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Cultural identity in landscape architecture, renovation of Managua's lakeside

Julio Alvarez

Florida International University

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE,
RENOVATION OF MANAGUA'S LAKESIDE

A thesis submitted in partial fulfillment of the
requirements for the degree of
MASTER OF LANDSCAPE ARCHITECTURE

by


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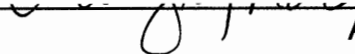
2005

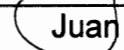
To: Dean Juan Antonio Bueno
School of Architecture

This thesis, written by Julio Alvarez, and entitled Cultural Identity in Landscape Architecture, Renovation of Managua's Lakeside, having been approved in respect to style and intellectual content, is referred to you for judgment.

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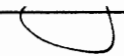

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Date of Defense: November 22, 2005

The thesis of Julio Alvarez is approved.


Dean Juan Antonio Bueno
School of Architecture


Dean Douglas Wartzok
University Graduate School

Florida International University, 2005

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DEDICATION

I dedicate this thesis to my parents Edgard Solís Martínez and Melba Cabrera de Solís, for their support and understanding throughout my academic education.

In memoriam to my father Julio Alvarez Chamorro and to my grandfather Emilio Alvarez Lejarza, for introducing me to the history of Nicaragua.

And to Managua, the beautiful city where I was born.

ACKNOWLEDGMENTS

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I would like to express my gratitude to editor Jill Baskins (Rome) for providing her valuable time and expertise in editing this thesis.

Thanks to all to those whose name have been inadvertently omitted, but without whose help along the way, this thesis would not have been possible.

ABSTRACT OF THE THESIS
CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE,
RENOVATION OF MANAGUA'S LAKESIDE

by

Julio Alvarez

Florida International University, 2005

Miami, Florida

Professor Juan Antonio Bueno, Major Professor

This thesis examines a design approach in landscape architecture in which cultural and historical values are reinterpreted in a contemporary urban environment. The site of this project is located in Managua's lakeside *area*, which was destroyed by hurricane Mitch in 1998. The lakeside area has been an attraction to Managua's residents because of its beautiful views and fresh breezes.

The majority of Nicaragua's population is of indigenous descent; however, Managua's urban environment is predominantly of European influence. The pre-Columbian heritage of Nicaraguans is hidden in their cultural expressions, such as the names of places and religious rituals.

This project provides a new lakeside *area* for Managua in which cultural identity in landscape architecture is represented in the use of the site and in a rescue of Managua's residents' pride in their pre-Columbian heritage. The lakeside renovation was planned using pre-Columbian design methodology and vocabulary to create a functional and environmentally sensitive landscape.

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CHAPTER I

Introduction

Cultural identity in Landscape Architecture is related to a sense of place perceived in the collective memory of residents. This sense of place is influenced by the natural landscape, the historical use of the site and a symbolic vocabulary derived from people's history. Collective remembering is related to cultural values and can take various institutionalized, popular and ritualized forms,¹ which are expressed in a spatial context. This thesis examines a design approach in landscape architecture in which cultural and historical values are reinterpreted in a contemporary urban environment. This research will focus on the old center square of Managua, the capital city of Nicaragua (plate 1), which has been repeatedly damaged by natural catastrophes.

The site of this thesis project is located at Managua's lakeside (plate 2), which was destroyed by hurricane Mitch in 1998. The lakeside has been an attraction to Managua's residents because of its beautiful vistas and fresh breezes. Residents continue to go to the lakeside to taste food and refreshments in several small and improvised restaurants during afternoons and weekends—a new lakeside area development is essential.

Nicaragua's population is 69% mestizo, the majority of them with a high degree of indigenous blood; 14% white; 5% aboriginal; 8% black, and 4% Zambo.² Although Nicaragua's ethnic makeup is mixed, Managua's historic buildings, public squares and parks show mostly European influences, expressed in the neo-Classical and Art Deco styles. The pre-Columbian heritage of Nicaraguans is found in a wide scope of cultural expression, such as many of their

¹ *Urban Planning and Cultural Identity*, p. 10, 3rd paragraph.

² *World Reference Atlas*, p. 215.

words and their accent. It is also found in the name of places, the food and religious rituals.

For example, the most important holiday in Managua is Saint Dominic's procession, where the image of Saint Dominic is placed on a decorated canoe and carried during part of its journey in the back of a truck down the hill through a dusty rural road, probably a former river basin, across the Valley of Managua. Crowds dance throughout the day accompanying Saint Dominic's image on its way, as it is then hand carried to Managua's old central area where the procession ends at a church. After a week of festivities, the image is returned to the hills in a similar procession. This procession is an example of the pre-Columbian cultural identity hidden in Nicaraguan traditions – the root of this practice can be traced back in time to an indigenous festivity, when crowds would bring down from the hills the idol of Xolotl (Aztec



fig 1. Crowds carry the tiny image while dancing.³



fig 2. The *cacique mayor* or main chief.⁴

deity of corn crops, from which the name of Lake Xolotlán is derived) in a canoe, through an old river bed, which is now dry, until they reached the lake, where they threw flowers in a ceremonial path.








The purpose of this research is to explore how landscape design can incorporate symbolical elements that evoke cultural legacy. The project will reinterpret Managua's cultural

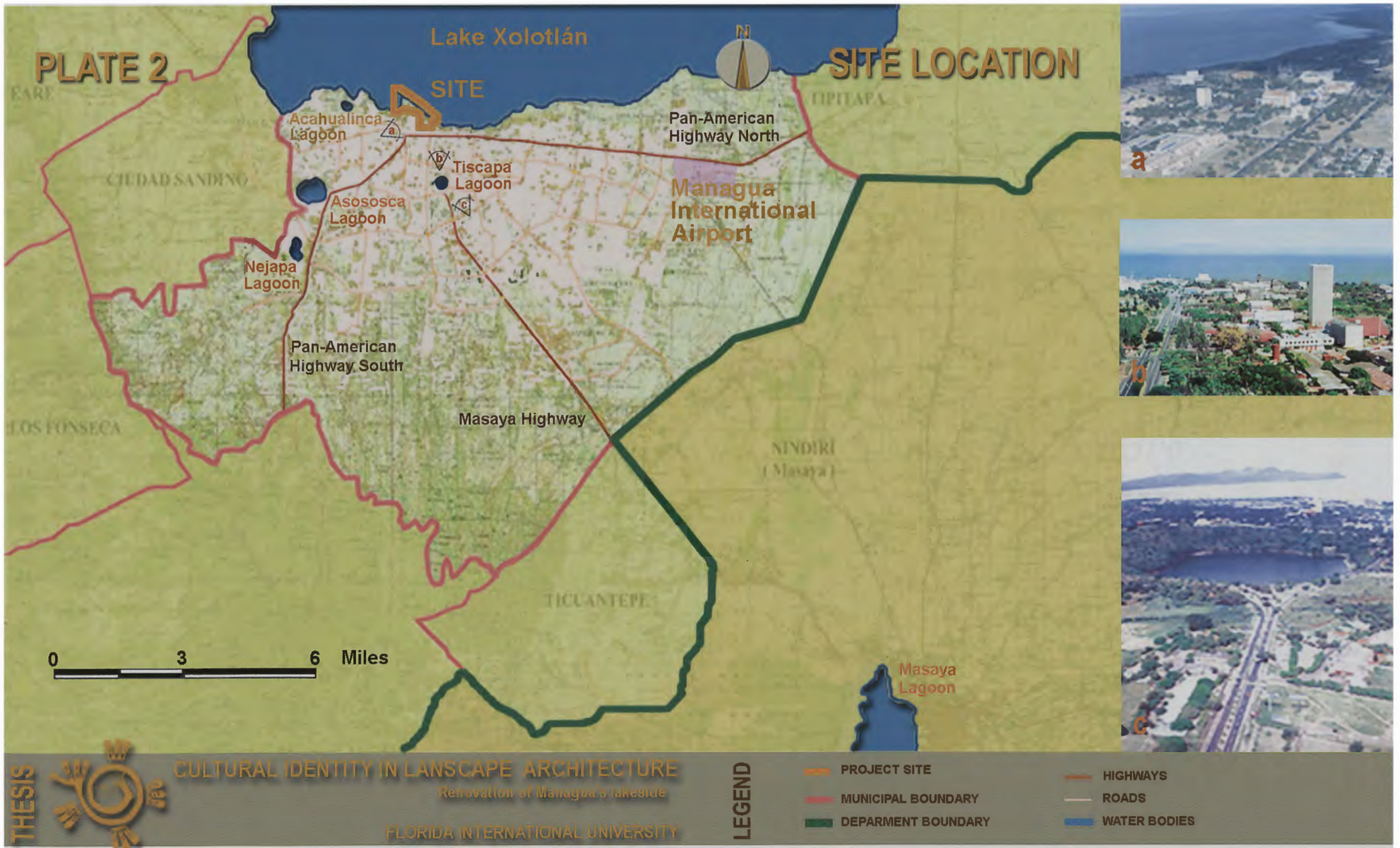
³ Picture taken from <http://www.guideofnicaragua.com/Junio/SantoDomingo/SantoDomingo.html>.

⁴ *ibid*



LEGEND

-  City
-  International boundary
-  Department boundary
-  Municipal boundary
-  Airport
-  Road
-  River



identity in a contemporary design that is environmentally sensitive, and will address local administrative plans for future development. The main goal is to provide a new lakeside for Managua in which cultural identity in landscape architecture is represented in the use of the site, while reclaiming the pride of Managua's citizens in their pre-Columbian heritage.

CHAPTER II

SITE PHYSICAL CONTEXT

Managua is located in the south basin of Lake Xolotlán between latitudes 12° 43' and 12° 7' North and between longitudes 86° 16' and 86° 40' West (plate 1). Lake Xolotlán's annual average water level is 38.70 m above the sea level, has a surface of 1025 km² and a maximum depth of 24 m.⁵ Its water is contaminated mainly by the city's sewage drainage, but a project for its rescue started in August 2001⁶ and it is planned to last ten years (Appendix I).⁷

Managua's minimum rise over the sea level is 42 meter and its maximum is 222 meters at the vicinity of the adjacent hills.⁸

The Pacific region of Nicaragua where Managua is located has numerous volcanoes, with the huge Momotombo volcano being the major feature in Managua's surrounding landscape. Managua has also five lagoons of volcanic origin, and the volcanic Chiltepe peninsula is the main landscape feature visible from the site. The soil in the southern basin of Lake Xolotlán is

composed of compacted volcanic ash.⁹ Managua sits on a seismic zone and is crossed by numerous quaternary faults, which had caused periodic earthquakes (plate 5, Fig e).

The Nicaraguan Instituto Nacional Forestal¹⁰ classified the natural vegetation of Lake Xolotlán's basin under the Ecological Region I (Pacific region). The Ecological Region I is mainly that of a deciduous forest, a characteristic of dry tropical zones. It is presently formed of scattered thickets and trees, which are remnants of previous forests. A low annual average rainfall of between 1000 mm and 1250 mm generates this type of vegetation, as well as annual temperatures that range between 26 and 28 degrees centigrade (plate 3, figs b, c and d). The annual relative humidity rate is 74%. Inside Ecological Region I, we also found sub-deciduous forests of tropical semi-moist zones. Managua is located in a transitional area between the typical deciduous forest and a sub-deciduous forest of tropical semi-moist zones. In the lower areas of Managua's lakeside, where water is almost present at soil level, the semi-moist type of vegetation is replaced by that of a tropical moist forest. This wetland type of vegetation is actually found in the lakeside at the eastern outskirts of Managua and on the northwest coast of the Chiltepe peninsula (Appendix II). Only in the highest part of the Chiltepe peninsula where the climate is cooler and the humidity is moderate, does one find an evergreen forest forming the vegetation. The annual average wind speed in Managua's downtown is 1.25 m/second.

⁵ <http://www.ineter.gob.ni/Direcciones/Recursos%20Hidricos/HIDROGRAFIA%20WEB/Lagunas/Lago%20Managua.htm>, p. 2.

⁶ *Saneamiento del Lago de Managua o Lago Xolotlán*, p.1

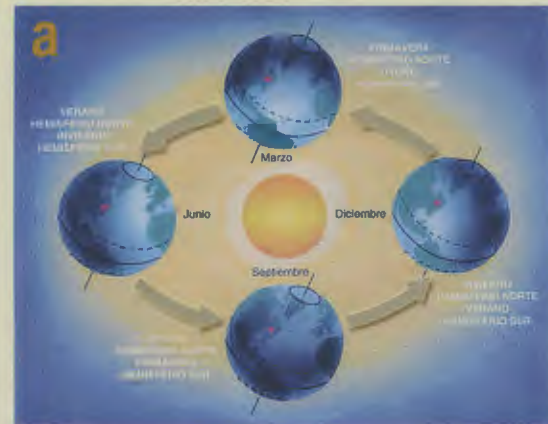
⁷ http://www.ineter.gob.ni/proyectos/proyectos_2005/monitoreo-lago.html.

⁸ *Flora arborecente de la ciudad de Managua y sus alrededores*, p.2

⁹ *Biogeografía de Nicaragua*, p. 477

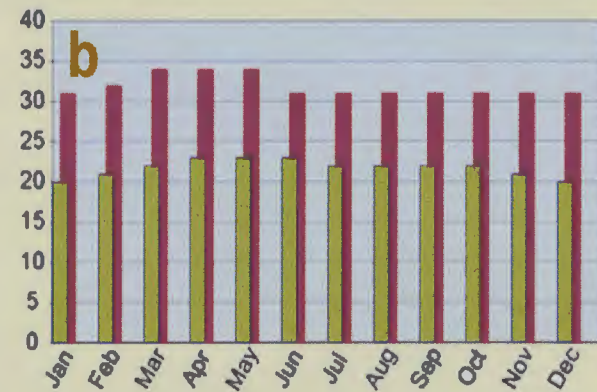
¹⁰ *Biogeografía de Nicaragua*, p. 71.

PLATE 3



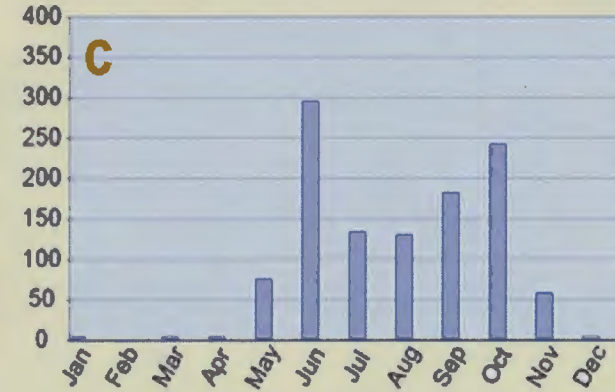
Climatology

Centigrades



Temperature

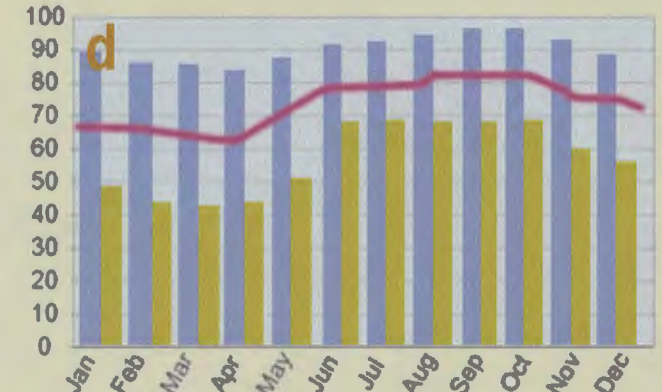
Centimetres



Rainfall

TECHNICAL DATA

Percentage

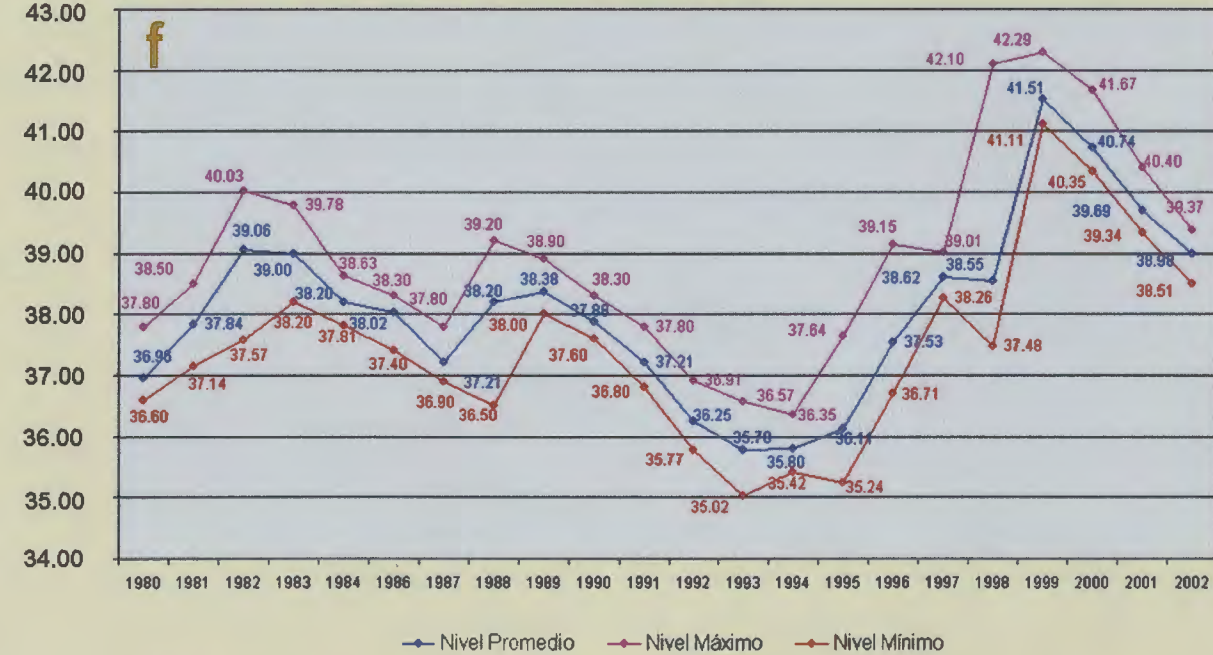


Relative Humidity



Managua's Quaternary Faults

Lago de Managua Niveles Históricos 1980-2002



Lake Xolotlán's Historic Water Levels 1980-2002

THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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SOURCES

- a. Nicaragua y el mundo, atlas básico ilustrado.
- b. <http://hotelsearch.com/countryinfo-NI-cl.html>
- c. <http://hotelsearch.com/countryinfo-NI-cl.html>

- d. <http://free-weather.com>
- e. Wilfried Strauch INETER, June 2000.
- f. INETER.

PLATE 4

VEGETATION



ECOSISTEMAS FORESTALES



a Ecological Regions of Nicaragua



c
Flor de Avispa
(*Hibiscus sp*)

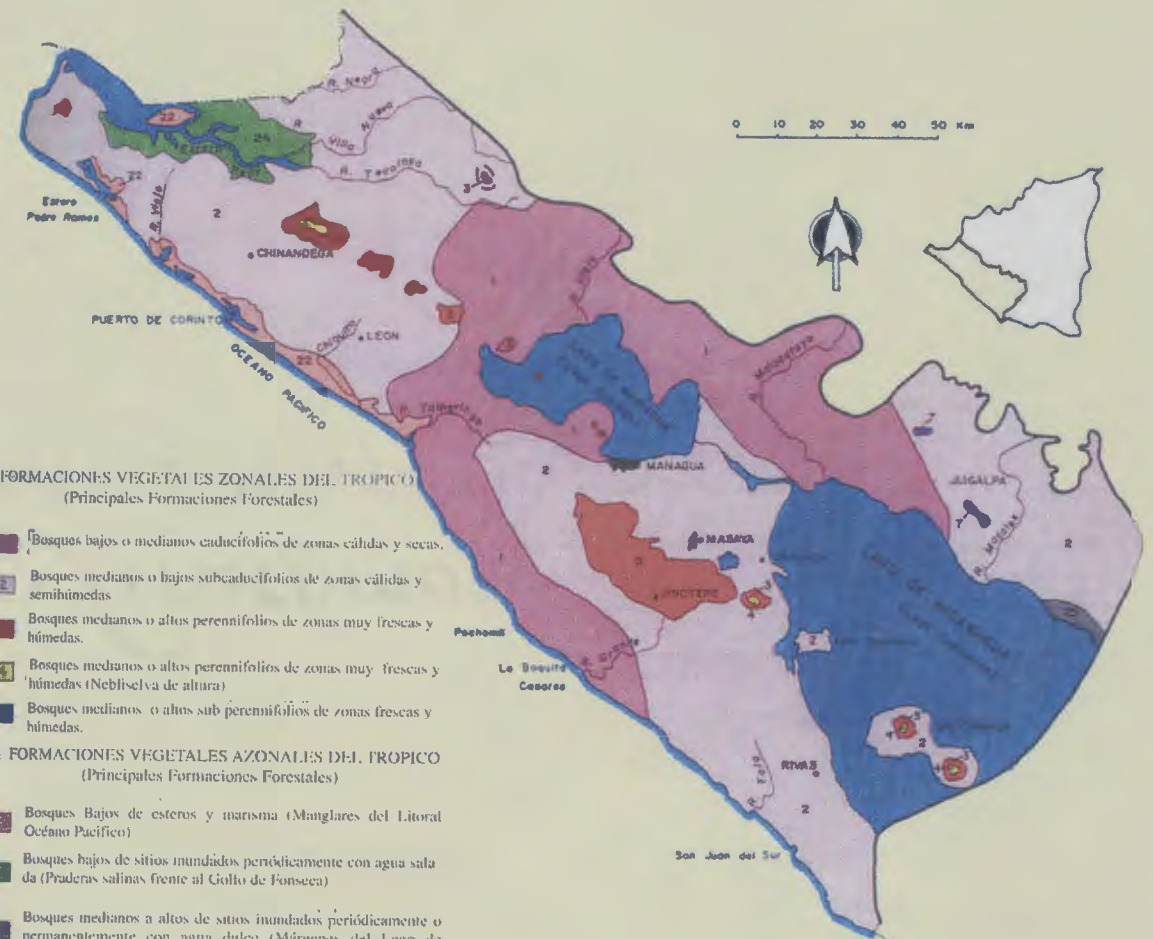


d
Flor de Sacuanjoche
Nicaragua's National Flower
(*Plumeria rubra, var alba*)



b Managua - El Muelle. c.1914

ZONIFICACION DE LA VEGETACION DE NICARAGUA Región Ecológica I (Del Pacifico)



- A. FORMACIONES VEGETALES ZONALES DEL TROPICO**
(Principales Formaciones Forestales)
- Bosques bajos o medianos caducifolios de zonas cálidas y secas.
 - Bosques medianos o bajos subcaducifolios de zonas cálidas y semihúmedas.
 - Bosques medianos o altos perennifolios de zonas muy frescas y húmedas.
 - Bosques medianos o altos perennifolios de zonas muy frescas y húmedas (Nebiselva de altura)
 - Bosques medianos o altos sub perennifolios de zonas frescas y húmedas.
- A FORMACIONES VEGETALES AZONALES DEL TROPICO**
(Principales Formaciones Forestales)
- Bosques Bajos de esteros y marisma (Manglares del Litoral Océano Pacífico)
 - Bosques bajos de sitios inundados periódicamente con agua salada (Praderas salinas frente al Golfo de Fonseca)
 - Bosques medianos a altos de sitios inundados periódicamente o permanentemente con agua dulce (Márgenes del Lago de Nicaragua)

g Ecological Region I

Preparado por: Dr. Juan B. Salas Estrada
Elaborado por: Martha Laynez Cáceres

THESIS **CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE**
Renovation of Managua's lakeside
Presented by Julio Alvarez **FLORIDA INTERNATIONAL UNIVERSITY**

LEGEND

- a. *Biogeografía de Nicaragua*, p. 68.
- b. Picture by G. Alaniz. Courtesy Luis Flores
- c. <http://www.oirsa.com>
- d. <http://www.pinoleros.com>
- e. <http://www.hubertzumwaid.ch/panamericana/z-reiseberichte/Nicaragua/images/nic-lago>
- f. <http://www.manfut.org/managua/managua.html>
- g. *Biogeografía de Nicaragua*, p. 71.

CHAPTER III

SITE HISTORICAL CONTEXT

Managua's Pre-Columbian Context

The oldest evidence of the presence of man found in Managua is the Acahualinca steps, which date from approximately 8,000 years ago.¹¹ They were found on Managua's west side, close



fig 3. Acahualinca steps. Partial view.¹²



fig 4. Acahualinca steps. c. 6,000 BC.¹³

to the lakeside, ten feet below water level in an inferior layer of quarry stone. This depth is divided into five feet of soil and five feet of quarry stone.¹⁴ There are also animal footprints, such as deer, boar and bison. According to Spanish archeologist Joaquín Matilló Vila, these primitive settlers were desperately running toward the lake during the eruption of Masaya volcano.¹⁵ They stepped in fresh volcanic ash that was then covered and preserved by more layers of ashes during the catastrophe.

¹¹ *Apuntes sobre la historia de Managua*, p. 25.

¹² Picture taken from <http://www.guideofnicaragua.com/Octubre/Acahualinca.html>.

¹³ Picture taken from <http://www.angel.org.ni/2002-49/buhosabio2.html>.

¹⁴ *Historia de Nicaragua*, p. 7

¹⁵ *Acahualinca en el panorama arqueológico de Nicaragua*

Scholars can identify at least three main migrations from the Valley of México to the Nicaraguan lakes basin. Nicaragua was a path of commercial and cultural interchange among different pre-Columbian people, from the north of the American continent and from the south as well. Due to the great abundance of prey and fresh water offered by the lakes basins, this area was also an object of dispute and wars among ancient inhabitants.¹⁶

The Olmecs invaded Cholula around the VIII century.¹⁷ Cholula inhabitants or Chololtecas were Náhuatl¹⁸ speaking peoples who were influenced by Teotihuacán and El Tajín cultures. These people were enslaved by the Olmecs and were forced to pay high taxes to their conquerors. The Chololtecas decided to migrate to the south in order to escape from Olmec domination. They settled mainly in the Pacific coast of Central America. In Nicaragua, they occupied all the area between the lakes and the Pacific Ocean after pushing the Chibcha tribes to the Atlantic Coast. Another important tribe, the Chontales, which means "foreigners" inhabited the east side of Lake Cocibolca (fig 5).

By AD 1000, the city of Tula was one of the most influential urban centers in Central México.¹⁹ It fell during the XII century, due to conflicts between ruling powers and to Chichimeca invasions. After the destruction of Tula, several Tula-Toltec groups settled in the Valley of México, giving birth to the Aztecs, and other groups migrated south.²⁰ One of these groups, the Nicaraos went to what is today Nicaragua and, after fighting with the Chorotegas

¹⁶ *La estuaria de la Isla Zapatera*, p. 19

¹⁷ *Introducción al habla Nicaragüense*, p. 131

¹⁸ Náhuatl: Language spoken by the inhabitants of the Anahuac or Valley of México.

¹⁹ *Ancient Tollan, Tula and the Toltec Heartland*, p. XVI

²⁰ *Prehistoric Mesoamerica*, p. 241

or Cholutecas, the invaders settled in the area between Lake Cocibolca and the Pacific Ocean and on the major islands of this lake, Ometepe and Zapatera. In the XV century, a four-year drought affected the Valley of México. Spanish friar Toribio de Benavente, who visited



fig 5. Pre-Columbian Nicaragua.²¹

Nicaragua in the XVI century, relates that because of this drought many people of Aztec stock migrated to the south in canoes along the Pacific coast until they reached the area that is now Nicaragua. They settled in the area of today's modern city of León. Benavente mentions in his testimony that these people's ancestors came from *Chicomóztoc* (meaning "Seven Caves" in Náhuatl), the Aztec place of mythical origin. Some scholars believe that this ancient myth is related to the Toltec culture.^{22 23}

²¹ Map mainly based in La religión de los Nicaraos, primera parte, *El pez y la serpiente*, revista de cultura, p. 13

²² *Archeology* magazine, November/December 2005, Volume 58, Number 6, p. 40

²³ *Mesoamerican Architecture as a Cultural Symbol*, p. 84

The Nicaraos, who migrated to Nicaragua in the XII century, became the most powerful tribe in the area by the time the Spaniards arrived. Their chief was called Nicaragua: according to philologist Carlos Mántica, Nicaragua or Nic-anahuac means "here is the Anahuac."²⁴ Most Probably, as time passed they mixed with the Chorotegas, who spoke a very similar language. These Náhuatl speaking people left an impressive legacy of monumental statues, mainly in the Island of Zapatera (fig. 6)). Art historian George Kubler said that these statues have an elaborate articulation and a powerful expressive character. He also pointed out its "mature technical skill of metropolitan demand" and paralleled them to the famous Toltec Atlantean statues from Tula (plate 17)²⁵ Zapatera's statues were colorful, as were Aztec and Maya pyramids and sculptures. Archelogist Rigoberto Navarro recently found in Zapatera's statues, evidence of color pigments, such as orange-red pigments derived from iron oxide, and yellow, violet, pink and black pigments derived from crystals.²⁶ Ancient Nicaraguans also left important hieroglyphics that relates them to their Toltec past, such as the ones in El Muerto Island, which belongs to the Zapatera archipelago.

Nicaraguan aboriginal ceramic clay vessels and artifacts are of high quality. Historian Ricardo Páiz Castillo mentioned that their colors, such as red, ochre, black and white were derived from plants and minerals.²⁷ Its shapes and decorations are representative of Mesoamerica's most important myths and imagery.

²⁴ *Introducción al habla nicaragüense*. p. 134

²⁵ *The Art and Architecture of Ancient America*, p.338

²⁶ *Los dioses vencidos de Zapatera, mitos y realidades*, p. 49-51

²⁷ *Historia de Nicaragua*, p. 18



fig 6. Zapatera's monumental statues



fig 7. Jaguar warrior, ceramic vessel.²⁸

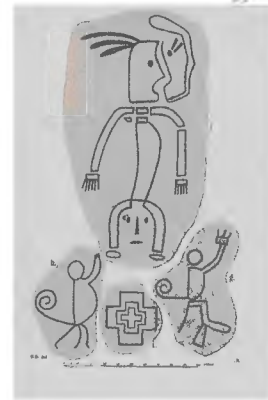


fig 8. Hieroglyphics.²⁹

Site Historical Architecture and Landscape Context

In 1524, Spanish conqueror Francisco Hernández de Córdoba founded the city of León at the northwestern side of Lake Xolotlán, and the city of Granada at the north side of Lake Cocibolca. The rivalry over which city was to become the capital city resulted in a determinant factor for the future importance of Managua.

Spanish historian Diego Fernández de Oviedo visited the aboriginal settlement of Managua in 1527. He described Managua as a long and narrow settlement of huts and orchards aligned with the lakeside, with an extension of about three Spanish leagues.³⁰ Spanish conquerors usually built their central squares in the same areas where the local tribes had their most significant "squares." In this case the square happened to be in the area called Manahuac, which in Náhuatl means "place where is a great extension of water," according to several scholars.³¹ In pre-Columbian times, Manahuac was the area of today's central square and

²⁸ Pictures taken from <http://dept.dawsoncollege.qc.ca/norso/kemarie/art3.htm>.

²⁹ Rock carvings from El Muerto Island, *Nicaraguan Antiquities*, plate 38.

³⁰ *Historia General y Natural de las Indias*, Volume 4. (One Spanish league equals 2.6 miles)

³¹ *Apuntes sobre la historia de Managua*, p. 27

lakeside. This area was affected by the Spanish policy of *congregaciones*, in which aborigines, scattered through the vicinity, were forced to concentrate into larger settlements where they could be readily controlled and Christianized. The name Managua was later extended to the overall neighboring settlements as they grew and joined together to form a town. It was not until 1720 that this town started to obtain importance when the Spaniards established a military base, due to its strategic location, almost equidistant between León and Granada. Managua's adjacency to the lake was also an advantage for commercial water transportation. In 1751, Agustín Morel de Santacruz, bishop of León, informed the king of Spain about his visit to the town of Managua. In his letter, the bishop described a typical Spanish colonial town with a main church and a *cabildo* or administrative building in its central square. In 1819 king Ferdinand VII of Spain conceded to the town of Managua the urban title of Leal Villa de Managua.³² This gave to Managua the right to have its own city hall and some tax exemptions.

In 1821 Central America obtained its independence from Spain. Managua served as kind of refuge to people who were escaping the political tensions that grew between León and Granada. Since 1823, these two cities were in continuous wars disputing the right to be the Capital of Nicaragua. During the first half of the XIX century (c. 1840), coffee crops were introduced in Managua's neighboring hills.³³ These crops created a need for labor and for increasing the infrastructure of the town. During the XIX century coffee crops became increasingly important in Nicaragua due to international demand. In 1846, the Nicaraguan congress signed a decree raising the rank of Managua from a *Villa* to a *City*. In 1849,

³² *Apuntes sobre la historia de Managua*

³³ *Desarrollo urbano e historia urbanística de Managua*. p. 2

George E. Squier, an archeologist and diplomat, was sent to Central America by the U.S. government in a diplomatic mission. He published a book on Nicaraguan archeology, culture and landscape. In his book he depicted a view of Managua's lakeside in which the undulating profile of the Chiltepe peninsula is clearly visible from an open square flanked by huts with wooden fences and colonial houses made probably of *taquezal* (timber frame wall system filled with layers of small stones and mud) and clay roofs. Large trees, palms and thickets form the vegetation, while several canoes sail along the shore. In the right forefront of the picture a low, thick wall seems to enclose a landscaped area with trees, palms and shrubs (fig 9).³⁴



fig. 9 Lakeside drawing by Squier, c. 1849.



fig. 10 Market of Managua. Luis H. Flores, c. 1930.

In order to end the wars between León and Granada, in 1852 the Nicaraguan authorities declared Managua as Capital of the Republic, and they called it City of the Peace

In 1852, a two-story colonial house with arcades served as presidential offices on the old central square. In 1860, the first dock of Managua was constructed.³⁵ In 1881 a new steam ship company started a transportation service between Port Momotombo (near the city of León) and Managua dock (fig 21). During the same year the Market of Managua was

³⁴ *Nicaragua, sus gentes y paisajes*, p. 153

³⁵ *Reconstrucción histórica y gráfica de Managua anterior al terremoto de 1972*. p. 10.

constructed with influences from the neo-Classical style.³⁶ The first Nicaraguan neo-Classical buildings kept the colonial types of plan layout and construction materials. The plan layout, which used to be square or rectangular, had exterior transitional arcaded corridors for sidewalk shade, and interior arcaded courtyards surrounded by corridors and rooms. Construction materials were appropriated for hot, tropical climate. Thick, thermal walls were made out of adobe, *taquezal* or clay brick; columns and beams were made out of wood; and roofs were covered with Spanish clay tile. The neo-Classical style influenced architectural ornamentation on the façade, such as pediment, cornices, striated pilasters, balustrades, arches with keystones and moldings, and also as decorative isolated elements (fig 10).

In 1886, train transportation serviced the tract between Managua and Granada, with a stop in the city of Masaya. In 1893, José Santos Zelaya became president of Nicaragua. The new president was educated in Paris, where he became familiar with the classical architecture of the French Enlightenment. Zelaya built a new National Palace in the French neo-Classical style, with Mansard roofs (fig 11).

The new National Palace and the first cathedral formed a central plaza. In 1898, President Zelaya inaugurated the General Estrada Park (generally called Central Park) next to this plaza. The design of this park was commissioned to the French designer Louis Lairac. The park site was two blocks wide from north to south, with carefully planned walkways with almond and malinche trees for shade. The park was designed with a wooden gazebo in the center of the main walkways, displaced in a north to south axis. This center also served as the point of tangent of several arches, which created secondary walkways. Some walkways were flanked with magenta and violet bougainvilleas, which provided shaded paths. The gazebo

³⁶ *Construcciones Municipales de Nicaragua en los Periodos Neoclásico y Moderno*. p. 6.

served also as the bandstand for the official every Thursday and Sunday evening for the enjoyment of citizens. They played waltzes by Johannes Strauss and Nicaraguan composer José de la Cruz Mena. Iron handrails with classic vessels motifs on a low wall base were used to protect areas of decorative plants. The main walkways were flanked by a series of wooden benches. One side of the park boasted a two-story pavilion in the neo-Classical style with a balustrade over the horizontal roof, and large rectangular windows with balconies.

Unfortunately, fire destroyed this romantic pavilion in the 1920s. A wooden, two-storied Swiss-style pavilion was built on the west side of the park, in front of the cathedral. This building had a café, which served refreshments, beer, fine liquors and ice cream to visitors. It had a central room and a corridor facing the lake with tables and chairs. The park was surrounded by iron fence with eight iron gates, which served as pedestrian access to the park. Four of these gates were located at the center of each side of the fence, and the other four at the corners. This new construction was located in the area of the old central square. Between the General Estrada Park and the lakeside, Zelaya built the Obelisk Park (today's Rubén Darío Park) to commemorate the turn-of-the-century. The government promoted a plan for planting trees in all the Managua's neighborhoods. During Christmas of 1902, President Zelaya inaugurated the new electric public lighting service.³⁷

The neo-Classical style continued to be dominant in Managua's institutional construction, because of its relationship with the democratic ideals from ancient Greece and republican Rome. In 1927, during the presidency of Juan Bautista Sacasa the new City Hall of Managua was built with modern materials, such as concrete and iron (fig 12). Its main portico was constructed with the façade of a Greek temple (most likely inspired by the Parthenon) with

³⁷ Breve historia del Parque Central de Managua

pediment, friezes and Doric columns. It was set over a stepped platform flanked by thick, low walls. Several years later, these thick low walls served as pedestals for two neo-Classical female marble figures. The lateral porticoes were designed in the manner of a Roman temple front, with smooth Tuscan style columns. Between porticoes a crisscross handrail runs over the platform. The original horizontal skyline of this building was broken when a second



fig. 11 Old National Palace, c. 1898.



fig. 12 City hall building or Palacio del Ayuntamiento .

story was added over the main structure, leaving the porticoes as projecting pavilions. The new story columns were thinner than the lower ones and the roof had a parapet.

In 1931 a strong earthquake devastated Managua. The National Palace and the Central Market were destroyed, though the Municipal Palace survived. In 1939, during the presidency of General Somoza García, the Central Park was renovated. Architect Víctor Savater and sculptor Ernesto Brow³⁸ were commissioned to design a new music pavilion for the park, which was called the Temple of the Music (plate 8, fig a) The new design was influenced by the Art Deco style. It had the shape of a drum with nine robust and protruded main columns from floor to top holding a thick circular beam. Each face of the thick beam, between columns displays a symbolic sculpted panel in high relief representing the most important historical events, such

³⁸ Proyecto, rescate de los monumentos públicos de la ciudad de Managua.

as episodes of indigenous resistance to the Spanish conquest; an important battle in which English pirates were defeated in the XVII century; the declaration of Central America independence from Spain in 1821; the main battle in which Californian filibuster William Walker was defeated by the Nicaraguan army in 1856, and depictions of agricultural machinery symbolizing the country's economic development. On top of the Art Deco pavilion roof was placed a sculpture of the goddess of music. The pavilion was surrounded by artistic water fountains and lighted bollards in the form of classic jars. Four female marble statues representing: Progress, Commerce, Industry and The Republic were placed at the pavilion four corners. Two of those statues were later placed at the City Hall on the low wall pedestals, flanking the main portico staircase.

The city was reconstructed in the same location after the 1931 earthquake. The imported metal structure of the new neo-Classical cathedral, which was under construction during the tragedy, survived the seismic event. The new National Palace was constructed in neo-Palladian style (plate 8, fig i). A horse racing track was constructed during the late 1930s in the area where the Rubén Darío theatre is found (plate 5). A new cabaret named Copacabana and the Casino Olímpico were constructed to the east of the racing track. Their structure was protruding over the lake (plate 5, fig e). The International style became popular in private buildings and residences. The modern Rubén Darío theatre was built in the late 1960's and became an important reference and point of attraction to the lakeside area (plate 7, fig f). In 1972, yet another earthquake devastated Managua. This time Managua was a much larger city with a population of 500,000 inhabitants. Even though new institutional and commercial buildings were constructed with concrete and iron, most of the city residences and older buildings were constructed of *taqueza*. Historian Emilio Alvarez Motalván defines the

use of this construction technique, which was commonly used before the 1972 earthquake, as "the culture of *taqueza*".³⁹ Unfortunately, this type of construction was not seismic resistant. Almost all the downtown area surrounding the central square was destroyed and not reconstructed. Since 1972, the city started growing in the periphery of its old center. The central square was shifted to different areas of the city. Poor people moved to the destroyed area where the wealthier used to live. The neo-Classical cathedral was severely damaged. Managua did not have a cathedral until the early 1990s, when President Violeta Chamorro donated land in the outskirts of the city to the Catholic Church, for its construction. Mexican architect Ricardo Legorreta designed this new cathedral with Islamic influence, and the Cardinal-Archbishop of Managua Miguel Obando inaugurated it in 1992. Some efforts have been done during the last ten years to revive the old city center. In 1992, a new lakeside area was constructed, that had a series of platforms for walks, refreshments kiosks, benches and trees (plate 4). The neo-Palladian National Palace was renovated and turned into a museum. In 1998, hurricane Mitch raised the water level of Lake Xolotlán by twelve feet (plate 3, fig f), and the lakeside was again destroyed. In 2000, President Arnoldo Alemán, who had the intention of reviving the old center, constructed the new presidential house in the same lot where the Club Social de Managua, a neo-classical building, used to be before the last earthquake (plate 5, fig a). Architect Alejandro Cardenal designed the new Presidential house in post-Modern style with neo-Classical influence, with the purpose of resembling the neo-Palladian National Palace (plate 7, fig e). Architect Nelson Brown pointed out the fact that unfortunately once again, the view to the lake was blocked from the central square. A large

³⁹ Emilio Alvarez Motalván, Honorary President of the Academia de Geografía e Historia de Nicaragua, interview by researcher, 24 December 2005.

PLATE 5

SITE HISTORY



0 500 1000 2000 Feet

Background aerial c. 1948

Lake Xolotlán

Site



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

a. View to Rubén Darío Park and Lakeside
Picture by Gurdíán & Co. Ltd.
Nicaragua Images of Yesterday and Today

c. Bar at beer factory *Monografía sobre Managua*
d. Courtesy of Luis H. Flores
Background aerial *Nicaragua an Historical Atlas*

PLATE 6

HISTORICAL LAKESIDE Before Hurricane Mitch (1998)

0 250 500 1000 Feet

Lake Xolotlán



THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

- a. East view
- b. Children's train
- c. improvised stroller
- d. Simón Bolívar monument and platform
- e. Lakeside East area
- f. Lakeside kiosks area
- g. Lakeside East round walkway
- h. Lakeside East area after Hurricane Mitch

PLATE 7

OLD CENTRAL SQUARE INVENTORY



Lake Xolotlán

0 250 500 1000 Feet



THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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LEGEND

a. Rubén Darío monument
b. Managua's century obelisk
c. Central Park Sandinista mausoleums

d. Frixione Park
e. Central Park pavilion and
f. Managua's century obelisk
g. New Presidential House

h. Old cathedral
i. Old National Palace or Palace of Culture

musical fountain filled out the open space of this historical square. A huge piazza called Plaza de la Fe Juan Pablo II was constructed to the northeast of the old central square to commemorate the pope's visit. In January 2005, during the presidency of Enrique Bolaños, the mayor of Managua inaugurated an acoustic shell designed by American architect Glenn Small. This sculptural acoustic shell was planned to serve as a stage for Plaza de la Fe during concerts or political meetings (plate 8, fig c). The Plaza de la Fe, which is in front of the lakeside area, is an important landscape element in this thesis proposal (plate 8, fig d).

CHAPTER IV

Site Analysis

The site is located within the boundaries of the *Reglamento del Area Central de Managua* or the Central Area of Managua Master Plan (CAMMP), as defined by the City Hall regulations booklet published in April 1995⁴⁰. In the Present Land Use and Zoning plan (plate 9) and the Future Land Use and Zoning plan (fig 13), which is part of CAMMP, most of the site area has been destined for parks and recreational areas. In the Quaternary Faults map (plate 3, fig e) and in the Environmental zoning plan (fig 14) from CAMMP, the seismic risk zones of the site are charted. The environmental Zoning plan also shows a historical flood risk line at the lakeside. The lakeside infrastructure was destroyed by hurricane Mitch in 1998, as previously mentioned. Presently, a series of improvised shelters are standing over the ruins, where vendors offer beverage and food service to tourists and residents. There are no benches



fig. 13 Future Land Use and Zoning plan, CAMMP.⁴¹



fig. 14 Environmental Zoning plan, CAMMP.⁴²

where visitors can sit and enjoy the views of the lake. The green, undulating crest of the Chiltepe peninsula, like a mythical Aztec serpent mountain rising from the waters, continues to be the most attractive landscape feature visible from the lakeside. There are no places for social communication apart from the seats offered by the commercial kiosks to their clients. There are no safe walkways for strolling, nor are there shade trees in the area. The coast is lined by rubble from the destroyed infrastructure and polluted by garbage left by pedestrians. The best part of the site is the new Plaza de la Fe and its sculptural acoustic shell, but shade trees and pedestrian corridors are lacking, as is a relationship with the surrounding landscape and lakeside. The high platform behind the acoustic shell is out of place: it is at an odd, angled relationship with respect to the Plaza de la Fe and it does not have meaningful architectural character. Several views of existing conditions are displayed in Site Inventory (plate 8). A list of opportunities and constraints (plate 10) is also part of this site analysis. The old central

⁴¹ *Reglamento del área central de Managua*, p. 69.

⁴² *Ibid*, p. 75.

⁴⁰ *Reglamento del área central de Managua*, p 65, 69, 75 and 77.

PLATE 8

SITE INVENTORY

Lake Xolotlán



0 250 500 1000 Feet



a



e



b



f



c



g



d



h

THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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LEGEND

- a. Lakeside West coast
- b. Play and Park
- c. Acoustic shell and platform
- d. Plaza de la Fe
- e. Improvised shelters
- f. Lakeside East coast
- g. Simón Bolívar monument
- h. Juan Pablo II obelisk at Plaza de la Fe



PRESENT LAND USE & ZONING

LEGEND

- RESIDENTIAL
- COMMERCIAL
- INSTITUTIONAL
- PARKS AND GREEN SPACES
- NATURAL RESERVE
- OPEN SPACE OR EARTHQUAKE RUINS
- LAKE OR LAGOON
- PROJECT SITE
- CENTRAL AREA OF MANAGUA
(AS DEFINED BY MANAGUA'S CITY HALL)



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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PLATE 10

Lake Xolotlán

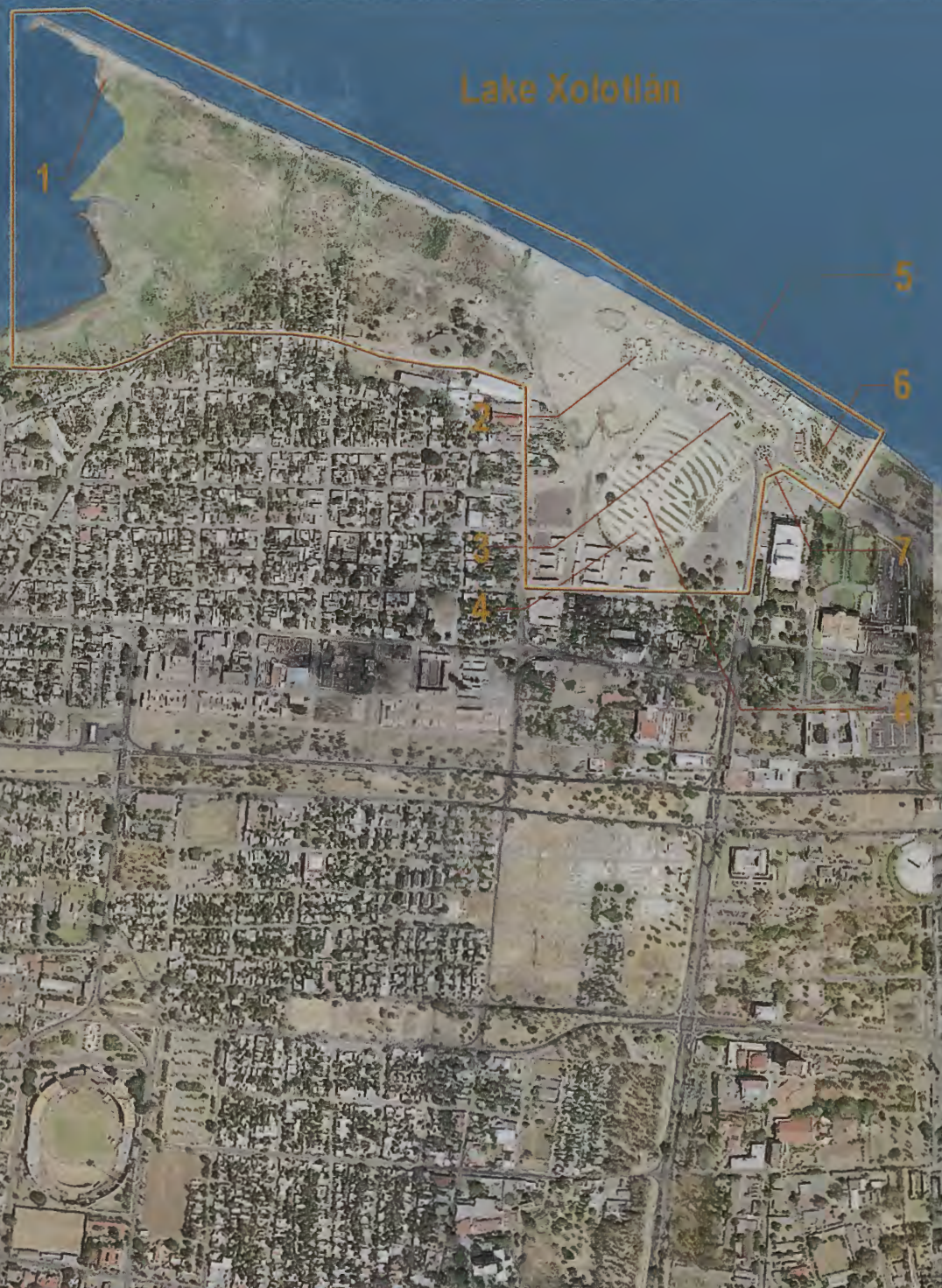


OPPORTUNITIES

- To create green areas for relaxation and social communication
- To provide areas for enjoyment of views
- To restore shoreline vegetation for protection and ecological improvement
- To provide permanent food and beverage amenities
- To plant canopy trees for shade
- To provide lighting hierarchy
- To improve pedestrian connectivity from site to Plaza Juan Pablo II and to old central square

CONSTRAINTS

- Absence of visual and tactile stimuli
- Poor temporary food and beverage shelters
- Poor pedestrian corridors
- Natural vegetation is disturbed in shoreline
- Lack of canopy trees for shade
- Site area is subject to seismic events and occasional floods
- Lack of parking spaces
- Lack of urban furniture



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

- | | | |
|--------------------------------|------------------------|--|
| 1. Lakeside West coast | 4. Plaza de la Fe | 7. Simón Bolívar monument |
| 2. Play and Park | 5. Main lakeside | 8. Juan Pablo II obelisk at Plaza de la Fe |
| 3. Acoustic shell and platform | 6. Lakeside East coast | |

square is the most important urban landmark close to the site, attracting tourists and residents to the area. An inventory of its main buildings and parks is displayed in plate 7.

CHAPTER V

Design Concept

This thesis proposes a new design for Managua's lakeside inspired in the citizen's pre-Columbian heritage, which is hidden in their cultural identity expressions. The design will appeal to the collective memory of residents by providing amenities to allow for the enjoyment of the lake's views, such as the mythical serpentine profile of the Chiltepe peninsula. A lakeside urban area is provided with amenities for the recreational use of the site: areas of native vegetation patches will work as stepping-stones creating transitions to the lakeside native vegetation restoration area, which will combine to enhance the environmentally sensitive character of the landscape.

Lakeside Urban Area

Architect Antonio Prado Cobos called Circular Design Methodology (CDM) the ancient method applied by the Maya, Aztec and Inca in their design process. Prado Cobos stated in his research that CDM worked through the use of center points, circumferences, concentric circles and arches in a harmonic and hierarchical relationship as the basic matrix for the tracing of figures or for the hidden geometry that guides the plastic composition.⁴³ Pre-Columbians used a straight and/or a circular main axis to articulate their design (plate 11, fig e). In many Nicaraguan aboriginal hieroglyphics, sculpture and ceramic vessels the

⁴³ *El creador Maya*, p. 172-199

researcher found evidence of the application of the CDM (figs 15 and 16). See plate 11, fig d. The aesthetic aspect of the project focuses on a rescue of pre-Columbian design vocabulary interpreted in contemporary landscape architecture.

Legibility is an important consideration in this design – a legible landscape presents a clear organization. For American urban planner Kevin Lynch legibility is “the ease with which parts may be recognized into a coherent pattern”.⁴⁴ Movement through legible space is led by the proper articulation and treatment of paths, nodes and edges. In the design of Managua's lakeside legibility was achieved through the application of CDM. This method was applied using Plaza de la Fe obelisk as the center point. The layout is articulated by a straight main axis and by a circular axis to achieve coherence. Paths or clear routes of movements whether vehicular or pedestrian, are mainly organized through these axes or through the main center



fig 15 Hieroglyphics representing Monkeys El Muerto Island. Drawing by Bovallius.



fig 16 Hieroglyphic representing Aztec god Quetzalcoatl. Found at Nejapa Lagoon in Managua. Drawing by Squier.

⁴⁴ *The Image of the City*, p. 12.

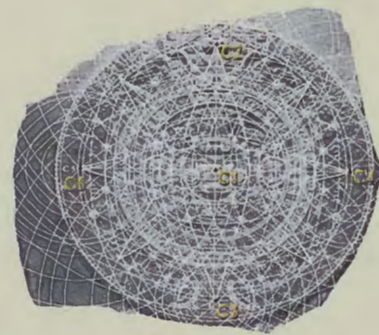
PLATE 11

CIRCULAR DESIGN METHODOLOGY (CDM)

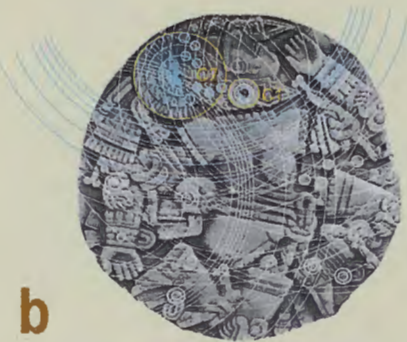
My design proposal for Managua's Lakeside is inspired by Nicaragua's main pre-Columbian heritage. Architect Antonio Prado Cobos called Circular Design Methodology (CDM) the ancient method applied by the Maya, Aztec and Inca in their design process. Prado Cobos stated in his research that CDM worked through the use of center points, circumferences, concentric circles and arches in an harmonic and hierarchical relationship as the basic matrix for the tracing of figures or for the hidden geometry that guides the plastic composition.



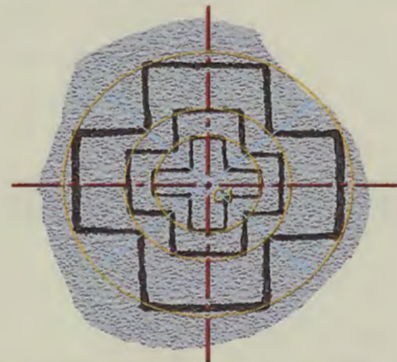
a
Maya king K'an Hok' Chitam II
Toniná, México. VIII century.



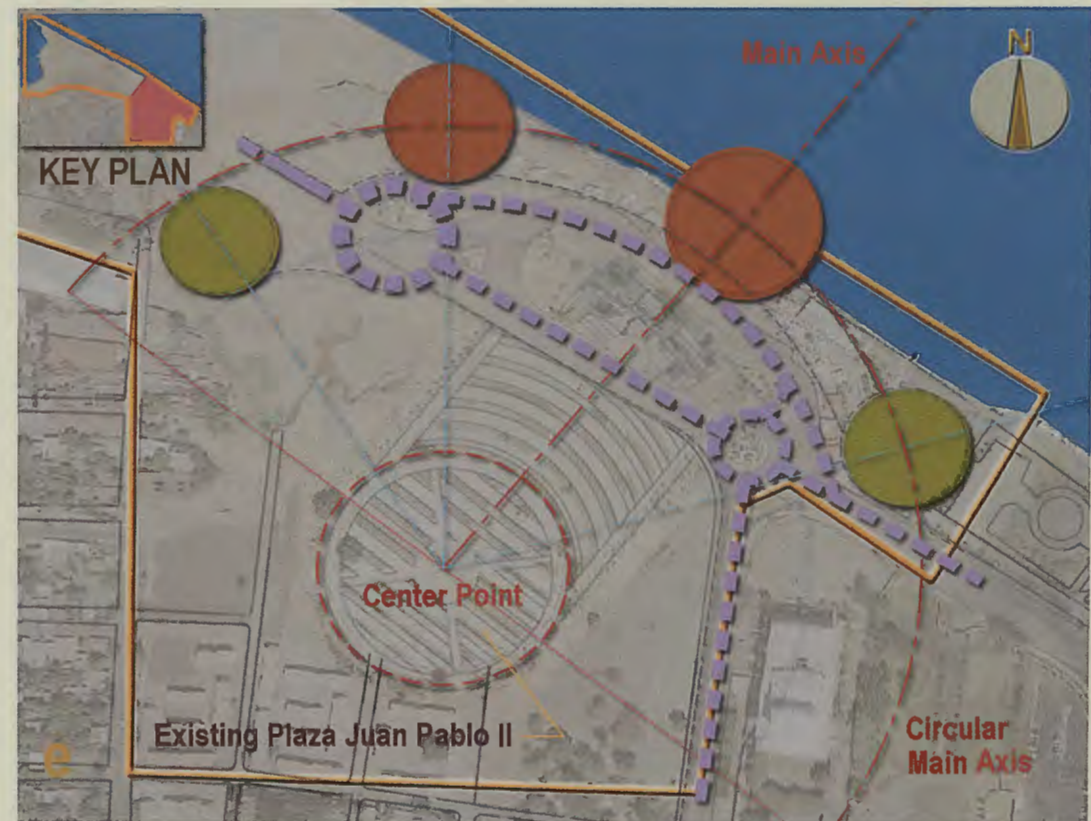
c
The Great Aztec Calendar Stone
Tenochtitlán, México. XVI century



b
Aztec goddess Coyolxauhqui
Tenochtitlán, México. XVI century



d
The Aztec Cross at El Muerto island
Zapatera archipelago, Nicaragua.
Probably XV century.



e
SITE MAIN AREA

THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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LEGEND

- a. *El creador Maya*, p. 176-179
- b. *El creador Maya*, p. 189
- c. *El Creador Maya*, p. 188
- d. Sketch by researcher over Bovallius drawing *Nicaraguan Antiquities*, plate 38, fig i
- e. Application of CDM in the site, by the researcher

point. The two main axes and secondary axes cross or are tangent to nodes or important point of interest along paths (plate 12). Edges or features providing borders are clearly defined by the coastline and the strong character of the landscape treatment.

The pre-Columbian design vocabulary was taken mostly from the hieroglyphics of El Muerto Island, those already known by scholars since the XIX century (figs 8, 15,16 and 17), and those recently discovered (figs 19 and 20). The latter ones display an overall pattern of spirals and undulated forms, which may represent Aztec stellar serpents. There is one figure with seven lobes around a defined center (fig 20), which is similar to Aztec codices representations of Chicomóztoc (Seven Caves). A comparable figure, but with only five lobes is a well-known Aztec-Toltec representation of planet Venus.⁴⁵ In this project Chicomóztoc's symbol displayed in *Historia Tolteca-Chichimeca* manuscript (fig 18) was used as an inspiration for the design of a relaxation and sculpture court. A new platform in harmony with the surrounding landscape is proposed to replace the old one adjacent to the acoustic shell. This platform is handicap-accessible from a spiral ramp and it is intended for relaxation and enjoying of the view. The base of the platform will be used as a public water station, storage and dressing rooms for events performed in the acoustic shell, while kiosks for food and beverage offer views of the lake. The new ferry dock also has a platform where people can sit and enjoy the view. Hard surfaces are provided for multi purpose use, such a play-and-park during festivities. Parking lots are added on both sides of Plaza de la Fe. The built area of the site is planted with shade trees, such as oaks and mahoganies, and palms, shrubs and grass extensions are also provided. One of the special landscape features is a native flower garden.

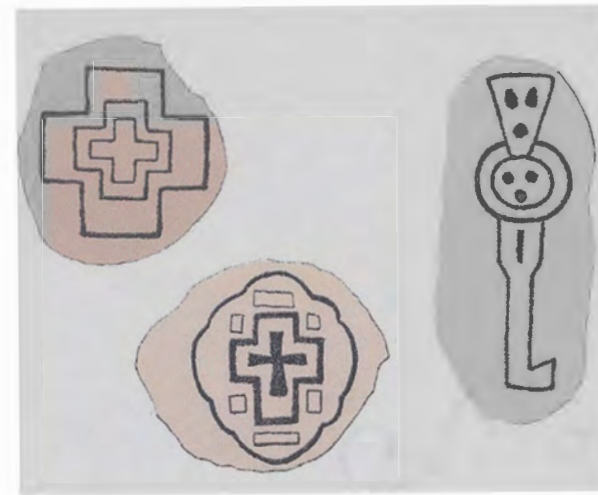


fig 17 Hieroglyphics from El Muerto Island
Drawing by Bovallius, 1883.⁴⁶

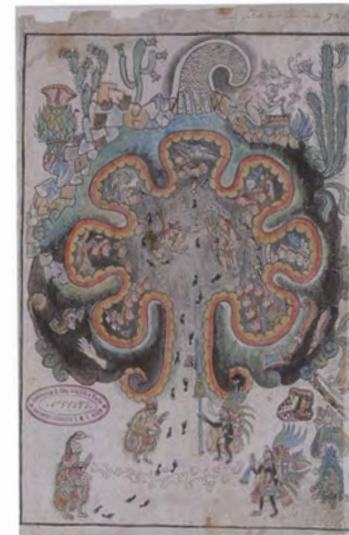


fig. 18 *Chicomóztoc. Historia Tolteca-Chichimeca* manuscript. Circa 1550.⁴⁷

The hieroglyphic representing Aztec god Quetzalcóatl (Plumed Serpent), found at Nejapa Lagoon in Managua is displayed in all plates as a logotype for this project (fig 16).

⁴⁶ *Nicaraguan Antiquities*, plates 37-39.

⁴⁷ Leibsohn, Dana, and Barbara Mundy, *Vistas: Cultura visual de Hispanoamérica, 1520- 1820*. <http://www.smith.edu/vistas>, 2004.

⁴⁵ *Ancient Tollan, Tula and the Toltec Heartland*, p. 96



fig 19. Recently discovered hieroglyphics at El Muerto Island. Picture by the researcher, 2005



fig 20. Hieroglyphic pattern with seven lobes. El Muerto Island. Picture by the researcher, 2005.

Lakeside Native Vegetation Restoration Area

Native vegetation will be restored in almost two-thirds of the site on the lakeside west coast (plate 12). The native vegetation of this area was devastated by human hands. In the past it was the area that connected commercial ships and the railroad, and also it became affected by sediments and contamination caused by Managua's black waters.



fig 21 Lakeside vegetation next to La Cervecería building, c. 1930. Courtesy of Luis H. Flores.



fig 22 Lakeside vegetation at Managua's west side. View of Love Island and Chiltepe peninsula⁴⁸



fig 23 Example of typical trail. Picture by Jerry Bauer.⁴⁹



fig 24 Restored vegetation will attract wildlife.⁵⁰

⁴⁸ Picture taken from <http://www.manfut.org/managua>

⁴⁹ Picture taken from <http://www.nps.gov/centralamerica/nicaragua/activities.shtml>

⁵⁰ Picture taken from <http://www.downtheroad.org/.../a11Nicaragua.htm>



fig 25 Momotombo Volcano. Rainy season.⁵⁰



fig 26 Momotombo Volcano. Dry season.⁵¹

As mentioned earlier, Managua is located in a transitional area between the typical deciduous forest and a sub-deciduous forest of tropical semi-moist zones. In the lower areas of Managua's lakeside, where water is almost present at soil level, the semi-moist type of vegetation is replaced by that of a tropical moist forest. The typical vegetation transition: Water, swamp, marsh and upland will be restored along the proposed lakeside area.

Trails for the resident's appreciation of the native vegetation and views are provided, as well as parking for visitors.

⁵⁰ *Nicaragua, Images of Yesterday and Today*, p. 60.

⁵¹ <http://www.mrhalliday.com/2001/NorthwestNicaragua/NorthwestNicaragua.htm>

PLATE 12

Lake Xolotlán

DESIGN PROGRAM



Ferry dock

Pedestrian trail

Native vegetation to be restored

Parking

Main Axis

Food and beverage service

Social Communication and statue court

Area reserved for president's security

Main Circular Axis

Flower garden

Parking

Center Point

Existing Simón Bolívar monument

Parking

Existing Plaza Juan Pablo II

Vehicular and pedestrian corridor to old central square



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE

Renovation of Managua's lakeside

Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

- Pedestrian corridor
- Vehicular corridor
- Social communication area
- Food and beverage service
- Parking
- Canopy trees and grass
- Native vegetation
- Water feature
- View

PLATE 13

MASTER PLAN



Lake Xolotlán

Pedestrian trail and restored native vegetation

- Ferry dock and platform
- Flower garden
- All purpose and occasional play-and-park area
- Central plaza and food and beverage service area
- Royal palms
- Existing acoustic shell
- Mahogany shade trees around Plaza Juan Pablo II
- Oak shade trees at walkways and parking areas
- Large scale Sculptures
- Existing Simón Bolívar monument
- Area reserved for President's residence
- Statues court with water fountains
- Parking

- Pedestrian trail
- Parking
- Relaxation areas
- Parking
- Restored native vegetation
- Stepped platform



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

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PLATE 14



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

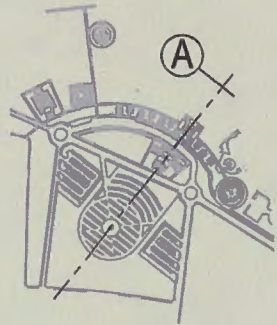
Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

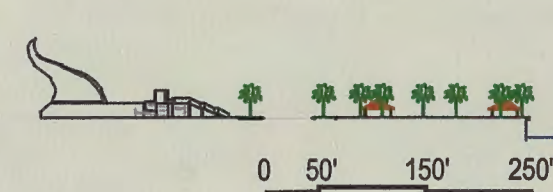
VIEW TOWARD CHILTEPE PENINSULA

PLATE 15

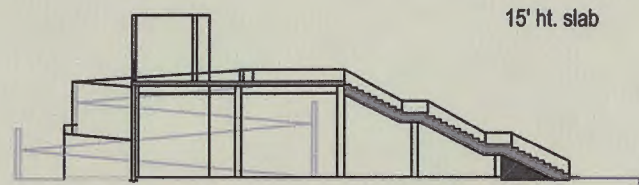
SECTION "A"



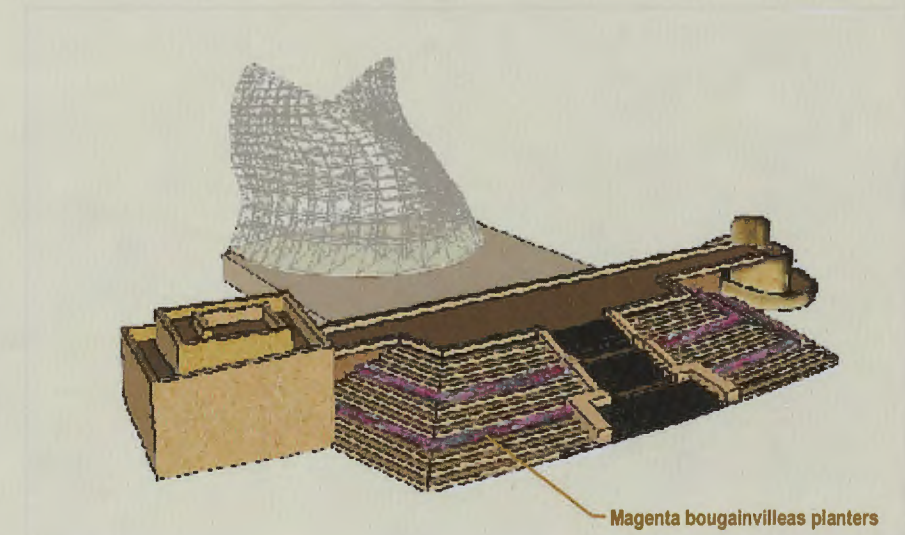
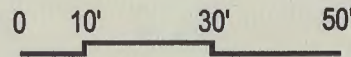
SECTION "A" THRU PLAZA JUAN PABLO II AND URBAN SITE AREA



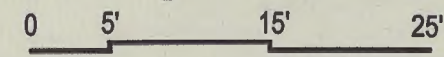
KEY PLAN



SECTION THRU STEPPED PLATFORM BLOW UP



SECTION THRU STREET BLOW UP



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

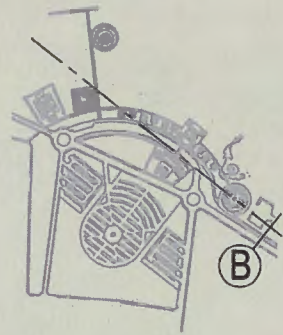
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LEGEND

SECTION "A" AND BLOW UPS

PLATE 16

SECTION "B"

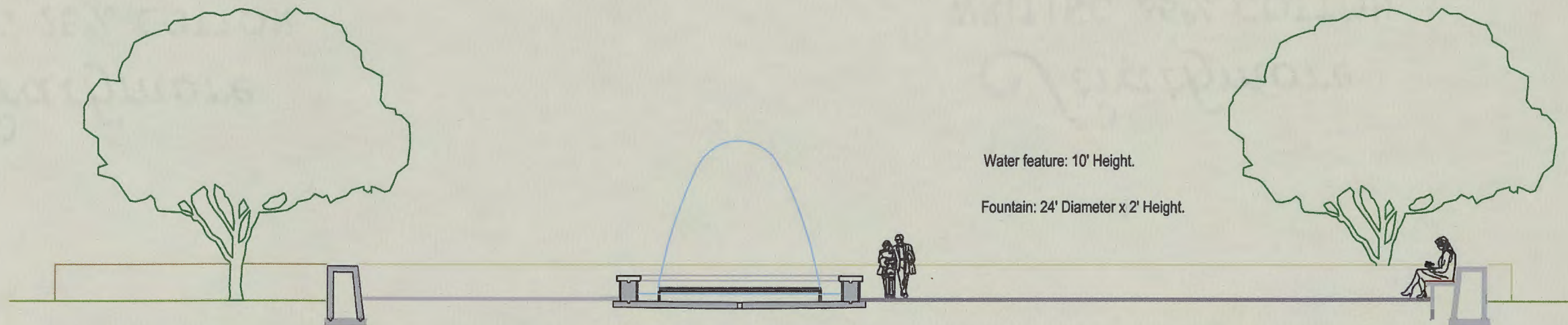


KEY PLAN



SECTION "B" THRU SCULPTURE COURT, STREET AND WALKWAYS

0 50' 150' 250'



STATUES COURT AND FOUNTAIN BLOW UP

Water feature: 10' Height.

Fountain: 24' Diameter x 2' Height.

0 5' 15' 25'

THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

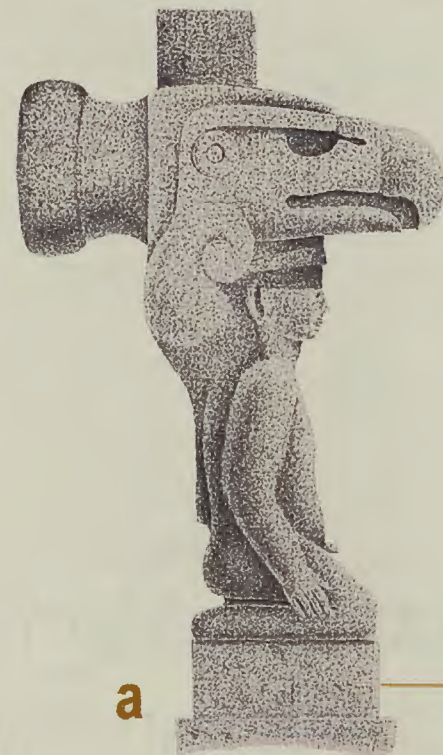
Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

SECTION "A" AND BLOW UPS

PLATE 17

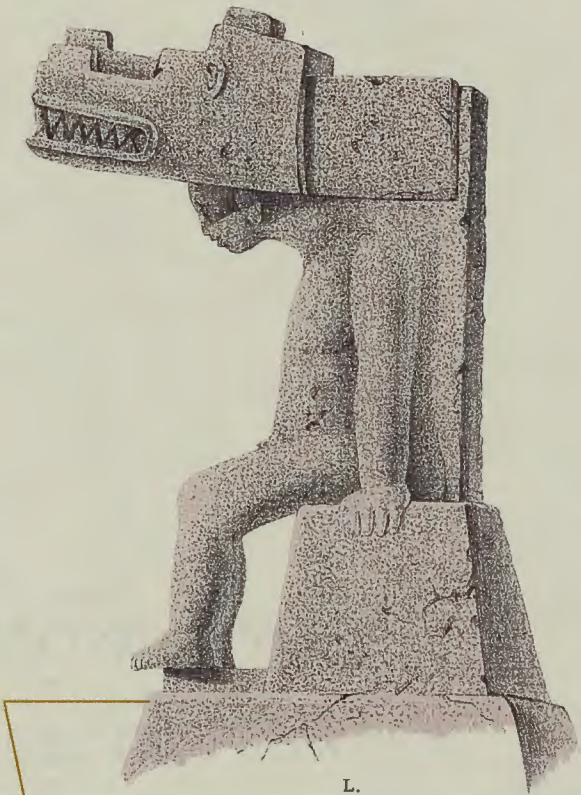
SCULPTURE COURT



a



b



c

Zapatera's Statues



THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

a, b and c. Bovallius renderings.

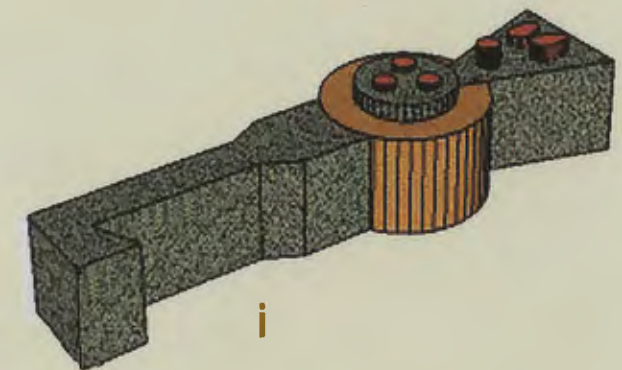
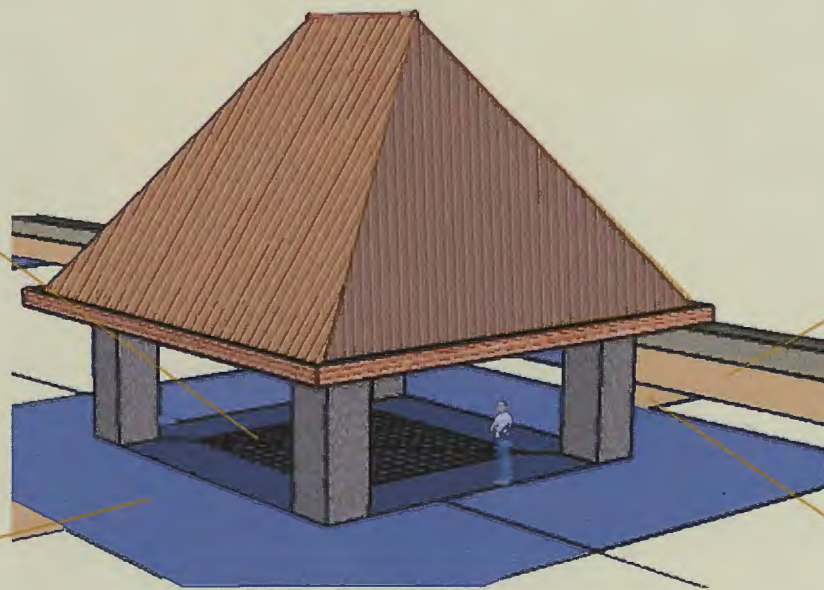
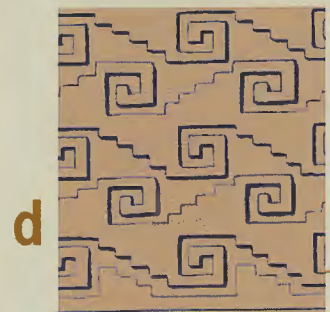
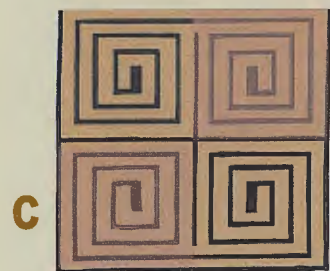
Modern reproductions of Zapatera's statues
will be displayed in Statues Court.

PLATE 18

DETAILS



h Hieroglyphic at EIMuerto Island



Examples of color concrete paving design

Kiosk's floor: 30' x 30'

Examples of color concrete paving design

Sculpture protudes over lake

TYPICAL FOOD AND BEVERAGE KIOSK

LARGE SCALE SCULPTURE

THESIS



CULTURAL IDENTITY IN LANDSCAPE ARCHITECTURE
Renovation of Managua's lakeside

Presented by Julio Alvarez FLORIDA INTERNATIONAL UNIVERSITY

LEGEND

- a. Vernacular dwellings at León, c. 1852. *Nicaragua Images of Yesterday and Today*, p. 8.
- b. Indigenous hut at Matagalpa, c. 1915. *Nicaragua Images of Yesterday and Today*, p. 271.

- c. *The Grammar of Ornament*, p. 63
- d. *American Indian Design & Decoration*, p. 52.
- f and g. *The Grammar of Ornament*, P. 65

Conclusion

This new lakeside landscape design complements Managua's old central square by unveiling the cultural inheritance of Nicaragua and introducing it to a contemporary urban environment.

This was achieved through the implementation of pre-Columbian design methodology, and through the use of meaningful pre-Columbian vocabulary in its landscape features. The native vegetation restoration of almost two-thirds of the site achieves an environmentally-sensitive goal in protecting the shores and preserving the historical landscape of Managua's lakeside for future generations.

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APPENDIX I

Lake Xolotlán's Rescue Plans.

Lake Xolotlán's annual average water level is 38.70 m above the sea level, has a surface of 1025 km² and a maximum depth of 24 m.⁵² Its water is contaminated mainly by the city's sewage drainage, but a project for its rescue started in August 2001⁵³ and it is planned to last ten years.⁵⁴ The project's first stage started with the installation of 17300 meters of pipes in 20 waste water treatment plants located in Managua's urban core. The project's second and third stages focuses in the lakeside rescue and in the treatment of Lake Xolotlan's waters.

The following illustrations were provided by the Alcaldía de Managua, Department of Planning.

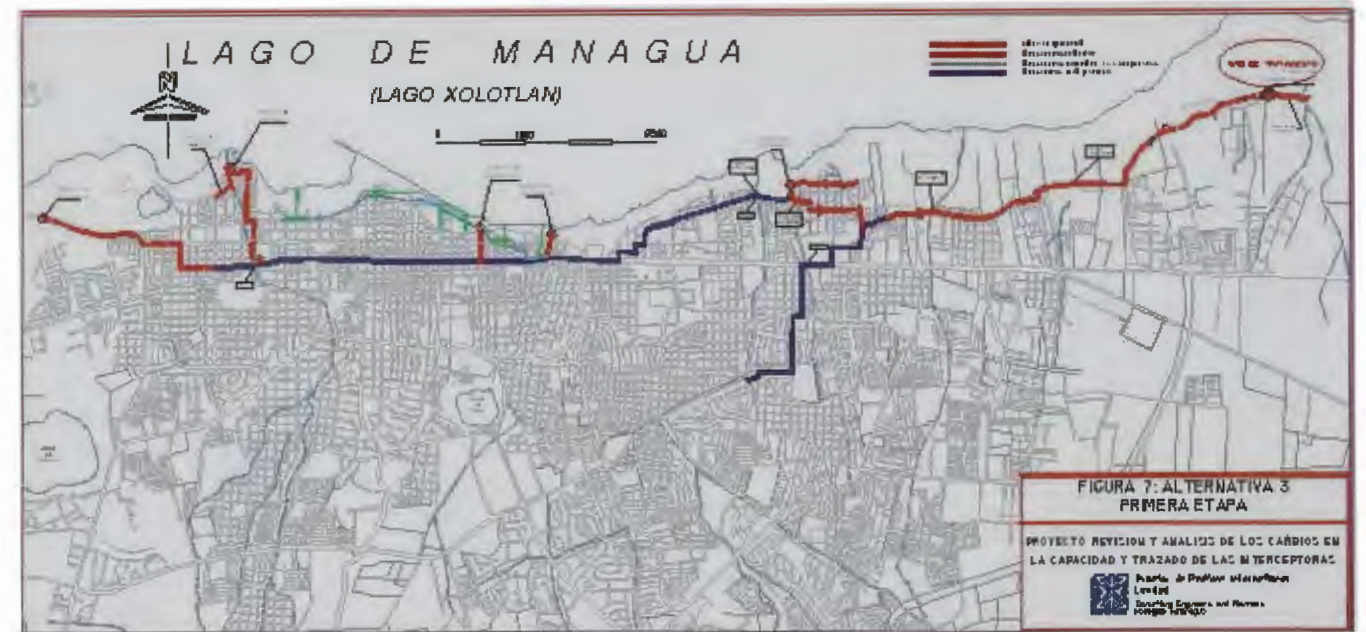


fig 29 Waste water treatment plants, approved locations.

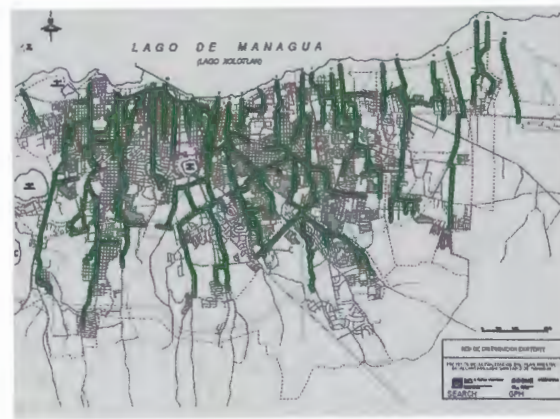


fig 27 Existing waste water distribution plan.



fig 28 Proposed locations for waste water treatment plants.



fig 30 Example of waste water treatment plant.



fig 31 View of typical waste water Treatment plant.

⁵² <http://www.ineter.gob.ni/Direcciones/Recursos%20Hidricos/HIDROGRAFIA%20WEB/Lagunas/Lago%20Managua.htm>, p. 2.

⁵³ *Saneamiento del Lago de Managua o Lago Xolotlán*, p.1

⁵⁴ http://www.ineter.gob.ni/proyectos/proyectos_2005/monitoreo-lago.html.

APPENDIX II

Ecological Region I Native Vegetation

The Ecological Region I is mainly that of a deciduous forest, a characteristic of dry tropical zones. It is presently formed of scattered thickets and trees, which are remnants of previous forests. The following list of plants represents its native vegetation.

Dry tropical zone

Guayacán	<i>Guaiacum sanctum</i>	Cimarra	<i>Jacquinia aurantica</i> Ait
Brasil	<i>Haemathoxylon brasileto</i> Karst.	Aromo	<i>Acacia farnesiana</i> (L.) Willd.
Escobillo	<i>Phyllostylon brasiliensis</i> Cap	Guanacaste blanco	<i>Albizzia caribaea</i> (Urban) Britt. & Rose
Nacascolo	<i>Caesalpinia coriaria</i> (Jacq.) Willd.	Guanacaste de oreja	<i>Enterolobium cyclocarpum</i> (Jacq.) Griseb.
Cornizuelo	<i>Acacia collinsii</i> Safford	Guácimo de molenillo	<i>Luehea candida</i> (DC.) Mart.
Cortez	<i>Tabebuia chrysantha</i> (Jacq.) Nicholson	Guácimo de ternero	<i>Guazuma ulmifolia</i> Lam
Laurel macho	<i>Cordia gerascanthus</i> L.	Chocoyito	<i>Diospyros nicaraguensis</i> Standl.
Laurel macho	<i>Cordia alliodora</i> (Ruiz & Pav.) Cham.	Sardinillo	<i>Tecoma stans</i> (L.) H.B.K.
Chinche	<i>Zanthoxylon culantrillo</i> H.B.K.	Madrono	<i>Calycophyllum candidissimum</i> (Vahl.) DC
Parate-hay	<i>Piptadenia flava</i> (Spreng.) Benth.	Chiquirín	<i>Myrospermum frutescens</i> Jacq.
Talalate	<i>Gyrocarpus americanus</i> Jacq.	Chaperno negro	<i>Lonchocarpus minimiflorus</i> Donn. Smith
Jiñocuabo	<i>Bursera simarouba</i> (Jacq.) Sarg	Espino Negro	<i>Pisonia macranthocarpa</i> J.D. Smith
Pintacordel	<i>Achatocarpus nigricans</i> Triana	Jobo lagarto	<i>Sciadodendron excelsum</i> Griseb
Jicarillo	<i>Plocosperma buxifolium</i> Benth	Jocote jobo	<i>Spondias mombin</i> L.
Guatuzo	<i>Neea psychotroides</i> Donn. Smith	Jocomico	<i>Ximenia americana</i> L.
Sombra de armado	<i>Bumelia pleitoschasia</i> J.D. Smith	Cacao de mico	<i>Morisonia americana</i> L.
Quebracho	<i>Lysiloma</i> sp.	Sangredrado	<i>Pterocarpus rohrii</i> Vahl.
		Cagalera	<i>Celtis iguanaea</i> (Jacq.) Sarg.
		Cerito	<i>Casearia corymbosa</i> H.B.K.
		Manzano de playa	<i>Crataeva tapia</i> L.
		Palo de rosa	<i>Hemiangium excelsum</i> (H.B.K.) A.C. Smith
		Ninciguiste	<i>Zizyphus guatemalensis</i> Hemsl
		Copalchi	<i>Croton niveus</i> Jacq.

Coyol	<i>Acrocomia vinifera</i> Oerst.
Elequeme de pantano	<i>Erythrina fusca</i> Lour
Aguiste, dormilona	<i>Mimosa pigra</i> L.
Pochote	<i>Bombacopsis quinatum</i> (Jacq.) Dug.
Carao	<i>Cassia grandis</i> L.
Cativo	<i>Ficus</i> sp.
Roble	<i>Tabebuia rosea</i> (Bertol) D.C.

Tropical moist forest zone

This type of vegetation is located in the lower areas of Managua's lakeside, where water is almost present at soil level.

Mangle blanco	<i>Bravaisia integerrima</i> (Spreng.) Standl.
Almendo de río	<i>Andira inermis</i> (W. Wright) H.B.K.
Zapotón de agua	<i>Pachira aquatica</i> Aubl.
Chilamate de río	<i>Ficus maxima</i> Mill
Matapiojo	<i>Trichilia hirta</i> L.
Tempisque	<i>Mastichodendron capiri</i> var. <i>tempisque</i> (Pitt.) Conq.
Panamá	<i>Sterculia apetala</i> (Jacq.) Karst
Guarumo	<i>Cecropia peltata</i> L.
Ceiba	<i>Ceiba petandra</i> (L.) Gaertn
Genízaro	<i>Pithecellobium saman</i> (Jacq.) Benth
Cedro amargo	<i>Cedrela odorata</i> L.
Ojoche	<i>Brosimum alicastrum</i> Swartz

Aguijote	<i>Prosopis juliflora</i> (Sw.) DC.
Pintacordel	<i>Achatocarpus nigricans</i> Triana
Huiscoyol, coyolito	<i>Bactris minor</i> Jacq.
Huiscotyol batano	<i>Bactris balanoidea</i> (Oerst.) Wendl.
Limoncillo	<i>Trichilia havanensis</i> Jacq.
Jaboncillo	<i>Sapindus saponaria</i> L.
Gavilan	<i>Albizzia guachapele</i> (H.B.K.) Little
Sombra de armado	<i>Bumelia pleistochasia</i> J.ID. Smith
Guácimo de ternero	<i>Guazuma ulmifolia</i> Lam.
Mora	<i>Chlosophora tinctoria</i> (L.) Don.
Capulín de comer	<i>Muntingia calabura</i> L.
Espino de playa	<i>Pithecellobium dulce</i> (Roxb.) Benth.
Manzano de playa	<i>Crataeva tapia</i> L.
Anona de río	<i>Annona glabra</i> L.
Guavillo de río	<i>Inga spuria</i> H. & B. ex Willd
Guachipilín	<i>Diphysa robinoides</i> Beth.
Helecho dorado de pantano	<i>Acrostichum aureum</i> L.
Madero negro	<i>Gliricidia sepium</i> (Jacq.) Steud
Melero	<i>Thouinidium decandrum</i> (Humbl. & Bonpl.) Radlk
Lavaplato	<i>Solanum erianthum</i> D. Don
Tamarindo montero	<i>Parkinsonia aculeata</i> L.