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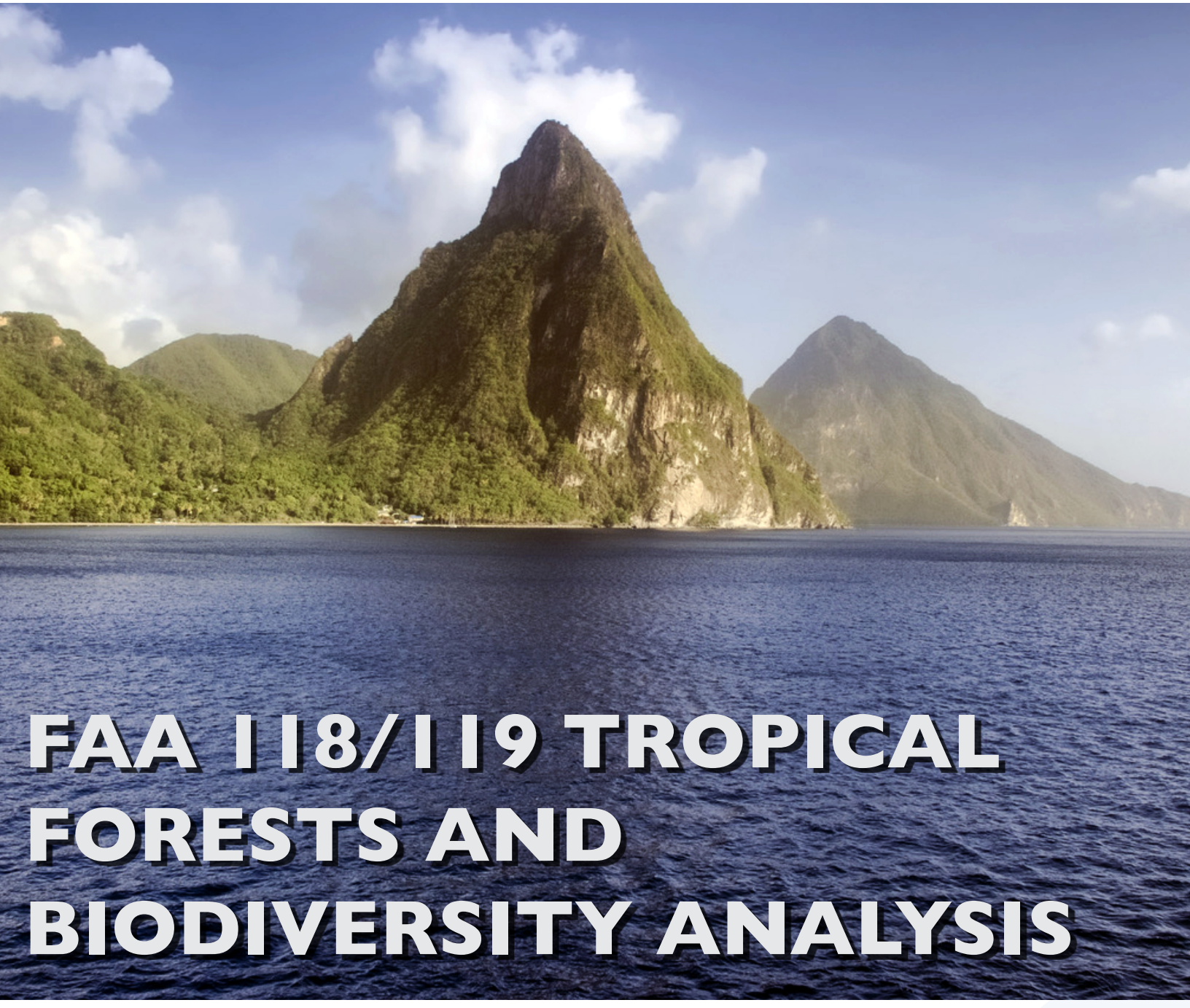

FAA 118/119 TROPICAL FORESTS AND BIODIVERSITY ANALYSIS

EASTERN AND SOUTHERN CARIBBEAN

OCTOBER 2020

CONTRACT INFORMATION

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Cover photo: View of the famous Piton mountains in Saint Lucia, Eastern Caribbean.

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ACRONYMS

ACP	African, Caribbean, and Pacific Group
AMECC	Adaptation Measures to Counter the Effects of Climate Change
AWS	Automatic Weather Stations
BIOPAMA	Biodiversity and Protected Areas Management
BMP	Best Management Practice
BMZ	Federal Ministry for Economic Cooperation and Development
BRCCC	Building Regional Climate Capacity in the Caribbean
CaMPAM	Caribbean Marine Protected Areas Managers
CANARI	Caribbean Natural Resources Institute
CARICOM	Caribbean Community
CariSECURE	Strengthening Evidence Based Decision-Making Project
CBF	Caribbean Biodiversity Fund
CBO	Community-Based Organization
CCAP	USAID Climate Change Adaptation Project
CCI	Caribbean Challenge Initiative
CCMB	Caribbean Coastal Marine Biodiversity
CDP	Caribbean Development Program
CEPF	Critical Ecosystems Partnership Fund
CERMES	Centre for Resource Management and Environmental Studies
CFYR	Caribbean Family and Youth Resilience
CIMH	Caribbean Institute of Meteorology and Hydrology
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLiC	Conservation Leadership in The Caribbean Program
CMBP	Caribbean Marine Biodiversity Project
CNFO	Caribbean Network of Fisherfolk Organisations
CORELLO	Coral Restoration Program for Resilient Ecosystems and Livelihood Opportunities
CR	Critically Endangered
CREAD	Climate Resilience Execution Agency for Dominica
CREWS	Caribbean Reef Early Warning Systems
CWT	Combating Wildlife Trafficking
CZMU	Coastal Zone Management Unit
DO	Development Objective
DOE	Department of the Environment
DR	Dominican Republic
EbA	Ecosystem-based Adaptation
ECMMAN	Climate-Resilient Eastern Caribbean Marine Managed Areas Network
EEZ	Exclusive Economic Zones
EN	Endangered
EPMA	Environmental Protection and Management Act
ESC	Eastern and Southern Caribbean
EU	European Union
FA	Focus Area
FAA	Foreign Assistance Act of 1961
FAO	United Nations Food and Agriculture Organization
FLEGT	Forest Law Enforcement, Governance, and Trade Action Plan
FSC	Forest Stewardship Council

ACRONYMS

GAMPA	Grand Anse Marine Protected Area
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	German Agency for International Cooperation
HoPE	HIV Prevention and Elimination Project
IAS	Invasive Plants and Animal Species
IBA	Important Bird Area
IFC	International Finance Corporation
IIRSA	Integration of Regional Infrastructure in South America
IPM	Integrated Pest Management
ITP	Indigenous and Tribal Peoples
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported, and Unregulated Fishing
JJRP	Juvenile Justice Reform Project
KfW	German Development Bank
MENB	Ministry of Environment and National Beautification
MMA	Marine Management Area
MMABE	Ministry of Maritime Affairs and Blue Economy
MPA	Marine Protected Area
NAP	National Adaptation Plan
NBSAP	National Biodiversity Strategy and Action Plan
NCTF	National Conservation Trust Fund
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Agency
NTFP	Non-Timber Forest Product
OECS	Organization of Eastern Caribbean States
OICP	Offshore Islands Conservation Program
PA	Protected Area
PEPFAR	The President's Emergency Plan for AIDS Relief
RDCS	Regional Development Cooperation Strategy
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RRACC	Rallying the Region to Action on Climate Change
SAMOA	SIDS Accelerated Modalities of Action Pathway
SASAP	Sectoral Adaptation Strategy Action Plans
SCTLD	Stony Coral Tissue Loss Disease
SIDS	Small Island Developing States
SMMA	Soufriere Marine Management Area
TNC	The Nature Conservancy
UWI	University of West Indies
VU	Vulnerable
WHSRN	Western Hemisphere Shorebird Reserve Network
WMO	World Meteorological Organization
WNT	Waitukubuli National Trail
WTTC	World Travel and Tourism Council
WWF	World Wildlife Fund
YES	Youth Empowerment Services

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EXECUTIVE SUMMARY

BACKGROUND

The purpose of this task is to conduct an analysis of tropical forests and biodiversity in alignment with Sections 118 and 119 of the Foreign Assistance Act (FAA) of 1961. The last 118/119 analysis for the USAID Eastern and Southern Caribbean Mission (ESC) was carried out in 2013, and much of the work in this current analysis entails updating the data and trends since that time. This analysis also considers the threats to the region's biodiversity and forests from climate change while identifying new developments and events occurring in the region during the past seven years that should be taken into consideration at a programmatic level (e.g., oil finds off the coast of Guyana and Suriname, illegal trafficking of wildlife, hurricanes, droughts, sargassum, etc.).

This analysis is designed to inform the USAID ESC Mission in the development and implementation of their Regional Development Cooperation Strategy (RDCS), a five-year planning tool to strategically target the sub-regions most challenging problems. The USAID ESC Mission, based in Bridgetown, Barbados, includes the eight island nations of Antigua and Barbuda, Saint Kitts and Nevis, Dominica, Saint Lucia, Barbados, Saint Vincent and the Grenadines, Grenada, and Trinidad and Tobago, as well as two of the Southern Caribbean South American countries, Guyana and Suriname. USAID's approach to development requires that the Agency examines cross-sector linkages and opportunities to ensure a robust development hypothesis. Biodiversity conservation is a critical component in achieving ecological and human well-being and must be considered in Mission strategic approaches to improve development outcomes. This analysis, therefore, defines opportunities to integrate biodiversity and forest conservation across priority development sectors to foster sustainable development.

Within this context, the analysis identifies the following, as required by the FAA Sections 118 and 119:

1. The ***actions necessary*** in that country (or region) to achieve conservation and sustainable management of tropical forests and biodiversity.
2. The ***extent to which*** the actions proposed for support by the Agency ***meet the needs*** identified.

THE ESC SUB-REGION

The Caribbean region is internationally known as a priority biodiversity "hotspot" as it contains a wide range of marine and terrestrial ecosystems including coral reefs, seagrass beds, mangrove stands, lagoons, beaches, wetlands, moist forests, dry forests, and grasslands; it is a region targeted in the global effort to conserve biodiversity. For the purposes of this report, the Eastern and Southern Caribbean sub-region is considered to include the eight islands and two South American countries mentioned above (i.e., the USAID ESC Mission). The Eastern Caribbean is somewhat isolated within the greater Caribbean and contains high levels of endemism. All islands in the Eastern Caribbean have been heavily affected by human activity, especially from agriculture, fishing, tourism, and invasive species (marine and terrestrial) as well as natural disasters.

In addition to serving as an important part of the Southern Caribbean boundary, Guyana and neighboring Suriname are two of the countries that comprise the "Guiana Shield," a vast area that encompasses 2,288,000 km2. The Shield contains 47 medium-large rivers that account for roughly a quarter of the total volume of freshwater discharged to the oceans from South America. The Guiana Shield also harbors some of the highest biodiversity levels in the world, including high levels of endemism. Together, Guyana and Suriname comprise roughly 12 percent of the Guiana Shield.

The rich and diverse terrestrial and aquatic ecosystems of the ESC countries are the foundation upon which local cultures, livelihoods, and economies have evolved. From mountain summits down to the coastal zones and open ocean areas, the assemblage of ecosystems and associated diversity of species furnish a wide range of services to regional populations. These ecosystems provide employment, food security, and health and generate income from tourism and exports. The forested areas of the upper watersheds filter, help store, and regulate water flow. The forests also conserve soils and help prevent landslides and soil loss. When watershed forests are removed, evaporation, surface run-off, and soil erosion all increase, which directly affects downstream ecosystems and livelihoods. Virtually all eight islands in the ESC are facing severe water shortages as a result of prolonged drought, increasing population demand, and deforestation in the watersheds.

All ten of the ESC countries have extensive coastal and marine resources. Beaches, coral reefs, mangrove forests, and inshore waterways have been heavily affected by commercial, residential, and tourism development. Mangroves act as a filter between land and sea, and they are an important nursery for a wide range of reef fish and other marine species. Coral reefs serve as a spawning ground for species that are essential for local and regional fishing industries. Both mangrove and coral reef ecosystems are front line protectors of coastal populations from severe storm surge and flooding; these services are growing in importance as climate change brings rising sea levels and increasing storm intensities. Beaches and coral reefs are also key components of the tourism industry in all ESC island nations. Apart from Trinidad and Tobago, the tourism industry is the largest single contributor to GDP in the ESC islands. In contrast to the ESC islands, the economies and employment opportunities in Guyana, Suriname, and Trinidad and Tobago are driven by the natural resource sectors of mining, oil and gas, forestry, and fisheries.

THREATS

Despite the direct and obvious links between ecosystem health and human well-being, the threats to these ecosystems are considerable. The following is a summary of the major threats presented in their relative order of importance. Due to the significant biogeographical differences in the ESC region, threats are subdivided into two groups: 1) Smaller Island Nations; and 2) Guyana, Suriname, and Trinidad and Tobago. Climate change, poverty levels, and global resource demands are contextual and cross-cutting; as such, they are drivers of several threats listed below. In addition to the division of threats by geographic location, threats are further subdivided by their potential to be prevented or mitigated on a local level.

SMALLER ISLAND NATIONS (PREVENTABLE AND MITIGATABLE THREATS)

1. Loss of habitat due to coastal and residential development (hotels, marinas, channel dredging, harbors, commercial, residential)
2. Invasive species (both terrestrial and marine), animal and plant diseases
3. Pollution and solid waste (most of this originates on land but ends up in the coastal zones and near-shore areas)
4. Biological resource use (hunting, poaching and collection of terrestrial animals, logging and wood harvesting, fishing and harvesting aquatic resources, including "legal take")
5. Human intrusions and disturbance (recreation, wildlife trafficking)
6. Agriculture and natural systems modification (land clearing, fires, water availability)
7. Sand mining
8. Transportation (vessel strikes of marine animals)

GUYANA, SURINAME, AND TRINIDAD AND TOBAGO (PREVENTABLE AND MITIGATABLE THREATS)

The threats are in order of importance relative to Guyana and Suriname, with notation where they also apply to Trinidad and Tobago. In addition to climate change, poverty, and global resource demand, corruption is a significant contextual driver of threats in all three countries; corruption is less prevalent in the smaller island nations.

1. Mining (artisanal and industrial gold mining is widespread in Guyana and Suriname and leads to forest cover loss, watercourse disruption, and pollution.)
2. Illegal logging (often associated with mining operations; all three countries)
3. Artisanal mining effluent (mercury and cyanide from artisanal mining in Guyana and Suriname)
4. Fossil fuel development and related oil spills (large reserves found off the coasts of Guyana and Suriname; production already underway)
5. Wildlife trafficking (all three countries)
6. New road construction (Guyana and Suriname)
7. Hunting (all three countries)
8. IUU fishing (all three countries, especially Guyana)
9. Sand mining (all three countries)

THREATS THAT ARE NOT PREVENTABLE

Apart from their devastating impacts on communities and human life, hurricanes, tropical storms, droughts, and geologic events (volcanic eruptions, earthquakes, and resultant tsunamis) have the power to destroy ecosystems and associated biodiversity; in the case of hurricanes and geologic events, the destruction can occur in an extremely short time frame and frequently over vast areas. The seven northernmost ESC islands have a 5-10 percent chance of a hurricane strike on an annual basis (as compared to, for example, the Bahamas and Florida that have a 20-25 percent chance); Trinidad and Tobago have a relatively low risk (1-5 percent) and Guyana and Suriname are not affected by hurricanes, as they are below the 10 degree north latitude line (hurricanes and tropical storms do not occur, or are extremely rare, between 10 degree south and 10 degree north of the equator).

All ESC countries are subject to earthquakes, possible tsunamis, and drought. Volcanic events are directly linked to seismological activity. Fortunately, volcanologists can use seismology to monitor earth movements under volcanoes and, by analyzing the seismic activity over time and tracking patterns, can help predict future eruptions. This, in turn, can help prepare communities for possible events as well as facilitate the planning of ex-situ conservation strategies for threatened or endangered endemic species. Earthquakes, however, cannot be predicted. Scientists can only provide a probability that a significant earthquake will occur in a specific area within a certain number of years. Droughts can be predicted, but usually only with a high level of confidence a month or so in advance.

EVENTS SINCE 2013

It is worth noting some of the significant natural and human-caused events that occurred in the region since the last analysis that directly affected biodiversity and forests. Hurricanes in 2017 had a devastating effect on a large part of the Caribbean, including Dominica and Barbuda. In addition to loss of life and infrastructure damage, vast forest areas in Dominica were destroyed by Hurricane Maria in September 2017 (damage to forests alone is estimated at USD 30 million). In the same year, Hurricane Irma leveled most of Barbuda, including the nesting area of the largest frigate bird colony in the Caribbean, the Codrington Lagoon (a Ramsar site). In August 2017, Tropical Storm Harvey led to severe flooding and landslides in Barbados and Saint Vincent and the Grenadines. Floods and landslides hit Saint Vincent and the Grenadines in 2013 and 2016, and Trinidad and Tobago experienced serious flooding in 2018. See additional detail on hurricanes, flooding, and landslides in **Annex F.**

Other incidences include:

- **The Pan-Caribbean drought.** The drought of 2013-2016 threatened the water supply in most ESC countries. Drought conditions are expected to worsen because of climate change. Barbados, Antigua and Barbuda, and Saint Kitts and Nevis are all considered water scarce countries by the FAO; Barbados is listed in the top ten of the world's most water stressed countries.
- **Sargassum.** The amount of sargassum washing up on the windward sides of the Caribbean islands increased significantly since 2013. Sargassum clogs beaches, releases foul odors, and generally disrupts all coastal activities. In 2018, a large raft of sargassum was responsible for the drowning of 40 sea turtles in Barbados.
- **The Stony Coral Disease (Florida disease).** The disease has made its way from Florida into the Caribbean. The disease, which threatens 20 species of stony coral, was first noticed in 2014 and has since spread widely. It is now found in the northern zone of the Eastern Caribbean. The disease has been studied since 2017, and although its cause is not clear at this time, it is suspected that a bacterium may be the pathogen.
- **Oil and gas**. Large oil and natural gas reserves have been located off the coasts of Guyana and Suriname. In January 2020, a Texas-based company, Apache, along with the French oil giant Total SA, announced a significant discovery of light oil and gas off the coast of Suriname. This area is adjacent to Guyana oil fields where ExxonMobil made major discoveries during the past several years. Guyana is also in the middle of an historical territorial dispute with Venezuela over the Essequibo region, which is part of the larger oil reserve that Guyana is ready to exploit.
- **Chinese investments.** As with other parts of the world, Chinese investments in the region continue to be a major concern. China is actively developing deals with most of the Caribbean countries that would provide them access to natural resources to be exploited with risks to sustainability. Loans and grants from China also contain provisions that require projects to use imported Chinese labor, even for non-skilled labor positions. This obviously works in opposition to reducing unemployment in the region and serves as a potential point of conflict. In fact, youth unemployment ranges from 20-30 percent in the ESC and is recognized as a driver of crime and insecurity. Opportunistic Chinese dealings are happening at the same time the United States has been pulling back support for the Caribbean.

POSITIVE TRENDS

Despite the threats noted above, there are a number of developments that point to biodiversity and forest conservation moving in a positive direction. Key legislation supporting sound environmental management has been passed in several countries; Guyana and Antigua and Barbuda are noteworthy in this regard. New ministries and initiatives have emerged in response to increasing climate challenges and pressures to expand economic growth in a sustainable manner (e.g., Blue Economy Ministries in Dominica and Barbados). International certification standards have been met for certain natural resource-based industries in Guyana and Suriname (forestry and fisheries).

Coordination efforts among donors, NGOs, and regional and national government agencies, and the willingness to exchange information regarding biodiversity conservation are improving across the Caribbean. Sustainable financing for protected areas is now becoming a reality in many ESC countries as evidenced by the development of the National Conservation Trust Funds (NCTFs) in Antigua and Barbuda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Grenada. The USAID Dominican Republic Caribbean Development Program (CDP) played an instrumental role in establishing the NCTFs and also helped design a USD 29 million Ecosystem-based Adaptation (EbA) facility, which was established as the first sinking fund within the Caribbean Biodiversity Fund (from multiple donor sources) to provide grants or the use of biodiversity and ecosystem services for effective climate change adaptation measures.

Sand mining has been banned in Dominica, Saint Lucia, and Grenada, and sand mining rehabilitation work is well underway in Barbados. Innovative efforts to control invasive species have been launched throughout the ESC. The Antiguan racer has been brought back from the brink of extinction, and perhaps most importantly, the rehabilitation of an ecosystem— Redonda Island, Antigua and Barbuda—at one time believed to have passed the point of salvaging, is well on the way to successful restoration due to the hard work and persistence of a team of NGOs with government support. The Redonda restoration is a model generated in the ESC that may well be looked at by the international conservation community as a way forward for ecosystems ravaged by invasive species and on the brink of collapse.

RESULTS FROM THE 2013 118/119 ANALYSIS

The team reviewed the ESC Mission programs during the 2013-2020 period in order to assess the results of the recommendations made in 2013 to support the current analysis. The 2013 analysis generated eight "actions necessary" to conserve tropical forests and biodiversity covering areas like capacity building, alternative livelihood strategies, resource valuation studies, data systems and management, species monitoring, planning, laws and regulations, and environmental review. These actions were then analyzed within the context of the anticipated USAID ESC programs, which were labeled "Focus Areas" (FA), to determine if and how these actions could be integrated into each ESC Mission FA. The four FAs were 1) Global Climate Change; 2) Citizen Security; 3) Economic Growth; and 4) HIV-AIDS.

As anticipated in the 2013 analysis, most of the direct links between biodiversity and forest conservation were with FA 1 Global Climate Change. All the FA 1 projects addressed some of the "actions necessary" to varying degrees. It also was anticipated that FA 2 and FA 3 would meet a limited number of "actions necessary"; however, the team did not find that integration into FA 2 and FA 3 occurred. Some of the programs had no direct linkage to biodiversity and forest conservation (e.g., juvenile justice reform), while others did (e.g., workforce training, youth volunteer groups, etc.), but no contributions to the "actions necessary" were identified. Additional information on the linkages between the "actions necessary" and the USAID ESC program is included in **Annex E**, "Results from the 2013 118/119 Analysis."

BIODIVERSITY AND FOREST CONSERVATION "ACTIONS NECESSARY" AND LINKS TO USAID 2021 – 2025 ESC PROGRAMMING

This analysis generated ten broad "actions necessary" to address threats that include:

1. Strengthening institutions, agencies, and organizations;
2. Sustainable funding for protected areas;
3. Improving regional collaboration;
4. Promoting alternative livelihoods;
5. Conveying conservation education messages;
6. Undertaking land use planning;
7. Enforcing environmental review;
8. Engaging the private sector;
9. Controlling invasive species and disease; and
10. Combating wildlife trafficking.

In relation to USAID ESC programming, it is anticipated that there will be continued support for disaster resilience, community strengthening, youth empowerment, and education. There are direct links between biodiversity and forest conservation and the ESC Mission's support to the disaster resilience systems and community strengthening work. There are also links to the youth empowerment program, chiefly through workforce development and vocational education activities. The Education program will be able to integrate environmental and conservation education messages into curriculum development. The links between the "actions necessary" and the 2021-2025 ESC Mission program are discussed in detail in Section VIII.

RECOMMENDATIONS

Recommendations in relation to "Actions Necessary" as well as ESC Mission programming are detailed in Sections VIII and IX. The following is a summary.

In general, USAID ESC should:

- Incorporate biodiversity conservation activities into the design of the upcoming Disaster Resilience Systems and Community Strengthening Programs.
- Encourage the Disaster Resilience Systems, the Community Strengthening Program, and youth-related programs to work with community-based NGOs to strengthen conservation approaches.
- For planning, ensure that the Disaster Resilience Systems public awareness/outreach work to communities, NGOs, universities, and government agencies includes clear links between biodiversity, forests, and climate mitigation.
- Ensure that information generated and networked within the context of the Disaster Resilience Systems (Coral Reef Early Warning System, or CREWS, and AWS) and Community Strengthening program be shared with projects/activities that are working to prevent/control/eliminate invasive species.
- Ensure that CREWS in the region provides real time information that can be provided to national-level stakeholders to help them better program funds for priority marine protected areas.
- Actively participate in regional seminars and meetings that are designed to improve the management of biodiversity in the region.
- Support alternative livelihood activities for communities practicing unsustainable resource use.
- Promote biodiversity conservation skills as part of the capacity development work in community strengthening and youth-related programs.
- Encourage the Education program to incorporate basic sound environmental management and conservation messages into curriculum development.
- Include the relevant government agency(ies) in all USAID environmental reviews to help create "ownership" as well as to implement host government procedures and strengthen environmental safeguards.
- Engage the private sector on the importance of following best management practices in relation to biodiversity conservation and environmental management.
- Integrate invasive species control measures into the vocational education and youth workforce development activities.
- Coordinate with, and provide ESC sub-regionally relevant information to CDP, including activities designed to combat wildlife trafficking.

I. INTRODUCTION

This section briefly sets out the purpose of the report, provides a description of the current United States Agency for International Development (USAID) program, and outlines the methodology used to prepare the report.

1.1 PURPOSE

The primary purpose of this report is to update the analysis of the ESC's tropical forests and biodiversity in compliance with Sections 118 and 119 of the FAA of 1961, as amended, and ADS 201 guidelines for programming. The previous ESC FAA 118/119 was conducted in 2013; this report will provide updates to the data and analysis trends for the period 2013 – 2020. The analysis will assist USAID/ESC in the development of a new Regional Development Cooperation Strategy (RDCS). It should also assist USAID/Dominican Republic in their upcoming efforts to design biodiversity initiatives and activities that will operate in the Eastern and Southern Caribbean.

1.2 BRIEF DESCRIPTION OF THE USAID PROGRAM

For almost 40 years, the USAID has provided development assistance to the Caribbean region. Apart from Guyana and Suriname, the ESC countries are small island developing states (SIDS) that share many of the same development challenges. They are constricted by limited land area and remain vulnerable to a range of natural and human-caused changes and events. The population centers for these countries are primarily located on the coast, and rising sea levels and intensifying storm events put these communities in harm's way for the foreseeable future. Proper planning and preparation for climate events is critical to the sustainability of these communities.

The economies of the SIDS are also heavily dependent on regional and global trends. Their limited terrestrial resource base puts them at a disadvantage relative to larger nations in relation to adaptability. Historically, their economies relied on agriculture, primarily from sugar cane, and fisheries. For the past several decades, the focus has shifted to tourism. Downward trends in these industries often leads to unemployment and resulting increases in crime and insecurity. Compounding these problems is the fact that the Caribbean has the second highest HIV prevalence rate in the world after sub-Saharan Africa. To address these and other critical issues, USAID has been supporting national and regional initiatives that mitigate risks resulting from climate change, reduce youth involvement in crime and violence, and increase epidemic control of HIV/AIDS. USAID/ESC's last RDCS was approved on September 6, 2013, and currently goes through September 30, 2020. The overarching goal for it is "safer, more prosperous Caribbean communities."

The mission has three development objectives for its 2016-2020 strategy, which is drawing to a close, all of which promote the overall goal. These are:

- Development Objective (DO) 1: Youth involvement in crime and violence in targeted communities reduced
- DO2: Epidemic control of HIV/AIDS among key populations increased (transferred to USAID/Jamaica October 2019)
- DO3: Risks to human and natural assets resulting from climate vulnerability reduced

Additional detail on the current and anticipated USAID ESC program is provided in Section VIII.

1.3 METHODOLOGY

The Environmental Incentives (EI) Team reviewed key documents as well as other relevant reports and consulted data portals and websites (**See Annex C**). The information gathered was supplemented and validated through key-informant interviews via teleconferencing. Field work and face-to-face interviews are the norm for 118/119 country and regional analyses, however, due to COVID-19, travel was not possible, so this entire study was conducted remotely.

The analysis looked at ecosystems (terrestrial, marine, and freshwater), institutional arrangements and governance, policy and legislation, valuation of ecosystems and biodiversity, threats and drivers, and proposed actions to address identified threats. The main tasks associated with the execution of the project were:

1. Contact/interview key resource specialist throughout the region;
2. Contact/interview all relevant USAID personnel at Mission, Regional, and Washington, D.C. levels;
3. Review of all relevant websites and documentation;
4. Provide a brief assessment of contextual events affecting forests and biodiversity since 2013; and
5. Production of a draft and final report.

II. REGIONAL CONTEXT

2.1 LOCATION AND REGIONAL CONTEXT

LOCATION

This analysis focuses on the Eastern and Southern Caribbean countries of Saint Kitts and Nevis, Antigua and Barbuda, Dominica, Saint Lucia, Saint Vincent and the Grenadines, Grenada, Barbados, Trinidad and Tobago, Guyana, and Suriname (Figure 1). The countries all have coastal contact with the Caribbean Sea apart from Guyana and Suriname, having coasts facing the Atlantic Ocean.

All the countries apart from Guyana, Suriname, and to a lesser extent Trinidad and Tobago, are within the Atlantic Hurricane Track area and are susceptible to storm impacts of varying severity. All the island countries have records of seismic activity resulting in earthquakes and some islands have volcanic-influenced activity such as geothermal vents and "live" volcanoes.[1]

ECONOMY

The countries included in this report have diverse economies based on multiple sectors. The main traditional sectors of the islands include agriculture, fisheries, and tourism, with the latter having been the main revenue source for most of the countries over the past decades.

Emerging sectors are logistics and non-traditional agricultural crops as well as the creative and digital sectors. The extractive industries, agriculture, and fisheries dominate the economic sectors of Guyana and Suriname. The extractives focus on oil and mining; the economy of Trinidad and Tobago is driven by this sector.

Figure 1. Map of the Caribbean Showing the Countries Included in the Analysis

Tourism and agriculture are vulnerable to climate variability and change as well as natural disasters. Altered trade arrangements and a series of natural disasters in recent years have led to agriculture declining as a significant contributor to GDP in the region. Nonetheless, biodiversity, land, and seascapes, as well as lush tropical forests in Guyana and Suriname underpin much of the daily life of the countries of the ESC as they support livelihoods, employment, traditional foodways, medicine, tourism, and valuable exports. Section IV of this report addresses this in further detail.

2.2 BIOPHYSICAL SETTING

The ESC comprises a volcanic island arc and a continental borderland with Trinidad and Tobago.[2] Northern Trinidad and the island of Tobago are located on the transition zone and fault system between the Caribbean and South American plates. The northern range of Trinidad and the island of Tobago are part of the southern Caribbean transform fault system where the Caribbean Plate meets the South American Plate. [3] The South American Plate is ancient, having rocks extending back through the Precambrian period (which ended 540 million years ago) with the coastal strip made up of younger rocks, Paleocene and later, brought down by the river systems. Trinidad was at one time part of South America, and Tobago is part of an island arc chain along the Caribbean Plate. Since Trinidad was connected to northwest Venezuela, Trinidad contains fauna and flora from South America, unlike Tobago and the Lesser Antilles.

The other ESC islands are young with mainly active or long extinct volcanoes often capped with reef-related limestone, but all younger than the Cretaceous (which ended 65 million years ago). The limestone Caribbean islands resulted from a readjustment of the Caribbean plate as it moved eastward. The subduction zone moved west in the middle of the tertiary, so volcanism stopped under Antigua, while new volcanoes developed to form Saint Eustatius and Grand Terre Guadeloupe. Barbados is unlike the other eastern Caribbean islands that are associated with the volcanic arc complex, as it sits on the Caribbean and South American Plate boundaries, much like Trinidad and Tobago.

This geological setting underpins the biogeography and biodiversity of the ten countries included in this analysis. As a result, the countries were divided into three country groups: Suriname, Guyana, and Trinidad and Tobago form the Amazonian Group. Proceeding north, Grenada, Saint Vincent and the Grenadines, Saint Lucia, Dominica, and Saint Kitts and Nevis form the Volcanic Islands Group. Barbados and Antigua and Barbuda form the Coralline Islands. With respect to moisture conditions, Saint Kitts and Nevis exhibit some similarity to the islands of this last group, having a slightly drier climate.

III. STATUS OF THE ESC'S BIODIVERSITY AND TROPICAL FORESTS[5]

The Caribbean and Amazonian regions are recognized biodiversity hotspots. New species and subspecies continue to be discovered; the biodiversity of Suriname and Guyana remain to a great degree undocumented.

Forests in Suriname and Guyana are acknowledged as net carbon sinks based on their vast extent and overall health. New invasive species as well as persistent ones remain threats in all countries. The volcanic islands, while historically clearing forests for agriculture and settlement, are seeing some secondary regrowth due to the decline of sugarcane and banana cultivation. However, there is a general decline in lowland (littoral) and mangrove forest coverage due to settlement and development. The coastal and marine environments in all countries are under pressure from a wide range of threats.

The threats detailed in this report have led to an increase in animal species listed as Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) on the International Union for Conservation of Nature (IUCN) Red List for all ESC countries since the last analysis; the only exception is Guyana and Suriname, where they registered "no change" in CR animals. For the Coralline Islands, the Red Listed plants remained stable or declined. In the Volcanic Islands, the endangered plant numbers declined while vulnerable numbers increased. Only

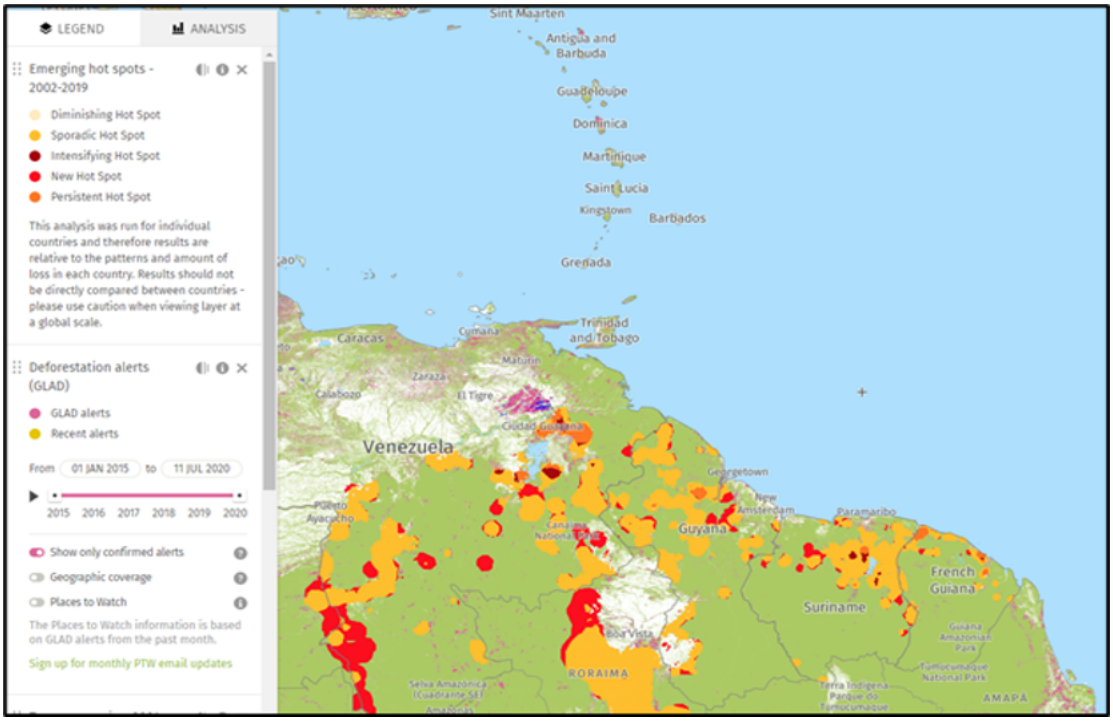


Figure 2. Emerging Hotspots and Deforestation. Source: Global Forest Watch

Saint Vincent and the Grenadines and Dominica have plants listed as Critically Endangered. In the Amazonian Group, all countries recorded increases in CR, EN, and VU species, with the exception of Suriname.

Suriname recorded a decline by one endangered plant species (**See Annex G**) while Trinidad and Tobago demonstrated a notable increase in CR plants.

All ESC countries have recorded deforestation alerts (Global Land Analysis and Discovery Lab)[4] for the 2015-2020 period. Of note is the coverage of emerging hotspots in Guyana and Suriname ranging from sporadic, intensifying through to persistent, with a number of new hotspots being mapped (Figure 2 on page 5).

ANTIGUA AND BARBUDA

The islands of Antigua and Barbuda have extensive wetlands, beaches, and coral reef ecosystems, as well as watersheds with accompanying waterways and forests. The total land area of all the islands is 443km2, which includes smaller offshore islands with coral reefs and seagrass beds. Collectively, these ecosystems provide habitat for many globally rare fauna. The country is known for one of the rarest and smallest known Racer Snake (*Alsophis antillensis antiguae*) populations in the world and hosts the largest Frigate Bird (*Fregata magnificens*) nesting ground in the Caribbean (Codrington Lagoon in Barbuda).

Frigate birds are exceptionally large, standing over a meter tall and having a wingspan of more than two meters. They soar over open waters in search of fish, which they capture by skimming the surface with their hooked beaks; they do not dive. Immature birds have white, and the males are all black except for a red throat pouch that expands in a mating display.

Frigate bird colony at Codrington Lagoon. Credit R. Clausen

Over the past ten years, there has been significant improvement in the management of biodiversity in the country, but the threats are still significant. Though the country has developed a National Environment Management Strategy and completed an initial draft National Biodiversity Strategy and Action Plan, there is still much work to be done to revise and implement the strategies and plans. Nevertheless, overall biodiversity conservation is trending in a positive direction.

Antigua and Barbuda share many plant and animal species with other Lesser Antillean Islands, but diversity and level of endemicity varies widely among different taxonomic groups. The population trend for most globally threatened species on Antigua and Barbuda is in decline, with the notable exception of two species recorded to be on the increase thanks to the success of conservation efforts: the West Indian Whistling-Duck (*Dendrocygna arborea*) and the endemic Antiguan Racer (*Alsophis antillensis antiguae*). Both species remain on the IUCN Red List, with the former classified as vulnerable and the latter critically endangered. Many terrestrial animals have become rare, endangered, or extinct due to the loss and/or fragmentation of natural habitats such as forested areas and grasslands. Marine organisms are negatively affected by the degradation of mangroves, wetlands, seagrass beds, and coral reef ecosystems.

Biodiversity provides a significant source of revenue for Antigua and Barbuda. Since the 1960s, the economy has relied mainly on tourism. The tourism industry, which is primarily centered on the country's marine and coastal assets, contributes to 42 percent of Gross Domestic Product (GDP). While there is recognition that the ecosystem goods and services have value, like many other countries, their value in Antigua and Barbuda is not well understood. In Antigua and Barbuda, the fisheries sub-sector within agriculture provides a contribution to the GDP (1 percent). About half of the revenue generated in the fishing sub-sector originates from the Codrington Lagoon, which is a Ramsar site.

There are several noteworthy developments in relation to biodiversity conservation initiatives, legislation, and institutional responsibilities. Antigua and Barbuda undertook the rehabilitation of major biodiversity hotspots in 2017, most notably the Redonda Island Restoration Program.[6] The recovery of the Antiguan Racer is another conservation success story generated in the ESC by Antigua and Barbuda with international assistance.[7] A critical piece of legislation, the Environmental Protection and Management Act, was enacted in 2015. The passage of this act has paved the way for a range of positive environmental initiatives. In 2017, Antigua and Barbuda ratified the Nagoya Protocol.

The Department of the Environment (DOE), which was created in 2014, has a wide range of responsibilities, including the conservation of biodiversity. The DOE also oversees multilateral agreements on environment and climate change, financial mechanisms to build sustainable livelihoods within protected areas, and biodiversity data collection. The DOE includes the Environmental Impact Assessment Unit.

Overall, the human resources and management capacity of the protected area (PA) system are not adequate. The PAs operate, to a degree, in isolation; a coordinated management system is needed. The Global Environment Facility (GEF) "Path to 2020 Project" is currently working on improving PA management. The DOE is also shepherding a proposal to create new protected areas. Additional information on Antigua and Barbuda is included in **Annex G**.

BARBADOS

Barbados is the most easterly island of the Eastern Caribbean island chain. The island is 34 km long and 23 km wide and has a total land area of approximately 432 km2. It is relatively flat, composed mostly of coral limestone with deep riverbed gullies. These gullies tend to have a large and mature collection of native ferns, climbers, shrubs, and trees; the gullies are significant as Barbados' natural vegetation cover was reduced dramatically following colonial settlement. Gullies account for about 5 percent of the total land area, but up to 35 percent of the plant diversity.

Aquatic ecosystems include wetlands, rocky intertidal areas, seagrass beds, coral reefs, and the open ocean. There is about a 16km2 surface area of coral reefs, most of which is bank/barrier reef and

the rest fringe reef. The freshwater ecosystems include streams, ponds, temporary pools, and inland brackish water marshes and swamps.

According to the IUCN Red List, there are 44 threatened species in Barbados. In the marine environment, there are 36 threatened animal species, including seven critically endangered, six endangered, and 23 vulnerable species. Critically endangered species include Elkhorn Coral (*Acropora palmata*), Staghorn Coral (*Acropora cervicornis*), Hawksbill Sea Turtle (*Eretmochelys imbricata*), the Barbados Threadsnake (*Tetracheilostoma carlae*), the Barbados Skink (*Alinea luciae*), the Leaf-Toed Gecko (*Phyllodactylus pulcher*), and the Barbados Cedar (*Cedrela odorata*); the Thread Snake and Leaf-Toed Gecko are endemic and rare.

To date, 261 species of birds have been recorded in Barbados. The Barbados Bullfinch (*Loxigilla barbadensis*) is endemic, and there are six endemic subspecies of birds on the island. Barbados is located on a major migratory flyway between North and South America; 150 species of migratory birds have been recorded on the island. There is one protected area by law with a management team, the Folkestone Marine Park, and seven Important Bird Areas (IBAs). Barbados' system of "Parks and Open Spaces" consists of seven categories with different policies and use plans for each category. There is a co-managed marine protected area (Carlisle Bay), and a sand quarry is being rehabilitated and turned into a forest nature park (Walkers Reserve).

While forest resources are declining only slightly nationwide, marine resources are increasingly threatened with inadequately planned development (urban housing, hotels), pollution of the near-shore environment, and invasive species. Management plans are developed or being developed for marine protected areas, but implementation is lagging. A quote from one of the resource specialists interviewed underscores this point: "We have done a lot of planning and have sufficient planning documentation; we need to get past the planning stage and implement."

Barbados's natural resources fuel the economy. The Barbados tourism sector is built upon the natural resource base, especially the beaches and coastal areas. Most tourists visiting Barbados are doing so for recreation and leisure. The contribution of tourism to GDP in Barbados is 31 percent. In terms of freshwater resources and drinking water, Barbados is almost entirely dependent on groundwater. Barbados is included in the list of the world's top ten most water stressed countries. The regional drought of 2013-2016 underscored the importance of effectively managing surface water and rainfall to recharge the aquifer.

Barbados has undertaken several initiatives, passed legislation, and reorganized government agencies that benefit biodiversity conservation. The government approved a new fisheries sector management policy and regulations in 2014 and established the Green Agricultural Research Fund in the Ministry of Agriculture in 2015. The country joined the UN Partnership for Action on a Green Economy in 2016 and created the Ministry of Maritime Affairs and Blue Economy in 2018. The new ministry is charged with the restoration of coral reefs and the expansion of marine protected areas, and it has the mandate to address the sargassum issue. This ministry also contains the Coastal Zone Management Unit (CZMU), which is responsible for shoreline protection, development control, and marine habitat management, and the Fisheries Division. The CZMU is also responsible for coastal project design and management. Both marine and terrestrial protected areas are managed by the National Heritage Department of the Ministry of Environment and Natural Beautification. This ministry is also the lead agency on all environmental issues.

SAINT KITTS AND NEVIS

Saint Kitts and Nevis have a land area of 261 km2, which is the smallest land area in the USAID ESC region. Each island is dominated by a single volcanic cone surrounded by fertile soils sloping toward the sea in all directions. Major ecosystems include wetlands/ponds, seagrass beds, mangroves, coral reefs, and forests of various types. The Reef Health Index for Saint Kitts and Nevis was only 2.3 (out of 5). This is the lowest score (shared with Antigua and Barbuda) of the ESC countries.

There are six main forest classes in Saint Kitts and Nevis based roughly on elevation. The classes include stunted forests (elfin woodlands) at the highest points (exposed, windy areas) palm forests, rain forests, montane thickets, dry evergreen forests, and dry woodlands in the lower elevations. Saint Kitts and Nevis have less than 1 km^2 of mangroves.

Bird life is rich, with 231 species listed for Saint Kitts and Nevis; 104 species are land birds, 159 are migratory species, 36 are seabirds, and 88 are waterbirds. There are no longer any endemic bird species on Saint Kitts and Nevis. The only native mammal species in the country are bats; there are eight species of bats overall. There are two species of snakes, the regionally endemic Leeward Blind Snake (*Typhlops geotomus*) and the endangered Orange-Bellied Racer (*Alsophis rufiventris*). The Ground Lizard (*Ameiva erythrocephala*) and two species of Anoles (*Anolis bimaculatus and Anolis wattsi schwarti*) are endemic to Saint Kitts, Nevis, and Saint Eustatius.[8] There are also two endemic geckos, *Sphaerodactylus sabanus* (Northern Leeward Sphaero) and *Sphaerodactylus sputator* (Leeward Banded Sphaero).

Four sea turtle species are found in Saint Kitts/Nevis waters (Leatherback, Loggerhead, Green, and Hawksbill). All sea turtle species are threatened globally, with the Hawksbill being categorized as critically endangered, Greens and Loggerheads as endangered, and Leatherbacks vulnerable. Sea turtles are still hunted in Saint Kitts and Nevis, but there is legislation pending that would prohibit this activity.

There are three legally established terrestrial park units. The Central Forest Reserve National Park has management based on integrated ecological conservation. The Royal Basseterre Valley National Park is managed by the Water Services Department with a goal to preserve and protect the aquifer. The Brimstone Hill Fortress National Park is a colonial-era fortress managed by a civil society organization as a historical and cultural site.[9]

In 2016, the two-mile radius around Saint Kitts and Nevis was legally declared a Marine Management Area (MMA). Management plans for its various zones (fishing, conservation, recreation, transportation) are being developed. There are three IBAs in the country that include the Central Forest Reserve National Park, the Southeast Peninsula, and Booby Island.

Nature-based tourism is a major driver of the economy, accounting for just over 28 percent of GDP. Tourism also provides about 14,000 jobs, or 59 percent of total employment.[10]

In Saint Kitts, the newly formed Ministry of Agriculture, Human Settlement, Cooperatives, and the Environment has oversight for the Department of Environment (DOE). The DOE has responsibility for Forestry (formerly administered by Agriculture) and obligations under the Convention on Biological Diversity. The Ministry of Sustainable Development has oversight for the Department of Agriculture and the Department of Marine Resources. The Departments of Agriculture and Marine Resources have joint responsibility for CITES obligations.

DOMINICA

Dominica's land area covers 750 km^2, and it has the smallest near-shore shelf area of the eight island countries, which supports stretches of seagrass meadows, coral reefs and limited wetlands. As one of the volcanic ESC islands, Dominica is known for its black sand beaches.

The National Biodiversity Strategy and Action Plan (NBSAP) designates seven natural vegetation communities: coastal swamp, littoral woodland, dry scrub woodland, deciduous/semi-evergreen forest (including grassland and savannah sub-types), rain forest, montane rain forest, and elfin woodland.

Fumarole vegetation associated with geothermal areas is also present. Dominica has seven watersheds, two lakes, and several rivers.

Approximately 61 percent of Dominica is under forest cover, with 27 percent of forests designated as protected by a network of two forest reserves, three national parks, and a protected forest. In 2010, Dominica had around 90 percent tree cover, but lost about 32 percent of that in 2017 as a result of Hurricane Maria. [11]

Black Sand Beach in Dominica. Credit: R. Clausen

Due to steep terrain and accessibility, only 30 percent of the forest is accessible for forest management interventions. The forest classes are montane cloud forest, evergreen montane shrubland, montane rain forest, lowland/sub-montane seasonal evergreen forest, lowland drought deciduous shrub, and seasonally flooded forest.

Hurricane Maria was estimated to have defoliated 85-90 percent of the country's trees, debranched 85 percent, broke the tops of 75 percent of the trees, and debarked 80 percent; these estimates were based on aerial photo interpretation coupled with ground level reconnaissance work. Six months after the storm, there was significant greening, with a number of secondary species such as ferns and vines emerging. The storm had positive effects as rotten spaces in tree trunks provided nesting sites for parrots. Based on the refoliation and growth rates, it is expected that the forests will return to their pre-hurricane appearance in 5-7 years.

Dominica has 206 species of birds, including two endemic and globally threatened parrots, the Imperial or Sisserou Parrot (*Amazona imperialis*) and the Red-Necked or Jaco Parrot (*Amazona arausiaca*). Endemic terrestrial reptiles include the Ground Lizard (*Ameiva fuscata*) and the Tree Lizard (*Anolis oculatus*). The most prominent amphibian is the critically endangered *Leptodactylus fallax* (Crapaud or Mountain Chicken), which is endemic to Dominica and Montserrat, widely consumed by the local population, and under increased threat from a fungal disease.

Twenty percent of the land surface is protected as well as 0.13 percent of the territorial waters, including 2.5 percent of its coral reefs. Dominica has two declared terrestrial protected areas along with two declared and one proposed marine protected area. Dominica has four IBAs.

Tourism accounts for 37 percent of the GDP; Dominica (the "Nature Island") is known for its nature tourism, particularly its forest areas where hiking is very popular. Unlike most other ESC islands, beach tourism is not a major attraction due to the limited number of sand beaches. Agriculture is also a significant part of the economy, contributing 12.6 percent to GDP; this is the highest agricultural contribution to GDP of any of the ten ESC countries.

Dominica has undertaken several initiatives that favor biodiversity conservation. In 2018, the government pledged to become the first "climate resilient" country by launching the Climate Resilience Execution Agency of Dominica, or CREAD. Dominica also banned single use plastic and styrofoam containers in 2019, and launched the "Go Green" initiative in 2020.

Dominica created a new Ministry of Blue and Green Economy, Agriculture, and National Food Security, which contains the Division of Fisheries. There are two other ministries directly related to biodiversity conservation and forest management that include the Ministry of Environment, Rural Modernization, and Kalinago Upliftment, and the Ministry of Tourism, International Transport, and Maritime Initiatives, which includes the Discover Dominica Authority that handles permits for natural areas and parks.

SAINT LUCIA

Saint Lucia is a volcanic island with a steep, rugged topography; the country has a land area of 616 km^2. Forests and woodlands account for more than 20,000 ha (about 35 percent of the land) and provide significant habitat for many flora and fauna. Forest types include elfin woodland, montane thicket, lower montane rainforest, rainforest, secondary forest, savannah and grazing land, and dry scrub woodland. Other habitats and ecosystems in Saint Lucia include rivers, active geothermal areas and sulfur springs, coastal wetlands, coral reefs, and seagrass beds.[12] The 2016 coral reef report card for Saint Lucia indicates an average coral cover of 21 percent, which is higher than the Caribbean average.[13]

Saint Lucia possesses a high degree of biodiversity, with over 1,300 known plant species, 160 birds, 250 reef fish, and 50 coral species. The Forest and Lands Resources Department and the Saint Lucia National Trust are working together with Fauna & Flora International and the Durrell Wildlife Conservation Trust to save the critically endangered Saint Lucia Racer (*Erythrolamprus ornatus*) from extinction. The racer is one of the world's rarest snakes, if not the rarest. The Saint Lucia Racer is found only on the small offshore island of Maria Major. The Saint Lucia whiptail is a critically endangered lizard, the only species of genus *Cnemidophorus* found in the Caribbean. The Fer-de-Lance (*Bothrops caribbaeus*) is a venomous viper endemic to Saint Lucia and a focus of conservation efforts.

There are 16 protected areas in Saint Lucia, covering 117 km^2 of land (19 percent of total land coverage) and 34 km^2 of marine area (<1 percent coverage). There are also three internationally designated protected areas, two Ramsar Sites (Savannes Bay and the Mankòtè Mangrove), and a UNESCO World Heritage Natural Site (the Pitons Management Area). There is a current proposal to expand the number of protected areas in the country from 16 to 40, including as many as 24 marine reserves.

Tourism accounts for over 40 percent of Saint Lucia's GDP, which is the second highest (behind Antigua and Barbuda) tourism contribution to GDP in the ESC region. The sector is also responsible for over 60 percent of the employment sector.[14] In addition to beach and coastal resource tourism, cultural and national heritage sites are also important in Saint Lucia, with Fort Rodney on Pigeon Island being one of the most heavily visited sites.

Biodiversity values and principles are incorporated into national and sectoral policies such as the National Environmental Management Strategy, National Environmental Policy, National Adaptation Plan, the Sectoral Adaptation Strategy Action Plans (SASAP) for the agriculture, fisheries, and water sectors, and the Disaster Vulnerability Reduction Strategy.

The Sustainable Development and Environment Division, as well as the Biodiversity Unit, is within the Ministry for Education, Innovation, Gender Relations, and Sustainable Development. The Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources, and Co-Operatives handles forestry and fisheries. Protected areas management is shared across the Forestry Department, Saint Lucia National Trust, and Soufriere Marine Management Area (SMMA) Inc.

SAINT VINCENT AND THE GRENADINES

The land area of Saint Vincent and the Grenadines is 389 km^2 in total; the highest point on the island is the Soufriere volcano (1,234 m). Saint Vincent is the largest and northernmost island; the Grenadines are a chain of 32 islands and cays between Saint Vincent and Grenada to the south. The country is home to forests, wetlands, grasslands, coastal, and marine ecosystems. The rain forest occurs chiefly between 300-500 m in valleys and on slopes and crests of low ridges. Palm (brake) forests are found mainly above 500 m mostly on steep, exposed windward slopes; elfin (stunted) woodlands are located on summit areas, ridges, and peaks. Freshwater ecosystems consist of surface water streams, small springs, three volcanic crater lakes (Lake Antoine, Grand Etang Lake, and Levera Lake), and a human-made lake (Palmiste Lake).

Coastal and marine ecosystems include seagrass beds, lagoons, mangroves, and a variety of patch, fringing, and bank barrier reefs. Total coral cover is 168 km^2. The Coral Reef Report Card for Saint Vincent and the Grenadines is 2.8, among the

highest scores in the ESC. Just over 42 ha of four distinct species of mangroves remain along coastal areas, mainly on Union and Mustique Islands and a very tiny area on Saint Vincent's south coast. Three quarters of the Grenadine Bank (Figure 3), which is shared by Saint Vincent and the Grenadines and Grenada, is less than 50 m deep and supports the most extensive coral reefs (estimated at 85 km^2) and related habitats in the southeastern Caribbean.

Saint Vincent and the Grenadines have no national forest policy or forest areas with management plans. There are three forest reserves, and over 90 percent of forest land is state owned. Forest coverage was estimated at 29,700 ha (75 percent of total land area) in 2010, but by 2019 there was a reduction of 101 hectares. [15] All lands above the 305 m contour in Saint Vincent and the Grenadines are Crown lands and named Forest Reserves, however, they are not yet legally declared as protected areas. One of the major causes of forest loss in Saint Vincent and the Grenadines has been the illegal cultivation of marijuana in the national forest reserves, especially on the forested slopes of the Soufriere Volcano. The passage of legislation in 2018 legalizing the cultivation of marijuana for medicinal and research purposes is anticipated to result in more environmentally responsible approaches to marijuana cultivation and a corresponding reduction in deforestation.

Saint Vincent has diverse biodiversity with multiple endemics. In total, there are more than 1,150 species of flowering plants, 163 species of ferns, four species of amphibians, 16 species of reptiles, 111 species of birds, and 15 species of mammals. Five hundred marine species have been identified in the waters of Saint Vincent and the Grenadines.

There are 35 protected areas in the country: three forest reserves, seven marine parks and reserves, and 25 wildlife reserves. The protected area system is under the management of the National Parks, Rivers, and Beaches Authority. There are 71 watersheds in Grenada, with the upper reaches of a number of these watersheds protected as forested Crown lands and Forest Reserves.

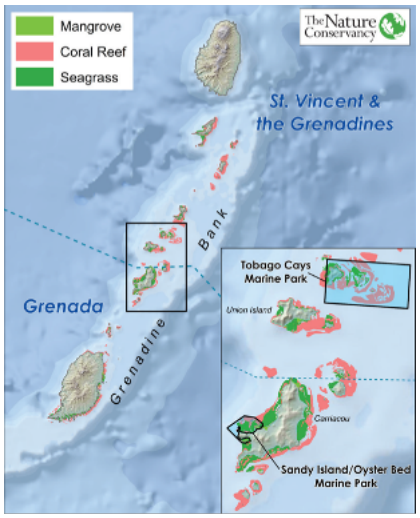


Figure 3. USAID Caribbean Marine Biodiversity Project ESC Seascape.

Nature-based tourism is a significant contributor to the Saint Vincent and the Grenadines economy, representing 28.6 percent of GDP and supplying over 45 percent of the nation's employment opportunities.[16] A study that provided an assessment of the economic value for a range ecosystem services delivered at two marine parks in Saint Vincent and the Grenadines (the proposed Saint Vincent South Coast Marine Park and the Tobago Cays Marine Park) indicated that at the South Coast, human health, ecosystem resilience, and fishing were the most valued, while at Tobago Cays, the highest valued services were ecosystem resilience and coastal protection.[17]

An innovative and inspiring example of how natural resources can provide not only subsistence and income for livelihood development, but also serve as a recovery and reform vehicle, comes from the Mustique Charitable Trusts and their work with prisoners in the Kingston Prison. The "Grow in Time" program distributes income from the sale of grass products to the prisoners to assist their families.[18]

The Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry, and Labor includes the Forestry and Fisheries Division. This division oversees Marine Protected Areas along with Resource Assessment and Management. Management of Forest Reserves and Protected Areas is within the Forestry portfolio along with sub-units for Forest Conservation, Tree Establishment and Management, Wildlife Conservation, Environmental Education, Upland Watershed Management, Mangrove Conservation, and Forest Recreation.

Three of the Grenadines: (left to right) Petite Nevis, Isle a Quatre, and Pigeon Island. Seen from Bequia looking south. Credit: R. Clausen

GRENADA

The country of Grenada includes the main island of Grenada, the smaller Southern Grenadine islands of Carriacou and Petite Martinique, and 600 mostly uninhabited islets. The land area of Grenada is 344 km^2. The major ecosystems are forests, freshwater systems (lakes, ponds, rivers, streams), coastal ecosystems (mangroves, swamp, marshland), and marine systems (coral reefs and seagrass beds). The major forest regions in Grenada are found at Mt. St. Catherine, Grand Etang Forest Reserve, Mt. Hope/Claybony water catchment (private lands), Levera, Morne Delice, the Annandale watershed, and High North Forest Reserve in Carriacou. In 2010, Grenada had 27,600 hectares of tree cover (77 percent of the country); from 2013-2019, Grenada lost 334 ha of this, or about 1.2 percent decrease in tree cover from 2010.[19]

Grenada's government is a regional leader in comprehensive marine management, fisheries regulations, educational programs, and community outreach. Grenada has 78km^2 of coral reef, 29 km2 of seagrass, and 3km^2 of mangroves. In general, the overall health of Grenada's coral reefs is below the regional average; the report card score is 2.5.

Grenada's terrestrial wildlife includes four amphibian species. The Grenada Whistling Frog (*Eleutherodactylus euphronides*) is endemic to Grenada and is among the most vulnerable in the West Indies.[20] There are eight species of lizard and five species of snake (one endemic). There are 150 species of birds (18 of which are threatened or endangered), 22 mammals (of which four are native terrestrial species), and 11 native species of bats.

In 2018, the Grand Anse Marine Protected Area (GAMPA) was declared, which doubled the size of marine areas under protection. GAMPA is a 1,965 ha coastal/marine area that includes coral reefs, dive sites, and fishery resources. It is Grenada's fourth marine protected area.

Grenada is also known as the "spice island" since spice production and exports have traditionally contributed significantly to the country's economy. The main spices exported include mace and nutmeg; Grenada is the world's second largest producer of nutmeg. As with many of the ESC countries, agriculture at one time dominated Grenada's economy, but that has shifted to tourism over the past several decades. Tourism is largely natural resource-based and contributes to 40.7 percent of Grenada's GDP (agriculture contributes about 6 percent).[21]

The Resilient Islands project commissioned a study that demonstrates the value of natural ecosystems in their role of providing protection from storms and hurricanes. The study demonstrated that restoring ecosystems like mangroves and reefs would cost one-tenth the amount of money it would take to build infrastructure for coastal protection.[22] Moreover, coastal ecosystems such as mangroves, tidal marshes, and seagrass meadows sequester and store more carbon ("blue carbon") per unit area than terrestrial forest, which underscores the importance of these ecosystems in reducing the effects of climate change.[23]

Grenada has undertaken several initiatives that enhance biodiversity conservation. In 2017, Grenada was the first Caribbean Community (CARICOM) country to complete its cabinet approved National Adaptation Plan (NAP). This plan forms the basis of national transformation processes and is designed to encourage international donors to provide financing. In the same year, Grenada adopted the Climate Change Policy and Action Plan for 2017 – 2021. In 2018, Grenada revised its forest policy, declared the Grand Anse Marine Protected Area, and banned single use plastics and styrofoam. In 2019, the Integrated Coastal Zone Management Bill was passed.

In 2018, the Ministry of Climate Resilience, the Environment, Forestry, Fisheries, and Disaster Management was established as a new super-ministry. The environment portfolio includes biodiversity, climate change, and multilateral environmental agreements. The ministry has oversight for climate change, coastal zone and ocean governance, biodiversity, multilateral environmental agreements, and the environmental protection portfolio.

TRINIDAD AND TOBAGO

Trinidad and Tobago's land area covers 5,128 km^2. The island's rich biodiversity is attributable to its geological history (it was at one time connected to South America) and current proximity to the South American continent. Terrestrial ecosystems in Trinidad include seasonal evergreens, littoral woodlands, montane rainforests, swamp forests, marshes, and savannahs. Tobago has lowland rain forest, lower montane rainforest, and seasonal forests. In the marine areas, ecosystems include mud bottoms, coral reefs, sandy bottoms, and rocky shores. These support a range of biodiversity, including an estimated 36 species of reef-building corals. Beaches on Trinidad's northern and eastern coasts are among the top three internationally most important nesting grounds for Leatherback Sea Turtles.

Forest cover for Trinidad and Tobago shows a net increase, with the greatest area increase recorded for evergreen seasonal forests. All of the Forest Reserves in Tobago are managed as "protection forests." Approximately 21 percent (28,000 hectares) of the Forest Reserves in Trinidad are currently designated as "production forests." This includes 13,000 hectares of teak and pine plantations, with the rest consisting of managed natural forests.

Terrestrial species diversity includes approximately 420 birds and 85 reptiles. Trinidad and Tobago also host among the highest number of mammal species of any Caribbean island. There are about 100 species of mammals from 22 different families, and include dolphins, manatees, monkeys, porcupines, ocelots, armadillos, peccary, deer, bats, and rodents.[24] Marine areas support a wide range of fauna, including an estimated 36 species of reef-building corals.

Protected areas include 36 Forest Reserves, 13 Wildlife Sanctuaries, one Protected Marine Area, Prohibited Areas, Environmentally Sensitive Areas, and cultural and heritage properties of interest.[25] **Annex J** contains maps of current and proposed Protected Areas for Trinidad and Tobago.

Trinidad and Tobago is considered an upper income country, and it is the wealthiest country in the Caribbean. Oil and gas account for about 40 percent of the nation's GDP. Nature tourism is a growth sector and currently contributes almost 8 percent to GDP; the agricultural contribution is 1 percent.

From 2011-2015, the Ministry of Planning and Sustainable Development partnered with the University of the West Indies to undertake a GEF-funded, UNEP-led initiative known as the "Project for Ecosystem Services" (ProEcoServ). As one of five countries around the world involved in ProEcoServ, Trinidad and Tobago contributed to some of the pioneering work in the Caribbean on valuation and the integration of biodiversity values into decision-making.[26] In 2019, the National Protected Area Systems Plan for Trinidad and Tobago was approved

Current ministries relevant to biodiversity and forests are The Ministry of Agriculture, Land, and Fisheries and the Ministry of Planning and Development (Environmental Management Authority, Institute of Marine Affairs, and Green Fund Executing Unit).

GUYANA

Guyana has a land area of 215,000 km^2, which contains wide range of ecosystems including white sands, serpentine rock soils, savannahs (Berbice River and Rupununi), swamps, mangroves, flood plains, rock outcrops, tropical rainforest, dry evergreen forests, and montane (cloud) forest. These ecosystems support a rich diversity of flora and fauna. The forests of Guyana and Suriname are a part of the Guiana Shield tropical rainforest eco-region, one of the largest contiguous and relatively intact forested eco-regions in the world. Forests cover approximately 87 percent (18,483,000 hectares) of Guyana's total surface area. Forest cover has declined by 1.1 percent from 2000-2019.[27]

Guyana's floral diversity is estimated to include over 8,000 species, approximately 6,500 of which have been identified. There are about 1,815 known species of fishes, amphibians, birds, reptiles, and

mammals. Fish are very diverse, with 352 freshwater bony species and 501 marine species. The Pakaraima Mountains have the country's highest level of plant endemism followed by the upper Mazaruni-Kako-Roraima. Most of the endemic vertebrate fauna of Guyana are restricted to highland areas, especially over 1,500 m.

The National Protected Areas System currently comprises 8.4 percent of Guyana's landmass and includes Iwokrama Forest (established by separate legislation, the Iwokrama Act 1996), Kaieteur National Park, Kanashen Amerindian Protected Area, Kanuku Mountains Protected Area, Shell Beach Protected Area, and Urban Parks (National Park, Botanical Gardens, Zoological Park, and Joe Vieira Park). Kanashen Amerindian Protected Area is Guyana's newest and largest protected area, established in 2017. The Kanashen Indigenous District, an area of 648,567 ha (3 percent of Guyana) is home to the Wai Wai people, and is the only indigenous-owned territory in the protected area system (Protected Area Map, Annex J). Marine Spatial Planning is being initiated to manage ocean and coastal areas for competing activities like oil and gas, fisheries, coastal ecosystems, and marine species.

The Iwokrama International Centre for Rain Forest Conservation and Development (Iwokrama) received and retained[28] certification for forest management from the Forest Stewardship Council™ (FSC). To date, this is the only area in Guyana that has been certified for meeting international best practices for forest management. Ecosystem services valuation studies of Iwokrama Forest are being conducted with European Union support. The projects are a part of the Forest Research Network, the Guiana Shield Initiative, and a program focused on capacity building to support national initiatives in reducing deforestation and degradation in Guyana. In addition to FSC certification, Guyana recently received certification for the seabob shrimp industry from the Marine Stewardship Council.[29]

Guyana has initiated a wide range of policies, legislation, and strategies since the 2013 analysis that are favorable to biodiversity conservation. The government has implemented improved controls over harvesting practices of the seabob shrimp industry (including the mandatory installation of by-catch reduction devices), the passage of the Wildlife Conservation and Management Act of 2016, a revision of the National Forest Plan in 2018, and the approval of a "Green State Development Strategy for 2020 – 2040," among other achievements.

There have been several oversight committees and specialized units formed in Guyana since the 2013 analysis, including the 2017 establishment of the Guyana Wildlife Conservation and Management Commission. Within the Environmental Protection Agency, there is now a Multilateral Environmental Agreement Unit and a Forestry Unit. A Protected Areas Commission, Coastal and Marine Affairs Committee, and Office of Climate Change have also been established.

SURINAME

Suriname has a land area of 164,000km^2 and contains a number of diverse ecosystems that include marine/open ocean, coastal mangrove forests and mangrove swamps, brackish water lagoons, a freshwater system of lakes and rivers, white and brown sand savannahs, wetlands, rainforests, dry evergreen forests, montane forests, and inselbergs.[30] Forests cover approximately 94 percent of the country, making it known internationally as a "green country," or the "world's greenest country." The Suriname Constitution accords land and natural resources to the government by default unless formally given to private ownership. The Principles of the Land Policy state that "all land, to which others have not proven their right to ownership, is the domain of the State."

There are 1,163 terrestrial vertebrate species recorded in Suriname. By group, there are 102 amphibians, 175 reptiles, 694 bird species, and 192 mammals.[31] There are 790 marine and freshwater species. Of the total number of vertebrates, about 36 species or 2 percent (mainly freshwater fishes) are endemic to Suriname.[32] There are five species that are critically endangered (four animals, one tree species), ten species that are endangered (eight animals, two tree species), and 59 species that are vulnerable (32 animals, 26 tree species).[33] Of the identified vertebrate species, approximately 36 are endangered, which is an increase of 18.6 percent

since the last report. Information on invertebrate fauna is largely missing, and there is very little information available on the total number of plant species.

Forty-one mammals are protected, including the Guianan Red Howler Monkey or Babun (*Alouatta seniculus*) and the Jaguar (*Panthera onca*). Thirteen species may not be exported without a CITES permit, including the Common Squirrel Monkey or Monki Monki (*Saimiri sciureus*) and the Red-Rumped Agouti or Konkoni (*Dasyprocta leorine*).[34]

Nearly the entire coastline of Suriname falls within the country's protected area system. Only a section near the eastern coast border and the highly urbanized central coastal area surrounding Paramaribo are excluded. Four Multiple Use Management Areas (245,000 ha) and six Nature Reserves (128,000 ha) are situated along Suriname's coastal zone. Each protected area is roughly divided between terrestrial and marine systems, extending approximately five kilometers inland and two kilometers into the sea. Bigi Pan, North Coronie, and North Saramacca are on the Western coast. North Commewijne – Marowijne is on the Eastern coast. Bigi-Pan is a Western Hemisphere Shorebird Reserve Network (WHSRN) site and a proposed RAMSAR site. Coppename-Monding Nature Reserve, located within North Saramacca, is an important RAMSAR and WHSRN site (Protected Area Map, **Annex J**).[35] There are four proposed protected areas—Nani, Kaburi, Mac Clemen, and Snake Creek—for a total area of 132,000 ha. The Coronie Swamp is also being considered as a Protected Area.

In 2015, Suriname established the TWTIS (formerly known as the Southern Suriname Conservation Corridor), which builds on the success of the Central Suriname Nature Reserve. TWTIS—which stands for the "Trio and Wayana Protect Land and Nature in Southern Suriname"—will protect 7.2 million ha of rainforest contiguous with protected areas in neighboring Brazil and French Guiana.[36] It is part of an initiative to empower Indigenous communities to take control of their cultural and historical lands and to prevent them from being destroyed by large-scale industrial agriculture, mining, and logging activities that have provided little benefit to these marginalized groups.

The economy of Suriname is largely driven by the extractive industry sectors of mining and oil. Bauxite and gold are the primary minerals mined, but Suriname contains sources of diamonds and other valuable minerals. Oil has been part of the economy for decades, but recent finds indicate that oil will be playing a larger role in relation to GDP. Other sectors important to the economy include forestry, fisheries, and agriculture. Suriname is making efforts to increase tourism as well.

The forests are recognized as a carbon sink of global importance. It is estimated that they store about 11 gigatons and absorb more than 8.8 million tons of forest carbon annually.[37] Because of its forest carbon sequestration and low deforestation, Suriname has been providing a key ecosystem benefit to the world.

There are a number of initiatives and plans that have been developed since the 2013 report that benefit biodiversity and natural forests. Coastal management plans have been prepared for the Bigi Pan, North Coronie, and North Saramacca Multiple Use Management Areas. Initiatives to address Indigenous and Tribal Peoples land rights began in 2017 and have resulted in draft legislation that has been approved by Parliament but is still waiting for the President's signature. Legislation on marine and coastal zone management have been drafted and are being reviewed by Parliament, and a National Strategic Tourism Plan was developed in 2017 and approved for the 2018 – 2030 period.

Government agencies related to biodiversity and forests include the Milieu en Omgeving (Ministry of Environment), which houses the Nationaal Instituut voor Milieu en Ontwikkeling in Suriname-Nimos (National Institute of Environment and Development), REDD+, and small-scale mining. The Agrarische Productie en Voedsel covers agriculture, livestock, and fisheries. The Ministry of Land, Spatial Planning, and Forest Management contains the Stichting voor Bosbeheer en Bostoezicht (SBB - Foundation for Forest Management and Forestry), which manages forests and forest concessions. The Natuurlijke Hulpbronnen (Ministry of Natural Resources) oversees the mining and oil sectors.

IV. VALUE AND ECONOMIC POTENTIAL

4.1 VALUE OF BIODIVERSITY

There is a high level of interdependence among the environmental, economic, and social systems in Small Island Developing States (SIDS), and progress toward attaining sustainability can only be attained if these three systems are viewed in an integrated manner. The country groups in this report, namely the Amazonian Group (Suriname, Guyana, Trinidad and Tobago); Volcanic Islands (Grenada, Saint Vincent and the Grenadines, Saint Lucia, Dominica, Saint Kitts and Nevis) and the Coralline Islands (Antigua and Barbuda, Barbados), have different natural resources based on their physiography.

Guyana and Suriname have rich mineral resources, both countries along with Trinidad and Tobago are oil producers, and Suriname's production is expected to grow considerably based on recent finds. All oil is offshore in their Exclusive Economic Zones (EEZ), which is the area adjacent to and extending from the outer boundary of the territorial sea. The EEZs of Suriname and Guyana are essentially extensions of their land areas in a north/northeasterly direction. The EEZ of Trinidad and Tobago is more complicated as its southern and western boundary is proximate to Venezuela; the main part of the Trinidad and Tobago EEZ extends in a northeasterly direction.[38] In an EEZ, the State has sovereign rights for the exploration, exploitation, preservation, and management of the natural resources as well as jurisdiction for marine scientific research, and protection and conservation of the marine environment. The known oil reserves for all three countries fall within their respective EEZs; a map of the Guiana Shield oil fields is included in **Annex F.**

Table 1 shows the contribution of Agriculture, Forestry, and Fisheries to the economic growth of the countries covered in this report through their respective contributions to GDP. These sectors have over the years contributed significantly to national development by providing raw materials to various industries, creating employment opportunities for citizens, and supplying domestic and export food resources. Figure 4 highlights the relative importance of agriculture to the economies of a wide range of Caribbean countries. Agriculture contributes most significantly to the GDPs of Guyana, Suriname, Dominica, and Haiti (> 11 percent), whereas in the economies of Trinidad and Tobago, the Cayman Islands, and the British Virgin Islands, the contribution from agriculture is less than 1 percent.

TABLE 1. CONTRIBUTIONS TO GDP FROM AGRICULTURE, FISHERIES, AND TOURISM

WASTE		AGRICULTURE[40]			TOURISM
COUNTRY	(US USD) BILLIONS[41]	CARICOM – % OF GDP[42]	CARICOM FISHERY STAND-ALONE CONTRIBUTION[43]	WORLD BANK – % OF GDP[44]	WTTC INFORMATION (2019)[45]
Antigua and Barbuda	1.728	1.7%	0.9%	1.8%	42.7%
Barbados	5.209	1.4%	0.1%	1.6%	30.9%
Dominica	.596	11%	0.4%	12.6%	36.9%
Grenada	1.228	5.2%	1.1%	5.9%	40.5%
St. Kitts/Nevis	1.051	1.2%	0.6%	1.3 %	28.2%
St. Lucia	2.122	2.0%	0.5%	2.0%	40.7%
Saint Vincent and the Grenadines	.825	7.2%	0.7%	7.1%	28.6%
Guyana	4.280	12.7%	1.3%	12.4%	4.4%
Suriname	3.985	11.6%	4.2%	11.6%	2.6%
Trinidad and Tobago	24.100	1.0%	0.06%	1.0%	7.8%

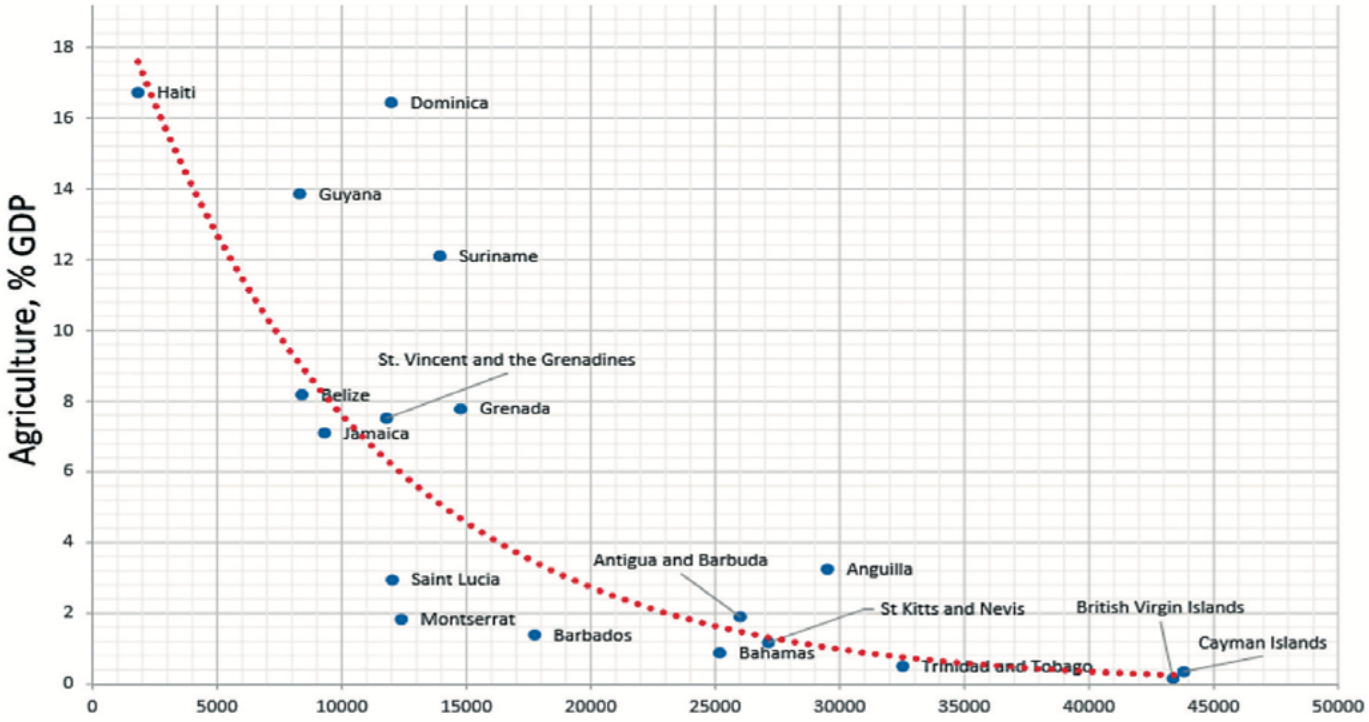


Figure 4. GDP Per Capita (USD) and Share of Agriculture of GDP[39]

4.2 ECOSYSTEM GOODS AND SERVICES

Ecosystem goods and services are broadly grouped into four categories:

1. Provisioning services that supply the goods themselves, such as food, water, timber, and fiber.
2. Regulating services that govern climate and rainfall, water (e.g. flooding), waste, and the spread of disease.
3. Cultural services, which cover the beauty, inspiration, and recreation that contribute to our personal well-being.
4. Supporting services that include soil formation, photosynthesis, and nutrient cycling, which underpin growth and production.

Figure 5 illustrates the relationships between ecosystem services, the drivers of change, and human well-being.

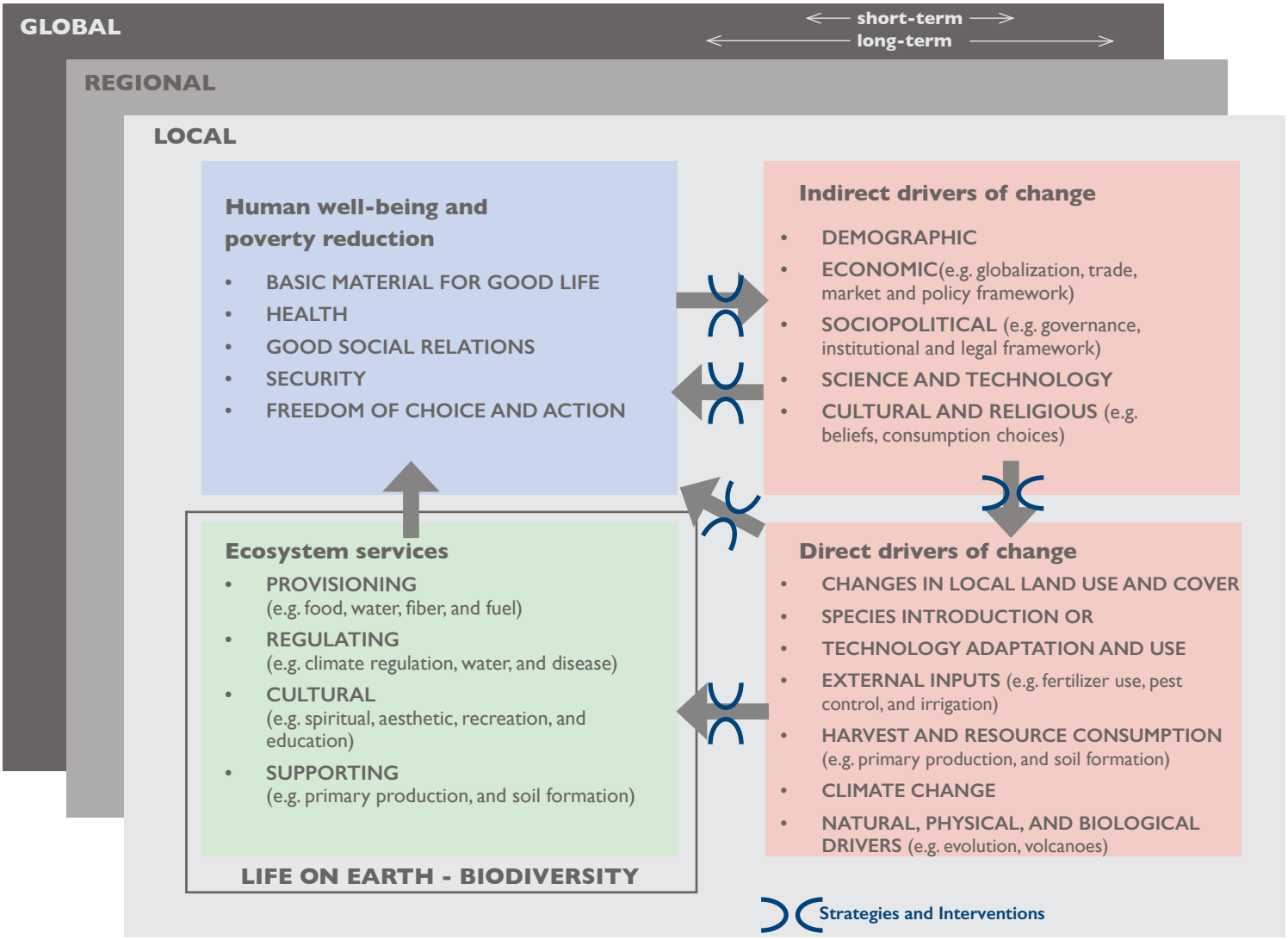
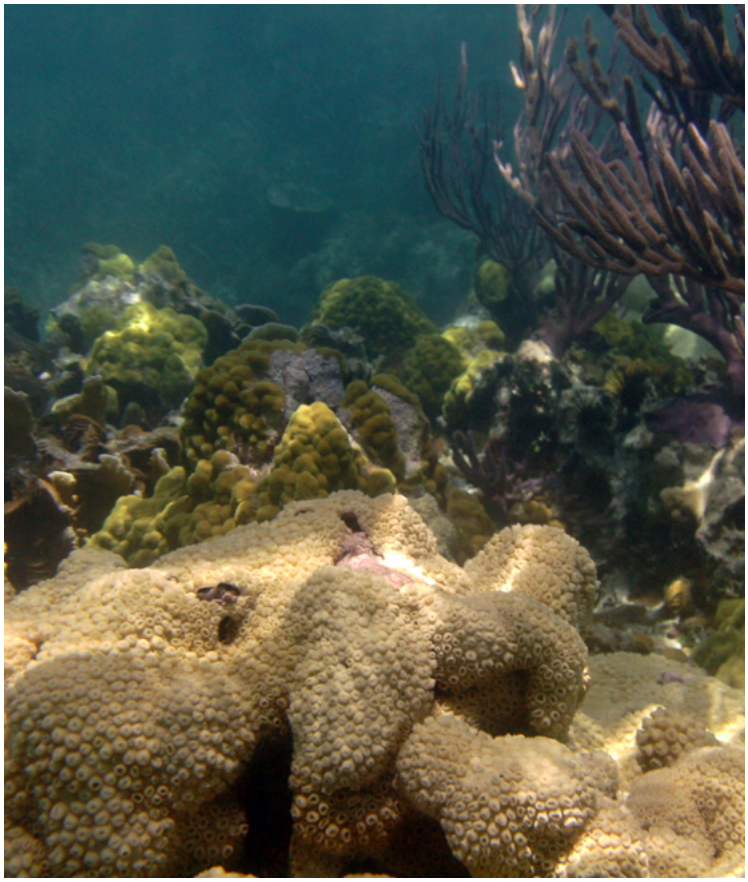


Figure 5. Defining Ecosystem Services. Source: Millennium Ecosystem Assessment

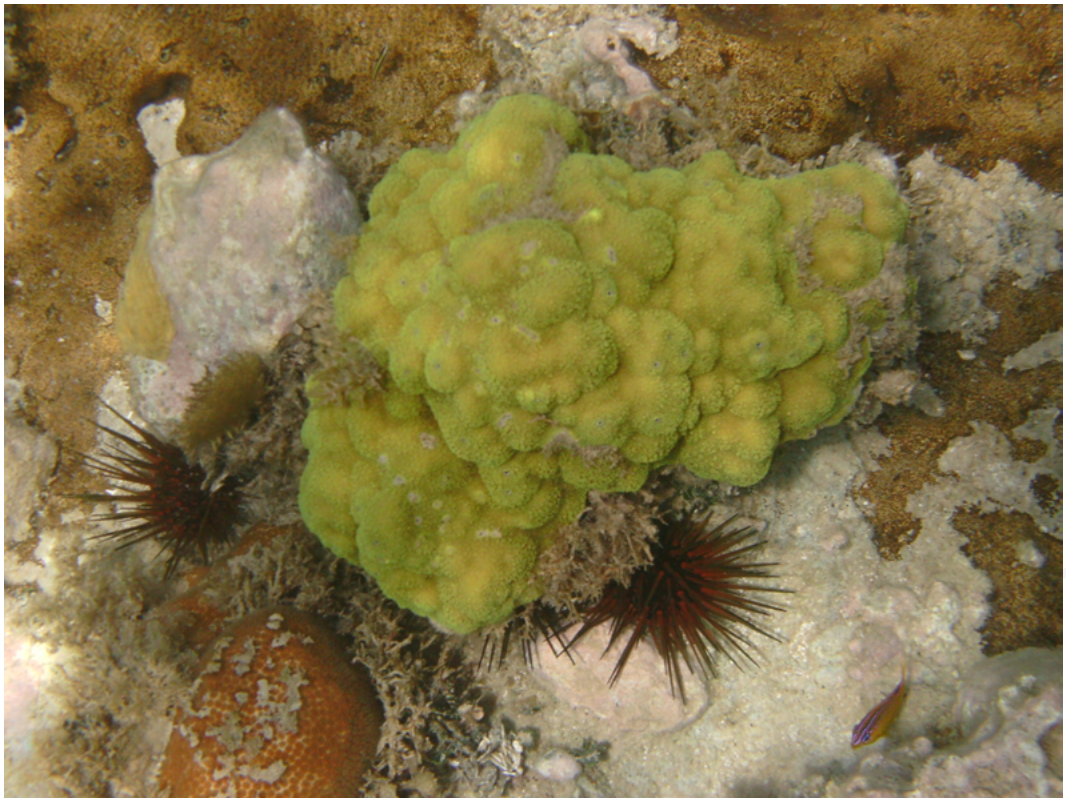
These goods and services are now emerging under approaches such as the Blue and Green Economy. During the last decade, there has been regional progress with efforts at promoting Green Economies, which balance environmental, social, and economic benefits, utilize green sectors and industries for growth, and develop climate change mitigation and resilience. More recently, the movement toward Blue Economies has received support and has gained traction.[46] Blue Economy Caribbean was launched in 2018 as a call for the region to prioritize coastal and marine economies that are sustainable, scalable, inclusive, and environmentally sound.[47] The initial transformative hub has new finance tools and marine technologies poised to transform economies region-wide.



Shallow water reef - Hard and soft corals. Credit R. Clausen

Marine ecosystems account for over 80 percent of CARICOM Member States and territories, supporting not just fisheries, but also tourism, ocean transportation, energy, and other economic sectors. They are also critical to the sustainable livelihoods of coastal communities and food security for markets even beyond their borders. Regional leaders have proposed that advancing a development strategy that includes the Blue and Green Economy can position the Caribbean to improve food security, promote the growth of existing productive sectors, invest in new and high-value Blue Economic industries, and reduce dependence on imported fossil fuels. Across the region, governments are increasingly focusing on this area as an important economic driver with significant potential.

A summary of biodiversity and ecosystem values for each ESC country is included in **Annex G**.



Shallow water reef - Rock boring urchin (Echinometra lucunter) and Mustard hill coral (Porites astreoides). Credit R. Clausen

V. LEGAL FRAMEWORK AFFECTING CONSERVATION

5.1 NATIONAL LAWS, POLICIES, AND STRATEGIES

There is a high level of interdependence among the enviroThe institutional and legislative frameworks for biodiversity and forest resources in the Eastern and Southern Caribbean evolved from the Stockholm, Rio, Barbados, and St. Georges Declarations as well as Agenda 21. The 1994 Barbados Declaration focused attention on the interdependence of environment and development in SIDS with respect to their vulnerable economies, small resource bases, reliance on international trade, and their susceptibility to natural disasters and the effects of climate variability and change. These initiatives have fostered the development, approval, and implementation of policy and legislation favorable to biodiversity conservation in most of the ESC countries. The scale and scope of the changes varies among the countries, but the overall regional thrust in that direction has been positive. Across the region, governments are also using these changes as important economic drivers with significant potential. The following list of examples illustrates this point:

- In 2013, OECS Heads of Government adopted the Eastern Caribbean Regional Oceans Policy and Action Plan. This regional policy provides a framework that guides the planning and development of marine activities in the Eastern Caribbean region in a rational and sustainable manner.
- Since 2016, Antigua and Barbuda have been actively engaged in developing key initiatives under the Commonwealth Marine Economies Program, the OECD Sustainable Oceans for All initiative, the Commonwealth Blue Charter, and the Commonwealth Clean Oceans Alliance.
- In 2016, supported by World Bank funding, Grenada produced a *Blue Growth Coastal Master Plan* designed to sustainably generate new jobs, foster alternative livelihoods, and expand the economy. Grenada's land size is 344 km^2 with an EEZ of 27,426 km^2.
- In 2018, Barbados established the Ministry of Maritime Affairs and the Blue Economy. Barbados' maritime space covers 186,898 km^2, and its land mass is 431 km^2. The Barbadian Government has recognized that this maritime space provides an opportunity to advance the economic interest of the country. The Government also stated that this is an economic sector that remains underdeveloped, fragmented, and unexplored.
- In 2019, Dominica's Prime Minister Roosevelt Skerrit established the Ministry of the Blue and Green Economy, Agriculture, and National Food Security with the objective of promoting sustainable growth and development. Dominica's land mass is 750 km^2, and its EEZ is 28,985 km^2.[48]

5.2 INTERNATIONAL AGREEMENTS

The main international agreements relating to tropical forests, biodiversity, and the environment are listed in Table 2 (accurate as of December 2019).[49] In 2014, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to The Convention on Biological Diversity entered into force. The SIDS Accelerated Modalities of Action (SAMOA) Pathway (2014) was the outcome of the Third International Conference on Small Island Developing States (SIDS Conference). The strategy recognizes the need to support and invest in SIDS so that they can achieve sustainable development. The strategy also clearly speaks to the conservation and sustainable use of biodiversity and its components. The threats from desertification, land degradation, and drought are articulated in paragraph 92.[50]

The Objectives of the Memorandum of Understanding between the CBD Secretariat and the International Tropical Timber Organization signed in 2014[51] (Resolution 62/98) are in line with, and directly support the SAMOA Pathway, paragraph 94 that focuses on decreasing, halting, or reversing deforestation and forest degradation and promoting trade in sustainably harvested forest products. Paragraph 94 also supports appropriate and effective reforestation, restoration, and afforestation.

In January 2018, the CITES Standing Committee determined that Dominica had failed to provide its annual reports for three consecutive years without adequate justification. As a result, the CITES Secretariat issued a recommendation to suspend trade in CITES-listed species with Dominica. The suspension, which has since been lifted, was Dominica's second suspension of trade for non-reporting.

5.3 GOVERNMENT AGENCIES

The government ministries, departments, and agencies that control various aspects of biodiversity, forests, marine affairs, and environment are varied in their arrangements and complexity across the countries of the ESC. Some countries like Saint Kitts and Nevis have very simple administrative arrangements, while others like Guyana have more complex arrangements with ministries, departments, agencies, and committees. A detailed update of national laws, policies, strategies, and changes in government agencies for each country since the 2013 118/119 study are included in **Annex G**.

5.4 GAP ANALYSIS OF CONSERVATION INITIATIVES

OVERVIEW

In terms of bilateral investments, the European Union (EU) has been the most significant contributor to natural resource management funding in the region through funding streams like the European Development Fund. German sources of funding have also been substantial through the German Development Bank (KfW), the German Agency for International Cooperation (GIZ) and the Federal Ministry for Economic Cooperation and Development (BMZ).

TABLE 2. RATIFICATION OF MULTILATERAL ENVIRONMENTAL AGREEMENTS IN THE CARIBBEAN

	ANTIGUA AND BARBUDA	BAHAMAS	BARBADOS	DOMINICA	GRENADA	GUYANA	SAINT KITTS & NEVIS	SAINT LUCIA	ST. VINCENT & GRENADINES	SURINAME	TRINIDAD & TOBAGO
Minamata Convention on Mercury (2013)	2016					2014	2017			2018	
International Treaty on Plant Genetic Resources for Food and Agriculture (2001)	2017					2015		2003			2004
Stockholm Convention on Persistent Organic Pollutants (2001)	2003	2005	2004	2003		2007	2004	**1999**	2005	2011	2002
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)	2010		**1998**	2005		2007	2012	1993	2010	2000	2009
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994)	1997	2000	1997	1997	1997	1997	1997	1993	1998	2000	2000
Convention on Biological Diversity (1992)	1993	1993	1993	1994	1994	1994	1993	1993	1996	1996	1996
Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (2010)	2016			**2011**		2014	2018				
Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (2010)	**2011**										

*Note: Dates in **red** indicate that the agreement has only been signed.*

TABLE 2. RATIFICATION OF MULTILATERAL ENVIRONMENTAL AGREEMENTS IN THE CARIBBEAN

	ANTIGUA AND BARBUDA	BAHAMAS	BARBADOS	DOMINICA	GRENADA	GUYANA	SAINT KITTS & NEVIS	SAINT LUCIA	ST. VINCENT & GRENADINES	SURINAME	TRINIDAD & TOBAGO
Cartagena Protocol on Biosafety to the Convention on Biological Diversity (2000)	2003	2004	2002	2004	2004	2008	2001		2003	2008	2000
United Nations Framework Convention on Climate Change (1992)	1993	1994	1994	1993	1994	1994	1993		1996	1997	1994
Paris Agreement (2015)	2016	2016	2016	2016	2016	2016	2016		2016	**2016**	2018
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)	1993	1992	1995	1998		2001	1994		1996	2011	1994
Vienna Convention for the protection of the Ozone Layer (1985)	1992	1993	1992	1993	1993	1993	1992		1996	1997	1989
Montreal Protocol on Substances that Deplete the Ozone Layer (1987)	1992	1993	1992	1993	1993	1993	1992		1996	1997	1989
Convention on the Conservation of Migratory Species of Wild Animals (1979)	2007										
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1973)	1997	1979	1992	1995	1999	1977	1994		1988	1980	1984
Convention on Wetlands of International	2005	1997	2006	2012						1985	1993

***Source**: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of United Nations, United Nations Treaty Collection [online] http://treaties.un.org/; Food and Agriculture Organization of the United Nations (FAO), "International Treaty on Plant Genetic Resources for Food and Agriculture" [online] http://www.planttreaty.org; United Nations Environment Program (UNEP), "Convention on the Conservation of Migratory Species of Wild Animals (CMS)" [online] https://www.cms.int/; CITES Secretariat, "Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)" [online] http://www.cites.org/; Ramsar Convention Secretariat, "Ramsar Convention" [online] and http://www.ramsar.org/. Updated 15 September 2018.*

*Note: Dates in **red** indicate that the agreement has only been signed.*

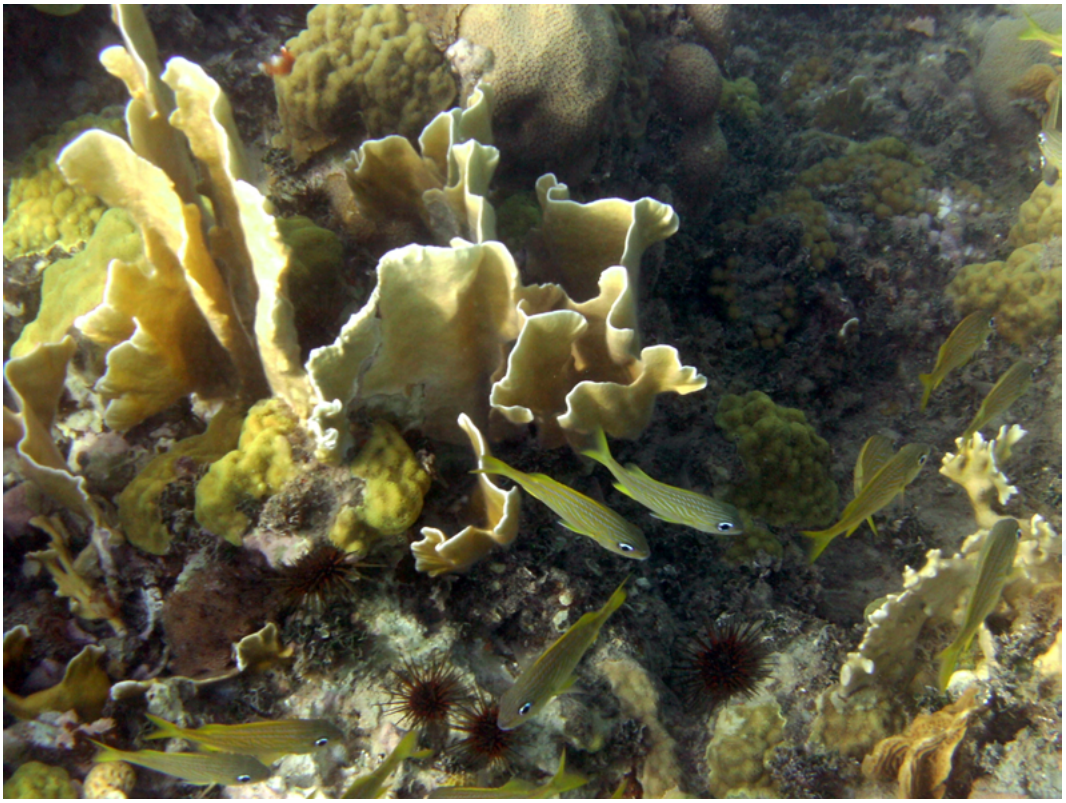
Pooled investments include:

- The Critical Ecosystem Partnership Fund (CEPF), which is financed by a coalition of The World Bank, GEF, Conservation International, the EU, l'Agence Française de Développement, the Government of Japan, and the John D. and Catherine T. MacArthur Foundation.
- The FAO in partnership with the Mexican Agency for International Development Cooperation for several CARICOM countries targeted at climate resilience in agriculture, food security, and rural livelihoods.
- The Caribbean Biodiversity Fund (CBF) for the conservation, protection, and maintenance of biodiversity in the Caribbean, with funding from KfW, BMZ, GEF, The World Bank, the United Nations Development Programme (UNDP), and The Nature Conservancy (TNC).

The GEF works primarily through the World Bank, UNDP, and UNEP by providing grants to government agencies. Within the Caribbean, the GEF is a major contributor to environmental management and is funding a range of projects related to biodiversity.

The World Bank and the Inter-American Development Bank are funding country-specific and regional projects that have direct and indirect links to biodiversity conservation and forest management. The World Bank has channeled most of its regional support through the OECS. The International Finance Corporation (IFC) has a limited presence in the ESC countries. The only ongoing IFC work is in Guyana in the mining sector, where they have been working since 2006.

Additional information on location, levels of support, and status of activities for all of the above-mentioned agencies and organizations supporting biodiversity conservation and forest management can be found in **Annex H**.



Hard corals and reef fish - French grunts (Haemulon flavolineatum), Blade fire coral (Millepora complanata), Star coral (Orbicella sp.), Mustard hill coral and urchins. Credit R. Clausen

VI THREATS TO BIODIVERSITY AND TROPICAL FORESTS

The threats to biodiversity are many, and they have diverse driving forces with some commonalities. Some of the challenges include varied government policies and institutional frameworks, declining and unstable environmental resources, external demand, corruption, human and financial resource constraints, and mixed institutional responses. A summary of the threats is below.

The structure of the threats section is taken from the "Open Standards for the Practice of Conservation,"[54] as suggested in the 2017 118/119 Best Practices Guide. Threats and their relative importance differ between the seven small island nations and Guyana, Suriname, and Trinidad and Tobago. In that regard, the threats are presented in order of importance for the two groups.

6.1 SMALL ISLAND NATIONS

6.1.1 LOSS OF HABITAT DUE TO RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Tourism and Recreational Areas. As the tourism industry is a main economic driver in most ESC countries, there is frequently pressure to further develop tourism infrastructure and increase tourist numbers at the expense of key biodiverse areas, especially the coastal zones. The growth has been largely uncontrolled over the past five decades, with widespread construction of hotels and marinas along the beaches and other important coastal areas. An IUCN report states, "Landscape modification due to tourism development is believed to be one of the main contemporary drivers of habitat loss in the Caribbean."[52] Roads are constructed linking remote tourism centers to airport facilities, airports have been built on drained and infilled wetland, and most resort construction in the Caribbean is focused at or near fragile coastal and marine ecosystems. [53]

Saint Lucia, Rodney Bay Marina. Formerly a mangrove ecosystem, the mangroves were cleared and the area dredged. Dredged materials were used to construct a causeway to Pigeon Island (background). Credit: Kirk Elliot, Saint Lucia Photo Tours.

Key ecosystems like mangroves and seagrass beds have been particularly affected by tourism development in the fragile coastal zones; mangroves are cleared for road, hotel, and marina construction, and seagrass beds are often cleared for beach areas. Hotels and associated structures are typically constructed on the leeward side of the islands and located on low energy beaches, which are the preferred nesting areas of sea turtles, including the critically endangered Hawksbill Turtle (*Eretmochelys imbricata*). This is the case in Barbados where there is pressure for further development along the southwest coastal area; Barbados has the largest nesting population of Hawksbill Turtles in the Caribbean.[55]

A report by the Critical Ecosystem Partnership Fund found that, second to invasive species, residential and commercial development is considered the top threat to biodiversity in the Caribbean.[56] For this analysis, interviews with key informants, coupled with an extensive review of documents and websites, supports the CEPF's finding. However, for the ESC countries, habitat loss due to development was more often mentioned and cited as the top threat. Habitat loss due to development is common in Antigua and Barbuda, Barbados, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, and Saint Vincent and the Grenadines.

6.1.2 INVASIVES AND OTHER PROBLEMATIC SPECIES, PATHOGENS, AND GENES

Invasive, non-native plants and animals. Invasive species frequently out-compete, or directly eliminate, native species sharing the same ecological niche. This in turn can damage ecosystems and lead to a reduction in biodiversity. All ESC countries are significantly affected by non-native plants and animals, some that were imported during the colonial period and other more recent arrivals via ships, currents, and other means. The more commonly shared invasives in the ESC include lionfish, sargassum, black rats, mongoose, vervet monkeys, giant African snails, feral goats and swine, Cuban tree frogs, cane toads, geckos, Asian green mussels, Asian shrimp, and barnacles. Invasives also include a wide range of plant species. The list of invasive species in the Caribbean is quite long. [57] The Commonwealth Agriculture Bureau International also has an extensive database on invasives including a mapping feature.[58] Additional information on invasive species is included in **Annex F.**

Pathogens and microbes. Emerging infectious diseases are a threat to biodiversity globally and in the Caribbean. Several diseases are having a profound impact on individual species and ecosystems. Perhaps the most alarming is the Stony Coral Tissue Loss Disease. Other prominent pathogens include banana sigatoka, the spiny lobster virus, and the amphibian chytrid fungus. Additional information on diseases is included in **Annex F.**

6.1.3 POLLUTION AND SOLID WASTE

Wastewater and solid waste. Wastewater discharge to near shore environments is a problem in most urban areas. Although there is limited quality data on the treatment practices of wastewater in the Caribbean, it is speculated that approximately 85 percent of wastewater entering the Caribbean Sea is untreated.[59] Countries generally deal with wastewater on an individual household or business level (soakaways, septic tanks, etc.) When systems are not well-maintained, storm events flush pollutants to coastal water areas. Stormwater/ flooding events also pick up pollutants from roads, parking lots, and fertilizers from golf courses, among other sources, and deposit the pollutants into the near-shore environment. Wastewater from Suriname's capital city Parimaribo drains directly into the Suriname River; parts of the city pump wastewater directly into the Atlantic Ocean. Both Suriname and Guyana are facing water quality issues from sewage, marine dumping, accidental oil leakage, leakage from sewer lines, animal waste, and leakage from landfills. Wastewater pollution problems have been recorded in all ESC countries.

Cruise ships and recreational vessels are an additional source of sewage within the region. It is estimated that the cruise ship industry generates a billion gallons of sewage each year. A 3,000-passenger cruise ship on a one-week cruise has been estimated to generate 210,000 gallons of sewage and 1 million gallons of graywater (wastewater from sinks, showers, and laundries). [60] The Royal Caribbean "Allure of the Seas" is an "Oasis - Class Cruise Ship" (one of the largest in service) that is 362 meters long and 72 meters high (from water level). Maximum capacity is 6,780

passengers with a crew of 2,200. This ship is based out of Port Everglades, Florida and is used for the Western and Eastern Caribbean. Eastern Caribbean trips are advertised as seven-day trips, therefore the amount of wastewater and greywater generated by an Oasis-Class ship can be multiplied by more than a factor of two when compared to the 3,000 passenger ships. A ship of this size dwarfs a port city like Basseterre (population just over 14,000).

Agriculture pollutants. Fertilizers and pesticide use is common in most ESC countries, and run-off from those agricultural inputs provide excessive nutrient loads and chemicals harmful to local ecosystems. There is general agreement in the scientific community that pesticides are a central factor for observed terrestrial biodiversity declines.[61] Unfortunately, pest control methods developed in the temperate regions were introduced into the Caribbean without adequately considering the ecological context.[62] Integrated pest management, where pesticides are a measure of last resort, is not widely employed in the ESC, but it is gaining recognition through education and extension programs.

Garbage and solid waste. Solid waste is a major issue for all ESC countries. The waste is not only generated in-country but frequently imported by cruise ships and free flowing garbage and plastics in the open ocean brought in by natural currents. Water bottles are used throughout the ESC and are a significant component of the waste stream. Ship-generated waste accounts for approximately 80 percent of solid wastes in the coastal areas.

Effective wastewater and solid waste management place immense pressure on local governments and communities as these countries have a high dependence on tourism and a limited land base. Solutions to waste management challenges must be locally planned and developed in a holistic manner that involves a broad range of stakeholders and focuses on waste prevention and reuse strategies through education and behavior change.

A recent study from Curacao indicates that using stakeholder engagement with top-down modeling can lead to decisions that avoid locking-in to costly short-term technological solutions while developing cost effective plans that can quickly adapt to a future changing environment.[63] Results from this study showed a "Circular Economy Strategy" to be the most effective. The strategy is essentially a closed-looped system that requires socio-economic elements common to SIDS, including national cooperation, stakeholder inclusion, and adoption of local strategies for improved outcomes.

A Litter-Strewn Beach. Credit: Gregor Hodgson, Reef Check

6.1.4 BIOLOGICAL RESOURCE USE

Hunting and collection of terrestrial animals. Hunting animals for bush meat and collecting animals for the international wildlife trade are major problems in Suriname, Guyana, and Trinidad and Tobago. In other islands such as Dominica (the Manicou/Opossum Didelphis marsupialis and Agouti Dasyprocta leporina) and Saint Kitts (the introduced White-Tailed Deer, Odocoileus virginianus), off-season poaching is noted as a problem. Additional information is included in section 5.2 and **Annex F** on the illegal wildlife trade.

Mangrove harvesting. Mangroves are found on almost all Caribbean islands in varying amounts and provide important environmental services including coastal protection, biological diversity conservation, habitat, spawning grounds, and siltation protection. Mangroves are still being cut for building materials and fuel (charcoal) and cleared for development in most of the ESC countries. Globally, deforestation rates of mangroves are four times greater than those in terrestrial tropical rain forests.[64] In the Caribbean, 42 percent of mangrove forests have been lost in the last 25 years.[65]

Fishing and Harvesting Aquatic Resources. "Open access" and illegal, unreported, and unregulated (IUU) fishing is a major problem in Saint Lucia and Barbados. Poaching seabird eggs occurs in Saint Lucia, Dominica, Saint Vincent and the Grenadines, Saint Kitts and Nevis, and Grenada; Chinese demand is driving sea cucumber and giant squid harvesting in the same countries. Long-line fishing is killing Leatherback Turtles in Barbados.

Saint Lucia still maintains a "legal take" of sea turtles; Saint Vincent and the Grenadines (the island of Bequia) still has a "legal whale take." Legal sea turtle and whale take are being contested in both countries. In Saint Vincent and the Grenadines there are indications that the annual whale take (four animals per quota) may have less interest among the younger population that see more benefit in whale watching tourism.[66] However, that is still strongly contested in other parts of Saint Vincent and the Grenadines, where people maintain that whale hunting is part of Bequia's cultural heritage.[67]

6.1.5 HUMAN INTRUSIONS AND DISTURBANCE

Recreational activities. The Caribbean is noted for tourism, especially tourism that involves beaches and coastal/in-shore ecosystems. Diving and snorkeling centers are found in most tourism-focused towns, while jet skiing is becoming a ubiquitous activity in coastal waters. Yachting and sailing are synonymous with many of the ESC islands. Boat tours are frequent, and whale watching occurs in Dominica, Saint Lucia, and Grenada. All these activities can be a threat to marine biodiversity.

Coral reefs are vulnerable to human impacts, including the physical breakage of corals and the removal of protective mucosa by humans touching corals. In many areas, corals are collected and sold to tourists as jewelry or souvenirs. Anchoring of vessels can physically damage corals, as can groundings of vessels. The anchors of cruise ships, sports fishing vessels, and yachts cause damage to coral reefs. In Barbados, in a study of 37 diving sites, 95 percent were damaged by boat operators.[68]

Wildlife Trafficking. The world is dealing with an unprecedented spike in illegal wildlife trade, threatening to overturn decades of conservation gains. After drugs, guns, and human trafficking, wildlife trafficking is the world's most lucrative organized crime, with an annual value of around USD 20 billion each year.[69] These activities are largely run by dangerous international networks that traffic wildlife and animal parts much like illegal drugs and arms. By its very nature, it is almost impossible to obtain reliable figures for the value of the illegal wildlife trade.

Wildlife trafficking is a serious problem in most of the Caribbean. However, certain countries are more heavily involved in this activity than others. Yachts that move from island to island, especially in places like the small low-population islands, are a frequent mode of transport for the illegal trade of animals. Additional information on the illegal wildlife trade is included in **Annex F**.

6.1.6 AGRICULTURE AND NATURAL SYSTEM MODIFICATION

Annual and perennial non-wood crops. For the past three centuries, agricultural expansion (at the expense of forests and wetlands) was a major driver of land conversion and the concomitant loss of natural forests and terrestrial biodiversity. In the last several decades, however, the growth of the tourism industry along with changing trade regimes, the abandonment of sugar cane plantations, and an increase in pests and diseases has led to a sector decline. Presently agriculture plays a less significant role in the overall GDP in most countries. However, agricultural encroachment is still a threat to the remaining natural forest areas in virtually all the ESC countries.

Fires. Wildfires in the Caribbean are nearly all associated with human activity and occur mainly in dry forest and grassland types during the dry seasons.[70] In rural areas, fires are used to clear land for agriculture, to improve pasture for livestock grazing, and to facilitate hunting by clearing an area to drive out animals. When grassland fires get out of control, adjacent forests are often burned.

Wildfires also spread invasive grasses. In Antigua, Lemon Grass (Cymbopogon citratus) was introduced for soil conservation. Dry forest areas destroyed by wildfire are now invaded by the species. Today, approximately 1,200 ha of the island are now covered with a thick carpet of Lemon Grass. On the leeward side of southern Caribbean islands, a similar dynamic is underway with the African Guinea Elephant Grass (Pennisetum purpureum). The grass was established for soil erosion measures, but it invades pine plantations. When fires pass through the pines, seedlings are killed and replaced by Elephant Grass.[71]

Water Availability/Systems. Several studies project a 10-30 percent decrease in annual precipitation in the Caribbean by 2080.[72] This is occurring at the same time the region is also under stress from increases in water salinity and pollution. The decrease in annual precipitation will mean less surface water for aquatic ecosystems and less groundwater for consumption. This is particularly problematic for countries like Barbados that rely almost exclusively on groundwater for drinking and cooking. Moreover, many of the country's water delivery systems are falling into disrepair, leading to additional losses of water. Of the 37 countries that the World Resources Institute has identified as having "extremely high" levels of water stress, seven are from the Caribbean: Dominica, Jamaica, Saint Vincent and the Grenadines, Trinidad and Tobago, Antigua and Barbuda, Barbados, and Saint Kitts and Nevis, with the latter three being designated as "water scarce" (less than 1,000 meters cubed of freshwater resources per capita).[73]

Livestock farming. Relative to the rest of the Caribbean, livestock play a much smaller role in the economies of the small island states. Livestock production does not fluctuate much on the islands in the region.[74] With the banana industry suffering, Saint Vincent and the Grenadines has become the largest exporter of livestock in the OECS (cattle and pigs); much of the exported livestock is headed to nearby Grenada.[75] Barbados is known for the "Barbados Blackbelly sheep," which is a highly adaptable breed that has evolved in Barbados but traces its origins at least in part to Africa.

6.1.7 SAND MINING

Sand mining has significant environmental impacts, including the destruction of natural beaches and ecosystems, habitat loss (turtles, shorebirds), reduced protection from hurricanes and floods, and the salinization of freshwater sources.[76] Sand mining has been banned on beaches in Dominica, Grenada, and Saint Lucia, however, it is still taking place in Saint Vincent and the Grenadines. Sand mining also occurs in Barbados and Antigua and Barbuda. There are efforts underway to rehabilitate mined areas. One example is the Walkers Sand Quarry in Barbados, where degraded land is being restored in a holistic manner.[77]

Rocks and pumice are mined in Dominica and Trinidad and Tobago, with Trinidad citing blasting as a major nuisance. Both islands reference the negative effects of the loose materials from mines and quarries.

6.1.8 TRANSPORTATION CORRIDORS

Shipping Lanes. A vessel collision or strike is defined as any impact between any part of a watercraft (most commonly bow or propeller) and a live marine animal.[78] Most research to date on these events has focused on collisions of large ships with whales, and this research has generated ways to mitigate such collisions.

A total of 75 marine species have been identified as having had collisions with marine vessels, but the frequency of these collisions is understudied and poorly understood. Aside from large whales, marine species that collide with marine vessels include smaller whales, dolphins, porpoises, dugongs, manatees, whale sharks, sharks, seals, sea otters, turtles, and penguins.[79] Propeller guards should be made compulsory for all boat-based cetacean tourism, as habituation to boat traffic seems to be a contributing factor in accidents.[80] These types of accidents are likely a common occurrence due to the density of shipping lanes (Figure 6).

Figure 6. Caribbean Shipping Lanes[85]

In addition to vessel strikes, increasing marine traffic also leads to the introduction of invasive species. A recent study indicates that rising global maritime traffic could lead to sharp increases in invasive species around the world over the next 30 years. The findings suggest that shipping growth will far outweigh climate change in the spread of non-indigenous pests to new environments in coming decades.[81]

6.1.9 GEOLOGICAL EVENTS

The Caribbean region is seismically active. Data from the past several centuries from the Eastern Caribbean indicate that earthquake activity has carried on unchanged through the 20th and 21st centuries. Earthquakes also frequently lead to tsunamis. Over the past 500 years, this region may have been exposed to approximately 100 tsunamis, of which 20 have been confirmed to have caused significant damage.[82] Large-scale natural disturbances can have profound impacts on ecosystems, affecting several ecological and fitness traits of key species through the reduction in population sizes and habitat destruction; earthquakes/tsunamis can also affect species and their genetic patterns.[83]

There are 19 volcanoes in the Eastern Caribbean that are likely to erupt again. Every island from Grenada to Saba is subject to the direct threat of volcanic eruptions. Islands such as Grenada, Saint Vincent, Saint Lucia, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, Saint Kitts, Saint Eustatius, and Saba have live volcanic centers, while other islands such as Anguilla, Antigua, Barbuda, Barbados, British Virgin Islands, most of the Grenadines, and Trinidad and Tobago (all of which are not volcanic) are close to volcanic islands and are, therefore, subject to volcanic hazards such as severe ash fall and volcanically generated tsunamis.[84] A volcanic eruption on Montserrat in 1995 destroyed the southern 60 percent of the island's hill forests. Additional information on Eastern Caribbean volcanoes, earthquakes, and tsunamis is included in **Annex F.**

6.2 GUYANA, SURINAME, AND TRINIDAD AND TOBAGO

6.2.1 MINERAL MINING

Mining is a major issue in both Suriname and Guyana. Mining is being carried out for bauxite, gold, and diamonds in both countries, although diamond mining is more well established in Guyana. Artisanal gold and diamond mining are destructive to forests and freshwater resources as vegetation is cleared, soil excavated, and surface water frequently polluted and diverted. The impacts on biodiversity are significant. Artisanal mining operations also usually lead to a rapid increase in poaching for bushmeat, and in some cases wildlife trafficking.

Gold mining is the largest driver of deforestation in Suriname and the rest of the Guiana Shield region. A regional study carried out in 2015 by the forest services of Suriname, Guyana, French Guiana, and Brazil's Amapa State showed that deforestation due to gold mining has doubled in the study area between 2008 and 2014 (+92,406 ha) compared to 2001-2008 period (+46,144 ha).[86] Also, if looking at Suriname alone, the area deforested due to gold mining doubled (from 27,254 ha in 2008 to 53,668 ha in 2014). Figure 7 illustrates the trend in mining and deforestation in that region.

Artisanal Gold Mining Impacts on Forested Areas and Water Systems in Guyana.

Credit: Marco Farouk Basir via Wikimedia Commons.

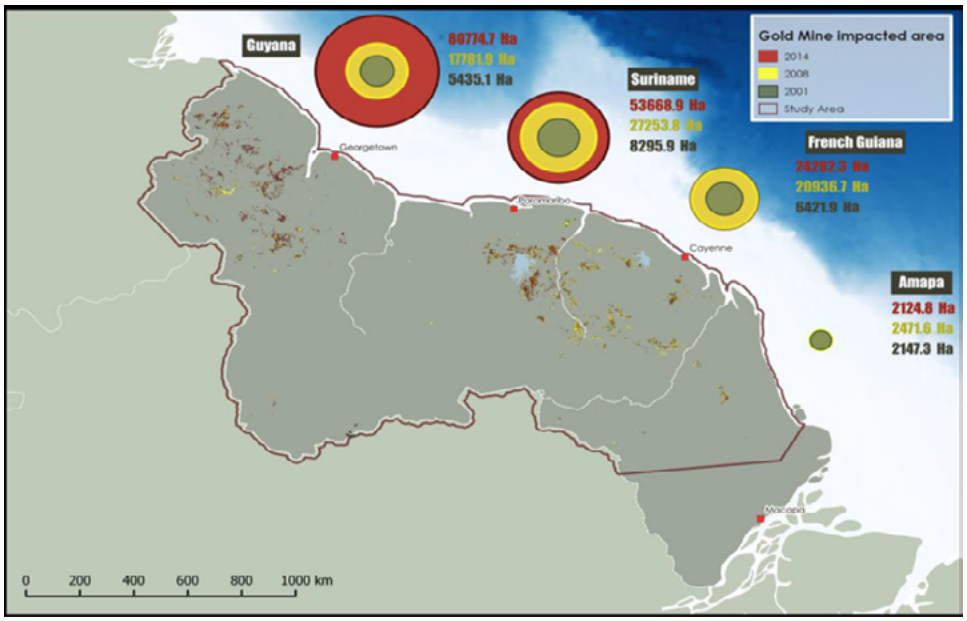


Figure 7. Evolution of Gold Mining Impact on the Forest Cover by Territory Since 2001 for 2001, 2008, and 2014[87]

6.2.2 ILLEGAL LOGGING

Both Guyana and Suriname are covered by vast forest areas, and forest industries (both commercial and artisanal) are a significant sector of their economies. Illegal logging is common in both countries, and it is frequently associated with timber and mining concessions that have been granted on or near lands traditionally held by Indigenous Peoples. The Rainforest Foundation skillfully captures the tension over land access between the logging and mining industries and the indigenous peoples while generating recommendations to help mitigate these issues in "Our Land, Our Life," which focuses on the Patamona and Makushi people and the Moruwa Valley of Region 8.[88]

Guyana has recently taken steps to address illegal logging by entering an agreement with the European Union on the Forest Law Enforcement, Governance, and Trade Action Plan (FLEGT).[89],[90] Suriname has not taken part in the FLEGT process. Timber illegally logged in Suriname also flows into Guyana along the Corentyne River. Suriname has higher export taxes than Guyana, which has sawmills established along the river. Most of the exported timber from both countries is destined for Asia. Additional information on forest resources in these countries is found in **Annex F.**

Mangroves are found in all three countries and provide important environmental services including coastal protection, biological diversity conservation, habitat, spawning grounds, and siltation protection. Mangroves are still being cut for building materials and fuel (charcoal) and cleared for development in all three countries.

6.2.3 OIL AND GAS DRILLING

Trinidad and Tobago have oil fields that have been developed for over 100 years. The industry was reinvigorated in 2017 as BP announced new discoveries totaling approximately 2 trillion cubic feet of gas. Energy production and downstream industrial use dominate the economy. Oil and gas typically account for about 40 percent of GDP and 80 percent of exports, but less than 5 percent of employment.[91]

A series of oil spills in 2017 severely affected more than ten miles of coastline and beaches. The national company (Petrotrin) used a controversial dispersant, Corexit 9500, which some scientists have said becomes far more toxic than the oil alone.[92]

The Guiana Shield region is known to contain vast reserves of oil and natural gas. Major oil deposits were first discovered near Guyana in 2015.[93] Just five years later, there were reports that Guyana had shipped its first crude oil.[94] The oil production region in question is at the center of a dispute over territorial rights between Venezuela and Guyana since oil was discovered by ExxonMobil in 2015. The dispute was taken by the International Court, but Venezuela recently boycotted the first hearing held on the issue.[95] Suriname, which has produced oil at modest levels, has very recently located large reserves.

Oil and gas companies continue to explore throughout the Caribbean for new opportunities, although some countries, such as Barbados, have proclaimed that future exploitation must take place in a way that is compatible with fisheries and tourism.[96] Oil exploration in Barbados is currently on hold due to COVID-19.

6.2.4 ARTISANAL EFFLUENT

Most large-scale and regulated gold mining companies do not use mercury in their mining operations. However, small-scale and illegal gold mining operations will often use mercury to separate the gold from other materials. Despite being banned for artisanal mining in many countries, mercury is widely used in Guyana and Suriname to extract gold from amalgam; the use of mercury in those conditions is a significant threat to human and ecosystem health. Cyanide is also frequently used in artisanal gold mining operations (additional information in **Annex F**).

6.2.5 WILDLIFE TRAFFICKING

As noted above, the world is dealing with an unprecedented spike in illegal wildlife trade, threatening to overturn decades of conservation gains. In Trinidad and Tobago, exotic birds from South America make up the majority of animals smuggled into the country. Birds such as Seed Finches and Blue and Gold Macaws are highly prized, with Seed Finches being used in songbird competitions. Monkeys are also frequently trafficked in this region. Guyana and Suriname are both sources for a wide array of trafficked wildlife, and there has even been an upsurge in the poaching of Jaguars for body parts used in Chinese folk medicine. Jaguars, which are a symbol of power and strength in several Central and South American countries, have not been hunted to this extent since the early 1970s.

6.2.6 NEW ROAD CONSTRUCTION

The most important supranational infrastructure plan for the Guianas is captured in the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), which aims to promote the development of regional transportation and energy and telecommunications infrastructure by improving the physical connections between the 12 South American countries.[97] In relation to Guyana and Suriname, the IIRSA planned for a road network that would connect both countries to their neighbors (Figure 8). While the design for the road system was completed more than a decade ago, so far there has only been one bridge constructed in the Guiana Shield region (the Takutu Bridge, connecting Brazil to Guyana, completed in 2010).

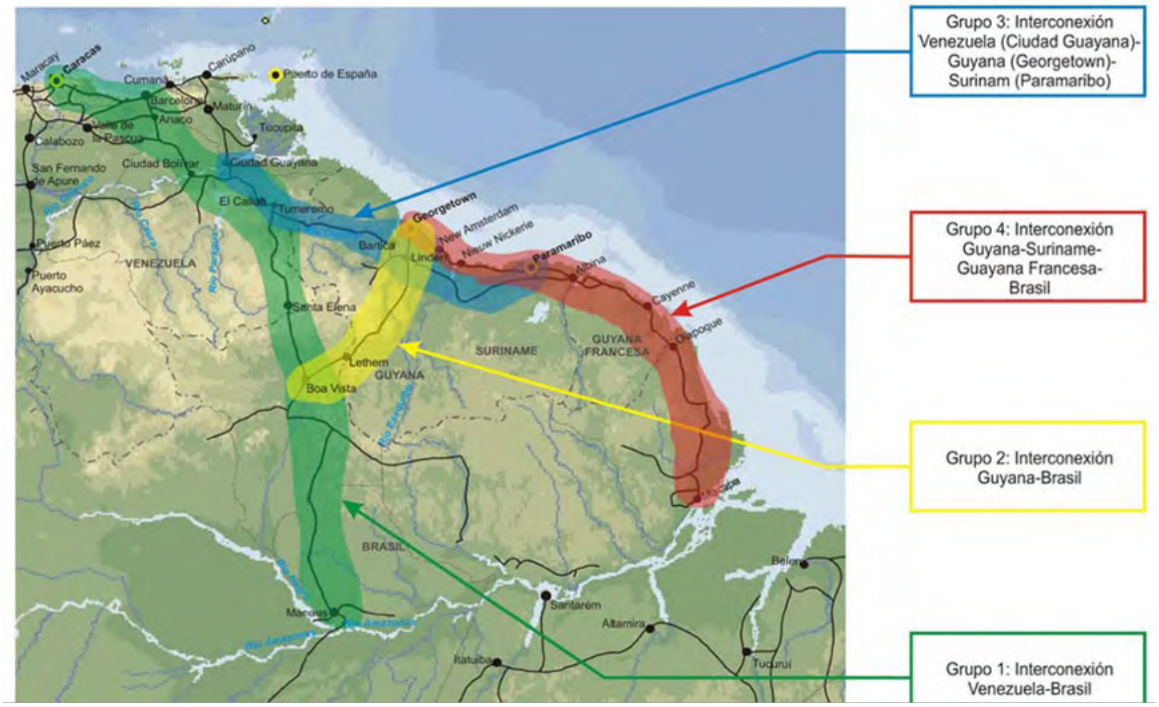


Figure 8. The Guiana Shield Hub. Planned and Considered Roads Within IIRSA. [110]

6.2.7 HUNTING, POACHING, AND IUU FISHING

Hunting animals for bush meat is a major problem in Suriname, Guyana, and Trinidad and Tobago. In Guyana, the Rupununi region has been especially targeted by hunters to supply internal and external markets. The Indigenous People of the region maintain their traditional subsistence livelihoods of hunting, fishing, and farming, but hunters from the coast and other urban areas are penetrating this area to provide bush meat to coastal communities and for export. This same region is where much of the wildlife trafficking begins, targeting parrots, macaws, parakeets, songbirds, reptiles, arthropods, and Jaguars. The main markets are Mexico, Singapore, and the United States.[98] Suriname is facing a similar situation with an increase in poaching of Jaguars for teeth (jewelry) and bones (Chinese folk medicine); the demand for Jaguar is mainly driven by the Chinese market.[99] Chinese funded infrastructure projects usually require the host country accepting Chinese skilled workers and unskilled laborers; once established in the country, many of these workers set up systems and engage in the illegal trade of wildlife and animal parts. Sea turtle eggs are locally demanded in Suriname and are viewed in some areas as a delicacy.[100]

In Trinidad and Tobago, the fishing industry is not well regulated (both commercial and artisanal), although there are lobster season and mesh size regulations. Trinidad is also conducting research on sharks as a food source in an attempt to more sustainably manage the resource; sharks are endangered and commonly a part of the local cuisine as "shark and bake." More than 30 species of shark are landed by small-scale artisanal and gillnet fisheries, however there is very little detail on which species were caught in landing records. The IUCN lists three of the shark species found in Trinidad and Tobago as endangered, nine as vulnerable, and 11 as near threatened. Although shark is mainly bycatch, it has cultural value as a traditional food, and is marketed as such.[101] Sharks are also known to contain high levels of mercury, which leads to human health issues.[102]

6.2.8 SAND MINING

Sand mining has significant environmental impacts, including the destruction of natural beaches and ecosystems, habitat loss (turtles, shorebirds), reduced protection from hurricanes and floods, and the salinization of freshwater sources.[103] Sand mining has been cited as a threat to beaches in all three countries. Rocks and pumice are mined in Trinidad and Tobago, with Trinidad citing blasting as a major nuisance. Both islands reference the negative effects of the loose materials from mines and quarries.

6.3 DRIVERS OF THREATS TO BIODIVERSITY AND TROPICAL FORESTS

6.3.1 CLIMATE CHANGE

About 70 percent of the Caribbean's population lives on the coast, where most of the climate change impacts are being felt.[104] In addition to coastal resources and marine biodiversity, the impacts of climate change on tropical forests are significant. A "Strengthening Disaster and Climate Resilience for the ESC" study funded by USAID for CIMH is now being conducted as one of the preliminary assessments necessary for the strategic planning process. This study will enhance the use of satellite imagery to strengthen regional resilience to hydrometeorological and climate related hazards and enhance weather and climate-related impact assessment workflows.

Rising sea levels and increased storm intensity is leading to loss of coastlines and beaches in most countries. Along with ocean acidification, increased drought and altered rainfall patterns, rising sea levels will degrade estuaries, inundate lowlands, displace wetlands, and alter tidal patterns in rivers and bays.[105] The coastal plain in Guyana, home to some 90 percent of the country's population and the main agricultural area, is at risk of rising seas and changing rainfall patterns, including the loss of protective coastal systems such as mangroves. Suriname and Guyana have both invested in concrete coastal defense walls to protect key coastal areas such as Georgetown.

Warming waters have led to coral bleaching events in all countries, primarily in 1998, 2010, and 2014-2017. Corals can survive a bleaching event but will eventually die under continued stress. Warmer oceans also lead to increases in acidification, which makes it more difficult for corals and other marine organisms to grow their skeletons and shells.[106]

The ESC region has been in drought conditions for the past three years, which increases stress on already limited potable water supplies and freshwater systems. Droughts dry out vegetation, which frequently leads to an increase in fires.

Tropical storms and hurricanes are annual events in the Caribbean. This report contains a list in **Annex F** of tropical storms and hurricanes that have occurred since 2013. Powerful hurricanes can destroy much of the terrestrial and near-shore marine ecosystems. Seagrass beds, which so many species rely on, can be ripped apart in one storm. Mangroves are uprooted and forests can be leveled, as was the case for Dominica during Hurricane Maria in 2017.

The influence of hurricanes on coral reefs can be beneficial and detrimental. Small hurricanes can provide fast relief with cooler water during periods of thermal stress, whereas waves from large hurricanes can reduce a reef to rubble. Within the context of a rapidly changing climate, the ability of corals to recover from severe storms, while facing the combined effects of increasing thermal stress and ocean acidification, could be severely diminished.[107]

6.3.2 OVEREXPLOITATION

Overexploitation of biodiversity resources in the ESC is due to a number of factors. The illegal trade in Caribbean plants and animals is growing, and it is largely driven by external demand. Trade destinations include North America, Europe, and Asia, especially China. IUU fishing is also on the rise and is driven to a great degree by Asian countries (e.g., China and Japan). China has been especially aggressive in the region during the past decade, establishing commodity chains to export natural resources from the region. Most of the illegally logged timber in Guyana and Suriname is destined for Asia. Compounding the demand issue is the relatively low enforcement capacity, or lack of political will, to confront these issues. Illegal wildlife trade is often associated with other illegal trafficking (drugs, arms, and human) as well. Regional poverty also plays a significant role as many communities are faced with difficult choices on how best to manage their resources; exploit rapidly to gain short-term profits or utilize in a more sustainable manner with fewer immediate benefits.

6.3.3 LACK OF POLITICAL WILL TO ENFORCE EXISTING LAWS AND REGULATIONS

In general, governments across the ESC are not effectively enforcing laws, policies, and government regulations to reduce environmental degradation. In Guyana and Suriname, breakdowns in control systems of forest concessions are contributing to excessive access road cutting and bad forest management practices. Mining is the leading cause of deforestation. Lack of political will to implement measures contained in environmental assessments for new development projects was also mentioned as a problem in Antigua and Barbuda, Barbados, and Saint Lucia.

6.3.4 LACK OF CAPACITY

While there has been significant improvement in the number of environmental laws, regulations, and initiatives in the ESC, there are still limitations in relation to financial resources needed for government agencies to implement actions, and in some cases a lack of technical expertise. NGOs and community-based organizations are often not well positioned to fill the capacity gap.

6.3.5 SLOW LEGISLATIVE AND POLICY PROCESSES

The ESC countries have very tedious processes for the drafting and approval of policies and legislation. This prevents much-needed protection and conservation from being implemented as the enabling policy, law, or regulations to accompany a law are frequently pending approval. Environmental legislation has taken five years or more in some countries to be approved.

6.3.6 LACK OF SPECIES AND ECOSYSTEM DATA

Most countries cited the lack of comprehensive species inventories and ecosystem assessments as an impediment to conservation and protection. Many countries noted the need for ongoing assessments to track species trends and ecosystem health to better respond to matters such as development permits, declaration of species protection, or establishment of protected areas. It is difficult for countries to plan and implement NRM without regular and systematic information and data sharing, which creates opportunities to coordinate efforts, leverage each other's resources, and share best practices.

6.3.7 POVERTY

Throughout the ESC, but especially in Guyana and Suriname, poverty factors can lead to destructive, resource liquidation measures for short-term profit at the expense of more sustainable livelihoods. Both countries also are the focus of migrant gold miners from Brazil who enter the vast forested areas that are difficult to monitor and often disrupt the local culture and economy.

6.3.8 LACK OF TRANSPARENCY AND CORRUPTION

The Amazonian group countries all reported corruption (and lack of transparency) as a driver of biodiversity degradation; this is also the group with the most valuable extractive natural resource-based industries. The border area of Guyana and Venezuela is noted as being lawless, with gangs and break away paramilitary groups controlling movement of goods and people across the border.[108] In the interior mining areas of Guyana and Suriname, there is a considerable amount of trafficking in persons, including women and children from urban areas and other countries (e.g., Haiti, Dominican Republic, Venezuela). Guyana is making efforts to control this activity and has reached Tier 1 status in the U.S. State Department list of Trafficking in Persons.[109] As noted earlier, wildlife trafficking is common between Guyana, Suriname, and Trinidad and Tobago. Trinidad and Tobago and Guyana have the lowest scores for the Transparency International's 2019 Corruption Perceptions Index in the ESC region; Barbados had the highest. There is no data for Antigua and Barbuda or Saint Kitts and Nevis. The rankings and scores of the other ESC countries, and the United States for comparative purposes, are included in Table 3.

TABLE 3. TRANSPARANCY RANKINGS. ADAPTED FROM TRANSPARENCY INTERNATIONAL'S RANKING AND SCORES FOR USAID ESC COUNTRIES, 2019[112]

COUNTRY	2019 RANK OUT OF 198 COUNTRIES	2019 POINTS OUT OF MAXIMUM 100	POINT CHANGE FROM 2018
United States	23	69	-1
Barbados	30	62	-5
St. Vincent and the Grenadines	39	59	+2
St. Lucia	48	55	+2
Dominica	48	55	-3
Grenada	51	53	+2
Suriname	70	44	+2
Guyana[111]	85	40	+8
Trinidad and Tobago	85	40	-7

VII. ACTIONS NECESSARY TO CONSERVE BIODIVERSITY

The following recommended actions are divided into two groups: 1) broad-based actions normally associated with the programming and planning level, and 2) actions more targeted to specific threats and issues. The broad-based programmatic actions are listed in their relative order of importance in the ESC region. However, given the significant diversity of the 10 ESC countries, the relative importance of any one action may differ based on the context of the country in question. The specific actions are often directly related to some of the broad-based actions. They are listed in relation to the main threats, but not in order of importance as each country and site-specific context will determine their relative importance.

7.1 BROAD BASED ACTIONS FOR PROGRAMMATIC PLANNING

1. Strengthen the capacity of environmental/NRM government agencies to fulfill their management mandates, especially the enforcement of laws and regulations.
2. Strengthen the capacity of local NGOs to implement conservation measures and write proposals more effectively.
3. Support mechanisms to provide sustainable funding for protected areas and the rehabilitation of key natural areas.
4. Promote regional collaboration so that technical resources, and data are shared in a transparent manner.
5. Support alternative livelihood activities to allow communities to move away from unsustainable and environmentally damaging practices.
6. Promote conservation education that focuses on the critical role that biodiversity and forests play in supporting livelihoods and national economies.
7. Support NGOs, universities, and government agencies in land use planning and related zoning activities that minimize negative impacts on key conservation areas.
8. Promote a sound environmental review process, which includes the implementation of management plans and recommendations to safeguard the environment.
9. Engage the private sector on the importance of following best management practices in relation to biodiversity conservation and environmental management.
10. Assist efforts to control invasive species and disease spread.
11. Support efforts to combat wildlife trafficking.

7.2 SPECIFIC ACTIONS BY THREAT AREA

TOURISM AND RECREATIONAL AREA DEVELOPMENT

1. Support local NGOs, universities, and relevant government agencies to prevent infrastructure development in key biodiversity areas.
2. Engage international private sector developers on the importance of careful site selection for tourism development.
3. Encourage the use of internationally accepted environmental review standards that incorporate biodiversity conservation and ecosystem service valuation into the analysis.
4. Support national ecosystem and species inventories to aid decision-making support systems.
5. Help with developing national land use zoning plans to guide sustainable development.
6. Support additional tourism taxation, especially for the cruise ship industry, to generate funding to help offset the costs of waste mitigation and improve access to fresh (desalination).

OIL AND MINING

1. Support non-governmental organizations (NGOs), community-based organizations (CBOs), and government agencies develop best practices to prevent and address oil-related accidents.
2. Support alternative livelihood strategies for artisanal miners.
3. Support training in safe and sustainable mining practices for artisanal miners.
4. Assist government agencies and NGOs in the management of the mining sector.

INVASIVE SPECIES

1. Assist governments efforts to eradicate invasives in key areas (e.g., Offshore Islands Conservation Program in Antigua and Barbuda – Redonda Island)
2. Assist governments to monitor arriving ships for invasives.
3. Assist with national efforts to control invasive species; (e.g., positive initiatives for Sargassum in Barbados).[113]

POLLUTION PREVENTION AND MITIGATION

1. Support the development of wastewater treatment systems.
2. Assist governments manage organized landfills.
3. Encourage private sector involvement in waste management.
4. Support integrated waste management planning models that could include "circular management strategies" tailored to small island nations.
5. Work with governments, NGOs, and the cruise industry to find ways to minimize the amount of solid waste and wastewater generated on ships and left at/near the port of call.

SPECIES CONSERVATION AND PROTECTION

1. Support government agencies to enforce laws on illegal take and trade in wildlife.
2. In concert with the majority of Caribbean nations (and led by the Dominican Republic), encourage the Government of Saint Vincent and the Grenadines to ban the "legal take" of whales in Bequia and the Government of Saint Lucia to ban the "legal take" of sea turtles.
3. Illegal logging in Suriname and Guyana - assist government agencies and NGOs in monitoring logging operations. Support the U.S. Lacey Act[114] and the FLEGT initiative.
4. Assist in enforcement of mangrove protection laws.
5. Support government enforcement of policies and regulations on fishing (closed season, mesh size, tracking of boats, etc.)
6. Assist government and NGOs with information and enforcement of laws involved with wildlife trafficking.

PROMOTE FOREST REHABILITATION AND RECOVERY

1. Support the development and strengthening of local, community-based fire watch prevention and mitigation programs.
2. Support early detection of illegal housing/settlement and land clearance in forests and mangroves and enforcement of policies and laws.
3. Support transparency efforts to verify sources of timber for export.

PROTECTION OF MARINE ENVIRONMENTS AND SPECIES

1. Assist government agencies and NGOs monitor whale watching and other tourist activities that have close species interaction; support the implementation and enforcement of propeller protector use for whale watching boats.
2. Support safe mooring techniques and restrictions especially in small outlier islands in multi-island states that may be underserved by enforcement officers.

AGRICULTURAL EXPANSION INTO FORESTED AREAS

1. Promote the protection of natural forest areas through improved land use planning and regulation enforcement.
2. Enforce regulations limiting the burning of materials on farmlands adjacent to forested areas.
3. Promote methods for more intensive and productive agriculture (e.g., greenhouses and "vertical agriculture").

DISASTER PREPAREDNESS, REDUCTION, AND RESILIENCE

1. Support government efforts to track and prepare for hurricanes, earthquakes, and tsunamis.
2. Support government efforts to reduce the effect of climate variability.
3. Improve resilience of countries to respond to adverse events.

IMPROVED LIVELIHOOD EFFICIENCIES AND ALTERNATIVES

1. Support the use of improved, more efficient, and environmentally sound technologies for sustainable natural resource use (e.g., ecosystem approach to fisheries management promoted by the FAO; fishing methods that reduce by-catch; vertical agriculture; no-till/low till farming and composting; improved hives for beekeeping; low impact logging; improved standards for artisanal and small-scale gold mining and elimination of the use of mercury; etc.)
2. Promote alternative livelihood strategies to unsustainable natural resource use.

PROMOTE PARTNERSHIPS WITH PRIVATE SECTOR AND LANDHOLDERS

1. Engage the private sector to promote the sustainable use of natural resources and to convey conservation messages to clients/members (e.g., hotels, guides services, dive shops, cruise industry, fishing and agricultural cooperatives/associations, land developers, etc.).
2. Encourage landholders of important habitat to promote sound environmental management through training, incentives, easements, etc.

VIII. EXTENT TO WHICH USAID ESC AND THE REGIONAL CARIBBEAN DEVELOPMENT PROGRAM MEETS THE IDENTIFIED ACTIONS NEEDED

8.1 CURRENT PROGRAMMING

The USAID mission's current Country Development Cooperation Strategy (CDCS) focuses on Youth and Citizen Security, Climate Change Resilience, Economic Growth and Health (HIV/AIDS).

8.1.1 USAID WORK ON GLOBAL CLIMATE CHANGE

Building Regional Climate Capacity in the Caribbean (BRCCC). This program was designed to strengthen the capability of the Caribbean Institute of Meteorology and Hydrology (CIMH) to establish a World Meteorological Organization (WMO) Regional Climate Center for the Caribbean at CIMH. This program achieved its objectives through 1) infrastructure renovation, 2) by increasing the range of products and services delivered to stakeholders, 3) by enhancing the human and technical capacities at CIMH and National Meteorological and Hydrological Services in Caribbean Small Island Developing States, and 4) improvement of service delivery mechanisms to stakeholders.

USAID Climate Change Adaptation Project. The USAID Climate Change Adaptation Project (CCAP) is a partnership between the USAID and the Caribbean Community Climate Change Center to assist the ESC region respond to climate change through the development and implementation of adaptation initiatives and policies for sustainable economic development and disaster management. The goal of the USAID CCAP is to reduce risks to human and natural assets resulting from climate change vulnerability. The project's purpose is to strengthen an integrated system for the implementation and financing of sustainable adaptation approaches in the ESC region.

A significant achievement of the CCAP directly relevant to this study was the installation of the Caribbean Reef Early Warning Systems (CREWS) and the Automatic Weather Stations (AWS). The CREWS network is designed to collect real time environmental data from prime coral reef sites throughout the world, analyze patterns and trends via expert systems (an artificial intelligence technology), and predict the effects of environmental events on coral reefs such as bleaching, fish and invertebrate spawning, and migration. NOAA began the implementation of this network in the ESC, and CREWS stations have been installed in Antigua and Barbuda, Saint Kitts and Nevis, Grenada, Saint Lucia, and Saint Vincent and Grenadines.

Preparing CREWS Station for Installation. Credit: 5Cs

There are 58 AWS hydro-meteo data stations in the ESC and other countries; they have been installed in all ESC countries. These stations generate data that has direct application for the agriculture and aquaculture, water resources, coastal zone management, health and tourism sectors.

RRACC Project. The Rallying the Region to Action on Climate Change project was implemented by OECS and focused on establishing early warning systems for storm events and information sharing, pilot activities that address water security and other issues linked to climate change, public awareness, capacity building, and policy development.

AMCECC. The Adaptation Measures to Counter the Effects of Climate Change (AMCECC) is a government-to-government program that aimed to lessen the potential impacts of climate change and increase the water management and flood resilience of Barbados. The components of the AMCECC Program were:

- A Stormwater Management Plan Update
- Flood Reduction Measures in the Trents/ Holetown Area
- Management of Holetown Lagoon
- Stormwater and Groundwater Quality Study
- Education, Awareness, Outreach, and Training
- Monitoring and Evaluation
- Development of a Plan for Institutional Strengthening

The study produced a wealth of information on the gulley system and the stormwater management challenges and options for Barbados. It also produced an Environmental Assessment of stormwater works in the Holetown area and their impacts on the Folkestone Marine Reserve. AMCECC represented a significant step in the progress toward an Integrated Water Resources Management approach for Barbados. IWRM is a process that promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.[115]

8.1.2 USAID WORK ON CITIZEN SECURITY

As part of a larger goal of creating a safer, more prosperous Caribbean, the U.S. Government, through USAID, in 2016 launched its Youth Empowerment Services (YES) project to reduce youth involvement in crime and violence. In doing so, the project sought to increase the institutional and technical capacity of regional bodies, select national government systems, and community stakeholders to reduce the risk factors that drive youth crime, violence, and victimization.

YES consists of three activities: Strengthening Evidence Based Decision-Making (CariSECURE); the Community, Family, and Youth Resilience (CFYR) Program; and the Juvenile Justice Reform Project (JJRP).

CariSECURE. This project promotes evidence-based decision-making by strengthening institutional capacities of governments to generate and disseminate disaggregated, standardized, reliable, and timely crime and violence data.

CFYR. This project strengthens youth, family, and community support systems, improves the skills of youth to resist involvement in violence, expands access to education and employment opportunities, and provides specialized services to youth at the highest risk of engaging in violence. More than 6,000 youth have been positively engaged, leading to significant results. This project works in Saint Lucia, Saint Vincent and the Grenadines, and Guyana.

JJRP. This project supports child justice reform in six Eastern Caribbean countries. It is designed to establish regular standards and processes for using and expanding the use of diversion,[116] improving rehabilitation so that it aligns with the needs of individual youth, and improve planning and coordination services to children and families around reintegration and aftercare support.

8.1.3 USAID SUPPORT FOR EDUCATION

For nearly 40 years, USAID has supported education development in the Eastern and Southern Caribbean. Recent projects include the Centers of Excellence for Teacher Training, the A Ganar Program (at-risk youth skills development), and Early Learner's Program (early grade reading).

8.1.4 USAID SUPPORT FOR THE FIGHT AGAINST HIV/AIDS

The Caribbean has the world's second-highest regional rate of HIV prevalence, behind only sub-Saharan Africa. USAID works through the PEPFAR (The President's Emergency Plan for AIDS Relief) program in the ESC. Under PEPFAR, the HIV Prevention and Elimination Project (HoPE) was a five-year, USD 46 million health project aligned with USAID/ESC's Regional Development Cooperation Strategy (RDCS, 2015-2019) goal of "safer, more prosperous Caribbean communities." The HoPE project is implemented in Jamaica, Trinidad and Tobago, Guyana, Suriname, Bahamas, and Barbados and aims to "increase the use of HIV services to reduce the rate of HIV transmission in target key population communities."

8.2 RESULTS FROM 2013-2020

In an effort to optimize linkages for the current strategic planning process, this study looked back at recommendations ("Actions Necessary…..") from the 2013 118/119 study and estimated the extent to which the proposed USAID ESC action actually responded ("Met the Needs") to determine to what level biodiversity conservation and forest management considerations were integrated into the overall ESC portfolio. We also added activities from the regional Caribbean Development Program in USAID/Dominican Republic; this program was not considered in the 2013 118/119 study. This analysis is in **Annex E**.

8.3 POTENTIAL PROGRAMMING - ESC MISSION

At this stage of the strategic planning process (Phase 1), it appears as though USAID ESC will continue to support activities in three of the four sectors noted above. The only sector that will likely not be continued is the HIV/AIDS program. One new program—energy—may be added to the ESC Mission; energy is already a regional activity under the Caribbean Development Program managed by USAID/Dominican Republic. The following is a summary of anticipated programs and activities for the 2020-2025 strategic development plan.

8.3.1 CLIMATE RESILIENCE

Disaster Resilience Systems and Community Strengthening. The Eastern Caribbean region experienced a rising number of storms with increased intensity over the past decade. These storms underscore the need for increased resilience efforts backed by improved warning systems to decrease the impact future storms will have in the region. USAID ESC will continue to support the region to be better prepared for these events.

Resilience Strengthening Across Sectors. Key sectors requiring protective support from a resilience perspective to natural disasters include water, tourism, and agriculture. These sectors are chosen based on their relative importance to the economies of the regional countries.

8.3.2 CARIBBEAN BASIN SECURITY INITIATIVE

The Caribbean Basin Security Initiative is strategically aligned to the intent and purpose of the YES program. However, the YES program did not have sufficient time to realize the most significant outcomes at the community or societal level. In this regard, the Mission seeks to refine its technical and operational approaches, incorporating lessons learned from the pilot programs implemented during the previous RDCS (2016-2020), which will likely lead to the development of YES Phase II (or 2.0)

Of relevance for biodiversity conservation and forest management programming is the Workforce Development Program, strategically delivered through private sector partnerships (e.g. Global Development Alliances) to support sustainable employment creation programs that match the existing and emerging needs of the labor market. This program was an effective part of the first YES program, but linkages were not made to the biodiversity conservation or forestry sectors. However, the employment demand from the tourism, natural resource management, and the waste management sectors has been, and continues to be, strong and ready to be developed.

8.3.3 EDUCATION

Linked to the priority areas of the USAID 2018 policy on education, the ESC Mission is contemplating a three-dimensional approach to combining traditional foundational subjects with marketable skills at various levels of learning to address prevalent education issues in the region. The approach consists of complementary interventions in the following areas:

1. Foundational literacy and numeracy
2. Experientially based education and youth workforce development
3. Timely data to support strategy and programmatic decision-making

8.4 POTENTIAL PROGRAMMING: THE CARIBBEAN DEVELOPMENT PROGRAM (CDP) OF THE REGIONAL OFFICE OF USAID/DOMINICAN REPUBLIC

As noted earlier, the USAID DR Regional CDP has had an impact on USAID ESC activities in the biodiversity sector; this support will continue during the RCDS five-year period as evidenced by the recently approved Project Appraisal Document for the CDP. Anticipated activities under the CDP that USAID ESC will be able to benefit from include:

1. **Caribbean Biodiversity Fund/National Conservation Trust Funds (NCTFs) - Technical Strengthening and Small Grants Program).** The CDP considers it important to continue supporting the establishment and strengthening of the Caribbean Sustainable Finance Architecture, which includes the Caribbean Biodiversity Fund (CBF) and its associated NCTFs in the region. These activities should be designed to support three dimensions of sustainability: economic, social, and environmental. In addition, the CDP team proposes to carry out small grants through the NCTFs. The purpose of the small grants would be to provide the CDP with specialized expertise in biodiversity conservation, combating wildlife trafficking, and other related areas to further support USAID environmental programming and objectives in the Caribbean.
2. **Combating Wildlife Trafficking (CWT).** This year, the regional CWT program has risen in importance due to its linkages to zoonotic diseases. CWT will continue to focus on the drivers of illegal trade and linkages to broader economic activity in the region, including tourism. The types of trade (ornamental, pet, food, etc.) will be addressed alongside drivers and consumer groups. Further research on CWT topics is also needed, including inter-island trade dynamics and transit hotspots to other global markets, particularly other Latin American countries, Asia, Europe, and the United States. Additional research will also be conducted in relation to CWT and linkages to organized crime and other forms of illicit criminal activity.
3. **Caribbean Coastal Marine Biodiversity Activity.** The purpose of the USAID Regional Marine Biodiversity Program is to reduce threats to marine coastal biodiversity in priority areas in the Caribbean, to maintain critical ecosystem services, and to realize tangible improvements in human well-being for communities adjacent to marine managed areas (MMAs). The program should focus on creating and effectively managing marine conservation areas, promoting sustainable fisheries, and stimulating sustainable alternative livelihoods in the Caribbean region.
4. **Interagency Agreement with National Oceanic and Atmospheric Administration (NOAA).** This will involve buying into existing activities to increase their geographic scope of work in the Caribbean region and to avoid duplication of effort. NOAA, in partnership with the Gulf and Caribbean Fisheries Institute, supports the Marine Protected Area Connect (MPAconnect) initiative, which facilitates international and regional peer-to-peer exchange between MPAs in areas of enforcement, protected area financing, outreach, public education, and coral reef monitoring. Other areas include IUU fishing and the Agreement on Port State Measures.

Table 4 matches the "Actions Necessary to Conserve Biodiversity and Tropical Forests" with the anticipated ESC program for 2020-2025 as well as the planned CDP program for the same period ("Extent to which the Proposed USAID Programs Meet the Needs"). This analysis is largely based on programmatic concept notes for the strategic plan from ESC and the Caribbean Development Program Project Appraisal Document, which has been recently approved.

TABLE 4. "ACTIONS NECESSARY" AND EXTENT TO WHICH PROPOSED ESC AND CDP ACTIONS "MEET THE NEEDS"

ACTIONS NECESSARY TO CONSERVE BIODIVERSITY AND TROPICAL FORESTS	EXTENT TO WHICH THE PROPOSED USAID ESC ACTIONS MEET THE NEEDS	EXTENT TO WHICH THE PROPOSED USAID CDP/DR ACTIONS MEET THE NEEDS
Strengthen the capacity of environmental/ NRM government agencies to fulfill their management mandates, especially the enforcement of laws and regulations.	Disaster Resilience Systems and Community Strengthening will assist government and communities prepare for natural disasters and their impact, especially in the agriculture, tourism and water sectors.	Support to the Caribbean Biodiversity Fund (CBF) will provide capacity building grants for coastal and marine biodiversity conservation and grants to combat wildlife trafficking. The Combat Wildlife Trafficking (CWT) program will provide training on legal, technical, and operational components of border control.
Strengthen the capacity of local NGOs to more effectively advocate for and implement conservation measures and write proposals.	Disaster Resilience Systems and Community Strengthening will assist government and communities prepare for natural disasters and their impact especially in the agriculture, tourism, and water sectors.	Support to the CBF will provide capacity building grants for coastal and marine biodiversity conservation and grants to combat wildlife trafficking.
Support mechanisms to provide sustainable funding for protected areas and the rehabilitation of key natural areas.	Not currently programmed; but indirect support through CREWS information sharing for Protected Areas.	Support to the CBF and the National Conservation Trust Funds – small grant program and technical strengthening.
Promote regional collaboration so that technical resources, and data are shared in a transparent manner.	Disaster Resilience Systems will build on the regional CREWS and AWS systems already in place and generating valuable information.	Support to NOAA will increase geographic scope in the region and avoid duplication in the areas of enforcement, protected area financing, communication/ outreach, public education, coral reef monitoring, and combating IUU fishing.
Support alternative livelihood activities to allow communities to move away from unsustainable and environmentally damaging activities.	Vocational education and youth workforce development through the education and security initiatives can introduce youth to sustainable livelihood options.	The Caribbean Coastal Marine Biodiversity activity will support sustainable alternative livelihoods.
Promote conservation education that focuses on the critical role that biodiversity and tropical forests play in supporting livelihoods and national economies.	The education program can incorporate these key conservation messages into curriculum development. The Disaster Resilience Systems will include building public awareness; the role biodiversity and tropical forests play in relation to resilience can be included in their messaging.	NOAA activity will indirectly support this need through their outreach work.

TABLE 4. "ACTIONS NECESSARY" AND EXTENT TO WHICH PROPOSED ESC AND CDP ACTIONS "MEET THE NEEDS"

ACTIONS NECESSARY TO CONSERVE BIODIVERSITY AND TROPICAL FORESTS	EXTENT TO WHICH THE PROPOSED USAID ESC ACTIONS MEET THE NEEDS	EXTENT TO WHICH THE PROPOSED USAID CDP/DR ACTIONS MEET THE NEEDS
Support NGOs, universities, and government agencies in land use planning and related zoning activities that minimize negative impacts on key conservation areas	Disaster Resilience Systems and Community Strengthening will, in part, address this action by assisting governments and communities prepare for natural disasters and their impacts, especially in the agriculture, tourism and water sectors; zoning and planning are critical for this work.	USFWS, the CCMB, and NOAA through MPAconnect program will partially address this need for MPAs.
Promote a sound environmental review process	All activities will be subject to environmental review, which will be shared with governments and, as appropriate, NGOs and the private sector. Partners will be invited to USAID Environmental Training Workshops.	All activities, including the grants program, will be subject to environmental review, which will be shared with the government and, as appropriate, NGOs and the private sector. Partners will be invited to USAID Environmental Training Workshops.
Engage the private sector on the importance of following best management practices in relation to biodiversity conservation and environmental management.	The Disaster Resilience Systems and YES 2.0 programs can integrate biodiversity best management practices into any agreements with the private sector.	The CWT program will engage with the private sector.
Assist efforts to control invasive species and disease spread	CREWs and AWS information to be shared with projects in their efforts to control invasives. Vocational education and youth workforce development can introduce youth to invasive species control measures.	CCMB and CWT.
Support efforts to combat wildlife trafficking	Not currently programmed.	USFWS and CWT.

IX. RECOMMENDATIONS

9.1 RECOMMENDATIONS BASED ON ACTIONS NECESSARY TO CONSERVE BIODIVERSITY AND TROPICAL FORESTS

Action Necessary: Strengthen the capacity of environmental/NRM government agencies to fulfill their management mandates, especially the enforcement of laws and regulations.

RECOMMENDATION: As biodiversity is directly linked to tourism, agriculture, and water resources, **the ESC Mission should incorporate biodiversity conservation activities into the design of the Disaster Resilience Systems and Community Strengthening Program.** The tourism industry is dependent on healthy ecosystems and their biodiversity. The agriculture industry is also strongly linked to biodiversity as it depends on healthy seed stocks, pollinators, decomposers, and other ecosystem services upon which agriculture is based. Biodiversity supports the water sector by providing erosion control measures, purification services, and flood prevention, among other services. The CDP will be working in this area through the CBF and CWT programs.

Action Necessary: Strengthen the capacity of local NGOs to more effectively advocate for and implement conservation measures and help develop their capacity to write proposals.

RECOMMENDATION:: As with environmental/NRM government agencies, the Disaster Resilience Systems and Community Strengthening Program and youth-related programs, where relevant, should work with community-based NGOs to strengthen conservation approaches. In that regard, **the programs should help the local NGOs better understand and appreciate the links between biodiversity and climate change.** The CDP will likely continue their work with local NGOs (e.g., SusGren), and they should be well positioned to provide training and capacity assistance in proposal development.

Action Necessary: Support mechanisms to provide sustainable funding for protected areas and the rehabilitation of key natural areas.

RECOMMENDATION:: The ESC currently does not envision working in this action area directly, however **the Mission should provide indirect support by ensuring that the Coral Reef Early Warning System in the region provides real-time information that can be provided to national level stakeholders to help them better program funds for priority marine protected areas.** This work should be done in conjunction with the DR Mission CDP, which will be tracking and supporting National Trust Funds in ESC countries that have been initiated under the CMBP project.

Action Necessary: Promote regional collaboration so that technical resources and data are shared in a transparent manner.

RECOMMENDATION:: **The ESC Mission should directly support this action through the Disaster Resilience Systems by building upon and supporting the regional CREWS and AWS systems** already in place and generating valuable information. **The Mission should also actively participate in regional seminars and meetings that are designed to improve the management of biodiversity in the region.** Coordination with the CDP will again be very important.

Action Necessary: Support alternative livelihood activities to allow communities to move away from unsustainable and environmentally damaging activities

RECOMMENDATIONS:: **The ESC Mission should directly support this action through its programs such as "Building Resilience in the Eastern and Southern Caribbean" with the Inter-American Foundation, the CDEMA activity, and the new youth-related activity.** All these activities include technical skills training to help community members engage in productive livelihoods. The tourism sector is in constant need of a wide range of service providers. Tour operators, parks, and dive shops need guides and assistants. Waste management is a major challenge for all the ESC countries, which can in part be addressed by volunteer groups and communities. The universities, NGOs, and government agencies need field personnel to conduct surveys, inventories, and monitor activities. Communities are often looking for income generating activities that can be managed in a sustainable manner. **Skills packages that include activities related to biodiversity conservation and livelihood development should be integrated within the projects mentioned above. The ESC Mission should also support the CDP in their efforts to build upon and expand livelihood work in the region (e.g., SusGren work under CMBP).**

Action Necessary: Promote conservation education that focuses on the critical role that biodiversity and tropical forests play in supporting livelihoods and national economies

RECOMMENDATIONS: The ESC Mission should encourage the education program to incorporate basic sound environmental management and conservation messages into curriculum development for youth at the primary and secondary school levels. In addition to the education program, the Disaster Resilience Systems program will have a communications component to build public awareness to the threats from climate change. The links between climate resilience and biodiversity (including tropical forests) are many. **The ESC Mission should ensure that the Disaster Resilience Systems program includes in their public awareness work the links between biodiversity and tropical forests and resilience (e.g., reef and mangrove protection from storm surge; upland forest cover reducing landslides, erosion, and soil loss, etc.)**

Action Necessary: Support NGOs, universities, and government agencies in land use planning and related zoning activities that minimize negative impacts on key conservation areas

RECOMMENDATIONS: Disaster Resilience Systems and Community Strengthening could, in part, address this action by providing government, communities, NGOs, and universities with important information that will help prepare for and monitor the impacts of natural disasters, especially in the agriculture, tourism, and water sectors. **The ESC Mission should ensure that the role biodiversity and tropical forests play in relation to resilience be included in information exchange with these institutions and agencies for planning purposes.** The CDP will also generate information that can be directly used for planning and zoning work, particularly in relation to MPAs and key coastal zones.

Action Necessary: Promote a sound environmental review and safeguard processes.

RECOMMENDATIONS: Inadequate environmental review processes, or the lack of enforcing recommended actions resulting from environmental assessments, is an issue mentioned frequently as a threat to biodiversity in most ESC countries. While the ESC Mission has limited ability to encourage government to follow their own procedures, **the Mission should include the relevant government agency(ies) in all USAID environmental reviews to help create "ownership" as well as to encourage following host government procedures and to strengthen environmental safeguards, which USAID is required to do. Moreover, any government to government agreements should explicitly state that both host country**

and USAID environmental procedures will be enacted and enforced, and that the Mission will receive regular reporting from the responsible government agency on the implementation and monitoring of all recommendations resulting from the environmental review/assessment; failure to do so could result in the suspension or cancellation of USAID support for the program in question.

Action Necessary: Engage private sector on the importance of following best management practices in relation to biodiversity conservation and environmental management.

RECOMMENDATIONS: There is potential for the ESC Mission to engage the private sector through the various programs planned under the 2021-2025 RDCS. When a company's development activities affect biodiversity negatively, the business faces potentially significant regulatory, financial, operational, and reputational risks, and companies are increasingly seeing the value of adopting internationally recognized best management practices (BMPs). This includes the cruise industry. This affords the ESC Mission the opportunity to discuss and promote internationally standardized BMPs for the sector in relation to biodiversity. **The ESC Mission should ensure that agreements between all programs and the private sector include references to biodiversity BMPs where relevant.** The CDP program will also be engaging the private sector and can make use of the BMPs.

Action Necessary: Assist efforts to control invasive species and the spread of disease.

RECOMMENDATIONS: Invasive species were regularly mentioned by virtually all resource specialists contacted for this study as one of the three most important threats to biodiversity in the ESC region. The ESC Mission does not anticipate any direct support to this action; however, the Mission can indirectly address this action through two anticipated programs. The ESC Mission should ensure that **information generated and networked within the context of the Disaster Resilience Systems and Community Strengthening program (CREW and AWS) be shared with activities/projects that are working to prevent/control/eliminate invasive species.** Climate change is a driver in expanding ranges of invasive species and diseases. Also, the **ESC Mission can integrate invasive species control measures into the vocational education and youth workforce development through the YES 2.0** (e.g., sargassum cleanup, lionfish harvesting, plant removal, snail collection, etc.). The CDP program will likely support activities in the ESC region that target control of invasives.

Action Necessary: Support efforts to combat wildlife trafficking.

RECOMMENDATION: As noted earlier, wildlife trafficking is a major threat to biodiversity in the ESC region. Moreover, it is associated with a number of other illegal trafficking activities, and in this regard, it is a priority issue for the USG. However, the ESC Mission does not anticipate direct support for this action. Wildlife trafficking is a key program for the CDP in the DR Mission. Guyana and Suriname are well known sources of wildlife for the illegal trade; Trinidad and Tobago serve as a main transit point as well as a supplier. Barbados and other ESC countries have also been named as transit points. While the CDP has the lead on this work, and the State Department will also be closely tracking illicit movements in the regions, the ESC Mission is well positioned to monitor activities through their network and contacts in the ESC region. In that regard, **the ESC Mission should keep abreast of illegal trafficking in the region and coordinate/support CDP on activities designed to combat wildlife trafficking and share the same information with the State Department.**

ANNEXES

ANNEX A. SCOPE OF WORK

STATEMENT OF WORK FOR USAID/EASTERN AND SOUTHERN CARIBBEAN'S TROPICAL FOREST AND BIODIVERSITY ANALYSIS

BACKGROUND

As part of the documentation for the 2021-2025 Regional Development Cooperation Strategy (RDCS), USAID's Eastern and Southern Caribbean Mission (USAID/ESC or the Mission) is required by Sections 118 and 119 of the Foreign Assistance Act, as amended, to prepare an analysis of tropical forests and biodiversity in the following countries: Saint Kitts and Nevis; Antigua and Barbuda; Dominica; Saint Lucia; Grenada; Saint Vincent and the Grenadines; Barbados; Trinidad and Tobago; Guyana; and Suriname.

By mandating FAA 118/119 analyses (hereafter referred to as "the analysis"), the U.S. Congress recognizes the fundamental role that tropical forest and biodiversity play in supporting countries as they progress along the journey to self-reliance. The analysis will examine the region-level forest and biodiversity conservation needs and the extent to which the Mission is currently addressing the identified needs for forest and biodiversity conservation. The report recommendations will help the regional Mission identify ways to strengthen regional commitment and capacity to biodiversity conservation.

SUMMARY OF RELEVANT PARTS OF FAA SECTIONS 118 AND 119

FAA Sections 118 and 119, as amended, require that USAID Missions address the following:

1. FAA Sec 118 Tropical Forests
   - 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.
2. FAA Sec 119 Endangered Species
   - 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.

In line with FAA 118 and FAA 119, the Agency requires similar consideration at the regional level. The FAA Regional 118/119 analysis for USAID/ESC will be a high-level analysis that examines relevant trans-boundary and regional biodiversity and forestry issues and adequately responds to the two questions for Regional Missions, also known as "actions necessary" and "extent to which."

PURPOSE

The primary purpose of this task is to conduct an analysis of tropical forest and biodiversity in alignment with Sections 118 and 119 of the FAA of 1961, as amended, and compliance with ADS guidelines. The last report was carried out in 2014, and much of the work will entail updating the data and analysis trends over the last five years. The analysis will inform USAID/ESC in the development and implementation of the RDCS. USAID's approach to development requires that the Agency examine cross-sector linkages and opportunities to ensure a robust development hypothesis. Biodiversity conservation is a critical component in achieving self-reliance and should be considered in Mission

strategic approaches to improve development outcomes. The analysis therefore should define opportunities to integrate tropical forest and biodiversity conservation across priority development sectors to support the Journey to Self-Reliance.

While the analysis should not be used as a climate-risk assessment, climate change is a global concern, and as such, the analysis will evaluate the threat to the region's tropical forest and biodiversity from climate change. The analysis team should review Mission reports on climate change. The analysis team should also include a review of other sources of climate information available such as the World Bank Climate Change Knowledge Portal and the United Nations Climate Change website.

The analysis will identify new developments in the region that should be taken into consideration at a programmatic level, for example the massive oil finds in Guyana. As the Mission's next generation RDCS will continue to focus on supporting and strengthening citizen security and will also have a strong emphasis on building the region's resilience to natural climate related events including disasters in order to foster improved, economic growth and governance in the region, accordingly, evidence-based programming decisions must include consideration of issues that include climate change, food security, water, governance and global health, all of which will be informed by this analysis.

MISSION PROGRAM

USAID/ESC's last RDCS was approved on September 6, 2013, and currently goes through to September 30, 2020. The overarching goal for it is "Safer, more prosperous Caribbean Communities."

The mission has three development objectives, the achievement of which will promote achievement of the goal. These are:

- DO1: Youth involvement in crime and violence in targeted communities reduced
- DO2: Epidemic control of HIV/AIDS among key populations increased
- DO3: Risks to human and natural assets resulting from climate vulnerability reduced.

DO1 is being implemented through three mechanisms funded under the Caribbean Basin Security Initiative that focus on: (i) Building the evidence based capacity of security services to support reduction in crime and violence especially by youth; (ii) targeted support to at-risk youth in 15 communities located in Saint Kitts and Nevis, Saint Lucia, and Guyana. The initiative seeks to strengthen resilience factors to participating in crime and violence and at the same time reducing those factors identified to cause deviancy; and (iii) support for strengthening the juvenile justice system, including increasing alternative sentencing options, rehabilitation of youth in-conflict with the law and support for their reintegration back into society thereby reducing recidivism within the youth cohort. DO2, which is now ended focused on reducing the spread of HIV/AIDs especially among key populations under the President's Emergency Plan for AIDS Relief (PEPFAR). DO3 focuses on strengthening an integrated approach through one implementer to build the data gathering and analytical capacity of countries to climate variability; developing promising projects for scale-up; and supporting countries to submit winning proposals to international climate related funding agencies such as the Green Climate Fund. Under DO3, the Mission initiated two new activities over the past year focusing on: building disaster risk and climate resilience, and a loan guarantee program that targets the energy sector. There is no current or expected biodiversity, landscapes or climate funding.

The current plan under the new RDCS is for a strong focus on the resilience of countries in the region as well as working to reduce youth involvement in crime and violence. Evidence-based programming decisions will therefore include consideration of issues that include climate variability, disaster risk reduction, water, governance and health, all of which will be informed by this analysis. The Mission's countries will also be supported by two regional initiatives being designed in USAID/Dominican Republic that focus on energy as well as strengthening the biodiversity in the region. This latter initiative will be a follow-on activity to the completed Caribbean Marine

Biodiversity Program. The ESC Mission is also supported by environment programs out of the USAID/PERU regional office for South America. There are currently two programs, SERVIR and SCIOA, the former is a satellite and spatial imaging platform and the latter focuses on indigenous groups capacity building. There is also a plan to include another program on tropical forest management but that is still pending.

Most of the countries in the ESC have a long history of being affected by natural disasters, which have severe negative impacts on their economies, over 200 percent of GDP in some cases. In addition, most are grappling with high public debt, which significantly constrains their ability to fund programs to effectively build resilience including the protection of the environment. Countries also have capacity issues with weak overall technical know-how to fully address critical needs.

STATEMENT OF WORK

To achieve the above-stated purpose, the analysis team, under the direction of the Team Leader, will proceed as described in this section. As described herein, the analysis is based on synthesis and analysis of existing information, coupled with key stakeholder consultations.

1.1 DESK-BASED DATA COLLECTION, ANALYSIS, AND PRELIMINARY REPORT

The Analysis team will conduct this desk-based approach to the report through two phases. Phase 1 Desk-based Data Collection, Analysis, and Preliminary Report; and Phase 2: Preparation of the FAA 118/119 Analysis. In undertaking these tasks, the Analysis team will gather and analyze existing background information on countries in the ESC, such as identification and analysis of priority landscapes, status of tropical forests and biodiversity, key biodiversity issues, stakeholders, policy and institutional frameworks, and gaps in available information.

As part of this effort, the Analysis team will also confer with the USAID's Latin American Countries Bureau Environmental Officer (BEO) and Biodiversity Advisor, the Regional Environmental Advisor (REA), and the Mission Environmental Officer (if established at the time of visit) or his designee, to ensure full understanding of USAID environmental procedures, the role of the regional bureau and mission in environmental compliance, and the purpose of this assignment. Using appropriate Analysis tools (e.g., GIS mapping, stakeholder consultations where possible, reviews of policy documents), this Analysis will result in the identification of current information gaps and approaches to get the relevant information.

1.1.1 DESK-BASED DATA COLLECTION AND ANALYSIS

Gather and analyze existing information to identify tropical forest and biodiversity status within the region, key biodiversity issues, stakeholders, policy and institutional frameworks, and gaps in the available information. Reports and other documentation to be reviewed include previous regional and bilateral 118/119 analyses, current regional project documents and regional biodiversity assessments such as the regional assessment reports on biodiversity and ecosystem services.

1.1.2 PLANNING AND LOGISTICAL PREPARATIONS AND PREPARATION OF REPORT WITH WORK-PLAN

1. **Organize weekly planning meetings with the Mission.** Within one week of contract signing, the Analysis team will hold an initial meeting with staff from USAID/ESC including the Activity Manager to discuss USAID's interest to the ongoing and potential ESC programs, as well as the approach the team will take to conduct the Analysis, and recommendations for potential biodiversity linkages to various sectors.
2. **Initiate U.S.-based consultations.** In coordination with the Mission, the team should begin outreach to key U.S.-based stakeholders, including within USAID, other parts of the U.S. Government, and non-governmental and private sector actors. Preliminary stakeholder consultations will be used to help inform and define key trans-boundary areas of ecological importance, information gaps best addressed via field-based consultations if requested, and in turn, the timing, locations and sequencing of prospective future programs. Additionally, findings from U.S.-based consultations will support a final report analysis and findings. U.S. entities contacted could include:
    - USAID E3 Forestry and Biodiversity (FAB) Office

- USAID LAC Bureau Technical Services
- World Bank
- U.S. Forest Service
- U.S. Fish and Wildlife Service (FWS)
- U.S. Department of State – Ocean, Environment, and Science
- U.S.-based conservation NGOs engaged in conservation activities in the Region (e.g., WCS, WWF, FFI)
- NOAA
- TNC
- Others

3. **Develop draft work plan.** Ten days after the start of the period of performance, the consultant will submit a draft work plan (Deliverable 1).

   The draft work plan will include a schedule of tasks and milestones, assessment methods and a brief discussion of information gaps. The draft work plan will also include a preliminary:
   - ist of the type of information to be obtained through further desk research and through the various consultation processes.
   - Map of regional biodiversity hotspots and trans-boundary areas of ecological importance to help inform the analysis.
   - Mapping of key people to engage throughout the analysis process. This may include additional U.S.-based (predominantly Washington) stakeholders; Mission staff – all sector technical staff, front and program office staff; implementing partners; and other key in-region stakeholders.
   - List of key regional persons to consult with via electronic means to support data collection.
   - Full report outline based on the outline attached to the SOW (refer to Annex A: Analysis Report Annotated Outline in the FAA 118/119 Best Practices Guide), with differences noted and explained, and building from pre-field work examinations.
   - Schedule for written progress reports to, or calls with, the activity manager on a biweekly basis. Calls must be documented with written call notes provided to the USAID activity manager.
4. **Revise work plan.** Following receipt of Mission comments and suggestions on the work plan, the team will revise the work plan and submit a revised final version within five days of receipt of comments.

1.2 MISSION CONSULTATIONS

Note: see Section 5 "Role of USAID Mission" for the role of the USAID activity manager in supporting the in-country program described in this section.

1. Conduct brief meetings with the USAID/ESC's technical team and Mission management to:
   - Orient USAID/ESC participants to the overarching objective of the regional 118/119 analysis, the methodology to be used (i.e., approach the analysis team will take to conduct the analysis and recommendations for potential biodiversity linkages with other sectors) per the approved work plan.
   - Review the approach to the assignment with the Mission and learn specific Mission areas of interest or concerns regarding the planned consultations.
   - Learn of any sensitivities related to the exercise (e.g., political and cultural constraints, Mission challenges in working with regional economic communities, host country governments, or other generalized in-region implementation challenges) that could refine the analysis team's consultations and strategic or programming recommendations (i.e., the potential for raising expectations and the need to be clear about the purpose of the analysis).
   - Understand the Mission's planned timeline for new RDCS development.
   - Gain an understanding of the status of the new RDCS development/results framework and anticipated changes to overarching strategic goals and/or development objectives, to the extent they are known at the time of fieldwork.
2. Consult with Mission's technical team to:
   - Understand current programming (geographic areas of focus, earmarks and related mandates or constraints) and

the ways in which it may have supported or contributed to actions necessary to conserve forests and biodiversity.
    - Learn about planned or potential future programming or strategic orientation.
3. Consult with key stakeholders virtually to better understand the environment as well as to learn about any major related changes observed in the region especially over the past five years.

1.3 PREPARATION OF THE FAA 118/119 ANALYSIS

1. Prepare and submit a draft full report (Deliverable 2). The analysis team will analyze the information gathered and will prepare a draft of the full report, working in accordance with the outline attached to the SOW and responsive to the policy requirements listed in Section 1.1 above. The report will:
    - Follow the outline and include the information recommended in Annex A of the 118/119 Best Practices Guide.
    - Be between 40-50 pages (excluding annexes) and submitted for review by USAID.
    - Include as annexes, where applicable, country-specific information.
    - Copy edited, formatted, and comply with USAID branding requirements.
2. Submit revised report (Deliverable 3). The Mission review period for draft reports will be ten days. The Mission will send the analysis report to the relevant Regional Bureau and Pillar Bureau staff in Washington for their review and collate comments before submitting the draft to the analysis team.

    Following receipt of USAID comments on the draft report, the analysis team will prepare and submit a final analysis within 15 days that incorporates USAID comments.

SCHEDULE AND LOGISTICS

The assignment is expected to last approximately three months from the date of contract signing to submission of the final deliverable. This includes six weeks of initial meetings, data collection and analysis, three weeks to produce the draft report, two weeks for USAID review of the draft report and one to two weeks to produce the final report.

DELIVERABLES

The following are the deliverables for this task:

Deliverable 1. Draft work plan (with schedule) submitted within ten days working days of the team lead's period of performance. The work plan will address all elements specified in Section 1.2.

Deliverable 2. Draft full FAA Regional 118/119 analysis report, conforming to all requirements specified in Section 2.3 submitted in accordance with the agreed timeline.

Deliverable 3. Final report incorporating all comments conforming to all requirements specified in Section 2.3 submitted in accordance with the agreed timeline.

ROLE OF THE USAID MISSION

- USAID acknowledges that substantial Mission engagement is required in support of the analysis team. To this end, the Mission is responsible for arranging the following:
- Virtual consultation meetings with technical offices, including notifying relevant Mission offices (as outlined Section in 1.2) and ensuring their direct participation. When key offices are not able to participate, the Mission will look to include appropriate alternatives that may participate on their behalf.
- Supporting coordination and engagement with relevant in-region bilateral Mission points of contact, including initiating outreach or facilitating introductions virtually. Regional Missions will work with the team to identify the appropriate Embassies to interview and facilitate contacting the Missions.
- Time for the exit-brief presentation.
- Separate, scheduled meetings with the front and program office.

Support also includes providing the analysis team with the following:

- A list of key USAID documents (Mission-wide activity descriptions, reports and evaluations) to review with links or copies of the documents;
- A list of USAID programs for each technical team with brief descriptions of technical remit, A/COR (and contact info), implementing partner (and key point of contact) and maps, ideally a regional map showing the geographic location of all programs;
- A list of key and/or recommended stakeholders (with contact information);
- Assistance to the team in making initial contact to arrange telephone interviews when deemed necessary, particularly to regional economic community and host country government stakeholders for whom USAID Mission outreach is often required;
- A list of relevant donor projects as available;
- Logistics support for site visits if determined necessary, i.e., suggestions for lodging, in-country/ in-region air travel, rental car agencies and logistics specialists; and
- Review and feedback on draft analysis reports.

To ensure continued coordination with the Mission over the course of the in-country work, the analysis team will provide the activity manager weekly progress reports that discuss progress, challenges, issues and key findings to-date. These may be submitted as written memos or conducted by phone with summary notes subsequently provided, as determined by the Mission and analysis team.

STAFFING AND ESTIMATED EFFORT

EI has assembled the following team to conduct this assessment:

Juan Carlos Martínez-Sánchez

EI Project Director, responsible for overall coordination with Activity Manager.

Rob Clausen

Team Leader, responsible for overall coordination of the team, former Regional Environmental Advisor (Caribbean Region), with experience in 118/119, mission programming, forestry, and environmental compliance.

Thera Edwards

Subject matter expert, with experience developing previous 118/119 for the region and Jamaica.

Laurel Wolf

Technical support specialist with climate resilience, environment, and agroforestry experience.

Amy Gambrill and Sue Hoye

Editors, responsible for compliance with USAID guidelines for the report.

Elma King

Financial management, contract specialist. Responsible for billing and other financial matters.

ANNEX B. BIO-SKETCHES

ROB CLAUSEN

Rob Clausen is a seasoned environment and natural resource management expert with more than 40 years of experience domestically and internationally. He began his career as an inventory forester in Alaska for the U.S. Forest Service and the Alaska Department of Natural Resources. His international work started in 1983 as a Peace Corps Volunteer working on a USAID forestry project in Burundi. Since that time, Rob has worked as an environment and natural resource management specialist for international NGOs as well as multiple U.S. Government agencies. Rob has lived and worked 19 years in Africa and six years in the Caribbean.

Rob's technical skills include forestry, agroforestry, biodiversity conservation, protected area management, agriculture, environmental management, and compliance. Rob has written, reviewed, and provided input to FAA 118/119 (Tropical Forest and Biodiversity) assessments in Africa and the Caribbean. He has written numerous technical field reports and co-authored technical papers and studies. Rob was the Africa team forester on the USAID-funded "Conflict Timber: Dimensions of the Problem in Asia and Africa" and the team leader of the USAID 25-year retrospective study on natural forest management: "USAID's Enduring Legacy in Natural Forests: Landscapes, Livelihoods and Governance."

THERA EDWARDS

Thera Edwards holds a Ph.D. in landscape history and a B.Sc. in environmental sciences from The University of the West Indies, as well as a M.Sc. degree in environmental management from the University of London. She has worked in environment and agriculture since 1992 in varying capacities. Her areas of professional expertise and experience include biodiversity, protected areas, watershed management, vegetation ecology, Geographical Information Systems, and mapping as well as project management. In the past 19 years, her work has focused on environmental management and sustainable development, with particular emphasis on biodiversity, forestry, watershed, and protected areas management.

Dr. Edwards has more than 15 years of experience working with USAID, in Jamaica, and the wider Caribbean Region. She has contributed to six FAA 118/119 Assessments as a Biodiversity Specialist. Dr. Edwards has written and co-authored many technical reports and papers for several development agencies as well as for presentation at conferences and symposia. In 2016, she co-edited the volume "Global Change and the Caribbean: Adaptation and Resilience" along with David Barker, Duncan McGregor, and Kevon Rhiney.

LAUREL WOLF

Laurel Wolf is a project assistant for the Latin America and the Caribbean's Environment Support Contract. Laurel's career has focused on environmental and climate issues as an organizer on environmental campaigns, an Agroforestry Extension Agent with the Peace Corps in Senegal, and most recently in international development organizations with a focus on resilient resource management. Laurel's graduate work at American University's School of Public Affairs has included research and writing with Dr. Todd Eisenstadt.

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ANNEX D. CONTACTS

TABLE 5. LIST OF INDIVIDUALS CONSULTED

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COUNTRY / ENTITY	NAME	POSITION	ORGANIZATION	EMAIL ADDRESS
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COUNTRY / ENTITY	NAME	POSITION	ORGANIZATION	EMAIL ADDRESS
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ANNEX E. RESULTS FROM 2013 118/119 STUDY

RESULTS FROM 2013 118/119 RECOMMENDATIONS: ACTIONS NECESSARY TO CONSERVE TROPICAL FORESTS AND BIODIVERSITY – EXTENT TO WHICH PROPOSED ACTIONS MET THE NEED, AND RESULTS SINCE 2013.

The purpose of this section is to look back at how recommendations from the 2013 were addressed to carefully assess how and where ongoing and anticipated USAID activities best align with the actions recommended by this study. In the 2013 study there were eight "action" areas recommended for conserving biodiversity conservation and tropical forests. A summary of the eight include: (i) capacity building and improved communications; (ii) increasing studies on the value of ecological goods and services; (iii) developing permanent data systems; (iv) land/marine use planning; (v) laws and regulations; (vi) establishing baseline data and species monitoring; (vii) alternative livelihoods; and, (viii) improved environmental review. These action areas were then matched with "focus areas" that correlate with the "extent to which proposed USAID actions met the needs." The four focus areas were: 1) Global Climate Change; 2) Citizen security; 3) Economic Growth; and 4) HIV-AIDS. Table 6 at the end of this annex summarizes contributions to the "actions necessary" from the ESC and the CDP. The "actions" and "extent to which" columns in Table 6 are taken directly from the 2013 study.

Table 6 also includes two other columns that summarize what transpired since 2013 in relation to the actions and USAID programs. The third column is for the ESC program (four focus areas); the fourth column is for contributions to the ESC Mission from the regional Caribbean Development Program (CDP), which is managed out of the USAID Dominican Republic Mission. Contributions from the CDP come chiefly from the Caribbean Marine Biodiversity Program (CMBP), which was implemented by the Nature Conservancy from October 2014 – December 2019. Although CMBP was in the design phase in 2013, it was not taken into consideration for the 2013 118/119 study. CMBP covers five seascapes, two of which are in the ESC region (Grenada, and Saint Vincent and the Grenadines).

Table 6 is mostly self-explanatory, but there are some elements that warrant additional information. First, the 2013 "recommended actions – extent to which" alignments for the ESC Mission were largely accurate in that the overwhelming number of actions on both the regional and country levels were linked to current (at that time) and anticipated Global Climate Change activities (Focus Area 1). All four of the FA 1 projects (The Building Regional Climate Capacity in the Caribbean project (BRCCC); the Climate Change Adaptation Project (CCAP); the Rallying the Region to Action on Climate Change (RRACC) project); and, the Adaptation Measures to Counter the Effects of Climate Change (AMCECC) met some of the actions through coral reef work (BRCCC and CCAP), grants for coastal revegetation and mangrove reforestation work (RRACC), and support for policies and legislation (RRACC). The BRCCC program with the Caribbean Institute for Meteorology and Hydrology (CIMH) supported the Coral Reef Watch Program.[117] The CCAP funded the installation of the CREWS (Coral Reef Early Warning System), which is designed to collect real time environmental data from prime coral reef sites. CREWS platforms and associated instrumentation have been installed in Antigua and Barbuda, Saint Kitts and Nevis, Saint Lucia, Grenada, and Saint Vincent and the Grenadines. Suriname and Guyana may also receive CREWS systems in the future. RRACCs support to policies and legislation has led to adoption of three regional policies. The AMCECC program was Barbados specific, but it produced a wealth of baseline information

on drainage and updated the Barbados Stormwater Management Plan; stormwater drainage has a direct impact on the Barbados Gulley system (rich biodiverse terrestrial system) as well as the coastal and near-shore ecosystems. The AMCECC program called for the adoption of an Integrated Water Management approach, which includes efforts to minimize environmental impacts from stormwater infrastructure work for conveyance systems.

Second, it was anticipated that Focus areas 2 and 3 would meet a limited number of "actions necessary..."; that was not the case. Two of the projects in these focus areas (CarSECURE and JJ Reform), which deal with policing and reforms to the juvenile justice system, have no linkage to the biodiversity and tropical forest actions. However, the CFYR project, which includes workforce training and youth volunteer groups, had multiple links that could have been used. The CFYR project was operational in Guyana, Saint Lucia and Saint Kitts and Nevis. Although agricultural and fishery related sector skills were employed in CFYR, biodiversity related actions (e.g., vocational training as nature guides, field technicians, volunteer clean up groups, etc.) were not integrated into CFYR programs.

Finally, the CDP through the CMBP made significant contributions to the "actions necessary..." directly in Grenada and Saint Vincent and the Grenadines as well as the greater Caribbean region. In Grenada and Saint Vincent and the Grenadines, CBMP helped develop coral reef baselines and data systems through the implementation of two biophysical reef surveys (2015 and 2018). CMBP also worked with groups involved with illegal fishing to provide alternative livelihood grants and training that could compliment their household income and help them better respect fishing regulations. CMBP led training on improved seafood handling that was designed to reduce spoilage, thereby allowing fishers in both countries to receive a higher price for their catch, reduce waste and contribute to the overall long-term sustainability of the sector. The fishermen were trained in post-harvest handling of seafood using the internally accredited standards for Hazard Analysis and Critical Control Point (HACCP). CMBP provided training and safety supplies to Carriacou (Grenadines) fishers to enable them to become licensed water taxi operators and earn additional income. CMBP trained 25 members of the Union Island (Grenadines) Fisher Folks Cooperative Society (UIFFCS) in introductory and advanced apicultural techniques. CMBP assisted the Mayreau (Grenadines) Explorers Multipurpose Cooperative to develop a sea moss mariculture business as an alternative/supplementary livelihood for fishers' households.[118]

An "action necessary..." that was not explicitly mentioned in the 2013 study but has been clearly indicated as a need in the current analysis, is sustainable financing. Since 2014 CMBP has worked with the Caribbean Biodiversity Fund (CBF), which was established in 2012 to create reliable, long-term funding for conservation and sustainable development in the Caribbean region. In addition to the CBF there are National Conservation Trust Funds (NCTFs), and CMBP helped establish NCTFs for Antigua/Barbuda, Grenada, Saint Vincent/Grenadines, Saint Lucia, and Saint Kitts/Nevis. CMBP also led the design of a USD 29 million Ecosystem based Adaptation (EbA) facility, which was established as the first sinking fund within the CBF (from multiple donor sources), with grants to support the use of biodiversity and ecosystem services for effective climate change adaptation measures.

TABLE 6. RESULTS FROM 2013 118/119 RECOMMENDATIONS

ACTIONS NECESSARY TO CONSERVE TROPICAL FORESTS AND BIODIVERSITY	EXTENT TO WHICH PROPOSED ACTIONS MEET THE NEEDS	RESULTS FROM ESC PROGRAM	RESULTS FROM CBF
Improve coordination, including clarification of jurisdiction among key governmental agencies. Provide funding, training, and capacity-building for employees of governmental agencies charged with environmental management and protection. Strengthen capacity of local/national NGOs and CBOs.	Focus Area 2 targets at-risk youth, and will support life skills development, basic education assistance, technical and vocational training, business skills development, internships, and assistance with job placements.	The programs/projects funded under "Focus Area 2" do not align with the "Actions Necessary" list. Government agencies involved in youth, security and justice reform do not have the mandate to address these actions. However, programs/projects funded under Focus Area 1 did contribute to improving coordination and capacity building of government agencies charged with environmental mgt. through the CREWS program as well as the AMCECC program, which was managed by the Coastal Zone Management Unit of the Government of Barbados.	CMBP provided support to the development and operation of five national conservation trust funds (NCTFs) in ESC that provide financing for long-term management of MPAs (financial sustainability) – though financial sustainability is not specifically mentioned as an action in the 2013 study, it indirectly supports this "Action." Indirect support to this Action – CMBP led the design of the EbA Facility as part of the CBF.
Perform studies of the socioeconomic value and ecological goods/services of natural resources (reefs, etc.) to tourism, real estate, and fisheries	Focus Area 1 will assist countries with adaptation measures to mitigate the effects of climate change integrating the private sector, NGOs, and local communities.	FA1 – The CCAP project addressed this action indirectly through the implementation of the CREWS program; in Barbados the AMCECC program provided a wealth of information on sectoral studies.	Regional Parrotfish Conservation Campaign. CMBP designed and carried out a major regional parrotfish conservation campaign to reduce parrotfish catch.[119]
Develop a permanent, reliable system and database to obtain, process, and analyze data, including spatial data (i.e., geographic information systems (GIS) and satellite imagery), especially for reefs and forests.	Focus Area 1 will assist countries with adaptation measures to mitigate the effects of climate change integrating the private sector, NGOs, and local communities.	FA1 – The BRCCC program, with the CIMH and NOAA, supported the development of the Caribbean Coral Reef Watch.	CMBP conducted "Reef Biophysical Conditions" surveys in 2015 and 2018 for Grenada, and for the Saint Vincent and the Grenadines seascapes.
Develop a comprehensive land use and coastal management plan to control coastal development and protect biodiversity and important ecosystems.	Focus Area 1 will integrate the private sector, NGOs, and local communities into the process of identifying and implementing adaptation measures.	AMCECC updated the national stormwater management plan for the west side of Barbados as well as site specific plans and infrastructure designs that were developed in association with community groups, NGOs and local leaders.	CMBP played a role in planning for and facilitating the declaration of the Grande Anse MPA in Grenada. Management of MPAs in Grenada and Saint Vincent/Grenadines has been improved with CMBP support. CMBP helped develop the Marine Protected Area management effectiveness tool. CMBP provided support for the development of Marine Spatial Plans (MSP) for Grenada and Saint Vincent/Grenadines.

ACTIONS NECESSARY TO CONSERVE TROPICAL FORESTS AND BIODIVERSITY	EXTENT TO WHICH PROPOSED ACTIONS MEET THE NEEDS	RESULTS FROM ESC PROGRAM	RESULTS FROM CBF
Acceleration of approval and implementation of/ update environmental laws and regulations	No proposed USAID focus areas meet this need.	FA1 – The RRACC project worked to support: i. The adoption of an OECS Model Water Policy and Law by all PMS; ii. The implementation of Model Legislation for Integrated Coastal Zone Management for the region; iii. The adoption and mainstreaming of the OECS Climate Change Policy Statement; iv. Land Policy for Carriacou and Petite Martinique.	No input
Establish baseline data and monitor endangered species, reefs, and forests (priority species/ ecosystems).	No proposed USAID focus areas meet this need.	FA1- The CCAP program provided indirect support to this action under the MACREAS activity that provides coral reef restoration in Barbados, Saint Lucia and Grenada. The BRCCC program, with the CIMH, supported the development of the Caribbean Coral Reef Watch.[120]	CMBP helped develop the Coral Reef Assessment Tool. CMBP conducted "Reef Biophysical Conditions" surveys in 2015 and 2018 for the Grenada and Saint Vincent/Grenadines seascapes.
Support alternatives to hunting, overfishing and other activities that damage natural resources and increase threats to biodiversity.	Focus Area 2 targets at-risk youth, and will support life skills development, basic education assistance, technical and vocational training, business skills development, internships, and assistance with job placements. Focus Area 3 will increase the ability of youth to participate in emerging market employment opportunities, enhance their healthy lifestyles, obtain quality education and training, thereby reducing the allure of involvement.	FA 1 – The RRACC project provided indirect support through coastal revegetation work and erosion monitoring in Grenada and mangrove restoration in Saint Lucia. The project also used school children and local volunteers for coastal revegetation planting. FA 2 and FA 3 – The possibilities of training youth with technical skills relative to biodiversity conservation could have taken place in the CFYR program, but those actions were not realized.	CMBP grants and training provided for improved seafood handling, water taxi operators (training fishermen), sea moss production, and apiculture granted to fisher groups in Saint Vincent/Grenadines and Grenada.
Establish rigorous environmental review/impact assessment for projects. Ensure that fair and transparent EAs are conducted and that mitigation is implemented and monitored.	Focus Area 1 will assist countries with adaptation measures to mitigate the effects of climate change integrating the private sector, NGOs, and local communities.	Though not directly addressing this "Action" – All ESC programs were subject to environmental review. The AMCECC program Environmental Assessment was conducted collaboratively between the Government of Barbados, their contracted engineering firm and the USAID ESC Mission.	Though not directly addressing this "Action" – All grants under the CMBP developed Environmental Management and Monitoring Plans (EMMPs).

ANNEX F. THREATS

LOSS OF HABITAT DUE TO COASTAL AND RESIDENTIAL DEVELOPMENT

Tourism is a crucial sector to the economy of the Eastern and Southern Caribbean. However, the rise in tourism has brought ecological consequences that cannot be ignored. Overtourism describes the adverse impact of uncontrolled tourism growth that influences the well-being of citizens and the degradation of natural habitats and biodiversity, which may result in diminishing visitor experiences and expenditures.[121] In one study in Aruba, the mounting risks of overtourism were associated with increasing social costs of low labor participation, low productivity, and increasing income inequality, as well as significant loss of scarce natural habitats, coastal erosion, and environmental decay. These are compounded by stresses from climate change; this relationship is depicted in Figure 9.

Small island tourism economies confront significantly higher risks from both climate change and overtourism, with Saint Maarten, Cayman Islands, and Saint Kitts and Nevis being exceedingly vulnerable. While Barbados, Bermuda, and the Bahamas seem relatively less exposed to extreme weather events and ecological shocks, the devastating effects of hurricanes between 2017 and 2019 are a clear reminder that small island tourism economies are not immune to climate change, regardless of their geological position and history with climate change.[122]

Improper siting of hotel infrastructure is a significant threat to habitat and associated biodiversity. An IUCN report in 2011[123] cited two examples from ESC countries. One is Lighthouse Bay Hotel in Barbuda, built on a spit of land between the ocean and the Codrington Lagoon. The IUCN report stated that the siting of this hotel would damage the beach. Codrington Park authorities reported during field visits with USAID ESC and DR personnel in 2016 that the environmental impact assessment recommendations for the resort were not properly implemented. A second example of poor planning and design in relation to siting is Rodney Bay in Saint Lucia where sewage treatment was inadequately addressed.

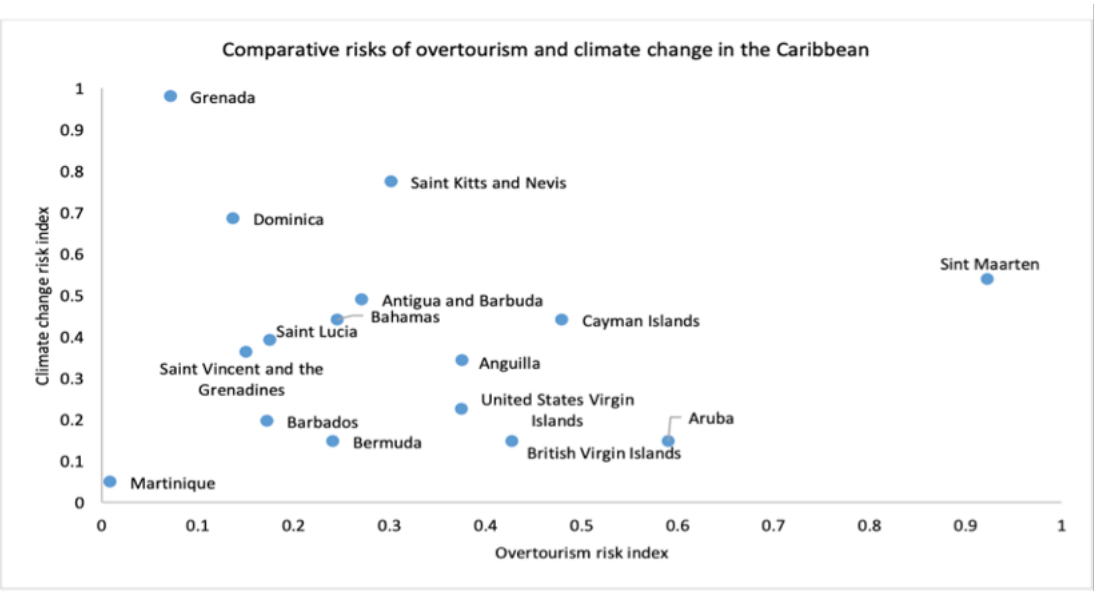


Figure 9. Benchmarking Aruba's Overtourism and Climate Change Risks. Adapted from UNDP, 2010; WTTC, 2017[125]

Cruise tourism has grown substantially during the past several decades. The environmental costs of the sector are difficult to determine since the cruise industry is largely unregulated. Furthermore, it is difficult to gauge its impacts, despite enforcing environmental standards for the industry. One U.S.-based civil society group, Bluewater, describes cruise ships, which can carry 5,000 passengers and crew, as "floating cities" producing large volumes of waste.[124] Table 7 lists the type of waste and damage produced by a typical 3,000 passenger cruise ship. It should be noted that the ESC countries regularly receive cruise ships that range from 800 passengers and crew to more than 6,000. The majority of the cruise ships in the ESC appear to be in the 3,000+ range of passengers and crew.

TABLE 7. CRUISE SHIP WASTE (ADAPTED FROM BRIDA AND ZAPATA (2010).

TYPE OF WASTE	DESCRIPTION	DAMAGE FROM A LARGE SHIP (3,000 PASSENGERS)
Blackwater	Sewage and wastewater from toilets and medical facilities, which can contain harm-ful bacteria, pathogens, diseases, viruses, etc.	15,000 to 30,000 gallons per day
Greywater	Wastewater from the sinks, showers, galleys, laundry, and cleaning activities	90,000 to 255,000 gallons per day
Solid waste	Includes glass, paper, cardboard, aluminum and steel cans, and plastics	24 percent of solid waste from vessels worldwide (by weight) comes from cruise ships
Hazardous wastes	Includes discarded and expired chemicals, medical waste, batteries, fluorescent lights, and spent paints and thinners, among others	Quantities are small, but their toxicity to sensitive marine organisms can be significant
Bilge water	Contains solid wastes and pollutants with high amounts of oxygen-demanding material, oil, and other chemicals	An average of 8 metric tons of oily bilge water for each 24 hours of operation
Ballast water	Often contains non-native, nuisance, exotic species that can cause extensive ecological and economic damage to aquatic ecosystems	There is little cruise industry-specific data on the issue
Air pollution	Generated by diesel engines that burn high sulphur content fuel, producing sulphur dioxide, nitrogen oxide, and particulate, in addition to carbon monoxide, carbon dioxide, and hydrocarbons.	Little cruise industry specific data on this issue

INVASIVE PLANTS AND ANIMALS

The Caribbean has an exceptionally high level of species endemism that supports extremely diverse ecosystems of global ecological and economic importance. Biodiversity on SIDS is fragile and particularly vulnerable to invasive alien species (IAS) due to their relatively low buffer capacity to severe environmental fluctuations and events. The fact that species become concentrated in small and fragmented areas, and that some endangered species have below critical mass breeding populations that are further restricted by habitat fragmentation, further exacerbates their vulnerability."[126]

The Convention on Biological Diversity defines IAS as "species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity." These species often come to their new habitat through human travel or trade. While they may start out in an ecosystem with a low population, if the new habitat is similar to their home habitat, and if they have no natural predators, they can begin to spread quickly and outcompete native species, which can stress the ecosystem.[127]

Invasive species can damage ecosystems by out-competing native species, preying on these species, and decreasing regional biodiversity. Their damage to economies and society are also important, as invasive species can result in disease outbreaks (for example due to invasive mosquitos), agricultural losses, or the destruction of habitat crucial to tourism.[128] Many options exist for eradicating or managing the various invasive alien species in the region, and cost-benefit analyses have been conducted for a few of these options.[129] The following is a brief description of key invasive species in the ESC region.

Giant African Snail

The Giant African Snail (*Achatina fulica*) is a tropical species native to East Africa. It can grow as large as 20 cm and weigh as much as a kilogram. They are now widely distributed in southern and eastern Asia, as well as many islands of the Indo-Pacific and the Caribbean. The snail has often been deliberately introduced for food, medicinal use, or as an ornamental species. They are capable of surviving adverse conditions. They are listed in the top 100 invasive alien species globally.[130]

Giant African Snails are already present in several Caribbean countries, in particular in Antigua and Barbuda and Trinidad and Tobago.[131] In terms of environmental impact, the snails feed on indigenous vegetation and pose a conservation problem by altering habitat and out-competing other snails for food. For agriculture, they have become a destructive pest of crops and garden plants. To humans, they are vectors for disease, such as eosinophilic meningitis, caused by the parasite rat lungworm that is passed to humans through eating raw or improperly cooked snails.

The snails are commonly consumed in their native range, and they are the focus of several traditional recipes (e.g., "green-green" from Ghana[132]); the snails are recommended for consumption in Nigeria due to their high protein content and high level of trace and minor elements.[133] Like lionfish, if the snails become part of the regional cuisine, that activity alone would go a long way to controlling their spread. At this time, however, the consumption of the Giant African Snail is not part of the ESC culture, and improper preparation of the snails can lead to serious illness as noted above.

Green Monkey

The Federation of Saint Kitts and Nevis is currently participating in an UNEP IAS initiative to better understand the impacts of invasive species on island biodiversity and economies. The invasive alien species of focus in Saint Kitts and Nevis is the African Green Monkey (*Chlorocebus sabaeus*).[134] While the monkeys' impact on agriculture is fairly well documented, there is a significant gap in our understanding of the species' impact on biodiversity. The green monkey is also found in Barbados.[135]

Green Mussel

The Asian Green Mussel (*Perna viridis*), also known as the Philippine Green Mussel, is a bivalve belonging to the family Mytilidae. The mussel is economically important in several countries where it is harvested for food; however it is known to harbor toxins, which are hazardous to human health, and cause damage to submerged structures such as drainage pipes. It is native to the Asia-Pacific region and was

introduced in the waters of Australia, the Caribbean, Japan, North America, and South America via boat hulls and ballast.

As an invasive species, the mussel is notorious for clogging and corroding water pipes used by industrial complexes, fouling marine equipment, and threatening the sustainability of the shellfish fishery. It also has the potential to displace native mussels by introducing harmful parasites and diseases.[136]

Lionfish

The Indo-Pacific Lionfish (*Pterois volitans*) was introduced in the Caribbean in 1998 and has been advancing throughout the region ever since. Its voracious appetite is a threat to all juvenile reef fish. Lionfish were first seen in 1985 in North Carolina, United States, in Bermuda in 2001, and the Bahamas in 2004. They are now listed as a priority IAS in Jamaica and have spread throughout the Bahamas and the northern Caribbean. They are efficient carnivores that feed on a wide variety of smaller fishes, shrimps, and crabs, out-competing native species. They also have the potential to decrease the abundance of ecologically important species such as parrotfish and other herbivorous fishes that keep seaweeds and macro-algae from overgrowing corals. The potential for loss to commercial fishers and reef-based tourism is severe. Venomous spines are also a serious threat to human health.[137] Fortunately, the meat of the lionfish is generally recognized as being light and buttery and it adapts well to a wide range of recipes and sauces. It is also the focus of spearfishing dive competitions throughout Florida and the Caribbean to control numbers while answering culinary demand.[138]

Green Iguana

The Lesser Antillean Iguana (*Iguana delicatissima*) is listed as "Endangered" on the IUCN Red List of threatened species. This iguana species originating from the northern Lesser Antilles (islands, West Indies), historically ranged from Anguilla to Martinique. It has now disappeared from several islands and is vulnerable on the others.

The Green Iguana (*Iguana iguana*) is native to South America and Central America. It is more adaptable, and more aggressive than the Lesser Antillean Iguana. The Green Iguana population is currently expanding to the detriment of the Lesser Antillean Iguana population. The main cause of Lesser Antillean Iguana decline is habitat loss and fragmentation, but other threats include road casualties, illegal hunting, predation by feral and pet carnivores (cats, dogs, mongooses) and to a lesser extent by raccoon (*Procyon lotor*), as well as hybridization and competition with the invasive Green Iguana. Wherever both species share the same habitat, hybridization is common. Hybrid offspring have been found to be fertile, and the gene pool of Iguana delicatissima is now being diluted by the gene pool of Green Iguana.[139]

Rats

Rats (*Rattus spp.*) are a major problem throughout the ESC. They will eat a wide variety of foods, from plants and seeds to bird and reptile eggs and small animals; they are a significant threat to native biodiversity in the ESC. Unfortunately, it appears as though rats thrive after storm events in the Eastern Caribbean.[140] As noted for Redonda Island (Antigua and Barbuda), efforts are underway to eliminate or at least control rat populations on Caribbean islands.[141]

Mongoose

The Indian Mongoose (*Herpestes javanicus*) was introduced into the Caribbean in over a century and a half ago, primarily to control rats in sugar cane plantations. They are an extremely adaptable species and feed on a wide range of animals. They are especially fond of sea turtle eggs and hatchlings, and they are a major threat to sea turtle populations.[142],[143]

White Top

White Top (*Parthenium hysterophorus*) is a highly invasive weed native to North and South America. It is widespread throughout the tropics and causes serious economic damage to crop production. It contains toxins that can cause illness and even death in cattle. It is an aggressive weed that is resistant to most herbicides; manual uprooting is the recommended method of control.[144]

Sargassum

There are more than 300 species of Sargassum, a brown algae that is now commonplace in the Caribbean but was once only an occasional visitor to the shores of the ESC region. Since 2011, its occurrence is a regular event preventing fishers from getting into the water and entangling their nets and propellers. It has entangled sea turtles and dolphins, fatally preventing them from surfacing for air. When sargassum dies offshore, it smothers seagrass meadows and coral reefs.[145],[146]

Scientists have begun tracking Sargassum using infrared-detecting satellites. This research has revealed that the large blooms of algae were not primarily originating in its namesake, the Sargasso Sea, but rather from the mouth of the Amazon.[147] Four factors, including a strong Amazon discharge, strong West African upwelling, moderate temperatures, and the presence of a seed population, could potentially explain why it appears every summer and why it was especially thick in 2015 and 2018. Due to a lack of good data on all four factors, Sargassum blooms will continue to be difficult to predict for the time being.[148]

DISEASES

Stony Coral Tissue Loss Disease

Stony coral tissue loss disease (SCTLD) is a new lethal disease first reported in Florida in 2014. The cause of the disease is unknown, but it is affecting more than 20 species of corals. The disease spreads quickly causing high coral mortality. It has spread from Florida, with outbreaks confirmed in the Caribbean off Jamaica, Quintana Roo (Mexico), Saint Maarten, Saint Thomas, the Dominican Republic, Turks and Caicos Islands, Belize, Saint Eustatius, Saint John, Puerto Rico, and Grand Bahama.

Sick colonies display multiple lesions and quickly die. Highly susceptible species are the meandroid corals, i.e., pillar corals (*Dendrogyra cylindrus*), elliptical star corals (*Dichocoenia stokesii*), smooth flower corals (*Eusmilia fastigiata*), and maze corals (Meandrina spp). Starlet corals that develop numerous "blotchy" lesions, as well as diverse brain and star (boulder) corals, are also attacked, followed by star corals (*Orbicella spp*) and other coral species.[149] Scientists are unsure of the nature of the infection, but it seems that antibiotic treatment, such as amoxicillin paste, have helped corals heal.[150] Figure 10[151] shows confirmed cases in Saint Eustatius, and the disease seems to be moving into the Eastern and Southern Caribbean from the north.

Efforts are underway in Florida waters to thwart the spread of the disease. NOAA is partnering with the Caribbean and Gulf Fisheries Institute and the Florida Department of Environmental Protection to implement a number of initiatives including gene banks, citizen diver outplanting activities, technical workshops, a GIS-based, online monitoring dashboard tool, and a reef restoration and awareness campaign. The program will be implemented in conjunction with "Force Blue," which is the only non-profit organization in the world that retrains and redeploys former Special Operations veterans to assist in marine conservation efforts.[152] Some of these initiatives will be replicable in the ESC region if, as anticipated, the disease spreads to a wider area in the Eastern Caribbean.

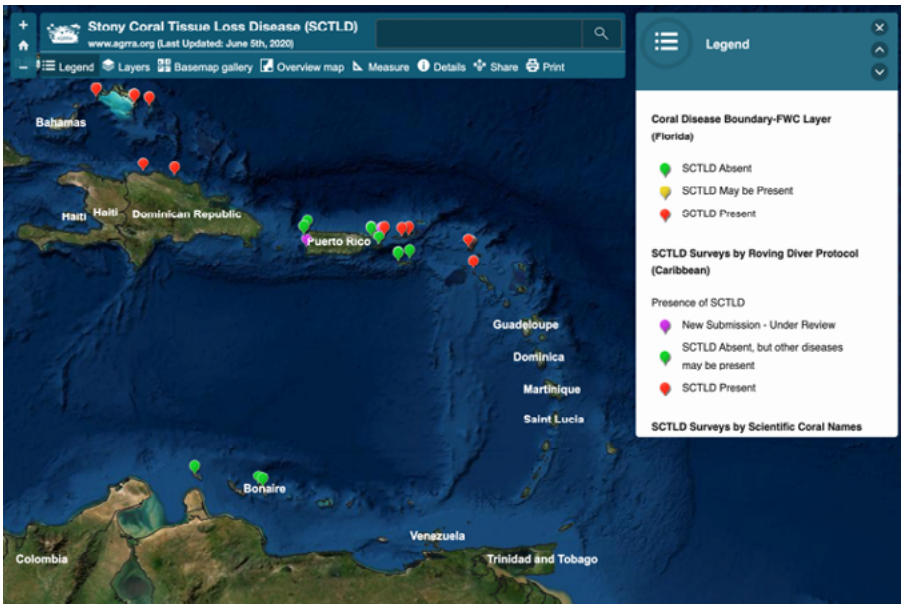


Figure 10. Current Range of SCTLD. Source: AGRRA

Caribbean Spiny Lobster Virus

The Caribbean Spiny Lobster (*Panulirus argus)* is under threat from a deadly virus, Panulirus argus 1 (PaV1), which is found throughout the Caribbean, infecting up to 30 percent of lobsters in some areas. Alongside overfishing, it is the biggest danger spiny lobsters are facing today. This is important because the species plays a vital role as both predator and prey in Caribbean seagrass and reef ecosystems. The annual catch of about 40,000 tons supports local fisheries and provides a food source for people across the world.[153]

Banana Diseases

The banana (*Musa spp*) is among the most important tropical crops, as both a dietary staple and an exported cash crop in the ESC. Bananas and plantains are the seventh most important crop by production in the developing world. Pests and diseases of bananas have been among the most rapidly spreading of all crops in recent years. The re-emergence of Fusarium Wilt (Fusarium oxysporum f. sp. cubense), also known as Panama Disease, in the form of Tropical Race 4 (TR4) from Southeast Asia, is of particular concern to the export industries of Latin America and the Caribbean, because planted cultivars of Cavendish bananas are highly susceptible to the disease.

Another fungal disease known as Black Sigatoka or Black Leaf Streak Disease has recently emerged from Asia and now causes the greatest yield losses in banana plantations globally. Black Sigatoka is caused by the Ascomycete fungus Pseudocercospora fijiensis (formerly *Mycosphaerella fijiensis*). P. fijiensis spreads via aerial spores, infecting banana leaves via the stomata and causing characteristic streaked lesions and cell death when fungal toxins are exposed to light. The disease is virulent against a wide range of banana genotypes, and infected plant yields are reduced by up to 80 percent if untreated.[154] The disease is established in the ESC.

Black Sigatoks Lesions on Banana in Saint Lucia. Credit: R. Clausen

Amphibian Disease

Another emerging disease is the amphibian chytridiomycosis caused by the recently described chytrid fungus (*Batrachochytrium dendrobatidis*). This disease is capable of driving amphibian populations and species to extinction. Within the Caribbean, the amphibian chytrid is known to occur on the islands of Cuba, Dominica, Montserrat, Puerto Rico, and Tobago. The disease has been implicated in the decline of one of the world's largest frogs, the critically endangered mountain chicken (*Leptodactylus fallax*) on Dominica and Montserrat, and it is suspected in the probable extinction of three species from Puerto Rico. Chytridiomycosis presents a unique challenge for biodiversity conservation because the pathways of transmission and the way it kills amphibians are not well understood.[155]

Avian Malaria

Plasmodium relictum is one of more than 40 species of Plasmodium that can infect birds and cause avian malaria. It has had a substantial effect on the geographic and altitudinal distribution of endemic forest birds in the Hawaiian Islands and has contributed to their decline and extinction over approximately the past 90 years.[156]

Avipox

The avian poxviruses (genus *Avipoxvirus*) constitute a group of viruses in the subfamily Chordopoxvirinae, family Poxviridae. Avian pox was one of the earliest described diseases of birds due to its distinctive gross lesions and histopathology. Avian poxviruses cause economically significant disease in chickens (fowlpox), domestic turkeys (turkeypox), farmed game birds (quailpox), and caged canaries (canarypox).[157]

Fireblight

Fire blight (*Erwinia amylovora*) is a serious disease of plants in the subfamily Maloideae, especially apple, pear, quince, and loquat. Epidemics, although sporadic, are often devastating depending on the occurrence of favorable climatic conditions, the amount of initial inoculum and virulence of the pathogen, and the susceptibility of the host species. Therefore, in any given site where fire blight is present, the disease can either be devastating or of secondary importance, according to the year and the varieties grown.[158]

OIL DRILLING & NATURAL RESOURCE EXPLOITATION

The ESC boasts numerous natural resources, and many have not yet been exploited or are just beginning to be exploited. As noted earlier, oil and natural gas reserves in Guyana and Suriname have gained a significant amount of international attention (Figure 11).

Offshore oil exploitation is often associated with oil spills, which include the uncontrolled release of any crude oil, gas, or any other oil by-product. Large-scale spills dramatically affect habitats, species, and human communities. The mitigation of large spills takes decades and can leave behind lasting damage.

Figure 11. Guyana-Suriname Basin Ranked Second-Most Prospective in the World for Oil[159]

ARTISANAL MINING AND MERCURY

Gold mining is a major industry in both Guyana and Suriname; diamonds are also mined in both countries, especially in Guyana. Gold mining is conducted on industrial and artisanal scales, and mining activities are having a significant impact on human and ecosystem health. Mercury-dependent artisanal and small-scale gold mining is the largest source of mercury pollution on Earth. In this practice, mercury metal is used to extract gold from ore as a stable amalgam. The amalgam is then heated to evaporate the mercury and isolate the gold. The evaporated mercury then returns to the soil and enters the surface and groundwater systems where it can be assimilated by animals and enter the food chain (Figure 12). This still widespread technique has been used for thousands of years.[160]

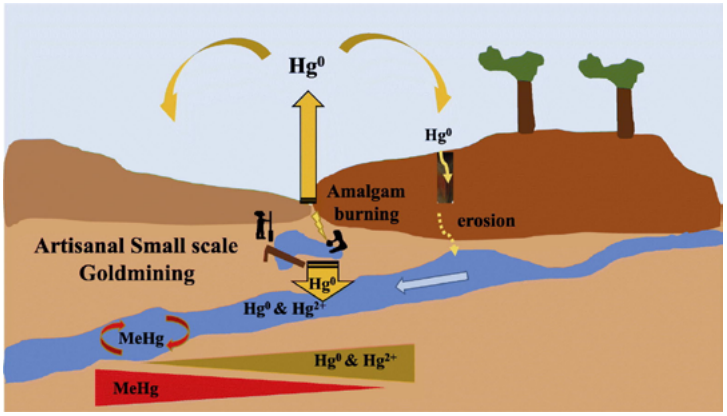


Figure 12. The Flow of Mercury from Artisanal Mining. Source: Niane, B. et al. (2019)[161]

Mercury poses serious health problems for those who work with it. Miners who inhale mercury vapors during the gold separation process often suffer from neurological damage and other health issues. The communities near mining operations are also affected by contamination of water and soil and subsequent accumulation in food staples, such as fish.[162] Because mercury is a persistent substance, it can build up in living organisms, inflicting increasing levels of harm on higher order species such as predatory fish and fish-eating birds and mammals through a process known as "biomagnification"[163] Mercury pollution also damages the wider ecosystem, compromising food chains and biodiversity. It has been demonstrated that mercury emissions can adversely affect algal growth, crustacean health, fish growth, brain function, reproduction, and amphibian larval health and survival.[164]

In proposing a solution to any one of these problems and challenges, it is essential that the technique, chemistry, and equipment be low cost, require minimal capital outlay, be able to operate in remote locations, and be easy to use. It is also important that the benefit to the miners be immediately obvious, so expediency in financial returns and health benefits are critical (Figure 13).[165]

A positive development since the 2013 118/119 study is the ratification of the Miamata Convention on Mercury, which is a global treaty to protect human health and the environment from the adverse effects of mercury. The Minamata Convention entered into force on August 16, 2017.[166] Guyana and Suriname have both ratified it.

Chemistry Research Opportunities for Supporting Artisanal Gold Mining

Key requirements for uptake: inexpensive, scalable, easy to use, obvious benefit, local engagement

Mercury detection	Risk mitigation	Remediation	Mercury-free mining
Rapid and disposable testing kits for air, water and soil	Air filters and masks to prevent inhalation of mercury vapor	Mercury capture from tailings ponds and water courses	Safe chemistry for extracting and recovering fine grain gold from ore
Point of care diagnostics for mercury exposure and poisoning.	Filters for water used for drinking and irrigation	Removal, recovery or immobilization of floured mercury in tailings	Safe chemistry for extracting gold from tailings
	Strategies for safer mercury recovery and recycling	Soil amendments to prevent mercury uptake in crops	Mining chemistry that results in biodegradable waste

Figure 13. A Summary of Ways in which the Chemistry Community can Support Artisanal Gold Miners' Health and Livelihood. Source: Esdaile and Chalker (2018)[167]

WASTE

Marine debris is recognized as a globally significant stressor on the marine and coastal environment, with impacts on marine biodiversity having been reported over the last four decades.[168] Plastics make up the vast majority of this debris, and can leach toxicants into the water or break down into microplastics, which can both accumulate in marine species. The Caribbean is the second most plastic-contaminated sea in the world after the Mediterranean Sea. Estimations of the volume of plastic waste in this area range from 600 to 1,414 plastic items per square kilometer in different locations.[169] In the ocean it harms marine life and threatens ecosystem health and the region's tourism-based economy. Plastic pollution not only diminishes the natural beauty for which the islands are known, it also compromises the ocean service as a provider of food, other resources, and livelihoods.[170]

ILLEGAL WILDLIFE TRADE

Illegal wildlife trade is estimated to be a multibillion-dollar industry involving the unlawful harvest of and trade in live animals and plants or parts and products derived from them. Wildlife is traded as skins, leather goods, or souvenirs, as food or traditional medicine, as pets, and in many other forms. It includes illegal logging of protected forests to supply the demand for exotic woods, to the illegal fishing of endangered marine life for food.[171] Wildlife trafficking is often conducted in association with other illegally trafficked goods (drugs, weapons, etc.) and used to generate income for gangs, cartels, and terrorist and insurgent groups; patterns and routes in the ESC are somewhat known (Figure 14).

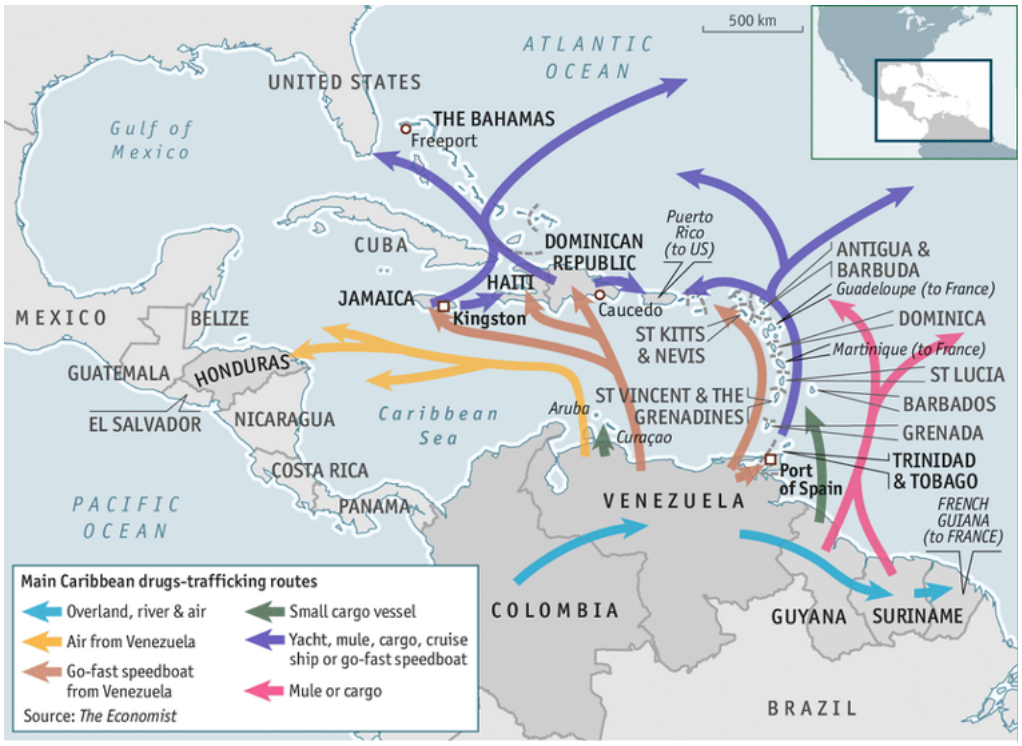


Figure 14. Caribbean Drug Trafficking Routes. Source: The Economist[188]

Trinidad and Tobago is known as a destination as well as a transit point for wildlife trafficking, largely birds from South America. Exotic birds from Venezuela are prized for a range of reasons. Parrots, especially macaws, are sold as pets while songbirds are often used in singing competitions in Trinidad and Tobago, Guyana, and Suriname. Songbirds can fetch up to USD 5,000 apiece.[172] Parrots are regularly trafficked from Guyana to Southeast Asia and from Suriname to Russia.[173]

The tropical forests of Southeast Asia, the Amazon Basin, and Central Africa are at the heart of the global illegal timber trade. Illegal logging, like illegal fishing and illegal mining, divests developing countries of much-needed revenue and jeopardizes sustainable development initiatives.[174] While Suriname and Guyana comprise only 2.1 percent and 3.02 percent of the Amazon forest, respectively, the forest covers over 90 percent of both countries. Illegal logging takes place in both countries, but their governments claim that illegal logging is mostly associated with gold mining operations. It appears that illegal logging is on the rise throughout the Amazon, especially during the COVID-19 pandemic.[175]

Tourists traveling in the Caribbean can find a wide range of animal and plant products sold as jewelry, pets, souvenirs, etc. and must be careful when considering what they will buy. Exporting or importing products made from protected animals or plants is illegal. By making informed choices, tourists can support wildlife conservation around the world.[176]

Private sector initiatives are educating tourists on the sale of illegal wildlife products. Royal Caribbean Cruises Ltd. along with 16 other companies and the U.S. Wildlife Trafficking Alliance (USWTA)[177] pledged to crack down on wildlife trafficking and educate consumers on the dangers trafficking poses to animals around the world. JetBlue, which offers flights from the United States to the Caribbean, has promised to show a movie about wildlife trafficking on every flight.

Another promising development is the formation of the Conservation Leadership in The Caribbean (CLiC) program. Initiated in 2014, this program has a goal to "establish a sustainable, Caribbean leadership-training program enabling effective regional networking and action to achieve sustainable conservation."[178] CLiC has also received support from the U.S. Fish and Wildlife Service[179] to stem the flow of the illegal wildlife trade. As of 2018, CLiC had already trained more than 40 emerging Caribbean conservation leaders from over 14 countries.

In terms of U.S. Government actions since the 2013 study, on February 11, 2014, President Obama issued the National Strategy for Combating Wildlife Trafficking.[180] The United States also addressed illicit wildlife trade through the Eliminate, Neutralize, and Disrupt (END) Wildlife Trafficking Act of 2016[181] and the U.S. Presidential Executive Order on Enforcing Federal Laws with Respect to Transnational Criminal Organizations and Preventing International Trafficking 2017.[182] The END Act directs federal agencies to strengthen law enforcement, reduce demand, and build international cooperation and commitment.[183]

AGRICULTURAL INPUTS (PESTICIDES AND FERTILIZERS)

Poor pesticide and fertilizer use have been a significant environmental issue in the ESC region for decades. Much of this is derived from the fact that agricultural input management approaches and techniques have been largely developed for temperate regions yet introduced into the ESC without adequately taking into consideration the ESC context. There are a range of issues that need attention, with some of the most obvious being the indiscriminate use of pesticides, which results in waste and high levels of chemical residues that present health risks to the general public. Moreover, many ESC countries have become overly dependent on pesticides, which leads to tolerance build up and the perceived need to use greater quantities of pesticides for crop production. The increasing use of pesticides may also be linked to a higher incidence of health issues such as cancer and other maladies. Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a wide range of other organisms including birds, fish, beneficial insects, and non-target plants. Insecticides are generally the most acutely toxic class of pesticides, but herbicides can also pose risks to non-target organisms.[184]

Drainage Canal Channeling Pesticide-Laden Water to Nearby Stream, which Empties into Mangrove Stand Less than 1 Kilometer Away. Credit: R. Clausen

Integrated pest management (IPM) is a sustainable, science-based, decision-making process that combines biological, cultural, physical, and chemical tools to identify, manage, and reduce risk from pests. IPM uses pest management tools and strategies in a way that minimizes overall economic, health, and environmental risks.[185] In IPM, pesticides are considered a measure of the "last resort" and avoided altogether when possible. IPM is not widely practiced in the ESC. The knowledge of pests and diseases is also frequently lacking, which can lead to misdiagnosis and affect crop protection, including the lack of awareness on integrated systems of disease management. It is common for farmers to use inappropriate chemical pesticides or use higher dosages than necessary. Chemicals are often applied at greater frequencies than needed and sometimes with incompatible mixtures.[186] Pesticide and fertilizer runoff from agricultural fields also pollute coastal zones and are a serious threat to the health of coral reef and seagrass ecosystems.

Expired pesticides pose serious human and environmental health problems if not properly disposed of. A positive development in the ESC in this regard was the removal of 319 tons of obsolete pesticides stocks and related wastes, which was confirmed by the Food and Agricultural Organization of the United Nations (FAO) at the 71st Special Meeting of the Council for Trade and Economic Development on Agriculture, held at the CARICOM Secretariat. Antigua and Barbuda, Barbados, Dominica, Guyana, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago received disposal certificates indicating that dangerous obsolete pesticide stocks were removed from their countries and had been safely incinerated at a specialized facility in the United Kingdom.[187]

SHIPPING LANES – MARINE ANIMAL VESSEL STRIKES

Marine animal vessel strikes are a global problem. Until now, the majority of the research has focused on vessel strikes of larger sea mammals, usually whales. However, around 80 species have been recorded to date.[189]

Encouraging responsible vessel practices and understanding the distribution of marine mammals (e.g., whale, dolphins, and seals) and sea turtles are two key components to reducing the risk of vessel strikes. To keep whales safe from ships, the relevant national government agency or department for the management of marine animals should work with the national coast guard agency (e.g., Marine Police Unit for Saint Lucia) and shipping industry leaders to conduct mariner outreach, collect information on vessel strike events, and support surveys and research programs to improve our understanding of animal distribution. NOAA and the U.S. Coast Guard could provide technical assistance and support in capacity building. The Southeast Regional office of NOAA has field offices in Puerto Rico and the U.S. Virgin Islands.

NOAA recommends the following mitigation measures to reduce vessel strikes, modified for the ESC region.[190]

Whales

- Establishing vessel speed restrictions in areas during certain times of the year to reduce the threat of vessel collisions to whales.
- Working with the national coast guards to establish recommended vessel routes and approaches to ports to reduce the overlap of whales and ships.
- Establishing temporary precautionary zones, called Dynamic Management Areas, around recently sighted whale groups in which mariners are asked to reduce speed or steer clear of the area.
- Alerting vessel and watercraft operators to the dangers to whales of collisions.
- Developing and implementing "approach" regulations and guidance for operating vessels around whales in a number of regions.
- Developing and distributing written material, placards, brochures, and interactive CDs, and posting signs in marinas to alert mariners to safe practices around whales.
- Developing and implementing Mandatory Ship Reporting Systems[191] with the coast guard. Ships are required to report to a shore-based station when entering key whale habitats, and in return they receive a message about whales, their vulnerability to ship strikes, precautionary measures ships can take to avoid hitting one, and locations of recent sightings. The systems were endorsed by the UN International Maritime Organization.
- Working with partners to modify shipping routes at a number of heavily used ports to reduce the chances of ship collisions with humpback, blue whales (rare in Caribbean), and other species.
- Supporting apps and tools that provide information to mariners and ships about where whales are located.

Sea Turtles

- Tracking of vessel strike occurrence through the Sea Turtle Stranding and Salvage Network.
- Tracking stranding of sea turtles with injuries caused by vessel strikes in coastal areas to understand the frequency of collisions and risk factors.
- Promoting awareness.

GEOLOGIC EVENTS

Large-scale natural disturbances can have profound impacts on ecosystems. Disturbances such as tsunamis, earthquakes, fires, and hurricanes can lead to a reduction in population sizes and habitat destruction, thereby affecting the abundance and distribution of species, community dynamics, and ecosystem processes in terrestrial and marine ecosystems.[192]

Over the past 500 years, the Caribbean region may have been exposed to approximately 100 tsunamis, of which 20 have been confirmed to have caused significant damage. The Caribbean Basin is an enclosed system, which means that tsunami waves can reach the coastlines in as little as a few minutes to 3-4 hours; this is in stark contrast to the 15-20 hours it can take a tsunami to cross the Pacific Basin. Relatively recent catastrophic disturbances, such as the 2010 earthquake and tsunami in Haiti, have demonstrated critical need for earthquake and tsunami preparedness in the Caribbean (Figure 15).[193]

While hurricanes are relatively common in the Eastern Caribbean, no hurricane has ever completely destroyed the capital of an Eastern Caribbean island and made it completely uninhabitable. Volcanic eruptions have done so twice, to Saint Pierre, Martinique in 1902 and Plymouth, Montserrat in 1997.[194] In Montserrat, a series of dramatic eruptions of the Soufriere Hills volcano devastated the southern two-thirds of the island, including 60 percent of the southern hills forests. The remaining forest areas have been affected by volcanic ash, which has persisted in that environment.[195]

Additionally, while property destruction levels from severe hurricanes generally range from 10-25 percent, property destruction levels (and by extension, casualties) in the Eastern Caribbean caused by volcanic eruptions approach 100 percent in the most severely affected areas. Volcanic eruptions and earthquakes share the common feature that they happen fairly infrequently, but when they do happen the consequences are usually devastating.[196]

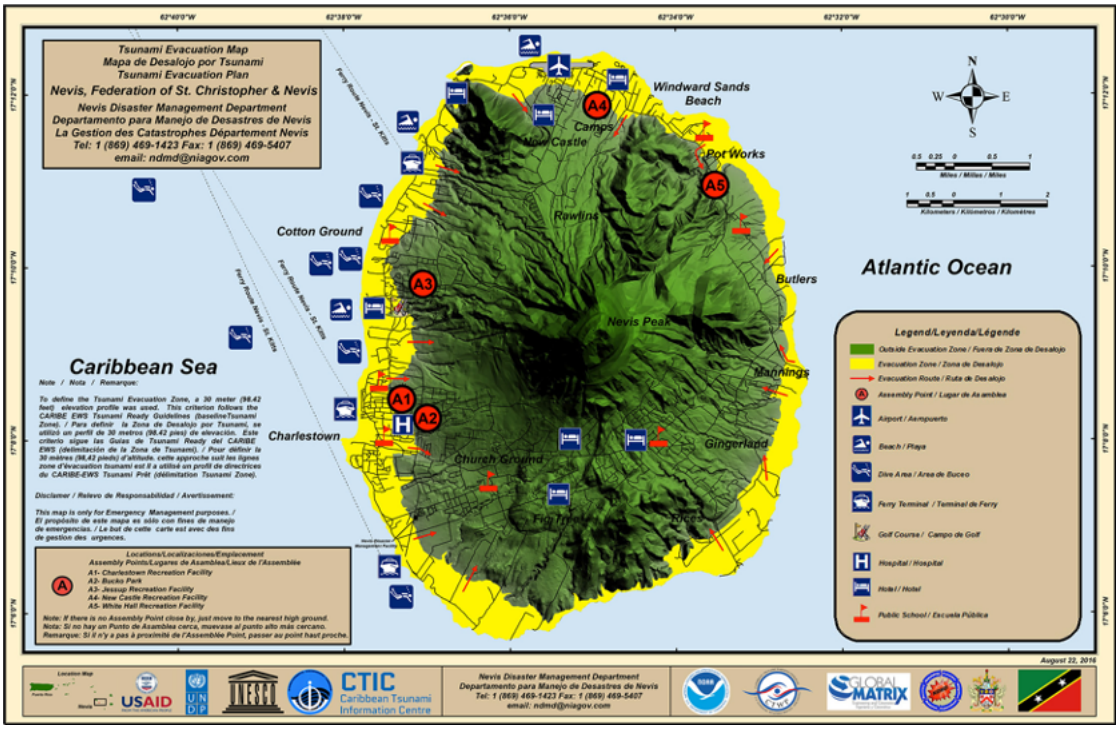


Figure 15. Tsunami Evacuation Map for Nevis in a Government Planning Document

Most of the earthquakes occurring in the Eastern Caribbean are either tectonic or volcanic in origin. Tectonic earthquakes are generated when plates move and accumulated energy is released. Volcanic earthquakes are generated by the movement of magma within the lithosphere.[197] The Eastern Caribbean islands lie on the boundary between the North American and Caribbean Plates. The North American Plate, which is the denser of the two, sinks beneath the Caribbean Plate creating suitable conditions for magma to be produced. The magma then rises to the surface of the Earth where it may erupt to form a volcano. This process is called subduction, which is how the volcanic islands of the Eastern Caribbean were formed (Figure 16).

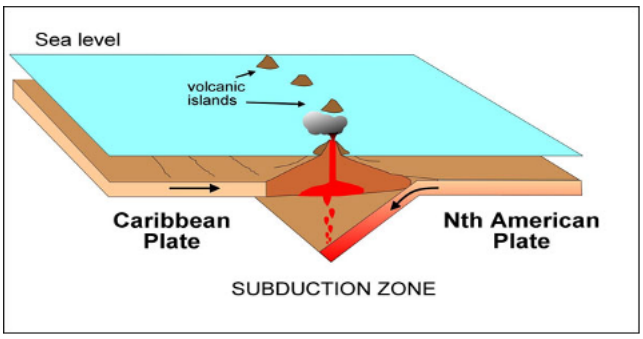


Figure 16. Volcanic Formation in the Eastern Caribbean. Source: University of West Indies Seismic Research Center[202]

There are 19 active (likely to erupt again) volcanoes in the Eastern Caribbean (Figure 17). Every island from Grenada to Saba is subject to the direct threat of volcanic eruptions. Islands such as Grenada, Saint Vincent, Saint Lucia, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, Saint Kitts, Saint Eustatius, and Saba have active volcanic centers, while other islands such as Anguilla, Antigua, Barbuda, Barbados, the British Virgin Islands, most of the Grenadines and Trinidad and Tobago (which are not volcanic) are close to volcanic islands and are, therefore, subject to volcanic hazards such as severe ash fall and volcanically generated tsunamis.[198]

Kick 'em Jenny near Grenada is one of the most active volcanoes in the Eastern Caribbean and the only known active submarine volcano in the region. The last eruption occurred in April 2017. During that eruption, people on the northern coast of Grenada were able to feel vibrations and see the ash cloud rise above the ocean in the distance. The eruption also produced a series of small tsunamis that were about six feet high when they arrived at beaches of Grenada and the southern Grenadines.[199] No injuries or damage were caused by the eruption or the tsunamis, but it called attention to a previously little known but active submarine volcano that has the ability to produce ash clouds, launch pyroclastic material, produce small tsunamis, and release large volumes of volcanic gas. It has erupted at least a dozen times since its first recorded eruption in 1939 but has not caused any reported deaths.[200]

In Dominica, the Morne Trois Pitons are three volcanoes (Morne Watt, Morne aux Diables, and Morne Plat Pays) located in the southern region of the country. Morne Watt is the only volcano in the group to have a recent eruption, which occurred in 1997. The area is a popular eco-tourism spot with hikes and sightseeing trips available.[201]

Figure 17. The Volcanoes of the Lesser Antilles and West Indies

HURRICANES AND TROPICAL STORMS

Hurricanes can negatively and positively affect biodiversity. Some negative effects include the force of wind (particularly on forests and bird species), loss of habitat due to flooding and landslides, and wave pressure on marine ecosystems.[203] Depending on when hurricanes pass through an area, they may have outsized disruptive effects on populations because of timing with breeding seasons.[204]

Hurricanes can have short- and long-term effects on forests as well. In the short term, trees are toppled, snapped, and defoliated. After many hurricanes, researchers have found that these events can even alter tree stand genetics, favoring trees that are shorter, have higher wood density, and are more resistant to disease. Trees may also adapt to encourage defoliation at high wind speeds, which would more likely save the tree at the expense of the leaves.[205] However, these shorter stands that are more frequently disturbed may threaten the large tree species of the region.[206]

Bird species may be affected by wind speeds, but they respond independently to changes in the forest as a result of hurricanes. Some groups, notably frugivores, are more sensitive and more likely to show changes in abundance or occupancy following strong storms.[207]

TABLE 8. LIST OF HURRICANES SINCE 2013 IN ESC

NAME	DATE IN ESC	WIND SPEED IN ESC	PRESSURE IN ESC	CATEGORY IN ESC	COUNTRIES MOST AFFECTED	EFFECTS
Karen	Sept 2019	35 kt	1007	TS	Grenada, St. Vincent and the Grenadines	Storm force winds, heavy rainfall, rough seas
Dorian	Aug 2019	45 kt	1004	TS	Barbados, St. Lucia	High winds, some interruption to power, nationwide lockdowns, emergency services mobilized, clearing drains in preparation[208]
Harvey	Aug 2017	40 kt	1004	TS	Barbados, St. Vincent and Grenadines	Power outages, severe flooding, minor landslides[209]
Maria	Sept 2017	145 kt	922	H5	Dominica	More than 14 people died in Dominica, and the island remained inaccessible after Category 5 Hurricane Maria decimated the island's east coast. At least 80 percent of the island's population was affected and needed support with shelter and water, according to CDEMA.[210] There were cuts in water service, and a cut to the power that resulted in only (TCI) 10 percent coverage in Dominica.[211]
Irma	Sept 2017	155 kt	914	H5	Antigua and Barbuda	On September 6, 2017, Hurricane Irma,[212] a powerful Category 5 hurricane with winds more than 185 miles per hour, affected several eastern Caribbean countries. Irma's wide band swept over Antigua and Barbuda, Anguilla, Montserrat, and Saint Kitts and Nevis, with Barbuda and Anguilla most heavily affected.
Matthew	Sept 2016	50 kt	1008	TS	St. Lucia, St. Vincent and Grenadines	Greater impact on Jamaica, Haiti, Cuba, Bahamas.[213]

Source: NOAA historical hurricanes tracker, [214] ReliefWeb[215]

FLOODS AND LANDSLIDES

Floods and landslides in the ESC are major destructive events that can be triggered by excessive rain, deforested landscapes, or hurricanes. The ESC has suffered unusually frequent floods and landslides since 2013, which have disrupted life in the region.

In December 2013, a tropical storm resulted in heavy rainfall across Saint Vincent and the Grenadines, Dominica, and Saint Lucia. The rain brought heavy flooding across these islands,[216] which seldom see rain that time of the year.[217] Saint Vincent and the Grenadines suffered nine lives lost and more than 500 affected.[218]

Heavy rainfall also affected the coastal regions of Guyana in 2015, where most of the population lives. These floods greatly harmed a community already dependent on agriculture and living with the stresses of inadequate sanitation, water access, and economic opportunity.[219]

Floods and landslides returned to Saint Vincent and the Grenadines in 2016, mostly in the northeast of the island. Homes were lost, as were subsistence crops and livestock; the island's water and sanitation systems were severely damaged, along with roads, pipelines, and bridges.[220],[221]

There was also flooding in Trinidad and Tobago in October 2018 following torrential rainfall. According to Government officials, Trinidad alone received a full month's worth of rain over two days. It was estimated 80 percent of the country was affected by flooding; 100,000 to 150,000 people, main roads, and public services were affected.[222]

Silt-laden reservoir at John Compton Dam, Saint Lucia. This is the result of heavy rain and landslides. The reservoir is the main water supply for the capital, Castries, and surrounding area. Credit: CARS (Caribbean Aqua-Terrestrial Solutions)

DROUGHTS

Pan-Caribbean Drought 2013-2016

The ESC islands are expected to see more frequent and severe droughts with decreased precipitation and increasing evaporation rates due to climate change. Between 2013 and 2016, the Caribbean experienced a widespread drought due in part to El Niño in 2015–2016; anthropogenic warming accounted for approximately 15–17 percent of the drought's severity and approximately 7 percent of its spatial extent. These findings suggest that the projected anthropogenic drying in the Caribbean is already underway, with major implications for people living in this region.[223]

The Caribbean is home to seven of the world's top 36 water-stressed countries. Barbados is in the top ten. The Food and Agriculture Organization of the United Nations (FAO) defines countries like Barbados, Antigua and Barbuda, and Saint Kitts and Nevis as water-scarce, with less than 1,000 m3 freshwater resources per capita. Although the region already experiences wet and dry seasons, a warming climate will more quickly compound soil moisture deficits, affecting tree and plant species as well as agriculture. [224] These sectors, as well as the tourism industry, need reliable water to continue to serve the population and ecosystems.[225]

One important tool under development is the Caribbean Drought Atlas.[226] It provides maps using the self-calibrating Palmer Drought Severity Index[227] and includes historical conditions with data beginning in 1950, as well as time series for specific countries.

ANNEX G. COUNTRY PROFILES

ANTIGUA AND BARBUDA

Major Ecosystem Types and Status

The islands of Antigua and Barbuda have extensive wetlands, beaches, and coral reef ecosystems, as well as watershed systems with accompanying forests. The total land area of all the islands is 443km2. The major ecosystems include:

1. Evergreen forests
2. Xerophytic (dry) forests
3. Watersheds
4. Scrublands
5. Grasslands
6. Mangrove forests
7. Herbaceous swamps
8. Salt ponds
9. Marine and coastal ecosystems

The marine and coastal ecosystems include sandy beaches, rocky shores, coastal lagoons, seagrass beds, coral reefs, and oceanic islands and rocks. Ecosystem variety is enhanced by presence of caves in many sections of the island, and by natural seasonal drainage channels and ponds.[228]

Antigua is internationally known for its 365 beaches (one for every day of the year), an effective marketing tool for tourism. There are also smaller offshore islands with coral reefs and seagrass beds. Collectively, these ecosystems provide habitat for many globally rare fauna. The country is known for one of the rarest and smallest known racer snake (*Alsophis antillensis antiguae*) populations in the world and hosts the largest Frigate Bird (*Fregata magnificens*) nesting ground in the Caribbean (*Codrington Lagoon*). The recovery of the Antiguan Racer is another conservation success story generated in the ESC.

Over the past ten years, there has been significant improvement in the management of biodiversity in the country, but the threats are still significant. Though the country has developed a National Environment Management Strategy and completed an initial draft National Biodiversity Strategy and Action Plan, there is still much work to be done to revise and implement the strategies and plans. Nevertheless, overall biodiversity conservation is trending in a positive direction.

Status of Tropical Forests

There are 54 identified vegetation alliances and associations[229] on Antigua, Barbuda, and Redonda, most of which can be seen on Antigua. Evergreen forests and xerophytic (dry) forests are dispersed throughout Antigua. Thorn woodlands dominate in the limestone region of the island, while littoral woodlands exist on various shorelines and slopes (vegetation map **Annex J**). In Barbuda, woodland areas dominate the center and south of the island.

In 2001, Antigua and Barbuda contained 19,300 hectares of forest (roughly 44 percent of the country terrestrial surface area). From 2001-2019, there has been a slight decrease in tree cover (757 hectares), with much of this coming during 2017 (72 ha.) and 2018 (163 ha.).

Dry Forest in Barbuda. Credit: R. Clausen

Species Diversity and Status

The three islands share many plant and animal species with other Lesser Antillean islands, but diversity and level of endemicity varies widely among different taxonomic groups. The population trend for most globally threatened species on Antigua and Barbuda is in decline, with the notable exception of two species recorded to be on the increase thanks to the success of conservation efforts: the West Indian Whistling Duck (*Dendrocygna arborea*) and the endemic Antiguan Racer (*Alsophis antiguae*). Both species still remain on the IUCN Red List, with the former classified as vulnerable and the latter critically endangered. Many terrestrial animals have become rare, endangered, or extinct due to the loss and/or fragmentation of natural habitats such as forested areas and grasslands. Marine organisms are negatively affected by the degradation of mangroves, wetlands, seagrass beds, and coral reef ecosystems.

At least 29 species of reptiles and amphibians have been documented on Antigua, Barbuda, and Redonda, of which 21 are probably native herpetofauna. Eight reptiles (47 percent of the native land herpetofauna) are national endemics, and at least one frog and three reptiles (24 percent of native land species) are Lesser Antillean endemics. Unfortunately, extinction rates have also been high, with at least five indigenous species lost: *Iguana delicatissima, Leiocephalus cuneus, Boa constrictor, Copeoglossum redondae,* and *Clelia clelia.*

Genetic Diversity

The GEF Pathway to 2020 Project has developed community management pilot activities for in situ management of globally significant biodiversity. The project funded a sustainable uses feasibility study and implementation of options for storage of genetic material for research and analysis purposes and seed banks. The project also helped increase uptake and cultivation of locally adapted varieties and landraces through outreach and capacity building and promoted the adoption of management practices consistent with protected area ecosystem services by farming communities. The threats to agricultural biodiversity are the lack of adequate research, lack of ex situ facilities, very little protection of intellectual property, and the lack of trained personnel for the implementation of approved policy initiatives.

Status and Management of Protected Areas

Since the 2013 118/119 study, there has been an increase in the number of proposed protected areas. They currently include:

- Mount Obama/Boggy Peak National Park
- Shekerley Mountain Managed Area
- Redonda – Redonda Restoration Program
- Body Ponds Forest Reserve – Forestry Unit
- Wallings Forest Reserve – (John Hughes Community Group)

Overall, the human resources and management capacities of the protected areas system are not adequate. The PAs operate more or less in isolation; a coordinated management system is needed. The GEF Path to 2020 Project is also currently working on improving PA management. Thus far, the project is developing a framework to coordinate the protected areas system including financial cohesion, a protected area coordinating mechanism, a training program for communities, and an NGO and government PA monitoring system. The project will lead to the gazettement and management of a new protected area (the Shekerley Mountain Management Area, estimated 3,035 hectares).

Status and Management of Key Natural Resources Outside of Protected Areas

Deforestation rates are relatively low throughout the country. Outside of marine and wetland protected areas, however, poorly planned development continues to degrade coastal resources. Some of this development even directly affects the protected area system (e.g., Codrington Lagoon).

Value of Biodiversity

Biodiversity provides a significant source of revenue for Antigua and Barbuda. Since the 1960s, the economy has relied mainly on tourism, the main attraction being the 365 white sandy beaches and other aspects of the country's marine and coastal environment. The tourism industry is responsible for over 42 percent of GDP. While there is recognition that the ecosystem goods and services have value, like many other countries, their value in Antigua and Barbuda is not well understood.

Data available through the "Mapping Ocean Wealth" portal put the annual tourism and recreation value of Antigua and Barbuda's 116 km^2 of coral reefs at USD 65.7 million. Thirty-five percent of that value (USD 23 million) is attributed reef tourism (e.g., diving, snorkeling, and glass bottom boats) and 64 percent (USD 42.6 million) is attributed to reef-adjacent tourism (beaches, calm seas, views, seafood). The highest value reefs (top 10 percent) generate more than USD 1.7 million per km^2 per year.[230]

Like many of the ESC countries, agriculture (mostly sugar cane in the past) has been replaced by tourism as the number one source of revenue. In Antigua and Barbuda, the fisheries sector within agriculture provides a significant contribution to the GDP. About half of the revenue generated in the fishing sub-sector originates from the Codrington Lagoon, which is a Ramsar site. Conservation of this all-important protected area is clearly a national priority.

National Laws, Policies, and Strategies

- 2015 – The Environmental Protection and Management Act (EPMA) enacted. The act is presently being updated and its regulations completed. The passage of this act has paved the way for a range of positive environmental initiatives. The Sustainable Island Resource Framework Fund, which is enshrined in the EPMA, was designed to provide the funding for all managers of natural resources, both governmental and non-governmental. Sustainable financing mechanisms for Protected Areas are yet to be established as part of the Fund, under the Path to 2020 Project. Environmental Impact Assessments: EIAs continue to be mandatory for certain projects and several new pieces of biodiversity-related legislation have been adopted with the passage of the EPMA.
- 2017 – Antigua and Barbuda ratified the Nagoya Protocol
- 2017 – Rehabilitation of major biodiversity hotspots and birding areas. The Offshore Islands Conservation Program (OICP) is a partnership between the Environmental Awareness Group, Fauna and Flora International, the Durrell Wildlife Conservation Trust, Black Hills State University, the Island Resources Foundation, and the Government of Antigua and Barbuda. The OICP restored 16 offshore islands, largely through the removal of rats. As a result, the Antigua Racer, one of the most critically endangered snake species in the world, has grown from just a few individuals to more than 1,200. The Redonda Restoration Project is also a product of OICP work.[231] The OICP removed both rats and goats from Redonda Island, which has led to the conservation of three critically endangered lizard species: the Redonda Ground Dragon (Pholidoscelis atratus), the Redonda Tree Lizard (Anolis nubilus), and the Redonda Pygmy Gecko (Sphaerodactylus sp). Once the rats and goats were removed, tree seedlings and grass were reestablished across the island within months.

Government Agencies

The government agency responsible for biodiversity and environment is the Ministry of Health and the Environment. Within that ministry is the Department of the Environment (DOE), whose core mandate is sustainable environmental protection and management, including biodiversity conservation. The department has been in this ministry since 2014. This department is also responsible for implementing multilateral agreements on environment and climate change. In relation to biodiversity, the department is developing finance mechanisms through the Sustainable Island Resource Framework Fund for building sustainable livelihoods within protected areas. The DOE is also responsible for biodiversity data collection and management. It manages the environmental impact assessment unit and has worked to integrate biodiversity considerations into the environmental review/assessment process and has trained officers in this area. The DOE has coordinated this work with the Development Control Authority. It also manages a public outreach/school awareness program to engage and inform the public on key environmental issues including the importance of biodiversity conservation. Within this context, the DOE has also launched tree-planting programs.

The Forestry Division of the Department of Agriculture (forestry unit, plant protection unit, agricultural stations, agriculture extension division, research unit, cotton station) is active in promoting the conservation and sound management of forest lands. The National Parks Authority operates the Nelson Dockyard National Park and has an environment unit monitoring terrestrial and marine environments within the park. The Fisheries Division manages the marine protected areas and offshore islands. The Barbuda Council governs the PAs in Barbuda, including the Codrington Lagoon National Park.

Other agencies and organizations involved with biodiversity and the National Biodiversity Strategy and Action Plan include the Central Board of Health, National Solid Waste Management Authority, Ministry of Tourism, National Office of Disaster Services, Ministry of Energy, the Ministry of Foreign Affairs, and environmental NGOs such as the Environmental Awareness Group, the Gilbert Agricultural and Rural Development Center, the Marine Ecosystem Protected Area Trust, and the Codrington Lagoon Park Authority.

BARBADOS

Major Ecosystem Types and Status

Barbados is the most easterly island of the Eastern Caribbean island chain. The island is 34 km long and 23 km wide and has a total land area of approximately 432 km^2. It is relatively flat, composed mostly of coral limestone with deep riverbed gullies. These gullies tend to have a large and mature collection of native ferns, climbers, shrubs and trees; the gullies are significant as Barbados' natural vegetation cover was reduced dramatically following colonial settlement. The main agricultural crop is sugar cane, and an increasing amount of abandoned sugar cane land is regenerating to a natural vegetation cover.

The plant communities of Barbados are classified according to the types of environments with which they are associated, namely gullies, forests, coastal wetlands (beaches, sand dunes, and sandy beaches), rocky land and inland cliffs, sea cliffs, and sea rocks. It is noteworthy that gullies account for approximately 5 percent of the land area yet contain as much as 35 percent of native plant diversity.

Aquatic ecosystems include wetlands, rocky intertidal areas, seagrass beds, and coral reefs. There is about 16 km2 of coral reefs, most of which is bank/barrier reef and the rest fringe reef. A diversity of freshwater ecosystems exist including streams, ponds, temporary pools, and inland brackish water marshes and swamps.

The Fisheries Division of the Ministry of Agriculture has developed a fisheries management plan. The plan contains eight fishery-specific plans for the following: 1) shallow-shelf reef fishes (e.g., parrotfish, surgeonfish, grunts); 2) deep slope fishes (e.g., snappers, grouper); 3) coastal pelagics (e.g., herrings, jacks, small tunas); 4) large pelagics (e.g., dolphin, tunas, kingfish, swordfish, shark); 5) flying fish; 6) sea urchins (i.e., sea egg); 7) turtles (e.g., loggerhead, hawksbill, leatherback); and 8) lobsters (e.g., spiny, spotted).

Status of Tropical Forests

From 2001–2019, Barbados lost 375 hectares of tree cover; most of this is attributed to "shifting agriculture" and the rest to "urbanization."[232] The national tree planning project *Green Barbados, We Plantin'* was launched in 2018 to plant 1 million trees by the end of 2020; the project is off to a good start. High level officials have noted that the popular project is not only a climate change initiative, but a food security one too. Fruit trees are an integral part of the tree planting activities.[233]

Species Diversity and Status

Approximately 990 genera and 1,548 species of organisms have been identified in the marine and freshwater ecosystems of Barbados and these include the commercial fishery resources. The terrestrial fauna of Barbados consists of 10 mammal species, 261 species of birds, 13 terrestrial reptiles (four snakes, eight lizards and the Barbados Red-Footed Tortoise (*Chelonoidis carbonarius*), which was introduced to the island during colonial times), two amphibians (Cane Toad and Whistling Frog), and approximately 1,320 species of insects and allied arthropods. Indigenous mammals are restricted to

six species of bats; introduced mammals include rats, green monkeys, and mongoose. Of the six bats species found in Barbados, one is an endemic and two others may be endemic subspecies.[234]

To date, 261 species of birds have been recorded in Barbados. The Barbados Bullfinch (*Loxigilla barbadensis*) is endemic. There are six endemic subspecies of birds on the island. Barbados is located on a major migratory flyway between North and South America, and as a result 150 species of migratory birds have been recorded on the island. The long-established practice of hunting migratory birds in shooting swamps has undergone significant change in recent years through the collaborative efforts of the Barbados Wildfowlers Association, Birdlife International, the Canadian Wildlife Services and the U.S. Fish and Wildlife Service; sustainable harvesting and management of shorebirds is now practiced.

According to the IUCN Red List, there are 44 threatened species in Barbados. In the marine environment, there are 36 threatened animal species, including seven critically endangered, six endangered, and 23 vulnerable species. Critically endangered species include Elkhorn Coral (*Acropora palmata*), Staghorn Coral (*Acropora cervicornis*), and Hawksbill Sea Turtles (*Eretmochelys imbricata*). The Barbados Thread Snake and Leaf-Toed Gecko are endemic and rare. There is a conservation program involving UWI, the Ministry of Environment and National Beautification, and Fauna and Flora International for the critically endangered Leaf-Toed Gecko. The UWI also hosts the Barbados Sea Turtle Project, which actively conserves and monitors endangered sea turtle populations around Barbados.

Approximately 700 species of native and naturalized flowering plants have been described and approximately 100 of these are trees. Two of these plant species are only found in wooded areas and are endemic; eight species as rare or endangered.

Genetic Diversity

The Barbados Natural Fibres project, funded by the GEF Small Grants Programme in 2015, identified over 60 species of fibers and seeds that have economic value for the national crafts sector. Both in-situ and ex-situ coral nurseries have been established using *Acropora palmata, Porites astreoides,* and *Diploria strigosa*. Material to supply nurseries are sourced from wild populations by fragmentation. Financing was provided as part of an IDB-funded project.

UWI has a herbarium and insect collection. There are, however, still some knowledge gaps about biodiversity location and extent, and patterns of distribution.

Status and Management of Protected Areas

Barbados has seven important bird areas (IBAs), which cover approximately 185 ha., including marine areas. The IBAs have been identified based on 11 key bird species found on the island that meet international IBA criteria. The national IBAs are wetlands that serve as an essential network of sites for native and migratory water bird species.

One protected area has a management team: the Folkestone Marine Park. Barbados' system of parks and open spaces is detailed in the Physical Development Plan and comprises seven categories and specific land use policies for each of the categories. The categories are: OS 1 The Barbados National Park; OS 2 Natural Heritage Conservation Areas; OS 3 Coastal Landscape Zone; OS 4 Public Parks and Open Spaces; OS 5 National Attractions; OS 6 Barbados National Forest Candidate Sites; and, OS7 Shore Access Point.

A co-managed MPA in Carlisle Bay represents a public-private partnership. Walkers Reserve is an old sand quarry that is being transformed into a forested area and nature park.

Status and Management of Key Natural Resources Outside Protected Areas

While forest resources are declining only slightly nationwide, marine resources are increasingly threatened by inadequately planned development (urban housing, hotels), pollution of near-shore environment, and invasive species. Management plans are developed or being developed for marine protected areas, but implementation is lagging.

Barbados is actively participating in the regional project on invasive alien species called "Preventing the Costs of Invasive Alien Species in the OECS and Barbados." There are four pilot projects planned:

- Construction of a biosecure site for the endemic Barbados Leaf-Toed Gecko
- Removal of invasive species found in the gully ecosystems
- Protection of nesting sites and turtles against predation from pest and invasive species
- Protection of reef ecosystems from Lionfish intrusion

The Water Sector Resilience Nexus for Sustainability project in Barbados was launched in 2019 at Bowmanston Water Pumping Station to address resilience of Barbados to impacts of climate change. This initiative was supported by USAID's Climate Change Adaptation Program.

Values of Biodiversity

A 2017 study confirmed the direct relationship between the quality of the coastal and marine environment, tourists' willingness to return to Barbados, and their willingness to pay for travel. Visitors to Barbados have strong preferences for high-quality beaches, clear water, and the presence of healthy coral reefs and other marine life.

The tourism sector, which relies heavily on Barbados' natural resources, supports approximately 44,900 jobs, accounts for 40 percent of employment opportunities, and contributes 30.9 percent to GDP and more than 50 percent to foreign exchange.[235] Seventy-five percent of tourists visiting Barbados do so for pleasure, participating in both land and marine-based activities closely linked to both ecosystems.

The 2019 Water Sector Resilience Nexus for Sustainability in Barbados project is the first Green Climate Fund project in the Caribbean to move to implementation. The project will strengthen the resilience of Barbados to the impacts of climate change, as well as supporting adaptation measures in the water sector, and reducing the carbon footprint of the Barbados Water Authority. Investment in photo voltaic solar power facilities for three water pumping stations, as well as micro-gas turbines for back-up use, will reduce the energy use of Barbados Water Authority, which is currently the country's largest energy client, from the grid. Some of the savings from reduced energy costs will be used to create a Revolving Adaptation Financing Facility that will subsidize water efficiency measures for households, businesses, hoteliers, and public entities to support adaptation measures.

National Laws, Policies, and Strategies

- 2013–2020 – Barbados Growth and Development Strategy
- 2014–2023 – Barbados Tourism Master Plan
- 2014 – Green Economy Scoping Study
- 2014 – Fisheries Sector Management and Development Policy; New Fisheries Management Regulations
- 2015 – The Ministry of Agriculture established the Green Agricultural Green Product and Green Energy Research Fund (AGPRF), geared toward funding with positive environmental impact
- 2015 – Approval was granted and legislation enacted to introduce user fees at the Barbados Marine Reserve at Folkestone
- 2016 – Barbados joined the UN Partnership for Action on Green Economy
- 2017 – The Physical Development Plan
- 2018 – Creation of the Ministry of Maritime Affairs and Blue Economy. Actions taken to date include upgrades to fish markets; coral restoration; planned expansion of marine managed areas; and a strategy to manage sargassum

Government Agencies

The Ministry of Environment and National Beautification (MENB) is the lead agency on environment and biodiversity issues. Its mandate is to "promote and facilitate the sustainable use of resources by encouraging the involvement of all citizens and the integration of environmental considerations into all aspects of national development." Within the Ministry is the National Heritage Department, whose role is to promote the conservation of special and unique biomes through "effective management of a network of terrestrial and marine protected areas for the recreation and enjoyment of Barbadians and by the creation of innovative ideas and initiatives to facilitate sustainable development of persons living in these areas." The MENB also leads a Biodiversity Working Group that includes a wide range of local actors from a broad spectrum of sectors that meet regularly to discuss biodiversity policies and related issues.

In addition to the MENB, the Ministry of Maritime Affairs and Blue Economy (MMABE) was created in 2018 to help the country better use and manage its marine resources. Within that ministry is the Coastal Zone Management Unit, a key agency in relation to biodiversity conservation that has responsibility for government oversight of coastal project design and management. The CZMU is responsible for shoreline protection, development control, and marine habitat management, and it performs a variety of functions including coral reef monitoring, updating the inventory of coastal resources, and coordinating with the Town and Country Development Planning Office on all coastal development. The CZMU also monitors beach erosion and coastal structures, regulates marine research, and has a public education role in relation to coastal zone management. The MMABE also houses the Fisheries Division (responsible for the management of all marine fisheries) and the Barbados Port Incorporated. Barbados does not have a forestry department or division in any of the ministries. Natural forest areas come under the purview of the National Heritage Department.

Other government agencies that have been involved with the National Biodiversity Strategy and Action Plan include Town and Country Development Planning Office, Ministry of Finance, Ministry of Economic Affairs and Investment, Ministry of Tourism and International Transport, Ministry of Agriculture and Food Security, and the Ministry of Energy and Water Resources.

SAINT KITTS AND NEVIS

Major Ecosystem Types and Status

Saint Kitts and Nevis are part of the Lesser Antilles; with a land area of 261 km2, they are the smallest land area in the USAID ESC region. Each island is dominated by a single, fairly young volcanic cone surrounded by fertile soils sloping toward the sea in all directions. Major ecosystems include wetlands/ponds, seagrass beds, mangroves, coral reefs, and forests of various types. The Reef Health Index for Saint Kitts and Nevis is only 2.3 (out of 5). This is the lowest score (shared with Antigua and Barbuda) of the ESC countries.

Status of Tropical Forests

Saint Kitts has five forest types: palm brake (dense stands of palms at high, sheltered elevations between 370 and 550 meters); elfin woodland (stunted vegetation on peaks and ridges above 600 meters); rain forest (mid-level elevations); dry evergreen forest (secondary forest occupying the lower margins of the forest, usually formerly cultivated); and dry scrub woodlands. Nevis has six vegetation zones, which includes the five listed for Saint Kitts plus the montane thicket, a very thin belt located just above the rain forest.

Saint Kitts and Nevis have less than 1 km^2 of mangroves. Small mangrove stands are found at Saint Kitts' South East Peninsula and Sandy Point and in bays such as Bogs Area and Pinney's Ponds on Nevis. Global Forest Watch indicates that from 2013 to 2019, Saint Kitts and Nevis lost 69 ha of forest.

Species Diversity and Status

There are 46 plant species endemic to the Lesser Antilles that occur in the country. The only native mammal species in the country are bats; Saint Kitts has seven documented species of bats (*Ardops nichollsi, Brachyphylla cavernarum, Monophyllus plethodon, Artibeus jamaicensis, Noctilio leporinus, Molossus molossus, and Tadarida brasiliensis*), while

Nevis has an eighth species (*Natalus stramineus*). There are 231 bird species found on Saint Kitts and Nevis.[236] BirdLife International identifies several threatened and endangered species found in the country: one critically endangered (Jamaica Petrel), one vulnerable (West Indian Whistling Duck), and four near threatened species: Semipalmated Sandpiper (*Calidris pusilla*), Piping Plover (*Charadrius melodus*), Reddish Egret (*Egretta rufescens*), and the Caribbean Coot (*Fulica caribaea*). There are three important bird areas in the country: the Central Forest Reserve, the Southeast Peninsula, and Booby Island.

There are two species of amphibians recorded for the country, both IUCN listed as least concern: the Lesser Antillean Frog (*Eleutherodactylus johnstonei*) and the Marine Toad (*Bufo marinus*), which was introduced. Four species of gecko are documented for Saint Kitts, of which the House Gecko (*Hemidactylus mabouia*) and the Thick-Talied Gecko (*Thecadactylus rapicauda*) are widely distributed throughout the Lesser Antilles. The Northern Leeward Sphaero (*Sphaerodactylus sabanus*) and the Leeward Banded Sphaero (*Sphaerodactylus sputator*) are endemic to Saint Kitts and Nevis. There are two species of snakes, the regionally endemic Leeward Blind Snake (*Typhlops geotomus*) and the endangered Orange-Bellied Racer (*Alsophis rufiventris*), which was previously recorded for both islands but is now listed by IUCN as extirpated on Saint Kitts and Nevis. The Ground Lizard (*Ameiva erythrocephala*), and two species of anoles (*Anolis bimaculatus and Anolis wattsi schwarti*) are endemic to the Saint Kitts, Nevis, and Saint Eustasius.[237]

New regulations (still in draft) would prohibit all hunting of Leatherback Turtles (*Dermochelys coriacea*) and Loggerhead Turtles (*Caretta caretta*) (the latter are only very rarely found in local waters) and prohibit tagging or feeding sea turtles for tourism purposes. A permit system is proposed but not yet legally in place to restrict harvesting of Hawksbill (*Eretmochelys imbricata*) and Green Sea Turtles (*Chelonia mydas*). At present, Saint Kitts and Nevis has a legal hunting season for all three species of sea turtles (Hawksbill, Green, Leatherback). The season currently extends from October to the end of February every year. During open season, it is prohibited to catch turtles within 300 yards of shore, catch or/keep turtles carrying eggs, disturb turtle nests, and catch undersized turtles.

An invasive species of seagrass (*Halophila stipulacea*) appears to have been brought in during the construction of the Christophe Harbor. So far, it has choked out native seagrass beds over a four-mile area.

White-Tailed Deer (*Odocoileus virginianus*), which was introduced to Saint Kitts in 1931, is a protected species. The Collared Dove (*Streptopelia decaocto*) population is doing well, unlike the St. Kitts Bullfinch (*Loxiguilla portoricensis grandis),* which is now feared extinct.[238]

Queen Conch (*Strombus gigas*) populations are declining across their range in the ESC, but in Saint Kitts the population appears to be stable and healthy. Climate change-related high temperatures has led to the bleaching and death of corals.

Genetic Diversity

Cultivars such as Amory Polly Mango (*Mangifera indica*), grafted avocados (*Persea americana*), and seedless limes (*Citrus spp.*) are specialized crops on Nevis.

Status and Management of Protected Areas

There are three legally established terrestrial park units. Only the Central Forest Reserve National Park has management based on integrated ecological conservation, which includes biodiversity conservation, protection of water catchment and other ecosystem services, and ecotourism and recreation activities. The Royal Basseterre Valley National Park is managed by the Water Services Department with a goal to preserve and protect the aquifer, which supplies the capital city of Basseterre and surrounding areas' drinking water. The Brimstone Hill Fortress National Park is a colonial-era fortress managed by a civil society organization as a historical and cultural site and is not managed for biological conservation purposes.[239]

In 2016, the UNDP funded an effort to increase the number of protected areas in Saint Kitts and Nevis and strengthen their management capacity. The mid-term evaluation of the "Conserving Biodiversity and Reducing Habitat Degradation in Protected Areas

and their Buffer Zone Project" determined that project progress was slow in part due to the project design underestimating the political complexities that arise out of implementing a project in both islands without fully taking into account the administrative and political issues germane to the Federation.

In 2014, Frigate Salt Pond was legally declared a protected area.

In 2016, the two-mile radius around Saint Kitts and Nevis was legally declared a Marine Management Area (MMA). Management plans for its various zones (fishing, conservation, recreation, transportation) are being developed. Three areas (Sandy Point, Keys, and the Narrows) totaling 11,693 ha within the MMA have been declared "conservation zones" to protect the coral reefs, seagrass beds, fish stocks, and other aquatic life (including the Spiny Lobster and the Queen Conch) that depend on these areas (MMA and Marine Ecosystem Maps, **Annex I**).

Two new terrestrial PAs have been proposed and one has been legally declared since 2013. These are the Booby Island Nature Reserve (300 ha) and the Nevis Peak National Park and Camps River Watershed Area (3,250 ha). Booby Island is a 300 ha bird nesting site (IUCN Category IA), which was proposed as a Nature Reserve in 2014.

Status and Management of Key Natural Resources Outside of Protected Areas

Several ongoing activities that are designed to conserve natural resources include the promotion of vegetation cover of the Basseterre Valley well fields (freshwater) and upland areas that supply the well fields. These include planting trees on banks to maintain vegetation cover along ghauts (intermittent rivers), monitoring sand mining from the ghauts, monitoring the harvest of trees that are used for making fish pots, and monitoring the harvest of sarsaparilla.

On Nevis, constant drought has caused a decrease in water resources, leading to limits on use of the island's water.

Value of Biodiversity

Nature-based tourism is a major driver of the economy, accounting for just over 28 percent of GDP. Tourism also provides for about 14,000 jobs, the equivalent of 59 percent of total employment.[240]

As noted above, efforts have been made to protect the Basseterre Valley well fields in Saint Kitts and Nevis island water supplies, as effects of vegetation loss and climate change are affecting these water systems.

Legislation, Policies, and Strategies

- 2014 – Yachting Policy launched to reduce the risk of damage to the environment and mitigate any potential damage
- 2015 – Maritime Pollution Act (draft), not yet passed
- 2015 – National Maritime Policy and Action Plan (draft), not yet passed
- 2016 – Fisheries, Aquaculture, and Marine Resources Act
- 2016 – The National Conservation and Environmental Management Bill drafted to replace the National Conservation and Environmental Management Act
- 2017 – Protected Areas regulations finalized
- 2017 – Standard Operating Procedures for PA management finalized
- 2019 – First Reading of the new National Conservation and Environment Management Act[241]

Government Agencies

In Saint Kitts, the newly formed Ministry of Agriculture, Human Settlement, Cooperatives, and the Environment has oversight of the Department of Environment (DoE). The DoE has responsibility for Forestry (formerly administered by the Ministry of Agriculture) and obligations under the Convention on Biological Diversity. The Ministry of Sustainable Development has oversight for the Department of Agriculture and the Department of Marine Resources. The Departments of Agriculture and Marine Resources have joint responsibility for CITES obligations.

DOMINICA

Major Ecosystem Types and Status

Dominica's land area covers 750 km^2; it has the smallest near-shore shelf area of the eight island countries. The shelf supports stretches of seagrass meadows, coral reefs, and limited wetlands. There are 10 km^2 of seagrass, representing its most extensive marine habitat. Only 5 percent of this seagrass is protected, with 0.7 percent being slated for new proposed protected areas. There are 0.8 km^2 of reefs, consisting of a rock base upon which coral and sponges have taken hold. Unlike many other islands, Dominica's reefs are predominantly sponge-dominated. As one of the volcanic ESC islands, Dominica is known for its black sand beaches.

The NBSAP designates seven natural vegetation communities: coastal swamp, littoral woodland, dry scrub woodland, deciduous/semi-evergreen forest (including grassland and savannah sub-types), rain forest, montane rain forest, and elfin woodland. Fumarole vegetation associated with geothermal areas is also present. Dominica has seven watersheds, two lakes, and several rivers.

The Cabrits Swamp consists of 35 ha along the eastern side of the Cabrits Peninsula. The dry scrub woodland is considered one of the most extensive ecosystems in Dominica. It is dominated by a variety of deciduous tree species and has one of the highest densities of reptiles recorded anywhere in the world. The area is home to important populations of butterflies including the endemic Godman's Leaf (*Kallima inachus*) and the endangered endemic Dominican Snout Butterfly (*Libytheana fulvescens*). The Cabrits marine area has a wide coastal shelf with expanses of coral reef.

Status of Tropical Forests

Approximately 61 percent of Dominica is under forest cover, with 27 percent of forests designated as protected by a network of two forest reserves, three national parks, and a protected forest. In 2010, Dominica had around 90 percent tree cover but lost about 32 percent of it in 2017 as a result of Hurricane Maria.[242]

The main forest areas are classified as undisturbed and disturbed sub-montane forest. Due to steep terrain and accessibility, only 30 percent of the forest is accessible for forest management interventions. The other forest classes are montane cloud forest, evergreen montane shrubland, montane rain forest, lowland/sub-montane seasonal evergreen forest, lowland drought deciduous shrub, and seasonally flooded forest.

There are virtually no protected dry forests anywhere on the island. The only exception is Cabrits National Park, but all of the forest in this small national park is secondary forest and dominated by non-native, planted timber species.

Hurricane Maria in September 2017 is estimated to have led to 85-90 percent defoliation of trees, 85 percent debranching, 75 percent toppling, and 80 percent debarking based on aerial photo and ground reconnaissance. Six months after the storm, there was significant greening, with a number of emerging secondary species such as ferns and vines. The storm had positive effects as rotten spaces in tree trunks provided nesting sites for parrots. Based on the refoliation and growth rates, it is expected that the forests will return to their pre-hurricane appearance in five to seven years.

Work is underway to characterize forests using a network of 1,605 plots defined on Google Earth to classify the forest type and land use changes. In this system, a forest is defined as 30 percent canopy cover with 15-20 percent mature trees per 2 acres. Of these 1,605 plots, 20-30 will be established for permanent forest monitoring across the representative forest types. Planning and management of public forests outside of parks (approximately 30,000 ha or 60 percent of forest area) is minimal.

Species Diversity and Status

Dominica has 1,226 species of vascular plants, with a number of plant species considered endemic, including the national flower, Bwa Kwaib (*Sabinea carinalis*). Dominica has two endemic and globally threatened parrots, the Imperial or Sisserou Parrot

(*Amazona imperialis*) and the Red-Necked or Jaco Parrot (*Amazona arausiaca*), which are included in the 206 species of birds attributed to the island. The Imperial Parrot, which is recognized as critically endangered, has an estimated population of only 250-350. The island also supports another globally threatened bird species, the vulnerable Forest Thrush (*Turdus lherminieri)* and is a breeding location for the endangered Black-Capped Petrel (*Pterodroma hasitata*).

Nineteen species of reptiles have been recorded on Dominica, 15 terrestrial and four marine species. The 15 terrestrial reptiles include ten lizard species, four sub-species of snake, and one tortoise. Of the ten species of lizards, the Ground Lizard (*Ameiva fuscata*) and the Tree Lizard (*Anolis oculatus*) are endemic. The amphibian fauna in Dominica consists of four species of frogs, one of which is endemic to the island. The most prominent is *Leptodactylus fallax* (Crapaud or Mountain Chicken), which is endemic to Dominica and Montserrat, widely consumed by the local population, and under increased threat from a fungal disease. The other amphibian species are three small (tree) frogs including one single-island endemic, *Eleutherodactylus amplinympha* that is restricted to higher elevations on Dominica, and two regionally endemics, the Tink Frog (*Eleutherodactylus martinicensis*) and Johnstone's Whistling Frog (*Eleutherodactylus johnstonei*).

The Cuban Tree Frog (*Osteopilus septentrionalis*) has become an invasive species on the island especially in the Portsmouth area. The Puerto Rican Anole (*Anolis cuvieri*) has been affecting local anole lizards and is being monitored for possible extirpation of local species. Mimosa pigra, African Tulip (*Spathodea nilotica*), and Lemon Grass (*Cymbopogan citratus*) are invasive plant species of note.

Genetic Diversity

The Mountain Chicken Frog remains the only species subject to genetic work by the Zoological Society of London (the London Zoo) to prevent its possible extirpation.

Status and Management of Protected Areas

Twenty percent of the land surface is protected, as well as 0.13 percent of the territorial waters including around 2.5 percent of its coral reefs. Dominica has two declared terrestrial protected areas along with two declared and one proposed marine protected area. The Cabrits Marine Reserve was created as an addition to the national park of the same name and is currently managed by community stakeholders and the Portsmouth Area Yacht Services. Another proposed marine protected area (Salisbury Marine Reserve) extending from Saint Joseph to Calihaut would further strengthen the marine protected area system.

Dominica has four IBAs that cover 106 km² (including marine areas) and about 13 percent of the islands' land area. The two forest IBAs (Morne Trois Pitons and Morne Diablotin) are national parks (totaling 9,845 ha); 93 percent of the area covered by the island's IBAs is under protection. The two seabird/marine IBAs (Point des Foux and L'Ilet) are not formally protected.

Status and Management of Key Natural Resources Outside of Protected Areas

Forests outside of protected areas require careful management to guard against deforestation due to development, agriculture, and fires, as well as quarrying for pumice, rock, and gravel. Seeds and beads are utilized for crafts. Harvesting of wood for charcoal has declined in recent years.

Biodiversity Value

In 2020, the GEF-funded project, "Leveraging Eco-Tourism for Biodiversity Protection in Dominica," valued at USD 3.65 million, was launched with three components in direct response to the recognition that ecosystems and biodiversity can be important revenue streams and serve to generate financing for their conservation and protection. Component 1 "Protected Area and Trail Planning" will support updating and revision of strategic and operational management plans for three national parks and for the Waitukubuli National Trail (WNT). Component 2 "Biodiversity and Sustainable Ecotourism Operations" will conduct operations and installation

of works and programs in line with current park and trail plans. This component also contains institutional strengthening support including preparation of a Divisional Operational Manual describing standard operational procedures for execution of forestry and parks works. Component 3 "Sustainable Livelihoods" addresses pressing social development needs in the Kalinago Territory through investments associated with the WNT that transits the territory. A major anticipated outcome is the strengthened individual and institutional capacity to generate a biodiversity-based economy.

The Tourism Master Plan has identified 20 Tourism Centers corresponding to six Tourism Development Areas spread around all coastal areas, including the capital, Roseau.

Water is provided for local consumption and export to other Caribbean countries and is also used to generate hydroelectric power.

Legislation, Policies, and Strategies

Dominica has undertaken several initiatives that favor biodiversity conservation. Following Hurricane Maria, the government pledged in 2018 to become the first "climate resilient" country by launching the Climate Resilience Execution Agency for Dominica, or CREAD. CREAD bolsters the ability of the business community, public services, and social sector partners to build strong and resilient communities, develop adaptive infrastructure, accelerate economic growth, strengthen institutional systems, enhance Dominicans' capacity to respond to the local impacts of global climate change, and set an example for the rest of the world on how to respond to the challenges of a changing climate.

The Mission of CREAD is to:

- **To make Dominica more resilient to future natural disasters,** able to withstand future hurricanes or earthquakes with a minimum of damage to lives and livelihoods.
- **Continue to ensure that recovery from the impact of Hurricane Maria will be as swift, transparent and cost-effective as possible**, and all reconstruction will be "built back better" to the extent possible
- **To assist all public institutions, private sector, and civil society** in becoming better equipped to manage disasters and recovery from disasters in the future.[243]

Other actions in Dominica since the 2013 study include:

- 2016 – National Resilience Development Strategy – 2030
- 2018 – Pledge from the Prime Minister to become the world's first "Climate Resilient" country
- 2018 – Climate Resilience Act passed
- 2019 – Ban on all single use plastic and styrofoam containers
- 2020 – "Go Green" national initiative launched

Dominica also created a new Ministry of Blue and Green Economy, Agriculture, and National Food Security, which contains the Division of Fisheries. There are two other ministries directly related to biodiversity conservation and forest management that include the Ministry of Environment, Rural Modernization, and Kalinago Upliftment and the Ministry of Tourism, International Transport and Maritime Initiatives, which includes the Discover Dominica Authority that handles permits for natural areas and parks.

SAINT LUCIA

Major Ecosystem Types and Status

Saint Lucia is a volcanic island with a steep, rugged topography; the country has a land area of 616 km^2. Forests and woodlands account for more than 20,000 ha (about 35 percent of the land) and provide significant habitat for many flora and fauna. Forest types include elfin woodland, montane thicket, lower montane rainforest, rainforest, secondary forest, savannah and grazing land, and dry scrub woodland. Other habitats and ecosystems in Saint Lucia include rivers, active geothermal areas and sulfur springs, coastal wetlands, coral reefs, and seagrass beds.[244] The 2016 coral reef report card for Saint Lucia indicates an average score of 2.8, which is higher than the Caribbean average.[245]

Reforestation and rehabilitation activities are underway for riverbanks and other ecosystems that provide essential services related to water supply and water security. The reservoir at the John Compton Dam is now being desilted to ensure a steady water supply to the capital, Castries, and surrounding areas.

Status of Tropical Forests

The Forest and Lands Resources Department has been working to restore forests across Saint Lucia after the devastation caused by Hurricane Tomas in 2010. Activities have included reforestation and the establishment of check dams and other interventions to restore and stabilize forested slopes. Observations and assessments in the field suggest that restoration interventions have been effective in facilitating forest recovery.

Several restorative measures have been implemented by the GEF-funded project Iyanola, the Natural Resource Management of the North-East Coast project. Activities include targeting degraded landscapes and riverbanks, planting economically valuable trees along waterways, enrichment of marginal landscapes, and establishment of forest parcels on privately owned and public lands. The aim is to restore 200 ha of degraded landscapes, with enhanced connectivity over at least 10,000 ha of forest area.

In the Soufriere and Fond St. Jacques areas, the focus is on restoring degraded landscapes and riverbanks by planting trees of economic value and managing established trees. The majority of the land in the Soufriere watershed is privately owned. In total, 55 parcels of land in the watershed have been targeted for restorative interventions.

The Mankòtè Mangrove is a designated Wetland of International Importance under the Ramsar Convention, and it is the largest remaining mangrove forest in Saint Lucia. Aupicon Charcoal and Agricultural Producers Group co-manage the Mankòtè Mangrove in collaboration with the Forest and Lands Resources Department and the Caribbean Natural Resources Institute.

Species Diversity and Status

Saint Lucia has a high degree of biodiversity with respect to habitats, ecosystems, and endemic species. The fifth national report to the Convention on Biological Diversity lists more than 1,300 known plant species, 160 birds, 250 reef fish, and 50 coral species.

Saint Lucia is taking measures to prevent the extinction of endemic and endangered species of fauna and flora, such as the Saint Lucia Whiptail (*Cnemidophorus vanzoi*), the White-Breasted Thrasher (*Ramphocinclus brachyurus*), and the Barbados Cedar. The Forest and Lands Resources Department and the Saint Lucia National Trust are working together with Fauna & Flora International and the Durrell Wildlife Conservation Trust to save the critically endangered Saint Lucia Racer (*Erythrolamprus ornatus*) from extinction. The racer is one of the world's rarest snakes, if not the rarest, only on the small offshore island of Maria Major. The Saint Lucia Whiptail is a critically endangered lizard, the only species of genus Cnemidophorus found in the Caribbean. The Fer-de-Lance (*Bothrops caribbaeus*) is a venomous viper endemic to Saint Lucia and a focus of conservation efforts.

The population of the Saint Lucia Amazon (*Amazona versicolor*) parrot has increased tenfold over the course of a 40-year conservation program, and its status has been amended from critically endangered to vulnerable. The White-Breasted Thrasher is an endangered bird species endemic to Saint Lucia and Martinique, with distinct subspecies found on each island.

Saint Lucia is also conserving rare native plant species, through the production, dissemination, and establishment of West Indian Laurel (*Calycophyllum antillanum*), Lowyé Kannèl (*Aniba ramageana*), and West Indian Mahogany (*Swietenia mahagoni*). Saint Lucia is home to the world's last remaining population of Pencil Cedar (*Juniperus barbadensis*). Of 107 verified invasive alien species (62 plants, 45 animals) in Saint Lucia, ten have been identified as invasive species of significant national concern.

Genetic Diversity

The Forest and Lands Resources Department has established gardens of traditional medicinal plants and is working to develop these into nurseries that can be used for the sustainable supply of planting material for communities.

Status and Management of Protected Areas

There are 42 protected areas in Saint Lucia, covering 117 km2 of land (19 percent coverage) and 34 km^2 of marine area (<1 percent coverage). There are three internationally designated protected areas: two Ramsar Sites (Savannes Bay and the Mankòtè Mangrove) and a UNESCO World Heritage Natural Site (the Pitons Management Area).

Since 2015, support from the Biodiversity and Protected Areas Management program has laid the groundwork for formal adoption and subsequent implementation of the Systems Plan for Protected Areas. The protected areas system will include the following locations: the Saint Lucia Forest Reserve (9,190ha), Iyanola National Park (5,090 ha), Pigeon Island National Landmark (17 ha), Pitons Management Area (2,990 ha), Anse Cochon Protected Landscape (410 ha), Dorée Piaye Protected Landscape (1,120 ha), Mandelé Protected Landscape (2,060 ha), Pointe Sable Protected Landscape (770 ha), East Coast Marine Management Area, West Coast Marine Management Area, Laborie Marine Management Area, Cold Upwelling Marine Management Area, Maria Islands Nature Reserve (8 ha), five minor islands (Frigate, Praslin, Scorpion, Dennery and Rat, each 5 to 10 ha), Parrot Reserve (1,328 ha), La Tourney Nature Reserve (110 ha), Cul de Sac Nature Reserve (240 ha), and 24 marine reserves. A 2017 study commissioned by the Caribbean Biodiversity Fund determined that Saint Lucia needs to triple the size of its current marine protected areas if it is to meet its 20 percent conservation goal under the Caribbean Challenge Initiative (Protected Area, Marine Management Area, Forest Reserve and Key Biodiversity Area Maps, **Annex J**).

The Coral Restoration Program for Resilient Ecosystems and Livelihood Opportunities (CORELLO) aims to restore Elkhorn Coral (Acropora palmata) and Staghorn Coral (Acropora cervicornis) populations in the Soufriere Marine Managed Area. Two coral nurseries have been established and coral installed in the area. Monitoring of the coral indicates that the cultivated coral fragments are showing significant healthy growth.

From 2013-2017, Saint Lucia was one of six countries participating in the Climate-Resilient Eastern Caribbean Marine Managed Areas Network project. Project activities in that country centered around the Point Sable Environmental Protection Area.

Status and Management of Key Natural Resources Outside of Protected Areas

Saint Lucia is a participant in the Caribbean Regional Oceanscape Project, funded by the GEF. This project, implemented by the World Bank and the OECS, aims to build capacity for ocean governance and marine geo-spatial planning in participating countries, and includes actions to incentivize the sustainable and responsible use of marine living resources.

Biodiversity Values

Biodiversity values and principles are incorporated into national and sectoral policies such as the National Environmental Management Strategy, National Environmental Policy, National Adaptation Plan, the Sectoral Adaptation Strategy and Action Plans (SASAP) for the agriculture, fisheries, and water sectors, and the Disaster Vulnerability Reduction Strategy. Saint Lucia is currently formulating an Ecosystems Resilience SASAP. A valuation of species, ecosystems, and ecosystems services in the northeast region of Saint Lucia is currently being carried out under the Iyanola Project. The valuation process is designed to be participatory and to take into social, economic, cultural, and environmental values.

Tourism accounts for over 40 percent of Saint Lucia's GDP, which is the second highest percentage of GDP in the ESC region. The sector is also responsible for over 60 percent of employment.[246] In addition to beach and coastal resource tourism, cultural and national heritage sites are also important in Saint Lucia. One of the more well-

known and visited sites is Fort Rodney on Pigeon Island, which is just a 20-minute ride from Castries and close to major hotels and tourism guide services. Pigeon Island was joined to the mainland when a stand of mangroves was cleared to develop the Rodney Bay marina, and the excavated rock and sediment were used to construct the causeway.

Legislation, Policies, and Strategies

- 2012–2020 – Saint Lucia National Invasive Species Strategy
- 2013 – Fisheries Management Plan (draft)
- 2013 – Saint Lucia Hotel and Tourism Association Tourism Enhancement Fund
- 2014 – Saint Lucia revised and updated its National Environmental Policy and National Environmental Management Strategy. Not yet been approved by the Cabinet
- 2015 – State of the Environment Report
- 2015–2025 – Forest and Lands Resources Department Strategy (not yet ratified)
- 2016 – Saint Lucia National Conservation Fund
- 2018 – National Land Policy (NLP) adopted based on revisions made in 2016
- 2018 – Sectoral Adaptation Strategy and Action Plan for the Fisheries Sector
- 2018 – 2028 Saint Lucia's Sectoral Adaptation Strategy and Action Plan for the Water Sector

Government Agencies

In Saint Lucia, the Sustainable Development and Environment Division as well as the Biodiversity Unit is within the Ministry for Education, Innovation, Gender Relations, and Sustainable Development. The Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources, and Co-Operatives handles forestry and fisheries. Protected areas management is shared across the Forestry Department, Saint Lucia National Trust, and Soufriere Marine Management Area Inc.

SAINT VINCENT AND THE GRENADINES

Major Ecosystem Types and Status

The land area of Saint Vincent and the Grenadines totals 389 km^2. The central hills and mountains, except the upper slopes of the Soufriere Volcano (highest point on the island at 1,234 m), support forest cover that has been classified as rain forest, palm brake, and elfin woodland. Rain forest occurs chiefly between about 300 and 500 m elevation in valleys and on slopes and crests of low ridges, largely on the periphery of the mountain chain, palm brake occurs mainly above 500 m mostly on steep, exposed wind-ward slopes, and elfin woodland is found on summit areas, ridges, and peaks. Storm damage has led to the establishment of secondary forest on Soufriere up to about 600 m. The island, outside the central hills and mountains, is extensively cultivated, and only small sections of mostly secondary forest exist.

Freshwater ecosystems include surface water streams, small springs, three volcanic crater lakes (Lake Antoine, Grand Etang Lake, and Levera Lake), and a human-made lake (Palmiste Lake).

In the Grenadine Islands, all reef-related habitats are represented: seagrass beds and lagoons, mangroves, and a variety of patch, fringing, and bank barrier reefs. Total coral cover is 168 km2. The Coral Reef Report Card for Saint Vincent and the Grenadines is 2.8, among the highest scores in the ESC. Just over 42 ha of four distinct species of mangroves remain along coastal areas, mainly on Union and Mustique Islands and a very tiny area on Saint Vincent's south coast.

Status of Tropical Forests

Saint Vincent and the Grenadines have no national forest policy or forest areas with management plans. There are three forest reserves. Over 90 percent of forest land is state owned. Forest coverage was estimated at 29,700 ha (75 percent of total land area) in 2010, by 2019 there was a reduction of 101 ha.[247] All lands above the 305 m contour in Saint Vincent and the Grenadines are Crown lands and named forest reserves, although they are not legally declared protected areas.

Species Diversity and Status

Saint Vincent has diverse biodiversity with multiple endemics. In total, there are more than 1,150 species of flowering plants, 163 species of ferns, four species of amphibians, 16 species of reptiles, 111 species of birds, and 15 species of mammals. Five hundred marine species have been identified in the waters of Saint Vincent and the Grenadines.

There are 21 critically endangered and endangered species in Saint Vincent and the Grenadines, and five of them are endemic: the Saint Vincent Black Snake (*Chironius vincenti*), the Union Island Gecko (*Gonatodes daudini*), the Saint Vincent Frog (*Pristimantis shrevei*), the Whistling Warbler (*Catharopeza bishop*), and the Grenada Wormsnake (*Amerotyphlops tasymicris*). Both Pristimantis shrevei and Catharopeza bishopi have declining populations.[248]

The endemic Whistling Warbler (*Catharopeza bishopi*) inhabits humid hills and mountain forests on Saint Vincent. Since its discovery, the Whistling Warbler's range has diminished by at least 50 percent from volcanism and deforestation. The species is slowly reoccupying its former range on Soufriere as forests regenerate. There are four globally threatened endemics birds: *Amazona guildingii, Chironius vincenti, Pristimantis shrevei,* and *Catharopeza bishopi.*

One species of bat, *Micronycteris buriri, and two subspecies, Sturnira paulsoni paulsoni* and *Ardops nichollsi vincentensis*, are endemic to the island.

The Union Island Gecko (*Gonatodes daudini*), threatened by pet trade, is now heavily surveilled, which led to the first successful arrest under the Wildlife Act in 2017.

Invasive species of note include the Brown Anole (*Anolis sagrei*), the Cuban Anole (*Anolis equestris*), the Lesser Antillean Whistling Frog (*Eleutherodactylus johnstonei*), and on Mustique, the Cuban Tree Frog (*Osteopilus septentrionalis*).

Sea birds are threatened on uninhabited Grenadine Islands by illegal harvesting of eggs from nests.[249]

Genetic Diversity

The Grenadines Pink Rhino Iguana (*Iguana insularis insularis*) has been identified through DNA analysis as an endemic subspecies (along with the Saint Lucia Iguana, *Iguana insularis sanctalucia*). Subsequent DNA analysis has shown it is an entirely new species now known as the Southern Antilles Iguana.

Status and Management of Protected Areas

Saint Vincent and the Grenadines has a total of 215.5 km^2 of protected areas distributed between the terrestrial and marine ecosystems. The Fisheries Conservation Act designated ten conservation areas within the EEZ. One of these, the Tobago Cays, has been legally designated a marine park. The country has 24 wildlife reserves, six marine conservation areas, three forest reserves, one marine park, and one marine reserve, which account for 47.2 percent of the country's total marine habitat, 42 percent of terrestrial habitat, and 38.4 percent of freshwater habitat (PA Maps, **Annex J**). The National Parks, Rivers, and Beaches Authority is the statutory government body designated for PA management.

Status and Management of Key Natural Resources Outside of Protected Areas

The Cattle Egret (*Bubulcus ibis*) roosting habits have been linked to loss of mangroves in the Brighton beach area. It appears that toxins caused by build-up of fecal deposits have polluted wetland soil, destroying plant roots. The introduced Armadillo (*Dasypus novemcinctus*) has done considerable damage to the ecosystem in the Vermont watershed, undermining trees and accelerating erosion. There are 71 watersheds in Grenada; the upper reaches of a number of these watersheds are protected as forested Crown lands and forest reserves.

Forested areas outside the PAs are important landscape features as they reduce the amount of edge effect around forested PAs and minimize the amount of agricultural land (and therefore the setting of fires and other impacts) directly adjacent to PAs. In addition, the forests provide habitat for biodiversity and connectivity between forests, help control erosion and enhance soil productivity, serve as a source of materials for economic activities, and provide carbon sequestration services.

Value of Biodiversity

Nature-based tourism is a significant contributor to the Saint Vincent and the Grenadines economy, representing 28.6 percent of GDP and supplying over 45 percent of nations employment opportunities.[250] A study to provide an assessment of the economic value for a range of ecosystem services delivered at two marine parks in Saint Vincent and the Grenadines (the proposed St Vincent South Coast Marine Park and the Tobago Cays Marine Park) indicated that at the South Coast, human health, ecosystem resilience and fishing were the most valued, while at Tobago Cays the highest valued services were ecosystem resilience and coastal protection. [251]The findings showed a significant difference in preferences between tourists and locals at both sites. At the South Coast MP, fishing was significant for tourists but not for locals. The fact that different groups of people have different preferences and values could have policy implications in that there would need to be site-tailored policies. The findings also pointed to how funds for protecting MPAs might best be equitably raised (e.g., a tourist tax to fund marine conservation programs). This study was commissioned by the Saint Vincent and the Grenadines government, and, like Dominica, points to a shift in government thinking to explore values of ecosystem services and how they can contribute to the conservation of resources.

Government Agencies

The Ministry of Health, Wellness, and Environment is primarily concerned with the environment as it relates to human health. The Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry, and Labor covers the Forestry and Fisheries Division. The Fisheries Division oversees marine protected areas along with resource assessment and management. Management of forest reserves and protected areas is within the forestry portfolio along with sub-units for forest conservation, tree establishment and management, wildlife conservation, environmental education, upland watershed management, mangrove conservation, and forest recreation. In 2018, the government launched the National Adaptation Plan.

GRENADA

Major Ecosystem Types and Status

The main island of Grenada, the smaller Southern Grenadine islands of Carriacou and Petite Martinique, and around 600 mostly uninhabited islets make up Grenada's 344 km^2. The major ecosystems are forests (cloud forests, rain forest, evergreen and semi-evergreen forests, secondary forests, deciduous forests, dry scrub woodlands, littoral woodlands, and mangroves), freshwater systems (lakes, ponds, rivers, streams), coastal ecosystems (mangroves, swamp, marshland), and marine systems (coral reefs and seagrass beds). The rocky, high-energy eastern coast of Petite Martinique is completely uninhabited; most residents occupy the western side (Habitat and PA Map, **Annex J**).

Status of Tropical Forests

Forested areas are not sustainably managed due to a lack of human, financial, and legislative capacity. The major forest regions in Grenada are found at Mt. St. Catherine, Grand Etang Forest Reserve, Mt. Hope/ Claybony water catchment (private lands), Levera, Morne Delice, the Annandale watershed, and High North Forest Reserve in Carriacou. Commercial species include the blue mahoe (T*alipariti elatum*), mahogany, white cedar (*Thuja occidentalis*), and Caribbean pine (*Pinus caribaea*). Non-timber forest products include bamboo and beads. In 2010, Grenada had 27,600 ha of tree cover (77 percent of the country); from 2013-2019, the nation lost 334 ha of tree cover, or about a 1.2 percent decrease from 2010.[252]

Species Diversity and Status

Grenada's terrestrial wildlife includes four amphibian species. The Grenada Whistling Frog (*Eleutherodactylus euphronides*) is endemic to Grenada and among the most vulnerable in the West Indies.[253] There are eight species of lizard and five species of snakes (one endemic). There are 150 species of birds (18 of which are deemed to be threatened or endangered), 22 mammals (of which four are native terrestrial species), and 11 native species of bats.

Species of importance identified by key informants in 2020 include the Lesser Chapman's Murine Opossum (*Marmosa fuscata carri*), Greater Chapman's Murine Opossum (*Marmosa robinsoni chapmani*), Nine-Banded Armadillo (*Dasypus novemcinctus*), Agouti (extirpated), Burmese Mongoose (*Herpestes spp.*), Mona Monkey (*Cercopithecus mona*), Fish-Eating Bat (*Myotis vivesi*), Long-Tongued Bat (*Glossophaga longirostris*), Great Fruit-Eating Bat (*Artibeus lituratus*), and the Leaf-Nosed Bat (*Artibeus jamaicensis*). Amphibians include the Cane Toad (*Bufo marinus*), Piping Frog (*Pristimantis euphronides*), Highland Piping Frog (*Pristimantis shrevei*), and Garman's Woodland Frog (*Leptodactylus validus*). Reptiles include Tree Lizard (*Anolis sagrei*), Slippery-Back Lizard (*Mabuya mabouya*), Wall Lizard (*Anolis aeneus*), House Gecko (*Hemidactylus mabouia*), Iguana iguana, Garman's Ground Lizard (*Ameiva aquilina*), and Aliens Ground Lizard. Snakes include the Tree Boa (*Corallus grenadensis*), Cribo (*Clelia clelia* - believed, extinct), and the White-Headed Worm Snake (*Amerotyphlops tasymicris*). Turtles include the Green Turtle, Hawksbill Turtle, Loggerhead Turtle, Ridley Kemp's Turtle (*Lepidochelys kempii*), and Leatherback Turtle. Notable birds include the Grenada Dove (*Leptotila wellsi)* and the Hooked-Billed Kite (*Chondrohierax uncinatus mirus*).

Very little formal documentation exists on the composition and status of Grenada's forest resources. However, four endemic plant species include the Grenadian Gouti Tree (*Maytenus grenadensis*), the Grenadian Towel Plant (*Rhytidophyllum caribaeum*), Lonchocarpus spp., and a tree fern, *Cyathea elliottii*.

Grenada's government is a regional leader in comprehensive marine management, fisheries regulations, educational programs, and community outreach. Grenada has 78 km^2 of coral reef, 29 km^2 of seagrass, and 3 km^2 of mangroves. In general, the overall health of Grenada's coral reefs is at the regional average: the report card score is 2.5. Grenada has many different coral reef types, and each provides important habitat. During recent surveys, more fish were found on reefs with complex structure and in deeper waters, but there was a notable lack of large-sized female fish to replenish populations. Reefs are under threat from pollution generated on land and bleaching, however it was noted that Grenada's reefs can recover if human impacts are reduced.[254]

Genetic Diversity

Efforts are underway to determine the status (species or sub-species) of the Hook-Billed Kite (*Chondrohierax uncinatus)* known to range between Grenada and Saint Vincent and the Grenadines, but now only attributed to Grenada. The Grenadian Black Racer (*Coluber constrictor priapus*) is also a part of ongoing genetic studies.

Status and Management of Protected Areas

In 2018, the Grand Anse Marine Protected Area was declared, which doubled the size of marine areas under protection. This is a 1,965 ha coastal/marine area that includes coral reefs, dive sites, and fishery resources. It is Grenada's fourth marine protected area. The declaration was made possible through a collaborative effort between the Ministry of Agriculture, Lands, Forestry, and Fisheries and The Nature Conservancy under the Climate-Resilience Eastern Caribbean Marine Managed Areas Network Project. The project received funding from the German Federal Ministry of the Environment, Nature Conservation, and Building and Nuclear Safety.

Biodiversity Value

Grenada is also known as the "spice island" since spice production and exports have traditionally contributed significantly to the country's economy. The main spices exported include mace and nutmeg; Grenada is the world's second largest producer of nutmeg. As with many of the ESC countries, agriculture at one time dominated Grenada's economy, but that has shifted to tourism during the past several decades. Tourism is largely natural resource based, and it contributes to 40.7 percent of Grenada's GDP (agriculture contributes about 6 percent).[255]

In 2018, a four-year initiative was launched in Soubise to prioritize and invest in ecosystems that reduce disasters related to climate change. Led by The Nature Conservancy and the International Federation of the Red Cross and Red Crescent Societies, the Resilient Islands project combines cutting-edge conservation science with expertise in disaster risk reduction. Activities develop tools and

test natural solutions that protect coastal communities in Grenada. Expected outputs are the construction and commissioning of a state of the art, eco-friendly facility for fishers in Soubise to provide protected fair weather storage with pier access and haul-out for maintenance; coastal vegetation to improve near-shore habitat, reduce erosion, and filter runoff; and enhanced areas for community gatherings and recreation. This area is a low-lying coastal community with marine dependent livelihoods. It suffers from severe beach erosion, nearly two feet per year, and a high risk of flooding, sea level rise, and storm surge. The community lacks adequate drainage and stormwater infrastructure and has limited community resources to respond to disasters.

The Resilient Islands project commissioned a study that demonstrates the value of natural ecosystems in their role of providing protection from storms and hurricanes. The study demonstrated that restoring ecosystems like mangroves and reefs would cost one-tenth the amount of money it would take to build infrastructure for coastal protection.[256] Moreover, coastal ecosystems such as mangroves, tidal marshes, and seagrass meadows sequester and store more carbon ("blue carbon") per unit area than terrestrial forest, which underscores the importance of these ecosystems in climate change.[257]

Legislation, Policies, and Strategies

- 2016 – Coastal Zone Management Policy approved
- 2016 – Blue Growth Master Plan completed
- 2017 – First CARICOM country to complete its cabinet-approved National Adaptation Plan
- 2017 – Adopted Climate Change Policy and Action Plan for 2017-2021
- 2018 – Revised Forest Policy for Grenada, Carriacou, and Petite Martinique
- 2018 – Grand Anse Marine Protected Area declared
- 2018 – Single use plastic and styrofoam banned
- 2019 – Integrated Coastal Zone Management Bill passed
- 2020 – Natural Resources Management Bill in development
- 2020 – New Water Policy in draft (pending approval)

Government Agencies

In 2018, the Ministry of Climate Resilience, the Environment, Forestry, Fisheries, and Disaster Management was established as a new super-ministry. The environment portfolio includes biodiversity, climate change, coastal zone and ocean governance, environmental protection, and multilateral environmental agreements.

TRINIDAD AND TOBAGO

Major Ecosystem Types and Status

Trinidad and Tobago's land area covers 5,128 km^2. The island's rich biodiversity is attributable to its geological history and proximity to the South American continent. The past and relatively recent (in geologic terms) "land bridge" to the South American continent and proximity to the Orinoco River Delta and outflow are the reason for the presence of relic continental species and the relative ease of colonization of mainland species in Trinidad and Tobago.

Terrestrial ecosystems in Trinidad include seasonal evergreens, littoral woodlands, montane rainforests, swamp forests, marshes, and savannahs. Tobago has lowland rain forest, montane rainforest, xerophytic forest, and seasonal forest. In the marine areas, ecosystems include seagrass beds, mud bottoms, coral reefs, sandy bottoms, and rocky shores. These support a range of biodiversity, including an estimated 36 species of reef-building corals. Beaches on Trinidad's northern and eastern coasts are noted among the top three internationally most important nesting grounds for Leatherback Sea Turtles. A few community-run conservation organizations help to maintain the nesting habitats and bring sustainable revenue generated via ecotourism into their communities.

Negative trends have been reported for most habitats in Trinidad and Tobago, with deteriorating coastal water quality affecting important ecosystems such as coral reefs and seagrass beds.[258] Data on the rate of loss of coastal/marine ecosystems was presented in Trinidad and Tobago's State of the Marine Environment Report. Numerous oil spills over the past decade have directly affected coastal habitats. The only positive trend is an increase in forest cover in recent times.

Status of Tropical Forests

Forest cover for Trinidad and Tobago shows a net increase, with the greatest increase recorded for evergreen seasonal forests. All forest reserves in Tobago are managed as "protection forests." Protection forests cover 79 percent of the forest reserves in Trinidad and include all areas above the 90-metre contour as well as proposed national parks, prohibited areas, certain wildlife sanctuaries, nature reserves, and dams and wind-belts within the forest reserves. Approximately 21 percent (28,000 hectares) of the forest reserves in Trinidad are currently designated as "production forests." This includes 13,000 hectares of teak and pine plantations, with the rest consisting of managed natural forests. Plantation forestry is not practiced in Tobago.

Decline in the agricultural sector in both islands has resulted in much of the former agricultural land reverting back to natural forests (especially mid-watershed areas in Tobago and abandoned cocoa estates). The National Reforestation and Watershed Rehabilitation Program aims to replant 13,367 hectares of forests, including 4,452 hectares of watersheds that have been denuded or destroyed. Quantitative data on rate of loss is also being compiled under the GEF/FAO-funded project "Improving Forest and Protected Area Management in Trinidad and Tobago (2015–2019)."

The 2009-2018 Nariva Project (Block B) ("*National Restoration Carbon Sequestration Livelihood and Wildlife Project*") was led by the Environmental Management Authority with funding from the Green Fund and executed by the Forestry Department. Approximately 500 ha were replanted by 2018 (mainly in wetlands).

Species Diversity and Status

Terrestrial species diversity includes approximately 420 birds and 85 reptiles. Trinidad and Tobago also host among the highest number of mammal species of any Caribbean island. There are about 100 species of mammals from 22 different families, including dolphins, manatees, monkeys, porcupines, ocelots, armadillos, peccary, deer, bats, and rodents.[259]

The Environmentally Sensitive Areas, Species, and Biodiversity Work Plan declares ten Environmentally Sensitive Species and develops and implements management plans for each of them. Designated species to date are the Sabrewing Hummingbird (*Campylopterus hemileucurus*), Manatee (*Trichechus manatus*), Pawi (*Pipile pipile*), and five marine turtles. Other important fauna are the Cocorico or Tobago Pheasant (*Ortalis ruficauda*), Green Hermit Hummingbird (*Phaetonis guy*), Red-Capped Cardinal (*Paroaria gularis*), and White Fronted Capuchin Monkey (*Cebus albifrons*). The Sundew (*Drosera kaieteurensis*) is an insectivorous plant endemic to Trinidad.

Thousands of Lionfish have been removed from the waters surrounding Trinidad and Tobago resulting in a reduction in their biomass by as much as 30 percent. Table 9 includes a list of threatened species.

Genetic Diversity

The Trinidadian Guppy (*Poecilia reticulata* – popular aquarium species) has been the subject of a current research project to study evolution in the wild and provide key insights into genetic rescue and gene flow during adaptation to new environments.

Status and Management of Protected Areas

Protected areas include 36 forest reserves, 13 wildlife sanctuaries, one protected marine area, prohibited areas, environmentally sensitive areas, and cultural and heritage properties of interest.[260] **Annex J** includes maps of current and proposed protected areas for Trinidad and Tobago.

Status and Management of Key Natural Resources Outside of Protected Areas

Some forested lands are privately protected, including approximately 526 hectares of mainly forested land in the Arima and Aripo Valleys under the management of the Asa Wright Nature Centre. There are also several private forest reserves (e.g., Adventure Farm, Englishman's Bay Estate, Arnos Vale, Charlotteville Estate, and Grafton Sanctuary) in Tobago.

TABLE 9. THREATENED SPECIES OF TRINIDAD AND TOBAGO

SPECIES	THREAT	LEGISLATION	REMARKS
Migratory waterfowl (Several species)	Illegal hunting	Conservation of WildLife Act (CoWA)	Hunted for decades
Scarlet Ibis (Eudocimus ruber)	Illegal hunting	CoWA; EMA ESS Rules	Hunted for decades
Flamingo (Phoenicopterus ruber)	Illegal hunting	CoWA; Act 19 of 2018	Migratory and hunted for meat
Red Howler monkey (Alouatta seniculus)	Illegal hunting	CoWA; Act 19 of 2018	Overhunted for decades
White fronted Capuchin monkey (Cebus albifrons)	Illegal hunting	CoWA; Act 19 of 2018	Endemic and over hunted
Capybara (Hydrochoerus hydrochaeris)	Legal Hunting	CoWA; Legal Notice 2018	Targeted for overkill and populations are small
Nine (9) Primaried Oscine Songbirds	Illegal trade and trapping	CoWA; Act 19 of 2018	Increased use in bird-singing competitions
Lappe (Cuniculus paca)	Illegal Hunting	CoWA; Act 19 of 2018	Increased used of night vision lenses for hunting
Red brocket deer (Mazama americana)	Illegal hunting	CoWA; Act 19 of 2018	Increased used of night vision lenses for hunting

Value of Biodiversity

Trinidad and Tobago is considered an upper income country, and is the wealthiest country in the Caribbean. Oil and gas account for about 40 percent of Trinidad and Tobago's GDP. Nature tourism is a growth sector and currently contributes almost 8 percent to GDP; the agricultural contribution is 1 percent.

From 2011–2015, the Ministry of Planning and Sustainable Development partnered with the University of the West Indies to undertake a GEF-funded, UNEP-led initiative known as the "Project for Ecosystem Services" (ProEcoServ). Under this project, valuation exercises were done on a number of ecosystem services, and there were preliminary efforts to explore how valuation could be incorporated into land use planning. The project helped bring economic valuation into national-level discussions about spatial planning and accounting in Trinidad and Tobago. As one of five countries around the world involved in ProEcoServ, Trinidad and Tobago contributed to some of the pioneering work in the Caribbean on valuation and the integration of biodiversity values into decision-making.[261]

Legislation, Policies, and Strategies

- 2013 – 2019 Hard-Substrate Demersal Fisheries Management Plan developed
- 2014 – Management Plan for Trinidad and Tobago Shrimp Trawl Fishery, Fisheries Division developed (covers all shrimp species and all trawl fleets)
- 2014 – Integrated Coastal Zone Management Policy Framework developed
- 2017 – National Plan of Action for the Conservation and Management of Sharks of Trinidad and Tobago, Fisheries Division, Ministry of Agriculture, Land, and Fisheries (covers all shark species) developed
- 2018 – Scarlet Ibis (Eudocimus ruber), the national bird, became protected under the Environmentally Sensitive Species Rules of the Environmental Management Act
- 2019 – National Protected Area Systems Plan for Trinidad and Tobago approved

Government Agencies

Current ministries relevant to biodiversity and forests are the Ministry of Agriculture, Land, and Fisheries and the Ministry of Planning and Development (Environmental Management Authority, Institute of Marine Affairs and Green Fund Executing Unit).

GUYANA

Major Ecosystem Types and Status

Guyana has a land area of 215,000 km^2 and contains a vast expanse of primary tropical forest. It has four main natural regions: the coastal plain, the hilly sand and clay region, interior savannas, and forested highlands. Ecosystems and major habitat types include savannahs (Berbice River and Rupununi), serpentine soils, white sand soils, wetlands/swamps, mangroves, flood plains, rock outcrops, rainforest, dry evergreen forests, and montane (cloud) forest. Collectively, these ecosystems support a rich diversity of flora and fauna. Areas that contain serpentine rock are known as sites with high levels of plant endemism; serpentine soils lack many micronutrients and contain heavy metals leading to select groups of plants that can adapt to these conditions.[262] The white sands support dense hardwood forests. These sands cannot support crops, and if the trees are removed erosion is rapid. Most of Guyana's reserves of bauxite, gold, and diamonds are found in the white sands region. Cloud forests as well as lowland rainforests support keystone species such as the Guianan Cock-of-the-Rock (*Rupicola rupicola*), the Harpy Eagle (*Harpia harpyja*), and the Olingo (*Bassaricyon gabbii*).

The forests of Guyana and Suriname are a part of the Guiana Shield tropical rainforest ecoregion, one of the largest contiguous and relatively intact, forested eco-regions in the world. Forests cover approximately 87 percent (18,483,000 hectares) of Guyana's total surface area. Forest cover has declined there by 1.1 percent from 2000-2019.[263] Forest types, as a percentage of total forest cover, include rainforest (36 percent), montane forest (35 percent), swamp and marsh forest (15 percent), dry evergreen forest (7 percent), seasonal forest (6 percent), and mangroves (1 percent).[264] Forest degradation is occurring in small areas, usually associated with artisanal mining. There has been some mapping of degradation pockets one hectare in size or larger.

There are more than 400 forest tree species, and six tree species are listed as protected and are not permitted to be harvested (e.g., Bolletrie, *Manilkara bidentata*).

The Iwokrama International Centre for Rain Forest Conservation and Development (Iwokrama) received and retained[265] certification for forest management from the Forest Stewardship Council and, to date, is the only area in Guyana that has been certified for meeting international best practices for forest management.

Mangrove restoration work has led to 142 ha of mangroves restored; 30 km2 of existing mangroves were protected from further depletion. Forestry management will incorporate indigenous communities in planning activities.

Species Diversity and Status

Guyana's floral diversity is estimated to include more than 8,000 species; approximately 6,500 of these species have been identified. There are about 1,815 known species of fishes, amphibians, birds, reptiles, and mammals. Fish are very diverse, with 352 species of freshwater bony fishes and 501 species of marine fish. The Illustrated World Compendium of Orchids List of Taxa includes 569 species of orchids with 34 listed as endemics. Guyana has 148 amphibians and 176 reptile species. The diverse herpetofauna include 137 species of frogs and toads, 11 caecilians, four crocodilians, four amphisbaenians, 56 lizards, 97 snakes, and 15 turtles.[266]

Eight threatened species are completely absent from the existing protected area system. These include four birds: Rio Branco Antbird (*Cercomacra carbonaria;* CR), Hoary-Throated Spinetail (*Synallaxis kollari;* CR), Red Siskin (*Carduelis cucullata*; EN), White-Bellied Piculet (*Picumnus spilogaster*; VU); two amphibians, MacConnell's Bush Toad (*Oreophrynella macconnelli;* VU), and Pebas Stubfoot (*Atelopus spumarius*; VU); two mammals, Reig's Opossum (*Monodelphis reigi;* VU), and the Venezuelan Fish-Eating Rat (*Neusticomys venezuelae*; VU).[267] The Global Invasive Species Database reports 49 invasive species in Guyana.

The Pakaraima Mountains have the highest level of plant endemism followed by the upper Mazaruni-Kako-Roraima. Most of the endemic vertebrate fauna of Guyana are restricted to highland areas, especially over 1,500 m. A 2014 WWF survey was conducted in less-researched sections and relatively pristine areas of the Upper Potaro watershed and within the Kaieteur National Park and the neighboring indigenous village of Chenapau. The park hosts 30 percent of mammals, 43 percent of amphibians, and close to 50 percent of birds known from Guyana; of these, 44 percent of amphibians, 16 percent of mammals, 13 percent of reptiles, 12 percent of birds, and 8 percent of plants are endemic to the wider region of the Guiana Shield and Guiana Highlands.[268] The survey revealed more than 30 species (including six species of fish, three plants, 15 aquatic beetles, and five odonates) that were new to science. WWF conducted other surveys in Guyana's southern Rupununi region resulting in broad-based documentation of the flora and fauna, including new data on terrestrial and freshwater taxonomic groups and an evaluation of water quality.

Genetic Diversity

The homestead cultivation of plant species diversity for food and agriculture represents an informal but significant depository of in situ diversity. Plant diversity found in homestead accounts for more than 80 percent of the plant species diversity for food and agriculture in Guyana. This form of "in situ homesteads" is encouraged, and it has been successful in so far as it supports a culture of food self-reliance.[269]

The Centre for the Study of Biological Diversity houses the National Herbarium and the zoological research collections, which contain approximately 50,000 plant specimens and more than 32,000 animal specimens (more than 10,000 fish, 700 amphibians, 300 reptiles, 350 mammals, 820 birds, and more than 20,000 insects).

Status and Management of Protected Areas

The National Protected Areas System currently comprises approximately 8.4 percent of Guyana's landmass and includes Iwokrama Forest (established by separate legislation, the Iwokrama Act 1996), Kaieteur National Park, Kanashen Amerindian Protected Area, Kanuku Mountains Protected Area, Shell Beach Protected Area, and Urban Parks (National Park, Botanical Gardens, Zoological Park, and Joe Vieira Park). The current protected area network covers 1.8 million ha, but contains only 48 percent of vertebrate species (60 percent, 24 percent, and 11 percent for bird, mammal, and reptile and amphibian species, respectively) and five of the 17 vegetation types: mangrove, marsh forest, mixed lowland forest, and white sand forest. Grasslands, highlands, and wetlands are missing from the current protected area network.

Kanashen Amerindian Protected Area was established in 2017 and is Guyana's newest and largest protected area. The Kanashen Indigenous District, an area of 648,567 hectares (3 percent of Guyana) is home to the Wai Wai people, and is the only Indigenous-owned territory in the protected area system (Protected Area Map, **Annex J**). The community's role as owners and managers of the area represents a new and innovative approach to conservation in Guyana.[270]

Understanding the critical values to livelihoods and climate change mitigation, Guyana has launched a National Mangrove Restoration Program to conserve and manage their extensive mangrove system.[271]

Status and Management of Key Natural Resources Outside of Protected Areas

In 2018, Guyana launched and pledged to support the Triple A Eco-Cultural Corridor Initiative, a regional initiative that seeks to establish and maintain connectivity between the three ecosystems—Andes, Amazon, and Atlantic—in an effort to guarantee ecosystems and biodiversity services of the Amazon Basin and to bolster innovative solutions to climate change.[272] The initiative builds on the global significance of the Amazon biome and Amazon Basin and recognizes the threats and opportunities presented by large-scale production and extractive activities affecting biodiversity and indigenous cultures from the Andes through the Amazon to the Atlantic.

Marine Spatial Planning is being initiated to manage ocean and coastal areas for competing activities like oil and gas, fisheries, ecosystems, and marine species.

Biodiversity Values

Ecosystem services valuation studies of Iwokrama forest are being conducted with European Union support. The projects are a part of the Forest Research Network, the Guiana Shield Initiative, and a program focused on capacity building to support national initiatives in reducing deforestation and degradation in Guyana. The first project is funded by the European Commission and the Centre for International Forestry Research EU-ACP Forestry Research Network Project. The second is funded by the European Union, the Dutch Government, the UNDP, the IUCN, and the Netherlands Committee. A third project is supported by the Gordon and Betty Moore Foundation. These three projects have begun to take research at Iwokrama in a new direction, building on baseline information to cover all aspects of the ecosystem services that forests provide.

Bollini and Millar (2019) examined the impacts on shellfish and finfish as a result of mangrove degradation in Guyana and Suriname. Their findings calculated the estimated percentage loss in fish catch was 1.81 percent because of mangrove clearing. The total value of the loss in seabob shrimp catch in Guyana is USD 586,400. The annual value of one hectare of mangroves adds USD 1,496 to the Guyanese seabob fishery.[273] Guyana recently received certification for the seabob shrimp industry from the Marine Stewardship Council.[274]

A multi-million agreement was signed between the Kingdom of Norway and the Government of Guyana in October 2009 based on Guyana's Low Carbon Development strategy. From 2010–2015, Norway gave Guyana USD 250 million per year to slow down deforestation (under a REDD+ agreement). The results were positive. However, once the Norwegian funding stopped in 2015, there were reports that deforestation rates increased considerably in 2016 and 2017; the government attributed part of this to El Niño. Deforestation also increased as a result of mining, which the government believes to account for 80 percent of it.

Legislation, Policies, and Strategies

- 2013 – National Strategy for Agriculture approved (2013 – 2020)
- 2014 – Harvest Control Rule developed. Under this rule, seabob vessels are restricted to 225 days at sea and to a Catch Per Unit Effort with varying indicator levels
- 2014 – Vessel Monitoring System (VMS) was implemented and made mandatory for all seabob shrimp vessels and prawn vessels. The reduction of by-catch is an important aspect of sustainable fishing
- 2015 – By-catch reduction devices mandatory on all seabob shrimp trawlers, along with a number of other measures
- 2015 – 2020 – Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge in the Environment revised but not finalized due to insufficient baseline data
- 2016 – Wildlife Conservation and Management Act 2016 (CITES compliance) passed and gazetted
- 2016 – 2020 – Protected Areas Commission's Strategic Plan approved
- 2017 – Kanashen Amerindian Protected Area gazetted
- 2017 – Sea and River Defense Sector Police/ Integrated Coastal Zone Management Policy drafted
- 2018 – National Tourism Policy and Strategic Action Plan (2018 – 2025) drafted
- 2018 – National Forest Policy Statement and National Forest Plan revised
- 2018 – Forest Regulations detailing the legal modalities for forest activities gazetted
- 2018 – Three new regulations in accordance with the Wildlife Conservation and Management Act 2016 approved by Cabinet
- 2018 – Wildlife Conservation Management and Sustainable Use Regulations approved by Cabinet
- 2018 – Zoo Administration and Management Regulations approved by Cabinet
- 2018 – Wildlife Holding Premises Regulations approved by Cabinet
- 2018 – National Mangrove Management Program launched

- 2019 – Guyana Marine Fisheries Management Plan 2013 – 2020 and Guyana Seabob Fisheries Management 2015 – 2020 adopted
- 2019 – Draft National Action Plan for Mercury Reduction prepared, and is currently undergoing revision
- 2019 – National Climate Change Policy and Action Plan drafted
- 2019 – Green State Development Strategy: Vision 2020 – 2040[275] approved
- 2019 – Guyana Wildlife Conservation and Management Commission Strategic Plan (2019 – 2020) approved

Government Agencies

A number of oversight committees and specialized units have been formed in Guyana since the previous assessment. These include the 2017 establishment of The Guyana Wildlife Conservation and Management Commission. Within the Environmental Protection Agency, there is now a MEAs Unit and a Forestry Unit. A Protected Areas Commission, Coastal and Marine Affairs Committee, and Office of Climate Change have also been established.

SURINAME

Major Ecosystem Types and Status

Suriname has a land area of 164,000 km^2 and contains a number of diverse ecosystems: marine/open ocean, coastal mangrove forests and mangrove swamps, brackish water lagoons, freshwater systems of lakes and rivers, white and brown sand savannahs, wetlands, rainforests, dry evergreen forests, montane forests, and inselbergs.[276] The existence of the Amazon Reef, at the mouth of the Amazon River, was confirmed in 2017. Its current known extent is from Brazil to French-Guiana. The reef has yet to be fully mapped, and it is possible that the Amazon Reef could reach as far as Surinamese waters.

In 2017, Suriname extended its Exclusive Economic Zone and it now has a maritime territory that extends 345 nautical miles offshore and includes a total marine surface area of 143,000 km^2. Suriname's coastal region is extensive and low-lying and has been identified as highly vulnerable to climate-induced sea level rise in future decades.

Status of Tropical Forests

Forests cover approximately 94 percent of the country, making it known internationally as the "green country" or "the greenest country in the world." The Suriname Constitution accords land and natural resources to the government by default unless formally given to private ownership. The Principles of the Land Policy states that "all land, to which others have not proven their right to ownership, is the domain of the State." Furthermore, Article 41 of the Surinamese Constitution states that wealth and resources are property of the nation and shall be used to promote economic, social, and cultural development.[277]

'Suriname is also the last country in Latin America to recognize the official standing of the Indigenous and Tribal Peoples (ITPs) as a distinct minority. ITPs have accused the central government of discrimination and have taken their case to the Inter American Human Rights System of the Organization of American States. In 2015, the System found that "Suriname is responsible for grave, institutionalized, and long-standing violations of ITPs' rights."[278] Most of the ITPs live in the forested interior, which is directly linked to their cultural heritage. The central government has given out concessions and leases to timber and mining companies on ITP historical lands.[279]

Suriname is considered a carbon net sink country, as it absorbs more greenhouse gases than it produces. From 2000-2019, Suriname lost 184,000 hectares of tree cover, which is the equivalent to a decrease of 1.3 percent.[280] The country has taken initiatives during the past several years to prepare the forest industry sector for certification.[281]

Species Diversity and Status

The total number of terrestrial vertebrate species recorded in Suriname is 1,163. By group, there are 102 amphibians, 175 reptiles, 694 bird species, and 192 mammals.[282] There are 790 marine and freshwater species. Of the total number of vertebrates, about 36 species or 2 percent (mainly freshwater fishes) are endemic to Suriname.[283] There are five species that are

critically endangered (four animals, one tree species), ten species that are endangered (eight animals, two tree species), and 59 species that are vulnerable (32 animals, 26 tree species).[284] From 2006 to 2016 the number of endangered species increased by 18.6 percent. The knowledge of invertebrate fauna is very much incomplete, and there is very little information available on the total number of plant species.

Forty-one mammals are protected, including the Guianan Red Howler Monkey (*Alouatta seniculus*) and Jaguar (*Panthera onca*), and 13 species may not be exported without a CITES permit, including the Common Squirrel Monkey or Monki Monki (*Saimiri sciureus*) and the Red-Rumped Agouti (*Dasyprocta leorine*).[285]

Genetic Diversity

Centrum voor Landbouwkundig Onderzoek in Suriname (Center for Agricultural Research) has established ex situ cassava gene banks in 2014.[286] These gene banks are situated in test field areas in the district of Saramacca (Tijgerkreek West) and in the interior (Phedra). This project has aimed to support the development of the Surinamese cassava cultivation and processing sector. Ex situ propagation of rice (SNRI/ADRON) is also taking place. The Ministerie van Landbouw, Veeteelt en Visserij (LVV Ministry of Agriculture, Livestock, and Fisheries) also manages several experimental gardens with collections of fruit crops and other varieties of agriculture crops.

Status and Management of Protected Areas

Nearly the entire coastline of Suriname falls within the country's protected area system. Only a section near the eastern coast border area and the highly urbanized central coastal area surrounding Paramaribo are excluded. Four Multiple Use Management Areas (245,000 ha) and six nature reserves (128,000 ha) are situated along Suriname's coastal zone. Each protected area is roughly divided between terrestrial and marine systems, extending approximately five kilometers inlands and two kilometers into the sea. Bigi Pan, North Coronie, and North Saramacca are on the western coast. North Commewijne – Marowijne is on the eastern coast. Bigi-Pan is a Western Hemisphere Shorebird Reserve Network (WHSRN) site and a proposed RAMSAR site. Coppename-Monding Nature Reserve, located within North Saramacca, is an important RAMSAR and WHSRN site (Protected Area Map, **Annex J**).[287]

There are four proposed protected areas: Nani, Kaburi, Mac Clemen, and Snake Creek for a total area of 132,000 ha. The Coronie Swamp is also being considered as a protected area.

Status and Management of Key Natural Resources Outside of Protected Areas

Outside the PAs, some NGOs have implemented projects for the management of community forest resources. Tropenbos International Suriname has implemented projects in the Upper Suriname River, from 2014 to 2017, with the goal to map ecosystem services for the local communities using Participatory 3Dimensional Modeling.
In 2015, initiatives were taken to establish a Mangrove Education Center in the district of Coronie by the Ministry of Spatial Planning, Land, and Forest Management as part of the GEF-funded Suriname Coastal Protected Areas Management Project.

Capacity in land use and forest cover mapping improved in ministries through technical collaboration and the development in 2016 of the Gonini Portal. All data is being shared through the online geoportal.[288]

The Fisheries Management Plan of 2014-2018 has identified different use zones. Zone one is for breeding, which means that there are no trawler activities allowed there. The waters off the beaches of Galibi (in the Marowijne River estuary) are declared no fishing zones as they function as breeding grounds for sea turtles.

Value of Biodiversity

The economy of Suriname is largely driven by the extractive industry sectors of mining and oil. Bauxite and gold are the primary minerals mined, but Suriname contains sources of diamonds and other valuable minerals. Oil has been part of the economy for decades, but recent finds indicate that oil will be playing a larger role in relation to GDP. Other

sectors important to the economy include forestry, fisheries, and agriculture. Suriname is making efforts to increase tourism as well. In 2019, agriculture contributed 11.6 percent to GDP, tourism only 2.6 percent.

The rainforest is a highly important ecosystem providing numerous services to not only the Indigenous and Maroon communities, but other local and urban communities as well. The rainforest has high value due to its ability to provide essential services, such as medicinal plants and other non-timber forest products and logging opportunities to all communities. ITPs have used the different ecosystem services in the interior in a sustainable manner for generations, including, amongst others, selective logging of palms as roofing material, as well as replanting and reserving part of the ecosystem for knowledge transfer.

The forest is recognized as a carbon sink of global importance. It is estimated that the tropical rainforest of Suriname stores about 11 gigatons and absorbs more than 8.8 million tons of carbon annually.[289] Because of its carbon sequestration and low deforestation, Suriname provides a key ecosystem benefit to the world.

Major initiatives are underway to develop working landscapes to realize sustainable forests, sustainable income generation, and forest livelihoods. A five-year program ending in 2023 aims to provide inclusive governance, climate-smart land use, and responsible business and finances.

Economic evaluations are being prepared for the Bigi Pan MUMA (coastal protected area management plan), which will be revised with a focus on fisheries, hunting, and tourism.

The ecosystem service value of mangroves in both Suriname and Guyana was the focus of a recent study.[290] After conducting interviews with community members and other stakeholders, the study produced a list of ecosystem services associated with the mangrove systems: aesthetics, culture, heritage and social values, health impacts, species existence, wood products, non-timber forest products, fish abundance (commercial and subsistence), recreational values, flood damage mitigation, shoreline property damage mitigation, protection of peatlands, and climate mitigation.

In relation to the "fish abundance" service that mangroves provide, Suriname and Guyana are now the two most productive CARICOM countries in the fisheries and aquaculture sector. The same study estimated percentage loss in fish catch was 0.76 percent and the loss in weakfish catch in Suriname was USD 180,900 due to mangrove destruction; the annual value that one hectare of mangroves adds to the Surinamese weakfish fishery is USD 476.[291]

Suriname became the first country in the world to have their shrimp industry certified by the Marine Stewardship Council. The seabob shrimp industry was recertified in 2016 after Suriname invested more than USD 20 million in enforcement vessels to strengthen the surveillance and monitoring programs.[292]

Legislation, Policies, and Strategies

- 2014 – National Plan for Forest Cover Monitoring prepared
- 2014 – Fisheries Management Plan (Visserij Management Plan voor Suriname) established (2014 – 2019)
- 2015 – Southern Suriname Conservation Corridor established, building on the success of the Central Suriname Nature Reserve and protecting 7.2 million hectares of rainforest, contiguous with protected areas in neighboring Brazil and French Guiana
- 2016 – 2019 – Rewriting of three coastal management plans within the Global Climate Change Alliance+ project for the Bigi Pan, North Coronie, and North Saramacca MUMAs
- 2016 – National Oil Spill Contingency Plan developed in anticipation of a crude oil find
- 2016 – Preliminary work for a new Mining Act (Mijnbouwwet)
- 2016 – Draft Coastal Protection Act (Ontwerpwet Bescherming Kustgebied)
- 2016 – Presidential Committee on the Rights of Indigenous and Tribal Peoples in Suriname established to develop proposals to address land rights issues

- 2017 – Protection of Residential and Living Areas of Indigenous and Tribal Peoples Act (Wet Bescherming Woon - en Leefgebieden). Approved by Parliament, but not enacted by the President. The act aims to protect residential and living areas of the ITPs against the issuance of concession rights in those areas
- 2017 – National Strategic Tourism Plan 2018-2030
- 2017 – Process to review the Nature Conservation Act 1954 (Natuurbeschermingswet) initiated
- 2017 – Maritime Zones Act (Wet Maritieme Zones) endorsed by Parliament
- 2018 – The Animal Welfare Act (Wet DierenWelzijn). Approved 2017 but enacted in 2018[293]
- 2020 – Environmental Framework Law (Milieu Raamwet) passed
- 2020 – Act on Coastal Protection before parliament to deal with increased threats to mangrove areas

Government Agencies

Government agencies related to biodiversity and forests include the Milieu en Omgeving (Ministry of Environment), which houses the Nationaal Instituut voor Milieu en Ontwikkeling in Suriname (National Institute of Environment and Development), REDD+, and Small-Scale Mining. The Agrarische Productie et Voedel covers agriculture, livestock, and fisheries. The Ministry of Land, Spatial Planning, and Forest Management contains the Stichting voor Bosbeheer en Bostoezich (Foundation for Forest Management and Forestry), which manages forests and forest concessions. The Natuurlijke hulpbronnen (Ministry of Natural Resources) oversees the mining and oil sectors.

ANNEX H. GAP ANALYSIS OF CONSERVATION INITIATIVES

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS (FAO)

The Caribbean Strategy for Climate Resilient Forests and Rural Livelihoods was developed in 2019. This strategy has five thematic areas:

1. Resilient forest products, livelihoods, and local green enterprises
2. Resilient forest ecosystems
3. Forest ecosystem services for climate resilience
4. Disaster resilience for the forestry sector
5. Frameworks, tools, and mechanisms for climate resilience

The entire Strategy and individual themes are aligned with international frameworks such as the Sustainable Development Goals 1, 13, and 15; the Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway and the International Convention on Biodiversity's Aichi Target 18. The implementation of the Strategy will require focus on three aspects: 1) capacity building; 2) strengthening of relevant institutional frameworks; and 3) generating and managing relevant knowledge streams, both academic and indigenous. This strategy was developed and will be implemented with the support of CANARI and FAO regional, sub-regional, and national offices partnering with national government agencies, civil society, academia, and other key stakeholders.

CARIBBEAN NATURAL RESOURCES INSTITUTE (CANARI)

Current and future work programs have a heavy protected-area focus looking at development of plans, strengthening PA networks, and establishment of corridors. A significant emphasis will be persons living on the fringe of PAs to address issues such as pesticide use, cutting of trees, and establishing alternative livelihoods.

The OECS biodiversity agenda being finalized with government portfolio ministers has five focal areas:

1. Restoration (includes pollution abatement)
2. Invasive Species (terrestrial and marine)
3. Climate and Disaster Resilience (includes EbA and climate proofing)
4. The Nagoya Protocol on Access and Benefit Sharing
5. Integration of Biodiversity into National Planning (includes ecosystem valuation)

CANARI has also assisted with implementation of the Critical Ecosystem Partnership Fund (CEPF) for organizations that affect biodiversity. The CEPF intends to link biodiversity to human well-being as well as establish links to global agendas such as the Aichi Targets (Targets 1, 12, 20) and the UN Sustainable Development Goals. The CEPF contributes to 11 of 17 goals. This new phase of the CEPF has revised the Key Biodiversity Area standards.

The new strategic direction will focus on:

1. Climate at the site level
2. Invasive species with emphasis on corridors
3. Species protection in particular Conservation Action Plans
4. Enabling conditions for biodiversity
5. Civil society capacity building
6. Regional Implementing Teams

CARIBBEAN BIODIVERSITY FUND (CBF)

The Caribbean Challenge Initiative (CCI) was created at a 2013 summit of political leaders from nine Caribbean countries, businesses, and international and national NGOs including The Nature Conservancy (TNC). Participating countries commit to conserving at least 20 percent of marine and coastal environments by 2020. CCI/TNC created the Caribbean Biodiversity Fund (CBF) as a sustainable funding mechanism. This umbrella fund has a flexible structure to implement innovative solutions for resource mobilization at the regional level through a range of financial instruments. Currently, the CBF manages a total of USD 125 million, including the now USD 75 million in its Conservation Finance Program endowment, which aims to supports 12 countries across the region, and a USD 50 million sinking fund for Ecosystem-based Adaptation, which anchors the CBF's Climate Change Program. These two instruments have jointly

disbursed to date approximately USD 4.4 million to partners' national conservation trust funds and grantees under the EbA Facility.

The CCI has two main goals:

- Goal 1: 20-by-20 Goal, which aims to conserve and effectively manage at least 20 percent of the marine and coastal environment by 2020.
- Goal 2: Sustainable Finance Goal, which is geared toward establishing fully functioning finance mechanisms that provide long-term, reliable funding to ensure marine and coastal areas are sustainably managed into the future.

At the center of the Sustainable Finance Goal is the Caribbean Sustainable Finance Architecture. This architecture, currently formed by ten national conservation trust funds and the CBF is designed to mobilize reliable and long-term funding for not only the Caribbean's marine and coastal environment and protected area systems, but also biodiversity conservation and sustainable development at large.

GLOBAL ENVIRONMENTAL FACILITY (GEF)

The GEF was established in 1992 to address some of the world's most urgent environmental issues. The GEF receives funding from 40 countries and provides support to developing countries in their effort to meet the terms and conditions of international environmental conventions. The GEF works primarily through the World Bank, the UNDP and UNEP, by providing grants to government agencies. Within the Caribbean, the GEF is funding a range of projects related to biodiversity.

The Caribbean and North Brazil Shelf Large Marine Ecosystems Strategic Action (CLME+ SAP) project is implemented by the UNDP (2015 – 2025) with a budget of USD 146 million. The Project aims to facilitate Ecosystem-Based Management and the implementation of the Ecosystem Approach to Fisheries in the CLME+ region in order to ensure the sustainable and climate-resilient provision of goods and services from shared living marine resources.

The Powering Innovations in Civil Society and Enterprises for Sustainability in the Caribbean project is implemented by the CANARI (2017 – 2020) with a budget of USD 2.3 million. The project uses information communications technology and social networks to support civil society in governance and management of marine and coastal resources, working with MPAs in Antigua and Barbuda, Santa Lucia, Jamaica, and Saint Vincent and Grenada.

The Critical Ecosystem Partnership Fund (CEPF), is funded by GEF, EU, World Bank, Government of Japan, l'Agence Française de Développement, and Conservation International. CEPF, functioning since 2000, has awarded more than USD 6.9 million in grants in the Caribbean through 2015, including grants for MPA strengthening. CEPF is designing a second phase in the Caribbean to start in 2020 with renewed GEF funding. Key partners include international, regional, and local NGOs, universities, and research institutes.

The Integrating Water, Land, and Ecosystem Management in Caribbean Small Island Developing States project (GEF IWEco, 2016 – 2021) has USD 20 million in grant funding, and USD 252 million in loan funding. Key partners include the United Nations Environment Program Caribbean Regional Coordinating Unit of the Secretariat to the Cartagena Convention, and the Caribbean Public Health Agency. The project is working in ten countries on sustainable land management; it focuses on the Land Based Sources of Marine Pollution Protocol implementation, and the strengthening of coastal ecosystems in cooperation with MMAs/MPAs. The project operates in the eight ESC island countries as well as Jamaica and Cuba.

The durable funding and management of marine ecosystems in the Eastern Caribbean and three linked projects in the Bahamas, Dominican Republic, and Jamaica (2015 – 2018) was funded by GEF in tandem with the CCI/CBF initiative and the ECMMAN projects. Key partners were CaMPAM and OECS. All four projects worked to support MMA/MPAs.

Mitigating the Threat of Invasive Alien Species in the Insular Caribbean was funded by GEF (2010 – 2015) for USD 3.1 million. CAB International is a key

partner. The most important output from this project was the Caribbean Invasive Alien Species Network and associated regional database on invasive alien species.

The Advancing Conservation in the Eastern Caribbean Project was approved in 2018 and is a USD 4.2 million effort implemented by UNEP to support biodiversity conservation through capacity building for protected area management in Antigua and Barbuda, Dominica, Grenada, and Saint Lucia.

The Promoting National Blue Economy Priorities through Marine Spatial Planning in the Caribbean Large Marine Ecosystem Plus (BE-CLME+) includes a USD 6.2 million GEF grant; the concept was approved in late 2019. Barbados, Saint Lucia, and Guyana are three ESC countries participating (also Panama, Jamaica, and Belize); most of the funding (USD 25 million loan from the implementing agency, the Development Bank of Latin America) is for the sustainable use of fisheries and expanding the marine protected area system.

Advancing the Nagoya Protocol in Countries of the Caribbean Region was a USD 1.8 million grant that worked on policy and legislation in Guyana, Saint Lucia, Dominica, Saint Vincent and the Grenadines, and Antigua and Barbuda. It was approved in 2015 and is now closed.

EUROPEAN COMMISSION

The Biodiversity and Protected Areas Management Program is funded by IUCN (with European Commission funds) (2017 – 2023) with a budget of USD 23.2 million. Key partners are ACP, GIZ, UNEP/CEP, and University of the West Indies/Center for Resource Management and Environmental Studies. It aims to make science and knowledge available for building capacity to improve policies and better decision-making on biodiversity conservation in both terrestrial and marine areas. The hub in the Caribbean is the Regional Observatory for Protected Areas and Biodiversity at the University of the West Indies. With IUCN, it also has a USD 20 million "action component" of small grants to strengthen the effectiveness and governance of protected and conserved areas (including MPAs/MMAs).

The voluntary scheme for Biodiversity and Ecosystem Services in Territories of European overseas was funded by the EC (2011 – 2017 and 2016 – 2021, BEST 2.0) for USD 4.4 million and USD 6.9 million, respectively. Key partners are IUCN and Global Island Partnership. It supports projects in 16 overseas territories of EU member states in the Caribbean, aimed at biodiversity conservation and sustainable use of ecosystem services including ecosystem-based approaches to climate change adaptation. It includes support for MMAs/MPAs through the small grants component.

The Eastern Caribbean Marine Managed Area Network project funded by German Federal Ministry for the Environment (2013 – 2018) at USD 4.6 million, provided funding and capacity development to MPAs in six countries. Key partners including OECS, TNC, and the UNEP/SPAW Regional Activity Centre are also working with the Caribbean Marine Protected Areas Managers network and CRFM with the Caribbean Network of Fisherfolk Organizations.

Regional support for the CCI: Networking, consolidation, and regional coordination of MPA management, funded by the Government of Italy (2016 – 2018) at USD 1.5 million. Key partners were UNEP/CEP, Gulf and Caribbean Fisheries Institute, and CaMPAM. It worked to create national, sub-regional, and regional networks of MMAs/MPAs. The main outputs have been to strengthen CaMPAM and to create tools for MPA management improvement.

INTERAMERICAN DEVELOPMENT BANK (IDB)

Barbados – four projects: 1) Coastal Zone Mgt. (spatial planning, natural resource asset mgt., disaster risk mgt. - USD 80 million, U.S. approved March 11, 2020); 2) Strategic Framework for Blue Economy (USD 300K – active); 3) Walkers Reserve Integrated Master Plan and Restoration Pilot (USD 650K – active); and 4) Totally Traceable Tuna[294] (USD 370,000 – active).

Guyana – four projects: 1) Forest Carbon Partnership Facility Project in Guyana to get Guyana "REDD ready" (USD 3.8 million – implementation); 2) Supplemental Endemic Fish Surveys for the Amaila Falls Hydroelectric Project (USD 440,000—approved 2014—closed); 3) Strengthening of the Environment Sector II (low carbon strategy, continuation of phase 1), capacity support to Ministry of Natural Resources in relation to new subsectors, improve monitoring and verification systems (USD 17.16 million—approved 2015—closed); and 4) CANEF – Promoting Sustainable Practices in the Mining and Forestry Sectors (USD 350,000— approved 2017—implementation)

Suriname – two projects: 1) Introducing a Natural Capital Asset Class in Global Exchange Markets: The Central Suriname Nature Reserve Company[295] (USD 1.2 million—approved 2017—implementation); and 2) Support for Suriname's National Sustainable Tourism Master Plan (USD 219,000—approved 2019)

Trinidad and Tobago – 1) Piloting an innovative approach to adaptation in Tobago[296] (USD 555,000 – closed).

Regional – 1) Developing Opportunities for Private Sector Investment in Biodiversity and Ecosystem Services (USD 250,000—approved 2014—closed)

WORLD BANK

Grenada – Fiscal Resilience and Blue Growth Development Policy Credit.[297] (USD 30 million—approved 2018—closed) (phase 2 - USD 20 million - active)

Trinidad and Tobago – The Nariva Wetland Restoration and Carbon Sequestration Project. The objective was to contribute to efforts to restore and conserve the Nariva Wetlands, through the recognition of the services it provides as a carbon sink and a biodiverse ecosystem. (USD 4.6 million – closed in 2018)

OECS – 1) Sustainable Financing & Management of Eastern Caribbean Marine Ecosystem Project[298] (GEF - USD 8.75 million; KfW—USD 4.5 million—closed 2016); 2) Regional Tourism Competitiveness Project for Grenada, Saint Lucia, and Saint Vincent and the Grenadines (one component will work on tourism sites) (USD 26 million – approved 2016); 3) Regional Agricultural Competitiveness Project (includes fisheries; USD 8.3 million – active); and 4) Caribbean Regional Oceanscape Project[299] (USD 6.3 million – active)

IFC

Guyana – In 2014, IFC, a member of the World Bank Group, completed a USD 185 million financing package for the construction and development of Guyana Goldfield's Aurora gold mine, located 170 kilometers west of Georgetown. The project is expected to become one of the largest contributors to Guyana's tax base and generate up to 900 jobs during peak construction. Since becoming a shareholder in the company in 2006, IFC has helped Guyana Goldfields establish an integrated environmental, health, safety, and social management system in line with international best practices.

ANNEX I. ANALYSIS OF RED LIST ANIMAL AND PLANT NUMBERS BY COUNTRY

COUNTRY	YEAR	ANIMALS						PLANTS					
		CR[300]	Trend	EN	Trend	VU	Trend	CR	Trend	EN	Trend	VU	Trend
Antigua & Barbuda	2020	11	↑	16	↑	40	↑	-	↔	2	↓	1	↔
	2013	7		9		22		-		3		1	
Barbados	2020	13	↑	14	↑	39	↑	-	↔	1	↔	2	↔
	2013	9		7		24		-		1		2	
Dominica	2020	11	↑	16	↑	41	↑	1	↔	3	↓	8	↑
	2013	6		12		24		1		4		4	
Grenada	2020	10	↑	15	↑	39	↑	-	↔	1	↓	2	↑
	2013	7		12		23		-		2		1	
St. Kitts & Nevis	2020	10	↑	13	↑	39	↑	-	↔	-	↓	2	↑
	2013	7		9		14		-		1		1	
St. Lucia	2020	10	↑	19	↑	38	↑	-	↔	2	↓	7	↑
	2013	8		10		24		0		3		2	
St. Vincent & the Grenadines	2020	10	↑	16	↑	40	↑	-	↔	1	↓	5	↓
	2013	6		8		35		1		2		23	
Suriname	2020	6	↔	16	↑	45	↑	1	↔	3	↑	25	↑
	2013	6		8		35		1		2		23	
Guyana	2020	8	↔	27	↑	65	↑	3	↑	9	↑	25	↑
	2013	8		10		24		-		2		2	
Trinidad & Tobago	2020	14	↑	18	↑	53	↑	15	↑	21	↑	15	↑
	2013	9		11		34		-		1		-	

ANNEX J. MAPS

ANTIGUA AND BARBUDA

All Antigua and Barbuda maps courtesy of the Department of the Environment.

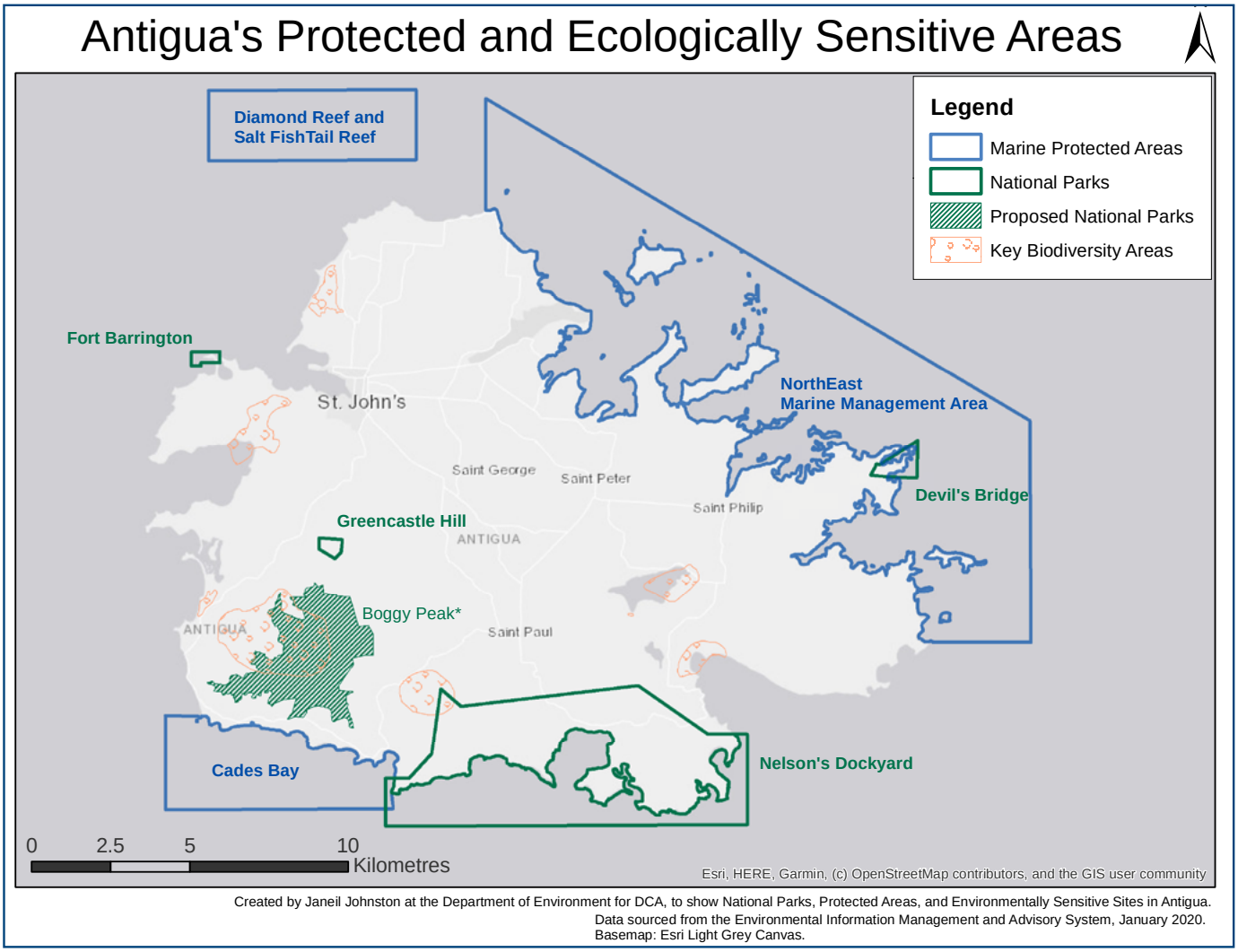


Figure 18. Antigua Protected and Ecologically Sensitive Areas

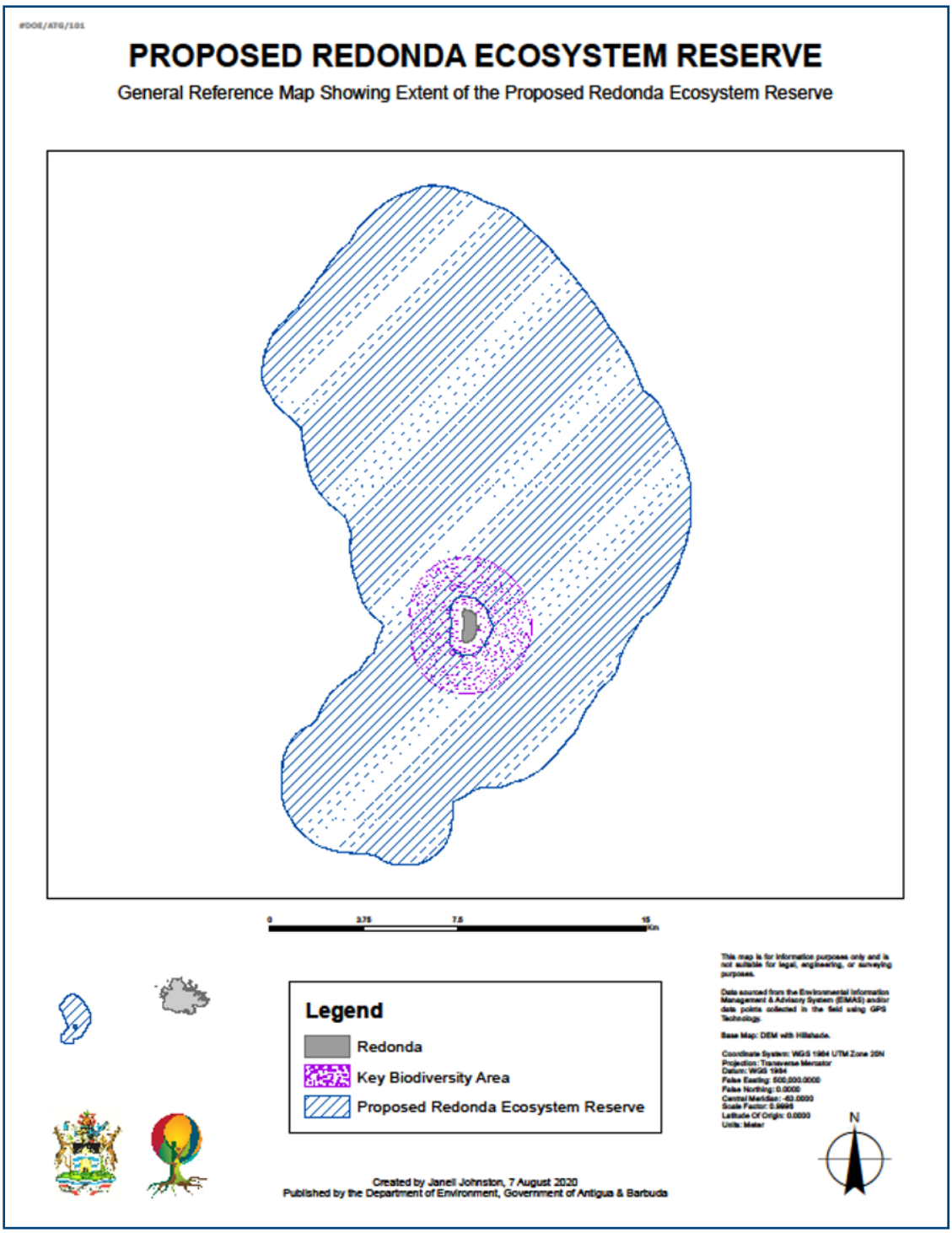
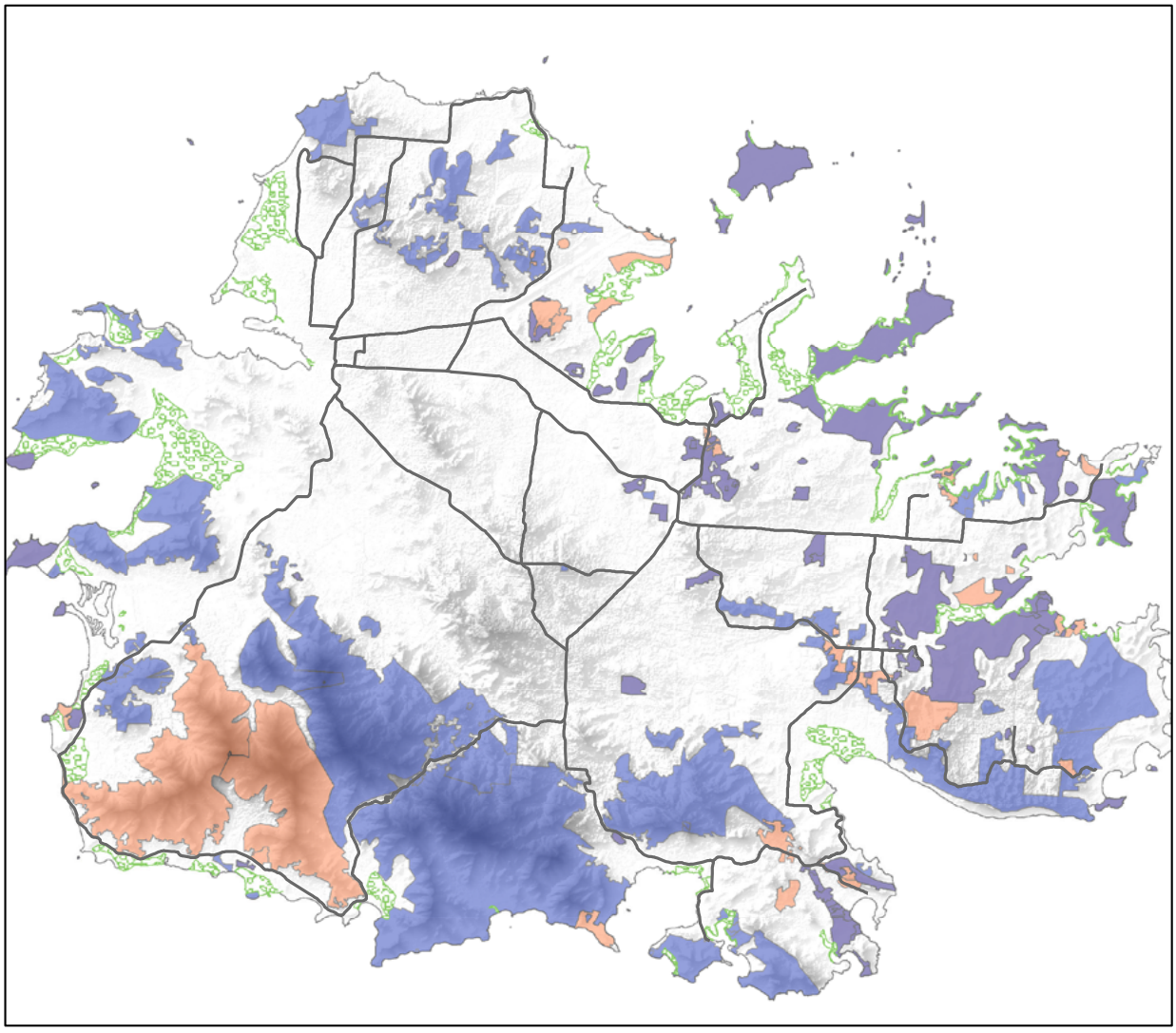


Figure 19. Proposed Redonda Ecosystem Reserve

#DOE/ATG/074

WOODLAND VEGETATION IN ANTIGUA

General Reference Map Showing Forest Populations in Antigua.



0 3 6 12 Km

Legend

- Major Roads
- Mangrove Wetlands
- Pre-Colonial Old Growth Forest
- Re-Growth Forest

This map is for information purposes only and is not suitable for legal, engineering, or surveying purposes.

Data sourced from the Environmental Information Management & Advisory System (EIMAS) and/or data points collected in the field using GPS Technology.

Base Map: EIMAS.

Coordinate System: WGS 1984 UTM Zone 20N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -63.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

N

Created by Janeil Johnston, 11 June 2020.
Published by the Department of Environment, Government of Antigua & Barbuda

Figure 20. Woodland Vegetation of Antigua

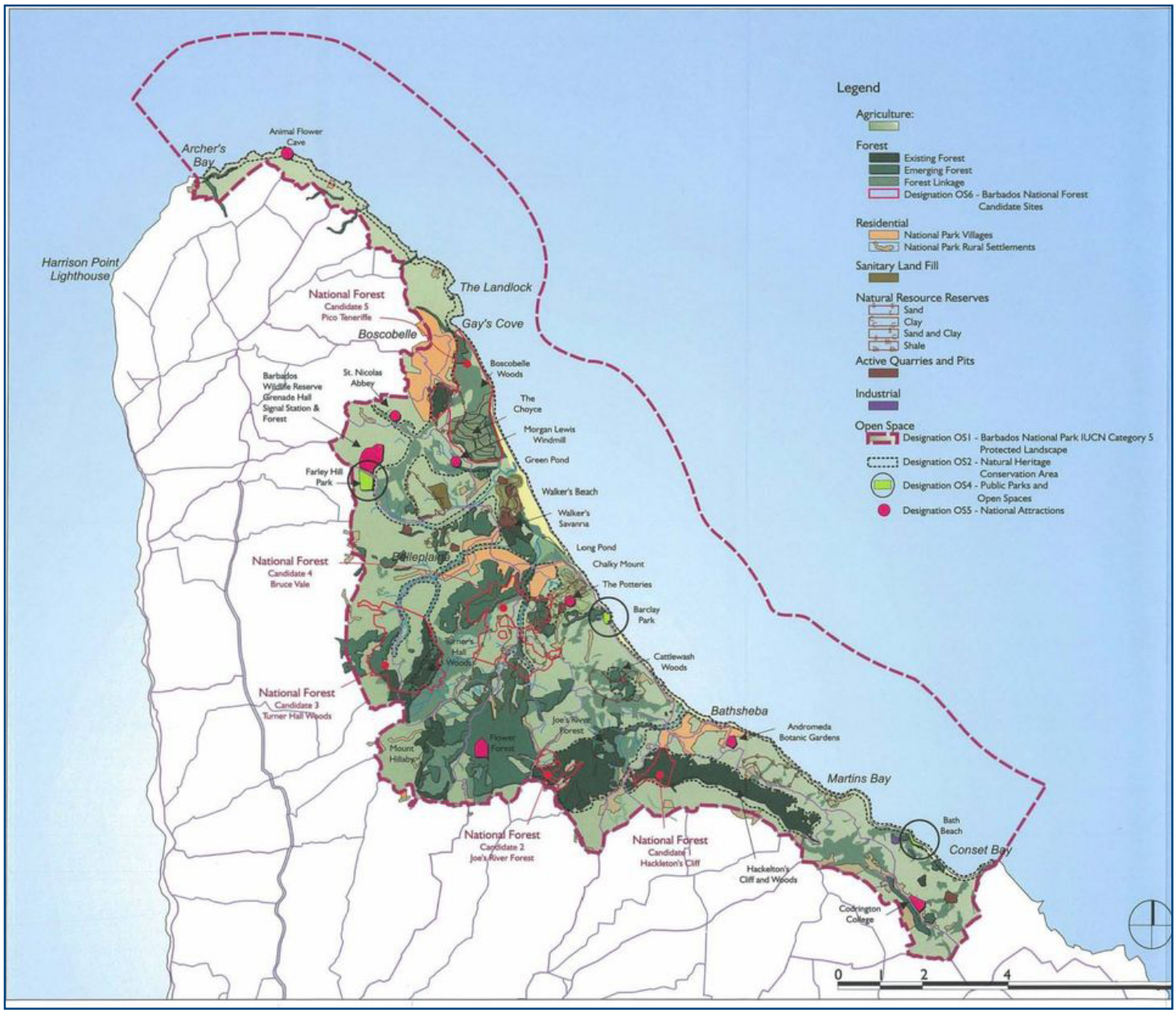


Figure 21: Map of Vegetation on Barbados

SAINT KITTS AND NEVIS

Figure 22. Saint Kitts and Nevis Marine Management Area Map. Source: Agostini, V. et al. 2015.[301]

SAINT KITTS AND NEVIS

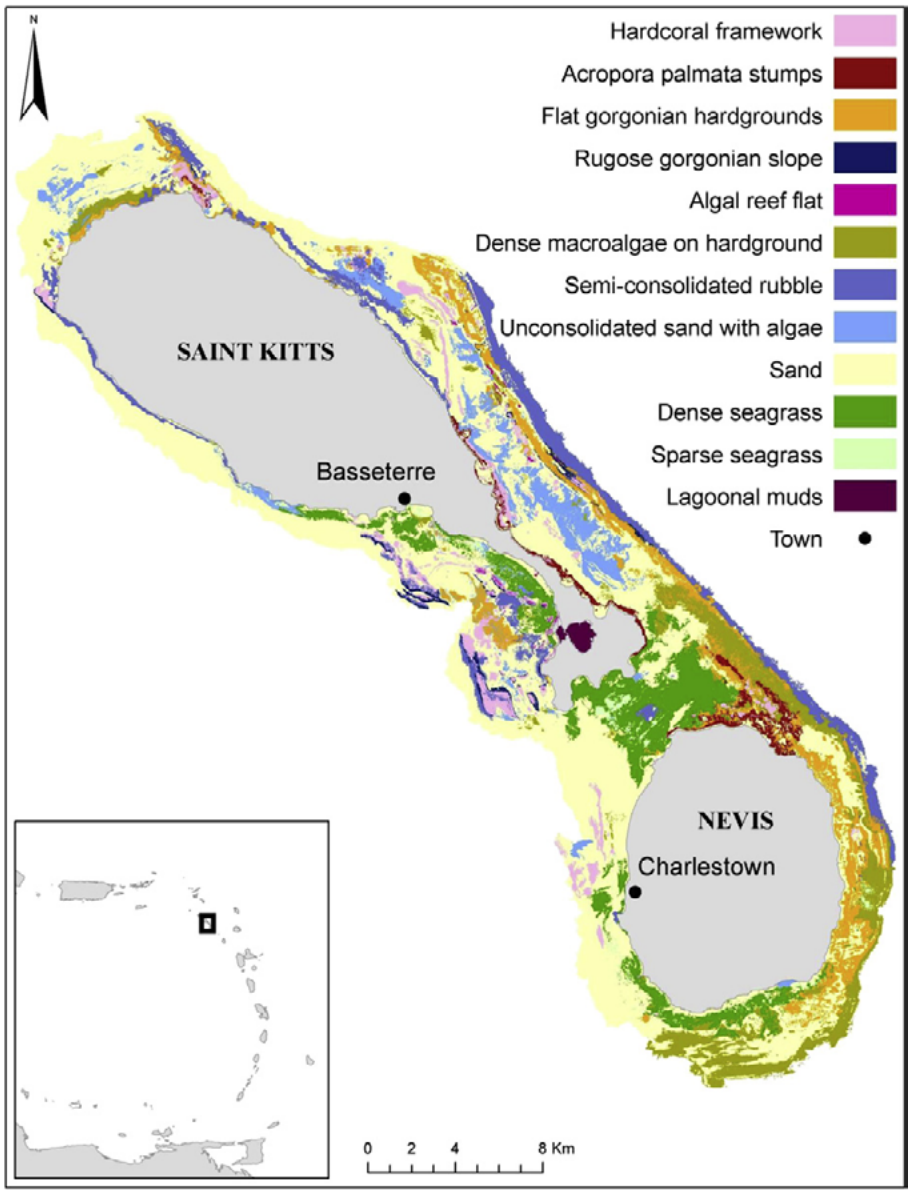


Figure 23. Benthic Habitat Distribution. Source: Schill, S.R. et al. 2011.[302]

DOMINICA

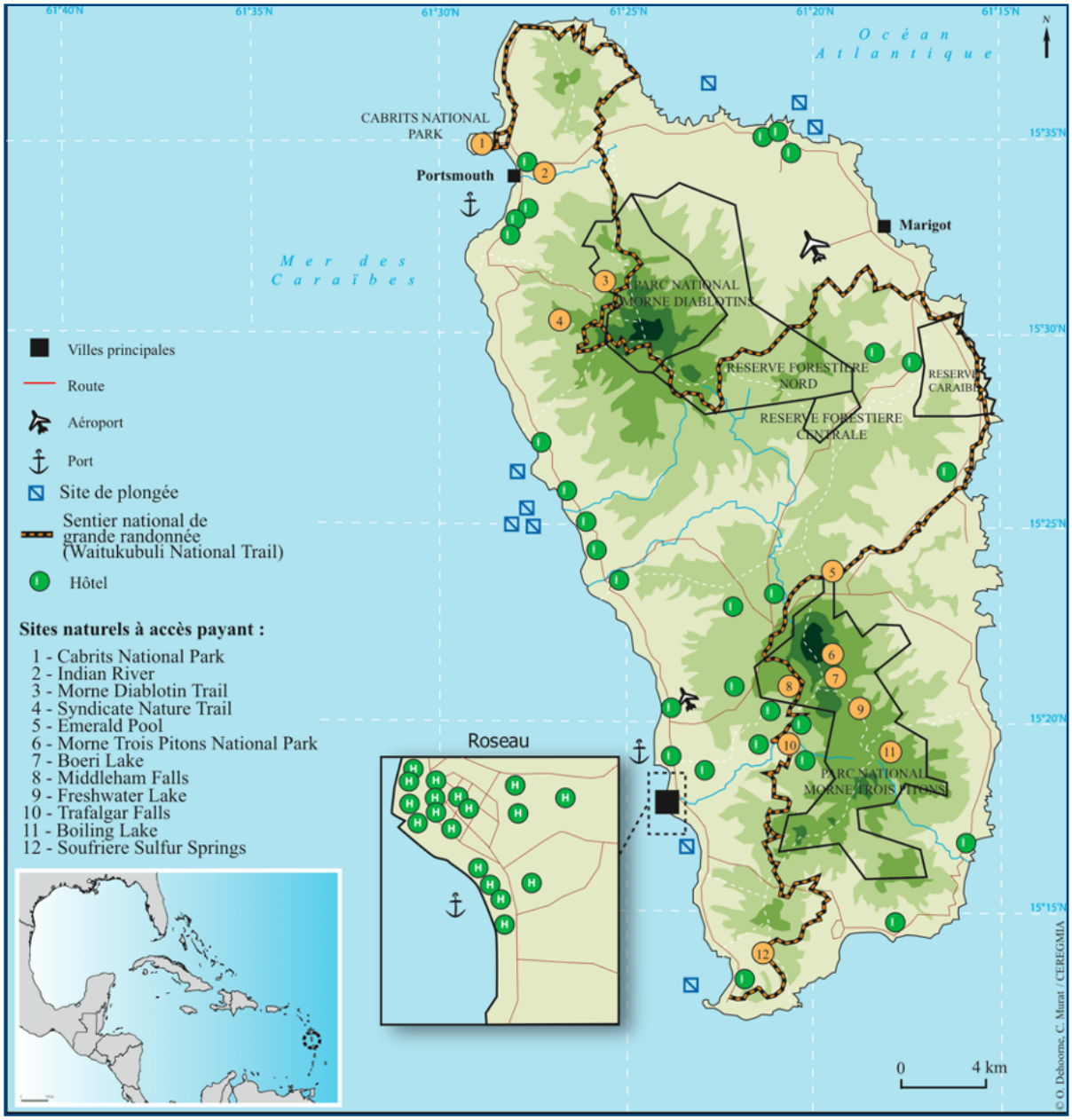


Figure 24. Protected Area Map. Source: Dehoorne, O. and C. Murat. 2010.[303]

DOMINICA

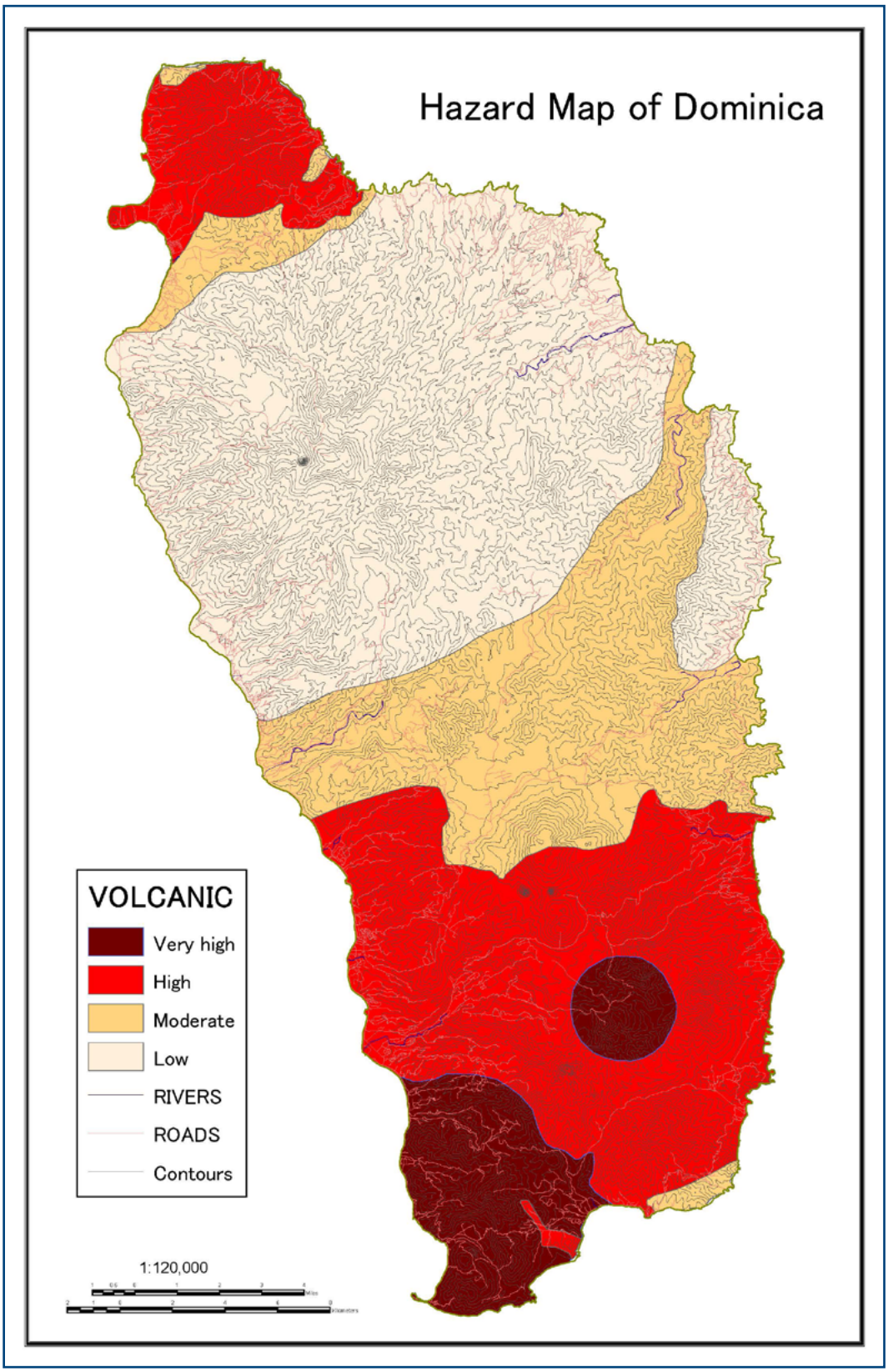


Figure 25. Map of hazardous volcanic areas on the island of Dominica.[304]

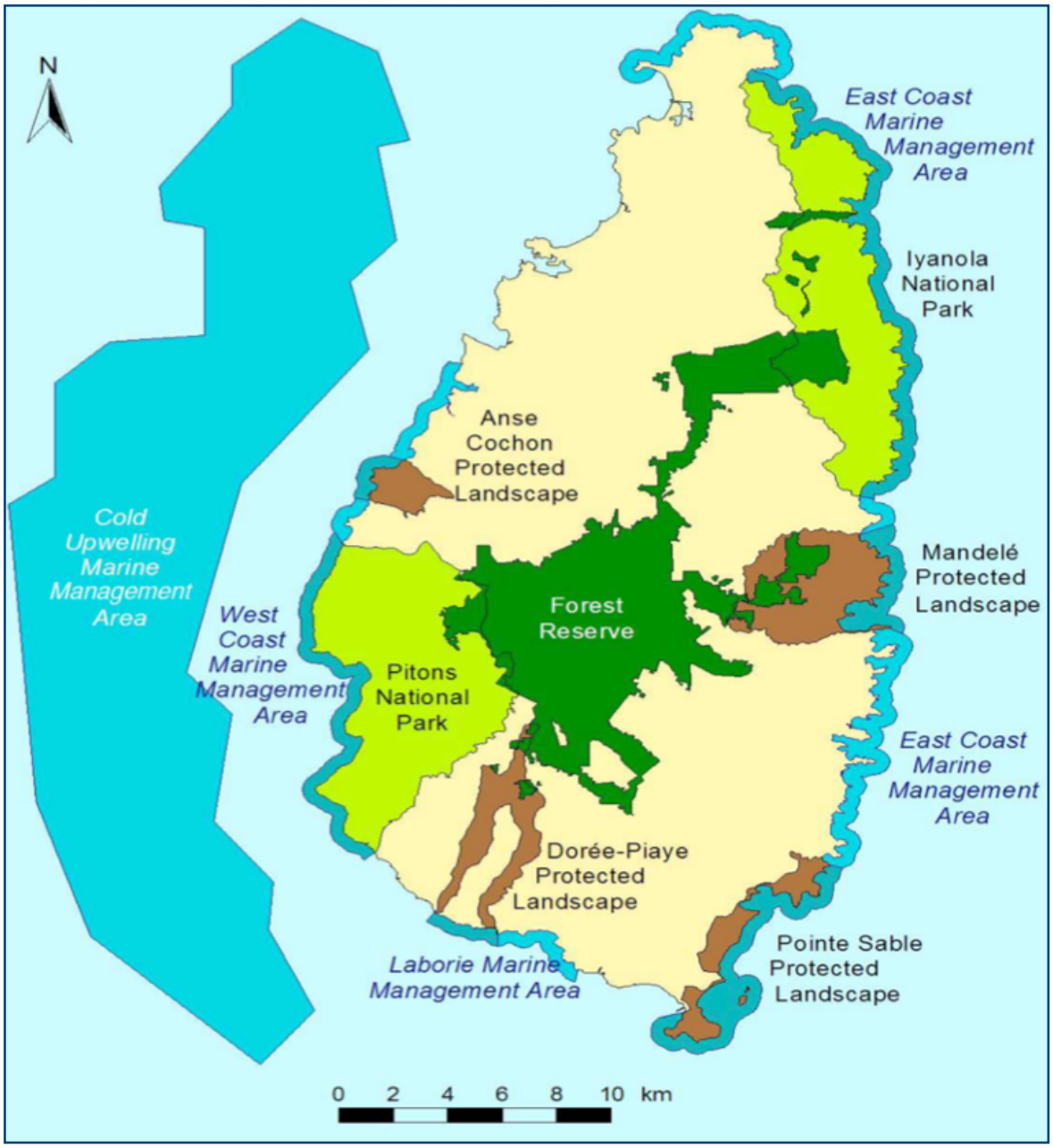


Figure 26. Saint Lucia Forest Reserves and National Parks, Protected Landscapes and Marine Management Areas[305]

SAINT LUCIA

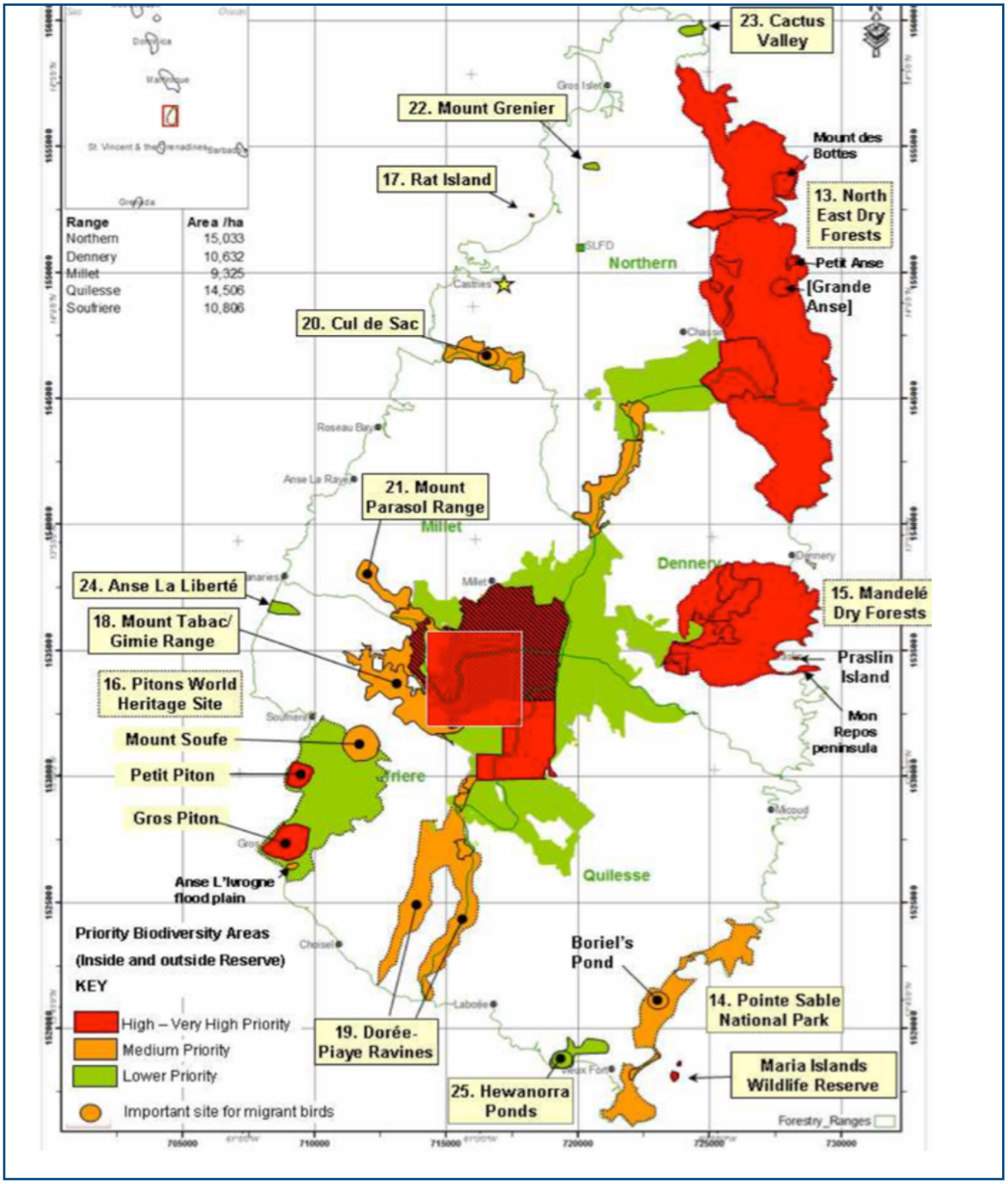


Figure 27. Priority Biodiversity Conservation Areas inside and outside Forest Reserves for Saint Lucia[306]

SAINT VINCENT AND THE GRENADINES

Saint Vincent and the Grenadines Protected Area Maps (three maps: north, central, and south)

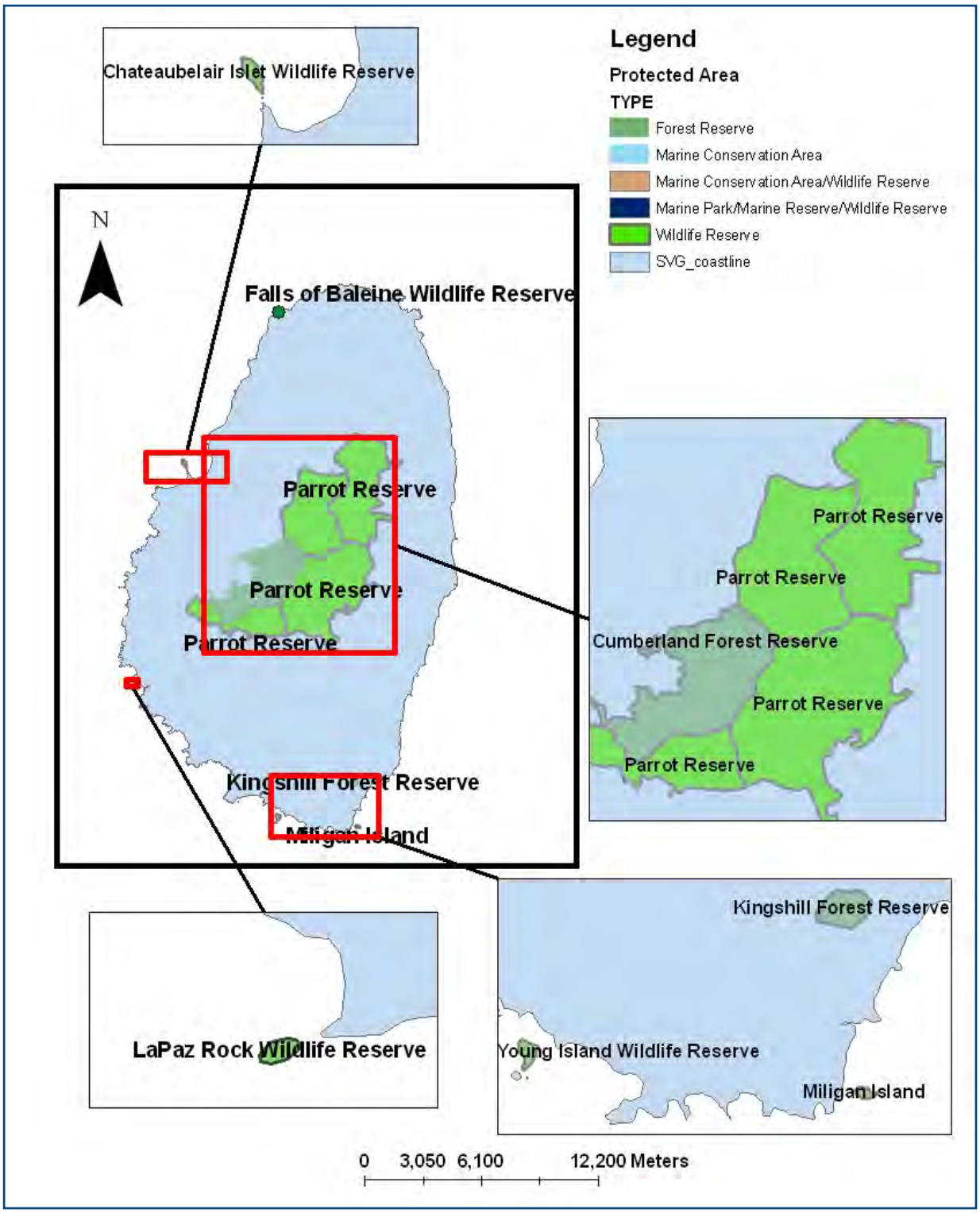


Figure 28. North Grenadines Protected Areas[307]

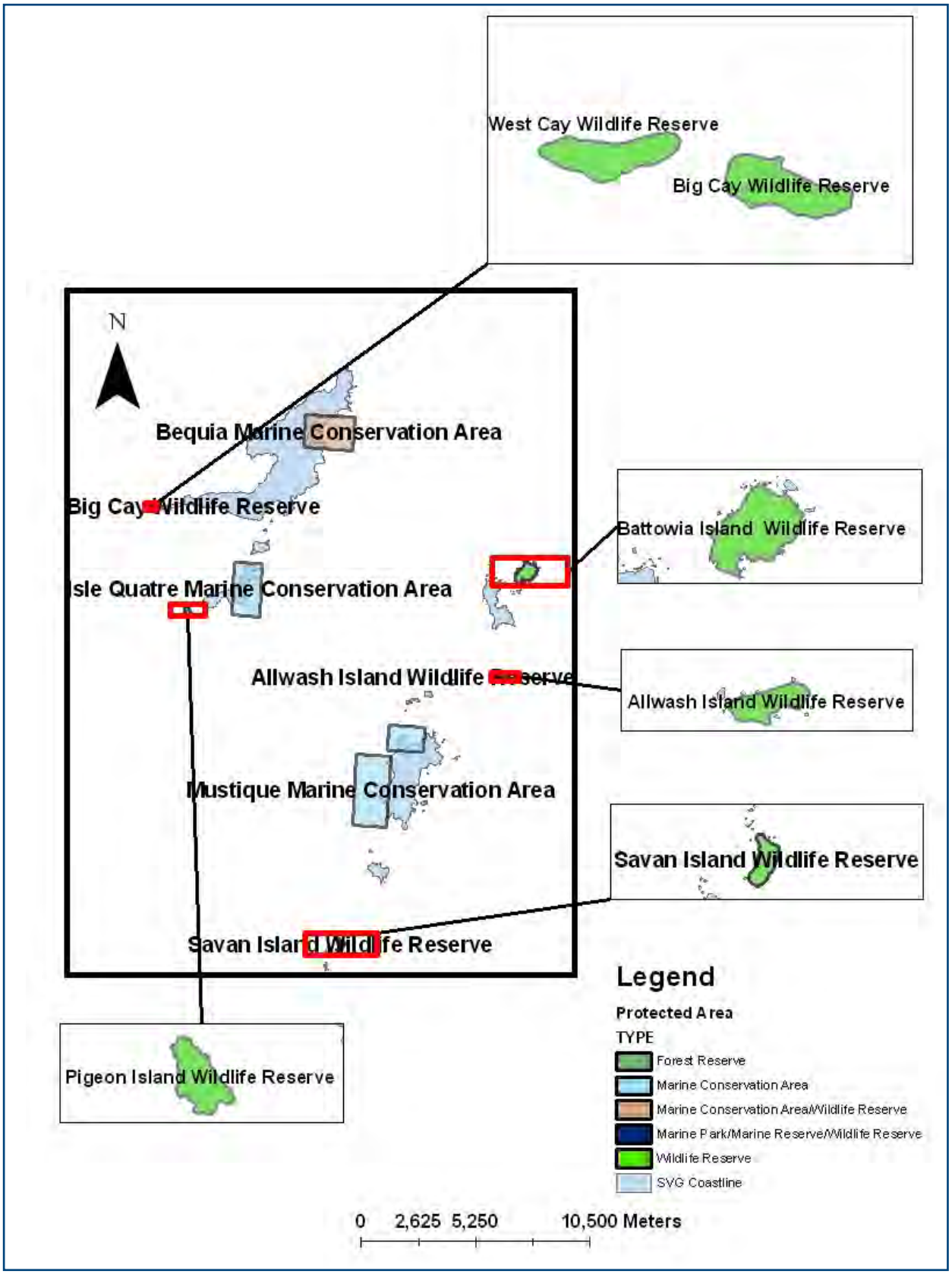


Figure 29. Central Grenadines Protected Areas

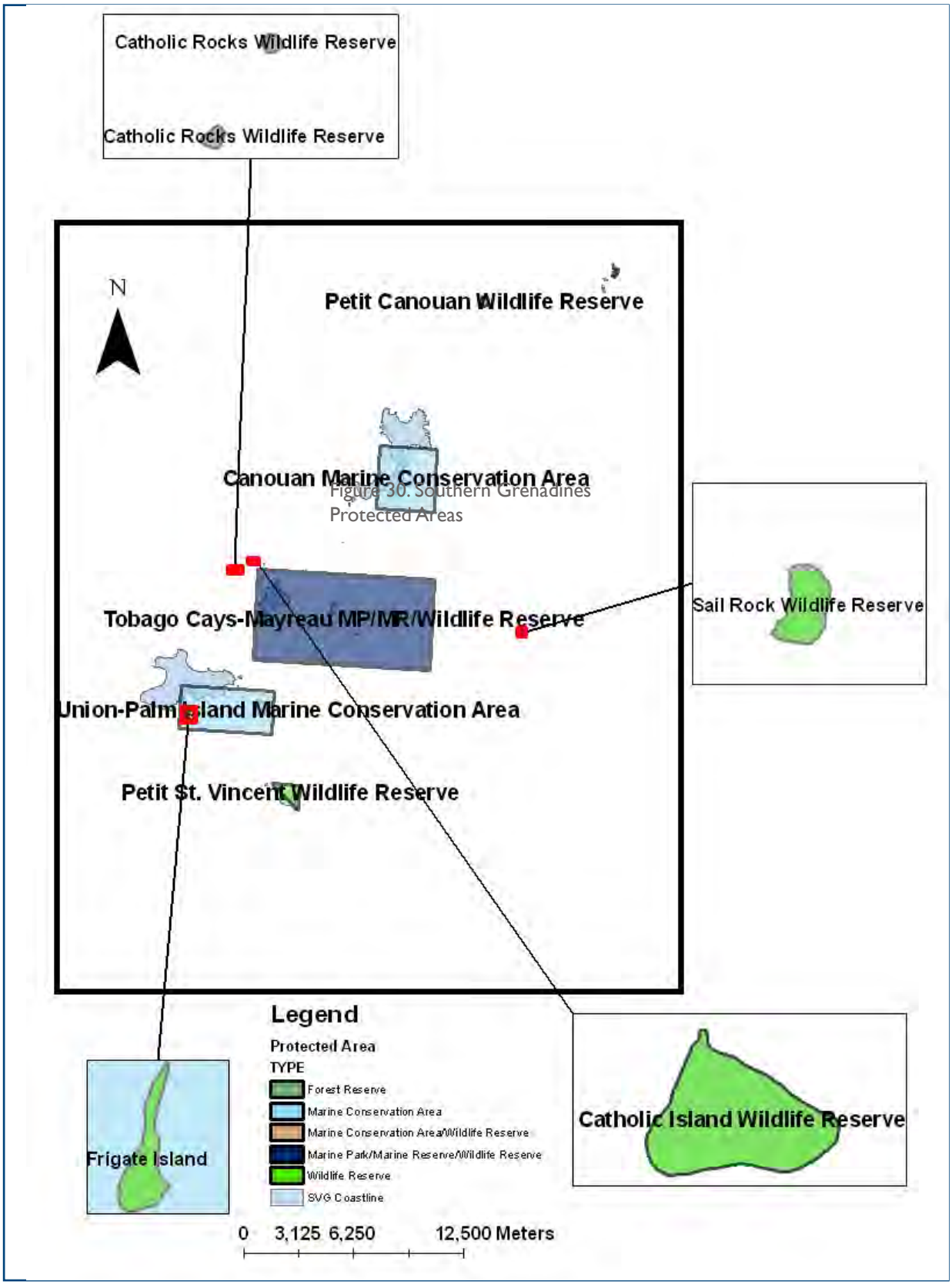


Figure 30. Southern Grenadines Protected Areas

GRENADA

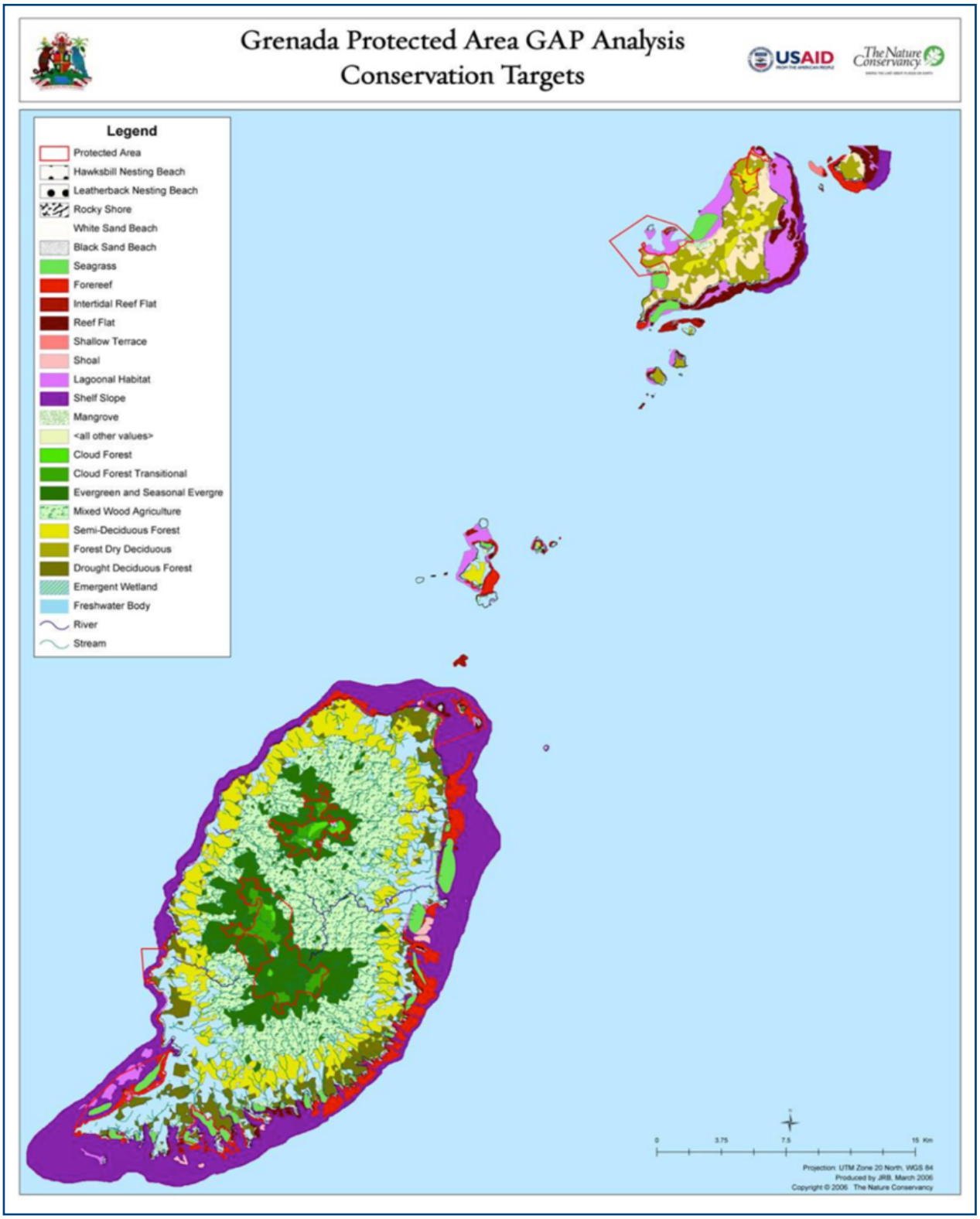


Figure 31. Grenada Protected Areas Gap Analysis

TRINIDAD

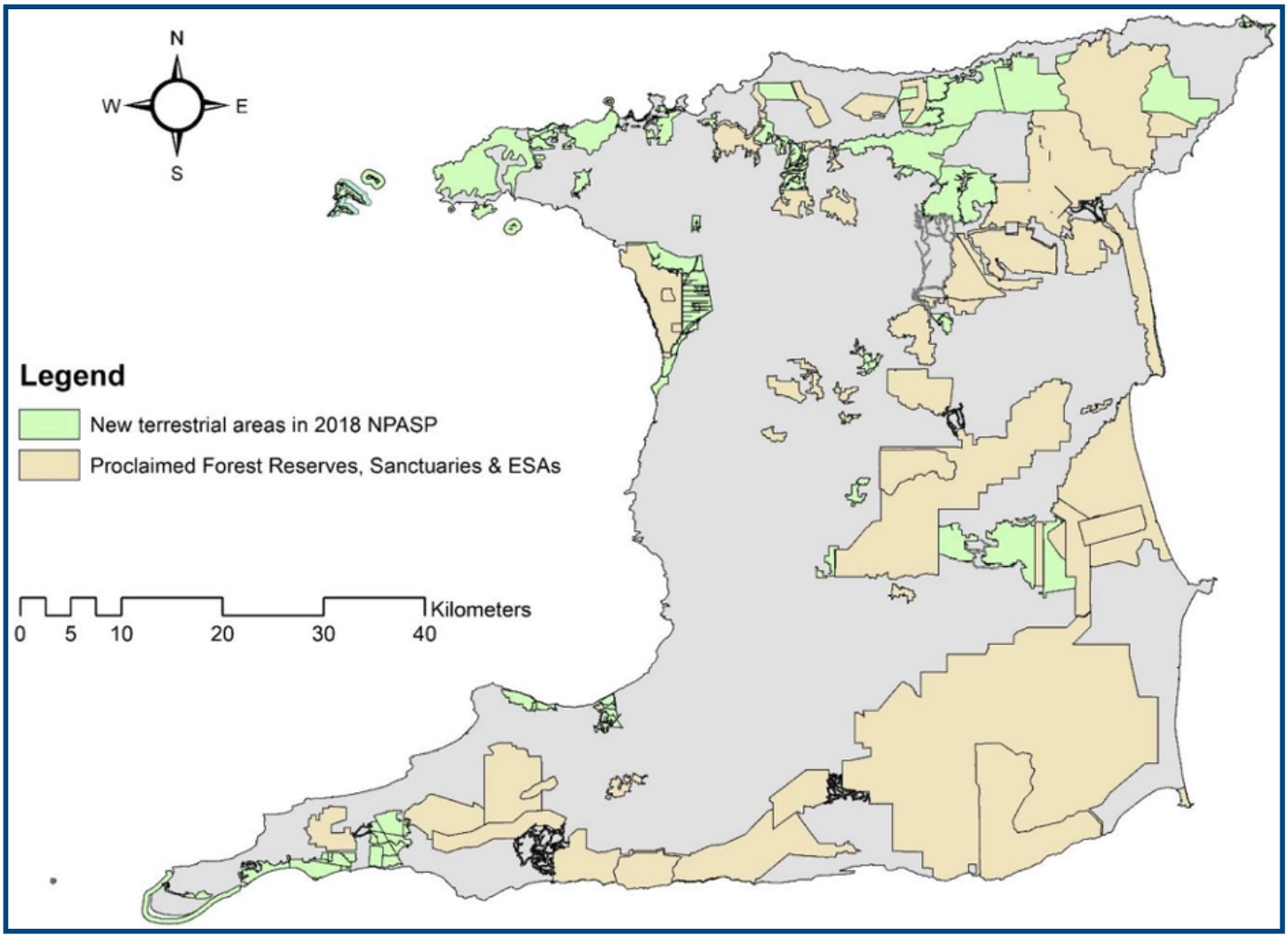


Figure 32. Proposed Additional Terrestrial PNAs for Trinidad and the Current Forest Reserves, Wildlife Sanctuaries, and Environmentally Sensitive Areas.[308]

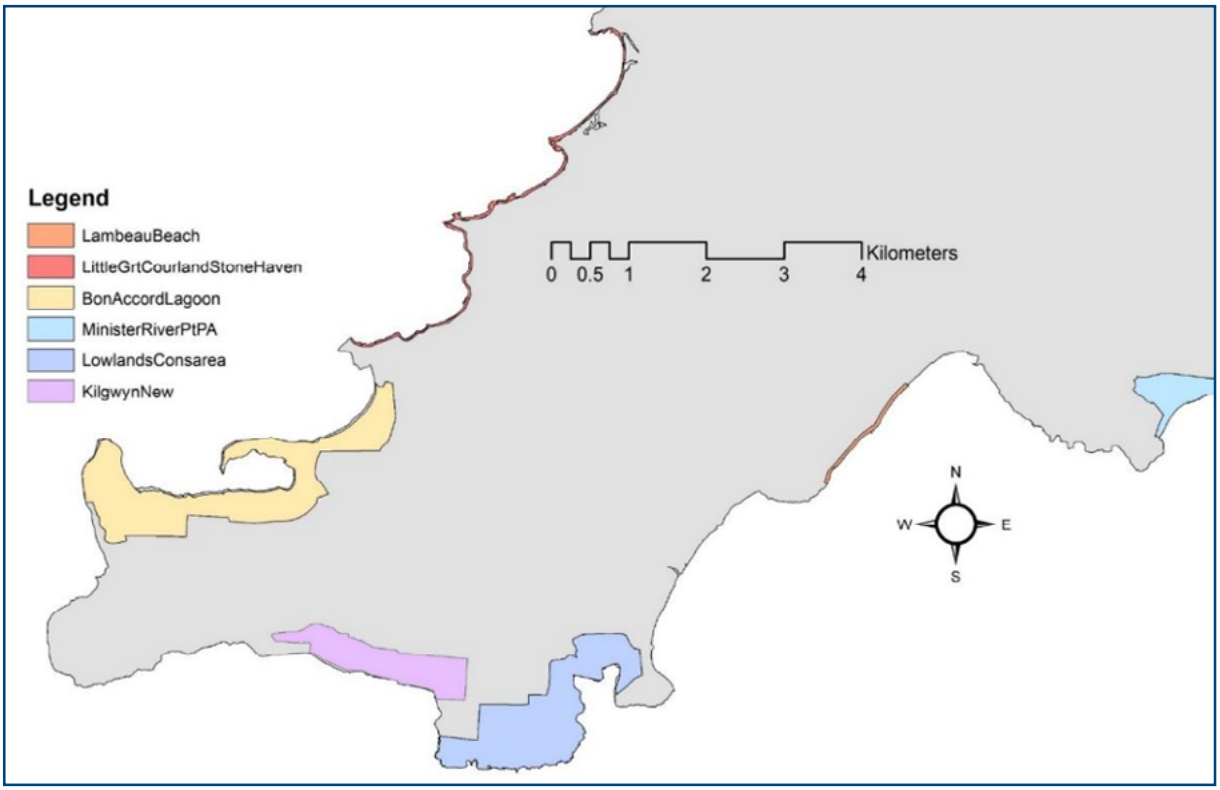


Figure 33. Proposed Terrestrial PNAs in Southwest Tobago

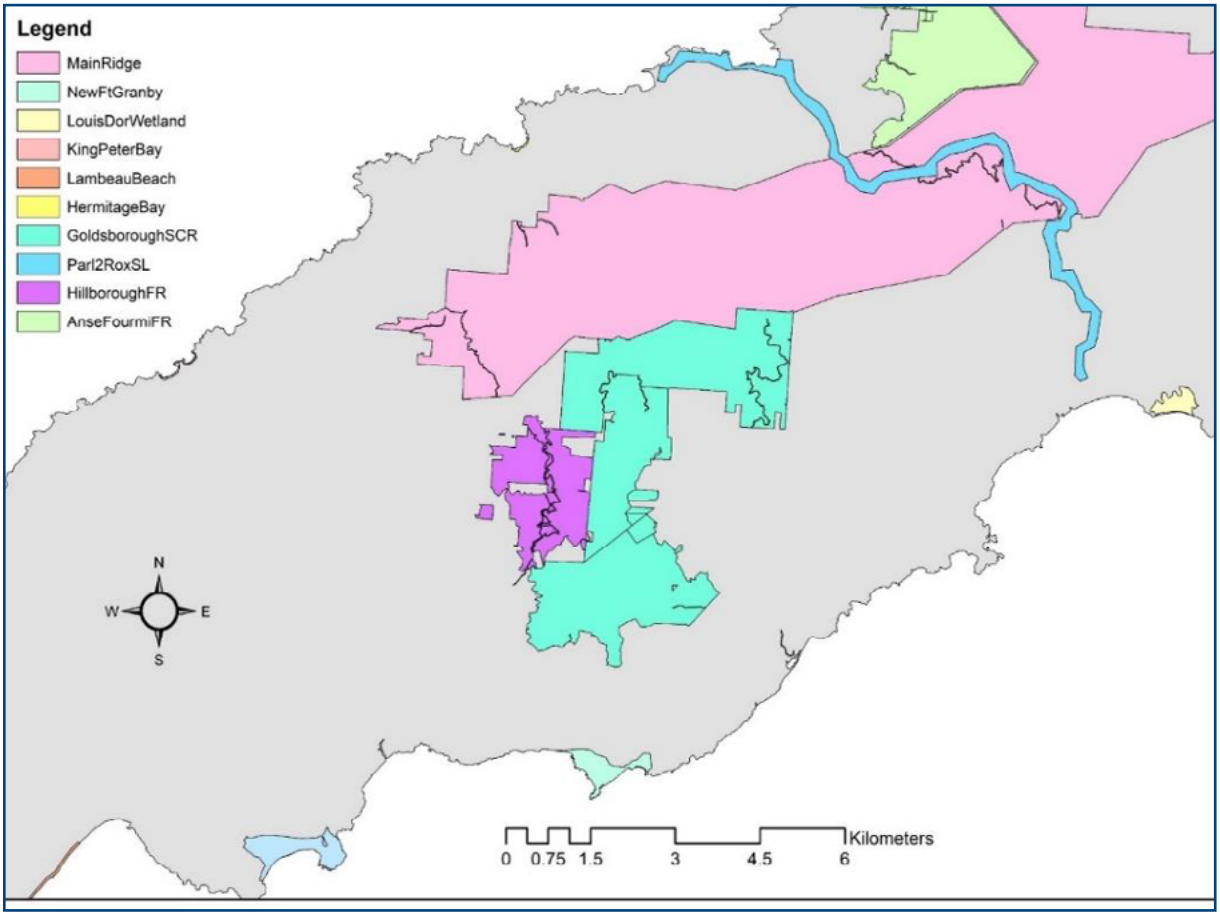


Figure 34. Proposed Terrestrial PNAs in Central Tobago

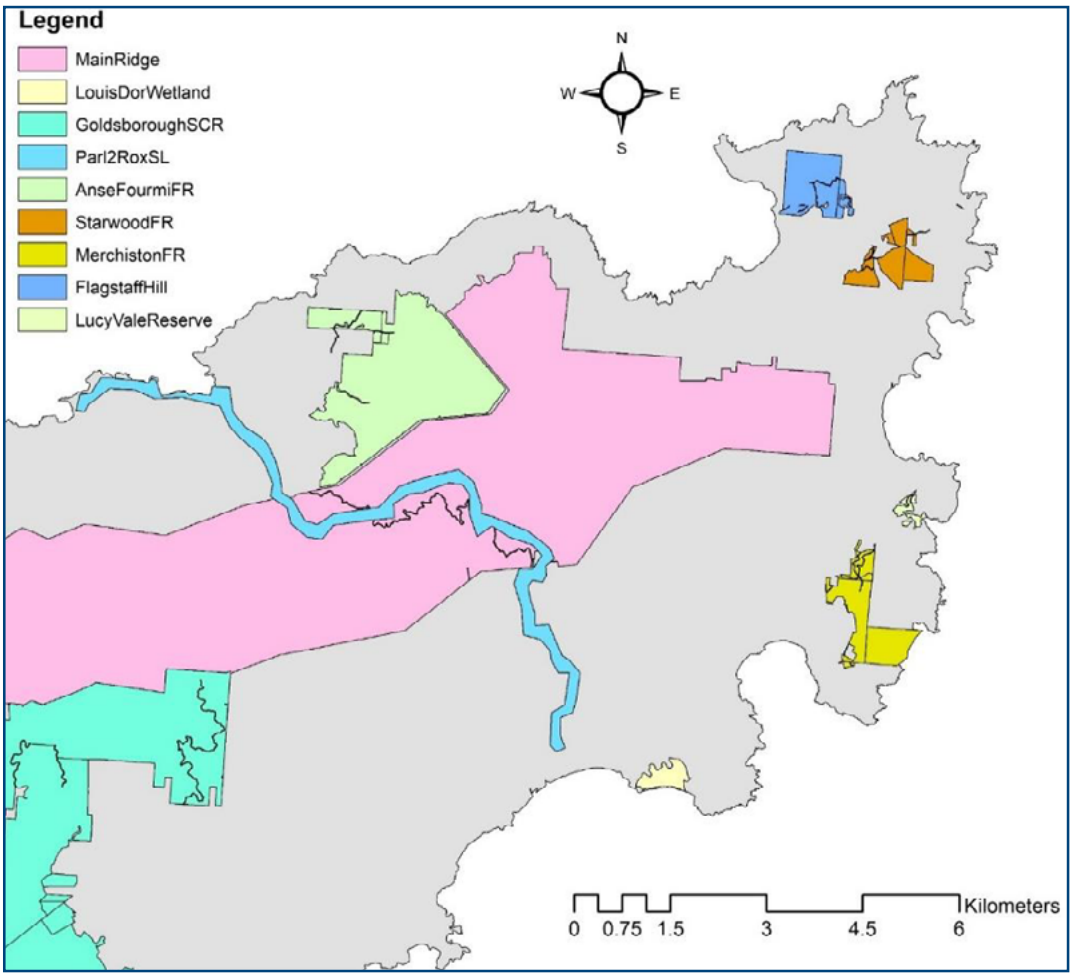


Figure 35. Proposed Terrestrial PNAs in Northern Tobago

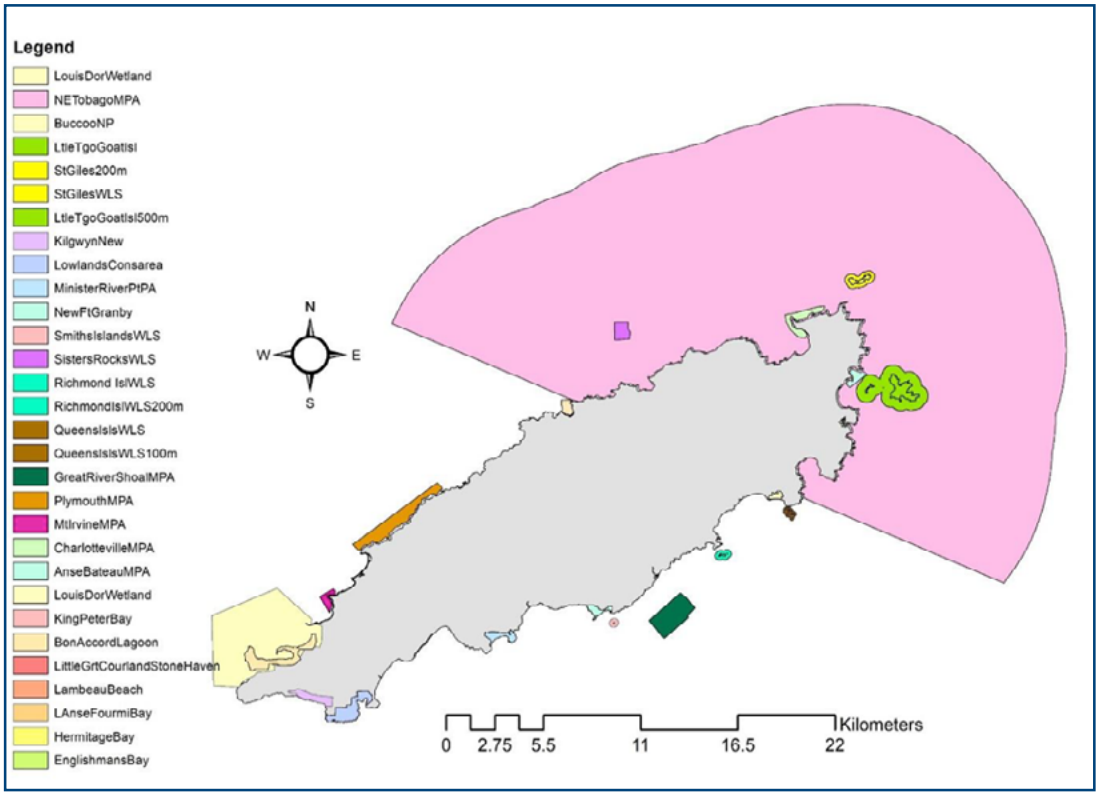


Figure 36. Proposed Coastal and Marine PNAs for Tobago

GUYANA

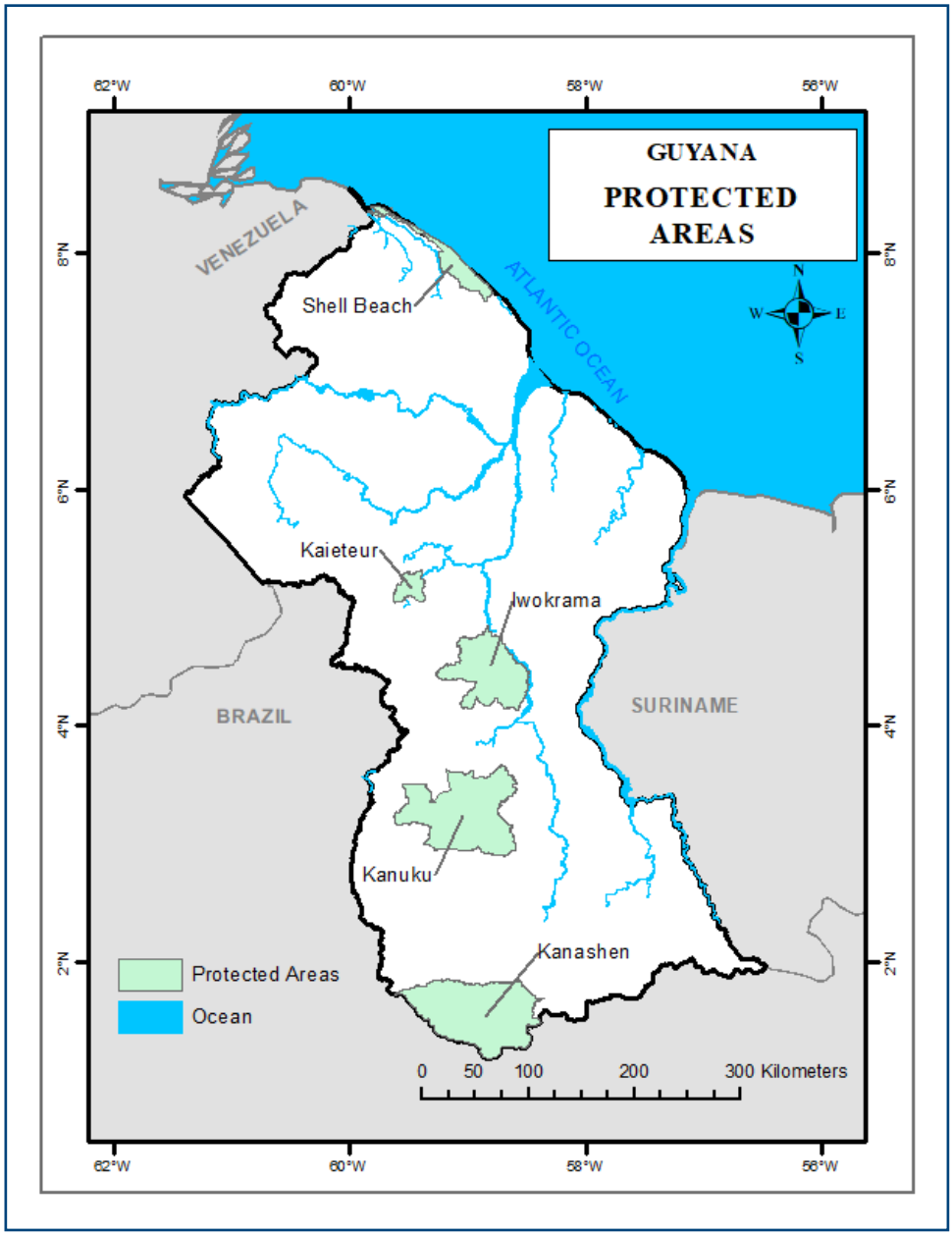


Figure 37. Protected Areas of Guyana. Source: https://factpage.glsc.gov.gy/

SURINAME

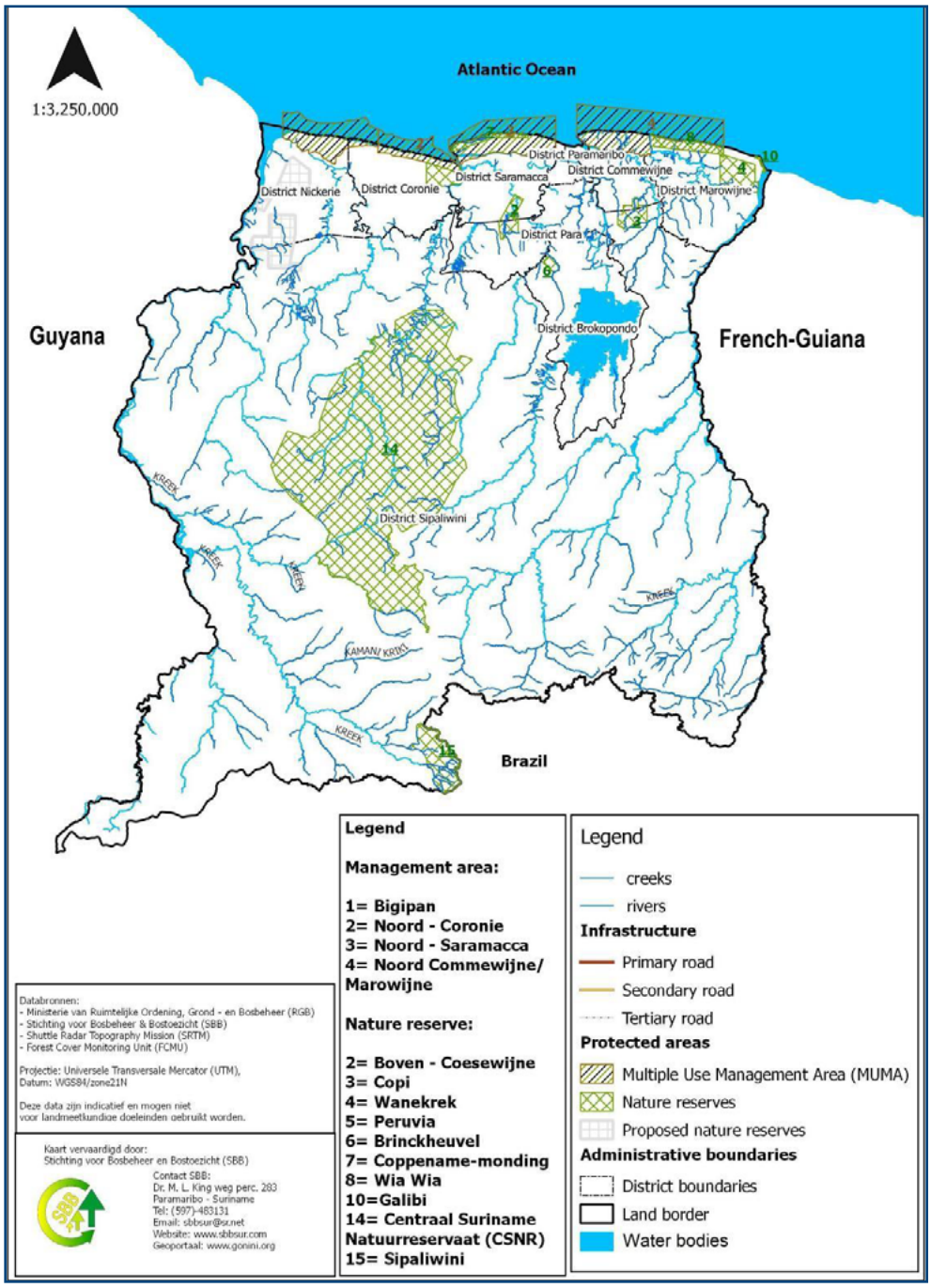


Figure 38. Protected Areas of Suriname. Source: Republic of Suriname. 2019. [309]

BENTHIC MAPS TO 30 METERS

Five of the ESC countries covered in this analysis were included in the TNC Benthic Habitat Mapping conducted between 2010-2017: Dominica (2016), Grenada (2017), Saint Kitts and Nevis (2010), Saint Lucia (2016), and Saint Vincent and the Grenadines (2015). Across all five countries, 28 unique habitats were recorded. Some of these habitats appear very similar such as Gorgonion Hardground (DMA/SLU) vs. Hardground with Gorgonians (SVG) vs. Flat Gorgonian Hardgrounds (SKN) and Coral Framework (DMA/GRD/SLU/SVG) vs. Hard Coral Framework (SKN).[310]

All islands, with the exception of Saint Kitts and Nevis, had sand recorded, while Saint Kitts and Nevis was classified as having bare carbonate sand. In general, Saint Kitts and Nevis had the most unique set of habitats, including lagoonal mud flats, rugose Gorgonian slope, and unconsolidated sand with algae. Dominica and Saint Lucia had very similar habitat profiles. Saint Vincent and the Grenadines has large habitat areas denoted as hardground with turf. Grenada has a more diverse suite of coral habitats including Montastrea reef complex, Porites reef complex, and Gorgonian habitat.

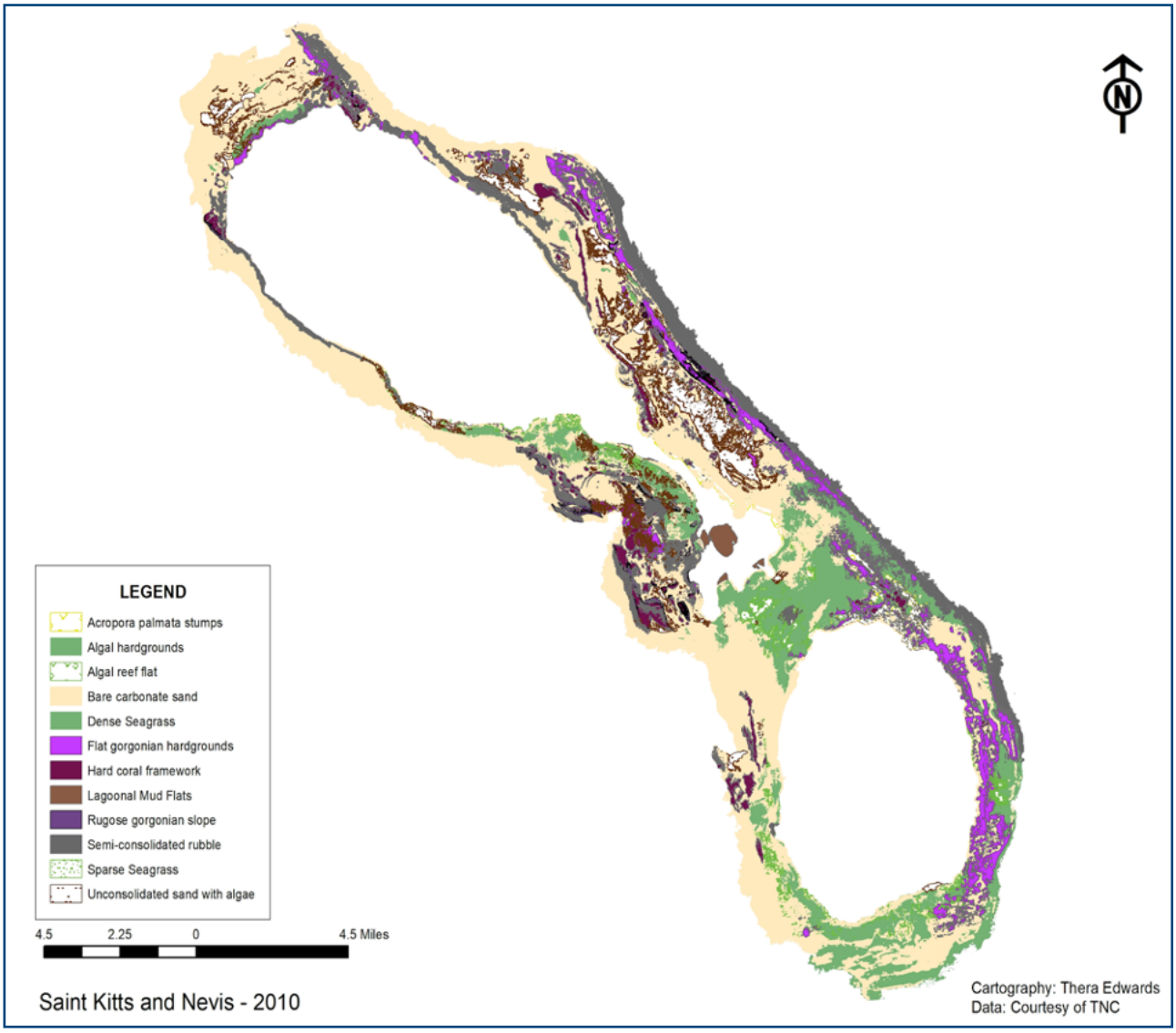


Figure 39. Benthic Map Saint Kitts and Nevis

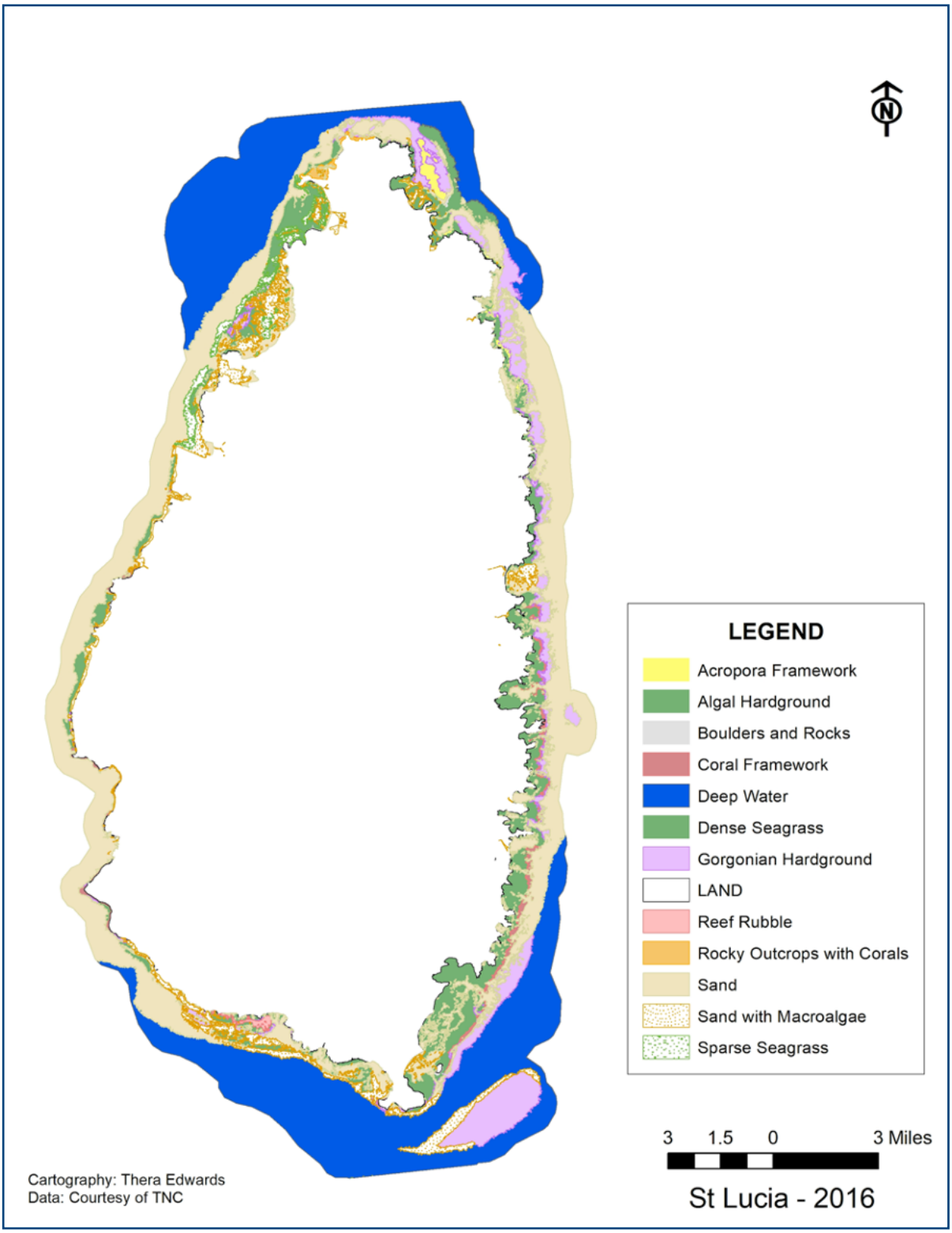


Figure 40. Saint Lucia Benthic Map

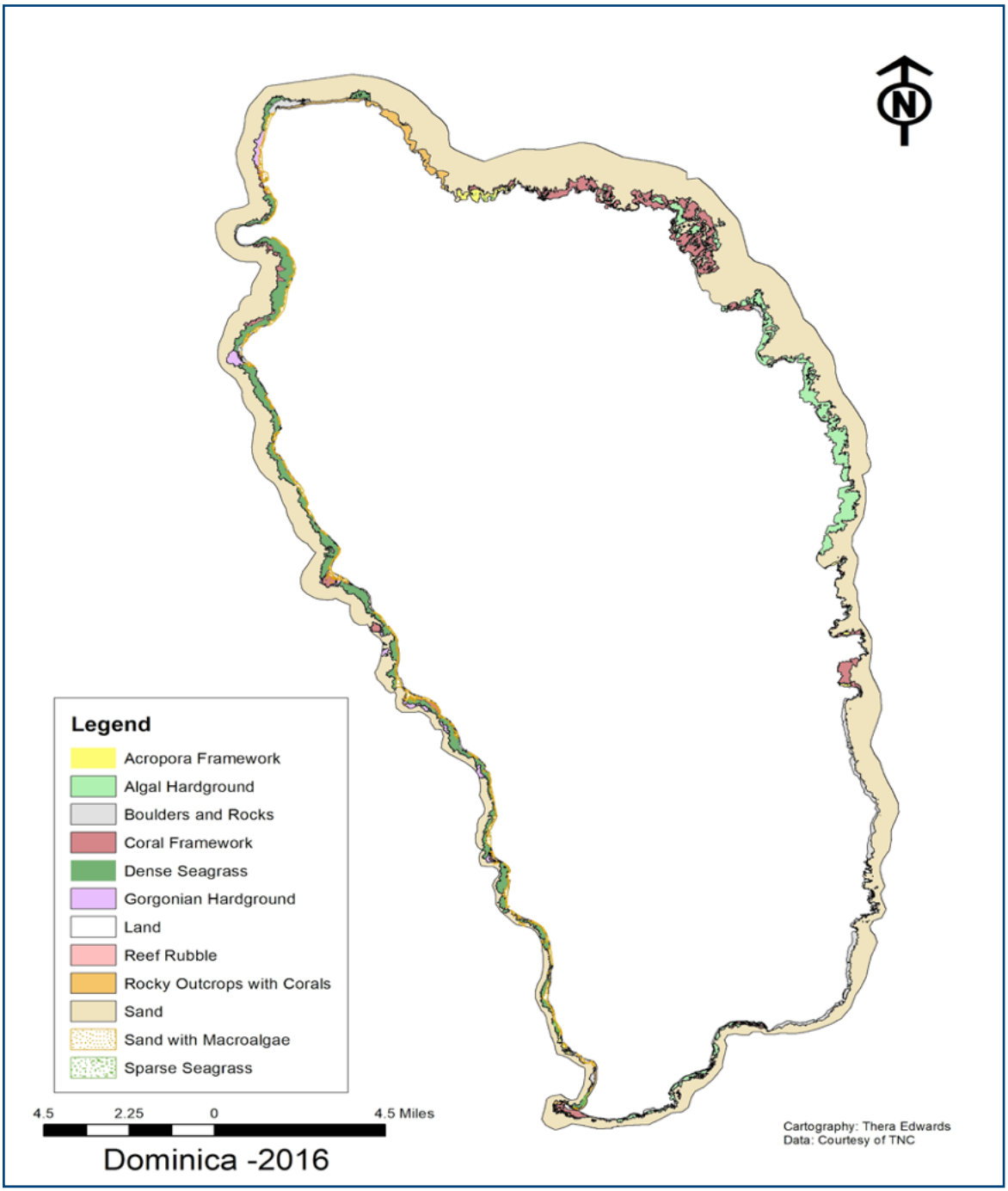


Figure 41. Dominica Benthic Map

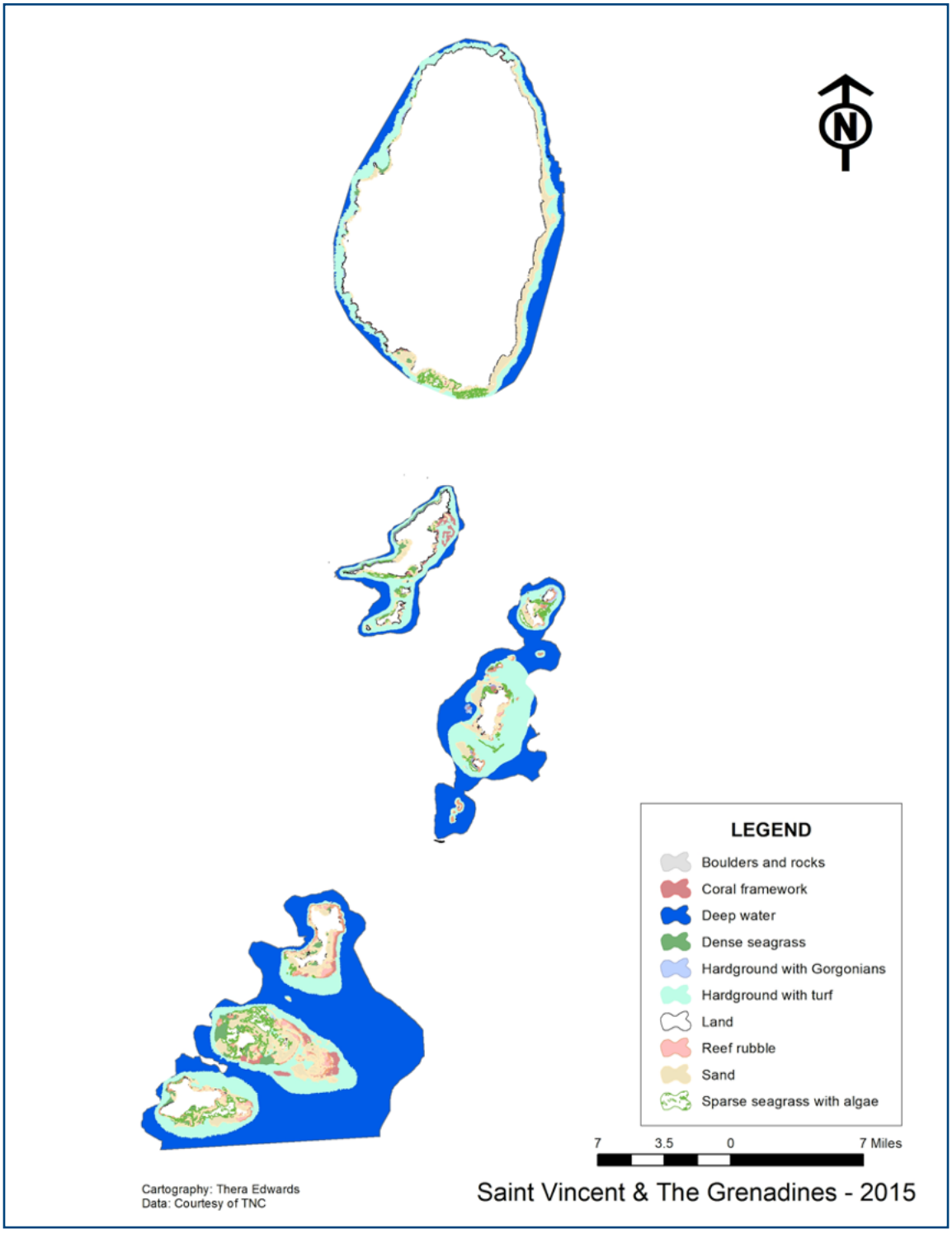


Figure 42. Saint Vincent and the Grenadines Benthic Map

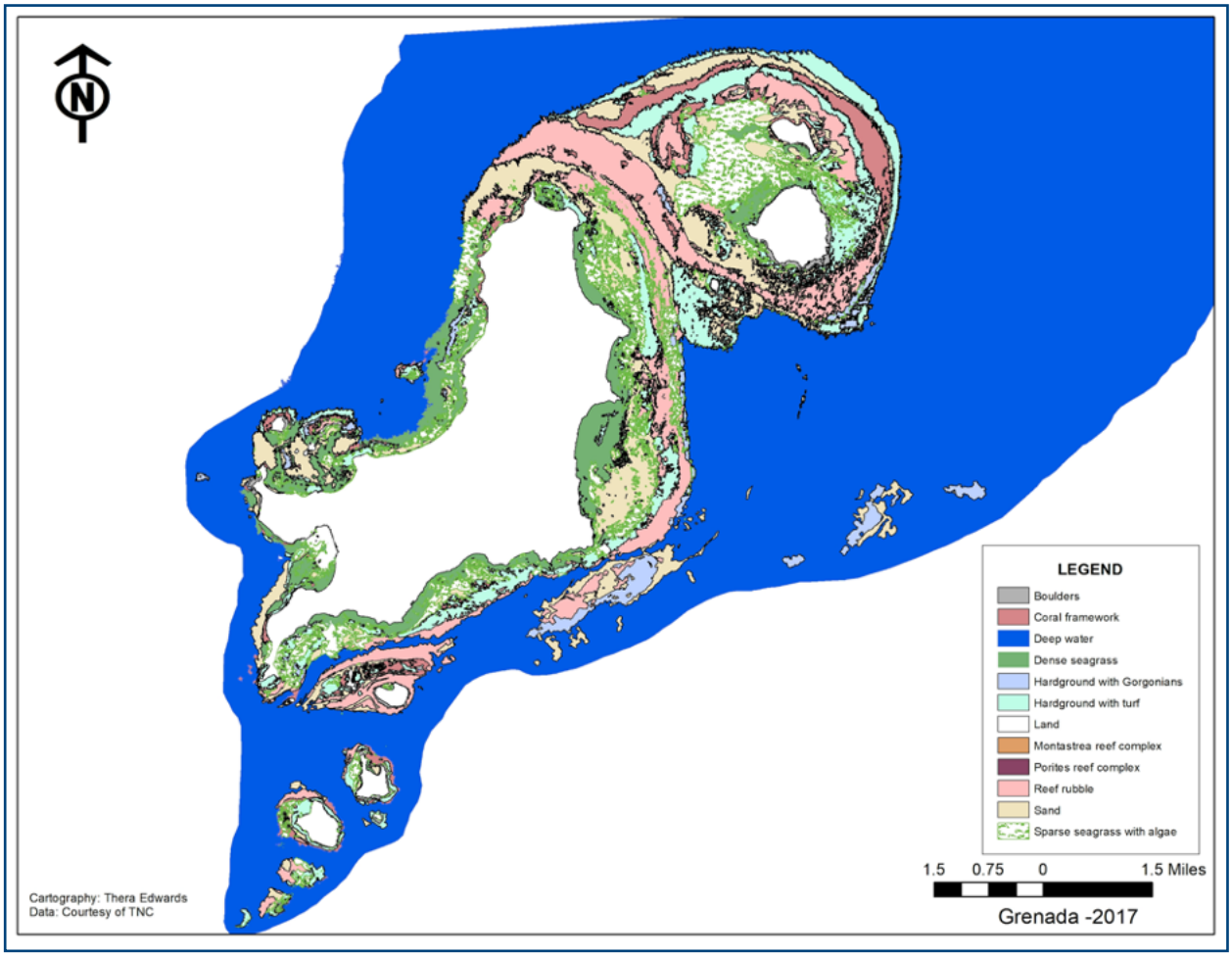


Figure 43. Grenada Benthic Map

Endnotes

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295. The primary mission of the project is to value/price the natural assets of the CSNR and to convert this value to financial capital using the tools and exchange mechanism of Intrinsic Value Exchange. These natural assets can be claims on benefit flows that produce private returns (e.g. water, genetic material, pharmaceutical, ecotourism), and public returns (e.g. carbon, biodiversity).
296. The project is intended to facilitate the rehabilitation and remediation of the reef, which has been progressively degrading due to the stress imposed by tourism and rising sea temperatures.
297. The Government's programs prioritize fiscal sustainability, strengthening resilience against natural disasters, and harnessing the "blue economy" as a way to fuel sustainable growth.
298. The objective of the Sustainable Financing and Management of Eastern Caribbean Marine Ecosystem Project is to contribute to enhancing the long-term sustainability of protected area networks in the Eastern Caribbean sub-region by: 1) establishing sustainable financing mechanisms; 2) strengthening of the marine protected area networks; and 3) deploying a regional monitoring and information system for the protected area networks. There are four components to the project. https://projects.worldbank.org/en/projects-operations/project-detail/P103470.
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