



St. Vincent & the Grenadines

Coral Reef Report Card 2016



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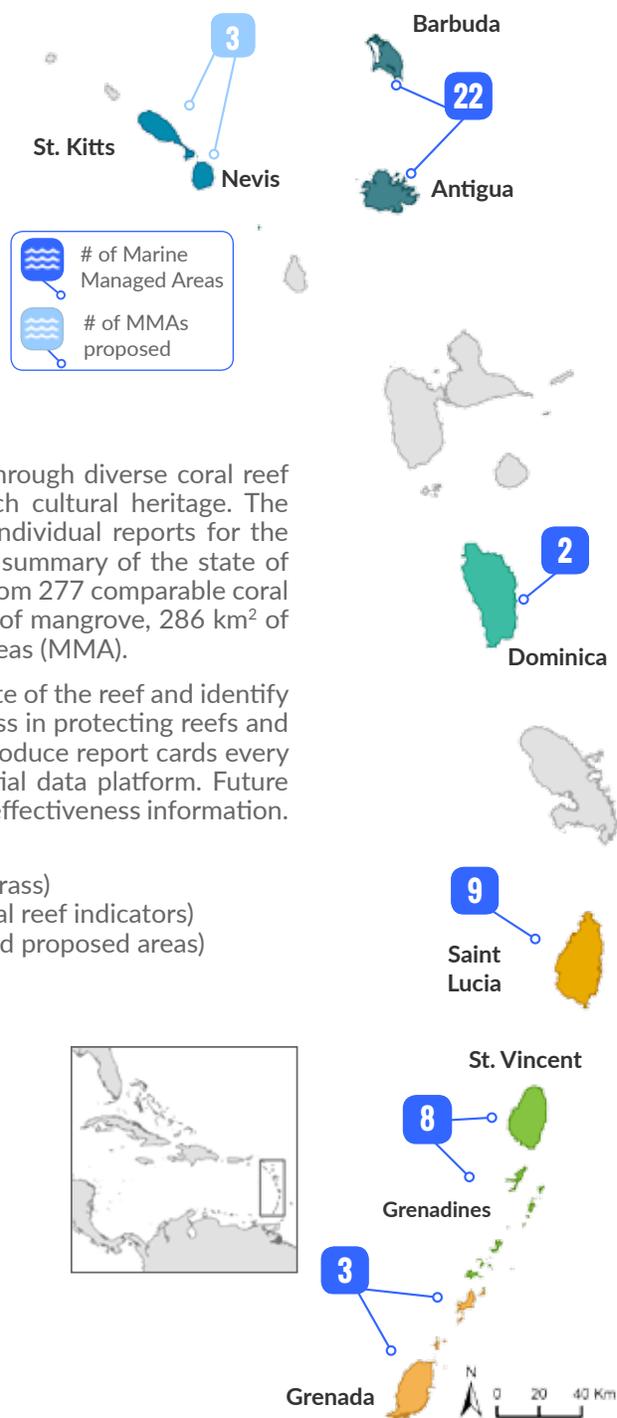
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Eastern Caribbean Coral Reef Report Cards

 **6** PARTICIPATING COUNTRIES
224,813 SQUARE KM OF OCEAN

 **44** AREAS DESIGNATED SINCE 1973
526 SQUARE KM OF OCEAN

 **50** AREAS PROPOSED
990 SQUARE KM OF OCEAN



The 2016 Coral Reef Report Cards

The Eastern Caribbean Seascape is an arc of islands linked through diverse coral reef ecosystems, oceanic currents, migratory pathways and a rich cultural heritage. The Eastern Caribbean Coral Reef Report Cards are a series of individual reports for the 6 participating countries and provide an easy-to-understand summary of the state of the region's marine resources. The Report Cards collate data from 277 comparable coral reef surveys and map in detail 383 km² of coral reefs, 19 km² of mangrove, 286 km² of seagrass, 44 designated and 50 proposed Marine Managed Areas (MMA).

The Report Cards provide an initial baseline on the current state of the reef and identify gaps. Reporting this type of information will help track progress in protecting reefs and inform future monitoring and management. The vision is to produce report cards every 2 years and share data through the CaribNode regional spatial data platform. Future report cards will include key socioeconomic and management effectiveness information.

Each Report Card includes information on:

- Key Habitats (location and extent of coral, mangrove, seagrass)
- Reef Health Index (a measure of the health of four key coral reef indicators)
- Marine Managed Areas (size and location of designated and proposed areas)

The Framework

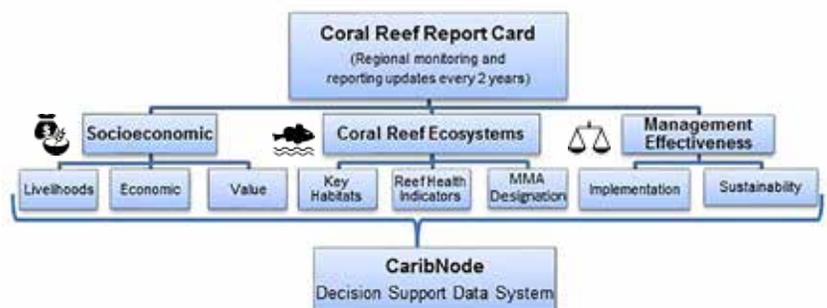
To protect the region's marine biodiversity, it is essential to understand key issues and share critical data. The Climate-Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) project developed the following framework to advance national and regional data collection and strengthen marine managed areas in the region.

1) **ECMMAN Monitoring Network:** The Network collects, analyzes and shares data through standardized methods. Three main themes include ecological, socio-economic, and marine management effectiveness. Indicator data (diagram right) are shared through the CaribNode.

2) **CaribNode:** This online information system combines regional and national data to create resource management tools. The Coral Reef Assessment Tool provides standardized indicators to monitor the marine environment, evaluate management, and track the wellbeing of coastal communities (www.caribnode.org)

3) **Coral Reef Report Cards:** Includes the Reef Health Index, an assessment tool to measure coral reef health. The Report Card integrates monitoring data and engages stakeholders to help protect marine ecosystems.

ECMMAN countries and number of MMAs with designated borders



Kramer PR, Roth LM, Constantine S, Knowles J, Cross L, Steneck R, Newman SP, Williams SM, Phillips M. 2016. St. Vincent and the Grenadines' Coral Reef Report Card 2016. The Nature Conservancy. (www.CaribNode.org).



St. Vincent and the Grenadines

St. Vincent and the Grenadines (SVG), in the southern Eastern Caribbean (EC), has 32 islands covering 390 km² of land with 406 km of coastline. It has the second largest shelf area (2,074 km²) and Exclusive Economic Zone (36,396 km²) of the 6 ECMMAN countries. St. Vincent, the mainland and largest island, has a steep mountainous landscape. Other inhabited islands include Young Island, Bequia, Mustique, Canouan, Mayreau, Union Island, Palm Island and Petit St. Vincent. SVG has an expansive mosaic of coral reefs, seagrasses and mangroves. Local communities have a long cultural heritage linked to their coastal waters. Like many EC islands, nearshore waters are affected by coastal development, sediments, pollution, unsustainable fishing, storms and coral bleaching. St. Vincent and the Grenadines is protecting marine resources through marine managed areas, sustainable fishing practices, and community partnerships.

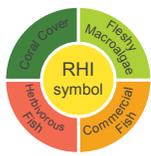


St. Vincent & the Grenadines Timeline

Protection for reefs (above line)
Key events impacting coral (below)

- | | | | |
|---|--|---|--|
| <ul style="list-style-type: none"> • Beach Protection Act - 1981 • Fisheries Act - 1986 • Fisheries Regulations - 1987 • Wildlife Protection Act - 1987 • Fisheries MCS • Mustique Co. Act - 1989 | <ul style="list-style-type: none"> • Marine Parks Act - 1991 • Calliaqua Fisheries complex - 1992 • Central Water & Sewerage Authority Act - 1992 • Forest Resource Conservation Act 1992 • Tobago Cays MP Act - 1997 | <ul style="list-style-type: none"> • National Parks Act - 2002 • SusGren Project - 2002 • Reef Check survey - 2005 • TNC/AGRRA training/survey South Coast - 2008 • Caribbean Challenge - 2008 | <ul style="list-style-type: none"> • National Parks Amendment Act - 2010 • MPA Network established - 2011 • Sandwatch Survey - 2013 • CATS project - 2013 • ECMMAN project - 2013 • H₂O Quality Task Force - 2014 • Reef/fisheries surveys 2011/13/14 • Lionfish Derby - 2014 • Proposed South Coast MP Plan 2015 • Derelict boats removed - 2015 |
| <p>1970 - 1980</p> <ul style="list-style-type: none"> • La Soufriere Eruption - 1979 • Hurricane Allen ('80) Andrea ('86) • Diadema urchin die-off - 1980s • Coral die-off due to disease | <p>1990</p> <ul style="list-style-type: none"> • Fish kill - 1999 | <p>2000</p> <ul style="list-style-type: none"> • Hurricane Ivan - 2004 • Mass coral bleaching - 2005 | <p>2010</p> <ul style="list-style-type: none"> • Coral bleaching - 2010 • Lionfish Invasion • Storms 2010/2011/2013 • Droughts 2010/2014 |

Tracking Coral Reef Health



The Reef Health Index (RHI) integrates four indicators to measure coral reef health (coral cover, fleshy macroalgae, herbivorous fish and commercial fish). The RHI “pie” symbol on the map is displayed at the site, subregional and national levels.* (For more information visit www.caribnode.org)



St. Vincent and the Grenadines (SVG)

The Reef Health Index for SVG includes comparable data from different surveys: 1 survey in 2005 by The Nature Conservancy (TNC), 8 surveys in 2008 by TNC; 15 in 2011 by Steve Newman and Stacey Williams of FORCE¹, 15 in 2014 by Robert Steneck of University of Maine and 3 in 2014 by Grenadines Network of Marine Protected Areas (GNMPA) (1 long term monitoring site (LTM) in South Coast Marine Conservation Area (MCA), 1 in Mustique MCA, 1 in Tobago Cays MP). SVG is divided into subregions based on similar biogeographic features to facilitate data reporting. Data were not available for 8 subregions. Subregions for the 6 ECOMM countries are numbered 1 to 41 from Grenada north to St. Kitts and Nevis.

Subregion	Subregion Description	# Sites	Score
8 - 9 10 - 11 12	W. Union: narrow fore reef, complex structure, good coral cover, abundant fish. North: abundant finger coral, octocorals. Limited data. East: shallow, windward-sheltered fringing reefs, low coral. Palm Island: hardground with octocorals, sponges, small head corals. Tobago cays: Largest coral reef-seagrass extent in SVG. Many reef types. Horseshoe Reef: unique narrow, semicircular-shaped reef, deep (8-15 m), mostly star coral (<i>Orbicella</i>), numerous fish. Patch reefs: shallow relict elkhorn with crustose coralline algae (CCA), some live elkhorn. Hardbottom: shallow, mixed coral, octocoral and seagrass. Mayreau East: high structure, many corals, octocorals, fish, high current. Data gap: around Mayreau, outside of park boundaries. W. Canouan: fringing fore reef, good coral cover, limited data. Shallow reefs no data. Upland construction impacts. E. Canouan: low relief, moderate coral cover, high CCA, limited data.	15	
13 - 14 15 - 16 17	W. Mustique: shallow nearshore boulders covered with small corals, some elkhorn, abundant <i>Diadema</i> . Pillories - sloping fore reef mixed algae, corals octocorals, some elkhorn and staghorn coral. Lagoon - complex fore reef. Plantain - low relief reef, small corals. Petit Mustique - low relief fore reef, abundant sponge, octocorals. Data gaps: 13, 14, 17, Mustique east.	7	
18 - 19 20 - 21 22 - 23	Bequia West: narrow fringing reef, steep slope, numerous octocorals, corals and fish. East: fringing reefs to north, data gaps east & Isle A Quatre. Baliceaux West: hardbottom with octocorals, sponges, some small corals. Data gaps: subregions 19, 20, 21, 23.	7	
24 - 25	Subregion 24: West coast: leeward, narrow shelf, steep slope. Shallow: nearshore boulders from land covered with small corals, some elkhorn, high <i>Diadema</i> . Slope: fringing reef, high coral cover, complex structure, high diversity of corals, sponges, octocorals and fish in 10-30 m. S. coast: Variety of reefs found in 3-10 m along Indian, Villa, Calliaqua, Canash Bays & Young Island, some high coral cover; Blue Lagoon -large living elkhorn reef. High sedimentation in some areas. E. coast: data gap, patch reefs in NE Owia/Sandy Bay; east coast	13	

Indicator	Description of St. Vincent and the Grenadines' Reef Health	Threatened	Healthy
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	<p>Corals build the reef's 3D structure, provide habitat, and protect coastlines</p> <ul style="list-style-type: none"> • Coral cover high (range 3-55%), but lower than historic • Complex reef structure had high coral cover (>30%); W. coast > E. coast • Several new healthy elkhorn corals found; largest stand at Blue Lagoon • Corals at risk from high sedimentation, storms & bleaching events 		
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	<p>Fleshy macroalgae, when too abundant, outcompete corals</p> <ul style="list-style-type: none"> • Most reefs (25 of 42 sites) had more live coral than algae (range 3-60%) • East coast reefs and South Coast mainland reefs had more macroalgae • Less macroalgae on reefs with abundant <i>Diadema</i> (shallow boulder reefs) • Lack of crustose coralline algae on many reefs; less open space for corals 		
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	<p>Herbivorous fish clean algae off reefs</p> <ul style="list-style-type: none"> • Biomass was fair (331-6219 g/100 m²); Tobago Cays, W. coast highest • Parrotfish common on all reefs; most small in size (0-5 cm size class) • Few large parrotfish; less grazing allows algae to overgrow corals • Many juveniles suggests populations could increase if protected 		
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	<p>Groupers & snappers are key predators that keep food chain in balance</p> <ul style="list-style-type: none"> • Commercial fish biomass was low (range 15-1300 g/100m²) • Few groupers & snappers; most small in size (most 6-10 cm size class) • Reefs with more complex structure had more fish (West coast reefs) • More fish & larger-sized fish in no-take protected area (Tobago Cays) 		
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	<p>Diadema urchins clean algae off reefs and open space for coral recruits</p> <ul style="list-style-type: none"> • West coast of St. Vincent and shallow boulder reefs had more <i>Diadema</i> • Reefs with more urchins had less macroalgae • <i>Diadema</i> urchins are important since few large herbivorous fish • Reducing sediments and nutrients will improve sea urchin habitat 		
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	<p>Coral recruits are "baby" corals. Recruits prefer algal free areas</p> <ul style="list-style-type: none"> • Recruits abundant, varied by reef type, most were smaller-sized species • Several elkhorn coral recruits seen suggests hope for recovery • High silt covering many reefs prevented coral growth or settlement • Reducing sediments and increasing herbivory will improve substrate 		
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Protecting Key Habitats

Key Habitats of St. Vincent and the Grenadines

Three main habitats - coral reefs, mangroves and seagrass beds - support productive fisheries, stabilize coastlines and host tourism and recreational activities.

- The Nature Conservancy conducted benthic habitat surveys (caribnode.org).
- Contiguous areas with corals, mangroves and seagrasses are important nursery areas and corridors for resident and transient species.
- Habitats are threatened by direct removal and damage, coastal development, sedimentation, poor water quality, unsustainable fishing and global climate change.
- St. Vincent and the Grenadines' government has proactive programs for marine management, fisheries regulations, youth education and community outreach.
- Tobago Keys Marine Park protects the largest area (52 km²) of corals and seagrass.



St. Vincent & the Grenadines Habitat Types	Threatened	Healthy
<p>Coral reefs: Largest extent of coral reefs of the 6 EC countries. Types vary with wave exposure and water depth. West side of islands: leeward, narrow shelf; shallow patch reefs or rock boulders encrusted with small corals; deeper reefs with steeper slope, greater coral cover; higher coral, gorgonian, sponge, and fish abundance. East coast: windward, higher wave energy, wider shelf, hardground or reef flats, low coral cover and diversity. Some areas recovering elkhorn. Tobago Cays: many reef types - fringing, patch, reef crest, hardbottom. South Coast: large shallow elkhorn reef, deeper spurs with abundant finger and pencil corals.</p>		
<p>Mangroves: Red, black & white mangroves and buttonwood, mostly fringing. Largest mangrove area: Ashton Harbor, Union Island (red & black); smaller areas in Clifton Bay, Richmond Bay, Palm Island. St. Vincent mainland: limited, few left, small area near Blue Lagoon (white). Isle A Quatre: east side. Mustique: Lagoon Bay (black) and North end near airport (scrub black, buttonwood). Canouan: Charleston and Carenage Bays. Tobago Cays: small area Petit Rameau & Petit Bateau. Mangroves have been cleared in several areas in SVG for marinas and coastal development. Intact mangroves provide higher quality habitat, protect shorelines, and improve water quality.</p>		
<p>Seagrass: St Vincent: Waillibou to South Coast. Largest - Chateaubelair, Cumberland, Kingstown & Calliaqua Bays and South Coast. Bequia: west coast & Admiralty Bay; Spring & Friendship Bays to east. Mustique: Endeavour, L'Ansecoy & Rutland Bays. SW Petit Mustique. Canouan: Charleston, Maho, Carneage, & Friendship Bays. Tobago Cays: Largest seagrass bed. Union: entire island, Ashton Harbor, Chatham Bay. Seagrass beds provide key fish, conch, & lobster nursery areas; sea turtle foraging areas. Impacted by sediments, pollution, direct damage. Invasive seagrass present. Healthy seagrass beds stabilize sediments & improve water clarity.</p>		

Climate Change Impacts

Local and regional resource managers need to incorporate planning for climate change in their efforts to protect coral reefs.

- Rising ocean temperatures increase coral bleaching, disease and mortality
- Oceans will become more acidic as more atmospheric carbon dioxide is dissolved reducing calcification in corals and other calcifying animals
- The intensity and frequency of hurricanes will increase as oceans continue to warm and will damage corals, coastlines and infrastructure
- Rising sea levels will flood coastal areas and may reduce light in seagrass beds and coral reefs



Reef Health Index and Marine Managed Areas



St. Vincent and the Grenadines' Reef Health Index

The National Reef Health Index (RHI) was 2.8 (out of 5) or 'fair'. Coral cover was good (score=4), suggesting these reefs could support larger fish populations. Herbivorous fish were common (score=3), but moderate to small in size. Fleshy macroalgae (score=2) were abundant in areas without herbivory and could be reduced if herbivorous fish, especially parrotfish, were protected. Commercial fish biomass was low (score=2).

Key findings:

- St. Vincent & the Grenadines has many coral reef types, each provides important habitat
- Many reefs have good coral cover with healthy corals
- More fish and larger fish found in no-take areas and reefs with complex structure
- Protecting herbivorous fish will improve habitat for corals
- Reducing sedimentation and promoting sustainable fish harvesting will help reefs recover
- Marine managed areas are helping to raise awareness and reduce threats
- Longer established MMA had high fish abundance

St. Vincent & the Grenadines' Reef Health Index

Indicator	Year	Score	Average	Trend	Caribbean**
Coral Cover	2015	Good	21	n/a	14
Fleshy Macroalgae	2015	Poor	16	n/a	30
Herbivorous Fish	2015	Fair	2204	n/a	3928
Commercial Fish	2015	Poor	563	n/a	2823

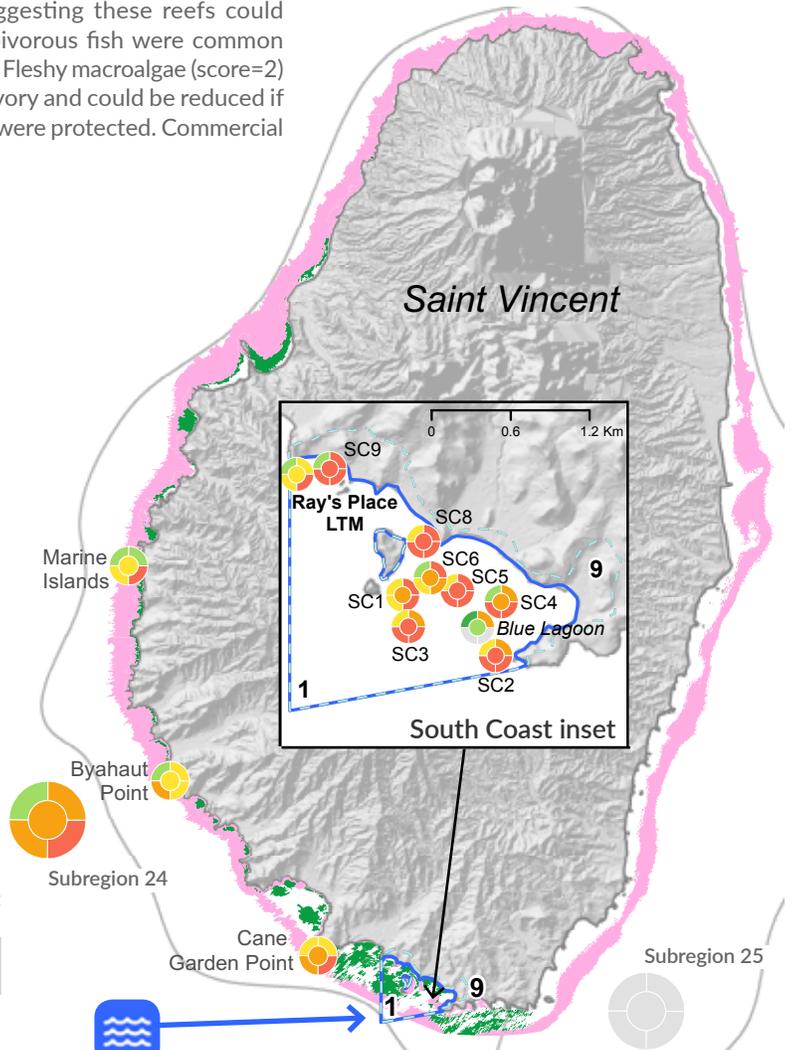
Subregion Data	West	East	Tobago Cays	S. Coast SVG
Subregion (# Survey Sites)	8,16,18,22,24 (n=25)	9,12,15,23 (n=9)	10 (n=5)	24 (n=10)
Coral Cover	23	15	24	23
Fleshy Macroalgae	14	30	14	27
Herbivorous Fish	2266	1546	2665	744
Commercial Fish	609	509	537	191

Marine Managed Areas

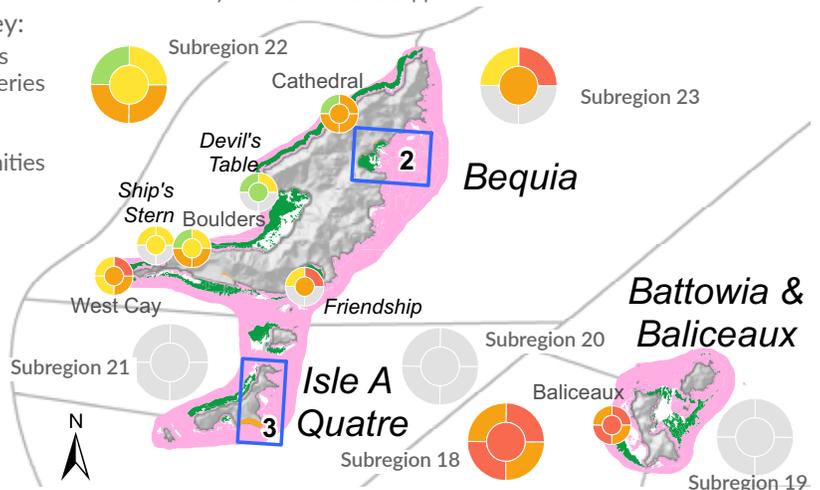
St. Vincent & Grenadines MMA's are important as they:

- Protect marine biodiversity by conserving critical habitats
- Provide refugia and replenishment zones for exploited fisheries
- Reduce negative impacts associated with human use
- Foster a higher level of sustainable use
- Increase community involvement and educational opportunities

Site names:
 Regular = TNC 2008
 Grey = FORCE 2011
 Bold = GNMMA 2014
Italics = Steneck 2014
 CAPS = TNC 2005

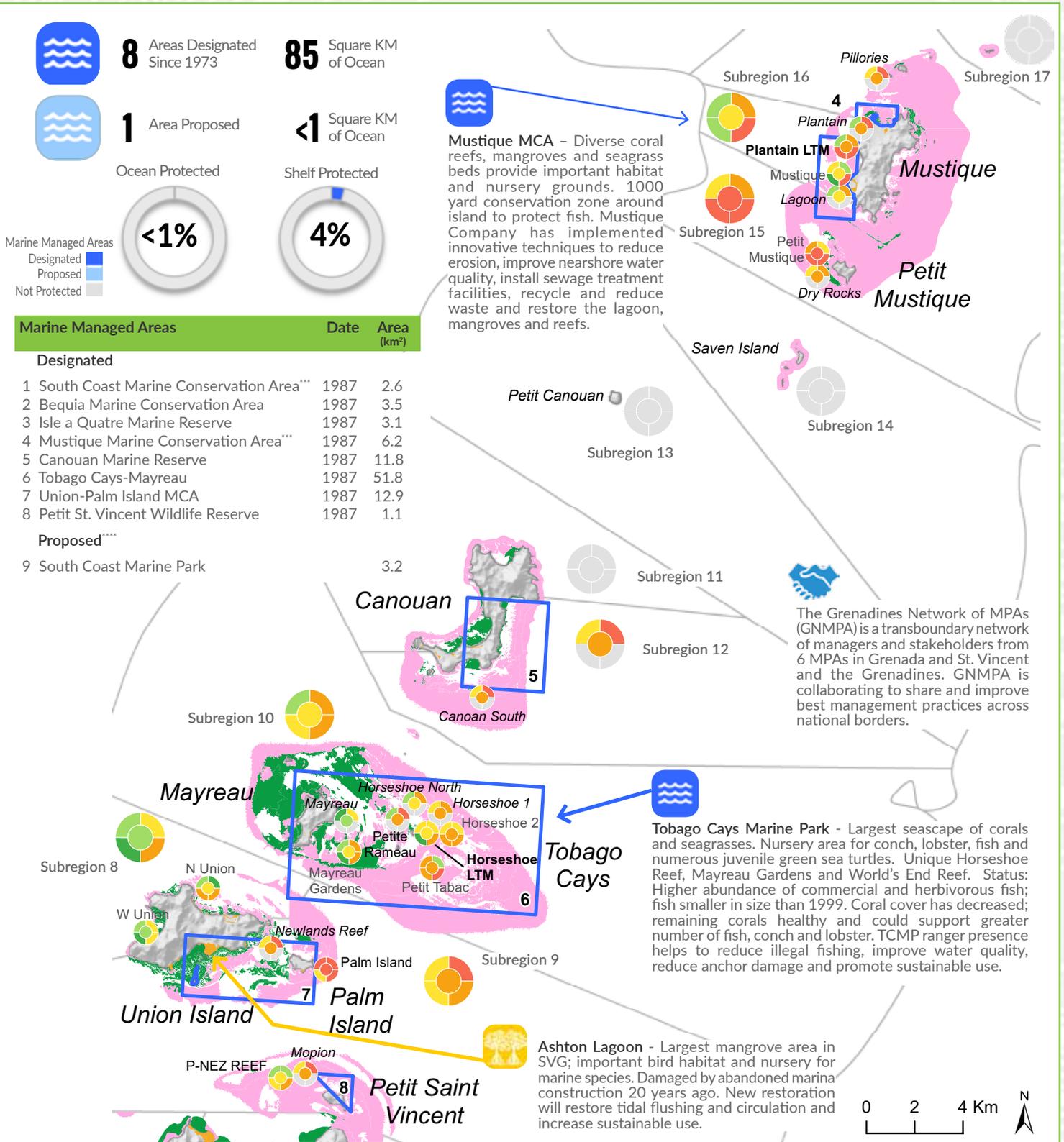


South Coast Marine Conservation Area (MCA) - Variety of reefs, many with high coral cover (25-60%); adjacent seagrass meadows, nursery grounds; Blue Lagoon has largest elkhorn stand. Status: Coral cover has declined since 2008; high sedimentation a concern. Herbivorous fish biomass has increased; commercial fish has decreased; both are low. Important recreation and tourism area. Management efforts underway to improve water quality, promote sustainable fishing and increase community involvement and support.



¹Future of Reefs in a Changing Environment (FORCE) (www.force-project.eu). *Reef Health Index developed by Healthy Reefs Initiative (www.healthyreefs.org) **Caribbean average based on AGRRA regional database 2011-2014 (www.agrra.org). A trend is calculated after an indicator has been assessed for at least two years, otherwise it is listed as not available (n/a). For data, maps and references see www.caribnode.org.

Reef Health Index and Marine Managed Areas



Reef Health Index Scores

The Reef Health Index "scores" are calculated by converting the average value of each indicator into a condition ranking from 'critical' to 'very good' based on reference values (table right). The four scores are averaged to obtain the overall RHI score. The pie displays the overall RHI (middle) and each individual indicator to show how each indicator affects the score.

	Reef Health Index Reference Values*				
	Critical	Poor	Fair	Good	Very Good
The Reef Health Index (RHI)	1-1.8	1.9-2.6	2.7-3.4	3.5-4.2	4.3-5
Coral Cover (%)	<5	5.0-9.9	10.0-19.9	20.0-39.9	≥40
Fleshy Macroalgal Cover (%)	>25.0	12.1-25	5.1-12.0	1.0-5.0	0-0.9
Herbivorous Fish (g/100m ²)	<960	960-1919	1920-2879	2880-3479	≥3480
Commercial Fish (g/100m ²)	<420	420-839	840-1259	1260-1679	≥1680

*** Operational MMA with active management. **** St. Vincent and the Grenadines have several other proposed marine managed areas not listed here as geospatial data on the boundaries were not available (e.g., Chateaubelair, Petit Byahaut, and Anchor Reef).

Eastern Caribbean Regional Overview

Status of coral reefs in the Eastern Caribbean (EC)

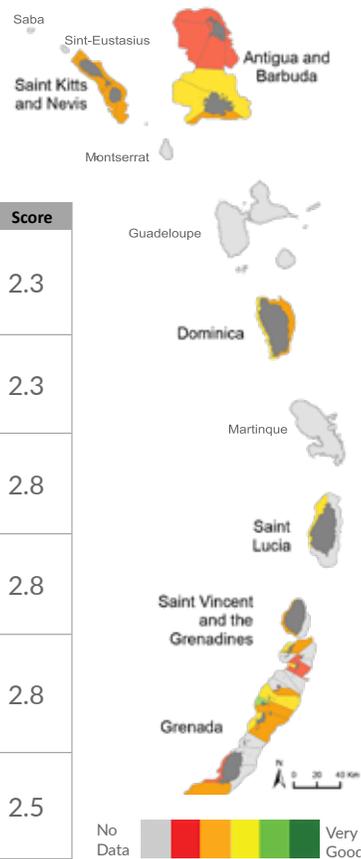
The Region's overall Reef Health Index (RHI) score was "fair" (2.5 of 5). Coral cover and herbivorous fish biomass were scored "fair", while fleshy macroalgae and commercial fish biomass were "poor". Reef condition varied at the local scale, but several regional patterns of reef condition were common:

- Endangered elkhorn/staghorn corals are recovering (NE island areas)
- Fleshy algae are often found on leeward reefs and near settlements
- Lack of large parrotfish has reduced grazing on several reefs
- *Diadema* urchins are abundant on several reef types in the EC
- Reefs with greater structure and relief have higher fish abundance
- Reefs under some level of protection have higher fish abundance, especially fully protected areas and longer established MMAs

Status of MMAs in the Eastern Caribbean

The long-term health and resilience of these ecosystems will depend on both effective local management and adopting collaborative and transboundary management strategies among the 6 nations.

- Currently 44 designated MMAs protect 526 km² of marine resources
- Many MMAs were designated >25 years ago (17 of 44)
- Most of the designated MMAs are small (27 of 44 are <10 km²)
- Few MMAs are fully protected "no take" zones, which had more fish
- Several key nursery areas with adjacent coral, mangrove & seagrass remain unprotected
- 50 new proposed MMAs will protect 990 km² of marine resources



# sites	Reef Health Index	Score
St. Kitts & Nevis 25		2.3
Antigua & Barbuda 29/121		2.3
Dominica 16		2.8
Saint Lucia 17		2.8
St. Vincent & Grenadines 42		2.8
Grenada 27		2.5

Next Steps

The following Management Recommendations and Monitoring Priorities are suggested to help protect St. Vincent and the Grenadines' coral reefs:

I. Management Recommendations

- Ensure resources for effective management, enforcement and education
- Continue to protect parrotfish & other herbivores to reduce harmful macroalgae
- Create more fully protected replenishment areas to let fish grow larger and produce more fish for the future
- Protect reefs adjacent to mangroves and seagrass beds
- Improve nearshore water quality & reduce siltation to increase reef resilience

II. Monitoring Priorities

- Coral Reef Monitoring 2016
 - Representative island wide surveys
 - Strategic surveys to fill data gaps - St. Vincent: South coast elkhorn, Barrouallie, Cumberland Bay, Chateaubelair, LariKai, Owia/Sandy Island area; N. Grenadines: Isle a Quatre, Baliceaux, Bequia west coast; S. Grenadines: Canouan, Union, Petit St. Vincent; east side of many islands.
 - Long term monitoring (LTM) - Resurvey: South Coast, Mustique & Tobago Cays LTMs. Select new LTM sites: South coast elkhorn reefs, Bequia MCA, Isle a Quatre; Canouan (near construction), Union, Petit St. Vincent.
- Socioeconomic monitoring
- MMA effectiveness monitoring
- Produce Report Cards in 2017 based on 2016 surveys
- Update CaribNode data platform with new data



Healthy endangered elkhorn corals & *Diadema* urchins give hope for the future



based on a decision of the German Bundestag