NEVIS REEFFIX PROJECT

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AN INTEGRATED COASTAL ZONE MANAGEMENT (ICZM)

ECOSYSTEM SERVICES VALUATION AND CAPACITY BUILDING PROJECT

FOR THE CARIBBEAN

SEPTEMBER, 2013

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PREPARED BY

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Acronym	Meaning
CANARI	Caribbean Natural Resources Institute
CBD	Convention for Biological Diversity
CCA	Caribbean Conservation Association
CCI	Caribbean Challenge Initiative
CERMES	Centre for Resource Management and Environmental Studies
CFMC	Caribbean Fisheries Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLME	Caribbean Large Marine Ecosystem
COSALC	Coast and Beach Stability in the Caribbean islands
CREP	Caribbean Regional Environmental Programme
CRFM	The Caribbean Regional Fisheries Mechanism
DAC	Development Advisory Committee
EAF	Ecosystems Approach to Fisheries
ECCU	Eastern Caribbean Currency Union
ENCAMP	Eastern Caribbean Natural Area Management Programme
EU	European Union
FFEM	Fonds Français pour l'Environnement Mondial
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF	Government of France
GIS	Geographic Information System
GLISPA	Global Island Partnership
IDRC	International Development Research
IWCAM	Integrated Watershed and Coastal Area Management
MarGov	Marine Resource Governance in the Eastern Caribbean
MPA	Marine protected area
NASPA	Nevis Air and Seaports Authority
NCRI	National Coral Reef Institute
NHCS	Nevis Historical and Conservation Society
NIA	Nevis Island Administration
NSE	Nelson Spring's Ecosystem
OAS	The Organisation of American States
OPAAL	OECS Protected Area and Associated Livelihoods
PERB	Protecting the Eastern Caribbean Region's Biodiversity
PPNRE	Physical Planning, Natural Resources and the Environment
RAPPAM	Geographic Information System
SAP	Strategic Action Program
SCUBA	Self Contained Underwater Breathing Apparatus
SocMon	Global Socioeconomic Monitoring Initiative for Coastal Management
SWMC	St. Kitts and Nevis Solid Waste Management Corporation
TDA	Transboundary Diagnostic Analysis
TFs	Trust funds
TNC	The Nature Conservancy
USAID	United States Agency for International Development

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Part 1: SITUATIONAL ANALYSIS

1.1 Introduction

The written history of Nevis begins with the account recorded by Christopher Columbus when he sailed on his second voyage in 1493. He called the island "Nuestra Senora de las Nieves" Which means "Our lady of the snows", hence the name Nevis. The Caribs, the last Amerindian group who inhabited the island, called Nevis "Oualie" which means "the land of beautiful waters." Soon after being colonised by the British in 1628, Nevis became the financial centre of the lucrative Caribbean sugar industry that generated an abundance of wealth for the British Empire. The resulting effect was that Nevis became known as one of the most developed islands in the Caribbean and was dubbed as the "Queen of the Caribbees", a title that it holds to this day.

The coastal waters around Nevis are used for a wide range of activities, dominated by coastal tourism development along the west coast of Nevis. Pinney's Beach Hotel, Four Seasons Resort, Chrishi Beach Resort, Cliff Dwellers, Oualie Beach Resort are all located along the west coast of Nevis. Along the west coast there are also four fish landing sites, Charlestown, Jessups, Cotton Ground and Jones Bay. Inter- and intra-island transportation, recreational boating, boat moorings and passive beach activities also take place along the west coast.

Coastal resources in Nevis are managed primarily by the Ministry of Communications, Works, Public Utilities, Posts, Physical Planning, Natural Resources & Environment and the Ministry of Agriculture, Lands, Co-operatives & Fisheries. With small local budgets, both Ministries have been supported by financing provided by the Global Environment Facility (GEF), USAID, CFMC, TNC and other donor agencies to help improve the management of coastal resources. Strengthening human resource capacities, institutional frameworks and improving stakeholder participation are priority measures for a number of funded initiatives.

1.2 Physical attributes

Nevis is volcanic in origin and almost entirely composed of Upper Pilocene to Lower Pleistocene volcanic rock. Classified as tropical marine, influenced by steady northeast trade winds and tropical oceanic cyclonic movements, Nevis enjoys warm even temperatures with a mean of approximately 27^{o}C. Seasonal and diurnal variations in temperature are small with average minimum temperatures around 22^{o}C in January and maximum temperatures averaging around 29^{o}C in July. The relative *humidity* level is usually low in the dry season and high in the wet season. The mean value is 76 percent but ranges from 70 percent in March to 78 percent in September, October and November.

1.2.1 Location

Nevis, the smaller island of the twin-island federation of St. Kitts and Nevis, is located at Latitude 17^{o} 15' N and Longitude 62^{o}40' W, in the group of Leeward Islands situated in the north east region of the Caribbean Sea. Nevis lies 2 miles southeast of St. Kitts,

approximately 230 miles from Puerto Rico and approximately 1,200 miles from Miami. (Figure 1).

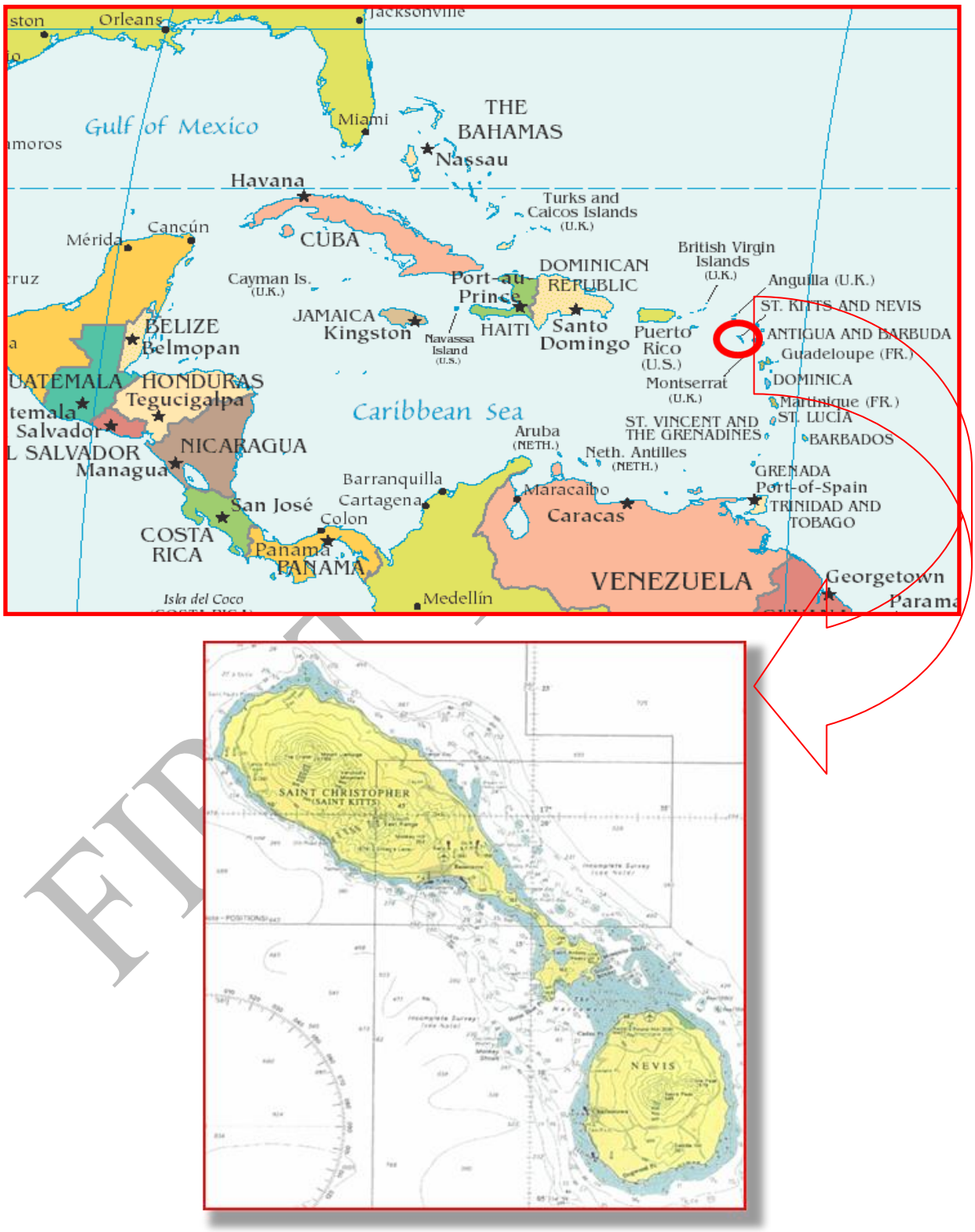


Figure 1. Location of Nevis

1.2.2 Area

Nevis is 93km^2 (36 sq. mi) , is rounded in shape (7 miles long and 5 miles wide) with an average radius of 3.4 miles (5.5 km). The coastline is approximately 50km (31 miles) in length.

The Federation's EEZ (territorial) waters (Figure 2) cover 20,400km^2 in area, with a relatively small ocean shelf area (845km^2) that surrounds both islands. On the western side of St. Kitts, the ocean shelf drops off steeply after reaching the depth of 30 meters.

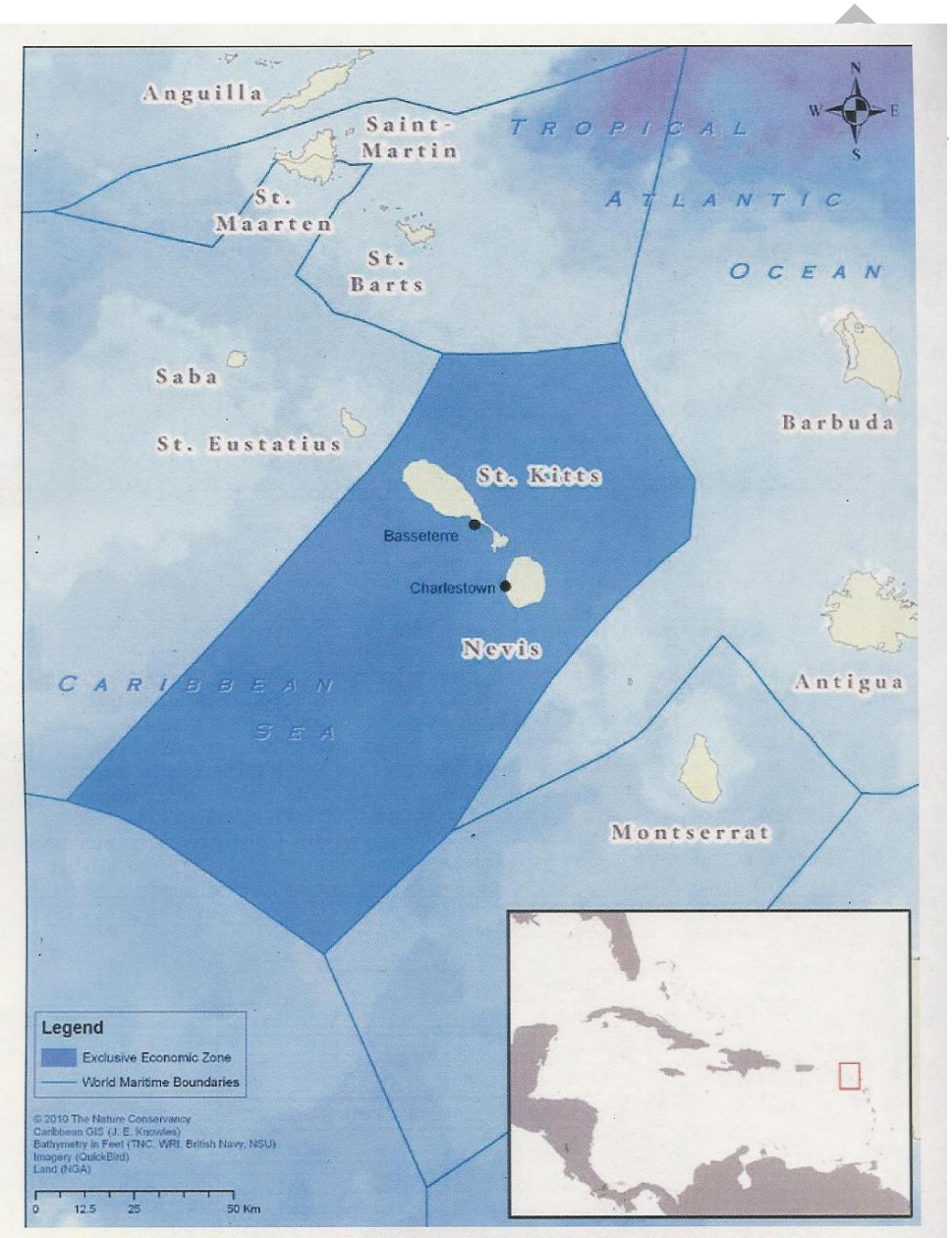


Figure2. Federation EEZ (Territorial Waters)

1.2.3 Physical landscape

Nevis is volcanic in origin and its landform is essentially conical with dramatic and scenic upward sweeps from the coast to Nevis Peak at the centre of the island. Nevis Peak rises to an elevation of 985 metres (3,232 feet) and dominates the landscape pattern. Other significant landscape and ecological features include the island's intricate natural drainage system, rich and diverse vegetation and wildlife habitats, coastal wetlands, and sea grass and coral reef habitats.

Nevis also has sandy beaches, rocky shores and massive sea cliffs. The most prominent sandy beach is a 4 km (2.5 miles) stretch of coastline north from Charlestown to Cades Bay, called Pinney's Beach. It is composed of both coral fragments and terrestrial soils that give it a yellow appearance and is typical of a number of beaches found along the leeward coast of the island (Planning Unit, 2004). South of Charlestown, there is a progression to black sand beaches which have been formed from volcanic materials. Black sand beaches are more typical of the east coast and are generally less extensive (HCL, 2003).

Nevis has a system of freshwater lagoons located throughout the island, some of which are along the coast and are therefore subject to saltwater intrusion (US Army Corps of Engineers, 2004). These lagoons may be as a result of either mountain ghaut (stream) run-off, as in the case of Pinney's Estate Lagoons, or underground springs as evidenced at Nelson's Spring in Cotton Ground (Planning Unit, 2004). These features contribute to the richness, diversity and beautiful scenic qualities of the island's ecosystem.

Nevis (and St. Kitts) boasts a representative cross-section of Caribbean marine life, including endangered corals, marine mammals, fish species, and sea turtles. There are several large seagrass beds, most notably in the area between the two islands called the narrows.

1.2.4 Coastal Zone Management

The sea around St Kitts and Nevis is oceanic and tropical. The Atlantic Ocean exists on the east side of the islands and on the west side the Caribbean Sea.

Most tourist and recreational activities occur along the west coast of Nevis. The public has a right to use the beaches of Nevis, which are vested in the crown, for recreational purposes. Any development alongside a beach must provide at least one public access. The Department of Physical Planning, Natural Resources and Environment is responsible for ensuring that all coastal development is consistent with the provisions for public access and use of crown lands.

The Department of Physical Planning, Natural Resources and Environment also requires compliance with COSALC 'setback categories' when approving permanent constructions (i.e. having a foundation) in the near shore areas.

The Newcastle Port, the Charlestown Port and the Long Point Port are managed by the Nevis Air and Seaports Authority (NASPA). NASPA installed moorings along the west

coast of Nevis to help minimize the degradation of seagrass beds and corals from indiscriminate anchoring.

1.3 Socio-economic context

The development history of Nevis was associated with plantation agriculture, in particular the production of sugarcane and cotton. From the 1960s however, the island began to experience a transition from a plantation-based economy to one based on tourism, construction, and financial services. Today the economy is largely service oriented with tourism and offshore financial services as the leading sectors. Historically, Nevis has experienced stable economic development, with a balanced budget, manageable inflation, a respectable current account surplus and relatively low unemployment.

Tourism is the largest and fastest growth sector in the world and there are real benefits for Nevis in terms of economic gains in employment, income and wealth and in improving infrastructure. However, it is important to consider the different tourism markets and the capacity of the Island in development and environmental terms. It may be desirable, or even necessary, to become more selective in particular tourism markets to avoid damage to the islands' identity, distinctiveness and quality of environment.

The tourism sector is the largest employer in Nevis; some 1,069 persons were employed in 2012 in the tourism industry which accounts for 22% of the employment on the Island (TABLE 1).

Employment Sector	No. of persons employed	Percentage of workforce
Agriculture	70.5	1.4%
Baking	28.25	0.5%
Civil Service	811	16.6%
Commercial	390.75	8%
Construction	376	7.7%
Domestic	162.5	3.3%
Financial	205.5	4.2%
Hotel / Guest House	1069.25	21.9%
Manufacturing	59.5	1.2%
Non Established Workers	719.5	14.7%
Restaurant	134.5	2.7%
Statutory Corporation	259.5	5.3%
Services	483.75	9.9%
Telecommunication	55	1.1%
Transportation	54.25	1.1%
Total (2012)	**4,879**	**100%**

Table 1. Nevis 2012 Employment Sectors
Source: Nevis Labour Department

The vision of the Nevis Island Administration through the Ministry of Tourism is to achieve sustainable growth that would be conducive to environmentally sensitive tourism development, worldwide recognition as a key tourism destination and maximum economic benefit for the people of Nevis. The Administration is determined that Nevis' position as one of the premier destinations in the Caribbean, will be maintained and enhanced.

The financial services sector while starting at a slow pace following the Nevis Business Corporation Ordinance in 1984 has, since the mid 1990s been a significant success story

contributing substantially to the island economy in financial terms, employment opportunities and status. While there are continuing external pressures on tax and financial havens, it remains an important part of the Island economy.

Nevis has a 98% literacy level. Education up to the secondary level is free and as a result the people of Nevis are well educated, making for an easily trainable work force.

The island is served by a fairly wide range of community facilities including primary and secondary schools, health care facilities, and recreational facilities. Key infrastructure facilities include the Vance W Amory International Airport on the north coast, a ferry passenger and cruise ship port at Charlestown, a car ferry (Sea Bridge) at Cades Bay and a cargo port at Long Point on the southwest coast. There is a network of roads, water supply, electricity, and telephone services on the island enjoyed by all citizens. Certain infrastructure facilities, (water supply, electricity, roads) are in the process of being upgraded.

1.3.1 Population

Based on the latest census data available (Nevis Statistics Office, 2011) the population of Nevis is 11,415 persons, comprised of 49% male and 51% female or 5,604 and 5,811 respectively. This population reflected an increase of 307 persons or an annual growth rate of 2.8% from the census in 2001. According to estimates of the proposed Nevis Physical Development Plan, in 2021 the population of Nevis will be approximately 15,800.

Nevis experienced a steady decline in population between 1960 and 1991 largely due to emigration. However, since the late 1990s with the increase in economic activity, the population has been increasing. This in part is reflected in returning nationals, immigrants from other Caribbean Islands and overseas investors buying property.

1.3.2 General Economy

Economic data for Nevis is usually included with that for St Kitts. Nevis does not produce its own National Account data, but there is a separate Financial Budgetary Report.

The GDP for St. Kitts and Nevis rose from US$536 Million in 2005 to US$712 Million in 2011 (ANNEX 1). The GDP per capita for the same period rose from US$10,906.00 to US$13,424.00. In 2011 St. Kitts and Nevis topped the list of ECCU countries, which are among the most highly indebted in the world. Through debt restructuring, the Government of St. Kitts and Nevis has implemented measures such as a 17% VAT and a Land for Debt swap option to significantly reduce the national debt.

Specifically in Nevis, the Government's budgetary revenue for 2013 is estimated at EC$125.81M.

In 2009 the public debt in Nevis was accelerated significantly, primarily because of the world recession and the closure of the Four Seasons hotel, the islands largest private

sector employer. The Nevis economy, like that of other Caribbean countries, is small, open and susceptible to natural disasters and economic shocks. It is also a service–based economy underpinned by tourism and financial services.

1.3.3 Poverty

A Cross-Country Study of Poverty Reduction and Human Development in the Caribbean by Judy I. Baker stated that countries such as St Kitts and Nevis that have invested heavily in the social sectors have achieved a relatively low level of poverty.

1.5 Legislative instruments of relevance to marine protection and management in St. Kitts and Nevis

1.5.1 *The Nevis Physical Planning and Development Control Ordinance (2005)*

This Ordinance makes provision [f]or the control of the development of land, including building operations and the subdivision of land, for the assessment of the environmental impacts of development, for the preservation of the natural and cultural heritage, and for related matters. Part V of the ordinance deals with enforcement.

Pursuant to the Ordinance, land is defined as "incorporeal as well as corporeal hereditaments of every tenure and description, and any interest therein, and also an undivided share in land, includes land covered with water and the seabed in the jurisdiction of the Nevis Island Administration and or the Nevis Air and Sea Ports Authority."

1.5.2 *The Fisheries Act (1984)*

Section 106 (1) of the 1993 Constitution of the Federation of St. Kitts and Nevis vests the power to regulate Nevis Island fisheries in the Nevis Island Administration. The Nevis Island Administration Fisheries Department operates using the federal Fisheries Act of 1984. The Fisheries Act authorizes the Minister to declare, by order, marine reserves and fishing priority areas in any area of fishery waters. Fishing priority areas are places where the minister feels special measures are necessary to ensure that authorized fishing is not impeded. Section 25 of the Act lists prohibited fishing methods and section 40 authorizes the Minister to make regulations for the management, development and conservation of fisheries.

The Fisheries Regulations (1995) contain conservation measures for lobster, conch, turtles, coral, sponges, marine algae, sea stars and aquarium fish.

1.5.3 *The Nevis Air and Seaports Authority Act No. 1 of 1995*

It shall be the duty of the Authority to operate the ports as appears to it best calculated to serve the public interest, and carry out exclusively the loading, unloading, landing and carrying of all goods to and from all ships and aircraft in a port. The Authority shall also provide for such ports and the approaches to ports such air traffic control services,

beacons, buoys and other navigational services and aids as it considers necessary or desirable.

1.5.4 *Nevis Zoning Ordinance, (1991)*

This Ordinance provides that no person shall carry out development which is contrary to the provisions of the approved Zoning Plan unless he shall be carrying out development pursuant to permission granted by the Minister. The Ordinance provides for the establishment of marine parks in Nevis.

1.5.5 *Solid Waste Management Act (1996)*

St. Kitts and Nevis has, for several years, maintained separate management authorities. The St. Kitts and Nevis Solid Waste Management Corporation (SWMC), created under Act of Parliament on July 24, 1996, has responsibility for solid waste management on St. Kitts. The Nevis Solid Waste Management Authority (Nevis SWMA) manages day-to-day operations on Nevis.

1.5.6 *Nevis Physical Development Plan (2008 DRAFT)*

A draft Physical Development Plan for Nevis has been developed to promote the sustainability of the island's resources through the improved regulation of land-use. The Plan was designed to address land development over a fifteen year period. It includes policies and guidelines for sustainable development and seeks to prescribe locations of housing, industry, parks/conservation areas, hotel and tourism development with regards to land suitability and other physical and environmental attributes.

Though not formally approved by the Nevis Island Administration, the Plan has been used as a guide to inform decision making on land use and development applications; zoning; environmental management; heritage matters; and infrastructure development. Generally, the objectives of the Plan support the island's sustainable development agenda.

1.5.7 *Nevis Historical and Conservation Society*

The Nevis Historical and Conservation Society (NHCS) was established in 1980 to conserve the natural, cultural, and historic resources of the island and adjacent marine areas. The Society is a non-profit organization managed by an Executive Board. Since its inception the NHCS has instituted projects and policies designed not only to preserve Nevis' unique history and environment, but also to make that heritage accessible and intelligible to locals and visitors.

Despite the existence of legislations, in several instances there are no accompanying regulations and/or guidelines to directly govern the administration of these laws. Additionally, the provisions of the Constitution of St. Kitts and Nevis grant a level of autonomy to the Nevis Island Administration (NIA) which sometimes constrains the effective and uniform implementation of key pieces of legislation across the Federation.

Several Federal legislative instruments, such as the Development Control and Planning Act, the Solid Waste Management Corporation Act and the National Conservation and Environmental Protection Act, among others, are not applied across the Federation. This peculiar situation also limits the scope of authority for the relevant line departments, particularly on Nevis.

1.6 Institutional arrangements for marine resource protection and management

1.6.1 The Department of Physical Planning, Natural Resources and Environment.

Pursuant to the Nevis Physical Planning and Development Control Ordinance, 2005 (The Ordinance) land is defined as "incorporeal as well as corporeal hereditaments of every tenure and description, and any interest therein, and also an undivided share in land, includes land covered with water and the seabed in the jurisdiction of the Nevis Island Administration and or the Nevis Air and Sea Ports Authority." Marine development outside the jurisdiction of the Nevis Island Administration and/ or the Nevis Air and Seaports is under the jurisdiction of the Federal Government.

Development in Nevis falls under the umbrella of several government agencies. However, it is the Department of Physical Planning, Natural Resources and the Environment (PPNRE) which has the lead role in regulating development activities and coordinating input from the various other agencies.

No development of any *land* in the Island of Nevis may commence without the prior written permission of the Director of PPNRE. The Ordinance further provides that neither electricity nor water services shall be granted until the Director of PPNRE has confirmed that the property or premises has been granted development permission in accordance with the provisions of The Ordinance.

Except in specific cases, The Director of PPNRE must not determine an application unless the application has first been referred to the ***Development Advisory Committee*** (DAC) for review and the Committee has considered the application and advised the Director of PPNRE of its findings. The Committee consists of the Permanent Secretary of the Ministry, as Chairman, and the following ex officio members: the Director of PPNRE; the Director of Public Works; the Engineer / Manager of the Nevis Water Department; an Inspector of Public Health; the Manager of the Nevis Electricity Company Ltd; the Manager of the Nevis Housing and Land Development Corporation; a member of the Nevis Historical and Conservation Society; a member of the Nevis Chamber of Industry and Commerce. The Committee must meet at least once per month. When an application for permission to develop land is duly made, the Director of PPNRE must issue a decision within a period of ninety days from the date of receipt of the application, or such extended period as may be agreed to in writing by the applicant. Unless the Director of Physical Panning issues a decision within the prescribed period, the application will be considered refused and the applicant may, within thirty days of the decision, appeal in writing to the Minister.

When permission is granted for any development subject to conditions, the Nevis Island Administration may enter into an arrangement or agreement with the developer in order to give effect to such conditions, if the Director of PPNRE considers it necessary. The Director of PPNRE may at any time revoke permission to develop land or any part of that permission, without compensation, if the developer does not substantially comply with the conditions subject to which it was granted.

1.6.2 The Nevis Department of Fisheries

The Fisheries Act, 1984, authorizes the Minister to declare, by order, marine reserves and fishing priority areas in any area of fishery waters. Fishing priority areas are areas where the Minister feels special measures are necessary to ensure that authorized fishing is not impeded. There are no marine reserves or fishing priority areas declared in the waters under the jurisdiction of the Nevis Island Administration.

The Nevis Department of Fisheries enforces the provisions of the Fisheries Act through Fisheries Regulations which are currently under review for amendments.

No person is allowed to undertake any research or remove any item from the coastal waters around Nevis without first obtaining permission from the Department of Fisheries. The Department of Fisheries collaborates with the Nevis Historical and Conservation Society with regards to this policy.

1.6.3 Nevis Turtle Group

Mr. Lemuel Pemberton, Nevis' then Director of Fisheries, founded the Nevis Turtle Group in 2001. The group eventually partnered with the Four Seasons Resort, the island's largest employer, along with the global Sea Turtle Conservancy, to expand the programme.

Figure 3. "Pinney 1" tagged at Pinney's Beach by Nevis Turtle Group
Photo Source: http://www.caribjournal.com

The aim of the project is to record the turtles' critical information when they come ashore to nest and tag them with special global positioning technology that facilitates the study of the mercurial movements of one of the world's oldest living species. Each time the turtle surfaces to breathe, its location is tracked and logged through GPS satellites. Through this information, scientists hope to learn more about the species' migratory behaviour so that protection efforts can be improved.

"We're at the point in Nevis where we know enough about the turtles, and we're beginning to develop a strong sense of pride in turtles in this country. With our

programme here with the Four Seasons, with the annual summer camp that involves the local kids, we're building this level of awareness." There could be an added benefit to Nevis and the Caribbean at large in stepping up the fight to protect turtles: eco-tourism.

1.6.4 Nevis Air and Seaports Authority

The Nevis Air and Seaports Authority (NASPA) supports the preservation of Sea Turtles by producing guidelines and facts on its web page (www.nevisports.com). NASPA encourages volunteering in conservation initiatives, reporting of turtle sightings and compliance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and most national laws.

1.8 Relevant regional project initiatives

The OECS region is characterized by a rich biodiversity endowment, which, in combination with its isolation from other areas, has resulted in relatively high rates of national and regional endemism. In addition to exhibiting differing degrees of endemism, the islands of the region also provide habitat and nesting sites for non-endemic migratory marine animals, turtles and avian species. A 2003 survey conducted by Conservation International, of the world's biodiversity hotspots, identified the Caribbean as the fifth ranking "hot spot" and one of the highest priorities in any global strategy for biodiversity conservation and sustainable management. There have been several regional initiatives to achieve biodiversity conservation and sustainable natural resource management in the OECS region.

1.8.1 OECS Protected Area and Associated Livelihoods (OPAAL)

The OECS Member States in the year 2000 issued and subsequently endorsed the St. George's Declaration of Principles for Environmental Sustainability in the OECS, which includes a commitment to the conservation of biological diversity and the protection of areas of outstanding scientific, cultural, spiritual, ecological, scenic and aesthetic significance.

The OPAAL project is a developmental plan that seeks to conserve the biodiversity of global importance in the participating countries of the OECS by removing barriers to the effective management of protected areas (PAs) and through increased involvement of civil society and the private sector in the planning, management and sustainable use of these areas.

This project represents the first phase of a proposed 15 year program. The end-goal of the program is to create an integrated system of protected areas among the OECS Member States, which will protect and conserve ecologically-sustainable, representative samples of the region's rich biodiversity endowment, while creating sustainable livelihoods for communities in and around the protected areas.

The present project represents a significant first step in fostering a number of critical common elements, which could evolve over time into an integrated regional system.

This could be achieved through; (i) promoting the development of a common or similar institutional framework governing protected areas; (ii) strengthening of institutions with shared mandates and (iii) supporting regional training and public awareness of the importance of conserving the region's biodiversity.

The OECS Secretariat through its Environment and Sustainable Development Unit (ESDU) is responsible for the implementation of the OECS Protected Areas and Associated Sustainable Livelihoods (OPAAL) Project. This initiative is being executed in partnership with the International Bank for Reconstruction and Development (the World Bank) acting as an Implementing Agency of the GEF; the Fonds Français pour l'Environnement Mondial (FFEM) of the Government of France; and the Organisation of American States (OAS).

The main thrust of OPAAL is biodiversity conservation and sustainable development. The project demonstrates strategic consistency with approaches embodied in various strategies in the region and the world (including the OECS Development Charter, the SGD of Principles and Environmental Sustainability, and the World Bank's country Assistance Strategy).

OPAAL consists of six demonstration sites located in Antigua and Barbuda, Dominica, Grenada, St Kitts and Nevis, St Lucia and St Vincent and the Grenadines. The OPAAL demonstration sites will in the long-term, reveal the benefits and opportunities for natural resources management.

The project recognizes that people are an essential part of the ecosystem of planet earth, and therefore must be accommodated in plans and processes of biodiversity conservation. OPAAL therefore embraces human activity and encourages opportunities for sustainable livelihoods. Through OPAAL, it is expected that selected terrestrial and marine areas will be preserved and human activity will be managed for the benefit of future generations.

The *Central Forest Reserve* in St. Kitts is the OPAAL demonstration Site for St. Kitts and Nevis.

1.8.2 Caribbean Regional Environmental Protection Programme (CREP)

The Caribbean Regional and Environmental Programme (CREP) was designed to strengthen Regional cooperation and build greater awareness of environmental issues in The Caribbean Forum of African, Caribbean and Pacific States. At specific sites (7 countries), CREP proposed to demonstrate that the Region's natural resources and biodiversity could be better protected and managed to bring greater social, economic, environmental, aesthetic and other benefits to this and succeeding generations.

CREP was envisioned as a dynamic process whose mission and activities were to be sustained by Regional and national environmental stakeholders. The four focus areas of CREP were:

- Developing and strengthening Regional Environmental Information Networks;
- Promoting environmental public education and awareness;
- Building the capacity of regional environment institutions;
- Establishing sustainable living demonstration sites in "Amenity Areas" - natural areas having significant ecological, social, recreational and economic value

The €500,000 project was to be funded by the European Union (EU) and implemented by the Caribbean Conservation Association (CCA) in collaboration with the Nevis Island Administration and the Nevis Historic and Conservation Society. CREP commenced in January 2001 as a four year programme but was later extended to be completed by June 30, 2006.

Resulting from a selection process, The Bath Bogs in Nevis was selected as the Amenity Area Demonstration site in St. Kitts and Nevis, to facilitate the establishment of a high-end, community based, ecotourism site, of such status, to gain designation as a World Heritage Site. The proposed Bath Estate Amenity Area Demonstration Project site was identified as an approximately 20 acre area site located in Bath Village, Nevis. The site features ***The Bath House*** built in 1607, ***The Bath Bogs*** which is the largest wetland in Nevis with over 28 bird species, crabs, lizards, turtles and ***The Bath Stream*** which is used by locals and tourists for health and remedial benefits. A coral reef area exists off shore, a public beach and a fish landing area are also within the proposed boundaries of the Amenity Area.

Figure 4 . Proposed Bath Estate Amenity Area under CREP
Photo Source: Nevis Historical and Conservation Society

Reports were completed for The Bath Estate Amenity Area Management Plan, an assessment of key natural, historic, social, economic and cultural resources within the Bath Estate Management Area and a preliminary design for rehabilitation of Bath Stream Water Quality.

Regrettably, The CREP project was never realized, in its entirety, in any of the participating countries. Challenges faced by The Programme Management Unit, with efforts to administer the project systematically across seven countries, each with individual challenges of human resource and technical capabilities, proved insurmountable. The bulk of the funding was not disbursed at the end of the financing agreement.

1.8.3 Caribbean Challenge Initiative

In 2008, the Caribbean Challenge Initiative (CCI) was launched by visionary governments to chart a new course for protecting and sustainably managing the marine and coastal environment across the Caribbean. The ten governments that have been participating in CCI include: Antigua & Barbuda, Bahamas, British Virgin Islands, Dominican Republic, Grenada, Jamaica, Puerto Rico, St. Kitts & Nevis, St. Lucia, and St. Vincent & the Grenadines. Other countries and territories are starting to express an interest in joining this effort.

During Phase I of CCI, senior government officials made two commitments:

"20 by 20" target. To effectively conserve at least 20% of their near-shore marine and coastal environment by 2020.

Sustainable finance target. To support and put in place a new sustainable fi nance architecture that will generate long-term funding for the marine and coastal environment.

The Sustainable Financing and Management of Eastern Caribbean Marine Ecosystems Project is under the umbrella of the CCI.

The aim of this project is to establish a sustainable financing mechanism for national systems of MPAs through the formation of a regional endowment fund and five national trust funds (TFs). The five participating OECS countries are Antigua and Barbuda, St. Kitts and Nevis, St. Lucia, Grenada and St. Vincent and the Grenadines. The national level TFs will be designed to finance sustainable management activities in PA systems and critical marine ecosystems. Diverse sources of funds will be channeled through the TFs, contributing to a more integrated framework for protected area management financing. Additionally, the aim of the project is to establish, strengthen and consolidate a policy, regulatory and institutional framework across the five OECS countries that harmonizes activities for sustainable financing of PAs. This activity will build on existing and past efforts in establishing endowment funds. The project will also support each country in legally establishing national TFs and defining regional cooperation arrangements.

To address the under-protection and under-representation of marine ecosystems in the OECS Protected Area systems, the project will support the designation of at least one

marine PA in each country. These five MPAs will be the first beneficiaries of the sustainable financing mechanism. Depending on the flow of funds from the endowment and from the national TFs, coverage will expand to include other PAs. The main outputs expected include: (i) increased management effectiveness of each country's national system of MPAs; (ii) selected MPAs are representative of all EC marine ecosystems; (iii) demonstrated effective management in at least 6 priority MPAs that are not supported by other projects and/or external funding; (iv) in cooperation with other GEF funded projects in the OECS region, the effects of climate change on the marine resources in the EC are modeled utilizing most appropriate methodology; and (v) regional climate change coping strategies are developed and applied to pilot demonstration sites. Outputs (i) through (iii) will be achieved through the completion and implementation of community-based conservation action plans including monitoring of fish stock and catch, control and reduction of land-based sources of pollution, and determining the carrying capacity of the selected MPAs.

The project also hopes to implement a Monitoring and regional information system network. The aim of this component of the project will be to establish a decision-support information system that integrates the entire PA network for the EC and the various management institutions into one regional system. The component will support: (i) design of an information system that will monitor financial, biodiversity, administrative and other relevant variables important for the management of the MPA system; (ii) deployment of hardware and software; and (iii) training of appropriate staff at all levels to administer and update the system.

In keeping with the GEF-4, the project will primarily address the Biodiversity Focal Area Strategy, while specific activities will also address the Focal Area Strategy for International Waters and the GEF-4 concern for climate change adaptation measures. The project targets the Biodiversity Strategic Program 1 ("Sustainable Financing of Protected Area Systems and the National Level") by seeking to increase sustainable funding of PA networks at the national level via a regional endowment fund and national PATFs. Increasing representation of effectively managed MPAs into PA systems targets the Biodiversity Strategic Program 2 ("Increasing Representation of Effectively Managed Marine Protected Areas in Protected Area Systems") and will be the priority of the project; the goal is to improve management effectiveness of selected MPAs by an average of 25 percent from the baseline and to increase the overall coverage of MPAs within national networks of PAs. The project will also incorporate the International Waters Strategic Program 1 ("Restoring and Sustaining Coastal and Marine Fish Stocks and Associated Biological Diversity") through the development of effective policy measures for fishery management and the controlling and monitoring of effluents. Finally, the project will address the GEF-4 concern with climate change adaptation strategies by supporting pilot and demonstration sub-projects for climate change adaptation activities as part of project activities.

The Sustainable Financing and Management of Eastern Caribbean Marine Ecosystems project would partner with the Caribbean Large Marine Ecosystem (CLME) project under preparation; it aims to address over-fishing and improve fisheries management across the Caribbean Basin. Important contributions for MPA management from this project include: (i) root-cause analysis conducted as part of the Transboundary

Diagnostic Analysis (TDA); (ii) the specific actions that will be defined as part of the Strategic Action Program (SAP); and (iii) the innovative government approach to medium-sized and artisanal fisheries. While the CLME will focus on the definition of sustainable management at LME level, the proposed project will implement the actions in specific MPAs. In addition, the proposed project plans to partner with the GEF-funded project: Integrated Watershed and Coastal Area Management (IWCAM) for SIDS in the Caribbean. This project aims to address coastal development issues via demonstration activities, improved policies, and better planning coordination. The partnership would provide relevant data on watersheds and coastal zones, which could enhance the sustainable management of the selected MPAs. In addition, the proposed project complements potential GEF projects associated with the "Caribbean Challenge". These include potential national projects in the Bahamas, Jamaica, and the Dominican Republic (all of whose PIFs have received Council approval), which focus on similar MPA management actions and sustainable finance, with the TNC as a co-financer. Finally, the proposed project is aligned with the Global Island Partnership (GLISPA). Launched in March 2006, GLISPA aims to build leadership and partnerships committed to actively supporting the implementation of the Island Biodiversity Programme of Work under the Convention for Biological Diversity (CBD) and other related global policies. Of the OECS countries, Grenada is already a member of the Partnership. Additional Caribbean countries that are also members of GLISPA include the Bahamas; others are expected to join in the near future. The project is funded by the Global Environment Facility (GEF) and implemented by the World Bank in coordination with each of the five participating countries.

To accelerate marine conservation action and funding, **Phase II of CCI** was launched at the Summit of Caribbean Political and Business Leaders in the British Virgin Islands in May, 2013. The Summit brought together government and business leaders, and key partners to set a new course for the region's marine and coastal environment. Building on Phase I, Phase II of CCI is expected to more actively engage the private sector and civil society, expand the scope of commitments beyond marine protected areas to a wider range of issues, and involve a larger number of countries and territories across the Caribbean.

1.8.8 Socio-economic Monitoring by Caribbean Fishery Authorities (SocMon) Project

The Global Socioeconomic Monitoring Initiative for Coastal Management (SocMon) works through regional and local partners to facilitate community-based socioeconomic monitoring. Household and community level data are collected to inform dependence on coral reef resources, perceptions of resource conditions, threats to marine and coastal resources, and support for marine management strategies such as marine protected areas. St. Kitts and Nevis participated in the Socio-economic Monitoring by Caribbean Fishery Authorities (Soc-Mon) project during the period 2008 – 2009. The goal of the project was to collect socio-economic data to inform marine conservation and development decision-making. The objectives of the project were to:

1. Determine trends in socio-economic benefits from resource use
2. Determine how coastal and marine ecosystems provide benefits
3. Enhance awareness of ecosystem services provided
4. Involve resource users in monitoring

The proposed marine protected area (MPA) encompassing the Booby Island Shoal was the study area chosen for socio-economic monitoring. The boundaries of the study area, with the exception of the terrestrial boundary, were set using an Admiralty Chart of the area. The SocMon team determined that if the coastal zone is not defined in the physical development plan, a coastal band of between ½ to 1km will encompass most of the major activities or issues of the study area.

A total of 98 persons were surveyed as part of the SocMon project, including 29 fishers. 67% of the persons surveyed agreed that MPAs are beneficial to St. Kitts and Nevis Marine Resource. Seventy-five percent (75%) of non-fishers were unaware of "The Narrows" becoming an MPA, while 52 % of Fishers were aware (Arthurton & McDonald, 2010).

1.8.9 Ecosystems Approach to Fisheries

At the University of West Indies, Cave Hill Campus, Barbados the Centre for Resource Management and Environmental Studies (CERMES) receives grant funding from the International Development Research Centre (IDRC) of Canada among others to assist in introducing Ecosystems Approach to Fisheries (EAF) via the Marine Resource Governance in the Eastern Caribbean (MarGov) project. MarGov offered a small grant in 2010 to help DMR (St Kitts and Nevis) to prepare for this transition.

1.8.10 Caribbean Conservation Association

The Caribbean Conservation Association (CCA) is a non-governmental organisation, founded in 1967, CCA has brought together governments and NG0s in the region to work together for sustainable development. CCA is the implementing agency for UNEP's Caribbean Action Plan on environmental education and public awareness. St. Kitts and Nevis are members of the Caribbean Conservation Association (CCA), a regional non-profit Organization dedicated to promoting policies and practices which contribute conservation, protection and wise use of natural resources. The Caribbean Natural Resources Institute (CANARI), formerly the Eastern Caribbean Natural Area Management Programme (ECNAMP) also supports St. Kitts and Nevis in its goal to strengthen local capacity to manage the living resources critical to development in the Caribbean region.

1.8.11 The OECS Protecting the Eastern Caribbean Region's Biodiversity (PERB) Project.

The creation of the Nevis Peak National Park (NPNP) is supported under the OECS Protecting the Eastern Caribbean Region's Biodiversity (PERB) Project. The purpose of this project is to aid in the development, adaptation and implementation of comprehensive national policies and strategies consistent with strategies and frameworks for sustainable development and backed by appropriate legislation.

The NPNP / Camps River Watershed (Wetland) Project encompasses a wide range of features, including volcanic formations, rainforest, the island's major watershed and springs, a freshwater lagoon, and the largest living reef system around Nevis.

The Nevis Peak National Park (NPNP) / Camps River Wetland is earmarked under the Draft Nevis Physical Development Plan as a protected area. Under that Plan, this is one of four areas in Nevis where conservation and enhancement of the natural environment will take priority.

1.8.12 Rapid Assessment and Prioritization of Protected Areas Management (RAPPAM)

A Rapid Assessment and Prioritization of Protected Areas Management (RAPPAM) workshop was conducted on June 25 and 26, 2009. The objective of the RAPPAM workshop was to receive inputs from key stakeholders concerning present and proposed protected areas in St. Kitts and Nevis.

As part of a parallel study of protected areas in St. Kitts and Nevis, The Nature Conservancy facilitated an Ecological Gap Assessment workshop on June 22 and 23, 2009 at the Nevis Cooperative Credit Union building.

1.8.13 The Caribbean Regional Fisheries Mechanism (CRFM)

The Caribbean Regional Fisheries Mechanism (CRFM) was established in 2003 and headquartered in Belize. Its mission is "To promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region". Its members are Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago and the Turks and Caicos Islands. It has three bodies – the Ministerial Council; the Caribbean Fisheries Forum; and the CRFM Secretariat.

1.9 Data Collection and Analysis

Economic valuation is a concept which is increasingly being used to put a dollar value on ecosystems in order to balance conservation and development needs.

The World Resource Institute's (WRI) economic valuation methodology provides a simple and replicable method for estimating the value of coral reefs and mangroves in the Caribbean. The methodology uses the concept of "ecosystem services" – the tangible benefits ecosystems provide which sustain and fulfill human life – as the basis for measurement. The approach looks primarily at the direct economic benefits provided by these resources and focuses on three important ecosystem goods and services associated with coral reefs: fisheries, tourism, and shoreline protection services.

The Ecosystem Services Value matrix provided by OAS (Huber, 2013) was used for this study, in which values which have already been estimated for similar ecosystems were applied to similar systems in St. Kitts and Nevis.

The best source of information to perform the economic valuation for Nevis came from benthic habitat maps produced by The Nature Conservancy in 2010. The benthic habitats from the shore out to 30 meters were mapped and quantified. The area of sea grass beds and coral reefs was obtained from these maps. Although the maps indicated the location of mangrove systems, there was no data regarding the extent or health of these systems.

A number of Plans and reports which have been developed over the years were reviewed to obtain useful information for the purposes of this report. Interviews with Government staff at the Department of Fisheries and Physical, Planning, Natural Resources and Environment primarily, as well as consultations with the Nevis Historical and Conservation Society provided information about the general status of the health of various ecosystems. Some field investigations were undertaken to document conditions of the resources.

A verification meeting will be conducted to confirm the information presented in this report.

Nevis could benefit from an information system to integrate the wide range of marine-based knowledge and provide stakeholders with a more detailed and comprehensive information base for marine planning and management. This information could also be used to highlight important areas such as: critical fishery habitats (essential fish habitats, nursery areas, endangered species); areas of high biodiversity; important marine ecosystems (mangrove, seagrass & coral reefs); areas of high cultural and recreational importance; areas important for fishing, marine-based tourism, yachting and shipping; areas of land-based sources of pollution, human threat and potential space-use conflicts.

Part 2: Identification of Critical Marine Habitats

2.1 Marine Ecosystems

A recently completed benthic mapping project, led by The Nature Conservancy (TNC) and the National Coral Reef Institute (NCRI), identified the extent and distribution of 12 different benthic habitats (FIGURE 5).

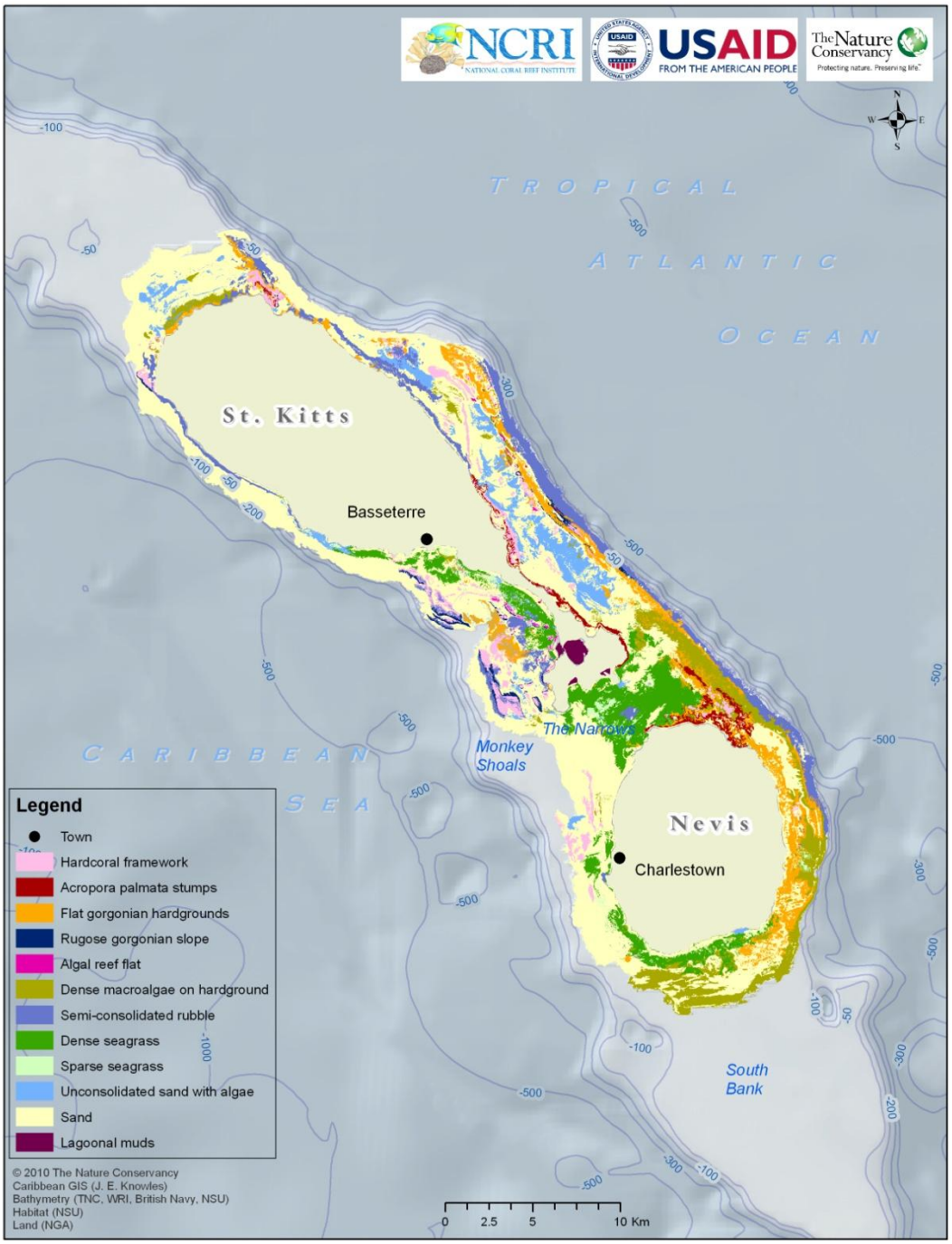


Figure 5. St. Kitts and Nevis Benthic Habitats

2.2 Coastal Resources of Nevis

The two-island nation of St. Kitts-Nevis has a fairly small ocean shelf of approximately 845 km^2, but it boasts all of the critical marine habitats found in the Caribbean, including mangroves and seagrass beds, fringing coral reefs, and offshore reef ecosystems. It is home to a number of threatened marine animals, including critically endangered elkhorn coral and staghorn coral, migrating marine mammals including humpback whales, sperm whales and several resident dolphin species, three different sea turtles, over 450 species of fishes, queen conch and spiny lobster, to name a few. Of major importance to these species is the Narrows, a shallow area between the two islands that supports extensive seagrass beds that serve as vital breeding grounds and nursery areas for conch, fishes and lobster and a feeding area for hawksbill turtles.

2.2.1 Coral reefs and Seagrass Beds

Coral Reefs and Seagrass beds provide an ecosystem in which a number of marine organisms thrive. They provide habitat for commercially important species such as lobster and conch, and nurseries for juvenile marine organisms. Coral Reefs act as barriers during periods of heavy wave attack to help protect shoreline properties from the devastating impacts of storm surge.

Booby Island which is located in the "Narrows" between St. Kitts and Nevis houses a shallow reef bordering her eastern side. The often choppy site is home to an abundance of lobsters and large green morays. The shelving reef provides shelter for glassy sweepers and schools of yellow striped grunts.

The major seagrass beds around Nevis are located primarily north of Nevis in the Narrows, and South of Nevis in an area called the south bank (FIGURE 6). According to the TNC Benthic habitat map the sea grass is described as follows: **Dense seagrass** – Sand sheets with a dense seagrass community (> 50% cover) dominated by *Thallassia tesdudium,* and secondarily *Syringodium filiforme.* Associated with the grass are green algae (Chlorophyta) - especially *Halimedia, Udotea, Turbinaria,* etc).

Nevis' largest reef system is located just off the coast of the Camps River Watershed on the north coast of Nevis (FIGURE 7). According to the TNC Benthic habitat map the reef system is described as follows: ***Acropora palmata* stumps** – Dense thickets of largely dead *Acropora palmate* interspersed with the occasional living colony of another hard coral species; predominantly either *Montastrea*, or *Siderastrea*. In deeper areas (< 5 m water depth) these stumps remain in an upright growth position and provide high habitat complexity. Shoreward, these corals are often displaced and mingle with rubble substrate. Narrow sand channels (1-2 m across bifurcate patches of this habitat). Only isolated live colonies (<1% cover) were identified on these reefs. The **Hard Coral framework** along the West coast is described as follows: moderately rugose frameworks with sparse coral cover (typically<10 %). Colonies are predominantly small (sub-meter) in size. The coral community is composed primarily of *Siderastrea, Montastrea, Diploria,* and *Colpophylia* spp.. Crustose coralline algae and fleshy algae (*Sargassum, Dictyota*) along with gorgonians dominate the remainder of substrate. This hardcoral framework tends to form a semi-continuous barrier, broken by narrow sediment filled channels.

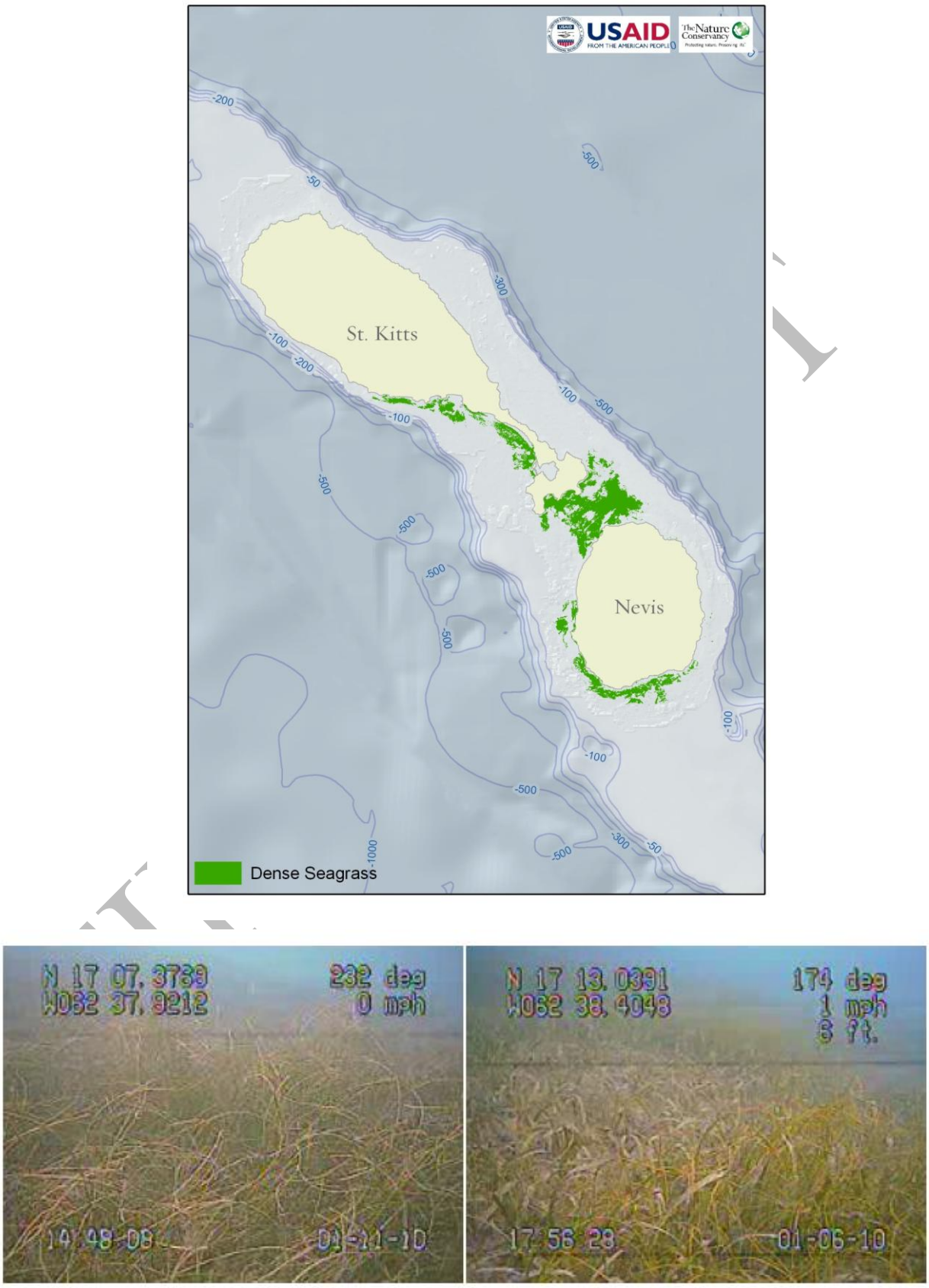


Figure 6. Seagrass Beds Map & Photo

Photo Source: Nevis Department of Physical Planning, Natural Resources and Environment

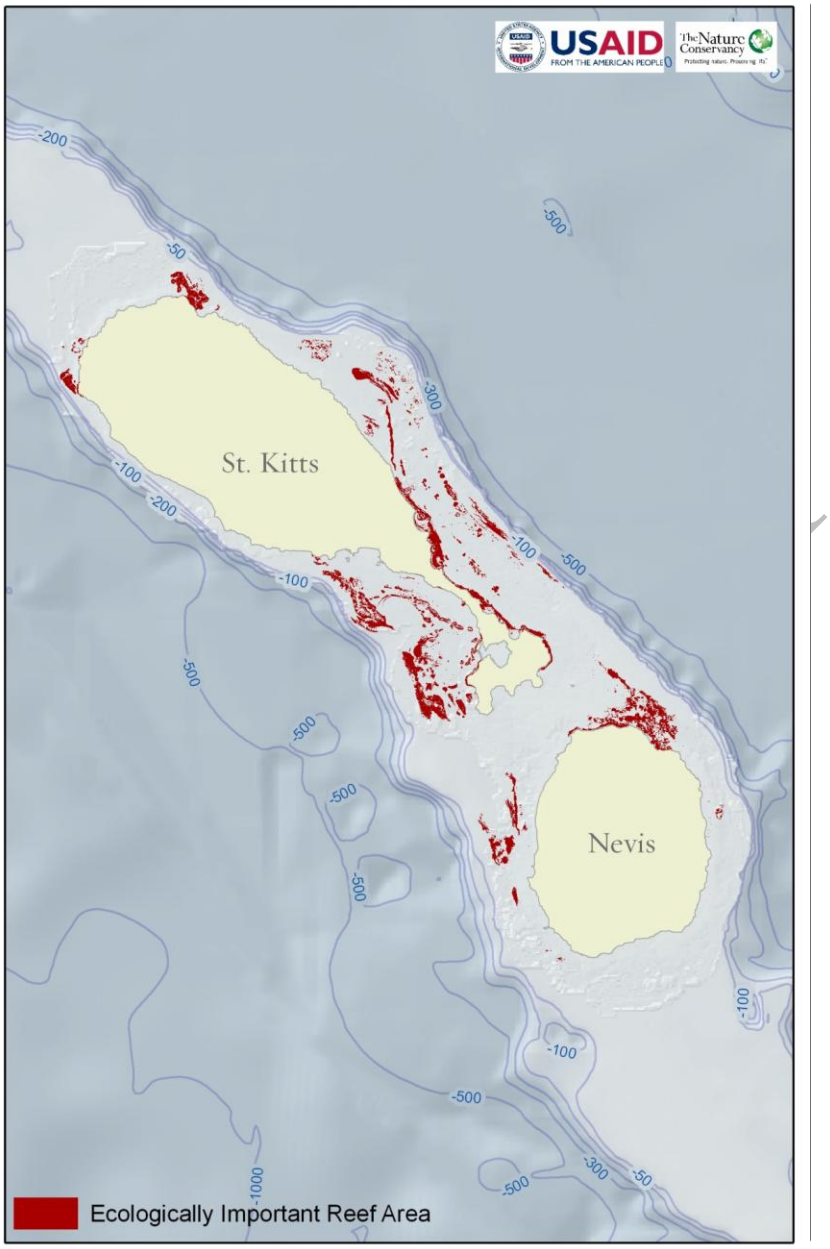


Figure 7. Nevis ecologically important Coral Reefs Map & Photo

Photo Source: Nevis Department of Physical Planning, Natural Resources and Environment

2.2.2 Mangrove Systems

Mangrove systems are known to be of ecological importance since they provide the primary habitat for various species of waterfowl, other migratory shorebirds and seabirds, fish, mammals and insects. Mangrove areas are also known to be popular breeding ground for waterfowl as well as a nursery for various species of fish and shellfish.

Mangrove systems naturally filter and recharges water, slow the flow of surface waters and reduces the impact of flooding; they prevent soil and coastal erosion and buffer waterbodies from damaging land use activities.

On the island of Nevis, red and black mangroves no longer occur naturally in any of the Mangrove systems, although they were present less than 20 years ago (HCL, 2003).

Stands of white mangroves are dominant on the island, accompanied by fewer buttonwood species. These mangrove systems can be found at:

- Bath Bogs / Bath Stream (Southwest coast adjacent to the Gallows Bay immediately south of Charlestown) This is the most extensive mangrove system in the Federation of St. Kitts and Nevis.
- Parris Pond (Southern extremity of Pinneys Pond immediately north of Pinneys Beach Hotel)
- Pinneys Pond (About ½ km north of Parris Pond along Pinneys Beach)
- Jessups Bogs / Bowrin Pond (West of Jessups along Pinneys Beach)
- Fort Ashby Lagoon (Northwest coast next to the ruins of Fort Ashby)
- Mariners Pub Lagoon / Lawrence's Pond (Northwest coast)
- Cades Bay (Northwest coast close to former Prinderella's Restaurant)
- Jones Bay (Northwest coast north of Cliff Dwellers)
- Oualie Beach (Northwest coast in Mosquito Bay)
- Newcastle (Adjacent to eastern end of Newcastle Bay on north coast)
- Nisbet's (Western end of Nisbet's Beach on the north coast)
- Long Haul Bay (Long Haul Bay on north coast)
- Indian Castle / White Bay (Southeast coast) (Nevis Physical Planning Unit, 1998

The Camps River empties into the second largest wetland on the island and into the sea. This mangrove swamp has white and buttonwood mangroves. The last indigenous red mangrove tree was found in this area up to 2012 (Pers Comm., Physical Planning, 2013). A number of herons, egrets and moorhens among other birds occupy this wetland and the odd osprey (*Pandion haliateus*) is seen when this bird migrates through the area. In addition to the ecological features of this site, the Camps river watershed is the largest source of potable water for the Nevis Public Water Supply, mainly from springs, but also from pumped wells (Ecoengineering Caribbean Ltd). FIGURE 8. Shows the location of Mangrove systems, and condition of some of these systems around Nevis.

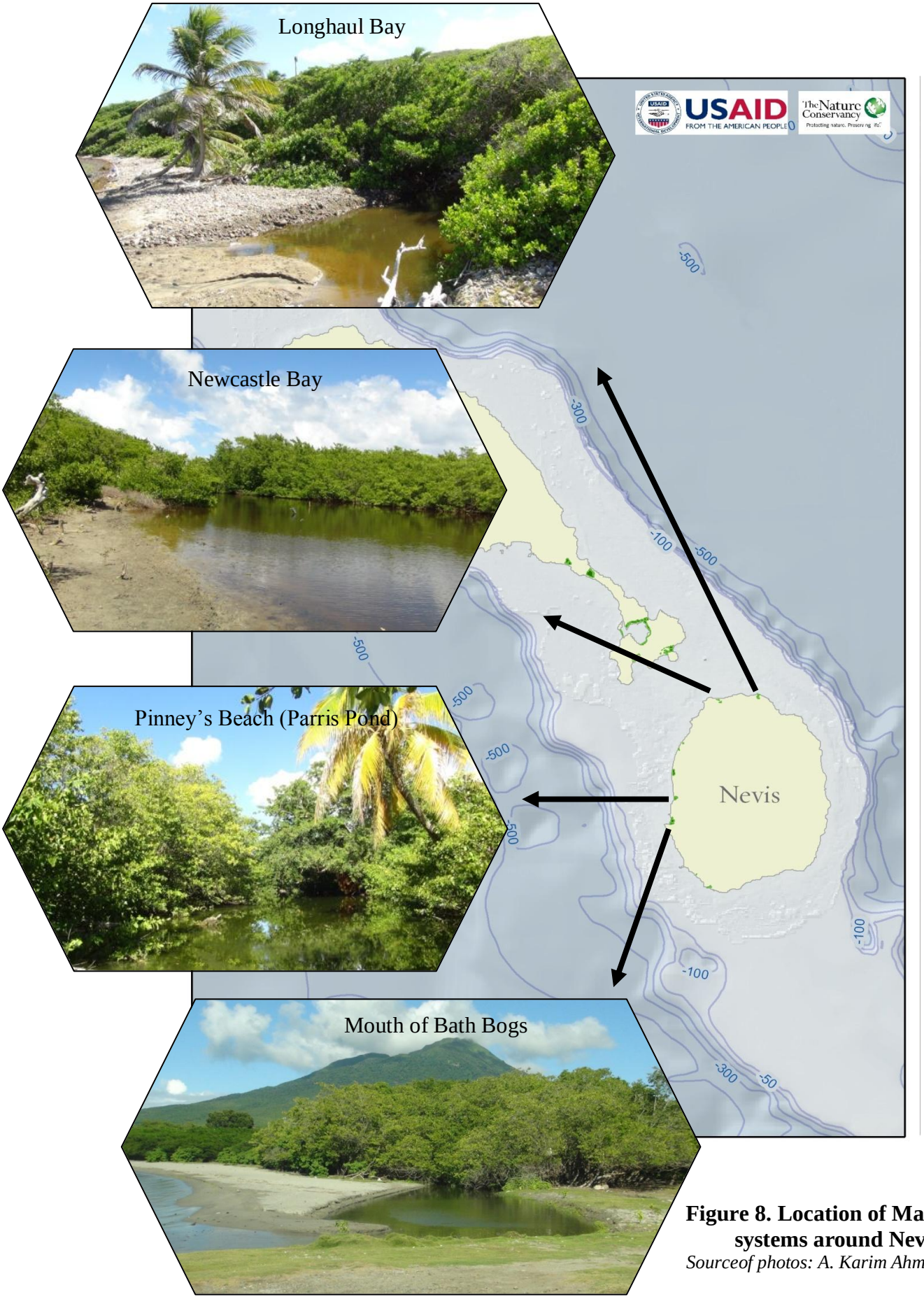


Figure 8. Location of Mangrove systems around Nevis

Sourceof photos: A. Karim Ahmed, 2013

2.2.3 Saltwater Ponds and freshwater lagoons

The fresh water lagoons are associated with the leeward (western) coastline of Nevis. The Pinney's Estate lagoons are the result of mountain ravine runoff whereas the Nelson Springs are the result of underground springs. The Bath Bogs lagoon system flushes into the ocean on a regular basis. Periodic mixing with ocean water results in the development of a brackish zone. The health of these systems directly impacts the productivity of the ecosystem of which they are a part and the health of the inshore fisheries. These systems provide habitats for many migratory seabirds and shorebirds in the fall and spring; they also support mangrove systems. There are a number of small wetland areas - ponds and swamps - where birds such as herons, gallinules and some waders can be found. The most extensive wetland area is the Bogs; others are to be found at Nelson Spring, Sea Haven Beach, near Nisbet Hotel and behind the beach at White Bay. There is a small seasonal pond just East of Newcastle which is very good for migrant waders, especially in September.

The Nelson Spring's Ecosystem (NSE) is a set of lagoons and surrounding wetlands located on the western side of Nevis, just below the village of Cotton Ground. It is historically significant as being near the site of Jamestown, the first settlement on Nevis (1620's) and the freshwater springs that were reportedly used by Horatio Nelson when he came to Nevis in the 1780's.

Chelonia mydas, the Green Turtle, and *Eremochelys imbricata,* the Hawksbill Turtle, have both been found nesting on this section of the beach, but females only nest every few years.

Rare Caribbean Fishing Bats, *Noctilus,* will feed at night on these lagoons during high winds, but are otherwise not found there.

Many birds also feed and/or nest in the surrounding areas. The lagoons supply them and their offspring with fresh water, something not readily available in many wild areas on Nevis. Some of the birds sighted in the Nelson's Spring Ecosystem include herons, egrets, pelicans, boobies, frigatebirds, ducks, osprey, falcons, rails, gallinules, coots, plovers, stilts, snipes, sandpipers, Turnstones, Vireos, Honeycreepers, Gulls, Terns, Ibises and Shearwaters (ANNEX 2).

The plant life in the Nelson Spring Ecosystem area is primarily scrub type vegetation and a mixture of native and introduced species. Coconuts, Sea Grape, and Clammy Cherry are the most prominent. There are also a few Mangroves and Mangoes as well as Lantana and small shrubs in the area. These are used by numerous insect species which are important pollinators of other plants as well. Several species of Sulphur Butterflies, *Pieridae,* breed in this area, they also migrate from island to island. There are also found *Heliconidae* Butterflies, commonly called Zebras.

Many other life forms (insects, lizards, and amphibians) are also found in the NSE area, but have not been properly documented or studied (*Johnson, J.*)

(FIGURE 9) shows the Nelson Spring Pond. Some vegetation around the Pond was cleared recently (2013) for security reasons associated with a new restaurant on the adjacent property. In close proximity to the pond, new facilities have been constructed for the benefit of the fishers who land their catch at the Cotton Ground Fish landing site. The parking lot for the restaurant mentioned above is shown in the fore (FIGURE 10). The enhancement facilities were provided by the developer of the adjacent condominium project as a measure to embrace the fishers and to show that the traditional use of fishing on the adjacent lot could comfortably coexist with the new condominium and restaurant project.

Figure 9. Nelson's Spring Ecosystem
Photo Source: A. Karim Ahmed, 2013

Figure 10. Fish landing site and condominium development (left) Enhancement structures at the Cotton Ground Fish Landing Site (right)
Photo Source: A. Karim Ahmed, 2013

2.2.4 Marine Fishes

Results from a 2010 Fisheries Uses and Values project indicate that fishing provides on average 66% of the household income of over 100 fishers who were surveyed. The St. Kitts and Nevis 2013 budget address reports that fish landings declined by 3% totaling 692,780 pounds when compared to 2011 with a total value of $6.8 million.

A 2011 coral reef assessment (Bruckner, A.) provides a listing of the fish species identified in the study areas around St. Kitts and Nevis. The assessment reported that generally the relative abundance of fish was low and very few large fish were observed (ANNEX 3).

The majority of fish captured consists of demersals caught using traps. Small schooling pelagic fishes are harvested with seines operating from beaches or offshore from boats. Spiny lobsters are fished primarily by traps, occasionally supplemented by SCUBA diving. Queen conchs are captured by diving, most frequently with scuba equipment. The large ocean pelagic and coastal pelagic are caught by trolling / handline.

TABLE 2 shows the ten fishery groups of interest in St. Kitts and Nevis.

Fishery Group Name	Associated Target Species	
Coastal pelagics	Gars Ballyhoo	Jacks Small tuna
Ocean pelagics	Billfishes Dolphinfish	Tuna Mackerel
Coastal demersals	Surgeon/Doctorfish Triggerfish Grunts Hinds Squirrelfish	Snappers Goatfish Parrotfish Groupers
Demersal shelf/deep slope	Snappers	Groupers
Lobster	Caribbean spiny lobster	
Conch	Queen conch	
Shark	Various species	
Diamondback squid	Diamondback squid	
Turtle	Leatherback Hawksbill	Green Loggerhead
Bait	Ballyhoo	Anchovy/Sardine

Table 2. Nevis' commercial fish species

2.2.5 Marine Turtles

Three species of sea turtle nest on the shores of Nevis; the Hawksbill *(Eretmochelys imbricata)*, the Leatherback *(Dermochelys coriacea)* and the Green *(Chelonia mydas)*. However, the data collected to date has confirmed that the majority of sea turtles nesting in Nevis are hawksbill turtles. The waters surrounding Nevis provide year-round foraging habitat for a fourth species of sea turtle, the Loggerhead.

Hawksbill and Green turtles nest from April to November, while Leatherbacks nest from March to June. Hawksbills prefer to nest on beaches with natural vegetation, while both Leatherbacks and Greens prefer high energy beaches and nest in open sand. All of these species are considered endangered or critically endangered, and each is protected against international trade.

2.2.6 Seabirds and Shorebirds

Research during the past decade has increased the number of bird species in the recorded literature for Nevis from less than 100 (*Hilder, 1989*) to 116 species (Steadman et al. 1997) The fieldwork sponsored under the St. Kitts and Nevis Biodiversity Project in 1997-98, and coordinated by Hugh McGuinness, led to several new sightings [8].

Booby Island, a rocky, vegetated islet approximately 40 m high, harbors a small yet diverse seabird breeding population. The island is located about half way between St. Kitts and Nevis. It is the only recorded (2004) breeding location within the Federation for a number of species: Red-billed Tropicbird Phaethon aethereus (2 pairs), Laughing Gull Larus atricilla (125 pairs), Roseate Tern Sterna dougallii (6 pairs), Bridled Tern Sterna anaethetus (60 nests), Sooty Tern Sterna fuscata (225 nests), and Brown Noddy Anous stolidus (8 pairs). There is no easy boat access to the island; visitors must swim onto the rocks. Fisherfolk sometimes collect seabird eggs at this site, especially those of Laughing Gulls. This island is listed as an Important Bird Area by Bird Life International.

2.2.7 Beaches

The beaches of Nevis come in basically two colors, black or white. Most of the beaches are of the white sand variety. The black sand beaches are less well known, and are due to the erosion of volcanic rocks. These can generally be found on the South side of the island. Some of the best beaches on Nevis are little known, and therefore are quiet, private, and almost pristine. The more popular beaches on Nevis are located along the west coast and they provide for recreation and cultural activities, sun, sand and sea tourism, propagation of sea turtles, fishing, boating and just about everything that occurs on a beach in Nevis.

Figure 11. Some of the Beaches along Nevis' West Coast
Oualie Beach at top, Cades Bay at center, Pinney's Beach at bottom

The beach with the highest turtle nesting density in Nevis is Lover's Beach (Sea Haven Beach), adjacent to the airport. However, other major nesting beaches on the island are in the process of being identified.

Turtle Nesting Beaches on Nevis

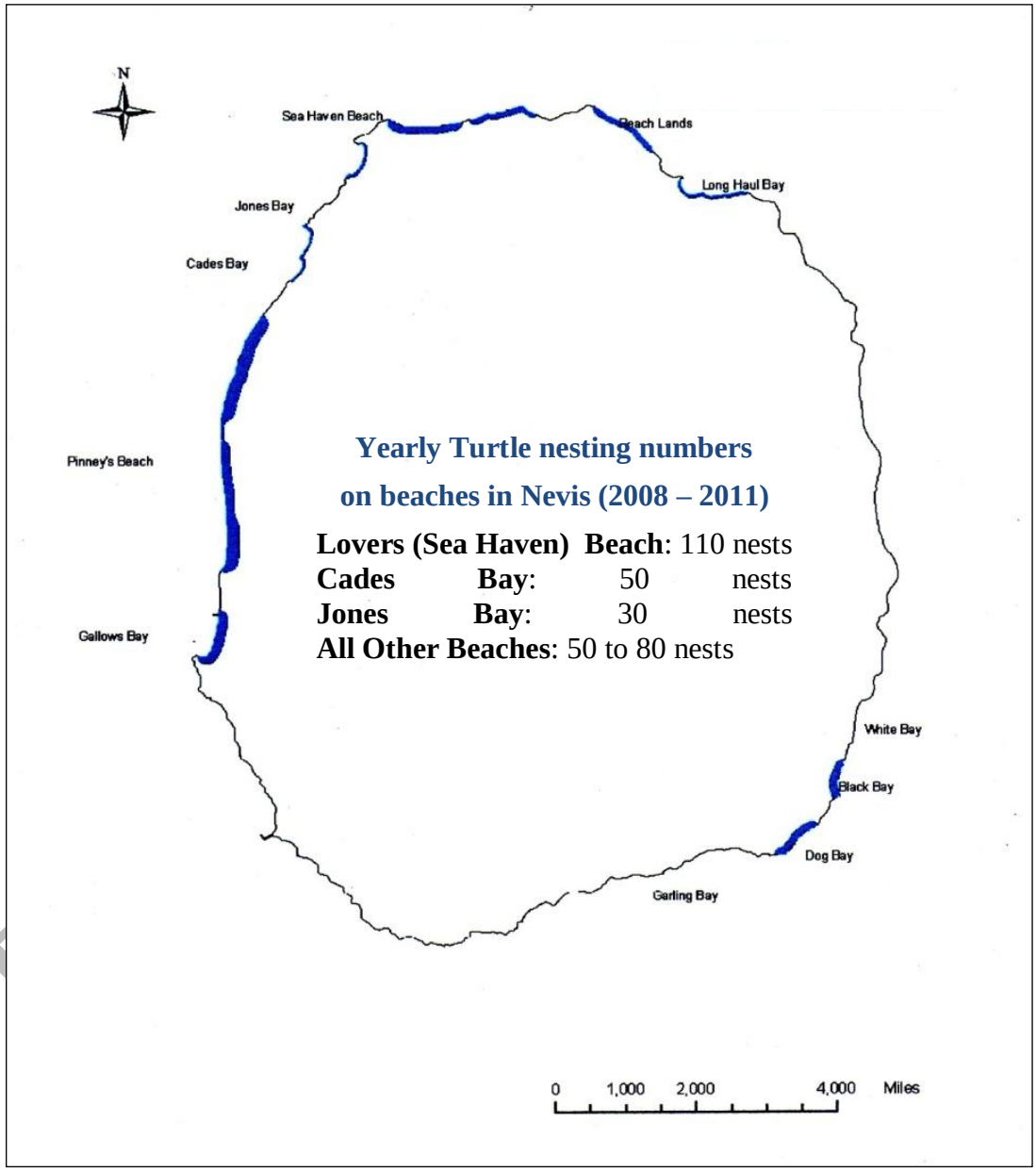


Figure 12. Turtle Nesting Beaches around Nevis
Map Courtesy: Lemuel Pemberton, President of Nevis Turtle Group, 2008

2.2.8 Migrant mammals

Humpback whales (*Megaptera novaeangliae*) travel further than any other mammal migrants, making a journey of up to 8,500km each way. 'Migration is one of the great wonders of the natural world. This fascinating phenomenon takes many forms and is much more than a simple trip from A to B,' says Ben Hoare, author of the Museum book Animal Migration. Humpback whales can be seen passing through the Narrows primarily during winter months. Whale watching trips are sometimes organized by recreational boaters.

2.2.9 Invasive species

Director, Nevis Historical and Conservation Society (NHCS) Ms. Evelyn Henville at a NHCS hosted Lionfish Workshop held on Monday November 5th 2012 at the St. Paul's Anglican Church Hall, warned that there is an invasion of lionfish species (FIGURE 13) in St. Kitts and Nevis seas and advised the public to be careful. "One was first sighted in 2010 and now a fisherman is saying he had 14 of them in one pot. That is only one fisherman and there are over 350 fishermen here in Nevis and if they each caught one, then we have an invasion. They are near, as much as four feet of water you can find them in. Be careful but don't be that careful that you don't want to go to the beach anymore. We just don't want that kind of message out there," she emphasised.

Figure 13. Invasive Lionfish which prey on demersals
Photo courtesy: K. Hodge, 2013

Swimmers are cautioned because the Lionfish could be a health hazard if its venom is injected into persons. However, skilled fishers can catch and prepare the fish for sale, in a manner where it is not dangerous or poisonous.

Of major concern is how the Lionfish are preying on the commercial species, when there is no known predator in the Caribbean waters for this species. FIGURE 13 above is a re-enactment of what a local fisher says he sees in the waters around Nevis. The Lionfish however, is now appearing on menus in restaurants around Nevis.

2.2.10 Thermal Vents

Minor fumarolic activity occurs at the Cades Bay soufrière and Farm Estate soufrière in Nevis. A number of hot springs are also present on the island but the hottest are those at the Bath Estate and at Cades Bay beach.

The Cades Bay soufrière is an area of warm, hydrothermally altered ground ~ 30 x 30 m in size. Local residents report that the Cades Bay soufrière began to form in 1953 with the burning of vegetation, deposition of sulphur in the soil, and development of small boiling pools and vigorously steaming vents. Soil temperatures of up to 100 ºC were reported for these early stages. In more recent years activity has decreased considerably, with steaming vents only visible during and after heavy rainfall. In 2001 ground temperatures of 100ºC were measured. It is likely that the Cades Bay soufrière formed in response to local readjustments in the groundwater system brought about by the severe earthquake swarm in Nevis between 1950 and 1951.

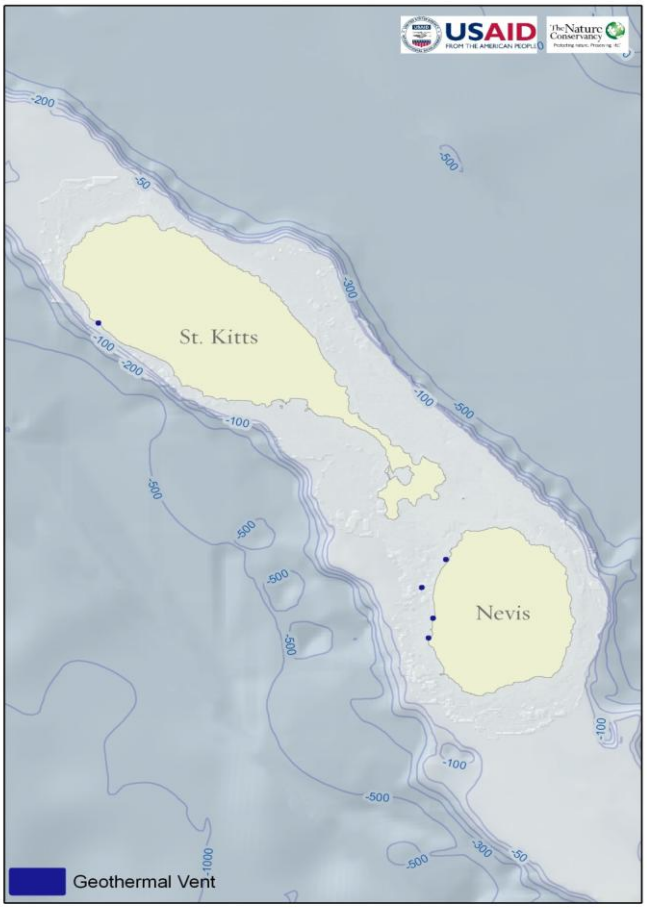


Figure 14. Nevis' Thermal Vents

Four marine vents were listed in the 2010 marine survey project, all on the western side of Nevis (FIGURE 14). The Thermal Vents are listed as a site for dive tours. A dive brochure for Scuba Safaris described the dive site as follows: *The reef begins at a shallow 35 feet and plunges to 95 feet. This reef is covered with large Black Coral "trees" which stem from the side of the reef. With overhangs and small canyons, this reef provides good hiding places for spotted drum, High Hats Arrow Crabs and some of the largest Lobsters. Divers can visit the hot vent at 90 feet where 100^{o}F water fizzes from the bottom.*

Nevis is well advanced in its quest to utilize its geothermal resources to supply its energy needs, thereby minimizing its dependency on the use of fossil fuels.

2.3 Users of Marine Resources

Marine resources around Nevis are used by persons primarily for fishing, transportation, recreation and marine-based tourism.

2.3.1 Fishers

Commercial and artisanal fishing is extremely important in St. Kitts and Nevis. Fishing activities supports families, restaurants, local and export markets, and tourism.

The Nature Conservancy (TNC), in support of a larger effort funded by United States Agency for International Development (USAID) to develop a national marine zoning plan for St. Kitts and Nevis, collected, compiled and analyzed commercial fishery data. Over 100 Fishers (51in St. Kitts and 65 in Nevis) participated in the project.

An open source geographic Information System (GIS) using a custom-built interface known as Open OceanMap which was modified for the St. Kitts and Nevis study region allowed for staff to enter fishing grounds directly into a spatial database, and standardize this information across a number of respondents or fisheries. (FIGURE 15) shows the relative value of fishing grounds around St. Kitts & Nevis, with red being most valuable and yellow being least valuable for coastal demersal fishing.

There are seven (7) official fish landing sites around Nevis located at Charlestown, Jessups, Cotton Ground, Jones Bay, Newcastle, Long Haul Bay and Indian Castle (FIGURE 16). The use of bottom traps (Fishing Pots) is the most common method of fishing reported by Nevisians. Other techniques include hand lining, beach seining, Ballahoo netting, trolling for migratory species and SCUBA diving for lobster and conch.

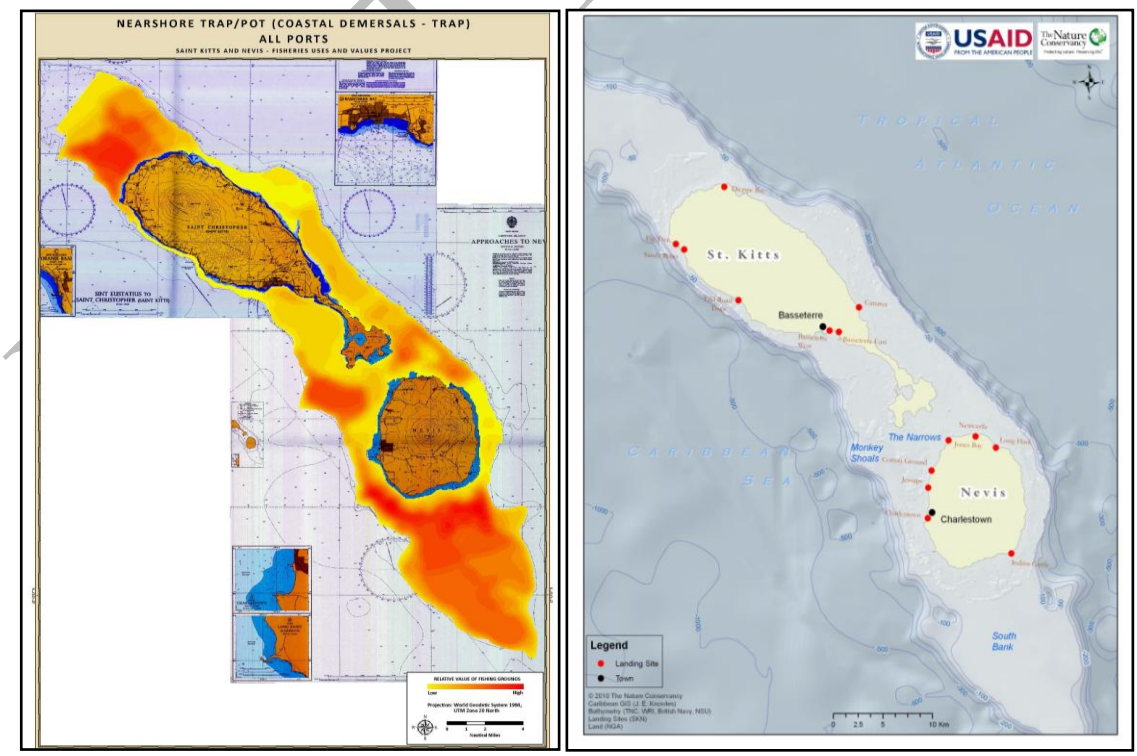


Figure 15. Coastal Demersals fishing grounds & Figure 16. Fish Landing sites around Nevis

2.3.2 Recreational users

The beaches of Nevis, north and west coasts are the preferred beaches for recreational use. (FIGURE 17). It allows residents to stay connected to long standing traditions as well as provides opportunities to build social capital and maintain community health and well-being. Picnicking, walking, jogging, snorkeling, fishing and swimming are some of the activities enjoyed by locals at the beaches, especially those along the sandy west coast of Nevis. Additionally, while some locals do, more tourists engage in Jet Ski, Kite boarding, wind surfing and horse back riding. Annual fishing tournaments and triathlons also take place along Nevis' west coast.

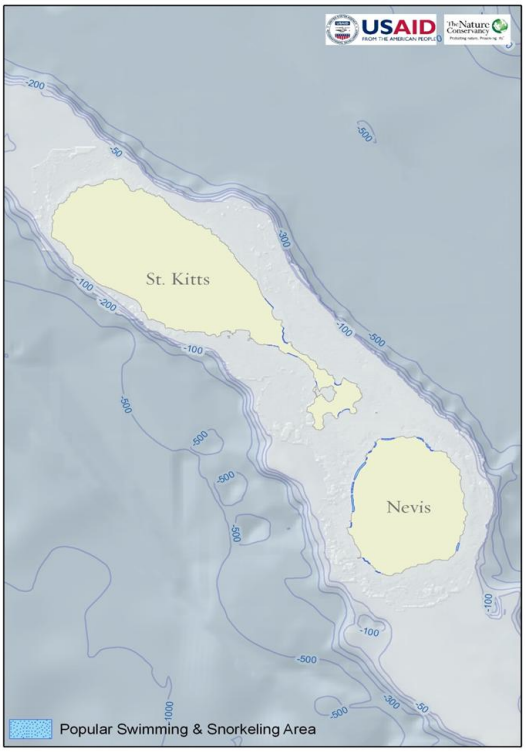


Figure 17. Nevis' popular beach recreational areas

The Nevis Air and Sea Ports Authority (NASPA) installed 100 yacht moorings along the western or Caribbean coast of Nevis from Oualie Beach to Charlestown (FIGURE 18) to provide safe anchorage for mariners visiting the island. Mooring installations took the marine environment into consideration by using environmentally friendly screw type embedment anchors thus avoiding any negative impacts to the seabed. Boats can now moor safely for long or short term usage. The moorings can accommodate vessels in three classes up to 90 feet.

- Up to 35 feet in length or 50 tons.
- 36 to 60 feet or 50 tons
- 61 to 90 feet or 80 tons

A safe area has been designated where vessels over 90 feet can drop anchor.

NASPA also installed 50 swim buoys along Pinneys Beach from the Four Seasons Resort to Pinneys Beach Hotel in order to create a safe swimming area.

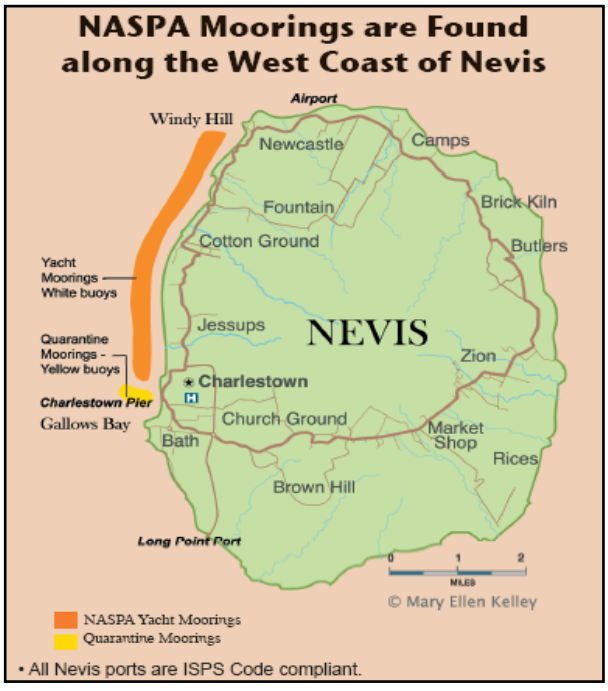


Figure 18. Location of moorings

2.3.3 Tourism

Tourism is a vital part of the Nevis economy. Visitors come to the island to take pleasure in the pristine beaches and surrounding waters and to enjoy an authentic Caribbean experience – Sun, Sand and Sea Tourism.

Pinney's Beach is the primary tourist beach in Nevis. Along Pinney's Beach there are hotels, restaurants, docking facilities, moorings, water sports, day vendors and recreational boating. Generally on weekends locals gather at Pinney's Beach for picknicking, swimming and socializing.

Together with the Four Seasons Resort, the Pinneys Beach Hotel, "The Hamilton", Nelson Spring Condominium, Cliff Dwellers, Oualie Beach Resort and Hurricane Cove Villas are located on the west coast of Nevis; Nisbett's Plantation is on the North coast and the various Inns of Nevis are located inland on former sugar plantations. Guest houses and villas are located throughout, but mostly inland.

2.3.4 Development

Ports, docks and marinas are coastal dependent facilities, critical for the social and economic development of Nevis. Heavily reliant on sun, sand and sea tourism, Nevis must ensure that it delivers an appealing and desirable tourism destination. Several of Nevis' hotels can be found along the west coast of Nevis to take advantage of the beautiful beaches and magnificent sceneries.

Figure 19. Four Seasons Resort dock at Pinney's Beach

Subsequent to the construction of the Four Season's Resort, tourist accommodation in Nevis is shifting gradually from hotels and guest houses to Hotel/Condo/Villa type developments. Along Pinneys Beach North, "The Hamilton" Condominium Development is nearing completion; along Jones Bay, The Cliff Dwellers hotel is currently expanding, with the addition of townhouses to its property. "The Kingfisher Club" is a condominium development which has recently obtained planning approval for the expansion of Oualie Beach Resort. Feasibility studies are ongoing for the upgrade and expansion of "Hurricane Cove Bungalows".

Plans are well underway to develop a marina along Cades Bay, to complement the ongoing high-end residential condominium development - The Residences at Tamarind

Cove. The marina project will displace some recreational users and fishers. However, Cades Bay is one of the few locations on Nevis with the natural embayment and coastal features for construction of a marina.

Figure 20. SeaBridge car ferry dock at Cades Bay

Development plans have been approved for the construction of a new community fisheries complex, including a jetty and revetment, at Gallows Bay. This development requires significant mitigation to minimize adverse impacts to the Bath Bogs.

Sustainable use of Nevis's limited coastal resources relies on careful planning to ensure that ecological sustainability and economic growth are not mutually exclusive.

2.3.5 Research

The waters around Nevis have been used as an open classroom for visiting students from around the world. Researchers are required to obtain approval from the Department of Fisheries in Nevis prior to the commencement of research and are also required to provide a copy of their research work upon completion to said department. Marine research around Nevis primarily occurs in the Narrows.

Coastal research has resulted in development policies requiring compliance with established development setbacks along the coast of Nevis (FIGURE 21), in an effort to protect life and property. Minimum size lobster catches, closed conch season and closed turtle harvesting are the result of research studies aiming to achieve sustainable use of critical habitats, species, nursery, feeding, and reproduction areas around Nevis.

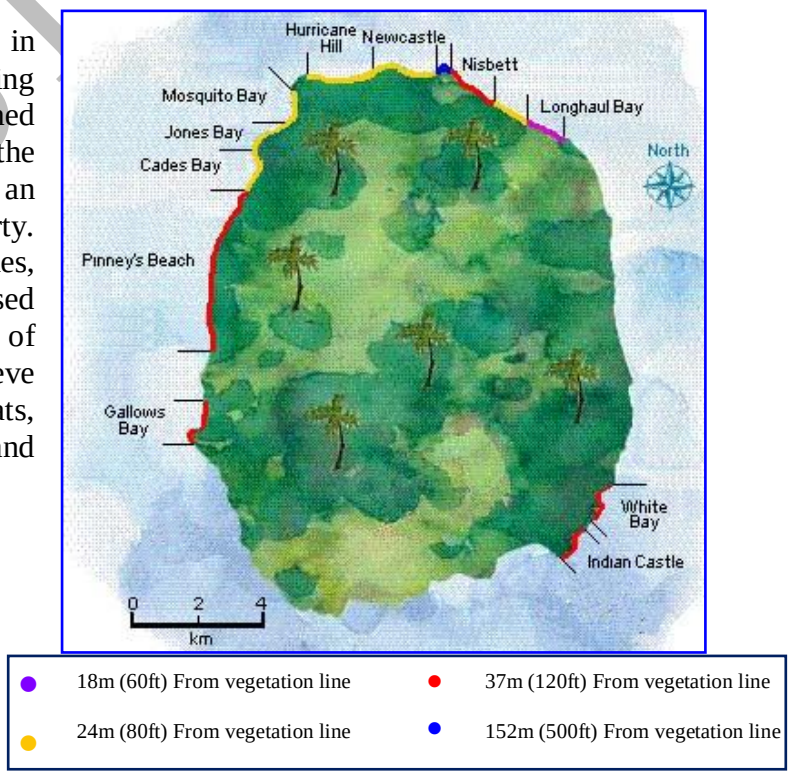


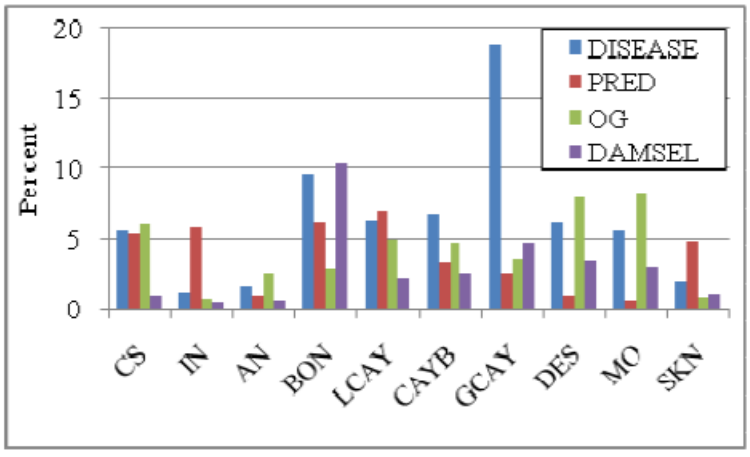
Figure 21. Nevis coastal development setbacks

In 2012, St. Kitts-Nevis, in collaboration with the Khaled bin Sultan Living Oceans Foundation and The Nature Conservancy participated in a research project as part of a multi-year Global Reef Expedition. Findings from the research will be linked to a world-wide study of the health and resilience of coral reef environments. The scientific objectives of the St. Kitts and Nevis research were three-fold: the validation of marine habitat maps by verifying the distribution and location of the shallow marine habitats; understanding the species composition of these marine habitats; and characterizing the community structure, health, and resilience of associated coral reef ecosystems.

The Expedition was "the first-ever comprehensive assessment of the coral reefs of St. Kitts and Nevis carried out at the request of the Government. The research built on work that was coordinated with local fishers to map the values of their fishing areas for various fisheries and the efforts for national multiple use marine zoning. The marine environment is vitally important to the people and economy of St. Kitts and Nevis. The work of the Living Oceans Foundation's Global Reef Expedition will contribute valuable information for its sustainable management" said Ruth Blyther of TNC.

The Living Oceans Foundation research focused on *Montastraea annularis* (species complex) which are the most important framework corals on western Atlantic reefs. The three species in this complex (M. *annularis, M. faveolata and M. franksi*) form large, long-lived corals that have been dominant for millennia. They play a critical role in reef construction and community ecology. Until recently, they were thought to be better able to survive periods of adverse conditions than most other coral species.

Conditions have changed regionally, and these species are disappearing from many reefs. Colonies are dying or are being reduced into small tissue remnants, yet their skeletons persist for decades, and are being colonized by other species. In all locations examined, reefs appear to be undergoing a progressive shift in coral assemblages to a dominance by shorter lived, smaller corals.



Prevalence of coral disease (DISEASE), snail and fish predation (PRED), overgrowth by sponges and tunicates (OG) and damselfish algal lawns (DAM) on Cay Sal (CS), Inaguas IN) and (AN) Bahamas, Bonaire (BON), Cayman Brac (CB), Grand Cayman (GC), Little Cayman (LC), Mona (MO) and Desecheo (DES) Puerto Rico, and St. Kitts and Nevis (SKN).

Disease prevalence was low in St. Kitts and Nevis in 2010, possibly because most *M. annularis* (complex) colonies died during or following the severe bleaching event in 2005 (Bruckner, A. 2011).

2.3.6 Conservation

Conservation of critical marine habitats and species contribute significantly to biodiversity, food security and the economy. Several attempts have been made to establish Marine Protected Areas in waters surrounding Nevis. While no area has been set aside for marine conservation, the Department of Fisheries and the Department of Physical Planning, Natural Resources and Environment work closely and are guided by proposed plans to help manage the identified conservation areas until they are legally established.

In an effort to restore critical mangrove habitat, the Nevis Historical and Conservation Society has coordinated efforts to help protect mangrove systems along the coast and have conducted mangrove plantings and beach cleanup activities.

The Nevis Turtle Group conducts field trips along the coast to help protect turtle nests and turtle hatchlings, especially at Sea Haven which is the most popular turtle nesting beach on Nevis. The group also tags turtles to help monitor their movements once they leave Nevis.

2.3.7 Transportation

Marine transportation is an important part of daily life in St. Kitts and Nevis. At least three passenger ferries operate between the piers at Charlestown and Basseterre, making several trips daily. Cargo vessels and a car ferry also travel between St. Kitts and Nevis, daily. From time to time ferries travel between Nevis and St. Maarten, between Nevis and Statia as well as between Nevis and Montserrat. The Four Seasons Hotel ferry travels as needed between Port Zante in St. Kitts and the Four Seasons dock at Pinney's Beach in Nevis, to transport its guests to and from St. Kitts. Water Taxis make daily trips primarily from the dock at Oualie Beach in Nevis to Reggae Beach in St. Kitts or to the dock at Port Zante in St. Kitts. (FIGURE 22) shows Nevis' primary transportation routes.

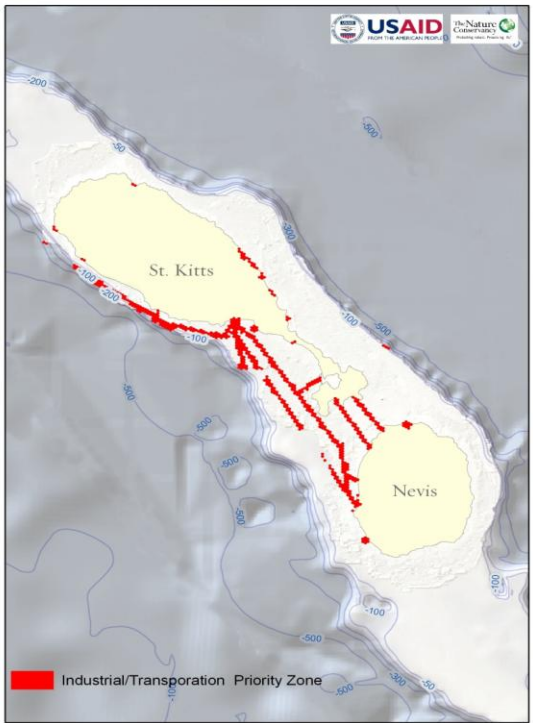


Figure 22. Nevis' primary marine transportation routes

Nevis produces only a small amount of its food needs. With minimum air travel, Nevis depends on its seaports for the weekly import of

produce from “The Dominica Boat”. The supermarkets rely on the weekly arrival of food to stock their shelves form shipping lines such as “Tropical Shipping”. Likewise, building material and most other dry good arrive to Nevis by seaport.

The seaport at Charlestown is used primarily for inter-island ferry passenger transport, cruise ships and yachts with draughts up to 3 meters. Larger vessels anchor in designated areas and use tenders to travel ashore. Approximately 300,000 passengers commute on the ferries annually.

The seaport at Longpoint is a 10-acre facility used primarily for commercial shipping and can accommodate vessels with draughts of 6.5 – 7.2 meters. Average annual cargo tonnage for Longpoint is 90,000.

2.4 Causes of marine resource depletion

Nevis’ coastal ecosystems have been increasingly under threat from natural and anthropogenic factors. The scale of these factors is at local, national, regional and global levels. Threats are primarily associated with natural hazards, illegal development activities, indiscriminate fishing practices, nonpoint source pollution as well as climate change.

2.4.1 Natural stresses on coastal resources

Natural hazards which lead to natural disasters have and will continue to have dire consequences for economic activities, infrastructure, human welfare and natural resources management on Nevis. To some extent, disasters result from the failures of development policy to mitigate vulnerability to hazard events.

A widely accepted definition characterizes natural hazards as "those elements of the physical environment, harmful to man and caused by forces extraneous to him.” More specifically, the term "natural hazard" refers to all atmospheric, hydrologic, geologic (especially seismic and volcanic), and wildfire phenomena that, because of their location, severity, and frequency, have the potential to affect humans, their structures, or their activities adversely.

Nevis' geographical location, in the hurricane belt between the Atlantic Ocean and Caribbean Sea, and its island status makes it highly vulnerable to natural disasters A natural hazard mitigation workshop (September 2000) identified six priority hazards for Nevis– wind/hurricane, coastal erosion, flooding, volcanic activity, storm surge and drought.

Hurricanes

Hurricane Omar in October of 2008 passed more than 70 miles away from Nevis. However, its impact profoundly impacted the people of Nevis. Uncharacteristically, Hurricane Omar approached Nevis from the west (FIGURE 23), which resulted in impact to the Leeward side (west coast) of the island including from Charlestown on the coast to the Island Main Road inland and north towards the airport. The wind and rain from this storm reached category two on the Saffir-Simpson scale, but it is the storm surge along the western coast of the island that caused the majority of damage.

Figure 23. Uncharacteristic path of Hurricane Omar

The Four Seasons Resort, located on Nevis' west coast, was closed as a result of damages incurred from the effects of Hurricane Omar and did not reopen until 2010. This single event staggered the island's economy and social well-being as hundreds were without work for approximately two years.

Hurricanes not only cause damage to tourism infrastructure, they have significant impacts on fisheries, as with damage to the seabed and pollutant loadings to the ocean when there is significant rain and polluted runoff. Sometimes fishers lose their boats and traps and it could take months after a hurricane before fishers can get back out fishing. Many juvenile species which usually find a haven in the coastal ponds are flushed out to sea prematurely and become vulnerable prey for the larger fish.

Volcanic Ash.

Although no historical eruptions are noted for Nevis (*Global Volcanism Program*) Nevis is routinely impacted by ash fall from the Montserrat Soufriere Hills Volcano which has erupted several times in the last decade. In 2012 Windblown volcanic ash from the Soufriere Hills Volcano on Montserrat caused the cancellation of two American Airline (AA) flights to St. Kitts and Nevis.

Fishers cited volcanic ash as a factor impacting fisheries.

The Nevis Disaster Management Department maintains a website (www.nevisdm.com) which provides live satellite imagery of weather conditions around Nevis and links to regional and international websites related to natural disasters. Videos and photos of natural hazard events affecting Nevis, along with related reports and other pertinent information can be found on the website.

Climate Change

The increase and severity of weather events (hurricanes, rainfall, drought) associated with Climate change are likely to result in sea level rise, increases in the rates of species extinctions and generally adverse effects to biodiversity, including human life.

Sea-level rise is expected to magnify the impact of storm surge and waves on coastal areas and lead to shoreline erosion and property loss. Adverse impacts of Nevis' west coast have been documented and shows the damage which occurred at Gallows Bay, Pinney's Beach, Cades Bay and Newcastle Beach. Figures 24 and 25 show damage to the fisheries dock at Gallows Bay, in 2008 and 2010.

Figure 24. Hurricane Omar impacting Fisheries Jetty (October 2008)

Figure 25. Hurricane Earl impacting Fisheries Jetty (August 2010)

The socio-economic effects of climate change could also impact on livelihoods in Nevis in the agriculture sector. Climate change will likely cause increased drought and flooding conditions and increased vulnerability of crops to vector-borne diseases, and decrease resilience of the agriculture sector. Climate change is also likely to weaken some protective ecosystems such as coral reefs and mangroves due to increased sea-surface temperatures and changes in salinity. These effects will likely adversely impact the fisheries populations.

Adaptation to climate change will place adjustment costs on all sectors, and mitigation will likely include replacement of fossil fuels with renewable energy and other energy sources. Nevis is well advanced in its effort to replace fossil fuels with geothermal energy and is currently receiving energy in its electricity grid from the Nevis Wind Farm located at Maddens Estate. Solar powered water heaters are used widely on the island and solar powered air conditioners are appearing in new development projects. Coastal development setbacks and construction design standards are being enforced to help build a more resilient Nevis.

2.4.2 Human impacts

Improper Fishing Practices

(TABLE 3) shows the factors, as perceived by fishers in 2010, to be impacting fisheries. The effect of weather / ocean dynamics relates to whether there are rough seas or if there are small craft advisories in effect, preventing a fishing trip.

Coded category	Number of responses	Percentage of responses
Climate change	5	5%
Development	6	6%
Harvesting juvenile fish	5	5%
Hurricane	9	9%
Increased competition	5	5%
Mesh size regulations	9	9%
Overfishing	9	9%
Poaching	12	12%
Runoff	2	2%
Volcano	4	4%
Water temperature	4	4%
Weather /ocean dynamics	17	17%
Other	12	12%
No Response	41	–
TOTAL[2]	140	–

Table 3. Fishers perception of impacts to fisheries
Source: Ecotrust, 2010

In a 2011 assessment report, it was noted that reef fish populations throughout St. Kitts and Nevis were dominated by juveniles and small adults. Many of the key fishery species were absent or extremely rare. The use of certain nonselective gear, such as gill nets and fish traps may be placing considerable pressure on fish populations by removing non-preferred species (e.g. butterflyfish, angelfish, doctorfish, squirrelfish, grunts, wrasses etc.) and by capturing fish at too small a size to allow them to reach reproductive maturity. Some fishers place their traps on reefs which can be damaging to the reefs. Abandoned fishing lines and fishing nets also adversely impact the reef systems.

While poaching of turtle eggs and of adult nesting females is illegal under laws already in place, it remains an issue here in Nevis due to insufficient enforcement. The turtle shell shown here was found on Longhaul Bay in October, 2013.

Figure 27. Turtle shell found at Longhaul Bay
Photo source: A. K. Ahmed, 2013

Generally, unsustainable fishing practices, which the fishers are aware of, can be managed by enforcement of existing laws.

Sand mining

Sand is important to the construction industry and beach sand is sometimes more accessible to local users. Illegal sand mining continues to be of grave concern in Nevis. It is illegal for anyone or any company to remove sand from the beaches of Nevis. However, the Department of Physical Planning, Natural Resources and Environment officials have reported sand mining at Dogwood Estate, Indian Castle, Herberts Beach and Paradise Beach.

Earlier this year, April 2013, The Nevis Island Administration (NIA) stated its intention to protect Nevis' pristine environment and warned persons involved in illegal sand mining that going forward there would be a zero tolerance approach in an effort to stamp out the illegal activity.

By September 2013, the Government Minister with oversight for sand mining stated as follows: "In the Environment section, we have seen a significant drop in the incidence of sand mining on the island of Nevis. This I would say is directly due to the Department's aggressive crackdown on sand mining. We however will remain diligent."

Nonpoint Source Pollution

Land clearing for construction activities and overgrazed lands from roaming sheep and goats increase the potential for erosion and sedimentation. Unpaved roads also contribute to erosion and sedimentation. The watersheds in Nevis are mountainous and have very short times of concentration. Because of highly erodible soils, heavy silt deposition is associated with flash floods. Continuous sediment loadings to ponds would reduce their capacity to hold runoff and eroded soil from upland eventually find its way into the beaches causing degradation of the coastal water quality. Plumes of sediment are more noticeable in the coastal waters along the west coast of Nevis after heavy rainfalls.

Many of the larger development projects require submittal of an Environmental Impact Assessment Report. Best construction practices to minimize erosion and sedimentation are usually a condition of approval but insufficient manpower, for effective enforcement of the provisions of approval and the environmental laws, is usually a limiting factor.

Illegal dumping

Generally, construction waste and white goods can be found in ghauts and wetland areas. Other debris dumped into these areas sometimes find their way into ponds and eventually into the coastal waters. Plastics especially are hazardous to turtles as they sometimes mistake it for food.

Human Resources

Human resources should be considered as a factor impacting the marine resources of Nevis. The Federation of St Kitts and Nevis is the smallest sovereign entity in the

Americas. This undoubtedly puts strong pressure on the human resources for governance. Both islands, St. Kitts and Nevis, have nearly parallel administrative structures covering all institutional aspects. The country has necessary legislation and policies in place (although many in draft form) but has inadequate human resources to implement them or even to a lesser extent control and enforce them.

2.4.3 Stress related signs

As part of a wider project funded by the Global Environment Facility (GEF) under its Small Grants Project Facility entitled "Towards the Sustainable Monitoring and Management of Coral Reefs in St. Kitts and Nevis", the Saint Christopher National Trust (SCNT) monitored several reefs around St. Kitts and Nevis. SCNT reported that "the coral reefs in Saint Kitts and Nevis are under tremendous stress and their vulnerability will be further exacerbated by climate change related phenomena and development pressures including land-based sources of marine pollution especially in the South-East Peninsula. This stress manifests itself in several ways not least being a reduction in biological diversity of the reefs, reduction in fish populations and reduction in catch. These are negatively impacting food security, sustainable livelihoods and other economic activities (including dive tourism and foreign exchange earnings) as well as environmental sustainability".

The report noted that throughout the Assignment, many instances of sponge disease affecting the Giant Barrel Sponges (*Xestospongia muta)* were observed on all the reefs studied. On the majority reefs more than 90 percent of Giant Barrel Sponges exhibited signs of bleaching. It is important to note that Giant Barrel Sponges (*X. muta*) go through cyclical bleaching and normally recover, however, much of the bleaching observed was fatal bleaching and can in most cases can be attributed to the documented "orange band syndrome" in Giant Barrel Sponges of the Caribbean.

Coral bleaching is a stress-related response that can be triggered by elevated sea surface temperatures (SST). Recent increases in the frequency of coral bleaching have led to concerns that increases in marine temperatures may threaten entire coral reef regions. We report exponential increases in the geographical extent and intensity of coral bleaching in the Caribbean with increasing SST anomalies. A rise in regional SST of 0.1°C results in 35% and 42% increases in the geographic extent and intensity of coral bleaching, respectively. Maximum bleaching extent and intensity are predicted to occur at regional SST anomalies of less than +1°C, which coincides with the most conservative projections for warming in the Caribbean by the end of the 21st century. Coral bleaching is therefore likely to become a chronic source of stress for Caribbean reefs in the near future (McWilliams et al).

Extremely high water temperatures were recorded in the waters around St. Kitts and Nevis in 2011. A pocket of warm water was sitting over the eastern Caribbean, causing reef temperatures to exceed 29° C and occasionally reach 30°C; 27-28° C is normal for this time of year. As a result of the sudden temperature spike, corals began to show signs of stress and a large proportion of the corals had begun to bleach (Bruckner, A.).

Other stress signs noted were a low abundance of herbivorous fish and black sea urchins along with dense growth of macroalgae in several areas.

2.5 Marine Management Areas proposed for Nevis

There are no legally established marine protected areas in Nevis. However, there are several proposed protected areas that are managed to minimize adverse impacts from development activities.

2.5.1 The Nevis Department of Fisheries

The proposed marine protected area (MPA) encompassing the Booby Island Shoal was the study area chosen for socio-economic monitoring (FIGURE 28).

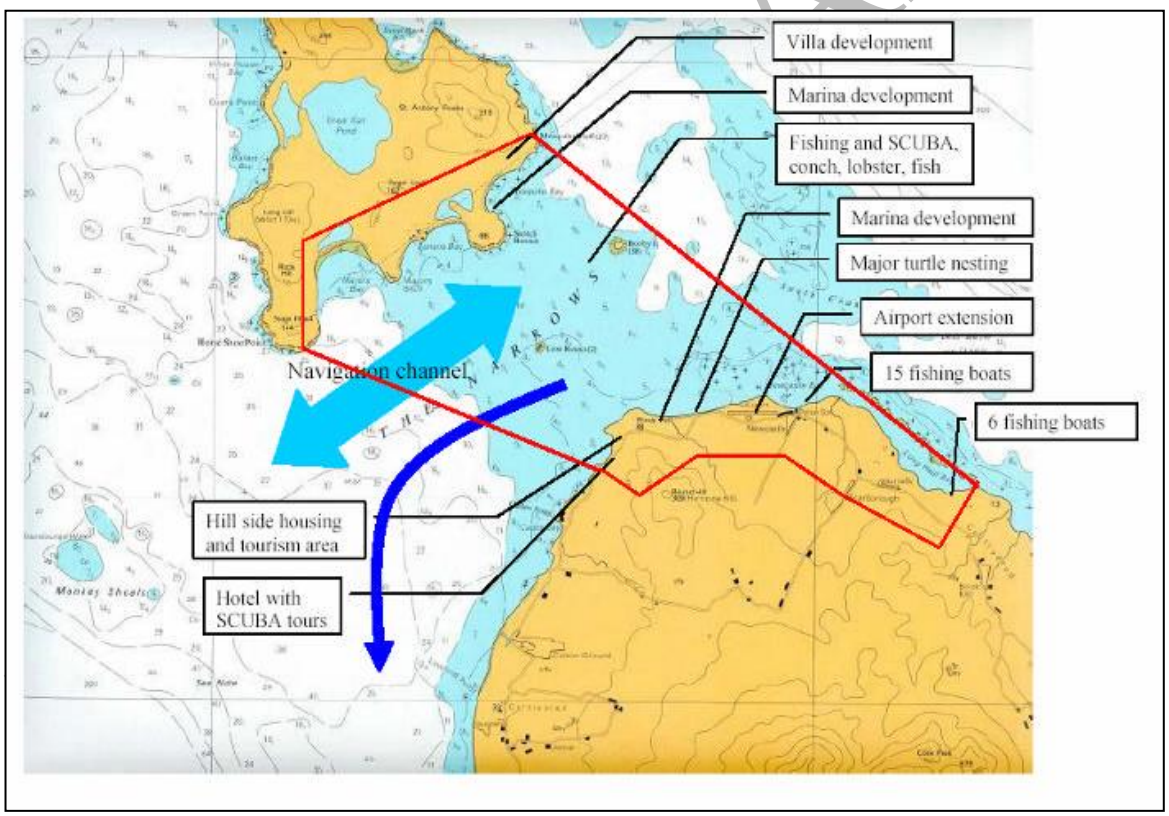


Figure 28. Proposed Narrows Marine Protected Area

The S. E. Peninsula Marine Protected Area is identified under the St. Kitts-Nevis Protected Areas Systems Plan, includes the Narrows but is exclusive of any land area in Nevis (FIGURE 29).

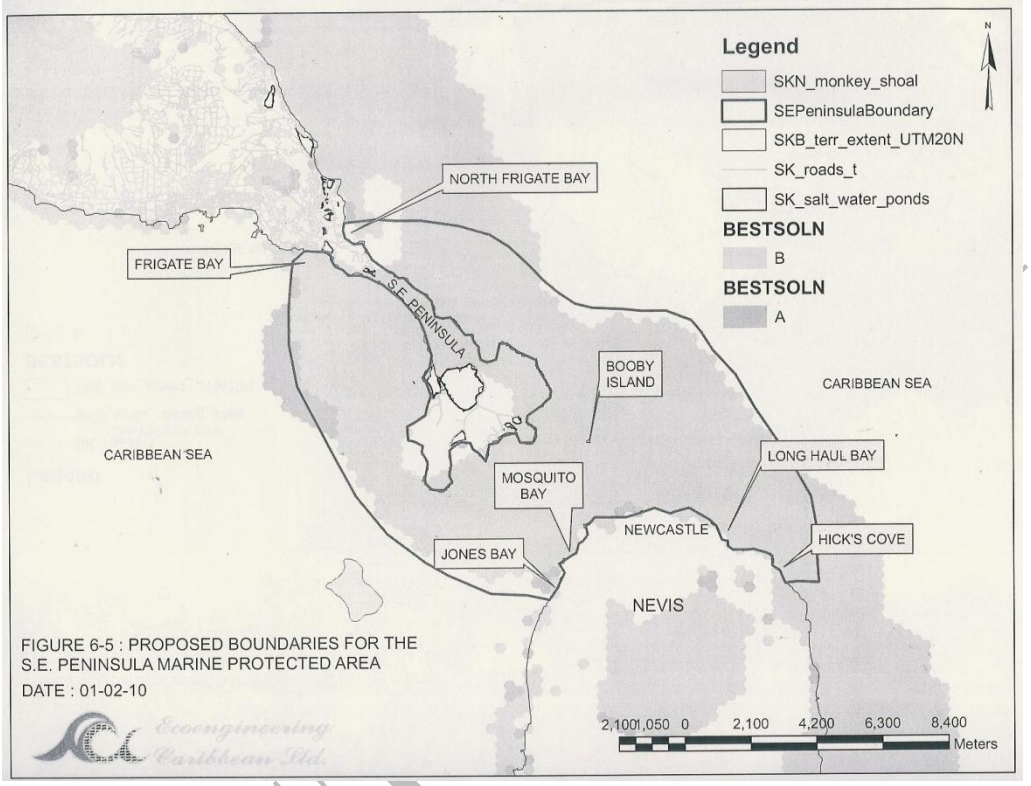


Figure 29 Proposed S. E. Peninsula Marine Protected Area

2.5.2 Nevis Physical Development Plan (Draft)

Under the Nevis Physical Development Plan (Draft) four areas have been identified where conservation and enhancement of the natural environment should take precedence over development, these are also included on the Island Zoning Plan. Within these protected areas there is a strong presumption against any form of development. The main areas that are to be designated as Protection Areas are

1). Nevis Peak Protected Area;
2). Bath Bogs Protected Area;
3). Camps River Wetland Protected Area; and
4). Indian Castle Protected Area.

In addition, Pinney's Beach and Sea Haven Beach have been identified as Coastal Conservation Areas. While within these areas development may be possible, any development must respect the natural quality of the area in its design, scale and type of use.

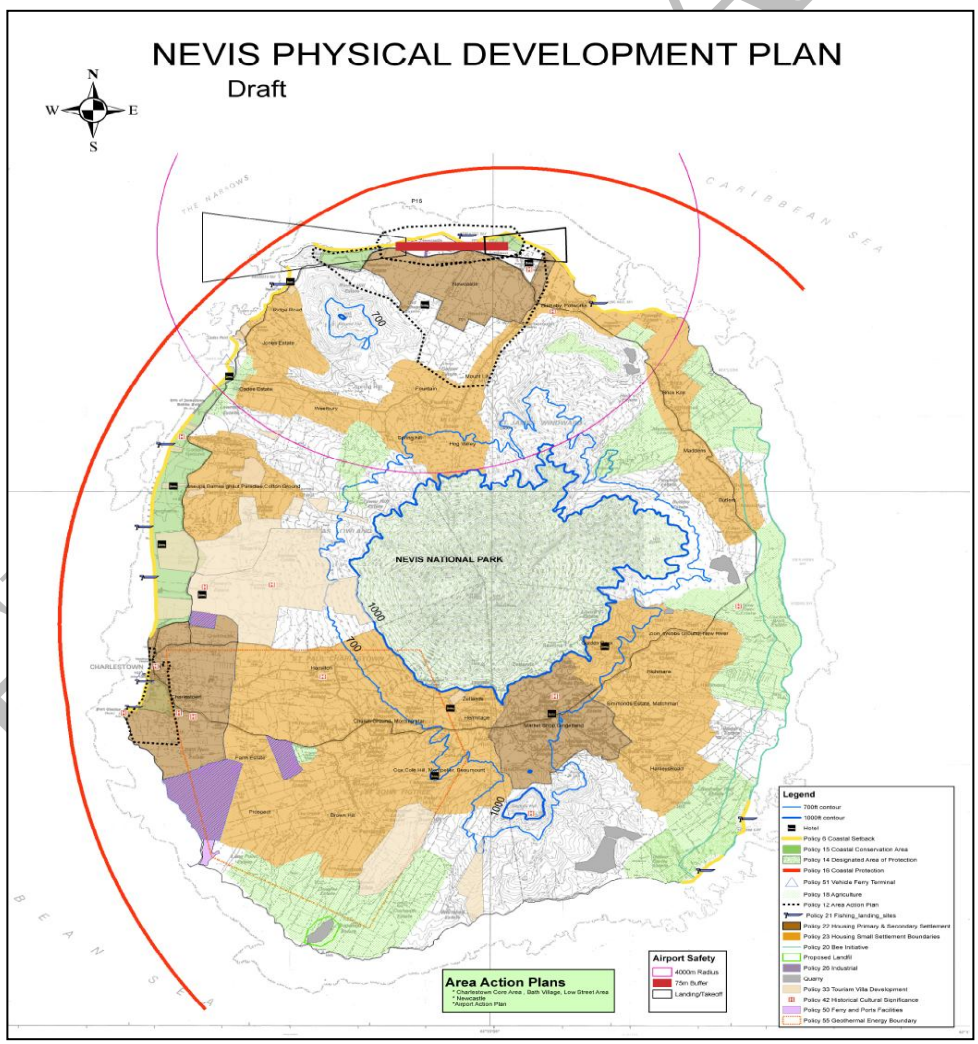


Figure 30. Proposed Nevis Physical Development Plan Map

2.5.3 Community Cohesion Foundation Marine Park Protected Area

The Community Cohesion Foundation provides a good example of how NGOs can moblize community action. Community Cohesion Foundation has been working with some members of the fishing community to establish, in partnership with the Department of Fisheries, a Marine Park Protected Area.

2.5.4 Marine Zoning Plan

The 2010 Marine Zoning Plan produced by The Nature Conservancy identifies areas that are proposed for various uses around Nevis, including conservation. The Plan has not been adopted but is used as a tool to guide development decisions on Nevis.

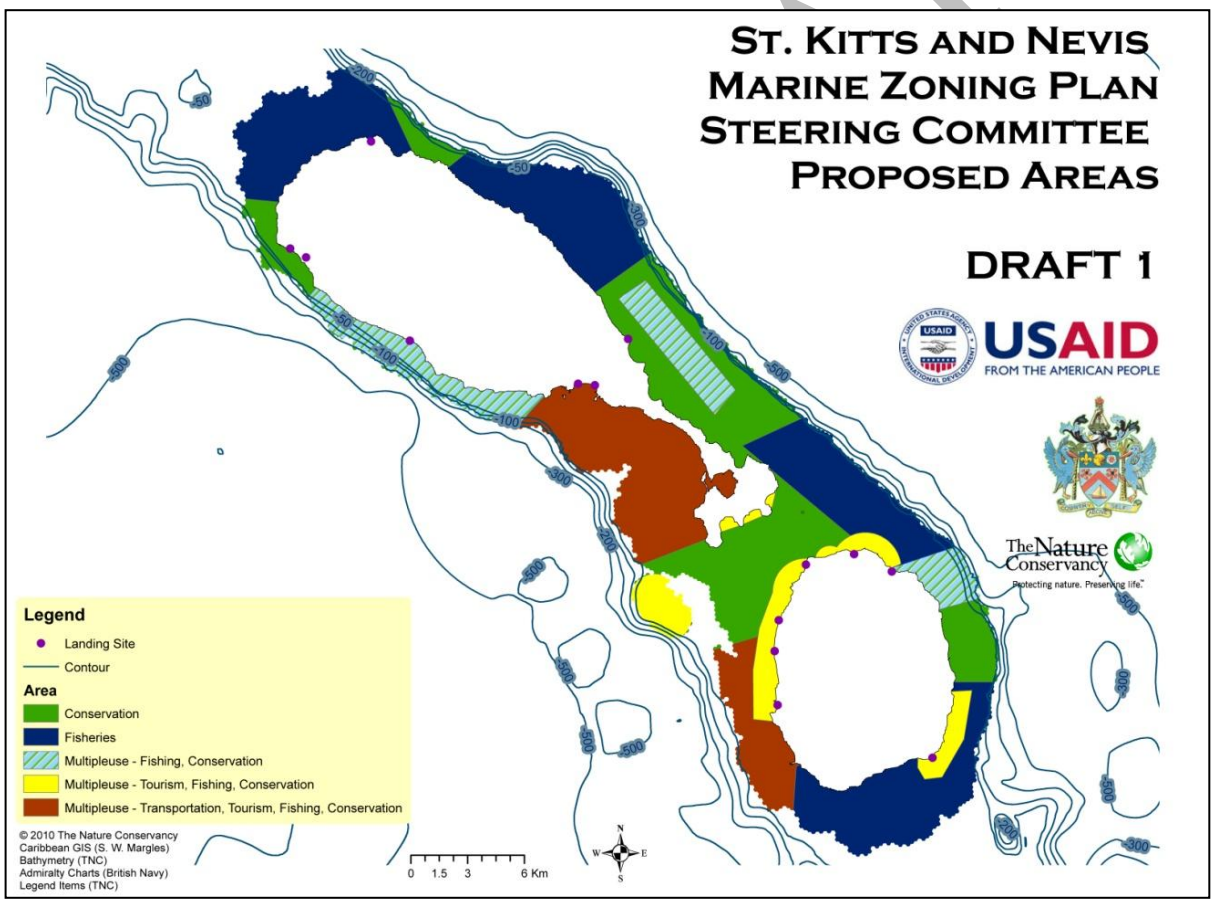


Figure 31. Proposed Marine Zoning Plan

Part 3 Valuation of Marine Ecosystems

3.1 Economic and environmental services of marine ecosystems

Neither economists nor ecologists seem to know or are able to quantify all of the benefits that result from healthy functioning wetlands; but most responsible people, in both disciplines, acknowledge that these values exist and that there may be a steep price to pay if these ecosystems are destroyed. Although not a large island, Nevis can boast a wide variety of habitats, each with its own characteristics.

Presently the country's fisheries sector, by its supply of 450 tons (~990,000 pounds) of seafood a year, only contributes a little more than 1 % to the GDP and thus it seems of little importance. The direct role in GPD however does not give a fair understanding of the importance of the sector. It has to be appreciated that in addition to livelihoods, fisheries is an important element in the "oceanic island' profile. Marine seafood is not only a traditional, quality food item for the residents, but it also fulfils the expectation of the many tourists visiting the islands; and through this image, the seafood actually contributes a higher value to the GPD.

Little appreciation has been given to the value of protecting the nursery grounds of juvenile fish from the impacts of other stakeholders. Juveniles of several marine fish species prefer to migrate into brackish water bodies to benefit from being away from the larger predatory fish; they also benefit from the nutrient rich environment found in the ponds or lagoons as most of the tropical oceanic seas are actually nutrient poor environments with little phyto- and zooplankton production.

The brackish water ponds/lagoons/ghauts are not given high enough awareness and appreciation by many stakeholders, especially developers. Damaging these coastal resources is not only about dislocating a few birds/waders, or cutting some bushes, but in fact the continuing destruction of these very limited numbers of sites eventually will have a direct limiting impact on the fisheries.

The value of a good constant flow ghaut, such as the hot water stream at Gallows Bay (Bath Bogs) could be compared to an 'artificial' marine fish hatchery and nursery, to have similar number of juveniles produced for restocking for the fishermen.

	Artificial fish hatchery and nursery	**Bath Bogs/ Hot water stream**
Construction cost	US$1-2 million	IOU to Mother Nature
Annual operation cost	US$ .5 million	IOU to Mother Nature
Annual maintenance cost	US$ .25 million	IOU to Mother Nature

Table 4. Cost comparison of an "artificial" fish hatchery and nursery compared to a natural system

The most numerous fish species found in these biotopes are mullet, snooks, pompano, jacks, gars, snappers and groupers all of them contributing to capture fisheries with price levels between XCD 8-12/pound (USD 6.50-9.75/kg). Therefore, decision makers should focus on keeping the health of these valuable natural resources healthy, with a different perception than 'only refuge for birds' (Sofreco).

3.2 Methodology to determine economic valuation

Several attempts have been made to estimate the value of coral reefs in terms of dollars. Benefits from coral reefs can be categorized into 2 types: "direct use values" (fisheries and tourism industry), and "indirect use values" (benefit derived from coastline protection). According to a United Nations estimate, the total economic value of coral reefs range from US$100,000 to 600,000 per square kilometre per year. Another report indicates that Caribbean tourism reefs are estimated to be worth US$1 million per square kilometer, based on the cost of maintaining sandy beaches and the value of attracting snorkelers and scuba divers.

Economic valuation literature on ecosystem services (namely flood control, water supply and nutrient recycling) provided by wetlands in agricultural landscapes was produced mainly for wetlands in the US and Europe but also a substantial number in developing countries. Values are standardized to USD per hectare per year (1hectare = 2.47acres). The mean values are found to be 6,923, USD/ha/yr for flood control, 3,389 USD/ha/yr for water supply and 5,788 USD/ha/yr for nutrient recycling. The values of these services are highly variable across individual wetland sites due to, amongst other factors, differences in wetland type, size, the scarcity or abundance of other wetlands in the surrounding landscape, and the socio-economic characteristics of the beneficiaries of these services.
From a different study, the annual economic values of mangroves, estimated by the cost of the products and services they provide, have been estimated to be between US$200,000 - 900,000 per ha. The range of reported costs for mangrove restoration is US$225 - 216,000 per ha.

	Artificial Wetland /ha/yr	**Bath Bogs / Wetland (~8ha)**
Flood control	US$55,000.00	IOU to Mother Nature
Water supply	US$27,000.00	IOU to Mother Nature
Nutrient recycling	US$46,000.00	IOU to Mother Nature

Table 5. Cost comparison of an "artificial wetland compared to a natural wetland

A 1998 study estimated the area of Nevis' sandy beaches to be approximately 195,000m (approximately 20 hectares) (Table 6). The total area of Mangroves was not established (Table 7) (Hanley).

Beach Name	Dwellings	Beach Length (m) 1998	Estimated Sandy Area (ha)	Erosion Hazard Ranking
NW Coast				
Pinneys Beach*	Yes	4,506	8.6	Very high at the extremities, Very low to high in between.
Cades Bay*	Yes	118	0.1	Moderate
Jones Bay*	Yes	473	0.5	Not monitored
Mosquito Bay (Oualie Beach)*	Yes	539	0.9	Low
Total			**10.1**	
North Coast				
Sea Haven Beach (Hurricane Cove) (Lover's Lane Beach)	No	1,920	3.2	High
Newcastle Bay	No	914	0.9	High
Nisbett's Beach to Herbert's Beach*	Yes	654	0.8	High
Long Haul Bay	No	1,912	1.4	Low
Total			**6.3**	
SE Coast				
Bachelor Hall Bay	No	214	0.3	
White Bay	No	734	2.1	High
Indian Castle	No	349	0.6	High
Total			**3.0**	
SW Coast				
Budgeon Bay	No	173	0.2	
Frost Bay	No	145	0.1	
Fort Charles Bay*	Yes	42	0.01	
Gallows Bay	No	493	0.7	Very High
Low Street Bay*	Yes	47	0.03	
Total			**1.0**	
Total Beaches			**20.4**	
Total Beaches near Dwellings*			**10.9**	

Table 6. Nevis Beaches Data

Mangrove Systems	Estimated Area (ha)
Bath bogs/ Bath stream	8
Parris Pond	n.a.
Pinneys Pond	n.a.
Jessups Bogs/Bowrin Pond	n.a.
Fort Ashbey Lagoon	0.2
Mariners Pub Lagoon/ Lawrence Pond	0.3
Cades Bay	0.6
Jones Bay	0.3
Oualie Beach	0.1
Newcastle	n.a.
Nisbet's	n.a.
Long Haul Bay	0.2
Indian Castle/ White Bay	n.a.

Table 7. Nevis Mangrove Systems Data

The 2010 Marine Zoning project of St. Kitts and Nevis determined the area of benthic habitat classes as follows:

Benthic Class	Hectares
Sand	16,351
Dense seagrass	3.098
Flat gorgonian hardgrounds	2,854
Dense macroalgae on hardground	2,774
Semi-consolidated rubble	2,595
Unconsolidated sand with algae	1,929
Hardcoral framework	1,578
Acropora palmata stumps	574
Sparse seagrass	370
Rugose gorgonian slope	258
Lagoonal mud	165
Algal reef flat	61

Table 8. Areas of benthic habitat classes

3.3 Economic Valuation Results

Utilizing the established average *Ecosystem Service Values* provided in the table below (Huber, 2013), the value of coastal resources in St. Kitts and Nevis is estimated at US$ 379,847,119.00 million per year.

Ecosystem Type	Average U$/ha/year	Total hectares	Ecosystem Service Value (U$)
Beach (NEV)	88,000.00	9.5	836,000.00
Beach near dwellings (NEV)	117,000.00	10.9	1,275,300.00
Wetlands (including saltponds and mangroves) (SKN)	550,000.00	?203.8	112,090,000.00
Nearshore aquatic habitat (dense sea grass beds) (SKN)	16,283.00	3,098	50,444,734.00
Coral Reefs (SKN)	100,000.00	2,152	215,200,000.00
Fresh water stream	1,085.00	1	1,085.00
Total Ecosystem Service Value			**379,847,119.00**

Table 9. Ecosystem Service Values for Coastal Resources in St. Kitts and Nevis.

3.4. Conclusion

The Coastal Zone of Nevis plays a vital role in the life of every Nevisian. Port activities, ferry operations, breeding grounds for endangered marine species as well as commercially important species, recreational fishing, swimming, snorkeling, sailing, diving, turtle watching and all the intangible benefits associated with the coastal zone, help to make Nevis a unique place to be enjoyed by citizens and tourists.

In order to meet current and future demands on the marine environment, The Nature Conservancy (TNC) assisted St. Kitts-Nevis with the development of a national marine zoning plan. The goal of the marine zoning plan is to minimize conflict between user groups and optimally accommodate existing/future human uses while maintaining healthy marine habitats and ecosystems.

This report provides a better understanding of the value of Nevis' coastal resources, based on the varied ecological, social and economic services which they provide. Nevis' coastal resources are critical to the health of our present and future economies, to our food security and to our lives.

The people of Nevis recognize that the island's resources must be managed, as evidenced by the development of various policies, plans and strategies commissioned. However, it is the effective implementation of these plans - Marine Zoning Plan and the Nevis Physical Development Plan especially, that would make a difference and would go a long way in helping Nevis to truly be "Oualie".

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