Chapter 1: Introduction

Coastal lakes are dynamic, sensitive environments that can provide detailed information on changes in sea level, major hurricane frequency, and changes in the surrounding vegetation and climate. Coastal lake sediments can provide snapshots of past regional conditions. It is through the interpretation of these sediments, in combination with studies from surrounding areas, that we can begin to understand the past climatic patterns of a given region and larger scale climatic oscillation. Although there are paleoenvironmental studies being carried out all over the world, the Caribbean region has been under-explored in terms of paleoenvironmental studies.

To date, Hispaniola's largest inland fresh water lake, Lake Miragoane, is the most extensively studied area. Brenner and Binford (1988) examining the lake's geochemistry and sedimentation rate over the past 500–1000 Cal YBP. They also analyzed the recent pollen record, finding evidence of two major European deforestations. Hodell et al. (1991) created a 10,500 year climate profile of the lake using stable isotope analysis of ostracod shells, which revealed periods of increased moisture and drought. Curtis and Hodell (1993) and Higuera-Gundy et al. (1999) looked in depth at temperature and precipitation changes within the region, as well as at changes in the pollen record, to reconstruct both changes in climate and the influence of prehistoric people in the region. Two studies examined bog sediments in the Cordillera Central of the Dominican Republic (Horn et al. 2000; Kennedy et al. 2006), focusing on the history and role of fire and climate in the highlands.

Additionally, there have been several papers published concerning studies of surrounding islands. A 1200 cal YBP history of climate variations using changes in sediment composition to determine wet and dry periods was conducted in Jamaica (Street-Perrott et al. 1993). Burney et al. (1994) have reconstructed a 7000 year history of human and fire activity from sediments in Laguna Tortuguero, Puerto Rico. Donnelly et al. (2007) created a 5000 year profile of hurricane activity in Laguna Playa Grande, Puerto Rico. This study primarily used bulk density analysis to identify overwash deposits. Two recent studies in Cuba (Peros et al. 2007a; Peros et al. 2007b) most similarly parallel the goal of my current research. In these two studies, the researchers have used a variety of sedimentary proxies, such as loss on ignition, biotic composition, and pollen, to compose an accurate depiction of changes in

vegetation, and biota to detect changes in salinity and the relationship between lake and the ocean. All of these proxies were then overlaid in order to produce a timeline of the lake's origin and key environmental changes (Peros et al. 2007a; Peros et al. 2007b).

Although researchers are beginning to develop records of past climate in this region, only one published study has looked at overwash deposits from major tropical storm events in the eastern Caribbean (Donnelly and Woodruff 2007). These deposits can be used to understand changes in the frequency and magnitude of past hurricanes (Liu 2004). There are no paleoenvironmental studies focusing on coastal Dominican lakes, which leaves a gap in the data concerning paleoenvironmental records of climate, vegetation, fire, and human history in this region. Long-term environmental reconstructions are necessary to understand long term changes in climate in tropical America. My study investigated the potential of an unnamed coastal lake in the Dominican Republic for long-term paleoenvironmental studies that can contribute to the body of literature on long-term climate change. This study also seeks to identify how various environmental and climate signals in this region are recorded in the sediment record through an array of proxies.

The following chapter is a manuscript in preparation to be submitted to a peer-reviewed journal.

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Chapter 1 Figures

Figure 1.1: Location of L. Alejandro (informally named by researchers) in the Dominican Republic on Landsat 7 imagery. (18.31^{o} N 71.03^{o} W)

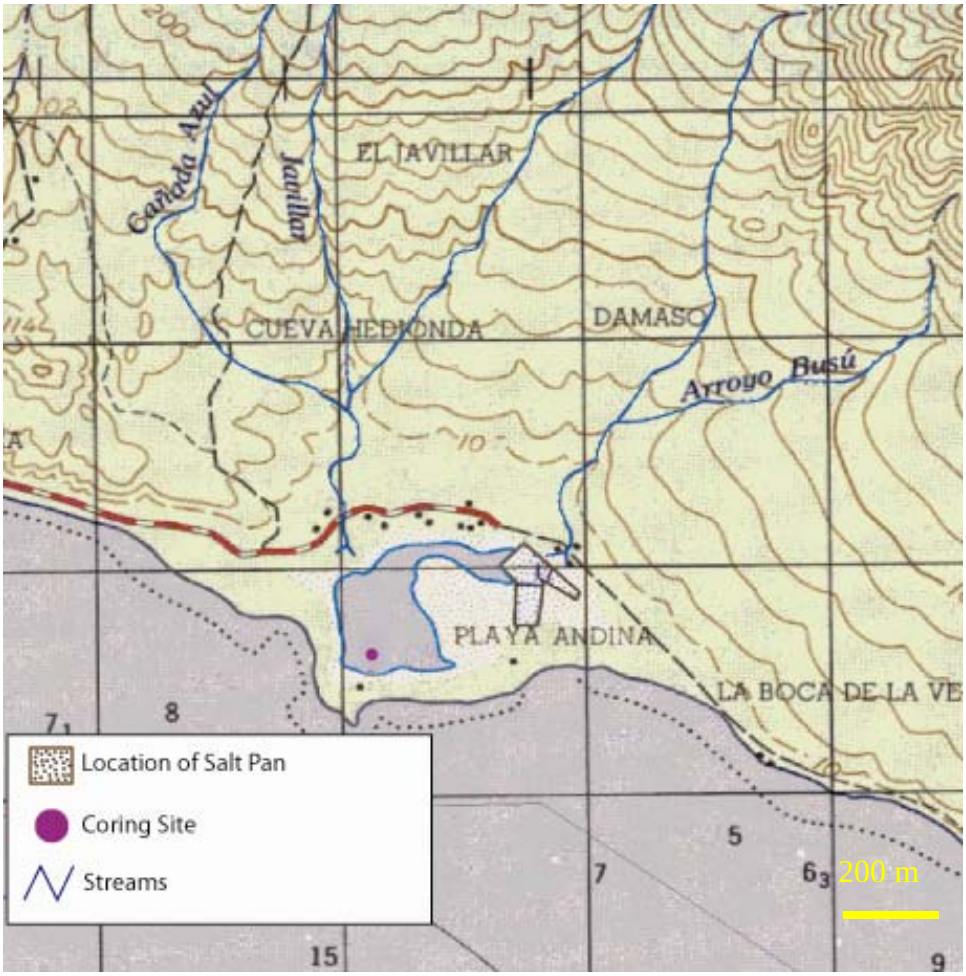

Figure 1.2: A section of the 1:50000 Barahona quadrangle showing L. Alejandro (18.31^{o} N 71.03^{o} W) and surrounding features. Map contour interval is 20 m and each grid square is 1 KM^2