selection as shown in Figure 34.

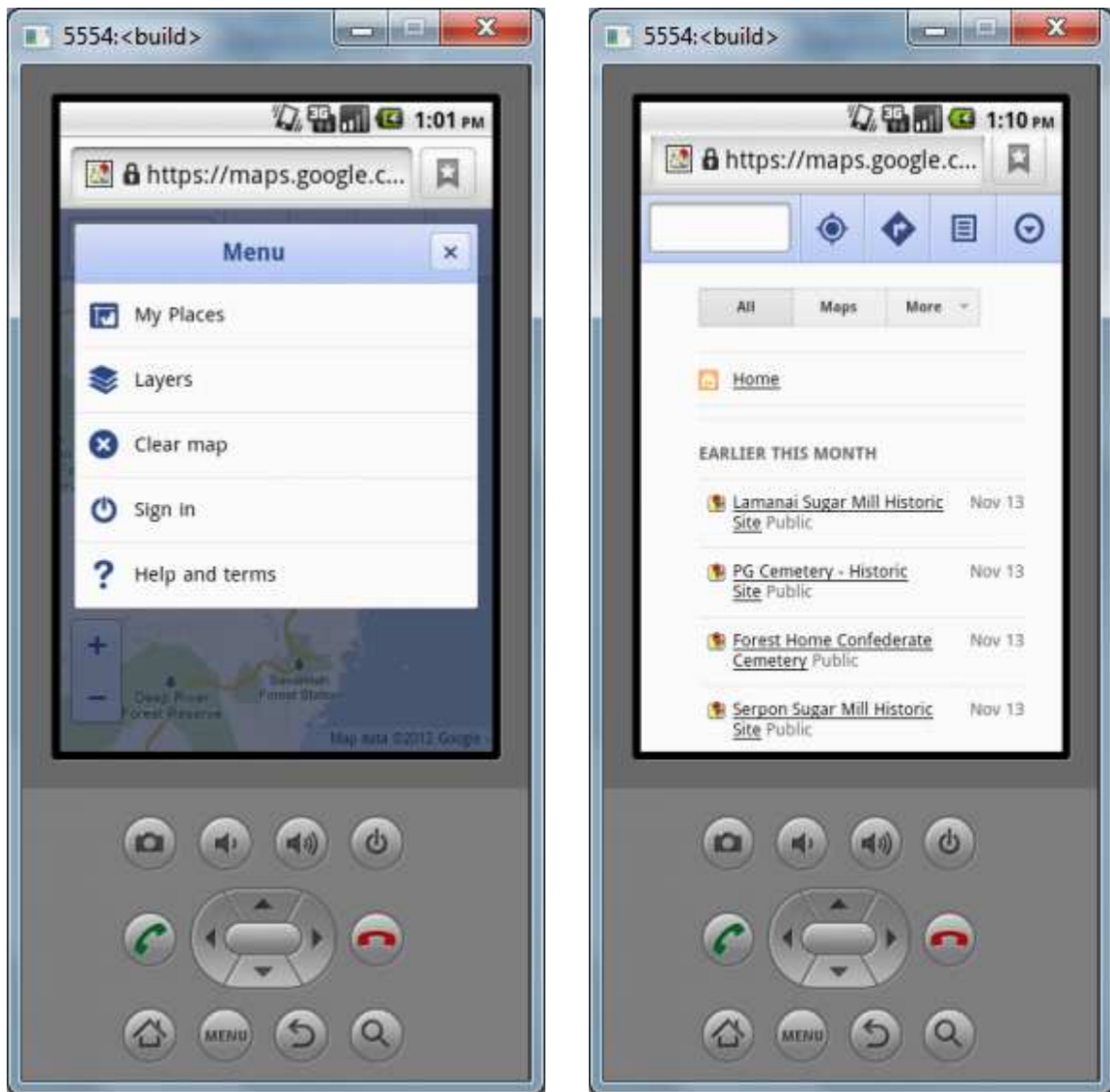


Figure 34. The Map Selections available in the “My Places” menu within the application

When the historic site of interest is selected, the following screens appear for the history and the related maps respectively. The history provided for each site is only a concise version of each site's information to allow incorporation into the application. More information can be obtained from linked sites in the database mentioned above. Figure 35 is the application screen giving a short history of Belize, using the following text (Bushong 1978, Pearce 1984, CIA World Factbook 2012):

About Belize

The country of Belize is located off the Caribbean coast of Central America and is bordered by Mexico in the north, Guatemala in the west and south, and by the Caribbean Sea in the east. It is geographically located at 17°15' north of the equator and 88°45' west of the Prime Meridian on the Yucatán Peninsula. The climate is characterized as being tropical with dry and wet seasons, with the dry season normally spanning February to May and the rainy season from June to November. It is hot and humid, and rainfall ranges from 60 inches in the north to 200 inches in the south annually. Average temperatures in coastal regions normally range from 24 °C (74.1 °F) in January to 27 °C (81.4 °F) in August. The country's natural resources consist of arable land, timber, seafood, and minerals. Primary sectors of the economic revenue are in agriculture, forestry, fishing, and mining, major export revenue is received from sugar cane, citrus concentrate, marine products, bananas, clothing, molasses, and crude oil. The country had a population of approximately 312,971 people in May 2010 with the official language being English. Belize is the only English-speaking country in Central America. Spanish is also commonly spoken. Belize is the most sparsely populated nation in Central America. Although it is no longer the capital, Belize City remains the nation's largest city and port. The current capital is Belmopan. The official name of the territory was changed from British Honduras to Belize in 1973, and full independence was granted in 1981.

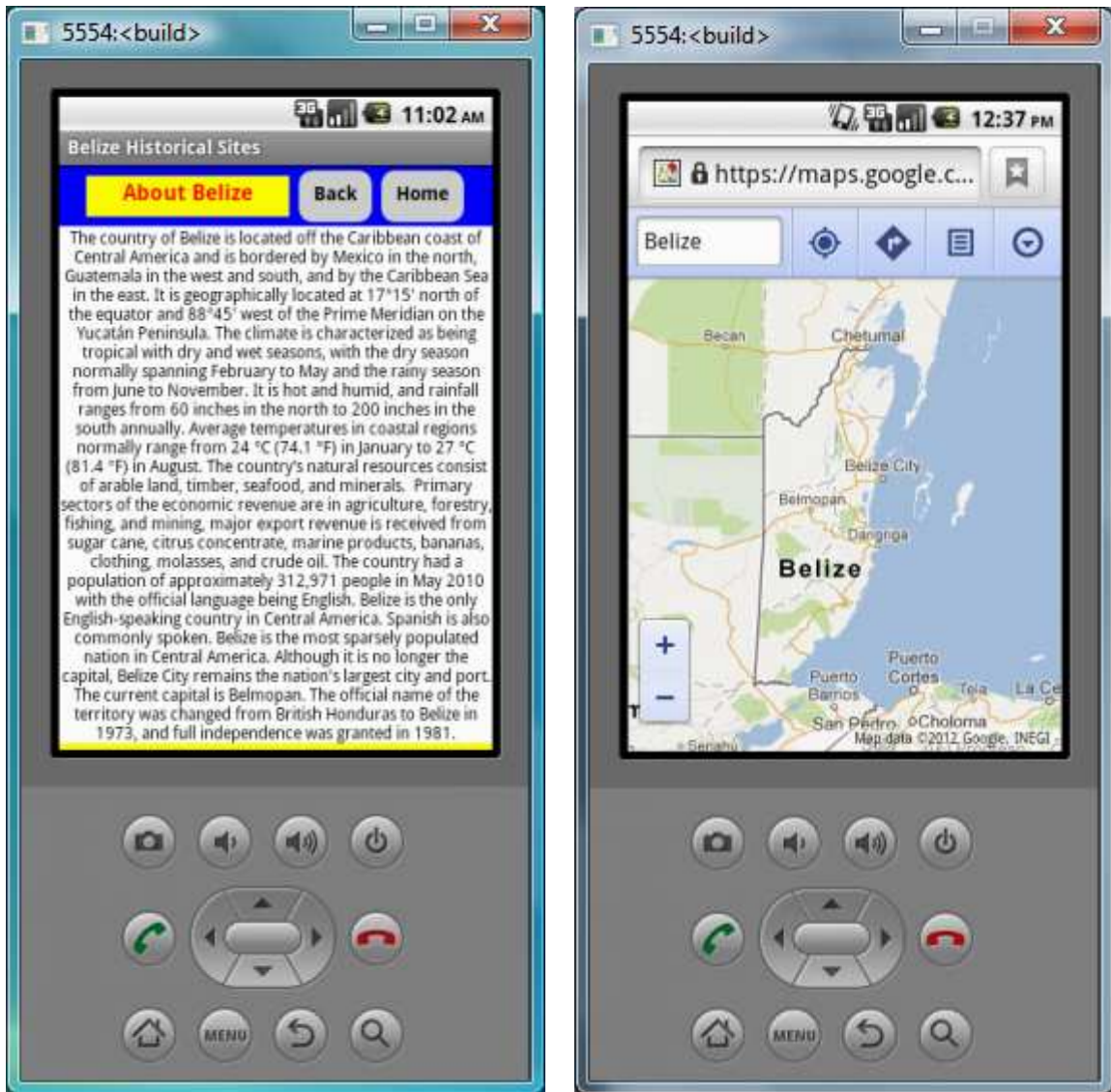


Figure 35. Emulator screens showing History of Belize and Map of Belize

Figure 36 shows the application's display for historical information and map about the Lamanai Sugar Mill (Pendergast, 1982).

Lamanai Sugar Mill

Lamanai, meaning “submerged crocodile,” is located on the banks of the New River Lagoon in the village of Indian Church and is famous for its Maya temples and ceremonial centers. However, a twelve minute walk from these magnificent sites reveals the remnants of an old British sugar mill location that also originated in the American expatriates migration era dating back to AD 1860-1875. This site was chosen for sugar production in the 19th century due to its location along the New River, as well as a cheap exploitable work force of rural Maya still living nearby. However, the Maya soon rebelled against poor treatment and low wages, the English owners were ravaged by jungle diseases, and the mill was abandoned. Remaining elements include the boiler and boiling house and evaporation tank amongst others. The mill is believed to have been in operation for only 15 years because of its unstable brick foundation being unable to handle the amount of friction stemming from the iron operations of the mill.

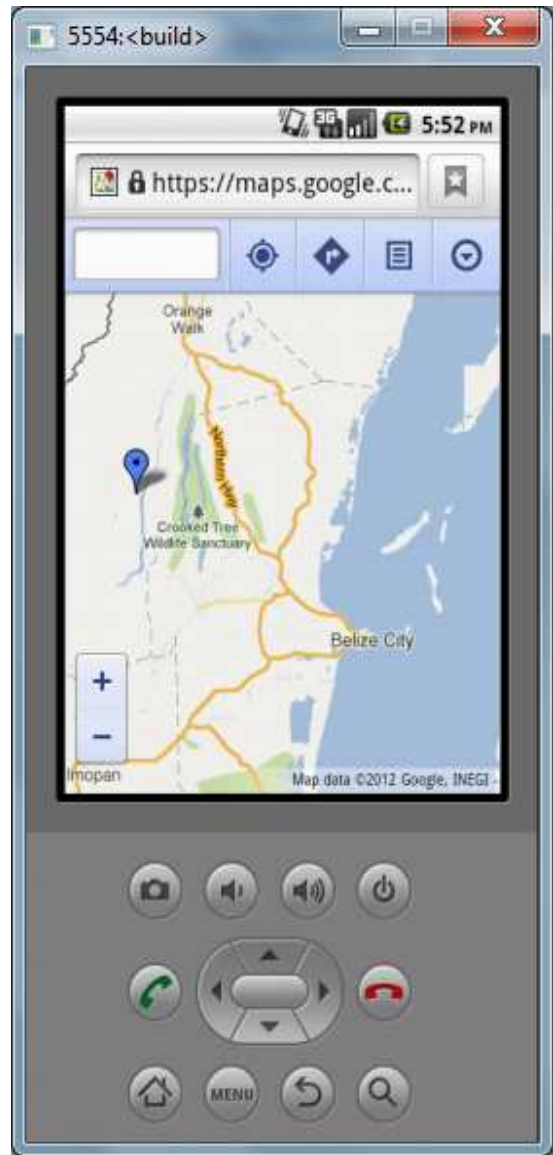
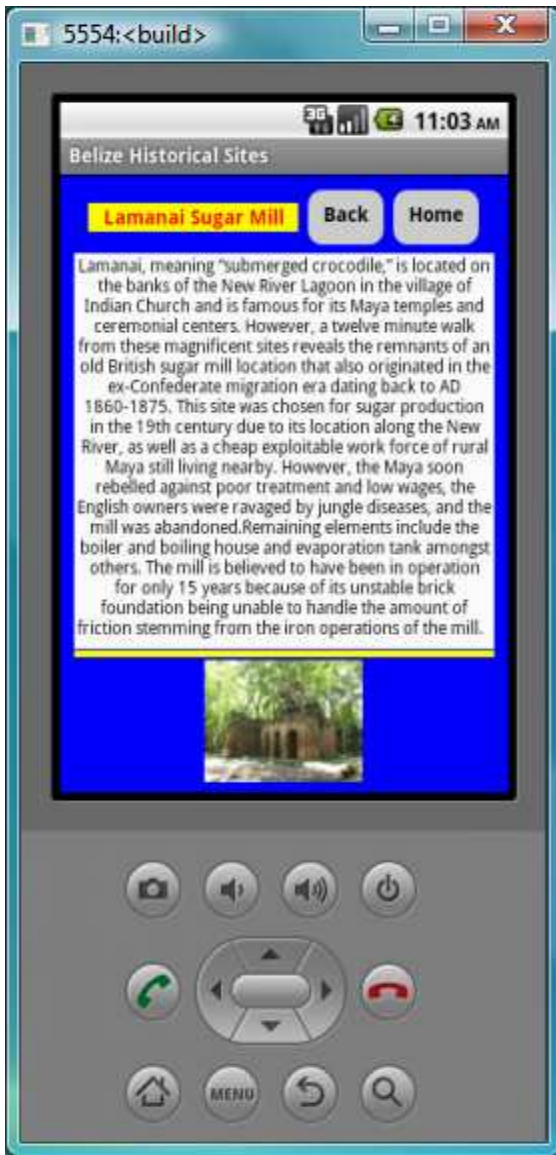


Figure 36. Emulator screens showing History of the Lamanai Sugar Mill and Map

Figure 37 shows the application's display for historical information and map about the Serpon Sugar Mill (Institute of Archaeology website).

Serpon Sugar Mill

Serpon, located near the Sittee River in Stann Creek County. This mill is no longer in use but its remnants are visible. It was one of the earlier sugar mills that helped produce enough sugar to contribute to the country's economy. It was established in 1865, after being bought and run by an American named William Bowman, who also bought a neighboring mill named Regalia located on the other side of the river. Due to its previous huge economic contributions, this sugar mill has played a role in putting Belize on the map in terms of sugar production and exports.

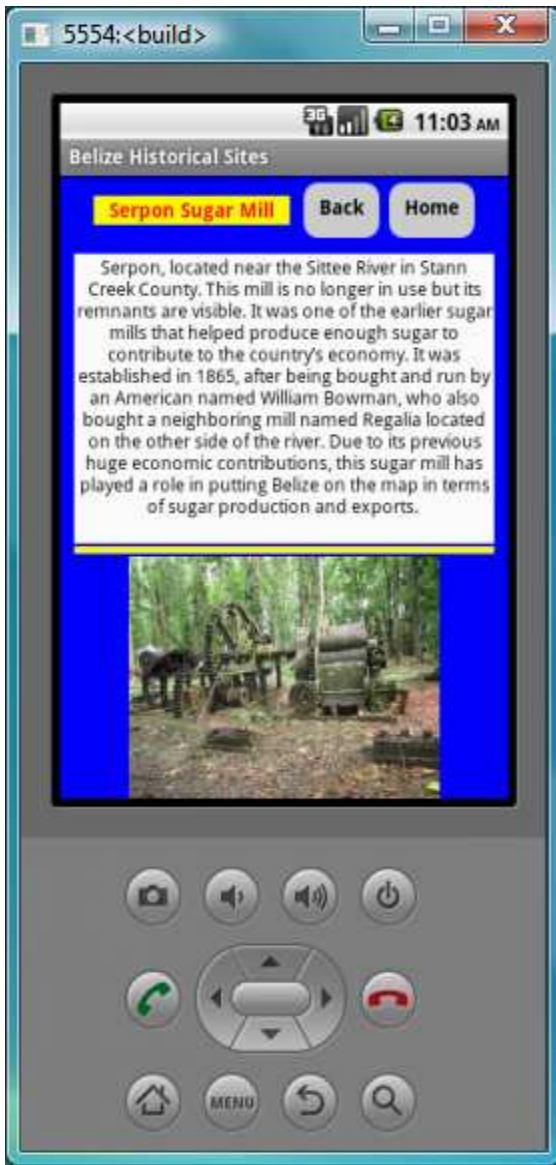


Figure 37. Emulator screens showing History of the Serpon Sugar Mill and Map

Figure 38 shows the application's display for historical information and map about the Tower Hill Sugar Factory (Thomson 2004, Merrill 1992).

Tower Hill Sugar Factory

Presently, the Tower Hill Sugar Factory in Orange Walk is the only operating sugar mill in Belize. It is owned by Belize Sugar Industries, Ltd. and is supplied with cane by more than 4000 farmers, reaping an estimated 40,000 acres each year. Currently, small farms in Northern Belize generate most of the sugarcane. In the early 1990s, the coordination of the agricultural aspects of sugar production and the organization of cane delivery were the responsibilities of the Cane Farmers' Association. The industrial segment of the sugar-production process was controlled by Belize Sugar Industries Limited (BSIL). Overall coordination of the industry was exercised by the Belize Sugar Board.

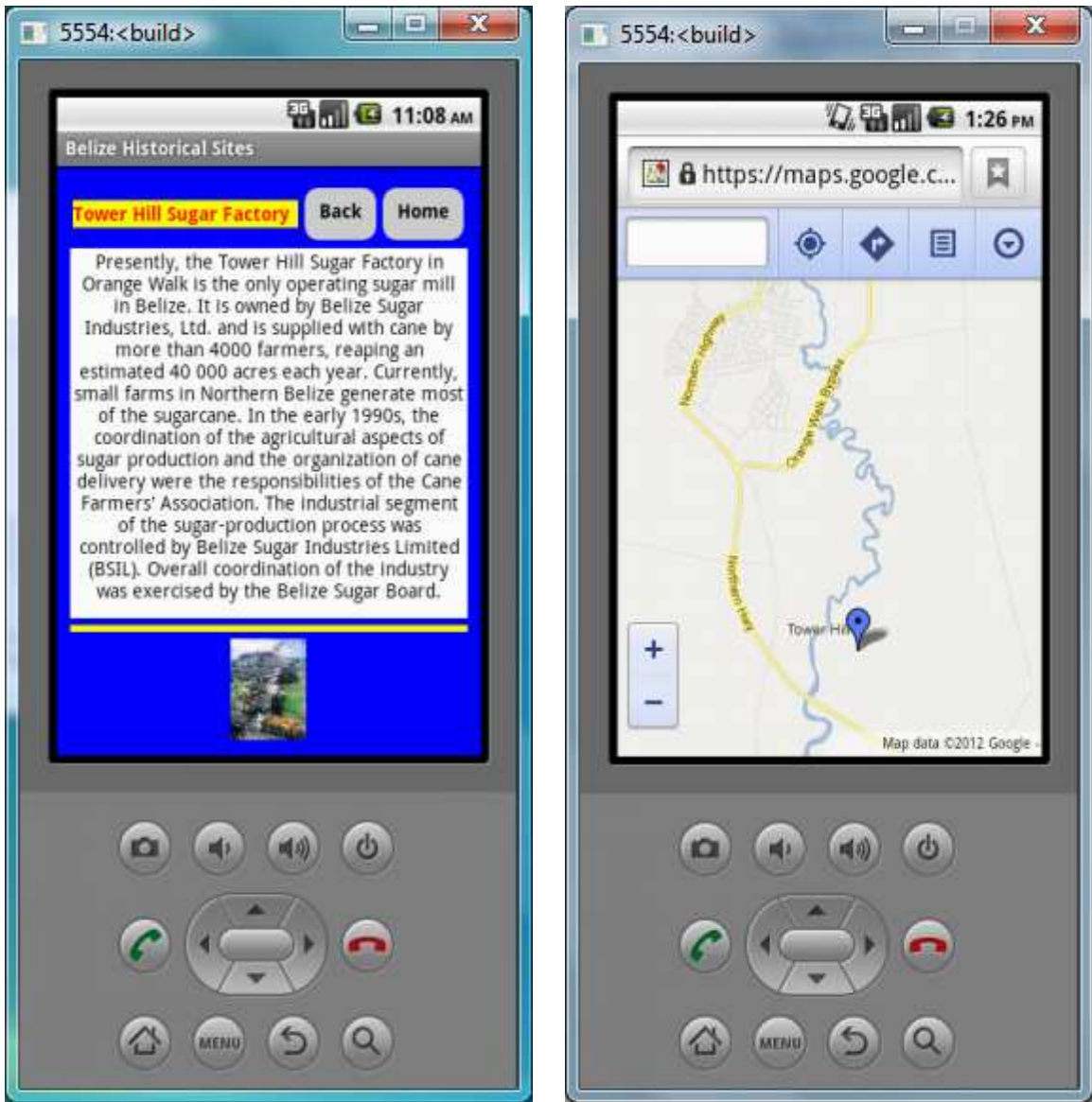


Figure 38. Emulator screens showing History of the Tower Hill Sugar Factory and Map

Figure 39 shows the application's display for historical information and map about the Forest Home Cemetery (Camille, 1986).

Forest Home Cemetery

The Forest Home Cemetery is the remaining evidence of the American migrant community that founded Forest Home. The small settlement of Forest Home has an interesting history because after the U.S. Civil War, eight American families migrated there from southern states of Texas, Louisiana and Alabama. Forest Home was settled by those intending to grow sugarcane to produce sugar successfully, however, but the settlement only lasted for about a generation. After realizing that cotton was not conducive to the new climate as a profitable endeavor, they eventually began to grow sugar cane around 1867, to be able to have a productive crop and compete in the market. Most eventually returned to the United States after a subsequent outbreak of malaria and cholera and also when it appeared that most of the crops attempted were still not conducive to the new tropical climate as they expected, As sugar beet production began to flourish in Europe in 1874, sugar cane profitability began to experience a rapid decline as imported sugar beet was being sold at lower prices. As a result, this was also a push factor for some Americans to return to the United States due to poor, economic conditions during the late 1870's.

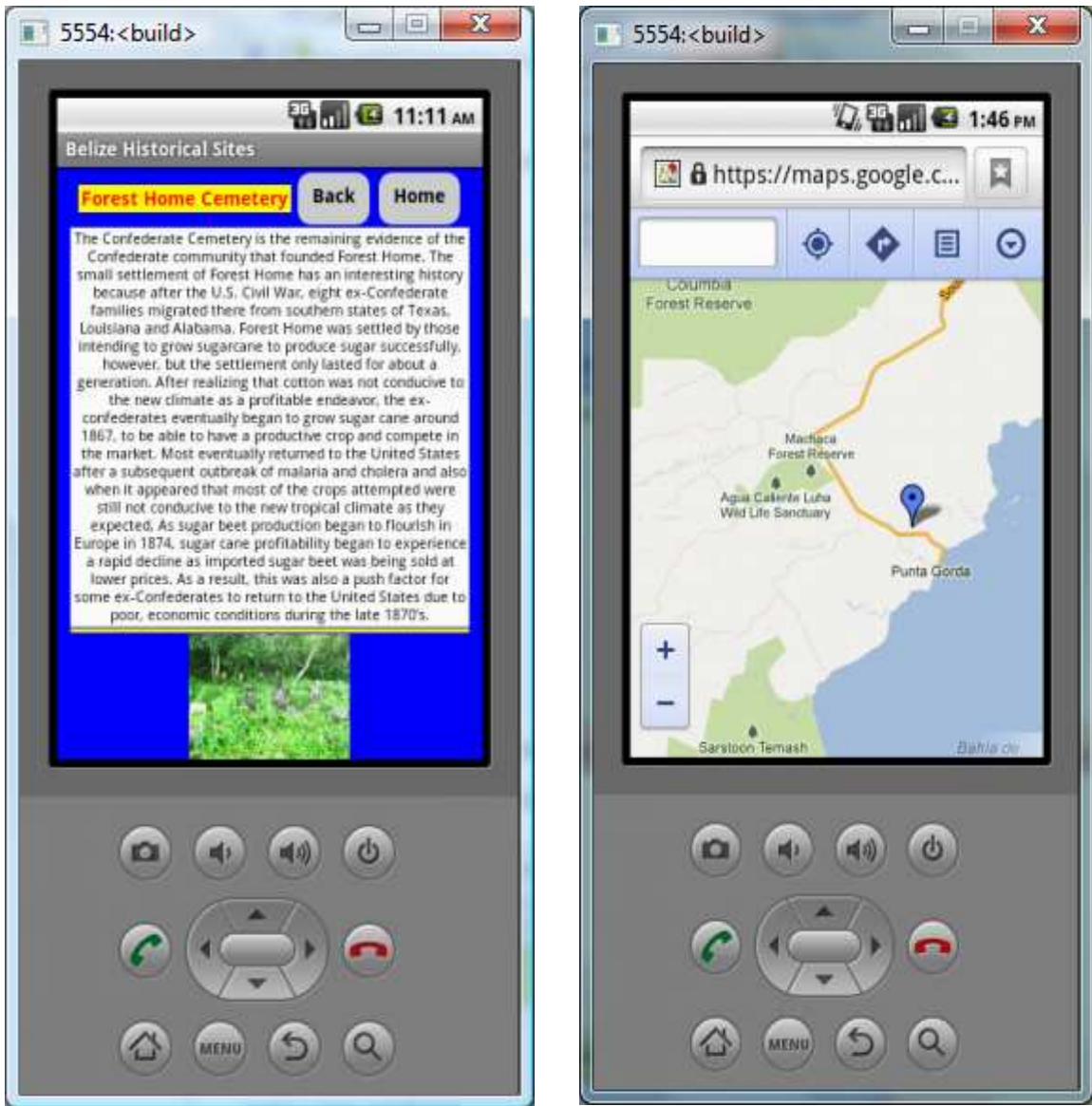


Figure 39. Emulator screens showing History of the Forest Home Cemetery and Map

Figure 40 shows the application's display for historical information and map about the PG (Punta Gorda) Cemetery (Camille, 1986).

PG (Punta Gorda) Cemetery

Due to the fact that the American expatriates preferred to “keep to themselves”, they had their own separate burial areas in the Toledo District. A visit to these cemeteries can provide a physical realization of their previous existence and physical presence in the area. The town of Punta Gorda is located on the west coast of the Caribbean Sea in Southern Belize. According to residents, some of the plots toward the back of the PG Cemetery on the brink of the ocean were the older ones that may be of interest. There are also reports in the area of crypts being washed out to sea due to the erosion of the land occurring toward the back end of the cemetery.

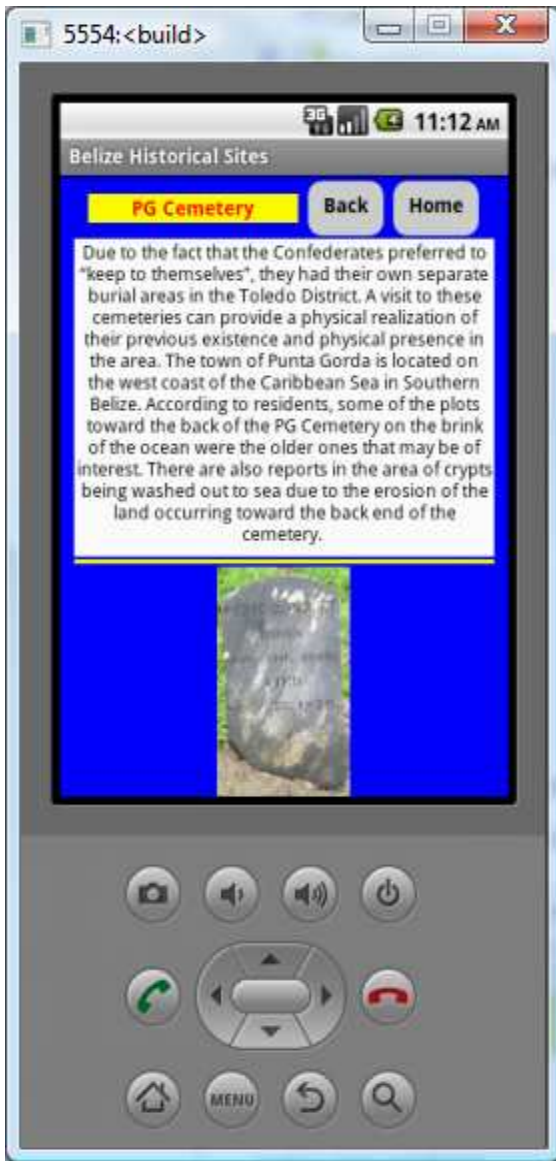


Figure 40. Emulator screens showing History of the Punta Gorda (PG) Cemetery and Map

After transforming the Google App Inventor program to reflect the information needed to represent Belize Historical Sites Application, and observing its behavior on the emulator which mimics an android phone, the application was then saved and packaged. This was done by selecting “Packaged for phone” within the App Inventor design window, which saves the application as a zip files (.apk) as shown in Figure 41. This file can then be shared with others and downloaded to an android phone for use by someone who wishes to learn about or explore some of these lesser known historical sites in Belize.

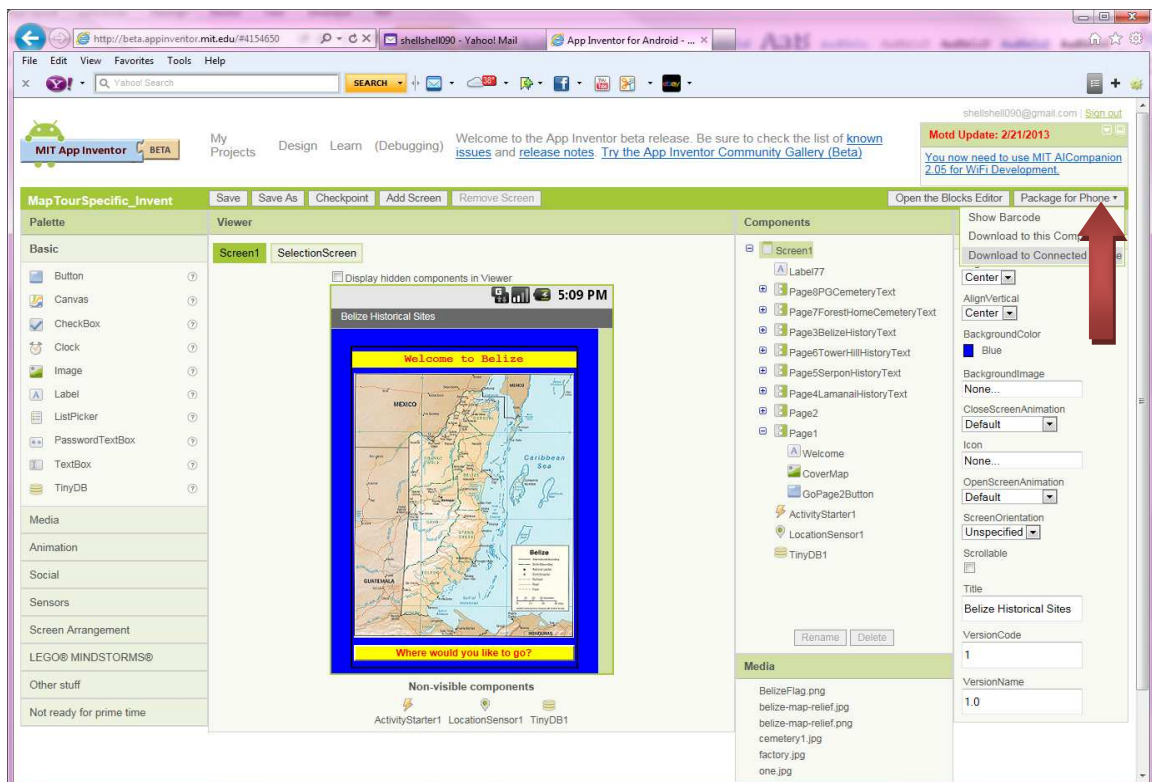


Figure 41. The App Inventor Designer window showing the “Package for Phone” option

The histories of the sugar mills accessible by the PDA are written to be brief informative and to lead interested tourists to more in-depth sources. The larger context of the sugar trade, the people involved, GIS, GPS, spatial application programming and modern tourism all combine to create a seamless information/directional system for the traveler.

The first research question asked the question: How has slavery, indentured labor and plant transfer played a role in the sugar industry in Belize and what are the physical and economic connections between humans and sugar?

Slavery and indentured labor has played a monumental role in the development and advancement of the sugar industry around the world, especially in the Caribbean and other South and Central American countries like Belize. Sugar prompted continued economic success in countries of the Caribbean and in this case, Belize. As shown in the sugar export graphs in Figures 3, 4, 5 and 6, sugar has been a relatively steady source of export and income for Belize since 1961 and continues to play a huge role in the country's economy.

The relationship between humans and sugar entailed much pain and suffering and unjust human treatment for many years in many parts of the world. Africans were abducted from their homelands in forced migrations to provide the labor pool necessary to grow, harvest and process the cane and its by-products. The importance of sugar in a plantation setting, along with its economic potential and success, aided in the continuation of slave-like working conditions after slavery's official end. It also

continued to influence attitudes regarding those who were imported for their labor in the fields cutting the sugar cane, and assisting in the processing of sugar or rum, mainly for export purposes.

In Belize, sugar played somewhat of a different role compared to other countries where it ultimately imported large numbers of slaves as part of the agricultural system, then indentured laborers after the abolishment of slavery, to work on sugar plantations. After sugar was introduced to Belize by the Yucatan immigrants in 1848, it was only grown in relatively small quantities for local use and the British focused more on wood cutting for their main source of income and export profits. However, when the American soldiers and politicians migrated from the United States after the American Civil War, they tried their hand at different crops, but eventually realized the successful nature of growing sugar cane for sugar and, for some, rum as a byproduct for local consumption and export.

American expatriates from the south migrated to Belize and hoped to recreate the plantation system, including its racial inequities of their homeland. Sugar is a labor-intensive crop and a few Belizeans were willing to work for the offered low wages or in the fields' harsh conditions. East Indians were willing to do so for the chance of work and possible landownership, regardless of the industry's inherent hardships.

The second research question asked: Why did so many mills initiated by the Americans not survive and who became owners of these mills?

During the 1800s, after discovering the profitability of sugar, the American immigrants in Belize served as non-indigenous farmers and/or businessmen, and began to export the product to other countries where the demand was great. Some of the mills did not survive due to a lack of labor supply or competition from sugar beets in the export market. Nevertheless, the practice of growing sugar cane and processing sugar and rum continued after many of the American expatriates either returned to the United States or died. Some abandoned their land to natural forest succession: however, many left land in the hands of their East Indian indentured workers who were working on the sugar plantations after slavery was abolished. Several absentee landowners ultimately sold their land to their tenants.

This transference of property played a pivotal role in the survival and progression of the sugar industry in the country. Even though some of the land that once was dedicated solely to sugar has transformed into the growing of rice and other crops, the planting, harvesting and processing of sugar cane into refined sugar and rum plays a major role in land practices in other parts of the country.

The third question addressed asked: How has the development of the sugar industry played a pivotal role in transforming the political, economic, geographical or cultural landscapes of Belize and how have non-indigenous farmers and/or businessmen played a role in the sugar history of Belize during the 1800s?

Throughout its history in Belize growing, processing, transporting and selling sugar and rum has affected the landscape, through clearing lands for fields, mills, workers' housing and the owner's home as well as construction of transportation features such as roads and ports. Regional geographic, cultural and historical differences led to uneven success in the early sugar industry. Nonetheless, sugar has played a major role in the historical and economic status of the country of Belize and continues to do so presently. As a result, the history relating American expatriates, slaves and the East Indian indentured laborers to the sugar industry has played a vital role in molding the country into its current state and in shaping its future. One way of preserving and imparting this history is through the use of modern day technology.

The fourth question posed was: How can technology and GIS be incorporated to advance the country's tourism industry through its cultural benefits, specifically related to its historical plantation and sugar histories?

Technology and GIS was incorporated in many ways to document, record and map the physical, historical, heritage and cultural attributes of Belize. This was done through the collection of GPS point locations in Belize for the sites of interest as well as taking photographs. Through the creation of a spatial database and a PDA application specifically for visitors and tourists, a fuller experience can be provided. This serves to impart knowledge and awareness to the locals about their ancestors and their own country as well as to inform and educate potential visitors and tourists about what the country has

to offer, not only regarding its physical beauty but its rich historical cultural heritage as well.

The modern day tourist is more involved in the decision making process regarding their choice of destination and what they plan to do when they get there. They are also more inclined to visit a place because of its historical or cultural history than solely for its typical physical attraction. With tourists seeking spatial and geographic knowledge, technology has presented ways of bridging the gap by allowing them to be more proactive in the decision-making processes associated with planning a trip as well as what they are able to do and see when they arrive at their chosen destination. Through the implementation of a database by the Tourism Board via their website, visitors to the site can see some of less commonly known historical facts and landscape features about Belize, such as the historic sugar mill sites, plan a trip and be able to locate these sites when they arrive in the country. This can provide them with a more authentic, cultural experience instead of simply enjoying the beaches and local food and they can also experience the ecotourism, history, people and traditions of the country.

The final question was: How does this knowledge enhance our understanding of Belizean culture?

Many countries of the Caribbean, Central and South America have a rich historical lineage from Amerindian history, colonialism, slavery, indentured labor, independence and a history of migration. The government of Belize has begun to promote and market tourism more intensely, using more unique niche aspects of the country to

draw tourists including its heritage sites such as the Mayan temples, as well as other lesser advertised historical locations that date back to its colonial history including buildings, cemeteries and sugar mill heritage sites. These site locations are being developed and preserved to attract the tourist to engage in its history and also for them to be able to locate and navigate more efficiently while in Belize.

Sugar and its historical influence can play a vital role within the tourism industry, being a driving force for migration patterns, landscape change, culture and economic standing for many post-colonial countries such as Belize. As this study has highlighted, there are many remnants of this sugar history still in existence which include the actual descendants of those who came voluntarily and those who were brought through slavery or indenture, sugar mill sites, cemeteries where Americans interested in genealogy may find ancestors and other imprints on the landscape. The sugar history of Belize is somewhat unique compared to others in the region or in the Caribbean in that there was no large plantation based sugar production system as there was in countries like Trinidad or Jamaica. The slaves, followed by indentured laborers came to work in the fields to produce sugar for export, but it was on a smaller scale than the huge plantations being run on other islands. Before slavery was abolished many slaves were acquired from Jamaica by the Americans instead of directly from Africa because they were in closer proximity to Belize and also already “Creolized”, as well as indentured East Indian workers. These migration patterns have all contributed to the uniqueness of Belize with its multi-cultural background and present diverse population.

With the promotion of the more cultural elements of the country, Belize tourism can blossom using the right marketing, preservation and technological advances, to attract visitors. Tourism should not only be a tool to stimulate the economy, but also a gateway to understanding the history of the people and place and having a fulfilling cultural experience. Technology is a doorway to the world and allows remote access to information and data. Tourists can then have access to points of interest as well as information on the history, people, climate and culture of a country like Belize, provided by the country itself as well as others who have visited previously. They can also observe maps and view destination routes to significant places even before they pick a final destination.

CHAPTER V

DISCUSSION AND CONCLUSION

Quantitative and qualitative results were accomplished by researching the dynamics of the use of slave and indentured labor and an overview of the sugar industry and migration in Belize from the Yucatan immigrants, the southern Americans after the Civil War to the East Indian period to the present. This was undertaken through the acquisition of archival information about their settlements and history through the initial summer field foray and subsequent documentary research.

Qualitative information led to the creation of a database accessible to the public for information regarding Belizean historical sugar sites and their histories, using a compilation of the GPS, archival and photographic data recovered on the trip to Belize, as well as previously existing documentation and literature. It also includes maps showing the locations of the historic sites. Finally there is a downloadable application that tourists can use to assist them in acquiring historical and location information about historical sugar mills, settlements and cemetery sites.

Some of the initial additional goals of the project were not achieved due to a lack of available data or of responses to repeated emails and attempts to contact certain departments locally. Another reason for limited data availability was the loss of documentation including land tenure data which was lost in the hurricane in 1931. Land tenure data and migration records from the 1800s to the present would have added

substantially to the historical timeline of the events and underlined how sugar has played a role in that history. Efforts to acquire this data from local departments proved to be unsuccessful. Nevertheless, the main goal of developing an initial understanding of Belize's sugar industry and its history and the creation of an application for use within the heritage tourism industry was accomplished.

Additions to this research can include the insertion of land tenure information into the database and maps, which can provide a more detailed progression of the changes that occurred when land changed ownership between the British, local Belizeans, Americans who migrated in, then left the country and East Indians. Future research may be able to uncover and piece together land tenure information based on absentee records which may include absentee landowner plots from wills or collections in the United States or other countries where early settlers migrated from. This would enhance the historical transitions, such as the choice of crops grown and exported, that occurred within the country from the 1800s to present, as well as concurrent migration data showing migration patterns to Belize.

Another form of further analysis that can be undertaken is research into the names on the tombstones at the sugar mill related cemeteries – Forest Home Cemetery and PG Cemetery. This can lead to genealogical connections of those who migrated from the southern United States after the American Civil War period. A variety of Americans are interested in genealogy – Americans also make up one of the largest groups visiting Belize.

The Director at the Institute of Archaeology, Dr. Jaime Awe, was very helpful during my research; however, I am still awaiting a reply from the Tourism department. Contact was also made to the Belize Tourism Board via their website and also through their webpage on the social media site – Facebook. I asked for their support and assistance with funding and possibly returning to Belize to field-test the application and work along with them to have it integrated into their system. I have not as yet received a response from my contacts in Belize. A second or third trip to Belize would enhance my interpretations; however the present lack of additional fieldwork does not invalidate the contribution of this research.

This study has contributed to the understanding of the evolution of the sugar industry in Belize, which was introduced by the Yucatan immigrants. The industry took root and grew with the arrival of the American expatriates during late 1860s and 1870s. By the late 1890s and early 1900s the East Indians, brought in as indentured laborers, achieved success by use of local and imported labor sources. The reasons for the early departure of the American immigrants were based partially on racial and social conditions. Their inability to adapt to people of African descent as being their social equal drove many back to the United States. Likewise their desire to have their children educated in America led many of their children to decide to remain in America. The tenure of the East Indians who took over the industry after the land owners left or died, has been explored. This succession plays a vital role in the successful enterprise that the sugar industry enjoys in Belize today.

The project researched the evolution of the Belizean sugar industry focusing on the change of the agrarian industry that can draw interest from local Belizeans and historians, American and East Indian immigrant descendants. This intensifies the potential of historical and heritage tourism for the country.

Finally the research explored the use of technological and geographical advances along with their current and potential roles in the tourism industry around the world and in Belize. Specifically, the use of hand held devices and downloadable applications, can be a valuable tool in helping tourists easily locate, explore and experience the physical geography, landscape, recorded history and archaeological remnants of the Belizean sugar industry. Ultimately, the research was able to identify some of these lesser known sites and show a visitor or tourist how to get there.

The intellectual merit of this research is the provision of expanded knowledge about the sugar industry as well as some of the migratory history connecting the United States and the country of Belize and incorporating it through technology. This research is new because it integrates the history of Belize with its historical geography, archaeology and heritage tourism with modern GIS, GPS and mobile applications. This project was undertaken and completed through a combination of resources including archival data, literature and photographs, and merging them into technologies of Google maps and cell phone applications. Methods and results achieved via this research could not have been accomplished before the advances in technologies such as cell phones and their

downloadable applications, handheld GPS devices, GIS maps and databases and the ever-increasing span and usage of internet access.

To complete this research project, I was forced to wear many hats and morphing them at times, being a historian, field researcher, tourist, tourist geographer, archaeologist, GIS geographer and becoming very familiar with new social technologies, programs and applications. This research has enhanced my knowledge of the country of Belize and allowed me to develop new skills and talents making me a more experienced and accomplished geographer. This study will benefit other researchers like Simmons and Harter who have special interests in this migrant population, Belizean descendants of the Americans, slaves and indentured laborers and Belize's general population.

The impact of colonial history and its subsequent sugar status is ripe for drawing the more culturally-inclined tourist interested in the history and landscape of a country that still possesses remnants of the colonial and plantation eras, intertwined with the sugar industry. This is enhanced by incorporating technology with the historical sites and history, thereby improving the tourism experience, leaving the tourist more satisfied. This can result in increased tourism numbers in Belize and the tourists can return to their homeland with contentment not only from the physical beauty of the country, but also through the attainment of an educational experience of a well-rounded trip.

Future Development

In the near future, I would like to be able to return to Belize to research and collect even more GPS points of other possible sugar related sites, to visit and tour the Tower Hill Sugar factory, which is the only one currently operating, and also visit the two main rum factories – L&R Liquors and Travellers Liquor Limited. The Tower Hill Sugar Factory offers tours if scheduled in advance. Attempts to contact the two rum factories proved futile, which is why a trip to Belize would provide more opportunity for interaction and information to observe and analyze their direct connections with sugar.

The rum factories will provide an additional aspect of the timeline following the path of the planting and harvesting of the sugar cane, and its subsequent refinement into sugar and use in the creation of rum from its by-products. Contact will also allow for the possibility of them sponsoring me to link them to the heritage sites, so that interested parties of heritage tourism, who are interested in the sugar mills can also experience the current sugar factory and rum factories as well.

Another essential reason for a return to Belize is to test the mobile application to determine its functionality on site and work out any kinks that may exist. It would also be a great opportunity to perhaps work along with the local Tourism Industry to possibly implement the application for use within their website or database. Their incorporation of the application can also serve as a form of record to acquire data from its users whether numerical, or about their decision making processes before, during or after visiting the various historic sites.

The Google App Inventor is currently designed for optimal use on Android Smartphones. Hopefully, in the near future it can be applied to Apple products such as the iPhone and Blackberry Smartphones, allowing it to reach an even broader sector of the user population.

Also, if implemented successfully in Belize, this downloadable application can be adjusted accordingly for use at other local sites, such as the Mayan historical sites. Even further expansion of the application can incorporate the heritage tourism for other countries such as my home country of Trinidad and Tobago. A major part of the reason that the history and culture of Belize was so intriguing to me was due to the many similar parallels yet fascinating differences between Belize and Trinidad and Tobago. Both countries relied heavily on the sugar industry spanning the rule of the British into their eras of independence, and both also relied on the labor of slaves and indentured laborers to work in the field and process the sugarcane into sugar and rum. Belize was more unique compared to many of the other sugar producing countries that relied on slave labor because it did not operate on a large-scale plantation system format as did other countries such as Trinidad and Tobago and Jamaica. Implementation of a similar application will also inform tourists of local heritage sites in these other countries that are associated with their individual sugar histories and likewise benefit their tourism industries.

Conclusion

This dissertation has presented the scope of influence of the sugar industry in Belize from its introduction by the Yucatan immigrants from Mexico to its current role in the country's economy and history. Its main focus was to link this history and heritage in a process turning that specific heritage into an asset to the country's tourism industry.

This research connected the evolution of sugar into a major source of income in Belize through the networking of information on sugar cane, sugar, rum, migration, slavery and indentureship and integrating them with technologies such as GPS, GIS, Google Maps and mobile applications. This technological assimilation has opened doors by making some of the historical and heritage information in Belize even more visual and accessible to everyone, including Belizeans, and especially tourists who may find new reasons to visit Belize.

The final products included a better awareness of the sugar history in Belize, a database showing the history and maps of sugar-related heritage site locations as well as an application that can be downloaded to a Personal Digital Assistant (PDA) or mobile phone to access history, maps and directions to these sites in Belize.

REFERENCES

- “Agriculture in British Honduras” (1895) *Bulletin of Miscellaneous Information (Royal Gardens, Kew) Springer* Vol. 1895, No. 97 pp. 9-11
- AlSayyad, Nezar (2001) “Consuming Tradition, Manufacturing Heritage: Global Norms and Urban Forms in the Age of Tourism” *London: Routledge*
- Arathymou, Spyridoula (2009) “Finding and Accessing the Right Archive and Archival Data: Archival Tools to Support Research and to Make Archives Available to Public” *Historical Social Research*, Vol.34, No.3 pp.71-77
- Arroyo, A. B. Marín (2009) “Assessing what lies beneath the Spatial Distribution of a Zooarchaeological Record: The use of GIS and Spatial Correlations at El Mirón Cave (Spain)” *Archaeometry* Vol.51, No.3 pp.506–524
- Avdimiotis S, et al. (2006) “GIS applications as a tool for tourism planning and education: A case study of Chalkidiki” *Tourism* Vol.54, No.4 pp.405-413
- Babcock E. et al. (2000) “Why International Migration has Important Consequences for the Development of Belize” *Conference of Latin Americanist Geographers* Vol.26, pp.71-86
- Beckford, George L. (1969) “The Economics of Agricultural Resource Use and Development in Plantation Economies” *Social and Economic Studies*, Vol. 18, No. 4 pp. 321-347
- Beckford, George L. (1972) “Economic Organization of Plantations in the Third World” *Studies in Comparative International Development (SCID)* Vol.7, No. 3 pp.243-263
- Beinart, William et al. (2004) “Plant Transfers in Historical Perspective: A Review Article” *Environment and History*, Vol. 10, No. 1 pp. 3-29
- Bennett, D. (2005) “Global tourism and Caribbean Culture” *Caribbean Quarterly* Vol.51, No.1 pp.15-24

- Birgül Egeli et al. (2001) "A Framework for a National Tourism Information System of Turkey, Anatolia" *An International Journal of Tourism and Hospitality Research* Vol.12, No.2 pp.125-137
- Bolland, O. Nigel (1981) "Systems of Domination after Slavery: The Control of Land and Labor in the British West Indies after 1838" *Society for the Comparative Study of Society and History* 1981 Vol.23, pp. 591-619
- Bolland O, Shoman A. (1977) "Land In Belize, 1765-1871" *Institute of Social and Economic Research*, University of the West Indies, Mona, Jamaica
- Ian, Boxill. (2003) "Towards an Alternative Tourism for Belize" *International Journal of Contemporary Hospitality Management* Vol.15, No.3 pp.147-150
- Boxill, Ian (2004) "Towards an Alternative Tourism for Jamaica" *International Journal of Contemporary Hospitality Management* Vol.16, No.4 pp.269-272
- Brown, Keith G, et al. (2010) "Island Tourism: Marketing Culture and Heritage Editorial Introduction to the Special Issue" *International Journal of Culture, Tourism and Hospitality Research* Vol.4, No.2 pp.87-95
- "British Honduras: Portrait of a Colony" (1953) *The Public Relations Office, Belize and the Central Office of Information*
- Buhalis, Dimitrios, et al. (2006) "Information communication technology applications for World Heritage Site Management" *Managing World Heritage Sites* pp.125-144
- Bushong, A. D. (1978) "Agricultural settlement in British Honduras: A geographic interpretation of its development" Thesis/dissertation
- Caldas, Carlos H. et al. (2006) "Using Global Positioning System to Improve Materials-Locating Processes on Industrial Projects" *Journal of Construction Engineering and Management*. Vol. 132, No. 7
- Cameron, Catherine et al. (2008) "Beyond Sun, Sand and Sea: The Emergent Tourism Program in the Turks and Caicos Islands" *Journal of Heritage Tourism* Vol.3, No. 1
- Camille, Michael Anthony (1986) "Historical Geography of Toledo Settlement, Belize, 1868-1985: A Transition from Confederate to East Indian Landscapes" *Louisiana State University and Agricultural and Mechanical College*

- Camille, Michael Anthony (1986) "Historical Geography of the U.S Confederate settlement at Toledo, Belize: 1868-1930" *Belcast Journal of Belizean Affairs* Vol.3, Nos. 1&2
- Carlson, Alvar W. (1980) "Geographical Research on International and Domestic Tourism" *Journal of Cultural Geography* Vol.1, No.1 pp.149-160
- Cave, Jenny et al. (2012) "Island Tourism: Destinations: an Editorial Introduction to the Special Issue" *International Journal of Culture, Tourism and Hospitality Research* Vol.6, No.2 pp.95-113
- Central Statistical Office (2010) "Abstract of Statistics" Belmopan Ministry of Finance Belize City: Government of Belize
- Chambers, Erve (2000) "Native Tours: The Anthropology of Travel and Tourism" *Prospect Heights, III: Waveland Press*
- Chang, Grace, et al. (2011) "Web-based GIS in Tourism Information Search: Perceptions, Tasks, and Trip Attributes" *Tourism Management* Vol. 32, No. 6 pp.1435-1437
- Chernela, Janet M. (2011) "Barriers Natural and Unnatural: Islamiento - As a Central Metaphor in Kuna Ecotourism" *Bulletin of Latin American Research* Vol.30, No.1
- Chiswick, B. et al. (1996) "Ethnic networks and language proficiency among immigrants" *Journal of Population Economics* Vol. 9, No.1 pp.19-35
- Chu, T.H. et al. (2012) "Mguiding (mobile Guiding) - Using a Mobile GIS App for Guiding" *Scandinavian Journal of Hospitality and Tourism* Vol.12, No.3 pp.269-283
- Clegern, Wayne (1967) "British Honduras: Colonial Dead End, 1859-1900" Baton Rouge, Louisiana State University Press, 1967
- Collison, Fredrick M. et al. (2010) "Marketing Cultural and Heritage Tourism: the Marshall Islands" *International Journal of Culture, Tourism and Hospitality Research* Vol.4, No.2 pp.130-142
- Constantinidis, Dora (2009) "GIS for managing the analysis and protection of archaeological remains in the Willandra Lakes World Heritage Area" *Archaeol. Oceania* Vol. 44, pp.112-118

- Crosby, Alfred W. (2004) "Ecological Imperialism: The biological expansion of Europe, 900-1900" Cambridge; New York: Cambridge University Press, 2004 2nd ed.
- Crouch, D. (2005) "Flirting with space: Tourism Geographies as Sensuous/Expressive Practice" In C. Cartier & A. Lew (Eds.), *Seductions of Places: Geographical Perspectives on Globalization and Touristed Landscapes* London: Routledge pp. 23–35
- Curry, M. (1998) "Digital places: Living with Geographic Information Technologies" London: Routledge
- Darcel, F.C. (1954) "A History of Agriculture in the Colony of British Honduras"
- Deerr, Noel (1949) "The History of Sugar" Volume One *Chapman and Hall Ltd.*
- Donohoe, William (1946) "A History of British Honduras" *Provincial Publishing Co. Ltd Montreal (Canada)*
- Dookeran, Isaac (1971) "A Pre-Emancipation History of the West Indies" Collins
- Economou, Daphne et al. (2008) "Cultural applications for mobile devices: Issues and requirements for authoring tools and development platforms" *Mobile Computing and Communications Review* Vol. 12, No. 3
- Elder, G. H., Jr. et al. (1992) "Working with Archival Data: Studying Lives" *Sage University paper series on Quantitative Applications in the Social Sciences*, series no. 07-088. Newbury Park, CA: Sage
- Ford, Anabel et al. (2009) "Modeling Settlement Patterns of the Late Classic Maya Civilization with Bayesian Methods and Geographic Information Systems" *Annals of the Association of American Geographers* Vol.99, No.3 pp.496–520
- Fotiou, S, et al. (2002) "Sustainable Development of Ecotourism in Small Islands Developing States (SIDS) and Other Small Islands" *Tourism and Hospitality Research* Vol.4, pp.79-88
- Found, William C. (2004) "Historic sites, material culture and tourism in Caribbean islands" *Tourism in the Caribbean: Trends, development, prospects* edited by David Duval Chapter Eight

- Foxell, Emilio et al. (2010) "Repositioning Malta as a Cultural Heritage Destination" *International Journal of Culture, Tourism and Hospitality Research* Vol.4, No.2 pp.156-168
- Fullerton, Leanne, et al. (2010) "Integrating Management and Marketing Strategies at Heritage Sites" *International Journal of Culture, Tourism and Hospitality Research* Vol.4, No.2 pp.108-117
- Fusco Girard et al. (2009) "Cultural Tourism and Sustainable Local Development" *Ashgate*, pp. 1-9: "Narrow Escapes: Pathways to Sustainable Local Cultural Tourism"
- Galloway, J H. (1968) "The Sugar Industry of Pernambuco During the Nineteenth Century" *Annals of the Association of American Geographers* Vol.58, No.2 pp. 285-303
- Gao, Shang et al. (2012) "The Adoption of Mobile Tourism Services: An Empirical Study" *ACM*, Bali, Indonesia
- Giles, Wayne (2003) "GIS Applications in Tourism Planning" *GIS Seminar 2003*
- Giudici, Ernestina (2013) "Is Intangible Cultural Heritage Able to Promote Sustainability in Tourism?" *International Journal of Quality and Service Sciences* Vol.5, No.1 pp.101-114
- Gleason, H. A. (1926) "The Individualistic Concept of the Plant Association" *Bulletin of the Torrey Botanical Club* Vol. 53, No.1 pp. 7-26
- Gottdiener, Mark (2000) "New Forms of Consumption: Consumers, Culture, and Commodification" *Lanham, MD: Rowman & Littlefield Publishers*
- Grant C. (1976) "The Making Of Modern Belize: Politics, Society, & British Colonialism In Central America" *Cambridge University Press*
- Green, William A. (1984). The Perils of Comparative History: Belize and the British Sugar Colonies after Slavery. *Comparative Studies in Society and History* Vol.26, pp 112-119
- Guerrón, Montero Carla (2011) "Heritage, Identity and Globalisation: the Case of Island Tourism in the Caribbean" *Bulletin of Latin American Research* Vol.30, No.1 pp.1-6

- Guerrón, Montero Carla (2011) "On Tourism and the Constructions of 'Paradise Islands' in Central America and the Caribbean" *Bulletin of Latin American Research* Vol.30, No.1
- Hall, C. Michael et al. (2006) "The geography of tourism and recreation: environment, place and space" London; New York: Routledge
- Hall, C.M. (2010) "Island Destinations: a Natural Laboratory for Tourism Introduction." *Asia Pacific Journal of Tourism Research* Vol.15, No.3 pp. 245-249
- Hall, Stuart (1997) "Caribbean Culture: Future Trends" *Caribbean Quarterly* Vol.43, pp.25-33
- Harter, Eugene C. (1985) "The Lost Colony of the Confederacy" *Library of Congress Cataloging* pp. 21
- Higman, B W. (2000) "The Sugar Revolution" *The Economic History Review* Vol.53 No.2 pp.213-236
- Hill, Lawrence (1936) "The Confederate Exodus to Latin America" *The Southwestern Historical Quarterly* Vol.39, No. 4
- Holdridge, Desmond (1940) "A Tropical Refugee Settlement in British Honduras" *Geographical Review* Vol. 30, No. 3
- Hugill, Anthony (1978) "Sugar and All That: A History of Tate and Lyle" London 1978
- Ioannides, Dimitri et al. (1998) "The Economic Geography of the Tourist Industry: A Supply-Side Analysis" *London: Routledge*
- Jennissen, Roel (2007) "Causality Chains in the International Migration Systems Approach" *Population Research and Policy Review* Vol. 26, No. 4 pp.411-436
- Jones, W. O. (1968) "Plantations", *David L. Sills International Encyclopedia of the Social Sciences* Vol. 12, pp.154
- Kenteris, M. et al. (2011) "Mytilene E-guide: A multiplatform mobile application tourist guide exemplar" *Multimedia Tools and Applications* Vol.54, No.2 pp.241-262
- Kushwaha, Avantika et al. (2011) "Potentials of GIS In Heritage & Tourism" *Maulana Azad National Institute of Technology, Bhopal, India Geospatial World Forum* Hyderabad, India

- Liburd, J. J. (1999) "Sustainable tourism development Case studies from the Eastern Caribbean" *Doctoral dissertation*, Aarhus University, Faculty of Arts, Aarhus, Denmark
- Liburd, J. J. (2005) "Sustainable tourism and innovation in mobile tourism service" *Tourism Review International* Vol. 9, No.1 pp.107-118
- Liburd, J. J. (2006) "Sustainable tourism, contested heritage and national park development in the Salt River Bay National Historical Park and Ecological Preserve of St. Croix" Paper presented at 18th Annual Conference of the Society of V.I. Historians, St.Croix, US Virgin Islands, Jan. 21, 2006
- Liu, Yuefeng (2008) "Research on the key techniques of Remote Sensing Information Mobile Services" *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*. Vol. XXXVII. Part B4. Beijing 2008
- Lucko, Gunnar et al. (2010) "Quantitative Research: Preparation of Incongruous Economic Data Sets for Archival Data Analysis" *Journal of Construction Engineering and Management* Vol. 136, No. 1
- Luken, James O. (1990) "Directing ecological succession" *Chapman & Hall*
- Massey, D. S., et al. (1993) "Theories of international migration: A review and appraisal" *Population and Development Review* Vol.79, No.3 pp.431- 466
- Martin, P. L. (1994) "Comparative migration policies: International Migration Review Vol.28, No.1 pp.164-170
- Martin, P. et al. (2008) "Managing Migration: The Global Challenge" *Population Bulletin* Vol.63, No.1 pp.1-19
- Matev, D et al. (2009) "Integration of remote sensing and GIS for archaeological investigations" *International Journal of Remote Sensing* Vol. 30, No. 7 pp. 1663-1673
- McCracken, Grant D. (1988) "Culture and Consumption: New Approaches to the Symbolic Character of Consumer Goods and Activities" *Bloomington: Indiana University Press*
- McKercher, B. (2002) "Towards a classification of cultural tourists" *International Journal of Tourism Research* pp. 29–38

- McKercher, Bob et al. (2002) "Cultural Tourism: The Partnership between Tourism and Cultural Heritage Management" *New York: Haworth Hospitality Press*
- McMinn, Stuart (1998) "Tourist Typology Observations from Belize" *Annals of Tourism Research* Vol. 25, No. 3 pp. 675-699
- Meierhoff, James (2008) "Abandoned Sugar Mill at Lamanai, Belize" *University of Illinois at Chicago*
- Merrill, Tim (1992) *Belize: A Country Study*. Washington: GPO for the Library of Congress, 1992
- Mintz, Sidney W. (1985) "Sweetness and Power" Viking
- Moran, Emilio F. (2010) "Environmental social science: human-environment interactions and sustainability" *Malden, MA: Wiley-Blackwell*
- Munt, I. (1994) "The 'other' Postmodern Tourism: Culture, Travel and the New Middle Classes" *Theory, Culture & Society* Vol.11, No.3 pp.101-123
- Nelson, Velvet (2007) "Traces of the Past: the Cycle of Expectation in Caribbean Tourism Representations." *Journal of Tourism and Cultural Change* Vol.5, No.1 pp.1-16
- Nielsen, Niels C. et al. (2008) "Geographical Information and Landscape History in Tourism Communication in the Age of Web 2.0: The Case of the Salt River Bay National Park in St. Croix of the U.S. Virgin Islands" *Journal of Travel & Tourism Marketing* Vol.25 pp.282-298
- Novelli, Marina (2005) "Niche Tourism: Contemporary Issues, Trends and Cases" *Oxford: Elsevier*
- Nurse, K. (2004) *Diaspora, Migration and Development in the Americas*
- Pearce, Douglas G. (1984) "Planning for Tourism in Belize" *Geographical Review*. Vol.74, No.3 pp.291-303
- Pendergast, David (1982) "The 19th-Century Sugar Mill at Indian Church, Belize" *Journal of the Society for Industrial Archaeology* Vol.8, No.1
- Pickford, Chris (2002) "Archives: A statistical Overview" *Public Services Quality Group for Archives and Local Studies*. Cultural Trends Vol.12, No.48 pp.1-36

- Poon, Auliana (1993) "Tourism, Technology, and Competitive Strategies" Wallingford: CAB International
- Prentice, Richard (1993) "Tourism and Heritage Attractions London: Routledge, 1993
- Pretes, Michael (1995) "Postmodern Tourism" *Annals of Tourism Research* Vol.22, No.1 pp.1-15
- Roopnarine, Lommarsh (2003) "East Indian Indentured Emigration to the Caribbean: Beyond the Push and Pull Model" *Caribbean Studies* Vol.31, No.2 pp.97-134
- Rosenberger, D. G. (1958) "An examination of the perpetuation of southern United States institutions in British Honduras by a colony of ex-confederates" *New York: New York University*
- Scher, Philip W. (2011) "Heritage Tourism in the Caribbean: The Politics of Culture after Neoliberalism" *Bulletin of Latin American Research*. Vol.30, No.1
- Schwinger, W. et al (2002) "Context-awareness in Mobile Tourism Guides – A Comprehensive Survey" by *Austrian Federal Ministry for Education, Science and Culture, and the European Social Fund (ESF)*
- Setlur, Vidya et al. (2010) "Towards Designing Better Map Interfaces for the Mobile: Experiences from Example" *Com.Geo 2010 Proceedings of the 1st International Conference and Exhibition on Computing for Geospatial Research & Application*
- Stine, Linda F. (1997) "Carolina's Historical Landscapes: Archaeological Perspectives" *Knoxville: University of Tennessee Press*
- Stine, Roy S. (2000) "Finding the Forge: Geographic Visualization in Archaeology." *Historical Archaeology* Vol.34, No. 4 pp.61-73
- Simmons, Donald C. Jr. (2001) "Confederate Settlements in British Honduras" *Jefferson, North Carolina and London: McFarland and Company*
- Stark, O. et al. (1989) "Relative deprivation and international migration" *Demography*, Vol. 26, No.1 pp.1-14
- Stinchcombe, Arthur (1995) "Sugar Island Slavery in the Age of Enlightenment" *Princeton University Press*
- The Library of Congress Country Studies; CIA World Factbook (2012)

- The Schomburg Center for Research in Black Culture (2003) "Jubilee: the Emergence of African-American Culture" *National Geographic Books*
- Thomson P. (2004) "Belize: A Concise History" *Oxford: Macmillan Caribbean, 2004*
- Toni K. Ruth et al. (2010) "Comparing Ground Telemetry and Global Positioning System Methods to Determine Cougar Kill Rates" *Journal of Wildlife Management* Vol.74, No.5 pp.1123-1133
- Uriely, N. (1997) "Theories of Modern and Postmodern Tourism" *Annals of Tourism Research* Vol. 24, No.4 pp.982
- Uriely, N. (2005) "The Tourist Experience: Conceptual Developments" *Annals of Tourism Research* Vol. 32, pp.199–216
- Urry, John (1990) "The Tourist Gaze: Leisure and Travel in Contemporary Societies" *London: Sage Publications*
- Walle, Alf H. (1998) "Cultural Tourism: A Strategic Focus" *Boulder, Colo: Westview Press*
- Weaver, David B (1995) "Alternative tourism in Montserrat" *Tourism Management*, Vol.16, No.8 pp.593-604
- Woods, L.A. et al. (1997) "The Composition and Ethnic Distribution of Ethnic Groups in Belize: Immigration and Emigration patterns, 1980-1991" *Latin American Research Review* Vol.32, No.3
- Young, Ruth C (1976) "The Structural Context of Caribbean Agriculture: A Comparative Study" *The Journal of Developing Areas* Vol.10, No.4 pp.425-444

Web References

- “Archaeology of Serpon Sugar Mill” *Institute of Archaeology*
<<http://www.nichbelize.org/ia-archaeological-sites-parks/archaeology-of-serpon-sugar-mill.html>>
- Food and Agriculture Organization of the United Nations (FAOSTAT)
Downloaded on 4/29/2013
- “History of Belize” *Belize Gateway*. 2007. <<http://www.belizegateway.com/History-of-Belize.php>>
- Leslie, Robert (2002) “A History of Belize, Nation in the Making” *Cubola Productions*
6th ed.
<<http://www.belizenet.com/history/chap4.html>>
- Massachusetts Institute of Technology (2012) App Inventor
<<http://appinventor.mit.edu/explore/>>