



# Forestry Management in Cuba: An Environmental History of the 20<sup>th</sup> Century

Honours Thesis

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## **ABSTRACT**

Environmental history explores the relationships and interactions that humans have –and have had- with the environment. These relationships and interactions were researched in the context of the ecological history of forestry use and management in Cuba during the 20<sup>th</sup> century. The shifting political dynamics strongly influenced and continues to influence the environmental management of the country's natural resources. Political eras of 20<sup>th</sup> century Cuba and environmental management are associated. Environmental history is a relatively new sub-discipline with a strong fundamental basis in political ecology.

The research examined the conditions of Cuba's forest ecosystems over three political eras; first, the Neo-colonial era characterized by the influence of the United States (1898-1959), followed by the Revolutionary era influenced by close relations to the Soviet Union communist regime (1959-1989), and the Special Period which is the current political era of Cuba. Comparisons and contrasts were made regarding the environmental conditions present during each political era. Research relied exclusively on historical documents including written sources, photographs, and recorded instrumental observations.

Policies and legislation were reviewed for this study to act as an indicator of the importance of forestry within Cuba. The study was conducted to gain a further understanding of environmental changes in relationship to political and social shifts that occurred in Cuba during the 20<sup>th</sup> century.

## **Glossary of Terms and Acronyms**

Afforestation- the conversion of bare or cultivated land into forest

CITMA- Ministry of Science, Technology, and the Environment

COMARNA- National Commission for the Environment and the Conservation of Natural Resources

Reforestation- the replanting of trees on land in which forest had been cut or denuded by fire

UNFF- United Nations Forum on Forests

## **Chapter 1- Introduction**

### **1.1 Background**

Forests are among the most valuable ecosystems on the planet, they are an important source of biological diversity, essential in the regulation of climate, and invaluable in maintaining biosphere integrity. Forests generate many economic goods and services including; timber, energy, food, water, pharmaceuticals, and recreation opportunities (Stevens & Montgomery, 2002). As a result of the economic wealth, forest ecosystems are exploited, predominantly in the form of deforestation. Deforestation is a critical environmental issue as forests are the structural support for terrestrial biodiversity. Furthermore, deforestation is estimated to cause approximately one quarter of anthropogenic carbon emissions (Obersteiner, 2006). Cuba has experienced fluctuations in the rate of deforestation of the national territory throughout the process of the country's development. This paper will examine the relationship among the political, socio-economic and environmental paradigms of the 20<sup>th</sup> century, particularly focusing on the effects of policy implementation on forest management practices.

Cuba is an island country located in the Caribbean, approximately 90 miles off the Florida coast of the United States. The history of Cuba is strongly characterized by the political and environmental management within the country. The area of the country includes 110,860 km<sup>2</sup>, and as of 2000, was 23.0 percent forest covered (World Resources Institute, 2003). To illustrate particular points, the Province of Pinar del Rio in western Cuba will be investigated to observe the impact of the changing political and socio-economic systems on Cuba's forest ecosystems. This province is strongly characterized

by the forest ecosystems within its borders as Pinar del Rio means “pinewood of the river” and it was named after a grove of pines near the river Guama (Vagts, 2004).

Deforestation is not an environmental problem endemic to Cuba and the history of Cuban society. Internationally, humans have been exploiting forest ecosystems for centuries, clearing forests for land cultivation or to use the wood for fuel. However, over the last 200 years and especially during the second half of the 20<sup>th</sup> century, deforestation has primarily resulted due to political or economic short-term motivations (World Bank, n.d.). In particular, Cuba’s situation is interesting as forest cover has increased over the second half of the 20<sup>th</sup> century through extensive reforestation programs. In comparison, forest cover of natural forests worldwide declined on average over this time period (World Resources Institute, 2003).

Cuba’s political and socio-economic structures were significant in the management of forest ecosystems, and therefore, instrumental in deforestation. Over the 20<sup>th</sup> century, Cuba’s political agenda shifted from the imperialistic influences of the United States to the socialistic influences of the Soviet Union. The political and socio-economic history of Cuba over the 20<sup>th</sup> century can be broken down into three predominant eras; the Neo-colonial Period (1902 to 1959) followed by the Revolutionary Period (1959-1989) and the Special Period which began in 1990 and continues into the present. Each era is researched within the context of the effects of political, social, and economic agendas on the forest ecosystems. These relationships are observed in the policy-making and implementation with respect to the overall improvement in the forest ecosystems.

Cuba has captured the attention of the international community as environmental reforms are drastically improving the forest cover of the country. Along with the improvement in environmental management practices, Cuba entered into the High Human Development Index calculated by the United Nations in 2006, demonstrating a vast improvement in the socio-economic situation of the country (Giraldo, 2007). The simultaneous social and forest development in Cuba during the late 20<sup>th</sup> Century has been remarkable.

## **1.2 Significance of the Study**

Forest transitions are often associated with population growth, increase demand for forest products, and changing environmental perceptions (Mather, 1992). This paper will study the environmental impacts of changing environmental perceptions, particularly those associated with political decisions. Understanding the social and political perceptions towards the environment in Cuba during each political era may provide insight into the subsequent forest management practices, or lack thereof.

Deforestation has a socio-economic connection, as standard of living increases, the consumption of forest products also increases (Rudel, 1994). As Cuba developed over the 20<sup>th</sup> Century, comparisons between political agendas and the resulting environmental impacts can provide valuable information regarding social development and forest development. Cuba has been regarded as a potential model for other countries struggling to overcome deforestation (Westoby, 1989). Foremost, understanding the mechanisms behind effective and ineffective forest management practices can provide important lessons for future forest management efforts.

### **1.3 Objectives and Research Question**

#### **Objectives**

One of the most pressing environmental issues of 20<sup>th</sup> century Cuba was deforestation. This study will focus on the three main objectives. The first to be investigated will be the involvement of human social organizations and economic activities and the effects they have on forestry practices. This will include the power that the social elite had in making decision about these activities. Secondly, the changes in the forest ecosystems themselves will be reviewed in the context of Cuba during the 20<sup>th</sup> century. Lastly, the study will provide research regarding the thoughts of the Cuban society regarding forest ecology through reviewing environmental legislation during the 20<sup>th</sup> century (Worster, 1988). This study will examine the extent to which human influences affected the forestry management practices of 20<sup>th</sup> Century Cuba.

These objectives will be utilized to explore how forest ecosystems have changed from biological evidence presented in historical documents. As well, human behavioral changes will be inferred from legislation and policies implemented over 20<sup>th</sup> century Cuba.

#### **Research Question**

How has forest management and utilization been affected by the political and socio-economic changes of 20<sup>th</sup> Century Cuba?

Through political and socio-economic changes, Cuba has evolved from a neo-colony of the United States into a country that is independent. This thesis will argue that this change has shaped Cuba's environmental history in respect to forestry management.



To elaborate on this idea, the study hypothesizes that there will be a positive relationship between improvement in political and socio-economic aspects of society and reforestation in Cuba. There are limitations to the research problem as information will be restricted to primary and secondary source material. Substantial information pertaining to the research problem may be absent from published material.

#### **1.4 Literature Review**

Cuba has a complex and dynamic environmental history. Foremost, environmental history has to be defined in a comprehensive manner to outline the context and provide a foundation to research forestry management practices of 20<sup>th</sup> century Cuba. Environmental history explores both the past and present interrelationships of humans and nature. The objectives to studying environmental history are to understand human influences, whether subtle or overt, benign or destructive, and how these influences impacted the historical to present environmental epochs. The study of environmental history often focuses on landscapes, as they are commonly used as the unit of analysis for human's impact on the earth (Egan and Howell, 2005). Furthermore, environmental history is a tool that can help maintain sustainable, diverse ecosystems by providing necessary information on ecological processes over extended spatial dimensions and temporal periods (Egan and Howell, 2005).

In the context of Cuba's environmental history, political agendas have been very influential in the forestry management practices of the 20<sup>th</sup> century. Political ecology integrates cultural, political, economic, and ecological perspectives in the analysis of environmental history. For the purpose of this study, political ecology will be defined as

“the extent to which environmental changes and societal processes are intertwined” (Hornborg et al., 2007). Three political eras of 20<sup>th</sup> century Cuba were analyzed for the study regarding forestry practices; the Neo-colonial period of 1902-1959, (Truslow, 1950; Huguet, 1958, and Webster, 1992), the Revolutionary period of 1959-1989, (Nunez Jimenez, 1972; Westoby, 1989; Comite Estatal, 1990), and the Special period of 1990-present (Eckstein, 1994; Ross, 1999; and Alvarez et al, 2001).

Christopher Columbus described Cuba as “the fairest island ever revealed to human eyes” upon the discovery (Nichols, 2000). However, Cuba’s resources were quickly sacrificed by the Spanish colonial landowners, “who burned down forests on slopes of the mountains and obtained from the ashes sufficient fertilizer for one generation of highly profitable coffee trees” (Nichols, 2000). The Spanish colonialist did not care that the “heavy tropical rainfall afterwards washed away the unprotected upper stratum of soil, leaving behind only bare rock” (Nichols, 2000). Over the 19<sup>th</sup> century, Cuba was transformed into a powerhouse exporter of sugar, coffee, and tobacco. Mass forest degradation resulted from this monoculture agriculture. Historical documents indicate that total forest cover fell from 89.2% in 1812 to 54% in 1900 (Government of Cuba, 1993).

The decline in forest cover of approximately 35% between 1812 and 1900 was primarily due the Spanish Crown’s quest for timber (Government of Cuba, 1993; Westoby, 1989). Spanish rule ended in 1898 with the intervention of the United States in the Spanish American War. The United States then occupied Cuba with a series of military governments. In 1902, the Platt Amendment was passed by the US Congress as an army appropriations bill to another piece of legislation. The United States granted

itself the right to intervene in Cuban affairs and to have control over Cuba's foreign policy, ability to borrow money, among other concessions. In order to end the military occupation of their country, Cuba had to agree to the Platt Amendment. It did so reluctantly. This amendment stayed in place until 1934, when Franklin D. Roosevelt's administration replaced it with the 'Good Neighbor Policy'. Unfortunately, this still ensured that the US retained a large economic control and ownership over most of Cuba's most valuable natural resources (Hitchman, 1967).

Cuba's large scale deforestation has been directly related to the Platt Agreement (Westoby, 1989). In 1959, at the time of the Cuba Revolution, forest cover had declined to 14% (Government of Cuba, 1993). As a result of the rapidly decreasing forest cover, the need for forestry management was increasingly being expressed within Cuban society. Between 1959 and 1991, forest cover increased from 14% to 19.5% (Government of Cuba, 1993). This percentage increase has been contributed to better forestry management practices, particularly due to reforestation practices. However, timber harvesting rates were also better managed (Westoby, 1989). These improved forestry management practices continued into the 1990's. According to the World Resources Institute (2003), total forest area had increased by 13% and natural forest increased by 1% in Cuba between 1990 and 2000. During this same time period, Central America and the Caribbean's experienced an 11% decline in total forest area and an 11% decline in natural forest. The world averaged a 2% decrease in total forest area and a 4% decrease in Natural Forest (World Resources Institute, 2003). As of 2000, the forest had recovered to 23% of the total land area (World Resources Institute, 2003).

In connection with the political agendas, foreign influences also affected the socio-economic structures of Cuba, which subsequently impacted forest management. The direct impact of the United States on the forest industry ended with the Revolution in 1959, however, the strained relationship that resulted between these two countries' has continued to impact the environment of Cuba into the 21<sup>st</sup> century. In 1961, the United States sanctioned an embargo on Cuba which ceased trade relations. This trade embargo greatly affected the living and economic conditions in Cuba as virtually all industrial structures were dependent on supplies and parts that were now denied to Cuba (Perez, 1995). As a result of the embargo, Cuba engaged in a strong relationship with the (former) Soviet Union, in particular between the years of 1962 and 1989 (Eckstein, 1994). This relationship with the (former) Soviet Union fostered further relationships with other Marxist-Leninist countries in Eastern Europe which resulted in trade and technological exchanges that improved all sectors of Cuba's industrial infrastructures, some in a more sustainable manners than others (Eckstein, 1994).

However, after the collapse of the Soviet Union in 1989, trade, commercial agreements, subsidies and economic assistance from the Soviet Union and other communist Eastern European countries were abruptly terminated (Perez, 1995). As a result of Cuba being forced into self-sufficiency there was an increased reliance on agriculture, which caused problems such as increasing pesticide resistance and soil erosion which resulted in the deforestation of land for agricultural use. These severe environmental problems were identified in the 1997 National Environmental Strategy, as selective deforestation lead to damaged soils, water tables and fragile ecosystems

(Nichols, 2000). Cuba's history over the Special Period is unique in that the country has had to adapt to being self-sufficient and environmental sustainable.

### **1.5 Research Design and Methods**

Environmental history studies utilize a variety of disciplines for data, research methods, analytical frameworks, and theoretical insight. This study relied heavily on written evidence from both primary and secondary source material to understand the relationship between shifting political and socio-economic influences and the management of the forests in 20<sup>th</sup> Century Cuba. Also, this study is interdisciplinary; reference material from many different disciplines: anthropology, ecology, economics, geography, philosophy, political science, and the history of technology were important sources used in understanding the connection between Cubans and their forests.

Document analysis was the basic method used to obtain data regarding the political, social, and environmental situations of each of the three periods; Neo-colonial period, Revolutionary Period, and the Special Period. Furthermore, legislation and policies were examined to provide an insight into the political agenda regarding the environment during each political period of the 20<sup>th</sup> Century (Houck, 2000). The environmental history of the forest ecosystems of 20<sup>th</sup> Century Cuba were inferred from political, social, and legal frameworks, as well as biological evidence of each political era.

A comparative analysis will be done to understand the interaction between political and socio-economic influences and forest management in each of the political eras over the 20<sup>th</sup> century. The comparative analysis will compare the political status and

agendas such as the degree of centralized state control in each period with the deforestation and afforestation rates, as well as, other indicators of political and societal perceptions of forest ecosystem. Particular focus will be given to the legal frameworks of each period regarding shifts in sustainable management practices of forests as this will also be used as an indicator of the awareness and importance granted to forest ecosystems.

## **Chapter 2. Forests in Cuba**

### **2.1 Overview of Forests in Cuba**

As a sub-tropical island, Cuba offers a wide variety of flora species. Palm trees are popular, as the tall Cuban Royal Palm, *Reystonea regia*, is the national tree (Vagts, 2004). Due to the climate in Cuba, palm trees function as foundational plants, in the same manner that conifers and other evergreens grow in Canada.

Cuba is a center for biodiversity in the Caribbean region. As of 2004, it was estimated that of Cuba's over 7000 plant species, approximately 50 percent are endemic (Vagts, 2004). Many protected ecosystem reserves have been established and with the diverse flora and fauna that are found within these reserves, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) has recognized six of them as World Biosphere Reserves (Bequette, 1998).

Typical to the Caribbean, Cuba has a limited number of conifer species (Vagts, 2004). However, the conifers that do exist in Cuba are of great value. They are economically, structurally, and aesthetically important. Cuban conifers are economically valuable as they are a source of wood products. They also prevent soil erosion, while

acting as an ornamental framework along Cuba's roadways and buildings (Vagts, 2004). Pines are the source of many wood products, including lumber. Also, another characteristic of the pine is that they can grow rapidly on poor soils, which helps in reforestation (Gessel, 1986). The pine species of Cuba are separated by region, indigenous to the east is *Pinus occidentalis* (also known as *Pinus cubensis*) with *Pinus caribaea* and *Pinus tropicalis* being indigenous pine species in the western region of the island. Among other conifers native to Cuba are two species of junipers, *Juniperus barbadensis* var. *lucayana* and *Juniperus saxicola*. There are two species of podocarpus, *Podocarpus angustifolius* and *Podocarpus aristulatus*. Lastly, the gymnosperm Cycadophyta is represented by the unique *Micocycas calocoma*. The deciduous tree species that inhabit Cuba include species such as ebony, *Diospyros* and mahogany, *Swietenia mahagoni* (Vagts, 2004).

## **2.2 Forests in Pinar Del Rio**

The ecology of the western end of the island, where Pinar del Rio is located is similar to the ecology of Florida and the Yucatan Peninsula (Esquivel et al. 1987). The province has four major natural zones; Cordillera de Guaniguanico which includes the mountains; Llanura ondulasa Norte which is the area of land between the mountains and the northern coast; Llanura alluvial Sur which are the southern lowlands; and Llanura carsica de Guanahacabibes which includes the vegetation of the far western peninsula.

As mentioned in the section above, *Pinus caribaea* and *Pinus tropicalis* are the indigenous pine species to Pinar del Rio (Vagts, 2004). These species, in particular *Pinus*

*tropicalis* will be observed over the ecological history of Cuba prior to and within the 20<sup>th</sup> Century.

### **Chapter 3. Forest Ecosystems of Cuba Prior to and during the 20<sup>th</sup> Century**

#### **3.1 Forests of Cuba: From the Discovery to beginning over the 20<sup>th</sup> Century**

Christopher Columbus and his crew discovered Cuba in 1492. Upon arrival, he described the landscapes as “full of palm trees and groves” and with “great and marvelous pinewoods” (Perez de Tudela, 1994). The discovery resulted in the Spanish Colonization of Cuba in 1510 (Perez de Tudela, 1994). At the time of the Spaniards arrival, it was calculated that forests covered 90 percent of Cuba’s territory (Monzote, 2008). There were flourishing aboriginal communities living sustainably along the coasts and riverbanks throughout Cuba; many had extensive agriculture called conuco. These people were largely exterminated by 1550. Into the Sixteenth Century, the percentage of forest cover was debated among historians, with some arguing it was between 70 and 80 percent while other estimated it at between 90 and 95 percent of the original 90% (Monzote, 2008).

The first known map of Cuba’s vegetation was created in the Sixteenth Century by Enrique del Risco Rodriguez (Figure 1). He stated that the predominant types of forests were “the semideciduous (or semicadncifolious) and the evergreen (or subperennifolious)” (Monzote, 2008). Pinar del Rio forest ecosystems were characterized by Evergreen (coniferous), Semideciduous, and Aciculifolious Perennifolious Tropical Forests. Evergreen or coniferous forests retain green foliage all



year round and tropical evergreen forests occur in areas that receive 200 cm or more of rainfall and have temperatures of 15 to 30 degrees Celsius (Perez de Tudela, 1994).

Among the evergreen forest in Pinar del Rio, the most common vegetation is low-altitude mesophyllic species. The semideciduous forests of Pinar del Rio are mainly composed of microphyllic and typical mesophyllic species. The third predominate forest type of Pinar del Rio is the Aciculifolious Perennifolious Tropical Forest or more commonly known as a pine forest. Within the pine forests of this province are the species, *Pinus caribaea* and *Pinus tropicalis*

The types of species that compose the Pinar del Rio forest ecosystem are precious woods that are useful for lumber. The type and abundance of trees combined with fertile soils found in Pinar del Rio explain the societal choice to exploit the resource to satisfy agricultural cropland needs and the wood for diverse uses. The forests of Cuba under Spanish Colonization were seen as nothing more than “lumber to build sugar mills, firewood to fuel them, and sources of stunningly fertile soil” (Monzote, 2008). The Spanish also used Cuban forests for building their ships and nearby Havana became a busy shipbuilding port. In addition, the Spanish felled a number of forests for building lumber destined for Spain. Many Cuban trees can be found as part of the woodwork of Spanish buildings today. The fertile soil was a result of rich organic matter that remained after the deforestation of the thick tropical forests.

During the Spanish colonization, the Cuba forests were indiscriminately exploited as large quantities of lumber were being shipped to Spain (Truslow, 1950). Large quantities of lumber were also consumed by the Spanish Navy (Demeritt, 1991). Lumber was a precious commodity as it was needed to build ships which enabled a more

powerful naval force. The economic value of lumber was the primary concern to the Spaniards. Like most colonization's, the Spanish had little respect for the natural state of Cuba, once they no longer found value within the colony, they could return to their homeland. Control of Cuban forests increased the capabilities of defending the Spanish empire's interests, and thus ensured the longevity of the Spanish control over Cuba. At the time of discovery, Cuba was deemed a disappointment to Spain in terms of having little gold and silver, but the use of Cuba as a shipping port for Spain's ships going to and from the New World was of great value and also strategically positioned militarily.

The Spanish Crown's continual desire for timber harvesters and agricultural laborers led to a mass influx of African Slaves in the Seventeenth and Eighteenth Centuries. When slavery was abolished in Cuba in the late nineteenth century, efforts turned to immigrating Chinese laborers who would also work for low wages with conditions scarcely better than those of the former slaves (Black, 1976). As a result, by the twentieth century, Cuba was composed of a blend of African and Spanish cultures, mixed with small Asian, European, and North American populations (Westoby, 1989). Today, the Cuba population is predominantly descendants of these cultures.

The eighteenth century, was characterized by the expansion of Cuba's agricultural sector to meet the demands of foreign markets and its growing population (LaHaye, 1996). Sugar, tobacco, and coffee plantations were numerous, while the harvesting of timber decreased due to the depletion of precious woods such as mahogany (Demeritt, 1991). At the turn of the Nineteenth Century, forests had regenerated naturally to over approximately 90 percent of the land; however, the forest structure had been seriously degraded (Westoby, 1989). The rich fertile soil, climatic conditions, and societal structure

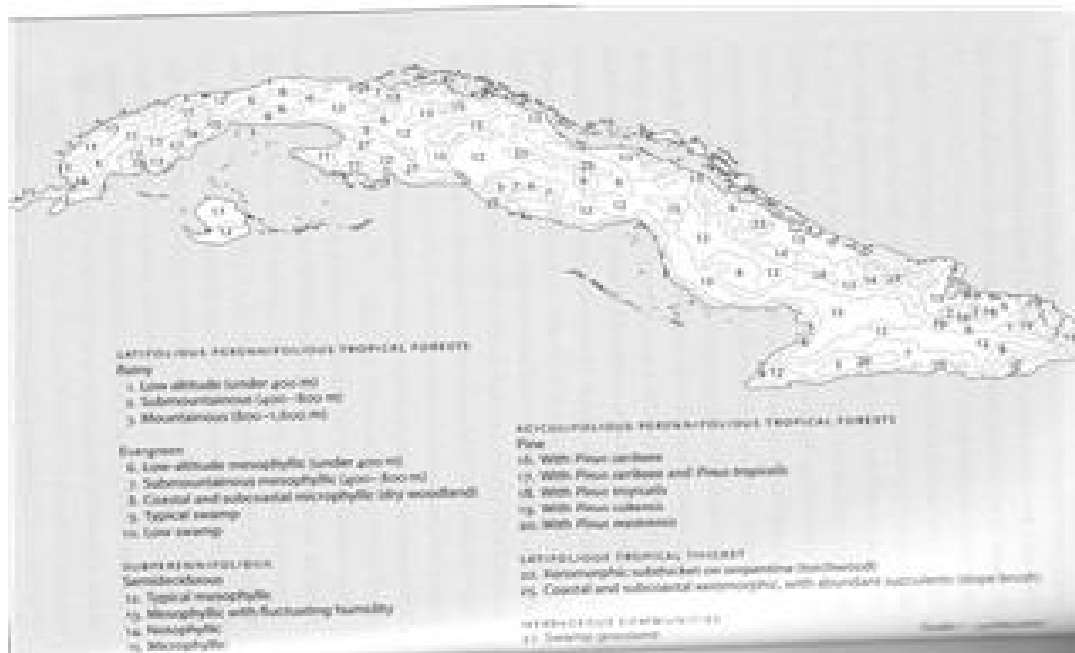
made Cuba an exceptional country for sugar cane production. The natural conditions combined with the lack of any restraint by the Spanish to engage in deforestation allowed for Cuba to produce an estimated half a million metric tons of sugar annually which accounted for about 40 percent of the world's sugar cane production and 30 percent of the total sugar supply (Hagelberg & Alvarez, 2006). Without foreseeing the environmental degradation of mass sugar cane production, the Cuba Scientist, Alvaro Reynoso (1829-1888), connected the development of the country with the international sugar trade stating:

*“By the nature of things, we had to face the advent of competitors in our market, since this was necessarily related to other nations developing their wealth. We can only aim for equality of access, it being up to us to succeed with low price of product, which leads to increased consumption. Proposing to obstruct the progressive evolutionary course of humankind is as foolish as wishing to halt the movement of the earth” (Reynoso, 1862 as cited from Hagelberg & Alvarez, 2006).*

At the time this was written, Reynoso could not have foreseen that sugar cane would eventually impede Cuba's development through the environmental degradation caused by the deforestation to obtain land for production.

From the arrival of the Spaniards in 1492 to the turn of the Twentieth Century, forest cover in Cuba declined from approximately 90 percent to an estimated 54 percent (Table 1). During the war of 1895-1898 the Cuban fighters had a scorched earth policy and much of the Cuban countryside was burned down which contributed to the decline in forest cover prior to the 20<sup>th</sup> century. The political and social shift that occurred at the turn of the twentieth century would further deteriorate the environmental integrity of Cuba, particularly the forest ecosystem.

**Figure 1.** Vegetation Map of Cuba in the Sixteenth Century (Monzote, 2008)



**Table 1.** Official Statistics from the Government of Cuba on Forest Cover in Cuba (CITMA, 1993)

Year	Total Area (Mil. ha)	Forest Cover (Mil. ha)	Forest Area (Percent)	Population (Mil. inhab)
1812	11.1	9.9	89.2	0.5
1900	11.1	6.0	54.0	1.8
1959	11.1	1.5	14.0	6.9
1991	11.1	2.16	19.5	10.8
1998	11.1	-	*22.0	***11.1
2000	11.1	-	**23.0	***11.2

\*Forest cover percentage for 1998 provided by Lane, 2000.

\*\*Forest cover percentage for 2000 provided by World Resources Institute, 2003

\*\*\*Populations for 1998, 2000, and 2005 provided by United Nation Statistics, n.d.

### **3.2 Forests in the Neo-Colonial Period of Cuban History (1902-1959)**

The domination of the United States imperialism over Cuba was a direct result of the Spanish-American War of 1898. Cuba was in the process of fighting for their independence from Spain, when the United States seized the opportunity for expansionism. As a result, Cuba became a neo-colony (Webster, 1992). Cuba gained independence from Spain in 1898, but it was not until May 20, 1902 that the Republic of Cuba was officially formed (Monzote, 2008). However, the country's sovereignty was interfered with by the United States through the Platt Amendment. The Platt Amendment was approved by the United States Congress in 1902 and was characterized by the allowance of the United States to intervene in Cuba's domestic and foreign affairs (Webster, 1992). Outlined within this amendment was the United States government's right to intervene for "the maintenance of a government adequate for the protection of life, property, and individual liberty". The Platt Amendment was complemented by a trade accord in 1903—The Reciprocal Trade Treaty. The trade accord reduced tariffs on Cuban products, particularly sugar entering the United States market by 20 percent, and in return the United States received tariffs between 25 to 40 percent for a number of their products (Monzote, 2008). This trade agreement, however, disadvantaged Cuba in most ways in regard to its exports to the United States and it was generally very unfair. The US insured that Cuba sent only raw products and all 'value added activities' were accomplished in the United States with most of the profits remaining there. According to Huguet (1958), the Platt Amendment in conjunction with the 1903 treaty was the predominant cause for the large scale logging operations in Cuba during the 20<sup>th</sup> Century.

The Neo-Colonial period of Cuba is characterized by the domination of the United States capitalistic ideologies. Through the massive investments, United States capitalists owned and were the primary producers of the island's sugar. They also constructed various mining facilities; owned the water and electrical companies, railroads, and most of the productive land. During this era, deforestation and environmental degradation were the most intense on Cuban ecosystems. Modern technologies funded by the United States more than tripled sugar cane production, and decreased the cost of production. Economically, the United States introduced greater efficiencies to the industrial sector of Cuba, in turn, endured an environmental crisis for the island (Monzote, 2008). The relationship between the United States and Cuba became known as the era of "American Ecological Imperialism" (Tucker, 2000).

At the turn of the Twentieth Century, the Bureau of Forestry had identified over 200 varieties of forest trees in Cuba. Of these 200 varieties, only approximately a dozen varieties were of economic value (Truslow, 1950). According to Truslow (1950), a complete inventory of the forest stands had not been compiled for the first half of the Twentieth Century. Therefore, accurate data are not available for indicating timber species by volume. Spanish cedar was identified as the most abundant of the hardwoods, while the most abundant of the softwoods, apart from pine was hog plum and a variety of birch species (Truslow, 1950).

In 1919, the forest cover was estimated at 13,000,000 acres, or nearly half the total land area of Cuba (Truslow, 1950). This statistic is reflective of those produced by the Government of Cuban forest development which had forest cover at 54 percent in 1900 (Table 1). In the document by Truslow (1950), forest cover was estimated to have

declined to 6,750,000 acres of which only approximately 2, 280,000 acres (8 percent of the land area of Cuba) were virgin stands. The statistic produced by the government of Cuba on forest development for 1959, had forest cover at 10 to 14 percent (Government of Cuba, 1993).

A leading contributor to the deforestation of Cuba was the continued mass investments by the United States to produce sugar. The Neo-Colonial period was also effected by World War 1. The war caused a decline in the world's production of beet sugar which increased the interest in Cuban sugar production (Monzote, 2008). During this time, Cuba's percentage of world sugar production increased drastically. From 1914 to 1919, the country's harvest rose from 2,244,500 metric tons to 4,104,100 metric tons, continuing to rise to 5,200,800 metric tons in 1925 (Monzote, 2008). The clear cutting of forests to keep up with the demand for sugar was a main cause of the decline in forest cover during the Neo-Colonial period.

Furthermore, the export of wood and other forest products from Cuba increased within the first two decades of the Twentieth Century. The main exports were mahogany and cedar. The economic value of wood in 1907, according to a census recorded the income from the industry at 2,375,733 pesos for the year which was significantly higher than that of 966,999 pesos recorded in 1899 (Monzote, 2008). The value of wood significantly increased into the Twentieth Century. As of 1946, Cuban wood products were valued at over 30.5 million pesos (Truslow, 1950). The breakdown of the sources of the forest products of Cuba in the first half of the Twentieth Century is as follows: 90 percent were privately owned forests, 1 percent was government forests that people were authorized to cut, and approximately 7 percent of the forest cuttings were not authorized

by the government (Truslow, 1950). The economic value of the wood products derived from each of the sectors above is summarized in Table 2.

**Table 2.** The Economic Value (US Dollars) of Wood Products of Authorized and Unauthorized Cutting of Forests in Cuba (1946)

Wood Products	Privately Owned Forest		Government Forest		Unauthorized Cutting		Total	
	Board Feet	Value	Board Feet	Value	Board Feet	Value	Board Feet	Value
Saw Timber	67,122,584	13,788,004	-	-	6,082,941	1,886,950	73,205,525	15,674,954
Wood (direct use)	70,921,593	4,444,082	550,900	66,115	1,401,063	103,188	72,873,556	4,613,386
Wood (fuel)	<u>281,673,300</u>	<u>8,339,055</u>	<u>11,910,225</u>	<u>53,339</u>	<u>5,068,350</u>	<u>152,900</u>	<u>298,651,875</u>	<u>8,845,294</u>
Total Value (for all wood)	419,717,477	\$26,571,141	12,461,125	\$419,454	12,552,354	\$2,143,038	444,730,956	\$29,133,634
Miscellaneous (bark, leaves etc.)	-	<u>1,388,026</u>	-	<u>23,244</u>	-	<u>2,205</u>	-	<u>1,413,475</u>
Total value of all wood products		\$27,959,167		\$442,698		\$2,145,243		\$30,547,109

Source: Truslow (1950)<sup>1</sup>

Charcoal accounted for one of the most widely utilized forest products in Cuba. Charcoal is used by Cuban's as one of the main sources for cooking. The production of charcoal was estimated at approximately three million bags in 1946, worth about seven million dollars. Unfortunately, charcoal production is detrimental to the environment, and is one of the predominant causes of deforestation in the first half of the Twentieth Century (Truslow, 1950).

<sup>1</sup> The Truslow Commission was sent by the US to categorize the economic potential of Cuba for further exploitation. The Commission was related to a precursor organization of the current World Bank.



The increasing environmental issue of deforestation could no longer be ignored as Cuba was entering the second quarter of the Twentieth Century. A crucial moment of Cuba's environmental history took place on April 13, 1926 when President Gerardo Machado approved the Decree 495. This was a document outlining the "absolute prohibition to clear in high woodlands belonging to the state or to private landowners". This ban on the clearing of high woodland forests to plant sugar cane was extended until the 1930's when the decree finally became a law (Monzote, 2008). The act of passing Decree 495 as a law by the Cuban authorities in the 1930's represented a progressive change in the attitudes towards the environment within Cuban territory.

### **3.2.1 Recommendations to Improve Forestry Practices in Cuba**

Recommendations adapted from Truslow (1950) in "The Report on Cuba" to improve Cuba's forest cover;

- 1) All responsibility for the control and administration of forestry and reforestation programs should be to one governing body such as the Ministry of Mines, Water and Forests.
- 2) Arrangements should be made for a "competent survey of the nation's forest resources, including inventory by species, approximate numbers and sizes of trees, areas covered and condition of stands" to develop appropriate reforestation programs.
- 3) There should be one qualified forestry specialist in each province to assist farmers and land owners in forest management.
- 4) The Ministry should enforce the planting of trees, example: commercial timber harvesters should be required to plant a seedling for every tree cut.

- 5) Exploration should take place into the growth processes of selected types of trees.

### **3.3 The Renewal of Forests in Cuba: the Revolutionary Period (1959-1989)**

The American influence in Cuba ended with the Revolution in 1959. Fidel Castro seized power on January 1, 1959. It marked the end of U.S. imperialism in Cuba and the beginning of Socialism with the implementation of Marxist-Leninist policies (Lahaye, 1996). The Revolutionary Period is characterized by the deterioration of Cuba's relations with the United States while marking the beginning of a flourishing relationship with the Soviet Union.

The United States became concerned with the uprising of the socialist movement in Cuba. In 1961, the United States implemented an embargo on Cuba which halted trade relations between the two countries. As a result, Cuba began to foster an even stronger relationship with the former Soviet Union, especially between the years of 1962 to 1989 (Ritter, 1992).

The Revolution marked the beginning of both social and environmental reform. Social reform became evident in areas of equal opportunities and access to employment, income, and basic services. Social development in Cuba progressed in such fields as Health Care, Education, Employment, and Social Integration. Education improved drastically, statistics for the school year in 1956-1957, prior to the Revolution had the percentage of school age children enrolled in school at 56.4 and in 1973 this percentage had increased to 98.5. To further bring this into context, in 1958, 717, 000 children

registered in primary education in the country which had increased to 1,898,000 children in 1973 (Castro, 1973). In the health care sector, between 1959 and 1991, over 1,500 Health facilities were constructed (Diaz-Briquets, 1983).

The Revolution brought significant changes to the environmental management by the State; some practices were more sustainable than others. A precursor to the environmental movement that would take place during the Revolution with respect to reforestation efforts was the various edicts of 1956 to 1958 regarding saving the forests in Sierra Maestra. Sierra Maestra was the mountainous area near the Castro's childhood home. At the time of the Revolution, the State claimed ownership of the forest resources, along with all other natural resources in Cuba. New policies were introduced which were environmentally conservative and the export of all timber was halted. Among the environmental sectors that received attention by the Cuban government was forest restoration. As a result of the decline in forest cover from 54 percent at the beginning of the Twentieth Century to 14 percent in 1959 (Table 1), the population widely supported the afforestation efforts introduced by Fidel Castro's government (LaHaye, 1996).

Fidel Castro's government, upon assuming power, began to implement a national reforestation program, as well as, providing a means to improve rural socioeconomic and employment, particularly in mountainous regions (Diaz-Briquets, 1996). Castro had outlined the need for reforestation as a national development priority as early as 1953, but the strategy had been banned for years (Castro, 1972). As a result of generations of the exploitation of Cuban forests, the country had developed an extreme dependency on lumber imports (Reed, 1992).

According to the reforestation framework implemented by Fidel Castro's Revolutionary government, between 1960 and 1966, 299 tree nurseries were constructed, and 348 million trees were planted (Nunez Jimenez, 1972; Diaz-Briquets, 1996). The data regarding the number of trees planted according to type of tree between 1960 and 1966 are represented in Table 2. Reforestation continued over the Revolutionary period and of the trees planted, approximately one third were eucalyptus (122 million), pines accounted for the second in volume (68 million), followed by casuarinas (48 million). Also, there were 109 million trees planted of other species (Nunez Jimenez, 1972). The data on the types of trees planted between 1960 and 1989 are given in Table 3.

**Table 3.** Number of Trees Planted (in millions) According to Type between 1960-1966

Year	Eucalyptus	Pines	Casuarinas	Other	Total
1960	25.8	0.1	0.2	4.1	30.5
1961	35.4	2.0	3.5	18.6	54.0
1962	31.9	3.7	8.2	26.2	58.1
1963	12.5	14.1	7.3	20.0	32.5
1964	4.9	8.6	7.3	16.3	37.1
1965	8.0	7.0	12.6	13.9	41.5
1966	3.6	31.9	9.3	10.4	55.2

Source: Nunez Jimenez (1972)

**Table 4.** Reforestation: Number of Trees Planted by Species in the Years, 1960, 1965, 1970, 1975, and 1976 -1989 (Million)

Year	Coniferous	Latifolious						Total
		Caoba	Majagua	Ocuje	Casuarina	Eucalyptus	Other	
1960	0.5	0.1	0.1	0.1	0.3	28.	1.5	30.7
1965	7.0	5.4	1.5	0.9	10.9	7.3	4.3	37.3
1970	6.5	0.7	0.7	1.2	2.7	0.1	1.1	13.0
1975	24.7	1.9	4.1	5.4	10.8	1.8	3.8	52.5
1976	26.9	3.0	4.0	1.7	13.2	3.8	3.1	85.7
1977	34.9	2.4	4.6	0.8	9.8	3.5	5.6	61.6
1978	41.2	3.5	3.3	0.9	10.6	3.2	5.3	68.0
1979	31.5	2.3	4.1	1.2	7.4	2.3	5.7	54.5
1980	34.7	1.7	4.2	3.2	9.7	2.1	11.5	67.1
1981	32.1	3.7	5.8	4.2	6.9	4.0	18.1	74.8
1982	22.9	3.9	5.3	7.8	7.0	3.0	19.3	69.2
1983	36.9	8.4	5.5	10.6	15.5	12.9	49.3	139.1
1984	40.1	6.6	3.5	11.1	17.0	12.4	50.1	140.8
1985	38.8	4.8	5.1	14.5	24.2	15.2	38.4	141.0
1986	30.5	2.7	4.8	11.1	15.0	12.5	48.3	124.9
1987	31.9	3.3	4.6	8.0	14.7	13.0	52.5	128.0
1988	23.0	3.3	3.8	6.3	7.6	7.5	86.6	138.1
1989	16.6	5.0	6.8	10.6	9.0	5.9	128.4	182.3

**Source: Comite Estatal (1990)**

However, as a result of poor education on forestry management early in the Revolutionary period, a significant proportion of the seedlings did not survive due to the poor quality of the seeds, species-site mismatches, and failure to manage the plantations properly (LeHaye, 1996). Other problems arose, especially earlier in the Revolutionary period, as the national reforestation program framework was under criticism. In 1993, Levins, provided a report on the poor reforestation practices that occurred in the mid-1970's;

*“the Institute of Botany refused to work with the Forestry Institute on its plan for terracing the mountainsides in Pinar Del Rio, planting monocultures of teak or hibiscus and clear-cutting of trees. They saw the plan as too vulnerable to pest problems and provoking massive erosion”*

As environmental education increased, especially in the area of forestry, reforestation programs became more successful. Volunteer efforts contributed to the success of the reforestation programs, during the Revolution period most Cubans planted trees. The reforestation framework initiated in 1959, resulted in the forest cover increasing from, the all time low of 14 percent in 1959 to 19.5 in 1991 (CITMA, 1993). This increase in forest cover was achieved through more sustainable management of timber harvesting rates, but more directly through reforestation (Westoby, 1989).

Another environmental strategy initiated during the Revolutionary period was the establishment of protected areas of forests. This was not the first time in the nation's history that forests were set aside as parks; in 1930, Cuba designated its first national park with four more to be established before 1959 (Houck, 2000). However, the designation of protected areas increased significantly during the Revolutionary period. Protected Areas Network (PAN) effectively organized and preserved forested areas since the enactment of Law 33 (Government of Cuba, 1993). Exemplifying the effectiveness of protected areas; natural forests accounted for 84 percent of the total area forested in 1992, of this total, two-thirds or 67.6 percent of the forests were recognized as protected areas while the other one-third or 32.4 percent was used for timber production (Diaz-Briguets, 1996). Cuba's PAN system, along with International cooperation had led to the development of several forest areas; 4 World Biosphere Reserves, 10 national reserves, and 5 national parks (Government of Cuba, 1993). Among the World Biosphere Reserves was Sierra Del Rosario which is located in Pinar Del Rio.

Legal framework pertaining to environmental issues, in particular forestry management, was essentially first implemented in the Revolutionary period. The first act

implemented by the revolutionary government was the Law of Agrarian Reform. The first Law of Agrarian Reform was structured around many different components including projects of reforestation (Houck, 2000). Cuba's commitment to the conservation of the environment was solidified in 1976 as the constitution outlined the need to create an agency to address environmental issues;

*“To assume the well being of its citizens, the state and society will protect nature. It is incumbent on the responsible agencies and on each citizen as well to see that the waters and air are maintained in a clean condition and that the soil, flora and fauna are protected.”*  
(Constitution, 1976)

Furthermore, in 1976 the National Commission for the Environment and the Conservation of Natural Resources (COMARNA) was established which was a conglomerate of Cuba's environmental agencies. COMARNA was largely advisory not a regulatory body and addressed issues that ranged from public health, to water, to fisheries and forestry (Houck, 2000). In 1981, Cuba adopted Law 33 which addressed environmental issues. This law was perhaps too advanced for its time and ineffective as it did not have an implementation mechanism (Houck, 2000).

The Revolutionary period was a time of environmental rebirth, especially in the area of forestry in Cuba. National reforestation programs implemented by Castro's Revolutionary government were effective in increasing the forest cover of the Island Nation. In the late 1980's, according to the COMARNA, for every hectare of forest harvested, 16.9 hectares of trees were being planted (Reed, 1992). Sustainable timber harvesting combined with extreme reforestation efforts aided in the regeneration of Cuban Forests. From 1959 to 1991, forest cover increased from 14 percent to 19.5 percent (Table 1).

### **3.3.1 Environmental Legal Framework of the Revolutionary Period: Highlights**

1959

The Agrarian Reform Law: the new government expropriated land from private owners with the government acquiring ownership of the land to which some of the degraded public land was designated as new forest development areas;

Environmental education programs were implemented to increase awareness and, in particular, train individuals in forestry techniques;

Forestry Management Strategies were introduced;

1976

The Constitution outlined the need for environmental agency in development (Article 27) with citizens and the state assuming responsibility in environmental protection;

The National Commission for the Protection of the Environment and the Conservation of Natural Resources (COMARNA) was established;

1981

Law 33, the Environmental Protection and the Rational Use of Natural Resources was adopted which reflected the requirements of environmental protection and sustainable development, addressing institutional means of sustainable forest protection activities.

### **3.4 Forestry and the Special Period (1989-Present)**

The disintegration of the former Soviet Union and Socialist nations of Eastern Europe had severe repercussions for Cuba. Subsequently, Cuba's economy was initially crippled by the dissolution of the Socialist Nations. Cuba had depended on the former Soviet Union and the Socialist Nations of Eastern Europe for approximately 80 percent of the country's trade relationships (Cuban National Bank, n.d.). As the Soviet-Cuban



relations deteriorated, the U.S. embargo on Cuba became more stringent with new U.S. legislation designed to cripple the Cuban economy (Eckstein, 1994). The Special Period can be characterized as an extended period of economic crisis in which the country was relatively isolated from the international markets. Cuba had no choice but to become sustainable as they were forced to rely on their own resources. Ideologies within the country shifted towards sustainable development in every sector. This followed Fidel Castro's participation in the Rio Summit in 1992, within a month of the summit, sustainable development was made a priority in the Cuban Constitution.

Forestry, in particular, was relied upon for a magnitude of products including: energy, medicine, food, building materials, recreation, and small scale industrial materials (LaHaye, 1996). The use of wood for fuel increased greatly as Cuba's supply of oil and other fuels were diminished (Diaz-Briquets and Perez-Lopez, 1995). In 1995, the National Energy Source Development Programme of Cuba acknowledged that the recent increases in the dependency of fuelwood were "weakening an already poor forest resource" (LaHaye, 1996). After years of reforestation efforts in Cuba during the Revolutionary period, in the early 1990's, between 1993 and 1995, estimates suggested that deforestation had surpassed afforestation efforts (LaHaye, 1996).

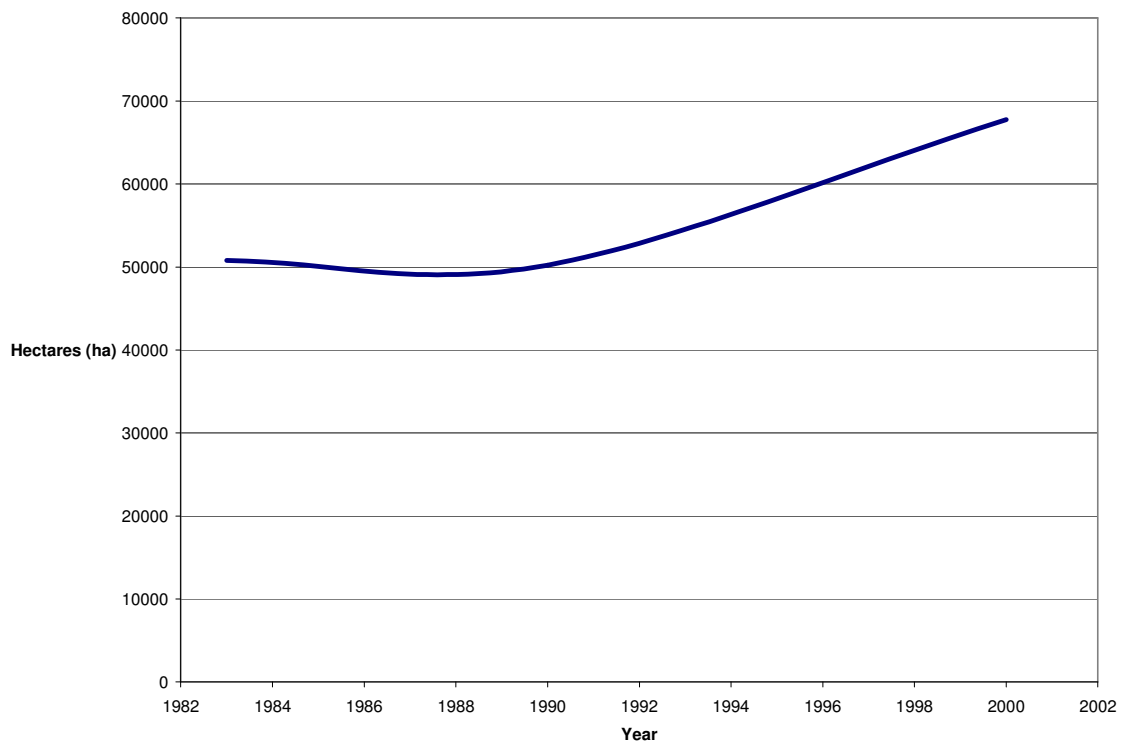
One of the leading contributors to the increase in dependency on Cuban forests, resulting in deforestation, was changes in trade of forest products and the economic repercussions. In terms of economic value and quantity, Cuban imports of lumber declined during the 1990's, as a result of the loss of the Soviet Unions subsidies and trade preferences with Eastern European Socialist Nations. For example; the quantity of

coniferous forest product imports decreased from 510,500 cubic meters in 1989-91 to 3,900 cubic meters in 1998 (Ross, 1999).

In Cuba, deforestation and the resulting habitat fragmentation were identified as main causes of species endangerment and extinction (Tuxill and Bright, 1998; Maal-Bared, 2005). One species, in particular, the *Pinus tropicalis* Morelet had been identified as a species at risk between the years of 1994 to 1999 (Alvarez et al., 2001). The *Pinus tropicalis* Morelet is an endemic conifer of Cuba, which is naturally distributed in the dry areas on the province of Pinar Del Rio and the municipality of Isla de la Juventud. The species can grow to a height of 20 m (Bisse, 1998). The variation in growth, resin production, and needle composition make the species ideal for a variety of uses including use as a feed supplement for battery chickens (Alvarez et al., 2001). Another characteristic contributing to the endangered status of the *Pinus tropicalis* is that the seedlings of this species are more susceptible to the pest *Fusarium spp.* than the other predominant pine species in Pinar Del Rio, *Pinus caribaea*. Also, defective aspects of *P. tropicalis* seed germination contribute to the decrease in numbers of the species (Alvarez et al, 2001).

In 1983, there was a recorded 53, 512ha of natural *P.tropicalis* in Cuba, of that total 50, 790ha were found in Pinar Del Rio and 2, 722ha in Isla de la Juventud. In 1990, the species had dropped by 1, 056ha (1.97 percent) to a total of 52, 456ha, with 50, 204ha in Pinar Del Rio (1.15 percent decrease from 1983) and 2, 252ha in Isla de la Juventud (a 17.27 percent decrease). In 1994, as a result of the decrease in the species, 6, 595ha of *P. tropicalis* plantations were established, with 6, 567ha in Pinar Del Rio and 27.4ha in Isla de la Juventud (Alvarez et al, 2001). In 1999, it was recorded that 121ha of

*P. tropicalis* were felled and only 10ha were planted because of difficulties with seedling (Alvarez et al, 2000). Despite this regression in 1999, data provided by the State Forest Service showed that in 2000, of the 450, 000ha of forested area in the province of Pinar Del Rio, 67, 773.8 ha were *P. tropicalis*, a 33.4 percent increase over the 1983 data for this species in the province (Bonilla, 2001). The volume increase of *Pinus tropicalis* in Pinar del Rio between 1983 and 2000 is depicted in graph 1.

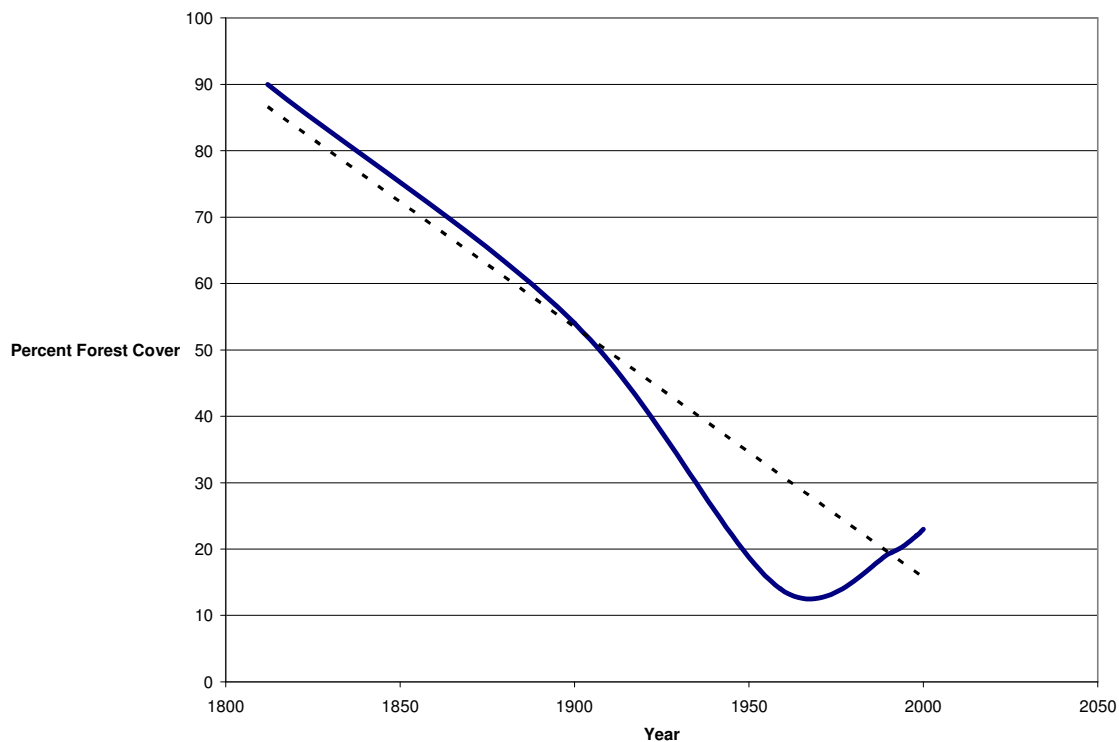


**Graph 1.** Volume (ha) of *Pinus tropicalis* in Pinar del Rio between 1983 and 2000

Also, threats have been recorded regarding some of Cuba's rarest palm trees. The species, *Coccothrinax crinita* is critically endangered. Only 130 individuals of this species remain in the wild and they are located in two regions of Pinar del Rio

(Global Trees Campaign, n.d.). A reason for this species status is the wide variety of uses it provides for the local people. The species leaves and fibres are used to make brushes, hats and fillers for pillows and mattresses. As well, the trucks are used in the construction of houses (Global Trees Campaign). The awareness of the endangered status of this species, as well as, another species, *Buxus spp.* that grows in the same forest sites was acknowledged in the late 1990's (Global Trees Campaign, n.d.).

Despite, the increased dependency on forest products as a result of the collapse of the Soviet Union and Socialist Eastern European Nations, Cuba continued to increase the forest cover of the island nations. Although, data suggested that deforestation was surpassing afforestation in the early 1990's, forest cover increased to 22 percent in 1998 (Graph 2).



**Graph 2.** Forest Cover (percent) of Cuba's Territory (CITMA, 1993; Lane, Unpublished; World Resources Institute, 2003).

In context of the era, Cuba, as well as other countries that attended the 1992 Rio Summit were forced to conceptualize their relationship with the environment. As a result, Cuba started establishing more stringent frameworks regarding environmental management such as institutions, policies, programs, and laws governing environmental impact assessments, forests, management of protected areas, and environmental education (Lane, 2000). During the Special Period, Cuba developed a more in depth realization of the connection between sustainable development and the conservation of natural resources and this was reflected in the policies developed.

Two major pieces of environmental legislation concerning forestry were passed during the Special Period. They were complemented by numerous other policies. The first was Law 81, enacted in July 1997, entitled “The Law of the Environment”. It is a comprehensive law consisting of 14 titles and 163 articles that address air, water, waste, noise, toxic substances, historic preservation, biological diversity, national parks, forests, wildlife refuges, coastal zone management, education, research and technology, environmental impact assessment and planning, inspection, enforcement, and penalty regimes (Houck, 2000).

The second legal framework addressing forest management was the comprehensive Forestry Act which was approved by the National Assembly on July 21, 1998. The Forestry Act consists of 70 articles addressing the use of Cuban forests, outlines a forestry fund, provides framework for preserving wood species and the extension of forest cover. Beyond all, the Act calls for forest cover to be increased to 27 percent of the national territory by 2015 (Ross, 1999).

### **3.4.1 Environmental Laws and Policies: Highlights**

1992

National Plan of Action (NAP) was rewritten in co-ordinance with recommendations of the 1992 United Nations Conference on Environment and Development (Rio Summit);

State Program for the Comprehensive Development of Mountain Areas to promote conservation and local participation in the management of natural resources;

1994

Establishment of the Ministry of Science, Technology, and the Environment (CITMA) to replace COMARNA as the lead agency for implementing environmental policies;

1997

Law 81, the Law of the Environment is introduced stating the necessity of updating legal principles, objectives and basic components of Cuba's environmental policy, institutional framework and tools for their implementation, the powers, functions and duties of the state agencies and bodies and, in general, the rights and obligations of natural and legal persons (Houck, 2000);

1998

The National Assembly approved a comprehensive Forestry Act outlining the goal of achieving 27 percent forest cover of the Cuba's national territory by 2015.

## **Chapter 4. Conclusions**

### **4.1 Trends in Forestry in Cuba over the 20<sup>th</sup> Century**

Forest ecosystems around the world have been modified or transformed by anthropogenic activities to satisfy the needs of human societies. Cuba has had a fascinating history of human interactions with forest resources of the country. Over the 20<sup>th</sup> century, ideologies that regulated resource use shifted from exploitation to

conservation and the consequences of these changes had significant effects on forest ecosystems, primarily in the rates of deforestation and afforestation.

This study did not focus on the relationship between population growth and deforestation but it is important to recognize that historically, deforestation has been correlated with population growth as there is an increasing need for arable land which encourages the conversion of forest land to other (usually agricultural) uses (Cropper & Griffiths, 1994). This trend is evident throughout Cuba's environmental history with the exception of the second half of the 20<sup>th</sup> century. From the time of discovery until 1959, deforestation coincided with population growth. However, this trend did not continue into the later half of the 20<sup>th</sup> century as forest cover increased due to social, political, and policy-making reforms.

Furthermore, colonialism and the colonial legacy that respectively affected Cuba prior to, and into the first half of the 20<sup>th</sup> century is one of, if not the predominant, cause of the deforestation of the national territory. The pressures on forest ecosystems brought about by colonialism and the neo-colonial period exaggerated deforestation. Under Spanish colonization, Cuban forests were utilized to meet the needs of not only Cuban societies but also Spanish societies. Large quantities of wood products were being shipped to Spain to aid in the development of infrastructure within the country. Then when Spanish Colonialism ended at the end of the 19<sup>th</sup> century, the United States expansionism manipulated Cuba into becoming a neo-colony. Agreements made between Cuba and the United States during the Neo-Colonial period were disastrous for the forest ecosystems of the island state. Forest cover decline was at its highest rate from 1900 to 1959. Huguet (1958), would agree with this statement as he referenced that the

interference of the United States was the predominate cause for the large scale deforestation operation in Cuba during the Twentieth Century.

The Cuban Revolution brought about the rebirth of state sovereignty. Sovereignty, being defined as the authority claimed by the state over state matters without the interference from foreign states. State sovereignty is instrumental in the management of natural resources. The research indicated a direct link between a shift from colonial control to centralized state control in Cuba and the rate of deforestation. Afforestation rates surpassed deforestation rates as Cuba became an autonomous nation.

Gadgil and Guha (1992) would agree with this finding as their research regarding the ecological history of India indicated that the shift from colonialism to centralized state control in India had a coinciding shift from unsustainable uses of forest resources to practices that had an emphasis on scientific management of timber species. Furthermore, the research by Gadgil and Guha (1992) acknowledged that colonial legacy of state control over forest resources continued after India gained independence in 1947. If it had not been for the radical changes brought by the Cuban Revolution in 1959, primarily the political shift from the capitalistic influence of the United States to Socialism, the deforestation trend in Cuba potentially could have undoubtedly continued.

Along with the radical political changes that the Revolution brought, there was also drastic social reform. Many sectors within society improved, and in particular the education and health sectors. This was instrumental as forestry management emerged in education curriculums. This contributed to the success of the national reforestation efforts as educational advances within the Cuban society emphasized the awareness of the



importance of forest ecology. The reforestation efforts were successful as forest cover increased from 1959 to the end of the 20<sup>th</sup> century.

The Revolutionary Period also marked a change in Cuba's economic system as there was a shift from capitalistic ideologies to socialistic and communistic ideologies. The shift had significant effects on the standard of living of Cuban citizens as basic needs were provided. There is a link between economics and deforestation that goes beyond the obvious relationship of the increase in value of wood products and the increase in rate of deforestation. This model of deforestation is best illustrated by the deforestation rates in the early 1900's. The more complex relationship between economics and deforestation involves societal incomes and behaviors. As Cubans were supplied with basic needs and alternative energies became available, primarily through the relationships forged with the former Soviet Union and other Socialist Nations of Eastern Europe, the need for wood resources decrease. Cropper and Griffiths (1994) addressed this argument of the relationship between economics and deforestation. They concluded that with a decline in deforestation rates among countries having higher incomes and, therefore having access to improved living conditions, a switch occurred to energy sources other than firewood. In addition, agricultural techniques that reduce the demand for agricultural land are often adopted, thus decreasing deforestation rates.

Retroactively, the Special Period resorted to some pre-Revolution practices as Cuba was forced to become more self-sufficient after the collapse of the Soviet Union. The United States embargo further forced Cuba to rely on their resources. In particular, oil and other means of energy became scarce, resulting in the use of wood products for fuel again. Land for agriculture also became an issue in Cuba again. Allegedly,

deforestation surpassed afforestation efforts in efforts in the early 1990's as there was an increased dependency on wood products within the Cuban society (LaHaye, 1996).

Despite the increase need for Cuba to use their resource, in particular their forest resource, forest cover continued to rise into the 21<sup>st</sup> century. The continuation of sustainable forestry practices can be attributed to the improvement in environmental education that instilled the intrinsic value of the forest ecosystems within the society, as well as the improvement in environmental law, policy-making and implementation.

Environmental law and policies regarding forestry was a relatively new phenomenon in Cuba introduced with the Revolution. For the purpose of conceptualizing the history of forestry legislation of Cuba, a comparison will be made with the history of forest legislation in Canada. Seemingly, both countries went through similar evolutionary stages of policy and legislation implementation. However, there is a significant difference in the time frame between Cuba's enactment of these laws when compared to Canada's time frame.

The first stage of forest policy and legislation in Canada was unregulated exploitation which occurred until the mid-19<sup>th</sup> century. This period was strongly characterized by the colonization of North America in which Britain preserved large quantities of timber for masts for the Royal Navy (Natural Resource Canada (NRC), 1997). In comparison, Cuba endured the same situation but not until the mid-20<sup>th</sup> Century.

The second stage in Canadian forestry history was regulation for revenue which occurred in the mid-to late 19<sup>th</sup> century. Evidence in Cuban history of revenue inspired action to intervene in forestry practices can be inferred from the data on the economic

value of wood products of authorized and unauthorized cutting of forests in Cuba presented in the Report on Cuba (Truslow, 1950). However, no regulations based on revenue were found in the research on Cuba's forestry legislation history.

The third stage in Canada's legislative history pertaining to forestry practices focused on the ideologies of conservation occurring in the late-19<sup>th</sup> to mid-20<sup>th</sup> century. An example of such legislation was the "creation of forest reserves to protect forest land from other uses" as represented in Ontario's Forest Reserve Act of 1898 and the federal 1906 Dominion Forest Reserves Act and the establishment of reforestation programs (NRC, 1997). Respectively, Cuba developed similar legislation but not until the Revolution in 1959.

The fourth stage in Canada's policy and legislation history was based on timber management which occurred during the mid-20<sup>th</sup> century to the late 1980's (NRC, 1997). As a result of the Revolution and the focus on forestry, Cuba had accelerated to this stage to proceed through it at the same time as Canada. Cuba's Law 33, enacted in 1981, emphasized the nation's commitment to timber management. The law outlines the "rational use of natural resources" pertaining to sustainable forest protection activities (Houck, 2000).

Lastly, the present stage of Canada's forestry legislation development is sustainable forest management which began in the late 1980's. Cuba is also currently in this stage with their forestry management development. The Comprehensive Forestry Act (1998) best describes Cuba's commitment to sustainable forestry practices as the legislation outlines the objective of increasing forest cover of the national territory by 2015 (Ross, 1999). Forestry policies and legislation reflect the changes in political and

societal attitudes towards the environment, and therefore, can act as indicators of the importance of environmental issues within society. Through this comparison, the advancement in Cuba's perceptions of the importance of forest ecosystems can be inferred.

As deforestation is an environmental issue that has global effects, an international forestry law is pertinent. Discussions regarding an international forest law have been ongoing within the United Nations Forum on Forests (UNFF), however, no legal framework has been decided upon (Dickson & Cooney, 2005). International legal frameworks regarding forests would place constraints on countries that are exploiting their forest resources. Also, without a legal framework in place, Countries that are practicing sustainable management of their forest resources maybe inclined to revert back to unsustainable practices as a result of political or social disruption such as economic hardships.

Deforestation is a critical environmental issue that needs to be addressed. Cuba is a country that has changed the trend of deforestation within the country's borders. During the second half of the 20<sup>th</sup> century, political and social realms of Cuba increasingly began to realize that an intrinsic link existed between sustainable development and conservation of natural resource (Maal-Bared, 2005). Cuba's environmental history regarding forestry management in the 20<sup>th</sup> century describes the political and social evolution from exploitation to conservation of the natural resource and can be deemed successful in overcoming deforestation.

## 4.2 Limitation to the Study

Data for this study was obtained from previously published material, and material collected by other researchers. As a result of the methods used for this study, access to information was not consistent throughout the 20<sup>th</sup> century history of Cuba. Information regarding forested area as a percentage of Cuba's national territory *was* the constant variable over the 20<sup>th</sup> century and, therefore was the most useful forestry data for this study. Also, it is important to note that environmental history is a relatively new discipline; historians often did not recognize the environmental changes in their work prior to the development of this field.

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