

Haiti Country Analysis of Tropical Forestry and Biodiversity

(Sections 118 and 119 of the Foreign Assistance Act)

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USAID
US Forest Service (METI)

Acronyms

ALERTE	Association pour la Lutte contre l'Erosion et la Réhabilitation Totale de l'Environnement
ANDAH	Association Nationale des Agronomes Haïtiens
ANAP	Agence National des Aires Protégé
ASEC	Assemblée des Sections Communales
ASSET	Agriculture Sustainable Systems and Environmental Transformation
ATPPF	Projet d'Appui Technique pour la Protection des Parcs et Forêts
BAPP	Bureau d'Approvisionnement en Produits Pétroliers
BID	Banque Interaméricaine de Développement
BME	Bureau des Mines et de l'Energie
CAMEP	Centrale Autonome Métropolitaine d'Eau Potable
CASEC	Conseil d'Administration des Sections Communales
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CIDA	Canadian International Development Agency
CIFOR	Center for International Forestry Research
CNRA	Commission Nationale de Réforme Administrative
CONATE	Conseil National de l'Aménagement du Territoire et l'Environnement
ECVH	Enquête sur les Conditions de Vie en Haïti
EDH	Electricité d'Haïti
EQPPH	Enquête sur les Perceptions de la Pauvreté en Haïti
ESMAP	Energy Sector Management Assistance Program
FAES	Fonds d'Assistance Économique et Sociale
FAO	Food and Agriculture Organization (United Nations)
FEM	Fonds de l'Environnement Mondial
FPPTAP	Forest and Parks Protection Technical Assistance Project
<i>FREH</i>	<i>Fonds pour la Réhabilitation de l'Environnement Haïtien</i>
GOH	Government of Haiti
GRAP	Groupe de Recherche en Administration Publique et Management International
IADB	Inter-American Development Bank
IAEA	International Atomic Energy Agency
IFAD	International Fund for Agricultural Development
IHSI	Institut Haïtien de Statistique et d'Informatique
IICA	Inter-American Institute for Cooperation on Agriculture
LGL SA	
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles, et du Développement Rural
MDE	Ministère de l'Environnement
MPA	Marine Protected Areas
MPCE	Ministère de la Planification et de la Coopération Externe
MPECE	Ministère de la Planification, de l'Environnement et de la Coopération Externe
MSP	Ministère de la Santé Publique et de la Population
MTPTC	Ministère des Travaux Publics, Transports et Communications
NB	Nota Bene
NBSAP	National Biodiversity and Action Plan
ODVA	Organisme de Développement de la Vallée de l'Artibonite
OMS	Organisation Mondiale de la Santé
ONG	Organisations non Gouvernementales
OPC	Office de Protection du Citoyen
OPS	Organisation Panaméricaine de la Santé

OSAMH	
PAGE	Projet d'Appui à la Gestion de l'Environnement
PADF	Panamerican Development Foundation
PAE	Plan d'Action pour l'Environnement
PAHO	Pan American Health Organization
PAM	Programme Alimentaire Mondial
PNUD	Programme des Nations Unies Pour le Développement
PNUE	Programme des Nations Unies pour l'Environnement
POP'S	Cartagena Protocol on Biosafety, Pollutants Organic Persistent Convention
PRIGE	Renforcement Institutionnel de la Gestion de l'Environnement
PRODETER	Programme de Développement du Territoire
SEDREN	Société d'Exploitation et Développement Économique et Naturel
SHADA	Société Haïtiano-Américaine de Développement Agricole
SMCRS	Service Métropolitain de Collecte des Résidus Solides
SNEP	Service National d'Eau Potable
SRF	Service des Ressources Forestières
TNC	The Nature Conservancy
TM	Tonne Métrique
TPTC	Ministère des Travaux Publiques, Transport, et Communications
UNFCCC	Conventions such as United Nations Framework Convention for Climate Change
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
UTSIG	Unité de Télédétection et de Systèmes d'Information Géographique
WFP	World Food Program

Executive Summary

Haiti continues to be held up as the example of ecological, social, and economic devastation in the western hemisphere. With recent flooding disasters and political unrest, a newly elected government has a daunting task ahead of it, and no more so than in the area of biodiversity conservation. The major cause of deforestation and biodiversity loss is land pressure due to population and degradation of soils, causing the poor to clear and farm increasingly unsuitable land. Major tree cover was lost when mangoes and then coffee became unprofitable and thus were cut down in favor of marginally profitable annual crops. A more recent cause of tree cover removal was the embargo of 1991-94, when selling trees for fuel was one of the only options for cash. These factors have since been mitigated and some small increases in tree cover have been seen in recent years due to specialty markets for these tree crops.

There are no direct threats to forests or biodiversity posed by USAID's new draft strategy. The strategy focuses on stability and addressing root causes of fragility, and should positively impact the status of forest and biodiversity. This is especially true in the economic and livelihoods domain as one of the primary reasons for forest and biodiversity loss is the encroachment of poor peasants into high biodiversity areas in order to eke out just enough for survival.

Recommendations

USAID must be vigilant not to indirectly put additional biodiversity rich areas under threat by developing the economic base around these last islands of nature. One habitat particularly vulnerable to increased development is the mangrove and coastal wetland ecosystem. Careful attention must be paid to the possible effects of increased agricultural production (from sediment and chemicals) and exploitation for building materials and fuel. Many of Haiti's watersheds drain into these rich habitats and development in lowlands, urban hot spots, and hillsides can have unintended impacts. Particular care should be taken in the proposed JOBS programs in Port au Prince, Cap Haitian, and Gonaives due to the presence of mangroves.

USAID Haiti is in the process of designing its new three year strategy (2007-2009) based in the fragile states strategy of USAID, and is mainly concerned with returning stability to the country after a period of transition. Thus, USAID's draft strategy does not directly address biodiversity and forest conservation. The proposed enhancement of government capacity especially in the ministries of Agriculture and Environment comes closest to direct action. However, the biggest threat to forests and biodiversity is the combination of poverty, institutional weakness, and the lack of government direction for the management of natural resources. The draft strategy does address these threats and therefore meets the most critical needs for biodiversity conservation.

USAID should attempt to link all of its programs with biodiversity, forest, and general environmental conservation. An example of this is the mangrove conservation requirement recently introduced to the urban based JOBS program. Additionally, USAID should remain open to targets of opportunity for the promotion of biodiversity and consider funding targeted activities especially where no other donor or entity is active. Two areas that present possible current opportunities are: the Forêt de pines and selected marine and coastal resources.

As most international aid focuses on stabilization; donor, NGO, and government coordination of conservation and natural resource management programs is essential for Haiti if the scarce funds in this area are to have an impact. Thus, support to the proposed National Environmental and Vulnerability Observatory is recommended. This program is chaired by UNDP and will consolidate environmental program data and GIS, taking on the role that USAID sponsored STAB (Watershed Information System) program did in the past. Based on donor coordination, USAID can make

contributions towards the support of the new Agence National des Aires Protégées as well as help determine a support strategy for the Foret des Pins which is not currently in any donor's development plans

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I. Introduction

Few countries in the world face a more serious threat to their own survival from environmental catastrophe than Haiti. Overpopulated, its resources are overexploited and trends towards further environmental degradation are apparent everywhere. The chance for reversing these trends, thereby preventing human suffering, destabilization of the country, and the further loss of development potential is diminishing daily. Much needs to be done, and quickly (Haiti Country Environmental Profile, Ehrlich et al., 1987). This vivid indication of the status of Haiti's tropical forests and biological diversity was portrayed in the opening words of the Haiti Country Environmental Profile in 1987. Unfortunately, these same words can be used to describe Haiti today, nearly 20 years later.

Degradation of watersheds due to inappropriate land use throughout the country has resulted from an increase in population above the carrying capacity of the land, coupled with the traditional agricultural practices of the Haitian peasant. In the absence of change, loss of habitat through deforestation, overgrazing and siltation of nearshore marine areas will continue and have a devastating effect on threatened, endangered and rare species.

Protection of natural areas has received little priority from the Haitian government. Largely as a result of the USAID-funded National Parks project, the Pic Macaya and La Visite National Parks were declared by the decree of April 1983, partially surveyed, and a management plan developed. The Massif de la Hotte and the Massif de la Selle, two major mountain ranges in Southern Haiti that harbors the Parc National Macaya and Parc National La Visite, are the main Haitian hotspots in terms of biodiversity.

According to Judd et al (reported by Joel Timyan 1998), nearly 700 species of vascular plants have been collected in the larger area of the Macaya Biosphere Reserve representing about 270 genera and 109 families. About 500 species of vascular plants have been collected in Parc National Macaya. The latter includes over 130 species endemic to Hispaniola (29%) of which over 70 species are endemic to Massif de la Hotte, representing 15% of the park flora. The majority of the endemics are among the flowering plants of which 19% are endemic to this region. Families representing the largest number of endemic species include Orchidaceae (39), Melastomataceae (29), Urticaceae (12), Asteraceae (15), Solanaceae (7) and Myrtaceae (6). Within the Orchidaceae, 29% are endemic to this region and 74% are endemic to Hispaniola.

Over 300 species of vascular plants have been collected in Parc National La Visite, representing 201 genera and 89 families. This represents 14% of the park flora. The majority of the endemics are among the flowering plants of which 16% are endemic to this region. Families representing the largest number of endemic species include Asteraceae (11), Melastomataceae (7), Urticaceae (8), Solanaceae (5) and Myrtaceae (5). Within the Orchidaceae, only 11 species have been found, requiring further study to confirm their status.

General description of Haiti

A - GEOGRAPHY

The Republic of Haïti shares with the Dominican Republic the second largest island of the Caribbean also known under the name of Hispaniola. Haïti occupies one third (27750 km²) of the territory on the Western side of the island. It is located between 18° and 20° north of latitude and between 71°30 and

74° 30 west of longitude. It is surrounded by the Atlantic Ocean to the North, the Caribbean Sea to the West and South and by the Dominican Republic (DR) to the East (Fig 1: Haïti in the Caribbean). The Haitian coastline covers 1535 km before giving a way to a relatively narrow continental shelf of 5000 km². Its also comprises five satellite islands: La Gonave (670 km²), La Tortue (180 km²), Ile-à-vache (52km²), Cayémites (45km²) and La Navase (Navassa island : 7 km²).



B - POPULATION

Historically, it has been estimated that as many as one million Tainos inhabited the island prior to the arrival of Christopher Columbus. The 16th century witnessed a complete collapse of the Amerindian population, mostly due to the introduction of diseases and intolerance to slavery conditions. This was followed by a gradual increase in population as the Amerindian population was replaced with ethnic groups originating in Africa and Europe. Haïti was considered the most productive of the French colonies during the Napoleon era. The sugar cane plantation economic system required a large number of slaves, resulting in Haïti's head start on the acceleration of its population.

Today, the country is one of the most densely inhabited regions in the Caribbean. The current overall density population is 286 inhabitants per km² with higher concentrations in the West Department: 641 per km² (IHSI 2003). Haïti's population is estimated to be 8 millions with a 2.2% annual growth rate. At this rate of annual growth, the doubling time of the population is approximately 32 years (2035) according to last census held in 2003 by the IHSI. The population is heavily skewed toward the younger age groups: 40 % of the population is younger than 15 years of age and the median age is 20 years.

C – CLIMATE

Haïti lies in the Low Subtropical Region (18 – 20 degrees North Latitude), not truly tropical but rather that portion of the Tropical and Warm Temperate Regions which is free of frost at low elevations above sea level and in which the temperature range is significantly wider than in the deep tropics.

Haïti's climate is a result of the country's position in the Caribbean and its mountain terrain. Hurricanes, Tropical storms, natural fire are largely influenced by Caribbean climate factors. These have shaped the natural ecosystems of the country.

Haïti is an Amerindian word that means *Mountainous land*. Mountains occupy 75% of the country and their orientation greatly influences local rainfall and insolation regimes. The climate of the plains and lower montane regions is primarily tropical monsoonal, while that of the montane area is sub-tropical. The dominant winds are from the northeast and the northerly directions. As a result, the moist ecosystems generally occur on the windward mountain slopes and the sub-humid ecosystems occur in the rain shadow of the leeward exposure. Most precipitation is brought by the Northeast Trade Winds and to a lesser extent by winds from the east. Site specific rainfall patterns are influenced mostly by orographic factors (related to topography). For example, high land masses such as mountains intercept precipitation so that the highest rainfall areas are in the mountains of the north coast (near Cap Haïtien) and in the southwest peninsula.

Rainfall patterns range from less than 400 mm in the northwest to more than 3000 mm in the mountains of the southwest. The arid and semi-arid coastal zones receive the least amount of rainfall. Two ranges in the southern part of the country - the Massif de la Hotte and the Massif de la Selle including Pic la Selle (the country's highest peak at 2,684 meters above sea level) – constitute the wettest spot of Haïti.

D – GEOLOGY AND SOILS

According to some theories, the island of Hispaniola was created by the uplifting of three major land masses and their subsequent collision over geologic time. These land masses were derived from oceanic crust, uplifted and influenced by the level of sea. Most marine terraces were exposed during the Pleistocene era. There have been no major sea level changes in the last 10,000 years.

In Haïti, exposed rock formations are igneous, metamorphic and sedimentary origin. The latter formations are the most abundant (80%) and are represented by limestone deposits from the middle and upper Eocene era.

Accordingly, the parent material of soils in Haïti is primarily limestone. These soils are moderately young and fertile, exhibiting neutral to alkaline pH properties and with a tendency toward salinization where exposed to high evapotranspiration rates from irrigation or salt water intrusion. Pockets of basalt soils (mostly igneous rock) are found throughout the country, giving rise to soils that are less fertile and more highly eroded. More highly weathered oxisols and *beauxitiques* soils (*sols ferralitiques et sols ferrugineux*) are a feature of several montane areas of the country.

E – HYDROLOGY

In general, precipitation increases and evapotranspiration decreases as a function of elevation in Haïti. The major portion of the rainfall that occurs on the island is orographic, or the result of warm moist air rising rapidly as a result of the mountainous topography. The humid and wet montane systems are the source of major rivers and streams in the country, as well as the aquifers of the highly porous limestone substratum.

Dissected by numerous mountain ridges and flowing across two relatively narrow peninsulas, Haïti's rivers are mostly short and swift flowing. The exception is the Artibonite river which originates along the border with the Dominican Republic and flows for approximately 290 km. Along this river is found the country's major hydroelectric power generating facility (*Le Barrage hydro-électrique de Peligre*).

Surface water is used by the great majority of people in Haïti for domestic purposes (drinking water and irrigation). In fact, four large irrigated plains constitute the country's most important agricultural areas: the *Plaine du Nord*, *Fort Liberté* area in the North, the Lower Artibonite and Estere Valleys in the Artibonite Department, the *Cul de Sac* plain in the West and the *Les Cayes* plain in the South. Groundwater represents the second most important source of water.

Erosion has resulted in heavy siltation and the deposit of talus in many of the riverine systems with drainage becoming subterranean in many cases. This has resulted in a dramatic increase in peak hydrological response that, in turn, has caused a great probability of flooding and destruction to downstream communities.

G – ECONOMY AND SOCIO-ECONOMIC CONDITIONS

With an annual per capita GDP of US \$ 361 in 2003, Haïti is the poorest country in the Western hemisphere. After growing at an average annual rate of 2.3% in real terms in the 1970's, real per capita GDP was an average of 2.4% per year in the 1980's and continued to decline in the 1990's at an average annual rate of 2.6% (ICF 2004).

The Haitian economy is largely dominated by an important agricultural sector which provides livelihoods to 80% of the Haitian population. Food crops cover approximately 80% of the cultivated area and are grown by small farmers on hillside plots. Production of these crops is generally made without any soil conservation practice and exposes most of these lands to severe erosion, decreases yields and forces Haitian peasants to clear a new plot, burn the vegetation and start a new cycle of production.

Haïti's agricultural sector faces many physical, socio-political, institutional and economic constraints. The potential of arable land area is limited by topography and high erosion risk. Natural disasters, floods, droughts, tropical storms make essential incomes from permanent crops insecure. Only about half of the land situated on plains are utilized. Approximately 400,000 hectares of mostly flat lands are not cultivated due to salinization, urbanization or lack of appropriate technology and investment (USAID 1986).

The export of agricultural commodities, which accounted for more than 50% of total exports in the early 1980's, has dropped drastically and the contribution of this sector to the GDP has systematically decreased every year. Currently the social indicators are alarming: Haïti is the only country of the American continent appearing on the list of Least-Developed Countries. Haïti is ranked 146th by the Human Development Index. Public health indicators are the worst in the Caribbean and Latin American region (ICF 2004): life expectancy is 53 years, infant mortality is 80 per 1,000; maternal mortality is 523 per 100,000 live births; only 28% of the population uses adequate sanitation facilities; half of the population has no access to potable water. The education indicators are also poor: the net primary school enrolment rate is 68 percent, with very poor service quality; more than one half of the population is illiterate.

Purpose

As part of the documentation for the new three-year Strategic Plan, USAID/Haiti is required by Sections 118 and 119 of the Foreign Assistance Act to complete an analysis of tropical forests and biological diversity in Haiti. Concept papers for the new strategy are in draft state. This country analysis has mainly been a compilation and review of existing information, coupled with analysis, synthesis, and corroboration and feedback from major players

Summary of relevant parts of FAA Sec 118 and 119:

From Sec 118 Tropical Forests:

(e) COUNTRY ANALYSIS REQUIREMENTS.—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—
(1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and

(2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

From Sec 119 Endangered Species:

(d) COUNTRY ANALYSIS REQUIREMENTS.—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—

- (1) the actions necessary in that country to conserve biological diversity, and
- (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

This assessment also examines the following

- That the planned activities and investments are not likely to adversely affect tropical forestry and biodiversity.
- The opportunities for program synergy among the strategic objectives that could contribute to the conservation of tropical forests and biodiversity.
- Other issues and opportunities related to forestry and biodiversity conservation for USAID assistance that may match the Mission's overall strategy thrust.

The findings of the assessment define how USAID/Haiti's new three-year country program strategy can contribute to conservation needs, as required by agency regulations. This assessment also serves as a planning tool to assist the Mission in better integrating environment issues into their overall program.

II. Status of Biodiversity

Biological diversity is the Earth's diversity of plants and animals, the ecosystems that support them and the genetic heritage they represent. For Haiti, special emphasis is given to native species that are endemic to Haiti or Hispaniola, that is, that are native to no other place, or that are rare and endangered in Haiti and elsewhere. Conservation of these genetic resources is desirable because the species might one day offer economic potential for production of food, medicine or other products, they might be essential constituents of ecosystems necessary for the survival of potentially economic species, and because they represent the natural heritage of Haiti and the World.

Ecosystem Diversity

Haiti can be divided in five general ecoregions (Appendix 1).

(Source <http://www.nationalgeographic.com/wildworld/terrestrial.html>)

Hispaniolan moist forests (NT0127)

For all of Hispaniola = 17,800 square miles (46,000 square kilometers) -- about the size of Maryland and Massachusetts combined.

Critical/Endangered

These wet forests originally occupied more than half (~60%) of the original vegetation on the island of Hispaniola, from the lowlands particularly on the eastern coast of the island to the valleys, plateaus, slopes and foothills of the many mountain ranges, up to an altitude of about 2,100 meters. In the Dominican Republic, moist forest frequently occur covering most of the eastern half of the country all along these shores till ending at the higher elevations of the mountains. Between the slopes of the eastern range and along the northern range in Haiti, the moist forests continue across the entire island of Hispaniola only lacking distinct presence in the southern extension of the island. They also

exist on most of the Tiburón peninsula, in southern Haiti (Tasaico 1967; Dominican Republic 1998; WWF-US 2000).

Hispaniolan pine forests (NT0305)

For all of Hispaniola = 4,500 square miles (11,600 square kilometers) -- about the size of Connecticut
Critical/Endangered

The pine forests of Hispaniola Island are located on slopes with shallow soils and higher elevations of the mountain systems of both Dominican Republic and Haiti. Located primarily in the central Dominican mountain range with the highest point in the Antilles then continuing in the northern massif of Haiti. This ecoregion is mainly in mountainous areas of the Cordillera Caentral, the Sierra de Bahoruco and other small patches of both countries. There are several other pieces in the La Selle massif and in the La Hotte massif and on the Tiburón peninsula, in Haiti. Originally these forests occupied about 15% of the vegetation on the island of Hispaniola and were located primarily on the low montane, from 850 to 2200 meters elevation, and montane, from 2100 to 3175 meters elevation, steppes of the island's principal mountain ranges. They may be intermixed with latifoliate species, forming mixed forests, and constitute the only type of forests above elevations of 2,500 meters. This type of vegetation maintains rich insular flora and fauna, with abundant endemisms and relict taxons.

Hispaniolan dry forests (NT0215)

For all of Hispaniola = 6,000 square miles (15,500 square kilometers) -- about the size of Hawaii
Critical/Endangered

The remaining patches of the Hispaniolan Dry Forests includes dwarf forest on the small northwest peninsula of Presqu'île Mole St. Nicolas in Haiti. This habitat is a riotous profusion of trees and shrubs, including mesquite, gumbo limbo, acacia, lantana, and tamarind marron. You may also see a large bird called a double-striped thick-knee! (As in all birds, its "knee" joints are actually its heels.) This bird takes shelter during the day, coming out at dusk to search for insects and lizards. It rarely flies but instead runs away in a burst of speed when alarmed.

Amapa mangroves (NT1402)

For all of Hispaniola = 2, 160 square Kilometers -- The ocean currents along the coast carrying the sediments and fresh water, released by the numerous rivers deposit large quantities of fine grained clay and sediment. These form hundreds of islands and mudflats that are continuously colonized by mangroves, and an intricate network of canals. The climate is humid tropical with a mean temperature between 25° and 26° C, high rainfall of up to 4,000 mm a year, and a very short dry season of two months. The combination of high rainfall with high freshwater input from an extensive river system results in mangrove vegetation is found in association with palms and freshwater macrophytes.

Enriquillo wetlands (NT0903)

Flooded Grasslands and Savannas

For all of Hispaniola = 200 square miles (600 square kilometers) -- about four times the size of Washington DC - Vulnerable

Jewel from the Sea

Known as one of the natural wonders of the West Indies, this wetland ecoregion occurs in and around Lake Enriquillo in the Dominican Republic and Lake Etang Saumatre in Haiti. Since the last ice age, sea levels have fallen and exposed the land that used to be a channel separating Haiti from the

Dominican Republic. Pieces of coral and seashell provide evidence of its prior submergence under the sea. Lake Enriquillo is 34 miles (89 km) long and 5 miles (13 km) wide. It is extremely high in salinity, with a salt concentration of 40 to 90 parts per million. Very little vegetation can live at such high salt levels, with the exception of green algae. Fed by seasonal streams and numerous wetlands, the lake is surrounded by high mountain ranges and dry forest habitats. On higher ground, areas with lower salt concentrations form the edges of the wetlands. Here, mesquite and a dense shrub layer occur, though they are partially submerged during the rainy season.

Life Zones

(see demonstrative map Appendix 2)

The topographic, and related climatic, variation results in nine different ecological life zones in Haiti. It is interesting to note that Holdridge developed his ecological life zone concept while working in Haiti during the 1940's, while confronted with the country's array of ecosystems. The ecological life zones of Haiti represent the type of vegetation that would be expected to develop in an unadulterated condition. While human intervention has altered the vast majority of Haiti's ecosystems, life zones are still useful to indicate the general type of managed land use that would be feasible in a given area. These life zones are (Ehrlich et al., 1987):

1. **Subtropical Thorn Woodland:** Semi-desert conditions, 550mm of rain, xerophytic forest dominated by *Prosopis juliflora* and other dry species. This life zone is typical of the cacti formations of the northwestern peninsula. In the Northwest, this life zone includes relatively large blocks of unassigned state land that are sparsely populated, marked by open range grazing, and mined for wood resources.
2. **Subtropical Dry Forest:** *This is Haiti's second largest life zone and one identified by the Ministry of Agriculture as a high priority.* Under 400 meters in elevation and characterized by seasonal drought, this zone can highly productive where soils are deep and irrigation available as in the Cul-de-Sac Plain near Port-au-Prince, has supported large sisal plantations and extensive stands of *Prosopis juliflora* (mesquite). Typical species are Antillean mahogany (*Swietenia ahogani*), hogplum (*Spondias mombin*), *Phyllostylon brasiliensis* and lignum vitae (*Guaiacum officinale*). Other areas of Subtropical Dry Forest are found along the southern coast, the Northwest, Northeast, and lower Artibonite
3. **Subtropical Moist Forest:** *This is the most extensive life zone in Haiti and supports the majority of small peasant farms and widespread cultivation of mangos and avocados.* Almost no natural forest remains in this life zone, having been converted to subsistence farming. The common association of avocados with mangos in this Life Zone suggests that avocados are an under-exploited market opportunity since this is the prime production zone for export quality mango Franisque. Characteristic trees include mahogany, tropical oak (*Catalpa longissima*), and royal palm. This Life Zone prevails on the Central Plateau and alluvial plains in the north, center, and south.
4. **Subtropical Wet Forest:** Calcareous soils. Covers low-altitude mountain ridges and small mountains along the northern and southern coasts of Haiti and portions of the Central Plateau. Supports coffee, cocoa, and rubber.
5. **Subtropical Rain Forest:** Lower altitudes of the Massif de la Hotte (southern peninsula), heavy rainfall but not productive for farming, under agrarian pressures and very susceptible to erosion.

6. **Subtropical Lower Montane Moist Forest:** Mountainous areas such as Kenscoff, 800-2000 meters in elevation. Well suited for cultivation of potatoes and other vegetables when using hillside conservation structures.
7. **Subtropical Lower Montane Wet Forest:** This zone includes most of the remaining pine forest in Haiti and should be protected and managed for sustained production of *Pinus occidentalis*.
8. **Subtropical Lower Montane Rain Forest:** Limited area in the high ranges of La Selle including pines and evergreen broadleaf forest.
9. **Subtropical Montane Wet Forest:** Similar to Life Zone number 8.

Freshwater habitats and ecosystems

The Haïti's freshwater system is composed of :

Watersheds, rivers basins that cover all the lands above the river-discharges to sea and represent in fact area drained by a single water course system forming sometimes several sub-watersheds and constituting a functional unit established by physical relationships where upstream land use can incite a chain of environmental impacts affecting downstream areas;

Wetlands , with the exceptions of some coastal/marine ecosystems (marshes, estuaries etc), that include a variety of habitat types from flood and alluvial plains or geological disturbances to shallow lakes and ponds.

Watersheds

Haïti is divided into thirty three major catchment areas (Appenix 3) which include over 158 rivers. Among them, four are considered as transboundary watersheds. The most spectacular watershed unit is represented by the *Fleuve de l'Artibonite* (The Artibonite River), 9,500 km², which is a transboundary basin shared with Dominican Republic. The principal watersheds and hydrological zones of Haïti are shown in table 1.

Table 1. – Principal Catchment areas and Hydrological zones of Haïti; (Source UNDP 1988, La gestion de l'environnement en Haïti : Réalités et perspectives and MARNDR 2000)

Basin or Zone	Catchment Area/ Km ²	Basin or Zone	Catchment Area/km ²
Môle St Nicolas- Moustique	987	Cap Haïtien	312
Bombardopolis_ Gonaïves	1147	Grande Rivière du Nord	699
Trois Rivières	897	Limonade- Ouanaminthe	1065
Port de Paix-Port Margot	543	Estère	834

La Quinte	690	Artibonite	9500
Limbé	312	St Marc-Cabaret	1090
Fonds Verettes	190	Cul-de-Sac	1580
Cayes-Jacmel-Anse à Pitres	1219	Côte de Fer-Baïnet	1060
Léogane-Carrefour	651	Petite Rivière de Nippes – Grand Goâve	661
Grande Rivière de Jacmel	535	St Louis du Sud-Aquin	706
Cavaillon	380	Grande Rivière de Nippes	459
Corail-Anse à Veau	877	Tiburon-St Jean	660
Cayes	634	Ile de la Tortue	179
Roseaux-Voldrogue	540	Ile de la Gonâve	680
Grande Anse	556	Jérémie-Les Irois	364

Wetlands

Wetlands are a key component of Haïti's freshwater system providing flood control, carbon storage, water purification and goods such as fish, timber and fiber. The most important wetlands for freshwater ecosystems in Haïti are represented by lakes and ponds. The country boasts two principal lakes (Azuei (Etang Sautmatre) and Peligre, one main pond (Etang de Miragoâne).

The Azuei is the main lake of the country with an area of 113 km², a maximum depth of 24 meters. Its constitutes in fact a transboundary lake with DR (Lago Enriquillo in the Dominican side). Peligre is an artificial lake with an area of 48 km² and a maximum depth of 170 meters. It harbors the main hydroelectric power facility of the country. The Miragoâne pond has a variable area ranging from 9 km² to 25 km² depending of the rainy season with a maximum depth of 45 meters. Additionally, there are 69 small ponds with an area totaling approximately of 20 km².

Coastal Habitats and Ecosystems

Rich seagrass beds occur along the north coast, and at Les Cayes. While there also appear to be seagrass areas near La Gonave and Les Cayemites, the distribution of these important areas of marine primary productivity is not well known for Haiti (Ehrlich et al., 1987). The distribution of coral reefs is also poorly known, however, these appear to affected by pollution from cities, siltation from rivers and over fishing.

Significant mangrove forests occur on the north coast between Bale de l'Acul and Fort-Liberte, in the Artibonite estuary, in the Grandes Cayemites area on the north coast of the southern peninsula, in the Les Cayes region, including Ile a Vache, and on the north coast of La Gonave (Ehrlich et al., 1987) (see map) . In the last 15 years coastal development has begun to effect mangroves greatly and they are receiving

increasing pressure for production of charcoal and building poles. Additionally, the animal resources present in these mangroves are being heavily exploited (Timyan et. al)

The coastal shelf of Haiti is generally narrow, covering about 5,000 square km. This area is not particularly productive because of low nutrient levels and warm waters, and is fished out in places (Ehrlich et al., 1987). The narrowness of the coastal shelf is significant, in that it allows relatively easy access to pelagic fisheries, but information on the potential of this resource is incomplete

Parks and Protected Areas

National Parks

The decree of 1968 created "Parcs Nationaux" and "Sites Naturels" under joint administration by the Ministry of Agriculture (MARNDR) and the Office National du Tourisme (currently under the Ministry of Trade). Additional sites that are suggested for protection by the DNR (now Soils Parks and Forestry division, but soon to be under ANAP-MDE) (table)

The official creation of "Pares National Naturels" was a decree published on June 23, 1983, setting aside Morne La Visite du Massif de la Selle (3000 ha) and Morne Macaya du Massif de La Hotte (2000 ha). Six additional natural sites below were declared as "Parcs National Naturels:

Table 2. Natural National Parks in Haiti

Name	Habitat type	Size (hectares)	Year Established
Fort Jacques and Fort Alexandre	Historical	9	1968
Fort Mercredi	Historical	5	1968
La Citadelle, Sans Souci, Ramiers	Historical site Mountainous	2200	1968
Sources Cerisier et Plaisance	Hot Spring	10	1968
Sources Chaudes	hot spring located 20 kms north of Port-au-Prince that is known for its medicinal qualities.	20	1968
Sources Puantes	Hot spring	10	1968
Lac de Peligre	Man made lake	100	1968
Parc La Visite	Tropical Moist Forest & Pine forest	3000	1983
Parc Macaya	Tropical Moist Forest & Pine forest	2000	1983
Foret des Pins	Pine and Mixed forest Reserve currently no legal harvest	5,500	

Data adapted from the World Database on Protected Areas: [http://sea-bov.unep-wcmc.org/wdbpa/index.htm?http://sea-bov.unep-wcmc.org/wdbpa/toplevelindex_new.cfm~summary tab](http://sea-bov.unep-wcmc.org/wdbpa/index.htm?http://sea-bov.unep-wcmc.org/wdbpa/toplevelindex_new.cfm~summary_tab)

Sites 1-6 are better classified as historical sites. The Foret des Pins is the largest area of contiguous forest, and until recently was a production reserve. Currently no legal harvest can take place, but this is not enforced. Emphasis was placed upon the initiation of the Pic Macaya and La Visite Parks, which were to be jointly administered by the DNR and by ISPAN under the Department of National Education. In the past USAID has funded a series of studies undertaken by the University of Florida, Gainesville. These include an inventory of mammals, birds, reptiles, land mollusks, butterflies and moths, orchids, vegetation, and geology. A park management plan was devised but unfortunately was not

implemented as planned due to the inability of the GOH to execute the plan and the termination of USAID financing for La Visite in March, 1988.

From 1992 to 1995 the PPM program of X worked to The latest parks development program was undertaken by the world bank from 1996-2001. The Forest and Parks Protection Technical Assistance Project (FPPTAP) provided \$ 15 million and maintained forest guards and enforcement. However, with the ensuing instability no follow-up was planned.

Park management in Haiti is ill-defined, lending itself to criticism unless a number of important issues and questions can be resolved. Overlapping roles in the park system management by different branches of the GOH cause confusion and inaction. A serious problem confronting management of Haiti's National Parks is their occupation by farmers. Control of invasion by still more farmers is crucial, if the last vestiges of native ecosystems in Haiti are to be preserved relatively intact. The recently approved GOH declaration on the environment will create the Agence National des Aires Protégé which will in theory have control over the parks, but it is yet to be seen if this will be enacted on the ground.

Table 3 - List. of Natural Sites Proposed for Protection (Source:DNR, MARNDR, Haiti).

Site	Size	Purpose
Ile de la Tortue reserve,	7000ha	Endemic Flora and Fauna
Labadie,	10 ha	Flora and Fauna, Geology
Horne de l'Hopital		Flora and Fauna,
Petit Paradis,	10 ha	Mangrove and Endemic Fauna
Saut d'Eau et Morne,	100ha	Water. Source, Wildlife
Sources Sulfureuses,	10 ha	Hot Spring, Medicinal
Cerca la Source,	10 ha	Hot Springs
Source Zabeth,	4 ha	
Savane Desole,	4,600ha	
Paillant		
Limbe Watershed,	1000ha	Endemic Vegetation
Forte Liberte Bay,	5100ha	Flora/Fauna-Closed Bay
Mangrove Swamps		Wildlife, Fisheries
Cretes des Mornes	1.000ha	Orchids, Endemic Flora
Cotes-de-Fer, Cliffs		Birds, Wildlife/Flora
Cotes de Baintet		Cliffs, Bird Roosts
Jacmel, Marigot,	100ha	
Etang Saumatre	10,130ha	Birds and Crocodile
<i>Etang Saumatre is a mangrove salt pond ecosystem reported to have about 450 crocodiles and which serves as important migratory water fowl habitat, as well as for waterfowl hunting.</i>		
Etang Bois Neuf,	40ha	Birds, Wildlife/Flora
Etang Miragoane,	1000ha	Flora and Fauna
Grottes Du Dondon		Flora and Fauna
Grottes de Petit-Trou		Mineral Formation de Nippes
Iles Caimites,	2000ha	Coral Reef, Endemic Flora and Fauna
Ile de la Gonave reserve,	5000 ha	Coral Reef, Endemic Flora and Fauna
Ile a Rat et Coraux	1800 ha	Coral Reef, Flora and Fauna
Ile Kayalo, Cayes		Coral Reef, Bird Life
Ile de la Navasse		Marine Birds

La Visite National. Park comprises about 2,000 ha, Pic Macaya National Park covers about 5,500 ha, and La Citadelle, Sans Souci and Ramiers National Park has about 2,200 ha (Paryski et al., 1988). The first two parks were declared because of their importance in protecting watersheds that are crucial to downstream agriculture, as well as to conserve Haiti's biological heritage. However, the GOH dedicates no budgetary resources to management of these parks.

The summit of Pic Macaya can be reached from Port-au-Prince in three days and a round trip requires 5-6 days. It is difficult to see how anybody but the hardiest, of adventurers will be willing to endure such a trip; certainly not the average tourist. This is unfortunate, since of the two nature parks, Pic Macaya contains the most diverse and greatest number of endangered species of flora and fauna.

The La Visite Park is six hours from the capital and accessible by a dangerous deteriorating road. It is also easily accessible by foot. Not only does it offer scenic beauty and unique habitat, such as cloud forests, it also possess a myriad of caves which offer the spelunker an opportunity for exploration. This park is close to the capital that if tourism can be rejuvenated, this area could generate income from a "Head Tax," from tours which would also provide valuable financial. resources to help the Government manage the Park.

Watershed areas and Protective areas systems

Protected areas, as integral parts of the development process and basic tools for sustainable development, were recently integrated in the development scheme of Haïti even if from an historical perspective establishment of protected areas was pronounced during the 1920's.

Officially, the Haïtian Government has identified a total of 35 protected areas covering about 6 % of the national territory. However, the percentage of effective protected areas is evaluated at no more than 0,3% of the overall surface of the country. With the latter statistic in mind, the Haitian Republic stands far behind other Caribbean countries (IUCN 1994) namely Jamaica (8,2%), the Bahamas (8,9%), Cuba (14,3%), the Dominican Republic (21,7%), Turk and Caicos (39,7%) and Martinique (66,3%).

In respect to this situation, few watershed areas have been included in the protective areas system in Haïti. In a practical way, only watershed located in the *Réserve Nationale de la Forêt des Pins*, the *Parc National de Macaya* and the *Parc National de la Visite* should be considered as being a part of the protected area systems. These watersheds roughly correspond to Fonds Verettes, Grande Anse, Cul de Sac, Roseaux-Voldroque, Ravine du Sud, Rivière l'Acuil, Rivière Port-à-Piment, Rivière les Anglais, Rivière Cavillon, Rivière Glace, Rivière Roseaux and Grande Rivière de Jacmel Basins.

Genetic Diversity

In Haïti, biological resources play an important role in the development of the nation. They are sources of food, firewood, construction of materials, medicines, ecosystem functions, or aesthetics etc. The genetic diversity of native species of Haïti is largely unknown. A limited sample of economically important native species were selected in the late 1980s with progeny testing, establishment of seed orchards and seed production areas and the harvest of seed undertaken for native species in an effort a) to maintain genetic diversity and b) to ensure that the best available tree germplasm be available to peasant farmers for reforestation and agroforestry purposes. In general, medicinal plants are popular in the country. Studies are needed to better assess the use of wildlife and native agro-biodiversity by local people.

The geographical isolation and ecological diversity of the island of Hispaniola, as well as the natural introduction of species from both North and South America, have resulted in the development of a rich and varied flora. Over 5,000 species of flowering plants are known in Haiti, of which about two-thirds are woody. There are also over 600 species of ferns. It is estimated that 36 percent of the plant species in Haiti are endemic to Hispaniola, that is, they are native to nowhere else in the world. Forty percent of the more than 300 species of orchid species native to Hispaniola are endemic (Ehrlich et al., 1987).

The available floristic literature for Haiti is discussed by Judd (1986), who recommends that special attention be given to species that are very susceptible to disturbance, such as *Juniperus ekmanii*. He states that little is known about these species besides the most basic taxonomic information. According to Judd, Eckman Juniper, may be the species in the most danger of extinction, because it does not sprout vegetatively after fire or cutting, which are common in the region. The only other significant population of this species besides in La Visite National Park, is a large population in the mountains south of Puerto Escondito in the Sierra de Baoruco in the Dominican Republic (Judd, 1986). Other endemic species that are rare or very restricted in distribution are found within Pic Macaya and La Visite National Parks. The degree of endemism is greater for flowering plants than for ferns, mosses or liverworts (Judd, 1986). Two hundred and one species of seed plants endemic to Hispaniola are listed as present in Pic Macaya and La Visite National Parks by Judd (1986),

Species endemism is more common in higher elevations of the Caribbean because species with fairly common distribution at lower elevations have radiated evolutionarily with dissemination up the slopes after natural migration to the islands. The existence of Pic Macaya and La Visite National Parks will assure survival of endemic species: only if human disturbance, such as cutting, burning and clearing, can be minimized. However, further study is required to determine the interaction of *Pinus occidentalis* with fire (Judd, 1986). *Pinus occidentalis* genetic resources have been greatly reduced due to deforestation and efforts should be made to locate well-formed individuals at lower elevations in Haiti in order to conserve their genes in seed orchards, arborea or botanical gardens.

Currently, the only terrestrial habitat that remains in a relatively pristine state lies in the steep sloped inaccessible highland of Haiti, primarily within the La Visite and Pic Macaya National Parks, which have been designated as national parks for the purpose of protecting watersheds and wildlife habitat. A sample of endemic and/or rare, endangered or threatened species found in the parks can be found in appendix I. These species are currently being protected on paper. In reality, people are living in and exploiting natural resources from these parks in an uncontrolled manner.

Species Diversity (including threatened & endangered species, & species of special economic or other importance)

The Caribbean is an internationally recognized biodiversity hotspot, ranking fourth in the world for major diversity indices (Meyers et al 2000) and perhaps containing the highest concentration of endemic species on a land area basis.

Table 4 - Species diversity and conservation status of major taxa in Haiti.

Taxa	# Species	# Critically Endangered	# Endangered	# Vulnerable
Amphibians	47	31	10	5
Birds	62	1	4	10
Fish	184	2	1	8
Mammals	20	1	1	2
Reptiles	115	4	2	3
Plants	5242	5	6	18

Data from: IUCN Red List <http://www.redlist.org> and WRI <http://earthtrends.wri.org>.

For a complete list of Red List species see table 5 in annex 6

FLORA

Haïti is one of the richest countries in the Caribbean in terms of botanical diversity. Certain botanical families are particularly rich in endemic species, notably the Orchidaceae, Melastomataceae, Rubiaceae, Flacourtiaceae, Poaceae, Urticaceae and Asteraceae (Vilmond Hilaire 2000). This is compared to other families, such as the ferns and allies that show a much lower level of endemism of the island. Very little is known of the basidiomycete fungi, though recent investigations conducted in the DR indicate high endemism among the saprophytic fungi families of the moist and wet forests (Lodge 2000).

The geologic history of Hispaniola characterized by repeated changes in level sea and the highly varied geomorphology provides a wide range of abiotic factors that favor habitat diversity and had given rise to significant local endemism. In spite of severe environmental degradation problems Haïti has, together with the Dominican Republic, the second most diverse flora in the Caribbean, after Cuba. Floristic studies among the vascular plants invariably reveal new species to science, particularly in biological rich areas. According to a floristic study conducted by the University of Florida in the 1980s and 1990s, an inventory of orchids of Macaya National Park (in the Southern Peninsula) revealed that a third of 134 species were undescribed at the time of their collection. The total orchid flora, occupying less than 10 km², represent roughly 40 % of the three hundred fifty orchid species known to exist on Hispaniola (Dod 1993; Hespeneheide & Dod, 1993).

Scientists who conducted inventories of Haïti's flora did not reach a consensus on existing vascular plant species. The number of those published in the literature ranges from 4,685 (WRI, 1998) to 5,242 (IUCN 1997). The dated treatment of the *Flore d'Haïti* (Barker and Dardeau 1931) suggests that over 5,365 vascular plant species are found in Haïti. It has been estimated that among these plants, 37% are endemic comprising approximately 300 species of Rubiaceae, 300 species of Orchidaceae, 330 species of Asteraceae, 300 Graminae and three species of Conifers (*Pinus occidentalis*, *Juniper juniperus*, *Juniperus ekmanii*). Overall, the Haïtian landscape hosts, according to the Holdridge classification based on climate factors, a total of nine zones which supports the diversity of forest formations.

FAUNA

The country boasts a rich fauna as well, with more than 2000 species of vertebrates of which 75 % are considered endemic. The mainland and satellite islands reflect a high degree of endemism. A recent biological inventory of one offshore island, Navassa island (7 km²), found more than 800 species, many of which may not exist anywhere else in the world, and as many as 250 that might be entirely new to science (Center for Marine Conservation, 1999).

Mammals

Two native mammals are known to occur in Haïti: the Haïtian Hutia (*Plagiodontia aedium*) and the Giant Island Shrew: the *Nez long* (*Solenodon paradoxus*). Both are considered endangered and likely extirpated over much of their native range. The possibility of *Isolobodon sp*, a rodent, and *Nesophantes sp*, an insectivore, occurring on *Ile de la Tortue* (Tortuga Island) remains unconfirmed.

The highest diversity among the native mammals in Haïti are bats. There are seventeen species of which seven taxa, including species and sub-species, are considered endemic. The remainder of the native mammal diversity are aquatic and include the West Indian Manatee (*Trichechus manatus*), the West Indian Monk Seal, the Sperm Whale, the Pilot Whale and Dolphin species.

Birds

Very little current studies have been conducted in Haïti on the distribution of avifauna. It has been estimated that two hundred and thirty six (236) birds have been recorded on Hispaniola island. A quarter of these species are considered endemic.

Recent ornithological fields observations conducted by US scientists from Vermont Institute and Cornell University in the montane forest bird community in Macaya and La Visite Parks confirm the exceptional diversity of birds in these areas in spite of threats posed by habitat loss and fragmentation. At two sites in the Macaya Biosphere Reserve (PLaine Boeuf and Rak Bwa), 37 species were recorded among 234 mist net captures, 121 point count detections and 451 total observations. These included 9 North American migrant species and 28 permanent resident species of which 11 were Hispaniolan endemics (Chirstopher C. Rimmer, Jason M. Townsend and al 2004). Those scientists documented in Macaya the first record of Swainson's Warbler for Haiti.

Reptiles and Amphibians

Two hundred seventeen (217) species of reptiles and amphibians are known to occur on the isle of Hispaniola (Thomas 2000). Approximately 70 % of this diversity has been recorded in Haïti. Ninety eight percent (98%) are endemic to Hispaniola with about a third of the species occurring in only Haïti. Five sea turtles, according to *Ottenwaldder* 1996, have been inventoried in Haïti. They are: *Eretmochelys imbricata* (found in Anse à Pitres, Ile à vache, Côtes de fer), *Caretta caretta* (found in Belle Anse, Cayes-Jacmel, Anse à Pitres), *Dermochyles coriace* (found in Tiburon) and *Lepidochyles olivacea*. Two terrestrial iguanas are recorded: *Cyclura cornuta* and *Cyclura ricardi*. The American crocodile often known under the name of Caïman is also found in Haïti.

From specific studies that have been carried out, we know that Haïti harbors an exceptional fauna of terrestrial frogs. From 49 Eleutherodactylus species described for Hispaniola, 20 species come from Castillon, a small village located North to the *Massif de la Hotte* and close to the small city named Leon. The *Massif de la Hotte* is known to host the most diverse frog species in the Caribbean. At least, 26 Eleutherodactyles species have been recorded. Haïti has contributed much to world wide biological diversity knowledge in terms of new species discovered: *Eleutherodactyles Amadeus* (Plaine Formond/Macaya Park), *Eleutherodactyles thorectes*, the smallest specie known from Hispaniola and the genus .

Invertebrates

Most of the faunal diversity represented by the invertebrates, is unknown to science or insufficiently studied (Rawlings 2000). It is estimated that at least three-quarters of this group of organisms have never been described. Since the invertebrates contain the highest diversity of organisms at the species level, it is reasonable to argue that most of biodiversity of Haïti remains largely unknown

III. Status of Tropical Forests

For purposes of this analysis, a broad definition of forestry will **be** used. This will include not only traditional forestry, such as production of timber from closed forest, but also: management of closed forest for other resources, such as water, wildlife and recreation; management of open forest and

savanna for production of fuelwood, conservation of soil and water, and grazing; and agroforestry in which trees are planted on farms in association with crops. Forestry ecosystems include dry-scrub forests, savannas and moist forests on peaks reaching almost 3,000 meters. Leslie Holdridge, a great American ecologist developed his ecological life zone concept while working in Haiti during the 1940's. The an example of the type of vegetation that would be expected to develop in an unaltered condition is found in annex 2.

Haiti's endowment of forest resources has been treated as a free good and exploited to capitalize economic development since colonial times. Europeans cleared mountain forests to establish coffee plantations and used clean-tilling agricultural practices that promoted soil erosion. European colonists and then, later, Haitian governments harvested and exported timber (chiefly mahogany, ironwood and logwood) to earn hard currency. Haiti's peasants, especially the land-poor, have historically cleared forest to expand agriculture. Peasants also exploit forest stocks in time of economic insecurity or to finance unexpected contingencies. In several situations, the unsustainable exploitation of trees or forest is the only remaining income-generating option available to peasants. In fact, forests (or former forest land) are everything to the Haitian peasant: space to grow annual crops, engage in animal husbandry, extract useful products, and a last ditch store of capitol. These values were well documented in a study supported by the World Bank in 1996 dealing with perceptions of the Forêt des Pins Reserve by local peasants. From a forest cover of 90% in pre-Columbian times and 60% in 1923, Haiti now has true forest cover on only 1.5% of its land area (Ministry of Planning 2002).

The current amount of forest cover in Haiti is not precisely known, but it is estimated that, considering soil, climatic and slope characteristics, 55 percent of the land area should be forested. In 1990 Only 600 square km were under **dense** forest cover, which represented only four percent of what should be forested, or 2.2 percent. of the lead area. Today only 338 square km are under dense forest cover (1.0 percent (UTSIG 2004)). Twenty percent, of the land area is under sylvopastoral conditions (grazed brush land and savanna), which is being constantly degraded due to overgrazing and charcoal cutting (FAO, 1987). Virtually no scientific management of forests is practiced in Haiti. Some potential may exist for managing the once dense pine forest for sustained timber production at Foret des Pins, but for the near to mid future this is unrealistic.

In 1982, available wood stock was estimated to 37.4 millions of cubic meters (BDPA 1982) with about 6 million cubic meters used for construction, building sector, and other purposes. This consumption is equivalent to approximately 30 million trees annually harvested.

At the same period, it was estimated that 20 millions trees were planted with a survival rate of about 40% (ESMAP/WORLD BANK 1991). The reforestation capacity was estimated at about 26% of the consumption (equivalent to 1.6 million cubic meters) while the annual capacity of self reproduction of natural wood without new plantations was also evaluated to 1.6 millions cubic meters. Thus the total regeneration capacity was roughly 52% of consumption.

Bearing in mind those figures and assuming they are reliable, it should have held that in 1990 the country was less than half of his wood stock of 1982 that is to say 18.6 millions of cubic meters. However, in large part due to the embargo of 1986 to 1990, the stock was much less (8 million cubic meters- See table 6). Since that time forest stock depletion has slowed. However, if such trends were to be continued without any corrective action, it is not too pessimistic to forecast complete depletion of that resource in a near future.

Table 6		
Growing stock in forest and other wooded land		
FRA 2005 categories	Volume (million cubic meters over bark)	
	Forest	Other wooded land

	1990	2000	2005	1990	2000	2005
Growing stock in forest and other wooded land	8	7	7	-	-	-
Commercial growing stock	-	-	-	-	-	-

Data source: FAO, Global Forest Resources Assessment 2005.

No comprehensive Forest Policy has been formulated for Haiti, but a series of laws and decrees bear on the sector. Pierre-Louis (1986) drafted an analysis of the legal status of forestry in Haiti, reviewing existing laws and proposing a forest policy. This policy has not been adopted by the government, however (Pierce, 1987). Enforcement of existing laws is essentially non-existent.

Forests and Watersheds

Conservation out of *protected* areas is one of the most crucial necessities in Haiti, if the rural productivity of the country is to be maintained, let alone increased. Land is degraded when it is used more intensively on a prolonged basis than it is capable of sustaining. According to a national land use capability determination for Haiti, only 30 percent of Haiti's land area is appropriate for agriculture, and over half of that needs special conservation practices. Another 16 percent is appropriate for grazing of livestock. Fifty-five percent of the national area should remain permanently under forest cover (Pierre-Louis, 1986).

Degradation of watersheds, due soil erosion caused by inappropriate agricultural practices, not only reduces the productive potential of hillside farms, but has tragic downstream consequences. Removal of tree cover exposes soil to the erosive impact of. Additionally, the annual input of organic matter to the soil from litterfall is lost. With less organic matter, the infiltration of rainwater is diminished. Soil loss results in reduced capacity of watersheds to store water, As a result of these two phenomena, the hydrologic cycle is changed, and river levels rise to dangerous levels quickly after heavy or prolonged rainfall (tragically exemplified by Fond Verette, Mapou, and Gonaives). Conversely dry season flows are reduced drastically, with negative impact an irrigation projects and well levels. Thus, watershed deterioration reduces the productive potential of both hillside and valley farms, and increases flooding. This degradation of drainages also has a negative impact on biological diversity, as sediment in rivers smothers coral reefs and seagrass beds.

Watersheds present a logical, topographically-defined land unit on which to base development activities, Social, biological and physical parameters interact within a watershed, and should be dealt with in an integrated fashion. An institution, STAB to collect and integrate information on a watershed basis was funded by USAID from 1982-1995 and was starting to have significant impact on policy reform. However, USAID ceased financing this activity due to the termination of bilateral assistance. There is currently a proposal to create a National Environmental and Vulnerability Observatory, but progress is slow (see policy section).

Fuel wood and Charcoal

Forest resources provide the most important sources of energy in Haiti in the form of fuelwood (rural) and charcoal (urban) which accounted for 75% of the final energy consumption by all sectors in the year 2000 (Bureau des Mines et de l'Energie). Charcoal is used by 90% of the households from Port-au-Prince and other major cities and the sub-sector employs more than 150,000 persons. Charcoal is made from trees with, according to Bureau des Mines et de l'Energie, a low conversion efficiency of about only 20% (5 kg of wood for 1 kg of charcoal).

Most charcoal is produced from land that has limited agricultural potential. In the northwest peninsula and the Ile de Gonave; charcoal-producing is important to farmers for generating cash, since the poor soils there do not allow sufficient crop production for the sale of surpluses; (FAO, 1987). The preferred charcoal species is lignum vitae, or Gaiac (*Guaiacum officinale*), but today this species is very rare. Mesquite, or Bayahonde (*Prosopis juliflora*) is the second preference. These species generally sprout after being cut, producing multiple stems, however management systems for these scrub forests, are not well defined and though local sustainable production is sometimes practiced it is not well understood nor widely used.

Agroforestry

Vast areas of Haiti have soil characteristics that theoretically favor permanent forest cover to prevent erosion and promote the infiltration and storage of rainwater. As a result of erosion of land that has been cropped in the past using inappropriate agricultural techniques, and the need for new land to crop because of population growth and dividing up of family farms, this steep land has been invaded and brought into cultivation. Agroforestry offers great potential for stabilizing land in these areas. Roots of trees help to stabilize the soil, and their foliage breaks the erosive impact of rain and wind. The water infiltration and rainwater storage is improved by the incorporation of organic matter from tree leaves and decomposing roots. Trees also contribute to farm economies by producing forage, fruits, medicines, fuelwood and building materials. In many cases, surplus tree production can be traded off-farm for cash or goods not produced on the farm. Trees are also valuable for producing shade for livestock and crops such as coffee that are commonly grown under partial shade. The USAID AOP was very successful in introducing trees into Haitian farms as a cash crop, and the demand for trees in areas where the project worked was generally greater than the supply (Lantagne 1987).

There are various ways to incorporate trees into a farming system. Trees can be planted in groups, or dispersed uniformly. They can be grown simultaneously with crops or sequentially. The USAID AOP and Targeted Watershed Management projects also examined ways to improve food crop yield in association with specific tree species.

Coffee, cocoa and certain other crops are traditionally managed under partial shade to achieve an optimal balance between crop production and the production of products from the shade trees. The USAID Coffee Cooperative Development project promoted shade tree management and some coordination of foresters within the AOP and TWMP was achieved.

Marine/Coastal Resources

The concept of coastal areas

The concept of coastal areas incorporates land-sea-air interactions within the extent of the continental plains and continental shelves. This zone contains a disproportionate amount of total biodiversity, productivity and human resources (IUCN 1993).

Significant coastal habitats, ecosystems and wetlands

With a Coastline of 1775 km and a coastal shelf of 5000 km² and five main offshore islands, Haiti's coastal and marine resources include examples of all types of life and geologic structures present in the Atlantic Ocean and the Caribbean Sea. All of these aspects together form a remarkably varied ecology and contribute to create a treasure of biodiversity.

Coastal resources

The coastal ecosystems play a crucial role in the production and the maintenance of fisheries and other biological resources of primary importance for the human population of Haïti and surrounding islands. The seagrass beds, coral reefs, and forest mangroves constitute a predominant feature of the Haitian coastline.

Seagrass beds occur along the North Coast, Les Cayes in the South, La Gonave, Les Cayemites and l'Île à Vache areas. They represent a great source of primary productivity providing oxygen and nutrients to marine species and a mean of stabilizing substrates.

Coral reefs seem to be distributed along important coastal zones in Haïti. They provide food and shelter for resident and migratory species, play a protection role for coastal property from tropical storm damage and offer a storehouse for potential valuable species (pharmaceuticals, commercial species)

Mangrove forests (180 km² in 1983) occur on the North and North east Coast (Baie de Fort Liberté, Baie de Caracol and Baie de l'Acul), the Artibonite estuary, Les Cayes, L'Île à Vache, La Gonave and the Grand Cayemites. They play an important role in the reproduction cycle of numerous coastal and pelagic fishes species as well provide shelter for their offsprings. These species include the pike (Centropomus undecimakis), and crustacean species like the prawn and the lobster (*Penaeus* spp and *Panulirus argus*) or mollusks (Strombus giga). They are thus considered important from an economic perspective since they are at the center of the fishing industry's productivity.

The mangrove forest habitat holds a rich and diversified fauna of which some representatives are permanent residents while others are seasonal visitors. At least 13 species considered either threatened or seriously in danger of extinction have been identified as inhabitants of mangrove forests and lagoons in the country. Among them are the west Indian manatee (Trichelus manatus), the American crocodile (Crocodylus acutus), the Atlantic sea turtle (Eretmochelys imbricata), the Flamingo (Phaenicopterus palmarum) etc.

Coastal wetlands

In the Haitian Coastline are found deltas, estuaries, coastal plains, coastal lagoons. These wetlands provide diverse, renewable natural resources which support mixed traditional economies based on capture fisheries, the use of forest products and gathering. Grasslands and mangrove forests support useful plants. Coastal lagoons and mangroves are the nursery grounds for many species, both benthic and pelagic. Representative threatened and endangered flora and fauna using the wetlands of Haiti are listed in appendix 1. Although there are proposed marine parks and reserves by the Government of Haiti and others at present no wetlands have been set aside for the purpose of preserving biological diversity (Ehrlich et al., 1987; , Woods and Harris, 1986, and World Wildlife Fund, 1987), Wetlands in need of protection include salt ponds, mangroves, seagrass beds, and mud flats.

Significant coastal habitats

A – Fort Liberté to Môle St Nicolas

Characterized by the presence of productive bays and coves, sandy beaches, extensive seagrass beds and coral formations. Significant mangroves between Baie de Fort Liberté, Baie des Caracoles and Baie de l'Acul. In this area is found Labadie (near of Cap haïtien), a small bay favored by tourists. Excellent shrimp habitat in Baie de l'Acul and good habitat for Manatee and green turtles.

B – Môle St Nicolas to Gonaïves

Fishing and salt production zones. Deep water and salting of fishes species.

C – Gonaïves to Baie de St Marc

Area of Artibonite Estuary. Harbors Manatees and mangroves that provide feeding habitat for flamingos and other shorebirds. Brine shrimp (*Artemia* sp) is found.

D - Baie de St Marc to Ile à Cabrit

Contains extensive fringing reefs and offshore reef formations surrounding Les Arcadins (30 km North of Port-au-Prince), an area prized by Scuba divers and identified to be declared as a MPA. Abundant specimen of both fish and invertebrates. Extensive seagrass beds are found.

E – Ile à Cabrit to Leogane

Well-developed mangroves, lagoons and coral reefs. Area threatened by pollution.

F – Léogane to Jérémie

Mangrove lagoon systems, coastal mangroves wetlands, rocky cliffs, offshore reefs and seagrass beds.

G –Baradères to Les Cayémites

Pristine coral reef system, relative large untouched mangrove formations. Identified for a MPA purpose.

H – Jérémie to Tiburon

Area of intensive fishing. Barrier reefs and sand bars.

I – Port - Salut to Baie d'Aquin

Vast seagrass beds and well-developed coral reefs systems. Intensive fishing. Flamingo and Crocodile habitats. Scenic landscape in St Louis du Sud, an area with a potential of 100,000 tons of shrimps.

K – Baie d'Aquin to Anse à Pitre

White coral sand beaches. Sea bird population near of Anse à Pitre. Jacmel city prized by tourists.

L – La Gonave

Large barrier and fringing reefs. Habitats for shorebirds and sea birds, conch, lobster, turtle and various fishes.

Marine Protected Areas

Marine Protected Areas (MPA) are usually established for one or a combination of several reasons including protection of bio-ecosystems, protection of geo-ecosystems, protection of fishing grounds, protection of cultural resources etc. MPA may be established with varying degree of protection from complete (no access) to various degrees of access for different activities such as fishing or scuba diving etc.

Although other nations in the wider Caribbean have established MPA with varying degrees of protection for the marine environment, Haiti has not yet established an MPA or other marine conservation area as shown in the following table.

Table 7 – Haïti and MPA in the wider Caribbean. Source: GBRMPA,WB,WCU 1995, A global Representative System of Marine Protected Areas

Country	MPA	Other	Total
Cuba	15	15	30
Dominican Republic	7	4	11
Jamaica	4	0	4
Haïti	0	0	0
St Lucia	2	1	3
Trinidad & Tobago	1	7	8
Barbados	1	1	2
Belize	2	0	2
Dominica	1	0	1
Bahamas	9	0	9
St Vincent and the Grenadines	1	0	1
Guadeloupe	1	0	1

IV. Institutions, Policies, Laws Affecting Conservation

Institutions

In Haiti biodiversity issues are the responsibility of a great number of State Agencies and other actors ranging from Academia to Municipalities, NGO's and private firms and CBO's in Haiti. The following is a listing of the key actors involved and an outline of their major responsibilities:

The Ministère de l'Environnement (MDE): The MDE, created in 1995 after the Rio Summit, is the entity responsible for the overall management and coordination of environmental activities. It prepares, implements and monitors national policy on the environment and has also responsibilities for monitoring compliance with obligations made under international Conventions such as United Nations Framework Convention for Climate Change (UNFCCC), Convention on Biological Diversity (CBD), Convention to Combat Desertification (CCD), Cartagena Protocol on Biosafety, Pollutants Organic Persistent Convention (POP'S Convention), Basel Convention, and Montreal Protocol etc. This Ministry has been recently restructured into :

Soils and Ecosystems Division responsible for land degradation problem management, protected area management, conservation and sustainable use of ecosystems and other biodiversity issues, abatement and control of coastal and marine degradation, protection of landscape, protection of water resources;

Life Quality and Sanitation Division in charge of land-based pollution control, sustainable pest and chemical uses and management, ozone depletion activities control, environmentally sound management plans for waste, management of hazardous products, land use regulation in relation to mitigation of ecological risks (climatic or geologic);

General Inspectorate for the Environment. Law enforcement, Environmental Impact Assessment;

Environmental Education and Resources Promotion Division where the primary focus is to increase awareness about the environment, prepare educational materials and promote new behaviours and attitudes with regard to the environmental problems, coordination of national networks of information on the environment, annual report on the state of the environment;

Planning Division responsible for the overall planning in environmental matters, annual plan and public sector investment programme, negotiation of cooperation projects, monitoring and evaluation of environmental programmes and projects performances.

Three important institutions recommended by the National Environmental Action Plan, dealing with biodiversity issues and subject to impact the current institutional panorama, are envisioned to be created in the light of the recent General Decree on Environment promulgated (Jan 06) by the Haitian Government. They are:

The Agence National des Aires Protégées (ANAP), an autonomous organism, under the umbrella of the MDE, which will be in charge of managing the National System of Protected Areas;

The Fonds pour la Réhabilitation de l'Environnement Haïtien (FREH), financial mechanism to be fed by green taxes and public funds and devoted to support environmental programmes and projects including biodiversity ;

The Conservatoire du Littoral to be in charge of natural and cultural patrimony related to coastline and marine areas;

The Ministère de l'Agriculture et des Ressources Naturelles (MARNDR): The MARNDR has several agencies that are responsible for major aspects of biodiversity. These agencies are the :

Fisheries Division involved in enforcement of fishery regulations, policy formulation on fishery, promotion of different kind of aquaculture activities, inland fisheries ;

Soils, Park and Forest Division dealing with soils and forest resources management, protected areas management, watershed management and soil conservation ;

Water Resources Division, including the *National Meteorology Centre*, is responsible for irrigation strategies management and infrastructures, Early Warning System in relation to flooding and drought, water surface and ground water, weather forecasting ;

Agricultural Research and Documentation Centre (CRDA) : Phytogenetic and zoogenetic resources management, a component of biodiversity, lies within the CRDA ;

Agriculture Division including the *Quarantine Service and the Coordination Nationale pour la Sécurité Alimentaire (CNSA)* : responsible for crop protection (quarantine measures) and development, pesticide promotion, pest and disease control, trends analysis in food security, monitoring and guidance in food security policy.

In addition, the MARNDR assures the leadership in the management of some international instruments : the International Zoosanitary Code used by the Quarantine Service for norms with regard to animal imports, the FAO International Treaty of Phytogenetic Resources and CITES.

It should be highlighted that several environmental missions under the Soils, Park, Forest and Water Resources Divisions of the MARNDR are expected to be transferred to the Ministry of Environment in the light of the General Decree on Environment.

The Ministère des Travaux Public, Transport et Communications (MTPTC): The MTPTC has also several agencies that have responsibility for key aspects of biodiversity issues. These agencies include the :

Autorité Portuaire Nationale (APN) : APN is dealing with regulation of shipping transportation and leads the management of UNCLOS (United Nation Convention Law of the Sea) and the MARPOL Convention for the country ;

Electricité d'Etat d'Haïti (EDH) Company and the Bureau des Mines et de l'Energie (BME) : EDH and BME are involved in energy policy and strategies and regulation of sand mining. BME is particularly linked with the Ministry of Environment, through a Memorandum of Understanding, to implement some technical activities that come under the UNFCCC ;

Service National d'Eau Potable (SNEP) and the Centrale Métropolitaine d'Eau Potable (CAMEP) : SNEP and CAMEP are responsible for the management of the national and metropolitan potable water system. Their mission includes several infrastructure projects that cover construction of new facilities to improve the availability and the quality of drinking water, rehabilitation protection and extension of systems etc.

The Ministère de la Planification et de la Coopération Externe (MPCE) : The MPCE's mandate includes preparing land-use policy and spatial management strategies, zoning the territory, mapping the density of housing for the entire territory, establishing spatial data bases through its GIS Centre, and formulating and implementing national and regional development plans.

The Ministère de l'Intérieur et des Collectivités Territoriales (MICT): The MICT, through its Civil Protection Directorate and the Permanent Secretariat for the Management of Risks and Disasters, is the leadership for hazard and disasters management. It has also interventions in watershed management.

The Ministère de la Santé Publique et de la Population (MSPP): Aspects dealing with water quality control and other environmental health-related problems (water diseases, atmosphere pollution diseases), and population policy are within this Ministry's jurisdiction. The MSPP has also a lead role for the implementation of norms suggested by the Codex Alimentarius dealing with labelling and hygienic aspects of products and their composition.

The Ministère du Commerce, de l'Industrie et du Tourisme (MCIT): MCIT is involved in coastal development and promotion of tourism. At the national level this Ministry is implementing WTO (World Trade Organization) agreements dealing with environment such as the TRIPS (Trade Intellectual Property Rights), SPS (Agreement on Sanitation and Phytosanitation measures) and OTC (Agreement on Technical Obstacles related to Trade).

Ministère de la Culture et de l'Information (MCI): MCI promotes through ISPAN, the protection of the natural and historic heritage of Haïti including coastal and marine sites. The implementation of WIPO (World Intellectual Property Organization) is under this Ministry's jurisdiction.

The Ministère de la Justice et de la Sécurité Publique (MJSP): The mandate basically includes the enforcement of the Law with regard to environmental violations. Currently, MJSP is working closely with the Ministry of Environment to establish an Environmental Surveillance Force to save the remaining forests from destruction, prevent encroachment in protected areas and improve urban environment.

The Ministère de l'Economie et des Finances (MEF): Fiscal policy, tax collectorship, budget repartition and some environmental projects in the Haïti-DR border.

The Ministère de l'Education Nationale, Jeunesse et Sports (MENJS): involved in the development of curricula related to environment.

The Fonds d'Assistance Economique et Sociale (FAES): The FAES under the Ministry of Finances and Economy was primarily established to support economic and social projects in the context of an anti-poverty strategy designed by the Haitian State. Currently FAES is providing funding for CBO and Municipal environmental projects.

State and Private Universities : The State University of Haïti and private Universities such as the University of Quisqueya, the Notre Dame Catholic University, the University of the Caraïbbes and the University of Anacaona are teaching programmes and delivering Engineer Diploma in environmental sciences namely Natural Resources Management including different aspects of Ecology. However, they do not offer postgraduate programmes in environmental sciences. Aspects dealing with land degradation are covered, but this is not the case for important aspects related to Biodiversity and Climate Change.

Local Governments and CBOs: The focus has been on Community Disaster Preparedness projects, reforestation and soil conservation and solid waste management projects.

Policies

In December 1999 the Haitian government, with the endorsement of the Council of Ministers, published the National Environmental Action Plan (NEAP) with the support of UNDP, USAID, CIDA, and the World Bank. The NEAP is the major policy that offers guidance on all aspects of environmental management. The specific objectives are to:

Strengthen and rationalize the management of the National System of Protected Areas; Restore the ecological balance of the watersheds through the implementation of exploitation norms and best practices; Improve the quality of life through a better management of urban and rural areas as well the valorization and conservation of natural and cultural heritage; Provide a framework to reach a better coherence among plans and programs within the environmental sector.

The NEAP process and its outputs have enabled Haiti to identify a strategy which sets policy direction and defines an action plan aiming to reverse the drastic environmental degradation observed in the country. The core elements of the strategy and the action plan are used as a research platform, or logical framework, to design specific and individual projects aiming at addressing the key issues of: energy for sustainable development, environmental education, conservation and sustainable use of biological diversity, integrated watershed and coastal management, management of natural disasters and hazards, management of urban waste disposal etc.

The sectoral Watershed policy of the MARNDR, published in 2001, provides orientation and guidelines to better manage soils in the watersheds and outlines the importance of stakeholder participation in all aspects of decisions-making dealing with watershed management.

The National Risk and Disaster Plan (NRDP), supported by UNDP, was produced in 2000 in the light of the great vulnerability of Haïti to natural disasters. The NRDP has two main objectives: 1) work on causes and factors that originate risks in order to reduce the impact of disasters 2) strengthen the capacity response in case of disaster at the national, departmental and communal level. This Plan envisages the creation of coordination and direction entities that could facilitate its implementation. For instance, the Permanent Secretariat for the Management of Risks and Disasters is a technical coordination entity composed of representatives from several Ministries and civil society. This Secretariat and the National Committee, constituted of several Ministers, plays a key role in the overall management of natural hazards in the country.

The Haitian government, under its commitment to fulfil its obligations to implement UNCCD, has approached the Global Mechanism, one of the financial mechanism of the UNCCD, to assist it to seize the global picture of the desertification process in the country and derive comprehensive actions to tackle the issue. A comprehensive Desertification National Action Programme Process in the border region with Dominican Republic (PAN-FRO), with the technical support of GM and the FAO and financial assistance from the CIDA is underway. The PAN-FRO is considered as an entry point to prepare the overall National Action Plan to Combat Desertification (NAP-CD) in the country.

A Draft of an Integrated Management of Watersheds and Coastal Areas Policy (IMCAWA), supported by UNEP, has been developed in 2001. The general objectives of this Plan are set forth by socio-economic and ecological conditions that influence the well-being of Haitian population namely: high rate of poverty, crisis in the local economy, accelerated degradation of watersheds and coastal environments. The IMCAWA proposes actions intended to provide a coherent set of specific and concrete actions for operational activities conducive to the improvement of integrated management of watersheds and coastal areas in Haïti.

In response to changes in watersheds and coastal ecosystems in the country, the Plan put the emphasis on four interlinked strategic areas. The two areas of importance to this study are: 1) The restoration of critical coastal ecosystems and associated watersheds in order to maximize the sustainable benefits to local communities from using resources within watersheds and coastal zones to generate food, employment and income, supply safe water and conserving biodiversity for the benefit of local and global community ; 2) The reduction of communities' vulnerability to natural disasters : the focus is to prepare communities for and respond to natural and human-induced disasters.

A number of drafts of sectoral policy documents exist but have not been yet approved by the Council of Ministers. They include the National Strategy to reduce pressure on wood resources, the Water policy, the Forest policy, the Protected Areas policy, the profile of National Biodiversity Strategy and Action Plan. Some policy documents are in preparation: the National Programme of Adaptation to Climate Change, the POP's Action Plan etc.

LEGISLATION

Haiti's current environmental legislation provides a basic framework for the conservation and sustainable use of biodiversity. More than 100 pieces of laws and decrees, to indicate the most important of them, characterize this juridical corpus, as well as some fifty Multilateral Environmental Treaties signed or ratified by Haïti (See Appendix 9) for international agreements to which Haiti is a Party). However the word "environment" only appears in the national juridical vocabulary after the Rio Summit in 1992 and the world biodiversity only in 2006.

Eighty percent (80%) of the environmental legislation is composed of pieces and laws and decrees dealing with trees, forests, soils and fisheries. The majority of the laws are not really enforced given the weakness of State Agencies.

These laws are primarily composed of different prohibitions and do not promote stakeholder participation. Historically, the starting point was legal restrictions enacted to protect forests and certain species of fauna and flora. Special authorizations could be delivered to allow cutting trees in a forest or for fishing during specific seasons. For example, in the Fisheries Laws of November 27, 1978, it is forbidden (art 97): a) to capture, to sell, to export the *triton* (*Claromis variegata*) b) to capture the green and the Caray turtle during the nesting season between May and October c) to capture sea turtles and caray on the beach d) to collect sea crabs between December 11th and March 31st. It is also forbidden (art 112) a) to capture, sell, buy small conch shells and to engage in the commerce of their shells, and b) to export lobster and conch without adequate cleaning.

Very few of these laws deal comprehensively with the protection, conservation and sustainable use of biodiversity, as they are primarily sectoral in nature. In becoming a party to the CBD, Haiti bound it self to implement specific obligations under the Convention. The Convention *inter alia* places obligations on State Parties to : a) put in place measures to develop or maintain the necessary legislative and or regulatory provisions for the protection of threatened species and populations b) take legislative, administrative or policy measures to facilitate access to genetic resources by national legislation c) as far as possible introduce appropriate procedures requiring environmental impact assessments of proposed projects which may have a significant adverse effect on biodiversity and where appropriate allow public participation d) subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity d) take such legislative, administrative or policy measures to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology, and provide for the effective participation in the biotechnological research, and fair and equitable sharing of benefits arising from the commercial utilisation of genetic resources, especially by countries providing genetic resources.

The Constitutional Law of 1987 contains provisions that set forth governmental duties to protect the environment and the state's natural resources. This Constitution states that the State should organize the valorization of natural sites and ensure their protection (art 254). To protect forestry reserves and expand forest cover, the state is required to promote the development of clean energy: solar, wind and others (art 255). In the framework of environmental protection, obligations are placed on the State to create and care for botanical and zoological gardens in some points of the territory (art 256). Law specifies requirements for flora and fauna protection and sanctions people who breaks the Law (art 257).

In general, the environmental legal framework as a whole is outdated and needs to be substantially revised. The legislative framework in Haiti does not comprehensively protect ecosystem diversity, species diversity or genetic diversity. A new framework is needed that recognises the components of biodiversity and ensures the sustainable use of biodiversity in Haiti. Along this line, the Haitian Administration has developed an array of legal measures to facilitate the management of the environment in the last three years, initiated by several sectoral Ministries. Efforts have been made in the following aspects :

The General Decree on Environment (See Appendix 5), *Décret Cadre sur l'Environnement*, prepared by the Ministry of Environment with the assistance of the Interamerican Development Bank (IDB). This Decree was recently approved by the Interim Gouvernement (November 2005) and promulgated to the Official Journal of the Haitian State, *Le Moniteur*, on January 26, 2006 (161 th Year, Number 11). The approval of this Decree represents, in theory, a major step in terms of prospects to solve jurisdictional conflicts in environmental management in the country.

The initiative, which represents the legal foundation of the national policy of environment and provides regulation guidance for a responsible behaviour of Haitian citizens in terms of sustainable development, will serve as a legal umbrella strategy for all sectors of the environment in Haiti, including biodiversity.

The General Decree on Environment contains a specific Chapter dealing with **Biological Diversity** (art 135 – 139). Art 136 stipulates: Authorities in the country should ensure in situ and ex situ biological diversity conservation. **Other related biodiversity issues** in this General Decree have to deal with **Environmental Planning** (Chapter 2, art 29.4, 29.5), **Land Use Planning** (Chapter 3, Section related to Common regulations: art 33.b, art 34; Section 4 talking about protection of the natural and cultural heritage: art 43-art 47), **Protected Areas** (Chapter 3: in fact it should be Chapter 4: art 48 – art 55), **Environmental Evaluation** (art 56 – art 61), **Environmental Surveillance** (Chapter 5: art 62 - art 67), **Environmental Education** (Chapter 6: art 74 – art 76), **Environmental Funds** (Chapter 7: art 77 – art 79), **Technical and Scientific Research** (Chapter 9: art 87 – art 88), **Common Norms** (Title 4 and Chapter 1: art 89-art 93), **Soils and Terrestrial Ecosystems** (Title 4 and Chapter 2: art 94 – art 105), **Fossils and Mineral Resources** (Title 4 and Chapter 3: art 106), **Continental Waters** (Title 4 and Chapter 4 art 110, 111, 112,115, 116, 117.6, 121), **Marine Waters and Associated Resources** (Title 4 and Chapter Title 4 and Chapter 5 art 126 – art 132).

Several efforts at clarifying and widely distributing these laws have been undertaken:

- The codification of Haitian law texts on Environment realized by COHPEDA, a local NGO ;
- An Index of Haitian laws from 1804 to 2000 prepared by the Ministry of Justice with the assistance of UNDP. The overall set of environmental legislation including International Conventions on Environment (ICE) ratified by Haiti has been an important part of this Index. This will contribute to distribution and use of Haitian environmental laws among judges and lawyers in the Haitian judiciary system ;

- A Guide for the monitoring of ICE including UNCCD, CBD and UNFCCC ;

V. Government, NGO, and Donor Programs and Activities

Environmental NGOs/Associations and Private Firms: Over 500 Environmental NGOs, Associations and Private Firms are involved in activities related to water resources management and soil conservation projects, promotion of awareness in solid waste management and deforestation. Only a few of these entities are concerned with Biodiversity and Climate Change issues.

Global Environmental Fund: The Haitian government initiated a Global Environmental Fund (GEF) Biodiversity Protection Enabling Activity to prepare a National Biodiversity and Action Plan (NBSAP) and establish a Clearing House Mechanism, with World Bank assistance. In order to meet obligations under the CBD, the MDE conducted a series of national and international consultations (thematic workshops on biodiversity, seminars etc), whose major objective was to capture views on the main biodiversity issues and gain a clear sense of the measures needed for the sustainable management and conservation of the country's biodiversity. Under this initiative, the Haitian government submitted an interim First National Report to the Conference of Parties (COP) in 1997.

However, The NBSAP was never completed due to the suspension of World Bank operations in the country as a result of the controversial elections of May 2000. The prepared NBSAP profile calls for a vision that links the future of the Haitian nation with the way local population plans to use the diversity of biological resources. This future, to become sustainable, needs to integrate a management approach that reconciles Haitian people with their environment and satisfies their present needs without compromising the well – being of the future generations.

The NBSAP profile has retained five specific objectives : 1) to promote education awareness among the public and decision-makers on biodiversity issues, in order to increase their understanding on the interest to conserve Haitian biodiversity and recognize its contribution in the process of sustainable development 2) to undertake immediate measures to stop biodiversity loss in natural areas and ecosystems of Haïti 3) to conserve biodiversity resources of the country 4) to develop and implement ecological management approaches to preserve and use biodiversity on a sustainable manner, and 5) to implement institutional, legal and fiscal measures in support to biodiversity conservation and sustainable use of components of biological diversity.

In the same line, by December 2005, the Global Environmental Facility/Small Grants Programme (GEF/SGP) is to be operational in Haïti. The GEF/SGP will be administered by UNDP Country Office and will provide grants to NGOs and CBOs in support of community-based initiatives that could contribute to conserving global biological diversity, adapting to climate change and restoring degraded lands.

The Nature Conservancy: The MDE has signed a Memorandum of Understanding (MOU) with The Nature Conservancy (TNC) to complete the National System of Protected Areas. The finalization of the NBSAP is included among the areas of action prioritized by the MOU. The government is also envisions taking concrete steps with the Dominican Republic to establish an International Biosphere Reserve, including a Biological Corridor along the Mountains of Massif de la Selle and Sierra de Bahoruco for conservation and economic purposes. There is a broad consensus that Haiti would like to capture some of the benefits of the tourism trade in the Dominican Republic (\$2 billion in revenues per year and 45,000 jobs created), but also avoid reliance on large-scale resort based tourism. The Ministry of Tourism has identified adventure tourism, ecological tourism, cultural tourism, and social tourism (living/working in rural communities) as priority areas for development. These activities are

intended to offer an alternative tourism development model, one that incorporates conservation and sustainable development concepts into tourism from the beginning, and recognizes that sustainable development through tourism is possible only if the conservation and restoration of biological diversity is insured, local stakeholders are guaranteed participation, and benefits are equitably shared.

UNEP: Since 2003, the Haitian government with United Nations Environmental Programme (UNEP) assistance has implemented the Haiti Development of the National Biosafety Framework Project. Modern biotechnology is a sector that has arisen under the CDB as a means of promoting conservation and the sustainable use of components of biodiversity, but also as a means that requires strong management considering the question of biosafety. The main objective of this project is to assist Haiti to prepare a National Biosafety Framework (NBF) in accordance with the relevant provisions of the Cartagena Protocol on Biosafety. Activities under the project have been carried out to assess the current use of modern biotechnology as defined in the Cartagena Protocol on Biosafety, review legal instruments related to biotechnology/biosafety, define mechanisms for adequate involvement of all stakeholders, including public and private sectors on issues related to biosafety. Several reports have been published in the context of the project including the drafting of a National Law on Biosafety. The NBF policy document is currently being drafted and will be subject, before its submission to the Cabinet of Ministers, to a large consultation to ensure the public views are reflected.

UNCCD: In response to the commitment of Haiti to fulfil its obligations under the article 26 of UNCCD and in accordance with Decision 11 of the First COP urging Parties to submit to the UNCCD Secretariat periodical reports, the First National Report of Haiti to the UNCCD was submitted in 2002. The specific objectives of this report were to put into focus strategies and priority set up in the context of plans and sustainable development policies implemented to tackle land degradation, to provide information on institutional and legal issues and progress accomplished so far in the implementation of UNCCD. From an institutional point of view, the Haitian government recognizes that land restoration is an important issue for the socio-economic advancement of the Haitian people. Various institutions have been established and a range of endeavours with expected impact in favour of land restoration have been put in motion.

With regard to transboundary issues dealing with desertification and natural resource management, a Binational Fund for the Development of Hispaniola Island has been created, since 2002, by both Haitian and Dominican governments to boost sustainable development at the level of the borders shared by Haiti and Dominican Republic (DR). However, concrete steps and measures to operationalize this financial mechanism from the two countries are still expected. Permanent National civil society institutions focused on environment and land restoration have been created and are striving to gain acceptance.

FHE & PABV: A private sector financial mechanism, named the *Fondation Haitienne pour l'Environnement (FHE)* and supported by USAID, has been established in a form of a Trust Fund. The FHE will generate and manage financial resources, encourage the participation of civil society institutions in environmental rehabilitation including desertification and increase public awareness of environmental issues. In addition to this initiative, the NGO Community created the *Plate-Forme des ONG pour la Gestion des Bassins Versants (PABV)* designed to strengthen the role of participatory structures in the management of environment in general and the restoration of degraded lands particularly within watersheds.

GEF-UNDP: Two GEF-UNDP Biodiversity-Related Projects : 1) The Sustainable Land Management (SLM) Medium Size Project 2) The PDF-B Haiti/Dominican Republic-Integrated Natural Resources Management of the Artibonite Watershed will impact forestry and biodiversity.

The immediate objective of the SLM Project is to strengthen national capacity for sustainable land management while ensuring broad-based participatory support in the context of the preparation of the National Action Plan, through co-financing, under the UNCCD, to reverse desertification processes in Haiti. The main outcomes of the SLM Project will be a) systemic capacity building and mainstreaming of SLM principles b) individual and institutional capacities for SLM enhanced c) better knowledge and awareness of the need for SLM strategies and options.

The PDF-B Haïti-DR will remove barriers and complete the framework and mechanisms for effective long-term management, financing, and technical development of the transboundary portion of the Artibonite watershed, a river that encompasses a 9,500 km² area whose waters flow from the western Dominican Republic across central Haïti to the Caribbean Sea. The PDF-B will a) assist both countries to better understand the environmental concerns of the watershed and work closely to address them at binational and local levels, and b) build the capacity at the local, institutional and systemic level to utilize a more comprehensive approach for addressing transboundary water-related environmental concerns.

One major initiative supported by IDB and another by UNDP with regard to capacity development in the environmental sector will have impact on biodiversity issues: the IDB Programme for the institutional strengthening of environmental management and the UNDP Programme to support environmental management (PAGE in French).

Currently, the most significant environmental donor is far and away the Inter-American Development Bank (IDB). Other major environmental donors include USAID, CIDA, The World Bank, and also the FAO, including short and medium term post-disaster assistance.

IDB: The purpose of the IDB Programme is to improve environmental management and the sustainable use of natural resources in Haïti. The programme is composed of three main components :

1) Institutional and capacity strengthening where the purpose is to reinforce the overall performance of the MDE and other actors involved in the environmental sector. This component will include : support to the restructuring and reorganization of the MDE, technical training of human resources working with MDE, regulation, technical norms and procedures in relation with the General Decree Project on Environment etc

2) Strengthening of the decentralization process of environmental management aimed at implementing the decentralized environmental management in some pilots sites in the country. Activities will cover support to the installation of departmental offices to facilitate monitoring and environmental surveillances, Environmental awareness and education programme, implementation of community pilot projects

3) Support to the design and the implementation of a National Environmental Information System targeting the development and the implementation of an Environmental Information System. This component will be developed in close relationship with the PAGE Project.

UNDP: The immediate objective of the PAGE Project is to contribute to the institutional strengthening and development of tools for the sustainable management of natural resources in Haiti. The PAGE was designed into three main interlinked components:

1) institutional strengthening of the environmental sector centred on institutional strengthening and partnerships building in support to the environmental management in Haïti. One of the main activities will be to realize an organisational audit of the MDE that could allow this institution to revise its organigram, missions and different attributions. The institutional audit will also identify needs in partnerships with NGOs (national and international), Universities and other technical entities from state agencies.

2) Strategic management of information on the environment to be implemented with the GIS National Centre of the Ministry of Planning and External Cooperation. One of the main output of this

component will be the establishment of the *Observatoire Nationale de l'Environnement et de la Vulnérabilité (ONEV)*

3) Development of portfolio projects for local management of natural resources where the UNDP Country Office will develop a systematic approach to design portfolio projects co-funded by the GEF and other donors.

Other Actors

Other activities of importance are actions promoted by international and national NGO's such as the Programme of Valorizing Biodiversity in Higher Altitude of Haiti/Pine Forest supported by Helvetas-Haïti, Agro-biodiversity Projects (Organic yam and coffee) by PADF and CARE and Ecotourism projects supported by Macaya Foundation, La Visite Foundation, Peasnts Association of Vallue and CEPAHPE.

For a Least Advanced Country like Haiti, with a shortage of financial resources and limited capacity, it is vital to build many partnerships both international and national. Over the past four years, Haiti has established bilateral and multilateral cooperation with a number of countries and international organisations with the overall goal of strengthening its capacity and enhancing its capabilities to reverse land degradation. Special attention was given to developing and strengthening national capabilities through human resource development and institution-building with Dominican Republic through different mechanisms: CARIFORUM, JOINT COMMISSION, BINATIONAL FUND etc. To ease the financial constraints, ties were established with European Union, Germany, Belgium, France, Switzerland etc. However, the majority of those efforts were undermined by the political crisis in Haiti (2003-2006).

Different field projects mainly supported by USAID, the United Nations System, CIDA, AECI (Spanish Cooperation) and the European Commission have also taken place over the past two years. These interventions focused not only on redressing the effects, such as soil erosion, deforestation but also the root causes and drivers of ecosystem decline and desertification. They put emphasis on integrated watershed management, irrigation and other water components, reforestation, rural roads construction, sustainable agricultural practices/management, animal husbandry, farmers training, training of trainers, extension and research.

Additional Donor activities are listed below (Smucker et al 2006)

The World Bank

Contribution is mainly to strengthen national and community-level preparedness for natural disaster. The World Bank's current and planned investments in rural infrastructure (16M\$) and "community driven development" (38M\$) may also have an impact on natural resource management, but these programs are not formulated as environmental projects.

CIDA and FAO

Focus on local level efforts including local environmental planning, agroforestry, and improved farming practices designed to protect the productive base on slopes. CIDA is also one of the few environmental donors with an interest in the energy sector, including renewable forms of energy. The World Bank plans to invest in energy, but this will be limited to support for Electricité d'Haiti and the urban grid.

IFAD

The International Fund for Agricultural Development (IFAD) has also invested in agriculture, including small-scale irrigation works. IFAD reports ongoing projects for small-scale irrigation first approved in 1989 (16.75 M\$) and food crop intensification approved in 1998 (20 M\$).

Taiwan

Taiwan has donated funds for the creation of a bamboo sector, and for the planting of bamboo as a hillside stabilization technique. Major sites include: Marmelade and in the South East near Fond Jacques.

IDB

The current IDB portfolio touches on a wide range of critical environmental issues in Haiti. The IDB is heavily vested in rehabilitating the Artibonite irrigation works, the country's largest and most productive irrigation system. IDB also works with smaller irrigation works in the Ennery/La Quinte river basins (Gonaïves), including some watershed stabilization. IDB activities complement USAID-funded rehabilitation of irrigation systems in the Gonaïves plain and along the Trois Rivières.

The IDB is gearing up to invest in the protection of La Visite and Pic Macaya parks and related watersheds. To a certain extent this picks up where the World Bank left off with the Forest and Parks Protection Technical Assistance Project, which closed at the end of 2001. IDB is also providing support for new and ostensibly more autonomous institutional arrangements for national forest and parks management in keeping with the environmental decree of October 2005 now formalized as ANAP published in the March 2006 bulletin.

IDB which is currently preparing a twelve to fifteen million dollar project on the rural supply chain for various agricultural commodities including export crops such as coffee and mangos. This picks up on USAID success in this sphere via the Hillside Agriculture Program, albeit with a contrasting strategy. The IDB strategy is to re-activate the regional agricultural centers of the Ministry of Agriculture, including the creation of public-private boards representing both farmers and agribusiness (for example, mango exporters), and to use the centers as a research and training network for high value commodities and production systems that protect the resource base.

Table 8 - Current and Planned Donor Activities in Disaster Mitigation and Other Sectors Related to the Environment

Donor	Project	Description	Funding (US\$M)	Date
IDB	Agricultural Intensification	Artibonite irrigation works, flood control (below Peligre only)	46.6	2003
	Ennery-Quinte Ag Intensification Proj	Rehabilitation of small irrigation systems; stabilize watershed.	27.4	2005 – 2010
	Support for the Competitive Haitian Coffees	Improve quality control, support market mechanisms that promote coffee quality	1.14	2005
	Flood Early Warning System	Targeting 13 priority watersheds	5.0	2005
	Watershed Management Program	Promote national policy; target watersheds of protected areas, La Visite and Pic Macaya parks	30.0	Projected 2006
	Environmental Management	Environmental regulation & monitoring, re-structuring protected	5.045	2005

	(PRIGE)	area mgmt (parks)		
	Parks	Parcs La Visite & Pic Macaya, conservation, guards, buffer zones, watersheds, MDE	10.0	Projected 2006
	GEF proposal	Parks, watershed mgmt	1.0	Projected 2006
	Rural Supply Chain Development	EG: Coffee, vetiver, mangos, maize, vegetables; activate MARNDR centers & promote public/private partnerships	Circa 12.0-15.0	Projected 2006-2011
USAID	Tropical Storm Jeanne Rehabilitation	Gonaïves and the Trois Rivières including small scale irrigation works and civil protection	34.0	2005 - 2006
	Hillside Agriculture Program	Commercialization of perennial crops and some NRM	25.0 + (?)	2001-2006
World Bank	Emergency Response & Mgmt of Risks/Disasters	Response to May 2004 floods, strengthen DPC, est. local protection committees	12.0	2005
	Energy	Support for EDH (electricity)		Projected
CIDA	Artibonite River Watershed Mgmt Project	Border project for poverty reduction, NRM, protection of environment, bi-nat'l dialogue	10.0	2004-2111
	Environmental Fund	Energy, sanitation, NRM, EAPs, institutional strengthening	5.0	
(CIDA)	Local development projects	Local agroforestry and NRM planning: Nippes, Marmelade (FAO), local gov'ts in Nord-Est	13.0	Future
IFAD	Small-Scale Irrigation	Irrigation rehabilitation project	16.74	Since 1989
	Productive Initiatives Support Prog in Rural Areas		28.15	Since 2002
FAO	Various emergency response projects	Post-disaster assistance to small farmers, Nord-Ouest, Gonaïves, Rivière La Quinte	3.179	2004-2006
	Local natural resource mgmt & agriculture project	Integrated NRM/agricultural development in Marmelade, some fuelwood	1.087	2003-2006
	Local development Phase II	Marmelade & Plaisance including NRM	3.992	2005-2010
OAS	Transboundary groundwaters of Hispaniola	Project development underway to protect border-area aquifers, Artibonite & Massacre Rivers	1.0 (est.)	Future
UNDP	Inst strengthening for environmental management (PAGE)	MDE, including environmental action planning	1.0	2005 -2008
	DPC risk mgmt	Nat'l flood early warning prog	0.5	Current
GTZ	Emergency aid	Post-disaster assistance Gonaïves		
	Artibonite River	Cross-border conservation, Artibonite Watershed upstream		
	Cross-border Disaster Prevention	F.Verettes/Jimani disaster prevention		Future
	Disaster prevention	Sud-Est including Fonds Verettes,		Future

	& risk management	Thiotte, Pine Forest		
EU	Cross-Border Environmental Project (PET)	Planning, agricultural development, Enriquillo/Azuei Lakes.		2001-2006
	Cross-Border Environmental Project (PET)	Project renewal including prospective biological corridor, Barahona/Pine Forest		Future
	Risk management	DPC, early warning	8.0	Future
UNEP	Office National d'Observation de Bassins Versants	Institutional strengthening, MARNDR, knowledge mgmt, including cross-border issues		

VI. Threats to Biodiversity and to Forests

Haiti is frequently termed the ecological disaster of the Western Hemisphere. The situation is well expressed in the opening paragraph of the Haiti Country Environmental Profile (UEP) (Ehrlich et al., 1987). Few countries in the world face a more serious threat to their own survival from environmental catastrophe than Haiti. Overpopulated, its resources are overexploited and trends towards further environmental deterioration are apparent everywhere. The chance for reversing these trends, thereby preventing human suffering, destabilization of the country, and the further loss of development potential is diminishing daily.

Only 20 percent of Haiti has slopes of less than 10 percent, while 63 percent has slopes of over 20%. Because of soil and climatic conditions, only 11.3% of the total land area offers the potential for irrigation, mechanized cultivation and high agricultural yields. These productive lands (usually plains) are often underutilized or are lost because of residential development (often slum sprawl) or salinization. A high percentage of other less productive cultivated lands are being used above their carrying capacity, resulting in a relentless process of degradation. It is estimated that the equivalent of 6,000 ha of all types of arable land is lost each *year* to erosion, an annual decline of three percent (Ehrlich et al., 1987). This loss of arable land occurs at the same time that the population continues to grow, creating a demand for new agricultural land and food. With the increased population, Haiti has gone from over 670 people per square km of arable land in 1987 to presently over 961 people per square km of arable land. This is the highest density pressure on arable land in the Western Hemisphere. Thus the loss of this land to erosion is the most critical threat facing Haiti; and due to peasant expansion into "virgin" lands, to its biodiversity and forest resource.

General Threats to biodiversity

The loss of biological diversity at the genetic, species and ecosystem level is taking place throughout the country. Paleontological evidence indicates that a major portion of the mammal diversity of Haiti has gone extinct, largely represented by rodents, ground sloths, monkey and shrews that were endemic to Hispaniola (Woods and Ottenwader, University of Florida 1992). The threatened status of Haiti's Flora described in the IUCN's *Red List of Threatened Plant* includes over one hundred taxa representing 31 families (see appendix I). The major factors and driving forces have contributed to biodiversity loss in Haiti include: a) poverty and population growth that negatively impacts natural ecosystems and drives the erosion of biological diversity; b) introduction of alien species; c) habitat fragmentation due to increasing pressure of agricultural sector and other human activities - urban development and transportation corridors; and d) inadequate policies and regulations, and inadequate enforcement of existing laws.

Direct Threats

Farmers and fishermen have few alternatives to cutting down the remaining forests or over fishing reefs to subsist and. earn essential cash. Agricultural practices on hillsides are poor, resulting in low yields, increased soil erosion and disruption of hydrological systems. Potentially productive valley soils are under-utilized due to siltation of irrigation/drainage canals, falling water tables and periodic floods.

Exotic animals prey on endangered species in the Pic Macaya and La Visite National Parks. Predators, such as feral cats, dogs and mongoose, hunt freely in designated park areas. Concern has been raised that this predation could jeopardized the endangered mammals, Zagouti and Nez Long, and the endangered bird, the Black-capped Petrel (Woods, 1986, and Woods and Ottenwalder, 1986).

Exportation of endangered species and their by-products, including coral, sea turtles lobster, conch, and aquarium fish, is uncontrolled. Marine resources are not managed in a scientific manner and are exploited for short term gains, at the expense of resource sustainability.

As traditional forest resources become exhausted, exploitation increases in Haiti's mangrove forests, which are important for bank stabilization and protection of the coast against storm and wave action, *and which are important to* maintain the productivity of Haiti's estuary and nearshore waters. Developers are insensitive as to the importance of mangroves, and use this habitat for fill and to construct buildings.

The genetic resources of important, forest species are being lost through uncontrolled deforestation. Superior phenotypes of native and exotic tree species are not exclusively used for reforestation.

Indirect Threats & Root Cause

Legislation and Enforcement

Inadequate and unenforceable natural resources and conservation legislation with overlapping responsibilities by different branches

Lack of a comprehensive forest policy, outlining rights and responsibilities of the public and private sector with respect to tree tenure and management guidelines.

Management of Protected Areas

Rural communities should be involved in the management of protected areas, especially Macaya and La Visite National Parks. Park management should identify ways to provide an economic incentive for local inhabitants to support the park.

The GOH lacks trained manpower and financial resources to adequately manage the little native terrestrial habitat remaining. An alternative management institution is required to assure the continued protection of Pic Macaya and La Visite National Parks, and development of Les Arcadins Marine Park

Outside of Protected Areas

The GOH lacks trained manpower and financial resources sustainable land management practices that are compatible with the Environment on private land.

Major threats to forest resources

Domestic pressures are the set of underlying factors that drive the remaining forest resources loss in Haiti. The most common domestic pressures are: invasion by peasant farmers, demographic changes, poverty, illegal logging and *bois gras* harvesting (Pine Forest), property rights on lands and poor environmental management.

Direct threats:

Fires in the context of Pine Forests in Haiti may be a management tool (because pines need fire to regenerate) or a tool of destruction (deforestation fires). Currently the harvest of pole sized timber in La Visite and in some sections of Forêt des Pins prevents the build up of fuels for a catastrophic fire. However, in the last decades, fire has become an increasing threat because of its use as a clearing mechanism for land incursion and sometimes as a tool for revenge. One important ecological effect of burning observed by the USAID Study Team involved in the preparation of this report, when visiting the Forêt des Pins Reserve, is the increased probability of destructive fires due to the accumulation of dead and toppled trees. Currently the amount of debris is manageable but should more dead wood accumulate, the combination of opening up the forest to drying by sunlight and accidental or intentional fire setting could endanger the forest.

Demographic change, including natural population growth and in-country migration, affects forest resources in a variety of ways. As already stated Haïti's population is estimated to be 8 millions and will double by 2035. In addition, forest resources represent the primary source of energy for Haitian people. In the absence of population control measures, ever-increasing population places direct demands and pressures on existing forest resources. This often leads to harvesting of forest resources at unsustainable rates. Besides, as many rural poor populations largely depend on subsistence agriculture for their livelihoods, populations pressures also lead to an expansion of agricultural lands notably slash and burn agriculture.

In-country- migration is also implicated in forest resources loss particularly in the Forêt des Pins Reserve and the Macaya Park. These biological rich zones attract peasants from other regions in search of land, resources and new opportunities to support themselves. Increasing numbers of encroachments are observed and lead to rapid environmental deterioration at these sites.

Bois gras harvesting, a direct consequence of poverty and demographic change, also drives forest resource degradation particularly in the Forêt des Pins Reserve and the Macaya Park. Due to the lack of alternatives, local sawyers and farmers illegally exploit pine woods to meet their cash needs. *Bois gras* is harvested by slashing the trunk of a mature pine under conditions of heavy sap production, and collecting the sap laden chips for kindling. This kindling is sold primarily to urban households to start charcoal cooking fires. The tree is left standing but vulnerable to disease, fire, and strong winds

Indirect threats:

The issue of property rights on lands, most known in Haiti as land tenure issue, has adverse impact on forest resources. Forest lands are de facto, or legal state lands in the country. Incomplete or no property rights leads to a lack of incentive to invest in conservation and sustainable forest land uses.

Haiti is the poorest country in the Western Hemisphere and poverty is closely linked with the loss of forest resources. Limited access to resources, infrastructure or opportunities characterizes economic marginalization of the poor. Desperate economic situation pushes poor Haitian people to use whatever they can to support themselves, with little time or resources left to invest in resource conservation. Inequality is also closely tied to poverty. Inequality of access, quality, size, location and ownership of land and other resources drive forest resource loss. In Haiti, wealthy populations appropriate the best lands and other valuable resources for themselves. Such inequality drives poor populations on to woodlots and forest lands.

Finally Forest resource loss is also fostered by a failure of the Haitian government to adequately protect the environment. There no official policy forestry. This failure is more closely associated with weak enforcement of existing laws, a lack of managerial capacity, and/or financial resources.

Major threats to management of freshwater ecosystems

Direct threats:

Over exploitation of the forest resources and erosion of drainage basins

Forests have been steadily exploited as wood for construction, as a source of energy and as an expendable resource in the clearing of land for agriculture development. Deforestation caused by subsistence agriculture expansion is the major cause of erosion and the most crucial environmental concern of the nation.

At present, of the thirty (30) major watersheds within the country, twenty five (25) are completely deforested (Ministry of Environment 1999). The forest cover was reduced from 60 % in 1960 to 6.7 % in 1978 (USAID 1986). It has been estimated that the percent of the country remains under some tree cover represents less than 3% of the land surface today.

The removal of vegetative cover negatively impacted freshwater ecosystems in Haïti by decreasing their capacities for sustained production. Non forested land use activities place at risk the continued availability of reliable sources of domestic water, create general denudation of the landscape and increase erosion potential of upper water areas.

River alteration

Due to massive deforestation and increasing erosion, the process of hydrologic systems is malfunctioning. It prevails a situation characterized by Haitian technicians as the *Phénomène des rivières sèches* describing the fact that many wetlands and rivers are frequently subject to flooding and many critical basins do not have permanent flow.

Mismanagement and non sustainable use of groundwater

It is characterized by contamination of aquifers due to unplanned water pumping, disorganizing open quarries etc.

Indirect threats

The accelerated population growth coupled with increasing rate of poverty and uncontrolled urbanization process (shanty town): The Haitian population will reach 40 million by 2040 according to projections of the *Secrétairerie d'Etat à la Population* and as already stated the GNP per capita is \$US 250, the lowest GNP in the western hemisphere (World Bank and UNDP 1997) ;

The lack of application of existing laws and land use control measures to fully protect upper water catchment against illegal squatting and land clearing;

The lack of application, up to now, of existing policy in domestic water and its integration into a *Schéma National d'Aménagement du Territoire* and decision making;

Up to now, the lack of official strategy and action plans for critical wetlands of the country.

Major threats to management of coastal habitats, ecosystems and coastal wetland areas

Coastal ecosystems in Haïti are experiencing growing level of stress due to certain factors. These threats are the symptoms of more fundamental forces that are driving coastal environment degradation: population growth, poverty and inequality, social change and development etc. These important ecosystems not only are the key to the survival of the endangered species mentioned in Annex 1 but are the key to important fishery resources, and have great potential to make a contribution to the economic sector through tourism. Unfortunately, they and the endangered species associated with them are in jeopardy from mismanagement and misuse. This includes:

Overexploitation: destruction of sensitive habitats, logging mangrove forests for their wood and bark and destructive harvesting methods used for fishes have led to the depletion of stock and species;

Coastal development: Coastal development in the form of residential, tourist, unplanned construction, commercial development and road construction alter coastline ecosystems and lead to overexploitation of resources and habitat degradation;

Pollution: Pollution caused by land-based sources (solid wastes and toxins, siltation, agricultural runoff) and oil spills from vessels and aggravated by coastal development stress critical ecosystems such as wetlands, coral reefs and mangroves;

Extraction of sand from the beaches for building is changing the morphology and the landscape, disturbing the hydrology, enhancing erosion and disturbing the whole ecosystem;

Corals death due to high turbidity, sedimentation and other stress from human activities.

Destruction of mangroves, seagrass beds and coral reefs from erosion and modified hydrology associated with deforestation and slash and burn agriculture, (Ehrlich et al., 1987). The apparent effects of sedimentation on coral degradation can be readily observed by divers.

Destruction of grass beds, coral reefs and mangroves from untreated liquid and 'solid waste pollution stemming from major population centers such as Port-au-Prince, Cap Haitien, Gonaives, Jacmel and Cayes. This is alluded to by Ehrlich et al. (1987), but needs to be studied and quantified. The apparent smothering out of large areas of coral reef by algae observed on Les Arcadins leads one to the impression that nutrient levels may be higher than normal, possibly stemming from Port-au-Prince and/or other nearby population centers.

Cutting of mangroves for charcoal, firewood and timber, as more traditional timber reserves become exhausted. Between 1956 and 1977 it is estimated that 7 percent of the mangroves disappeared. In 1987 there were approximately 22,360 hectares of mangroves in the coastal zone of Haiti (Ehrlich et al., 1987). Currently, that figure has dropped to 17,337 hectars (UTSIG 1998), a decline of 24 percent.

Draining and filling mangroves for development. Currently, this is taking place for the purpose of housing construction at Cap Haitien, Archain, and other coastal urban areas. It is difficult to determine to what degree it is taking place throughout the country and needs to be investigated.

Over Harvest of wildlife food sources for human consumption. A new development in the over exploitation of the mangroves is the netting and sieving of mangrove pools for large zooplankton and

brine shrimp (Timyan 2006). The creatures form the base of the fisheries food chain, and with their decline fisheries resources can be expected to plummet.

Accelerated silting-in of salt ponds and other wetlands from increased erosion caused by traditional agricultural practices. It is reported that Lac Peligre has lost over 30 percent of its storage capacity due to sedimentation (Ehrlich et, al., 1987). This is also a huge threat to salt harvester's whose principal livelihood derives from inherited pools.

Transboundary threats

Cases of conflicts are often reported between Haitian and Dominican fishermen along the North East Coast (Fort Liberté) and the South East Coast (Belle Anse). Other threats have to deal with pollution problems caused by plastic containers mismanagement and sedimentation. Many Haitian fisherman have lost their boats and catch when fishing off of Dominican Islands (see website)

Impacts of Climate Change on Agriculture and forests in Haïti

A preliminary results of a study supported by UNEP and conducted both by the MARNDR and the MOE under the UNFCCC entitled: "*Etude de Vulnérabilité d'Haïti face aux effets des Changements Climatiques*". suggests that Climate Change would:

Negatively impact conditions of water feeding for important crops like beans (Phaseolus vulgaris. L) production. Haïti is normally affected by drought every five years but this situation could change the periodicity and frequency of drought;

Increase the occurrence of pests and diseases. There would be an expansion of fungi and bacterial diseases like Ustilago scitaminea (Sugar cane), Hemileia vastatri (Coffee), Pseudomonas salacearium (Solanaceae: tomato, tobacco etc);

Increase the frequency of wider uncontrolled fire in the Pine Forest (Pinus occidentalis) and affect the repartition and the abundance of mangrove forest in Haïti.

VII. Actions Needed to Conserve Biodiversity

Guiding Principles

In undertaking actions to conserve biodiversity, it should be taken into account the following considerations:

Reduce the widespread poverty and the effects of poverty on communities who rely on biodiversity for their survival and prosperity. Biodiversity actions need to be correlated with measures that achieve sustainable population growth (national population control) and a sound strategic plan against poverty that provides employment opportunities and diversifies income generation activities.

Promote a decentralizing approach to manage biodiversity by strengthening Haitian civil society and territorial collectivities while building their capacities to take appropriate actions to conserve biological diversity and to facilitate sustainable use of biodiversity components and the fair and equitable sharing of the benefits arising from the utilization of genetic resources;

Develop an increasing partnership with the private sector in favor of conservation causes;

The need to achieve synergies and avoid duplications by scaling up on what is being implemented by the Government, donors and various components of the civil society (NGO's, Ecological Associations and Foundations etc);

The need for urgent conservation action for remaining forests and other biological rich areas ecologically significant and/or most important for biological diversity on national scales.

SUGGESTED ACTIONS

Parks and Protected Areas

Serious consideration should be given by the international donor organizations to the development of Pic Macaya and surrounding areas as one of the worldwide system of Biosphere Reserves. This concept is currently being considered for a transnational Biosphere reserve and corridor between Foret des Pins and Barahuco park in the Dominican Republic (see NGO section). Other potential areas to be developed as parks have been recommended (table x), including Les Arcadins, which offers promise for development as a Marine Park.

Given the unlikelihood that the GOH will soon be able to fund parks as a priority, international donor support should be given to the capacity development and roll out of the new Agence National des Aires Protégé. The Foret des Pins should continue to be managed as a protected reserve until it can offer the potential for sustainable, multiple-use management. Given this critical situation, the international donor community should continue to develop strategies for protection of the remaining areas of native habitat in a manner compatible with survival needs of local residents. Offering productive alternatives to fuelwood an lumber cutting, such as *permanent* crops, improved forages and marketing assistance, will help to raise on-farm incomes beyond the subsistence level.

Steps to promote a national system of Protected areas

- ▶ Create an institutional and socio-economic enabling environment in favor of biodiversity and forests by assisting in the implementation of various institutions dealing with biodiversity issues in the General Decree on Environment, in the formulation of appropriate policies, promotion of forest law enforcement, addressing socio-economic failures and distortions (incentives for sustainable practices, methods of valuing forest biodiversity and other forest ecosystem goods and services) and increasing public education, participation and awareness;
- ▶ Institute a more coherent System of National Protected Areas (SNAP) including a management policy for protected areas and create the ANAP, the autonomous National Office to Manage Protected Areas. Protected areas management must be consolidated under one authority, if an efficient, viable parks program can be expected in the future
- ▶ Establish a more efficient surveillance system to ensure that the SNAP is protected from encroachment of any kind including sustainable security through the implementation of surveillance environmental force;

Protected Areas and the Population

In order for these Parks to succeed in the poverty-stricken, resource-poor environment of Haiti, they must be income generators, both to the Government and to the people living in and around the park. Only

in this manner can one expect to conserve the unique flora and fauna found within their boundaries. In spite of the importance of these parks for, protecting watersheds, it is unlikely that the GOH will allocate significant budgetary resources to their management in the near or mid future. Therefore it will be necessary for the international community and the private sector to support these areas. Methods to improve the valuation and income generation potential of these parks are below.

- ▶ Promote Communities-Based Biodiversity Enterprises by valuing biodiversity products (agro-biodiversity, medicinal plants etc), providing certification, financial services, technical and business services;
- ▶ Promote environmentally friendly income generating projects for communities living in the buffer zones of protected areas;
- ▶ Microprojects consisting of small investments funds to generate incomes and which can directly address poverty concerns related to the communities
- ▶ Another innovative idea which has proven very successful and very popular in West Africa is to integrate tourism into the lives of the rural community. Tourists spend a couple of days on the coastal beaches, and then are lodged in rural villages where they become integrated into everyday activities. They have the chance to experience local dance and music, arts and crafts, and the traditional cuisine. This idea should be explored by the private sector.
- ▶ Other examples that have been considered are the employing local people as park guards and guides, and determine ways to include local businesses such as stores and restaurants. However, the remoteness of La Visite and Pic Macaya reduce the likelihood of significant development of tourism and nature-based recreation by foreign or Haitian populations, which limits the possibility of employment local people

Such integration of local populations with protected area management fits within the concept of a Biosphere Reserve

Unless it can be demonstrated to be a true income generator, the next best chance for a protected area to succeed would be for the buffer zone to be managed as natural forest where income can be generated from periodical harvest of the forests, grazing, etc., by the rural community, under close scrutiny of the GOH or a designated managing authority. The core zone would be kept intact as a major preserve for biological diversity. Details of some of this plan are contained in Woods and Harris (1986). The only other option would be for an international conservation agency to undertake a debt equity swap, in which part of the GOH's debt would be swapped for the right to set this area aside as a preserve. For either of these solutions to succeed, it would be necessary for a long term program to be developed, integrating into and benefiting the rural community from the management of this land mass.

Coastal and Marine Resources

- ▶ Implementation of measures to promote sustainable fisheries management by vulgarizing sound methods of fishery, establishing fishery data base (information on fish biology and ecology, stock size, qualitative and quantitative information on aquatic biodiversity, socio-economic characteristics of fishery stakeholders etc);
- ▶ Establishment of Marine Protected Areas through relevant biogeographic criteria, empowerment of responsible stakeholders, zoning plans, co-management partnership, research and monitoring programme etc;

- ▶ Protection of mangroves and coral reefs from encroachment and destruction by giving more responsibility to fishermen organizations, replanting mangroves and formulating appropriate community management plans and promoting the recovery of damaged reefs thru restoration techniques (transplanting corals, construction of artificial reefs, farming corals etc);
- ▶ Wetlands Management (Coastal wetlands or inland waters that are wetlands) intended to work closely with communities to conserve the wetlands and use them sustainably in order to improve their buffering capacity;

Development of Ecotourism.

Sites with great potential of ecotourism should be identified in collaboration with local entrepreneurs and Territorial collectivities. Action plan to promote ecotourism needs to be elaborated and implemented.

Aside from the May 2004 flooding disaster in Mapou, the Minister of Environment views the entire Sud-Est as a high priority for watershed interventions due to the presence of major protected areas (Pine Forest, La Visite Park), proximity to the Dominican border, and prospects for tourism as an offshoot of the Dominican tourist industry. The other market with great potential is the Haitian diaspora, who regularly visit the country and are willing and able to spend on luxury, adventure, ecological, and cultural tourism.

Provide assistance to the Haitian Tourism Association (ATH)

They have identified the following issues:

- ▶ **High priority zones as follows:** “La Côte des Caraïbes” including Jacmel, Les Cayes, Ile à Vache; “La Côte Nord” from Fort Liberté to Môle St.-Nicolas; La Côte des Arcadins; Pétion-Ville; and the environmental areas such as Parc la Visite, Parc Macaya, Séguin, Furcy, etc.
- ▶ **Decentralization and Rural Development** including environmental protection. ATH has asked whether there can be *money leveraged from any agency to provide studies or technical assistance on: a) Tourism as a way to ensure National Park protection; and b) Managing National Parks.*
- ▶ **Tourism documents:** the association would like to continue with the implementation of the Tourism Master Plan, a document developed in 1996 and reviewed last year by the World Tourism Organization. On the basis of this they want to formulate a national tourism strategy that can become a development platform for the next government. (They also asked whether USAID would fund a meeting between the Association and political candidates)

Watershed Management

According to recent interviews with GOH officials, there are differences in strategy between the MARNDR and MDE approaches to watershed priorities. MARNDR views the watershed itself as the optimum unit of program intervention. In contrast, the MDE is oriented to the national environmental action plan (NEAP) based on local government jurisdictions (“proximity approach”), including local action plans that take into account watershed protection. Interventions for intervening at the watershed level include:

- ▶ Development and Implementation of planning and management tools/guidelines and other appropriate mechanisms to prepare integrated watershed and coastal areas management plans

and to promote environmentally sound practices and forms of land-use, watershed management and coastal development;

- ▶ Support and develop best practices or methods in forest management and create reforestation areas in strategic watersheds of the country;
- ▶ Promote sustainable management of inland water ecosystems and Integrated watershed and coastal management;
- ▶ Catchment afforestation and revitalizing farming systems aiming to increase forest cover and arrest soil degradation through production of seedlings, tree planting, agroforestry techniques, soils conservation practices with the full involvement of communities; This component will also contribute to create forests to feed important aquifers and protect different sources of water

Table 9 - Donors & Priority Watersheds per DPC & MARNDR (Smucker et. al 2006)

Zone	Donor	Activity	C	P
*Camp Perrin	IDB	Ravine du Sud (linked to Pic Macaya protected area per IDB planning)		X
	UNDP	Preparedness/disaster alert	X	
* Mapou	WB	Watershed planning & restoration	X	
	GTZ	Risk management plan for Sud-Est		X
*+Fonds Verrettes	WB	Watershed planning & restoration	X	
	GTZ	Risk management plan for Sud-Est		X
	GTZ	Fonds Verettes/Pine Forest/Jimani cross-border, disaster prevention		X
*+Artibonite	IDB	Agriculture Intensification (irrigation)	X	
	GTZ	Cross-border (upstream Artibonite)	X	
	CIDA	Cross-border (upstream Artibonite)	X	
	OAS	Cross-border (upstream Artibonite)		X
*+Maribaroux				
*+Gonaïves	USAID	Trois Rivières and Gonaïves Plain (irrigation)	X	
	IDB	Ennery-Quinte (irrigation, watershed)	X	
	CIDA/ FAO	NRM, Marmelade watershed upstream from Gonaïves	X	
	GTZ	Post-disaster response	X	
*+Jacmel				
*+Port-au-Prince				
*+Cap-Haitien				
*+Saint Marc				
*+Les Cayes	IDB	Cavaillon/Ravine du Sud watersheds linked to Parc Pic Macaya		X
*+Léogane	IDB	Watersheds linked to Parc La Visite		X
*+Petit Goave				
*+Port de Paix	USAID			
*+Limbé	IDB	Soil and water conservation center (Rural Supply Chain project)		X
Priority zones	IDB	Early Flood Warning 13 priority sites	X	
	EU	Early flood warning priority zones		X
	WB	Disaster preparedness Grand'Anse, Sud, Artibonite, Nippes, PauP	X	

* DPC-identified priority watershed or zone.

C = Current project.

+ MARNDR-identified priority.

P = Project under preparation

Other Needs

Genetic Resources

The Rural development projects should take care to identify and conserve superior genotypes of economic plants and animals already present in Haiti. Better record-keeping is necessary to assure that only the best native and introduced germplasm is distributed to farmers. Special care must be taken when considering introduction of exotic species, such as fish, which have the potential of reproducing in the wild and threatening the survival of native species. Conservation of the genetic resource of *Pinus occidentalis*, native only to Hispaniola and Cuba, has significance not only for Haiti, but for all areas of the tropics with droughty, alkaline soils.

Reduction of fuelwood and charcoal use

The promotion of alternative fuels is receiving a lot of attention, to reduce the market for charcoal, and thus relieve the pressure on remaining forest. Petroleum-based fuels might be proving more and more economically unfeasible. Additionally, they would add to the foreign exchange burden of Haiti. Production of charcoal provides an essential source of cash to Haitian peasants; thus it is uncertain whether a lower charcoal price would serve as a disincentive to these peasants, or would cause them to produce yet more charcoal to meet their cash needs. Conversion to fossil fuels would also necessitate an investment in equipment that would be difficult to retrofit to wood-based fuel, should the economic picture change, and locally produced fuelwood becomes more environmentally acceptable.

Large areas of semi-arid, degraded land are occupied by thorn, Forests, *which do not support*, agriculture, but that are extensively grazed. Management systems for these "forests" (they are probably not included as forest in statistics on the amount of forest cover in Haiti) to maximize sustainable production of naturally regenerating species for fuelwood and other products should be developed and promoted, as discussed for mesquite forests of the southwest U.S. by Felker et al. (1987). There are local sustainable-rotational systems in use but they are not well understood and may be on the decline. Thinning of sprouts and reduction in tree spacing could increase tree growth rates and size, at the same time that grazing would be improved by reducing shade on subordinate vegetation.

Other sources of alternative fuels. (Smucker et al 2005)

Bagasse is widely used as the primary fuel for artisanal sugar production (boiling down syrup) and distillation of *kleren* (raw rum). Raw artisanal sugar (*rapadou*) is still produced on the Central Plateau. Some rural areas near Maissade visibly demonstrate the dramatic impact of conservation structures linked to resistant varieties of cane that gave rise to landscape level changes in the local environment and economy. There has also been recent talk of replicating the Brazil experience with sugar cane ethanol, for a Hispaniola wide energy system. This is intriguing as cane is a traditional Haitian crop and the Dominican Republic has the industrial base for large-scale processing.

Other biomass fuels have been considered, but each faces a large infrastructure challenge as well as political hurdles. Small generating facilities would need to achieve a regular supply of fuel (a chicken and egg dilemma), and also negotiate grid use with EDH as a public utility. There is also the problem

of the management and billing infrastructure that would have to be addressed. al for biomass sugar cane and oilseed crops (castor bean and jatropha) for biodiesel.

An interesting option for biodiesel would be the commercial baking and dry cleaning sectors. These industries have been shifting gradually to diesel powered energy (away from fuelwood). They constitute a specialized and specific enough market that would lend itself to biodiesel. Research on the use of biodiesel would need to be done, as well as initiating large-scale growth of biodiesel species. In the interim, other biodiesels (corn or soy oil) could generate momentum towards this supply. With the high cost of imported fuel and taxes, there might be enough impetus to begin a switch. Other sectors with a potential interest in biodiesel include the numerous small generators in Haiti, irrigation pumps, government diesel vehicles, company fleets, and regional power grids. A potential source of expertise and funding is the GDA mechanism with private biodiesel firms.

VIII. USAID Proposed Strategy & Program

USAID Haiti is in the process of designing its new three year strategy (2007-2009). This strategy is based in the fragile states strategy of USAID, and is mainly concerned with returning stability to the country after a period of transition. The primary focus is to allow the newly elected government to establish itself and begin proper function while addressing the root causes of the fragility. USAID has identified three main causes of fragility and will target its strategic objectives to address these: Increase employment and livelihood opportunities, increased access to basic services, and improved rule of law and responsive governance.

Threats from Proposed Activities

There are no direct threats to forests or biodiversity posed by USAID's new draft strategy. The strategy focuses on stability and addressing root causes of fragility, and should impact the status of forest and biodiversity positively. This is especially true in the economic and livelihoods domain as one of the primary reasons for forest and biodiversity loss is the encroachment of poor peasants into high biodiversity areas in order to eking out just enough for survival.

However, USAID must be vigilant not to indirectly put additional biodiversity rich areas under threat by developing the economic base around these last islands of nature. Development programs have the potential to draw more population to an area that is experiencing a rise in living standards and this can unintentionally increase pressure on resources. As well, in a country where rule of law is weak, the wealthy and powerful overly influential, and corruption ever present, increased wealth can be an attractant for undesired exploitation. One habitat particularly vulnerable to increased development is the mangrove and coastal wetland ecosystem. Careful attention must be paid to the possible effects of increased agricultural production (from sediment and chemicals) and exploitation for building materials and fuel. Many of Haiti's watersheds drain into these rich habitats and lowland, urban hot spots, as well as hillside development can have unintended impacts. Particular care should be taken in the proposed JOBS programs in Port au Prince, Cap Hatian, and Gonaives, because of the presence of mangroves.

Extent to Which Proposed Actions Meet Needs

USAID's draft strategy does not directly address biodiversity and forestry conservation. The proposed enhancement of government capacity especially in the ministries of Agriculture and

Environment comes closest to direct action. However, the biggest threat to forests and biodiversity is the combination of poverty, institutional weakness, and the lack of government direction for the management of natural resources. The draft strategy does address these threats and thus meets the most critical needs for biodiversity conservation.

USAID should attempt to link all of its programs with biodiversity, forest, and general environmental conservation as described below. Additionally, USAID should remain open to targets of opportunity for the promotion of biodiversity and consider funding targeted activities especially where no other donor or entity is active. Two areas that present possible current opportunities are: the Forêt de pines and selected marine and coastal resources.

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Appendices

- Appendix 1 Eco Regions
- Appendix 2 Holdridge Life Zones
- Appendix 3 Major Watersheds
- Appendix 4 Protected Areas & Natural Resources
- Appendix 5 General Decree on Environment (41 pp)
- Appendix 6. Threatened, Rare, and Endemic Species
- Appendix 7 List of Contacts
- Appendix 8 SOW for Analysis
- Appendix 9 List of International Treaties

Appendix 6.

Threatened Rare and Endemic species associated with Parc Macaya

Source: Woods and Harris, 1986 and Supporting Background Reports)

Vascular Plants

Myrsine magnoliifolia, Endemic, Endangered Meliosoma abbreviata, Endemic, Endangered Calycogonium torbecianus, Endemic, Endangered, Tabebuia conferta, Endemic, Endangered Brunfelsia picardae, Endemic, Endangered

Orchids

Too numerous to list, but 38 endemic to the Massif de la Hotte, in which the park is found, and 58 species endemic to Hispaniola.

Butterflies

Calisto loxias, Endemic, Found only in Massif de la Hotte

Mollusks

Twenty-three endemic species known only from the immediate park vicinity. Herpetofauna

Eleutherodactylus ventrilineatus, Endemic; Frog plus another 17 frogs, 11 lizards and 5 snakes.

Birds

Least Grebe, Endangered Black-capped Petrel, Threatened Sharp-shinned Hawk, Threatened Peregrine Falcon, Rare . Limpkin, Rare and Threatened Hispaniolan Parrot, Rare and Endangered Broad-billed To-dy, Rare Yellow-bellied Sapsucker, Rare Grey-checked. Thrush, Rare White-winged Warbler, Rare and Endangered Chat. Tanager, Endangered Antillean Siskin, Rare Lincoln's Sparrow, Rare Trogon, Endangered Solitaire, Endangered Cross-bill

Mammals

Plagiodontia aedium "Zagouti," Endangered Solenodon paradoxus, "Nez Long," Endangered

Threatened Rare and Endemic species associated with Parc La Visite

Source: Woods and Harris, 1986 and Supporting Background Reports)

Vascular Plants

All 35 plant species endemic to the park, especially the following species:

Juniperus ekmanii

Hypericum millefolium, Miconia rigidissima Gesneria hypoclada

Siphocampylus caudatus Rondeletia Dalmatian

Butterflies

Calisto archbates restricted to the park. Mollusks

Three species endemic to the park.

Herpetofauna

Eleutherodactylus armstrongi

Eleutherodactylus fulvipes (Frog) Eleutherodactylus leonci. (Frog) Wetmorena haetiana (Lizard)

Birds

Black-capped Petrel, Threatened

Limpkin, Rare and Threatened

Hispaniolan Parrot, Rare and Endangered Antillean Mango, Rare

Hispaniolan Trogon, Threatened

Cedar Waxwing, Rare

Black-wiskered Vireo, Rare Nashville Warbler, Rare

White-winged Warbler, Rare and Endangered

Blue-hooded Euphonia, Rare Chat Tanager, Endangered Lincoln's Sparrow, Rafe Ground Warbler,

Endangered Trogon, Endangered

Solitaire, Endangered

Laselle Thrush, Endangered

Mammals

Plagiodontia aedium, Zagouti, Threatened

Threatened Rare and Endemic species associated with Coastal and Wetland habitatst

(Source: Extracted from Country Environmental Profile (Ehrlich et al, 1987).

Mangroves

Buttonwood, Conocarpus erecta

White Mangrove, Laguncularia racemosa,

Red Mangrove, Rhizophora mangle

Black Mangrove, Avicennia germinans

Reptiles

American Crocodile, Crocodylus acutus, Endangered

Green Sea Turtle, Chelonia mydas, Endangered

Hawksbill Turtle, Eretmochelys imbricata, (Caray), Endangered

Loggerhead Turtle Carreta caretta, Endangered

Birds

American Flamingo, Phoenicopterus ruber, Endangered Roseate Spoonbill,

Ajaia_fajita, Endangered

Reddish Egret, *Di. Iij! :omannssa rubescens*, Endangered West Indian Tree Toad, *Dendro
naxar:horea*, Endangered Masked Duck, *py.y■rr2k.dp2TAll*, Endangered
White-crowned Pigeon, *Columba leucocophala*, Endangered Hispaniolan Tropicbird,
Temnotroon rose, Endangered Peregrine Falcon, *Talco_per_e,rinus*, Endangered

Mammals

West Indian Manatee, *Trichechus manatus*, Endangered All require a permit from the
DNR.

Invertebrate:

Triton, *Cladocera*, Snail, Endangered

Dent saignante, *Norita poJor.cirita*, Snail Permit from DNR

Brig no.ir, *Liinovo_pica*, Snail, Permit from DNR

Cascluec, *Cassida thei osis* and *Cassida srariensis* Snails.

Lobster, *Panulirus argus*-Closed season April 1 to Sept. 30, no females with eggs.

Conch, Length 10 cm or greater-use of air compressors to catch forbidden between Feb. 1
and July 31.

Table 5 IUCN Red List

Species Scientific Name	famname	Comname_en	Red List Class	Pop Trend
Epinephelus itajara	SERRANIDAE	GOLIATH GROUPER, JEWFISH		
Epinephelus nigritus	SERRANIDAE	WARSAW GROUPER		
Eleutherodactylus amadeus	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus apostates	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus bakeri	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus brevirostris	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus caribe	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus chlorophenax	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus corona	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus darlingtoni	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus dolomedes	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus eunaster	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus fowleri	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus furcyensis	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus glandulifer	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus glanduliferoides	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus jugans	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus lamprotes	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus leoncei	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus lucioi	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus nortoni	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus oxyrhyncus	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus parabates	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus parapelates	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus paulsoni	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus poolei	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus rhodesi	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus schmidti	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus sciagraphus	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus semipalmatus	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus thorectes	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus ventrilineatus	LEPTODACTYLIDAE		CR	Decreasing
Eleutherodactylus warreni	LEPTODACTYLIDAE		CR	Decreasing
Buteo ridgwayi	ACCIPITRIDAE	HISPANIOLAN HAWK, RIDGWAY'S HAWK	CR	decreasing
Isolobodon portoricensis	CAPROMYIDAE	PUERTO RICAN HUTIA		
Celestus warreni	ANGUIDAE	GIANT HISPANIOLAN GALLIWASP		

<i>Cyclura ricordi</i>	IGUANIDAE	HISPANIOLAN GROUND IGUANA, RICORD'S GROUND IGUANA, RICORD'S IGUANA LEATHERBACK, LEATHERY TURTLE, LUTH, TRUNKBACK	CR	decreasing
<i>Dermochelys coriacea</i>	DERMOCHELYIDAE	TURTLE	CR	
<i>Eretmochelys imbricata</i>	CHELONIIDAE	HAWKSBILL TURTLE	CR	
<i>Attalea crassipatha</i>	PALMAE		CR	
<i>Pseudophoenix lediniana</i>	PALMAE		CR	
<i>Manilkara gonavensis</i>	SAPOTACEAE		CR	
<i>Nectandra caudatoacuminata</i>	LAURACEAE		CR	
<i>Nectandra pulchra</i>	LAURACEAE		CR	
<i>Hippocampus reidi</i>	SYNGNATHIDAE	LONGSNOUT SEAHORSE, SLENDER SEAHORSE		
<i>Thunnus thynnus</i>	SCOMBRIDAE	NORTHERN BLUEFIN TUNA		
<i>Siphonorhis brewsteri</i>	CAPRIMULGIDAE	LEAST POORWILL	DD	
<i>Aetobatus narinari</i>	MYLIOBATIDAE	SPOTTED EAGLE RAY		
<i>Papilio aristor</i>	PAPILIONIDAE	SCARCE HAITIAN SWALLOWTAIL		
<i>Grampus griseus</i>	DELPHINIDAE	GREY DOLPHIN, RISSO'S DOLPHIN FRASER'S DOLPHIN, SARAWAK DOLPHIN	DD	
<i>Lagenodelphis hosei</i>	DELPHINIDAE	ATLANTIC SPINNER DOLPHIN, CLYMENE DOLPHIN, HELMET DOLPHIN	DD	
<i>Stenella clymene</i>	DELPHINIDAE	ATLANTIC SPOTTED DOLPHIN, BRIDLED DOLPHIN	DD	
<i>Stenella frontalis</i>	DELPHINIDAE		DD	
<i>Coccothrinax ekmanii</i>	PALMAE		DD	
<i>Vitex heptaphylla</i>	VERBENACEAE		DD	
<i>Epinephelus striatus</i>	SERRANIDAE	NASSAU GROUPER	EN	decreasing
<i>Eleutherodactylus alcoae</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus armstrongi</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus counouspeus</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus glaphycompus</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus grahami</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus heminota</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus hypostenor</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Eleutherodactylus ruthae</i>	LEPTODACTYLIDAE		EN	Decreasing
<i>Osteopilus pulchrilineata</i>	HYLIDAE	HISPANIOLAN YELLOW TREEFROG		
<i>Osteopilus vasta</i>	HYLIDAE	HISPANIOLAN GIANT TREEFROG		
<i>Hyetornis ruficularis</i>	CUCULIDAE	BAY-BREASTED CUCKOO, RUFIOUS-BREASTED CUCKOO		
<i>Loxia megalplaga</i>	FRINGILLIDAE	HISPANIOLAN CROSSBILL		
<i>Pterodroma hasitata</i>	PROCELLARIIDAE	BLACK-CAPPED PETREL	EN	decreasing
<i>Turdus swalesi</i>	MUSCICAPIDAE	LA SELLE THRUSH	EN	decreasing
<i>Solenodon paradoxus</i>	SOLENDONTIDAE	HAITIAN SOLENODON, HISPANIOLAN SOLENODON		

<i>Caretta caretta</i>	CHELONIIDAE	LOGGERHEAD	EN	
<i>Chelonia mydas</i>	CHELONIIDAE	GREEN TURTLE	EN	decreasing
<i>Juniperus gracilior</i>	CUPRESSACEAE		EN	
<i>Copernicia ekmanii</i>	PALMAE		EN	
<i>Ekmanianthe longiflora</i>	BIGNONIACEAE		EN	
<i>Guaiacum officinale</i>	ZYGOPHYLLACEAE	COMMONER LIGNUM VITAE, GUAIAAC TREE		EN
<i>Guaiacum sanctum</i>	ZYGOPHYLLACEAE	HOLYWOOD LIGNUM VITAE		EN
<i>Pouteria hotteana</i>	SAPOTACEAE		EN	
<i>Ara tricolor</i>	PSITTACIDAE	CUBAN MACAW, HISPANIOLAN MACAW		
<i>Brotomys voratus</i>	ECHIMYIDAE	HISPANIOLAN EDIBLE RAT		
<i>Hexolobodon phenax</i>	CAPROMYIDAE	IMPOSTER HUTIA	EX	
<i>Isolobodon montanus</i>	CAPROMYIDAE	MONTANE HUTIA	EX	
		CARIBBEAN MONK SEAL, WEST INDIAN MONK SEAL, WEST INDIAN SEAL		EX
<i>Monachus tropicalis</i>	PHOCIDAE			
<i>Nesophontes hypomicrus</i>	NESOPHONTIDAE	ATALAYE NESOPHONTES		
<i>Nesophontes micrus</i>	NESOPHONTIDAE	WESTERN CUBAN NESOPHONTES		
<i>Nesophontes paramicrus</i>	NESOPHONTIDAE	ST. MICHEL NESOPHONTES		
<i>Nesophontes zamicros</i>	NESOPHONTIDAE	HAITIAN NESOPHONTES		
<i>Plagiodontia ipnaeum</i>	CAPROMYIDAE	SAMANA HUTIA	EX	
<i>Quemisia gravis</i>	HEPTAXODONTIDAE	TWISTED-TOOTHED MOUSE		
<i>Rhizoplagiodontia lemkei</i>	CAPROMYIDAE	LEMKE'S HUTIA	EX	
		PACIFIC PILOT WHALE, SHORT-FINNED PILOT WHALE	LR/cd	
<i>Globicephala macrorhynchus</i>	DELPHINIDAE	LONG-BEAKED DOLPHIN, LONG-SNOURED DOLPHIN, SPINNER DOLPHIN		
<i>Stenella longirostris</i>	DELPHINIDAE		LR/cd	
<i>Carcharhinus leucas</i>	CARCHARHINIDAE	BULL SHARK	LR/nt	unknown
<i>Carcharhinus limbatus</i>	CARCHARHINIDAE	BLACKTIP SHARK	LR/nt	unknown
<i>Carcharhinus longimanus</i>	CARCHARHINIDAE	OCEANIC WHITETIP SHARK		
<i>Galeocerdo cuvier</i>	CARCHARHINIDAE	TIGER SHARK	LR/nt	unknown
<i>Mustelus canis</i>	TRIAKIDAE	DUSKY SMOOTHHOUND		
<i>Negaprion brevirostris</i>	CARCHARHINIDAE	LEMON SHARK	LR/nt	unknown
<i>Prionace glauca</i>	CARCHARHINIDAE	BLUE SHARK	LR/nt	unknown
<i>Sphyrna zygaena</i>	SPHYRNIDAE	SMOOTH HAMMERHEAD		
<i>Anetia briarea</i>	DANAIDAE	LESSER FALSE FRITILLARY		
<i>Anetia jaegeri</i>	DANAIDAE	JAEGER'S ANETIA	LR/nt	
<i>Anetia pantheratus</i>	DANAIDAE	FALSE FRITILLARY	LR/nt	
<i>Danaus cleophile</i>	DANAIDAE	JAMAICAN MONARCH		
<i>Brachyphylla nana</i>	PHYLLOSTOMIDAE	CUBAN FRUIT-EATING BAT		
<i>Mormoops blainvillii</i>	MORMOOPIDAE	ANTILLEAN GHOST-FACED BAT		
<i>Phyllonycteris poeyi</i>	PHYLLOSTOMIDAE	CUBAN FLOWER BAT		
<i>Phyllops falcatus</i>	PHYLLOSTOMIDAE	CUBAN FIG-EATING BAT		

<i>Pteronotus quadridens</i>	MORMOOPIDAE	SOOTY MUSTACHED BAT		
<i>Tadarida brasiliensis</i>	MOLOSSIDAE	BRAZILIAN FREE-TAILED BAT		
<i>Trachemys stejnegeri</i>	EMYDIDAE	CENTRAL ANTILLEAN SLIDER		
<i>Pinus occidentalis</i>	PINACEAE		LR/nt	
<i>Epinephelus morio</i>	SERRANIDAE	RED GROUPER	NT	decreasing
<i>Mycteroperca venenosa</i>	SERRANIDAE	YELLOWFIN GROUPER	NT	decreasing
<i>Columba leucocephala</i>	COLUMBIDAE	WHITE-CROWNED PIGEON		
<i>Corvus palmarum</i>	CORVIDAE	HISPANIOLAN PALM CROW, PALM CROW		
<i>Fulica caribaea</i>	RALLIDAE	CARIBBEAN COOT	NT	
<i>Laterallus jamaicensis</i>	RALLIDAE	BLACK RAIL	NT	
<i>Phaenicophilus poliocephalus</i>	EMBERIZIDAE	GREY-CROWNED PALM-TANAGER		
<i>Priotelus roseigaster</i>	TROGONIDAE	HISPANIOLAN TROGON		
<i>Tryngites subruficollis</i>	SCOLOPACIDAE	BUFF-BREASTED SANDPIPER	NT	
<i>Vermivora chrysoptera</i>	PARULIDAE	GOLDEN-WINGED WARBLER		
<i>Balistes vetula</i>	BALISTIDAE	QUEEN TRIGGERFISH		
<i>Dermatolepis inermis</i>	SERRANIDAE	MARBLED GROUPER		
		LINED SEAHOSE, NORTHERN		
<i>Hippocampus erectus</i>	SYNGNATHIDAE	SEAHOSE	VU	decreasing
<i>Lachnolaimus maximus</i>	LABRIDAE	HOGFISH	VU	
<i>Lutjanus analis</i>	LUTJANIDAE	MUTTON SNAPPER	VU	
<i>Lutjanus cyanopterus</i>	LUTJANIDAE	CUBERA SNAPPER	VU	
<i>Scarus guacamaia</i>	SCARIDAE	RAINBOW PARROTFISH		
<i>Thunnus obesus</i>	SCOMBRIDAE	BIGEYE TUNA	VU	
<i>Bufo guentheri</i>	BUFONIDAE		VU	Decreasing
<i>Eleutherodactylus audanti</i>	LEPTODACTYLIDAE		VU	Decreasing
<i>Eleutherodactylus pictissimus</i>	LEPTODACTYLIDAE		VU	Decreasing
<i>Eleutherodactylus wetmorei</i>	LEPTODACTYLIDAE		VU	Decreasing
<i>Hyla heilprini</i>	HYLIDAE		VU	Decreasing
		HISPANIOLAN AMAZON,		
<i>Amazona ventralis</i>	PSITTACIDAE	HISPANIOLAN PARROT	VU	decreasing
		HISPANIOLAN CONURE,		
<i>Aratinga chloroptera</i>	PSITTACIDAE	HISPANIOLAN PARAKEET	VU	decreasing
<i>Calyptophilus frugivorus</i>	EMBERIZIDAE	CHAT TANAGER, CHAT-TANAGER		
<i>Catharus bicknelli</i>	MUSCICAPIDAE	BICKNELL'S THRUSH		
<i>Charadrius melodus</i>	CHARADRIIDAE	PIPING PLOVER	VU	decreasing
<i>Columba inornata</i>	COLUMBIDAE	PLAIN PIGEON	VU	decreasing
<i>Corvus leucognaphalus</i>	CORVIDAE	WHITE-NECKED CROW		
		BLACK-BILLED WOOD-DUCK,		
		CUBAN TREE-DUCK, WEST INDIAN		
		TREE-DUCK, WEST INDIAN		
<i>Dendrocygna arborea</i>	ANATIDAE	WHISTLING-DUCK	VU	decreasing
<i>Tachycineta euchrysea</i>	HIRUNDINIDAE	GOLDEN SWALLOW	VU	decreasing

<i>Xenoligea montana</i>	PARULIDAE	WHITE-WINGED GROUND-WARBLER, WHITE-WINGED WARBLER	
<i>Mastigodiptomus purpureus</i>	DIAPTOMIDAE		VU
<i>Rhincodon typus</i>	RHINCODONTIDAE	WHALE SHARK	VU decreasing
<i>Battus zetides</i>	PAPILIONIDAE	ZETIDES SWALLOWTAIL	
<i>Plagiodontia aedium</i>	CAPROMYIDAE	CUVIER'S HUTIA, HISPANIOLAN HUTIA	
		AMERICAN MANATEE, CARIBBEAN	
		MANATEE, NORTH AMERICAN	
		MANATEE, WEST INDIAN	
<i>Trichechus manatus</i>	TRICHECHIDAE	MANATEE	VU
<i>Crocodylus acutus</i>	CROCODYLIDAE	AMERICAN CROCODILE	VU
<i>Cyclura cornuta</i>	IGUANIDAE	RHINOCEROS IGUANA	VU
<i>Trachemys decorata</i>	EMYDIDAE	HAITIAN SLIDER, HISPANIOLAN ELEGANT SLIDER, HISPANIOLAN SLIDER, JICOT	
<i>Juniperus barbadensis</i>	CUPRESSACEAE		VU
<i>Podocarpus aristulatus</i>	PODOCARPACEAE		VU
<i>Albizia berteriana</i>	LEGUMINOSAE		VU
<i>Albizia leonardii</i>	LEGUMINOSAE		VU
<i>Antirhea radiata</i>	RUBIACEAE		VU
<i>Calyptranthes ekmanii</i>	MYRTACEAE		VU
<i>Catalpa brevipes</i>	BIGNONIACEAE		VU
<i>Cedrela odorata</i>	MELIACEAE	CIGAR-BOX WOOD, RED CEDAR,	
<i>Cinnamomum parviflorum</i>	LAURACEAE	SPANISH CEDAR	VU
<i>Cleyera bolleana</i>	THEACEAE		VU
<i>Cleyera vaccinioides</i>	THEACEAE		VU
<i>Guarea sphenophylla</i>	MELIACEAE		VU
<i>Hurtea cubensis</i>	STAPHYLEACEAE		VU
<i>Juglans jamaicensis</i>	JUGLANDACEAE	WALNUT, WEST INDIAN WALNUT	VU
<i>Manilkara valenzuelana</i>	SAPOTACEAE		VU
<i>Mappia racemosa</i>	ICACINACEAE		VU
<i>Picrasma excelsa</i>	SIMAROUBACEAE		VU
<i>Senna domingensis</i>	LEGUMINOSAE		VU

LIST OF CONTACTS

Names in bold type indicate members where the presence of Mr Ben Swartley may be required

A) Governmental institutions:

Vernet JOSEPH, Director of Soils and Ecosystem Division and National Focal Point of the UN Convention to Combat Desertification/Ministry of Environment

Ogé PIERRE LOUIS, Director of Soils, Park and Forest Division/Ministry of Agriculture, natural Resources and Rural Development

Gina PORCENA, Director of GIS and Teledetection Unit/ Ministry of Planning

Béthonus PIERRE, Director of Energy Division/ Offices of Mines and Energy

Wilfrid SAINT JEAN, National Focal Point of the UN Framework Convention on Climate Change/Office of Mines and Energy and Ministry of Environment

Edmond MAGNY, Technical Adviser of the Ministry of Agriculture (General Direction)

Jean Robert Badio/ Guy Lafontant, Fishery Services, Ministry of Agriculture

B) Non-Governmental Institutions/Ecological Associations and Private Resource-Person:

Claude PHANOR, Director of the Programme of Sustainable use of biodiversity in higher altitude of Haïti/Forêt des Pins, HELVETAS

Brunot MAINTOR, General Coordinator of Macaya Foundation

Winnie ATTIE, Coordinator of Seguin Foundation

Hilaire VILMONT, National Director of Audubont Society and Coordinator of the TNC Programme on National System of Protected Areas

Abner SEPTEMBRE, National Coordinator Peasants Association of Value

Jean-André VICTOR, Legal Expert on Environmental Law and Former CEO of the Haitian Foundation for Environment

Louis Buteau, Former Director of World bank funded Projects: National Forestry Project and Technical Assistance for Parks Protection and Forestry Reserves

C) International institutions:

Lyès FERROUHKI, Chief Technical Adviser , PAGE Project/ UNDP

Gladys ARCHANGE, National Expert on Environment, UNDP

Suze LUBIN, National Expert on Environment, Canadian International Development Agency/UAPC

Wiener PETUELLI, GTZ Representative

Volny PAULTRE, Programme Officer/FAO

Rosa BERTRAN, Programme Officer/ Spanish International Development Agency

UNESCO: Jorge Espinal

Inter-American Development Bank: Denis Corales

EXACT CONTACTS TO BE IDENTIFIED

PAN-AMERICAN DEVELOPMENT FOUNDATION/PADF

World Bank

National Association of Fishermen

**Statement of Work
Haiti Country Analysis on Tropical Forest and Biological Diversity
For USAID/Haiti's Country Strategy (2007-2009)**

31 Jan 06

I. Background

As part of the documentation for the new five-year Strategic Plan, USAID/Haiti is required by Sections 118 and 119 of the Foreign Assistance Act to complete an analysis of tropical forests and biological diversity in Haiti. Concept papers for the new strategy are in draft state. This country analysis will mainly be one of compilation and review of existing information, coupled with analysis, synthesis, and corroboration and feedback from major players. A partial bibliography of key documents is appended to this statement of work. However, the contractor shall review at least the following documents:

- ADS 201.3.8.2. Environmental Analysis. January 31, 2003.
- Strategy Statement Guidance for Programs Under the LAC Regional Strategic Framework (December 20, 2005).
- Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned and Best Practices from recent USAID experience. September 2005.
- USAID/Haiti's FY 2007 Congressional Budget Justification – Data Sheets.
- USAID/DR's Environmental Analysis (118/119) – Conserving Biodiversity and Tropical Forest
- Evaluations and assessments

Summary of relevant parts of FAA Sec 118 and 119:

From Sec 118 Tropical Forests:

(e) COUNTRY ANALYSIS REQUIREMENTS.—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—

- (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and
- (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

From Sec 119 Endangered Species:

(d)⁸⁵ COUNTRY ANALYSIS REQUIREMENTS.—Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of—

- (1) the actions necessary in that country to conserve biological diversity, and
- (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

This assessment will also provide the following

- That the planned activities and investments are not likely to adversely affect tropical forestry and biodiversity.
- Explore the opportunities for program synergy among the strategic objectives that could contribute to the conservation of tropical forests and biodiversity.
- Identify other issues and opportunities related to forestry and biodiversity conservation for USAID assistance that may match the Mission's overall strategy thrust.

Based on this assessment, USAID/Haiti will define how its new three-year country program strategy contributes to conservation needs, as required by agency regulations. This assessment will also serve as a planning tool to assist the Mission in better integrating environment issues into their overall program. Currently, USAID/Haiti is in the process of developing the Strategic Statement and identifying new strategic objectives and areas of intervention. The Strategic Statement and annexes should be submitted to USAID/Washington by June, 2006, and country strategy statements will not be approved if the mandatory 118-119 analyses are not done

II. Scope of Work

The SOW will include an overall review of the current status of tropical forests and biological diversity in Haiti. The contractor will coordinate with USAID experts provided by USAID-Haiti. Activities will include:

1. Compile information related to, and describe the tropical forests and biological diversity of Haiti, including their current status and trends (with a particular focus on USAID/Haiti mission utility based on approved concept papers). (10%)
2. Describe the factors affecting the management of these natural resources, including the principal threats and opportunities to sustainable management of tropical forests and biological diversity in Haiti. (10%)
3. Review the current institutional infrastructure for the management of tropical forests and biodiversity, including a description of major organizations, both public and private, which have a role in this process. Interview key personnel of key institutions. (15%)
4. Review the legislative basis, both national and local, for the protection of biological resources, including tropical forests (and Haitian Forestry Law), in Haiti (including the ratification of international treaties and agreements such as CITES, the Convention on Biodiversity, and the Convention on Desertification, and the effectiveness of national implementation). (15%)
5. Review private/commercial sector aspects of the forestry and wood industry, including non-timber forest products (especially charcoal), and including an analysis of national and international markets (much work has been done recently on markets, so this will involve mostly a compilation of existing information). (10%)
6. Identify the priority actions (cost effective and implementable) necessary to achieve sustainable management of tropical forests and the conservation of biological diversity in Haiti. (20%)
7. Identify the extent to which the actions proposed for support by USAID/Haiti meet the needs thus identified, and recommend any further actions not described or outlined in the concept papers. (10%)

8. Analyze the effects of USAID/Haiti's entire proposed strategy (FY 2004 – FY 2009) on Haiti's tropical forests and biodiversity. In particular, the proposed strategic objectives of Alternative Development, Food Security, Economic Opportunities, Environment and Natural Resources, and Health should be carefully reviewed. (10%)

III. Outline of Haiti Country Analysis of Tropical Forests and Biological Diversity:

- Title page
- Table of contents
- List of appendices
- List of tables and figures
- Executive summary (no longer than 5 pages)

A. Introduction

B. Legislative and institutional structure affecting biological resources

- (1) Government of Haiti
- (2) Nongovernmental organizations
- (3) Private sector
- (4) Bilateral, international organizations, and other donors

C. Status and management of protected areas and endangered species

D. Status and management of forest resources

E. Conservation outside of protected areas

- (1) Managed natural systems
- (2) Impacts of development projects
- (3) Ex-situ conservation (eg: zoos, seed banks)

F. Major issues in tropical forests and their sustainable management

G. Major issues in biological diversity conservation

H. Recommendations and proposed actions, including review of actions proposed for support by USAID/Haiti

I. Appendices

- (1) Bibliography
- (2) Biodata sketch of team members
- (3) List of persons contacted
- (4) Other appendices as appropriate

IV. Details for specific sections of the above outline

A. Introduction

This section of the assessment will provide an overview of the information available and used in the assessment. It should identify significant gaps, if any, in information on the status and management of tropical forest and biological diversity resources in Haiti.

B. Legislative and institutional structure

The assessment should include a review of the current legislative and institutional infrastructure for the management of biological diversity and tropical forests. This review should include a description of major organizations, both public and private, which have a role in this process.

(1) Government of Haiti

The background assessment should include a review of the legislative basis, both national and local, for the protection and management of biological resources, including tropical forests, in Haiti. This should include a review of international treaties and agreements, which have been ratified by Haiti (CITES - e.g. Appendix listing of Mahogany and its affects on tropical forests, the Convention on Biodiversity, and the Convention on Desertification, Convention on wetlands, etc), including a review of National Actions Plans, and the effectiveness of national implementation. Briefly describe the Forestry Law, but an analysis of this Law on the forestry sector should be included in Section F. A description should be provided of the Government of Haiti (GOH) institutions responsible for tropical forest and biological diversity issues, and management of all natural resources, within Haiti. Include key players in Ministry of Commerce. It should assess the interest and commitment of the government to the conservation of biological diversity and tropical forests.

Sections B (1) and B (2) and B (3) should also include the identification and assessment of GOH, NGO, and private sector institutional and education and training programs to preserve and augment tropical forests and biological diversity, especially where endangered species are apparent.

(2) Nongovernmental organizations

This section should include a description of major organizations (public, private, indigenous and international) which have a role in conserving biological diversity and tropical forests and the levels of funding they contribute toward this issue.

(3) Private Sector

As the conceptual basis for sustainable forest management (and biodiversity-based tourism) includes tapping exports and markets, identify mayor players, and review private sector interests involved in tropical forestry and biological diversity. Also identify commercial and export issues, and information awareness needs of the private sector.

(4) Bilateral, other donors and international organizations

This section should include a description of other donors and international organizations, both indigenous and external, which have a role in conserving biological diversity (including tropical forests) and the levels of funding they receive or contribute toward this issue. Their relationship with the government, membership, principal programs, and overall effectiveness should be identified.

C. Status and management of protected areas and endangered species

This is a descriptive section that should include a brief inventory of declared and proposed national parks, wildlife refuges, forest reserves, sanctuaries, hunting preserves and other protected areas. The government agency, indigenous organization, or NGO managing each protected area should be identified, including all partners in cases of co-management. It should include a country map with the location of all existing and proposed protected areas. It should include a general assessment of the overall effectiveness of these areas in protecting plant and animal resources, and of their importance to Haiti's economy (e.g. for providing tourist opportunities or for protecting important watersheds). An overall analysis of the management effectiveness in these areas should be included.

This section should also include a summary of threatened and endangered species found in Haiti (along with references or appendix for more detailed information) and their status. It should identify their critical habitats and evaluate the major threats and opportunities to protection of their habitats. It should provide a general review of efforts that have been made for protection of these species and their habitats and assess their effectiveness.

D. Status and management of forest resources

This section should include a brief description of the different types of forests in Haiti. An assessment should be made of these forests' economic importance to Haiti, including values for wood, non-timber forest products, tourism, ecosystem services, etc. Existing management structures should be described, including those of the private forest industry and of rural communities. In the context of this section, briefly describe USAID-supported (and other major donor) actions to date. The Protected Area map (described above) should include: Parc Macaya, Parc La Visite, and Foret du Pines, as well as any additional private reserves, and marine reserves.

E. Conservation outside of protected areas

This section should include a description of conservation activities in Haiti which are being undertaken outside designated protected areas. This should include, but not be limited to review of:

(1) Managed natural ecosystems

This section should include a general description of the major Haitian ecosystems and an overall analysis of their present conservation status. A country map (to the same scale as the protected area map) of the natural vegetation or habitat types (biogeographic regions) should be included. The text should review the status of managed natural ecosystems including but not limited to:

- forest resources

- rangeland resources
- wetlands
- agricultural systems

The text should include a general discussion of the economic, ecological and social importance of these ecosystems to Haiti, it should address their role in the regulation of erosion, management of water flow, and the maintenance of productive soils. This section should specifically address the relationship of these ecosystems to USAID Haiti’s proposed strategy.

(2) Impacts of development projects

The text should include a review of the impacts of internationally and locally-funded major development projects on tropical forest and biological diversity resources. The text should review the regulatory framework concerning the implementation of development projects as they affect biological diversity, with emphasis on tropical forests, and any direct or indirect impacts on USAID Haiti’s proposed strategy. The text should specify the environmental review and permitting requirements of the GOH as they concern major projects. This is not a review of USAID environmental procedures (Reg. 216), but should set the stage in terms of overall impacts of major development projects, such as the proposed IDB-funded Parks Program, and La Quinte basin program, and Haitian environmental regulations.

(3) Ex-situ conservation

This subsection should provide a brief description of ex-situ species conservation efforts being undertaken and/or planned in Haiti. It should review any programs of natural history museums, herbariums, botanical gardens, zoos, captive breeding programs, and gene banks, including a summary of any existing conservation actions and data bases. This section should provide a summary of the activities being undertaken in Haiti for the conservation of economically important species and germplasm. It should review the status of gene banks for crop and livestock species, native seed selection, and activities being undertaken to support the sustained production of commercially important wild plant and animal species (e.g. for forestry production, agriculture, hunting, fishing or commercial trade), and in-situ conservation of land races and wild relatives of important crops.

F. Major issues in tropical forests and their sustainable management

This section of the assessment should provide a summary of the major issues requiring attention in order to improve the conservation and sustainable management of forest resources. Special attention should be given to the problems of assuring adequate protection of tropical forests. This section should include the principal threats and opportunities to sustainable management of tropical forests in Haiti. It should cover the following issues:

- The study should explore environmental education and communications strategies as applied to the forestry sector (USAID/Haiti considers this to be important enough for the overall country analysis to warrant including an expert on this particular topic),

- Assess the PAE (Plan d'Action de l'Environnement) Haiti's biodiversity and tropical forests and their management, including an analysis of its effects on important forestry species.
- Address the relationship between land ownership patterns and effectiveness of sustainable forest management.
- Include an analysis of the principal threats to tropical forests and impediments to their management, such as illegal logging, fire monitoring and control, conflict over natural resources and other issues as identified.
- Include an analysis of any major opportunities to improve sustainable forest management.
- Commercial potential for forest products, including a summary of existing marketing studies,
- Commercial potential for sustainable charcoal production through charcoal gardens, and removing the threat posed by unsustainable charcoal production in forested areas.
- Regulatory environment and GOH institutional capacity for regulation and monitoring,
- Complete an analysis of forest management systems (refer to Section D), and identify which aspects of these systems seem to be working and successful, and which are not. Include a map of the overlap between protected areas, national forest, mining concessions, oil and gas concessions, etc.
- Identify present and future requirements for the development of local institutions and training, both government and nongovernmental.
- Identify and prioritize major issues needing the most immediate attention.

G. Major issues in biological diversity conservation

This section of the assessment should provide a summary of the major issues requiring attention in order to improve the conservation of biological diversity in Haiti. It should include the principal threats and opportunities to conservation of biodiversity. For example, the study should explore issues such as environmental education and communications strategies, illicit crops in protected areas, illegal logging and hunting in protected areas, uncontrolled agriculture expansion, unsustainable charcoal production, regulatory environment, GOH institutional capacity, land tenure, etc. The present and future requirements for the development of local institutions and training, both governmental and nongovernmental, should be addressed. Issues concerning the management of protected areas should be reviewed. Special attention should be given to the problems of assuring adequate protection of wetlands (e.g. do existing protected areas encompass most significant biological resources). This section should prioritize issues needing most immediate attention. Also, it should examine exemplary projects in Haiti that are providing income from ecosystem services such as carbon sequestration, watershed protection, and biodiversity payments.

H. Recommendations for proposed actions

This section should provide a review of proposed actions to address issues concerning tropical forests and biological diversity which may be implemented, with support from USAID, GOH, international development organizations, and local and international NGOs. Recommendations should be identified with regard to their relative priority and length of implementation period. If available, proposed actions shall include a brief description of their objective and anticipated benefits.

Moreover, this section will identify the extent to which the actions proposed for support by USAID/Haiti meet the needs thus identified, and recommend any further actions not described or outlined in the concept papers.

Analyze the overall effects (including potential negative impacts) of USAID/Haiti's entire proposed strategy (FY 2007 – FY 2010) on Haiti's tropical forests and biodiversity. All strategic objectives should be analyzed and special attention focused on economic growth, food security, natural resource management, agriculture and democracy and governance.

The assessment will address program constraints, including the need to consider conditioning certain assistance upon Haiti's legislative or administrative action in order to officially designate and strengthen GOH commitments for protected areas and tropical forest conservation.

I. Appendices

The assessment should include, but not limited to the following appendices:

- (1.) Annotated bibliography
- (2.) List of relevant government agencies and NGOs
- (3) Biodata sketch of team members
- (4) List of persons and institutions contacted

Other appendices may be added as appropriate to the objective of the biological diversity/tropical forest assessment.

V. Duration and Timing of Consultancy

This consultancy is for 30 working days (6-day work week permitted) in Haiti with most work in Port-au-Prince, and possibly other locations in Haiti. It is expected to begin as soon as possible but no later than February 20th.

VI. Reporting, Deliverables

The deliverables are expected to be from the assessment team. The consultant will coordinate with the team leader and together will submit an activity schedule for the analysis by COB of the second day of the consultancy period. The consultant will be responsible to produce a complete draft sections of the report (as assigned) for review and comments by the 118/119 Analysis Team COB of day 23. A debriefing for the Team and other USAID representatives will be conducted on Day 24. Comments will be incorporated and the consultant will assist in the production of a final draft report by COB of Day 26. The team leader will have two (2) working days to approve the document or send any final comments or changes to the consultant, and the consultant will have 2 working days after that to make final changes to meet Team Leader approval. The full report should have a length of approximately 30 pages.

Deliverables (for the team):

- Hard copies of the document in English, a hard copies in French (to be delivered maximum 2 weeks after the English version)
- Copies of the documents (in English and French) on CDs, (to be delivered maximum four weeks after the English version).
- Document to include a map of biogeographic regions of Haiti, including Holdridge Life Zones
- Document to include a map of protected areas of Haiti
- Document to include forest reserves of Haiti
- Document to include a map of threats to biodiversity and tropical forests (mining concessions, oil and gas concessions, etc.)
- Document to include a thorough bibliography with annotations for most important documents

VII. Illustrative Schedule, Level of effort

1. Schedule

WEEK	Activity	Comments
Week 1	Office preparation and research for team leader. Logistics person does logistics.	
Week 2 (<u>begin contract</u>)	Contractor begins. Clearance to mission. Submit schedule for approval on Day 2. Compile and review information. Begin analysis activities.	
Week 3	Begin to interview key personnel of key institutions. Continue analysis activities.	
Week 4	Complete interviews of key institutions. Continue analysis activities. Submit initial draft.(day 23)	
Week 5	Finalize analysis activities Incorporate comments, complete second (perhaps final) draft.	
Week 6	Approve document or send any final changes to the team leader before document is approved. Submission of deliverables, French translation to be delivered by week 8.	

2. Level of Effort:

1. Haitian Biological Diversity Specialist:
 - 6 weeks (30 days) in Haiti
2. USAID mission Environmental specialist - Team Leader
 - 7 weeks (35 days)
3. USAID Washington based forestry specialist

- 2 weeks (10 days)

VIII. Qualifications of the Consultant

1. Haitian Biological Diversity Specialist

- i. Knowledge of USAID environmental programs and procedures in Haiti.
- ii. Knowledge of GOH environmental programs and procedures.
- iii. Significant experience (10 years) with conservation of biological diversity or protected area management (at least 5 in Haiti),
- iv. A strong professional background (Ph.D. or Masters with five additional years of experience) in conservation of biological diversity, protected area management, biology or related disciplines and at least five years of related experience in Haiti,
- v. Fluent in French and Creole and High level of English competency

ACTIVITY SCHEDULE FOR THE NATIONAL CONSULTANT
(Discussed and agreed upon in consultation with USAID/ Haïti Forestry Expert, Mr Ben Swartley)

Following the USAID approvals, the US Forest Service requests that METI (Management and Engineering Technologies International Inc.) secure the services of a qualified national consultant to undertake an overall review of the current status of Tropical Forests and Biological Diversity in Haïti.

The national consultant has hold its first meeting with the USAID/ Haïti Forestry Expert, Mr Ben Swartley, on March 02, 2006. The meeting was devoted to analyzing different technical aspects of the Scope of Work, developing working relationships and dividing responsibilities among the Team members.

For the last parts of the work review, it is expected that the general schedule will be:

► **March 05- March 12:** Desk reviews; consult relevant strategic and technical reports from USAID/ Haïti Office; Stocktaking exercise dealing with a variety of reports related to the thematic areas of biodiversity/forestry; discussions with key Task Managers from Governmental, Non-governmental and International institutions in the country; Sharpening of issues; logistical planning for field work; Start writing some sections of the report;

► **March 13 – March 14:** Discuss and review sections written; Visits and arrangements with the GIS and Teledetection Unit/Ministry of Planning for the production of appropriate maps;

► **March 16 – March 17:** Field work: a 2 day visit of the Forêt des Pins (Unit I and II). This site, a national Forestry Reserve, is the most important vestige of forestry ecosystems of Haïti in terms of areas still covered by forests; interview with stakeholders; analyze main threats for this Forestry Reserve;

► **March 18 – March 27:** Production of the first draft report ;

► **March 28 – March 29:** Continued desk reviews and Task Managers interviews; Inclusion of all relevant comments in the first draft report to be submitted;

► **March 30 – March 31:** Submission of the first draft report; Debriefing for the Team Leader and other USAID and Governmental representatives;

► **April 1st- April 3:** Incorporation of comments by the consultant;

► **April 3 – April 09:** Translation of the report in French;

► **April 12, 2006:** Copies of the documents (English and French versions) on CDs