

U.S. VIRGIN ISLANDS



View of a bay from St. John, U.S. Virgin Islands.

The U.S. Virgin Islands (USVI) includes three main islands – St. Croix, St. Thomas, and St. John – and several smaller islands (Figure USVI-1). St. Thomas and St. John are geologically part of the Lesser Antilles and sit on the same shelf platform as Puerto Rico. The shelf platform ranges from 40 to 60 ft, with fringing, patch, and spur and groove reefs distributed patchily. Extensive coral reefs lie in water along the shelf edge in depths from 120 to 200 ft. These deeper reefs are dominated by plating forms of the *Agaricia* spp. and *Montastraea* spp. complexes, while corals in shallower water vary from columnar forms of *Montastraea* spp. to *Acropora* spp. to gorgonian dominated habitats. Maps of USVI benthic habitats (to 30 m) show that 61% of the 485 km² area is coral reefs and coral on hard bottom; 33% is predominantly seagrass beds, and 4% is sediment or rocky bottom.

St. Croix is part of the Greater Antilles and sits on a narrow, shallow shelf platform that drops off into the 4,000+ m deep Virgin Islands Trough. The shallow (46 to 60 ft) shelf edge is relatively close to shore in many places with classic back bay/lagoons to reef crest and fore reef habitats. The eastern and southern ends of the island are protected by a barrier reef system. Stocks and resources

do not appear to move across the Puerto Rico Trench, whereas St. Thomas and St. John have fish populations more similar to Puerto Rico. Thus, St. Croix and St. Thomas/St. John are not considered a single management unit.

Many stresses affecting marine resources in the Caribbean may be causing degradation of USVI coral reef ecosystems. Over the past 40 years, living coral cover has decreased, while macroalgal cover has increased. Intensive fishing along with habitat degradation has been blamed for the loss of spawning aggregations and decreases in mean size and abundance of reef fish. Groupers and snappers are far less abundant now, while herbivorous fishes comprise a greater proportion of samples in traps and visual surveys than they did in the 1960s. Other damage to marine resources results from natural stresses such as hurricanes and coral diseases, as well as land-based pollution and other anthropogenic factors.

The jurisdiction over these coral resources is shared by several U.S. agencies and the Virgin Islands Government. In 2001, the Virgin Islands Coral Reef National Monument off St. John was established, and the Buck Island Reef National Monument off St. Croix was expanded. Both areas are managed by the National Park Service. In 2002, the St. Croix East End Marine Park, which is managed by the USVI Department of Planning and Natural Resources, was established as the first in a series of marine parks for the territory. These areas are designed to provide protection for important marine resources, including coral reef areas, thus allowing depleted populations of certain marine organisms (groupers, snappers, corals) to recover. Other managed areas in St. Thomas and St. John include: the Hind Bank Marine Conservation District (established in 1999) and Lang Bank designated by the Caribbean Fishery Management Council to protect spawning aggregations and coral habitats; the Grammanik Bank, established as a temporary seasonal closure area for 2005 (permanent regulations are pending); and the Cas Cay/Mangrove Lagoon and St. James Marine Reserves, established in 1994 to protect juvenile reef fish and associated habitat. In St. Croix, MPAs include the seasonal Mutton Snapper Spawning Area Closure, the seasonal Lang Bank Red Hind closure, and the Salt River Bay National Historical Park and Ecological Preserve. The latter was designated in 1995, but the regulations have yet to be signed.⁴

⁴ The sources for the introduction are Vasques (2005), Kelty (2004), and Jeffrey et al. (2005).

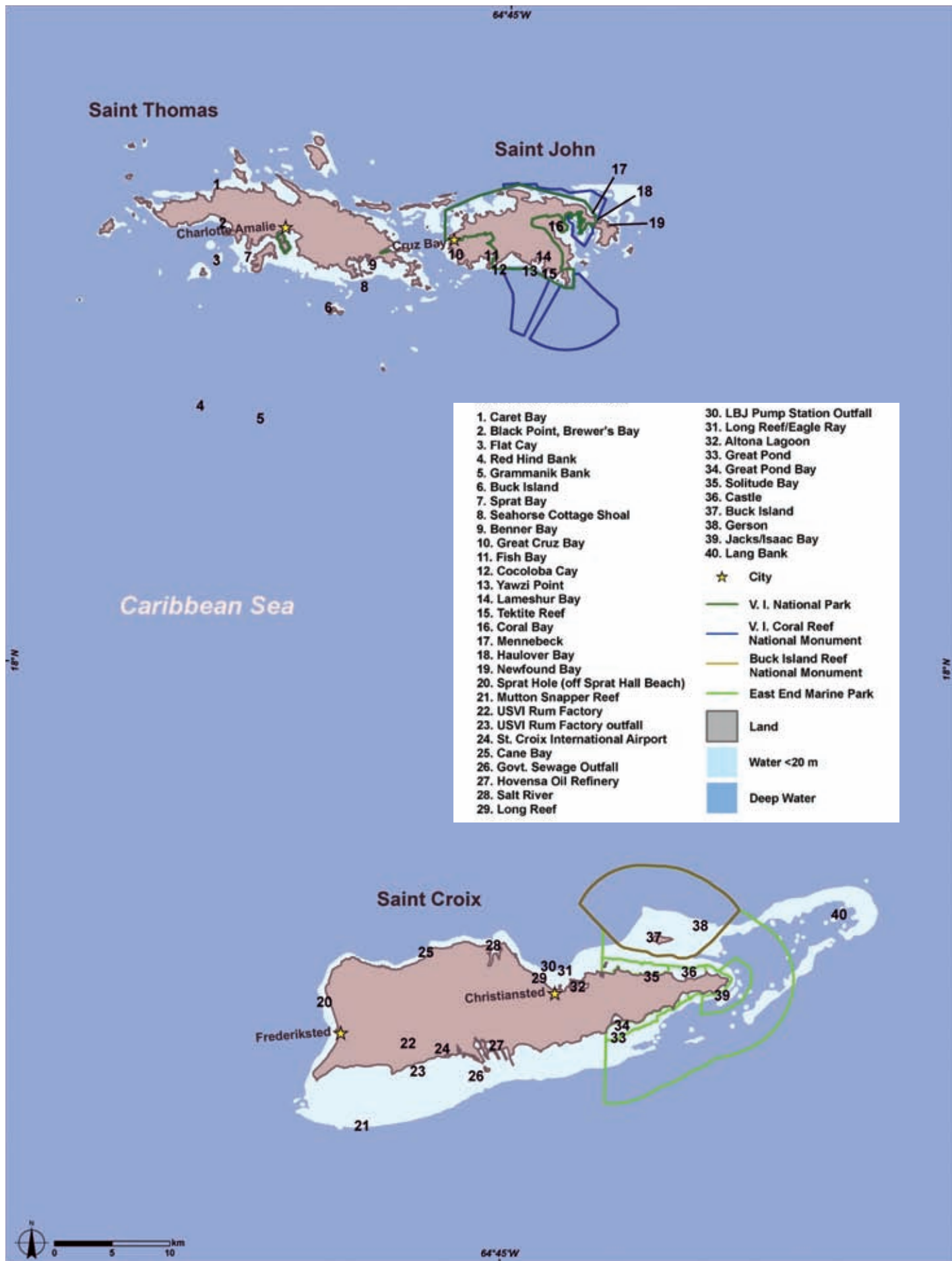


Figure USVI-1. A map of USVI showing managed areas, municipalities, and other locations of interest. (See Figure 4 for geographical context.) Map: A. Shapiro. Source: Jeffrey et al. (2005).

Research Needs

U.S. Virgin Islands	FISHING
<i>Management Objective</i>	<i>Research Need</i>
<p>Conserve and manage fisheries to prevent overfishing, rebuild stocks, and minimize destructive fishing.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Assess the impacts of fishing on spawning aggregations and monitor their recovery after regulations are enacted, especially at Grammanik Bank off St. Thomas.</p>
	<p>Assess the total catch and the value of local fisheries and the number of fishermen employed.</p>
	<p>Investigate the viability and effectiveness of enhancement programs (e.g., use of fishery aggregating devices to remove fishing pressure away from reefs) to mitigate fishing pressure on target organisms of commercial and recreational importance.</p>
	<p>Investigate expansion of pelagic fisheries within user groups affected by the establishment of MPAs, including benefits to coral reef ecosystems, socioeconomic implications, and other factors.</p>
	<p>Compare the population status of managed reef species in representative coral reef areas in St. Croix and St. Thomas, and identify environmental and anthropogenic factors that may explain differences in population dynamics of these species.</p>
	<p>Characterize fish assemblages on gorgonian dominated habitats and determine their importance as essential fish habitat.</p>
<p>Protect, conserve, and enhance the recovery of protected, threatened, and other key species.</p>	<p>Identify factors that promote or inhibit the recovery of key species and identify those factors which can be managed.</p>
	<p><u>Queen Conch, Spiny Lobster, Octopi</u></p>
	<p>Evaluate commercial, subsistence and recreational fishing pressure on conch, lobster, and octopi and the adequacy of existing regulations.</p>
<p>Evaluate and improve the effectiveness of MPAs as a fisheries management tool.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Evaluate the level of enforcement and assess what effect increased enforcement would have on juvenile reef fish stocks and reef habitat.</p>
	<p>Quantify abundance and size structure of different life stages of commercially and ecologically important fish and invertebrate species, coral condition, and major reef processes (e.g., herbivory and recruitment) within and outside protected areas in Buck Island Reef National Monument, Virgin Islands Coral Reef National Monument, the St. Croix East End Marine Park, St. Thomas Marine Conservation District, Cas Cay/Mangrove Lagoon Marine Reserve, St. James Marine Reserve, and the Salt River Bay National Historical Park and Ecological Preserve.</p>
	<p>Determine whether user groups displaced by the establishment of MPAs have shifted to pelagic fish species.</p>
	<p>Evaluate the efficacy of the marine reserves in St. Thomas and determine if additional management measures are necessary.</p>
	<p>Determine if existing managed areas are facilitating the recovery of protected, threatened, and other key species including, conch, grouper, and lobster.</p>
<p>Assess the costs and benefits of the Marine Conservation District on the commercial fishing community of St. Thomas.</p>	

U.S. Virgin Islands	FISHING
<i>Management Objective</i>	<i>Research Need</i>
<p>Develop and support aquaculture projects that minimize impacts to coral reef ecosystems, fishery stocks, and existing fishing communities.</p>	<p>Determine the viability of restocking populations of commercially and recreationally important reef species to aid in their recovery.</p>

U.S. Virgin Islands	POLLUTION
<i>Management Objective</i>	<i>Research Need</i>
<p>Reduce the impacts of pollutants on coral reef ecosystems by improving the understanding of their effects.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Quantify the impacts of sewage and sedimentation associated with accelerated coastal development and assess temporal changes in the abundance of key organisms, such as macroalgae and corals.</p>
	<p>Quantify the impacts on coral reef ecosystems of effluents from Cruzan Rum Distillery and Hovensa Oil Refinery in St. Croix.</p>
	<p>Quantify the impacts of run-off or effluents from land fills, rum distilleries, and other industrial effluents on sensitive habitats (e.g., Mangrove Lagoon).</p>
	<p>Develop internal circulation models for USVI to understand and predict the fate and effect of nutrients and other pollutants.</p>
	<p>Investigate the effects of sewage and sedimentation on USVI coral reefs. Adapt the GIS-based sediment delivery model developed for St. John for application to St. Croix and St. Thomas and implement the model to predict effects of future coastal development.</p>
<p>Improve water quality by reducing land-based pollutant inputs and impacts on coral reef ecosystems.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Develop BMPs to reduce or eliminate the highest priority sources of pollution and evaluate the effectiveness of implemented measures (e.g., erosion and sediment control regulations).</p>
	<p>Determine the effectiveness of upgrading regional primary sewage treatment facilities and monitor the long-term effects of upgrading on water quality and coral reef ecosystems.</p>
	<p>Evaluate the role of coastal wetlands in reducing contaminants before they are released into the marine environment.</p>

U.S. Virgin Islands	COASTAL USES
<i>Management Objective</i>	<i>Research Need</i>
<p>Reduce the impacts from recreational use, industry, coastal development, and maritime vessels on coral reef ecosystems.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Investigate the effects of oil pollution, cruise ship discharge, sedimentation (and resuspension), and other factors and assess whether they offset the benefits associated with designation of MPAs.</p>
	<p>Investigate the impacts of vessel traffic, including cruise ships, and the lack of designated anchorages on coral reef ecosystems in St. Thomas and St. Croix.</p>
	<p>Investigate changes in coastal land use and benthic habitat over time to determine whether and how increased development in certain areas has impacted coral reef ecosystems.</p>
<p>Balance resource use to minimize user conflicts, provide equitable uses, and ensure optimal benefits to present and future generations.</p>	<p>Examine coral reef-related recreation and tourism links to the economy and the environment.</p>
	<p>Determine the effectiveness of management efforts, such as the installation of mooring buoys in seagrass and reef areas and the elimination of fishing by assessing changes in seagrasses, macro and turf algae, and coral cover.</p>
	<p>Assess the costs and benefits of protective management tools (e.g., the installation of mooring buoys in seagrass and reef areas and the elimination of fishing) on the community.</p>
<p>Protect, conserve, and enhance the recovery of protected, threatened, and other key species.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p style="text-align: center;"><u>Acroporids</u></p>
	<p>Identify critical habitat for <i>Acropora</i> spp. in USVI, including the historical and current distribution of acroporid populations, and identify factors that contributed to the expansion/reduction in the spatial extent of these corals.</p>
	<p style="text-align: center;"><u>Sea Turtles</u></p>
<p>Reduce the impacts from and restore habitat damaged by vessel anchoring and groundings.</p>	<p>Investigate the impacts of recreational vessel anchoring to benthic habitats to determine whether management measures, such as the installation of mooring buoys, are necessary.</p>
	<p>Assess the damage of large vessels (e.g., propeller damage) on the shallow water habitats of St. Thomas.</p>
	<p>Quantify the impacts of ferry and recreational vessel groundings.</p>

U.S. Virgin Islands	COASTAL USES
Management Objective	Research Need
Restore injured and degraded coral reef habitat.	<i>See Jurisdiction-Wide Section for research needs.</i>
Manage coral reef ecosystems and their uses in a holistic manner. <i>See Jurisdiction-Wide Section for Additional Research Needs.</i>	Develop and evaluate ecosystem or trophic models for use in ecosystem management. Identify the connectivity of resources between eastern Puerto Rico and northern USVI, focusing on larval dispersal and movement of reef fish species that travel long distances to spawning aggregations (i.e., grouper and snapper).
	Identify the connectivity of resources between the British Virgin Islands and USVI to inform management practices that address the sharing of resources.
	Characterize interactions among reefs, mangroves, and seagrass beds and how deterioration of these contributes to changes in reef communities.
Evaluate and improve the effectiveness of MPAs as a management tool. <i>See Jurisdiction-Wide Section for additional research needs.</i>	Evaluate the ecological impacts of the de facto marine reserve (no transit zone) off the oil refinery in St. Croix.
	Conduct socioeconomic studies of recreational and commercial user groups affected by closures and restrictions in East End Marine Park.

U.S. Virgin Islands	INVASIVE SPECIES
Management Objective	Research Need
Minimize the introduction and spread of alien species.	<i>See Jurisdiction-Wide Section for research needs.</i>
Control or eradicate invasive species that have the potential to cause damage to coral reef ecosystems. <i>See Jurisdiction-Wide Section for additional research needs.</i>	Investigate the status of known invasive species within coastal waters of USVI, and establish a response network and protocol in the event of new invasive species introductions.

U.S. Virgin Islands	CLIMATE CHANGE
Management Objective	Research Need
<p>Minimize the effects of climate change on coral reef ecosystems.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Develop and implement a response plan to address bleaching events in the USVI.</p>

U.S. Virgin Islands	EXTREME EVENTS
Management Objective	Research Need
<p>Identify causes and consequences of diseases in coral reef ecosystems and mitigate their impacts.</p> <p><i>See Jurisdiction-Wide Section for additional research needs.</i></p>	<p>Determine the spatial and temporal distribution and abundance of the different coral diseases present in the USVI and their effects on affected corals and overall reef condition (e.g., species diversity and community composition).</p>
	<p>Examine coral community structure and impacts of disease and predation on coral reefs found in deeper areas such as Red Hind Bank Marine Conservation District.</p>
	<p>Inventory which diseases are present, their associated pathogens, and possible correlations with environmental factors such as temperature and nutrients.</p>
	<p>Assess the recovery of coral species impacted by disease (particularly acroporids).</p>
<p>Reduce impacts to and promote restoration of coral reef organisms affected by extreme events.</p>	<p>Examine the role of hurricanes in the decline of <i>Acropora</i> and how hurricanes influence patterns of recovery, including synergies with other stressors.</p>
	<p>Develop a model to predict the potential impact of storms to coral habitats including, factors such as spatial extent and degree of storm damage; storm strength, speed, and path; and benthic habitat characteristics.</p>
	<p>Identify anthropogenic factors that need to be addressed to enhance the recovery of reefs following hurricane and storm damage.</p>
	<p>Develop a system of coral mariculture farms as a strategy to maintain propagule sources through a wide geographic range and evaluate the value of these sources of corals for use in coral reef restoration projects in response to storms and ship groundings.</p>