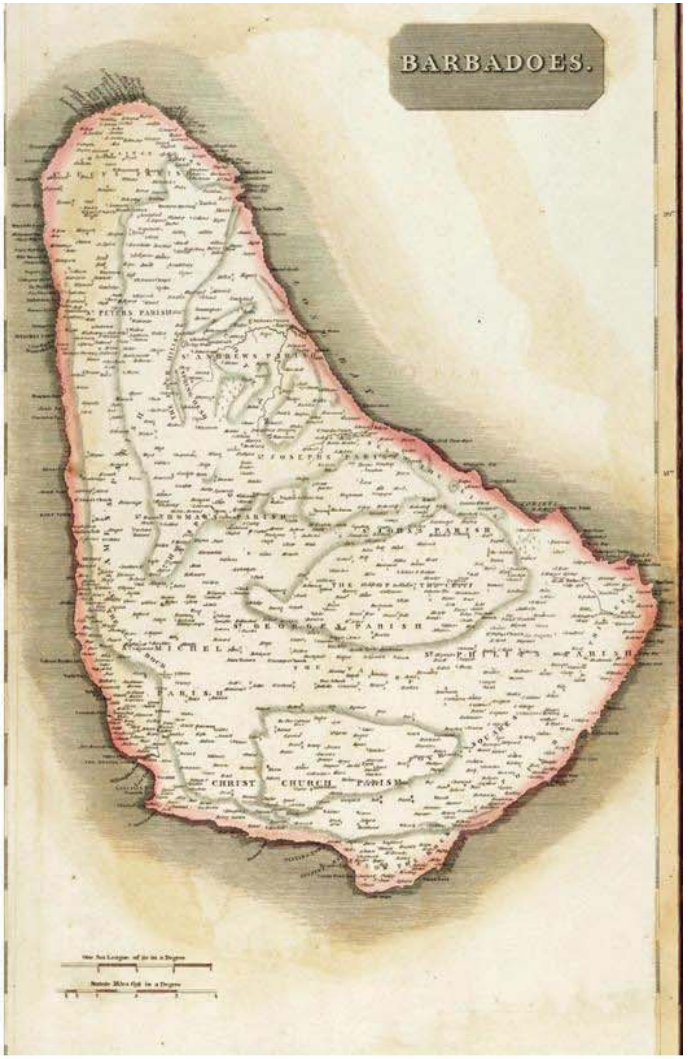
Environmental Sensitivity Index
Map of the Island of Barbados



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Introduction

The sensitive coastal environments of Barbados were mapped using the techniques established by the National Oceanic and Atmospheric Administration (NOAA). This produces a standardized symbology and classification that is familiar to the spill response community. Digital map data was mainly provided by the office of Coastal Zone Management Unit and the Department of Environmental Protection. Other data providers were, the Center for Resource Management and Environmental Studies (CERMES) University of the West Indies, Julia Horrocks director of the Barbados Sea Turtle Project. Special thanks to Susan Mahon of Bellairs Research Institute of McGill University who actually wrote and developed an Environmental Sensitivity Index map for Barbados in 1993. Much of the historical data in her document is included in this one; her contribution to this effort is much appreciated.

Barbados is the most easterly island of the West Indies islands, and is located at a latitude of 13o 10' N and a longitude of 59o 35' W. The island measures approximately 32.0 km by 23.5 km (20 miles by 14.5 miles); and has an area of approximately 430 square km (166 square miles). The length of the entire coastline is approximately 74.0 km (46 miles). The climate is tropical but the island is cooled by the easterly trade winds with only slight seasonal variations, in wind direction and intensity. In a normal day, peak wind speeds occur between 8 o'clock in the morning and 4 o'clock in the afternoon.

Most of the rainfall over Barbados is due to the passage of tropical waves. Tropical waves generally develop during the rainy season which usually extends from June to November which coincides with the Caribbean hurricane season. The dry season with little to no rain extends from February to April. In addition, localized rainfall is due to convectional air currents and orographic effects. Convectional air currents, which rise as the land gradually warms during the day, may cause condensation and precipitation during the late morning or early afternoon. In Barbados, orographic precipitation is most likely to occur between December and May.

Shoreline Habitat Mapping

Shoreline habitats were mapped by site visits to individual coastal areas and using existing GIS data provided by the government agencies. Aerial photographs provided by Coastal Zone Management and Google Earth as well as topographic maps were first examined to determine the initial classification followed by confirmation via site specific surveys. Mangrove and other wetland polygons were based primarily on publications and interpretation of aerial photography.

Determination of the sensitivity of the different shoreline habitats was based on existing ESI models. The persistence of stranded oil in a shoreline depends on wave energy, tides, and currents. Cleanup options are determined by the speed that natural processes remove oil. The possibility of injuries to natural resources and the effort needed for clean up are also factored into the ESI rank. Some of the coastal areas in Barbados are exposed to high wave action with low natural resources such as cliffs; these would be ranked low, whereas sheltered beaches with sea turtle nesting would be ranked more sensitive.

Given Barbados' limestone geology, the following shoreline types were identified in order of increased sensitivity to oil spills:

1A) Exposed Rocky Cliffs
1B) Exposed Solid Man-made Structures
2A) Exposed Wave-cut Platforms in Bedrock
3A) Fine to Medium-grained Sand Beach
5) Mixed Sand and Gravel Beach
6A) Gravel Beach
6B) Riprap
8B) Sheltered Man-Made Structures
8C) Sheltered Riprap

Wetlands

Because of the limestone geology and past agricultural practices, wetlands are not as common as in other Caribbean Islands. There are no coastal mangrove forests on Barbados, forested wetlands are considered rare and are limited primarily to Graeme Hall Swamp. The lack of perennial rivers restricts the coastal estuary wetlands to small pockets associated with intermittent streams. Man-made ponds are used for waterfowl hunting and provide some wetland habitat and values.

The wetlands adjacent to roads are very susceptible to spilled petroleum products from vehicular accidents, or during flood events.

Wetland types depicted in this Atlas include:

Mangroves
Freshwater Swamp
Freshwater Marsh

Environmental Setting

Currents

Most offshore surface currents affecting Barbados are westward going. In summer the main surface current direction is to the northwest and is strongly influenced by the North Equatorial Current, driven by the trade winds. The west-flowing surface current is strongest in May to July, averaging 50 km per day. A speed of 2-3 knots (about 50 to 75 km per day) is attained southeast of the island (Cambers, 1979; Hunte et. al., 1992).

During the winter, the main current direction is due west. Water movements around Barbados are strongly influenced by the Guiana Current which brings water from the Amazon and other rivers of north-east South America past the island -- especially in December-April (Cambers, 1979; Hunte et. al., 1992).

North of Barbados, the Equatorial Current is about 25 km per day, year round, rarely exceeding 1 knot (44.5 km per day) (Hunte et. al., 1992). "Westerly flow from the south is deflected northwards along the west coast of the island for most of the year, and there is a decrease in speed as these currents move around South Point. Loss of speed is noticeable closer to the coast, within a few hundred meters, where reversing tidal flow becomes important ... However, net flow is towards the west, in association with long-term trade wind drift" (Hunte et. al., 1992).

Some research on inshore circulation in the Deep Water Harbour/Brighton area indicates that during the winter months there is a strong flow of current towards the north, adjacent to the Deep Water Harbour and towards the west further offshore. During the summer months, the general flow is apparently towards the same directions, only weaker than in the winter; but "there is an indication of a reverse circulation loop in the Northern (lee) of the Harbour, which brings the flow southwards down the coast adjacent to Brighton Beach. Other research has produced detailed information on surface currents, subsurface currents and upwelling in the Spring Garden/Brighton Area, at certain times of the year.

There is some difficulty in predicting the fate of oil, since the knowledge of local currents is limited. Oil-spill contingency plans will need to consider that, "eddies of moderate size may produce a complex local flow pattern. This may occur near an irregular coastline, over uneven bottom topography or where major current systems meet; storms may produce a similar effect. Oil trajectory modelling will probably be crucial in decreasing the negative impact of an oil spill.

Waves

The east coast of Barbados is most exposed to the effects of wind-driven waves, since approximately 90% of winds approach Barbados from the Northeast to East-Southeast. In the event of an oil spill, high-energy waves and wave reflections/refraction are more likely to keep oil offshore from the exposed rocky headlands of the east coast, than from the more sheltered bays around the island. However, containment of oil may be inhibited by the rough seas and strong currents along the east coast.

Direct onshore winds on the west coast are rare, thus strongly reducing the influence of wind-driven waves generated directly from the leeward segment. Oil may therefore be more likely to accumulate on the west coast than on the other coasts. Containment of oil may be easier on the west coast than on the east or south coasts except under unusual conditions. For example: during the December to March winter months, northern swells created by long-period waves are generated by storms in the Atlantic, oil may be driven southwards, close to the shore along the west coast.

In the Spring Garden/Brighton Area, where most storage facilities and transfer of petroleum products occurs, the Deep Water Harbour provides a shelter to wave trains from the southerly direction. Major wave incidences are more likely to occur from the north since prevailing sea conditions are primarily influenced by the trade winds, northern winter swell, and hurricanes.

The south coast, particularly along the stretches from Needhams Point to Dover Beach, and South Point to Kitridge Point, is subject to an almost constant influence of waves. Much less wave action occurs within Oistins Bay, which is sheltered by South Point.
Tropical storms and hurricanes generate waves of greater height, shorter period, and are more variable than the common prevailing wave systems. Almost every year some swells are felt due to hurricanes in the Caribbean. These swells would normally propagate from the west to northwest direction.

Tsunamis are ocean waves of extraordinary length and velocity which, like hurricane surge, may increase the risk of accidents and influence the dispersion and/or containment of oil. Most Tsunamis (or "Tidal Waves") are associated with subsurface disturbances such as submarine volcanoes or earthquakes. Tsunamis frequently occur in Barbados, but most of them are so subtle that they go unreported except in the tidal record. However, the description of a tidal wave in the Careenage in 1755 indicates that Tsunamis may influence coastal conditions considerably, and should not be discounted.

Tides

The tides of Barbados are a mix of semi-diurnal type with two highs and two lows each day. An inequality exists in the times of each tidal cycle so that periods occur when there are not two complete cycles in a 24 hour period. There is no marked difference between the heights of the tides. However, one tide each day has a greater amplitude than the other. The tidal range is low and rarely exceeds 0.6 metres (1.96 feet). The diurnal range is about 1.1 meters: that is; on any given day, the difference between the mean high-water-mark and the mean low-water-mark, is about 1.1 meters.

Geology

Barbados is geologically distinct from the majority of the Caribbean Islands which are volcanic in origin. The island's origin is tectonic in nature and its geology is formed mainly by limestone originating from coral reefs. The terraces which characterise much of Barbados are underlain by fossil coral reefs. The limestone of these terraces was deposited around the margins of the island as it emerged from the sea during the later part of the Pleistocene epoch (about the last 900, 000 years). Tectonic uplift has been more or less continual through this time resulting in uplift of the older terraces to over 300 meters above sea level. The older, higher reef terraces have been exposed above sea level the longest and show substantially greater erosion than lower ones.

The terraces are covered by 0.6 to 1.0 meter of soil resulting from limestone erosion, volcanic ash from St. Vincent and subaerial debris transported from the Sahara by trade winds.

Coral reef terraces form a cap only about 100 meters thick over older non-reef sediments. The coral cap has been eroded away in the east of the island, the area known as the Scotland District which stretches along the coast from Gays Cove to Conset Bay. The exposed sediments below are up to 50 million years old, comprising sandstones, oil and gas-generating mudstones, and chalks interbedded with volcanic ash.

Other outcrops of Scotland deposits occur along the coastline at Cluffs (in St. Lucy), and at Skeetes Bay and Ragged Point (in St. Philip).

Today, the island is still fringed by a coral reef system which is in many respects is similar to the older reef terraces. This modern day system is characterised by fringing reefs, patch reefs, and offshore reefs. Water

depth increases rapidly across the shelf, being 200 meters deep 2.5 km from shore (656 feet deep 1.5 miles from shore).

Sensitive Biological Resources

Biological information presented in this atlas was collected and compiled with the assistance of the Costal Zone Division, the University of the West Indies, Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and many other agencies, webpages and environmental groups.

The Coastal Zone Division provided information regarding the range and distribution of important wildlife species, bird nesting areas and sea turtle nesting areas as provided by the Barbados Sea Turtle Project and WIDECAST. Six major categories of biological resources are presented in this atlas: marine mammals, birds, reptiles/amphibians, invertebrates, plants and benthic marine habitats. The distribution of biological resources on the maps is represented as lines or polygons associated with an icon which shows the type of habitat or species.

Polygon or line colors are generally the same for all species in a group. Each biological resource has an associated resources at risk identification number (RAR#). The unique RAR# references a table at the back of each map that shows the complete list of species associated with that map and other important biological or cultural resource information. The biological information shown on the maps represents known information at the time the data was gathered and the maps produced. **Therefore biological information shown on the maps by no means represents the full distribution of species range or habitats.**

There are currently 13 nationally known protected areas, some of which are privately managed and owned. Graeme Hall Swamp is recognized as a wetland of international importance area under the Convention on Wetlands (Ramsar Convention, Ramsar site no.1591).

COASTAL PLANTS AND ANIMALS

Numerous plants and animal resources would be at risk in the event of an oil spill close to the coast of Barbados. These resources include fishes, lobsters, conchs and helmet shells, sea urchins, turtles, sea moss, and birds. In this section, each species is described separately. This is designed to give an overview of the kinds of resources and possible locations where they may be impacted by an oil spill.

Fish and Fisheries

The fishes around the coast of Barbados are living resources of great value to the people of Barbados, and are critical to marine productivity of nearshore habitats such as coral reefs and seagrass beds.

The fishery exploiting reef fish alone accounts for about 8% of the total annual landings, in an industry dominated by open-water species such as flyingfish and dolphin fish. The diverse array of fishes that lives on the reefs and nearshore slopes of Barbados are of commercial value to dive operators, glass-bottom boat operators, submarine tour operators, and to hoteliers. Fishes also serve as an attraction for visitors to the Folkestone Marine Park Underwater Trail, and the Stavronikita underwater shipwreck.

Coastal fishes include shallow-water fishes such as those that inhabit tidepools and mangroves; small to medium-sized schooling fishes; and reef-fishes. Other fishes such as snappers and groupers occur on the steep drop-off at the edge of the continental shelf around Barbados. Large open-water fishes such as tunas, bonitos, and kingfish also occur close to the coast, in small schools or individually. The species composition, and abundance, of fishes around the coast of Barbados varies among habitats and with the degree of harvest. Coastal fishes are caught by cast netting (from the shore); seining (from small boats close to shore); and trapping, handlining, and spearfishing (up to a distance of about half a mile offshore).

The quantitative status of the distribution and abundance of fishes around Barbados is continuously under investigation by the Fisheries Department, Ministry of Agriculture Food and Fisheries. Fisheries data exist for the landings of species at each of the major fisheries complexes at Oistins, Bridgetown, and Speightstown. The status of the fisheries of Barbados is also a focus of the CARICOM Fisheries Resource and Assessment Management Program (CFRAMP) which is coordinated from Belize, Central America.

The abundance and variety of species are relatively high at locations such as the bank reefs on the west and south coasts, in the shallows at the northwest tip of the island, along the seaward edge of the inshore shelf on the east coast, and along the stretch from Tent Bay to Conset Bay (Oxenford, pers. comm.).

Sea Urchins

The white sea urchin (*Tripneustes ventricosus*) known locally as the "sea egg" has been fished in Barbados for centuries. This traditional fishery has been so important to Barbadians that local laws were enacted from 1879 to protect the urchins from May to August (breeding occurs May to November). The gonads (reproductive organs) are known as a great delicacy in Barbados and abroad. Over harvesting has lead to a virtual collapse of the fishery in recent years. The Government of Barbados now opens and closes the fishery depending on surveys of existing stocks.

The following areas are known for their populations of white sea urchin; Six Mens Bay, Clinketts, Speightstown, and St. Albans, Golden Palm (within Marine Reserve) and Paynes Bay, Rockley, St. Lawrence Gap, Sandy Beach/Oistins area, Silver Sands area, Crane Beach, Sam Lords Castle, Kitridge Point, Ragged Point, Skeetes Bay to Conset Bay, Bath,,Cattlewash, Morgan Lewis/Green Pond.

Other important areas for sea urchin development are; Six Mens Bay, Heywoods, Drill Hall Beach to Coconut Court, and Rockley. Sea urchin larvae and eggs may drift along any of the coastal areas of Barbados,

Lobsters

The Caribbean lobster is an important commercial species and is found throughout the coastal areas of Barbados:

North Coast: Lobsters can be found "all along the North coast" (David Farmer, pers. comm.).

East Coast: "Big red lobsters are found at Skeetes Bay and Ragged Point. At Cattlewash and Bath there are also concentrations of lobsters.

South Coast: Along the stretch from Kitridge Point to Long Bay the shallow forereef just seaward of the crest of "The Fathom" provides shelter for many invertebrates including numerous lobsters.

West Coast: lobsters are reported to be caught off the Cement Plant near Maycocks Bay, and from the rocky rubble at Bridgetown Harbour and Carlisle Bay, and Hastings.

In addition to the locations named above, lobsters may be expected to occur in any of the coral rubble areas or seagrass beds around Barbados in holes in coral reefs, or under large sponges.

Conchs and Helmet Shells

Queen Conchs (*Strombus gigas*) and Helmet Shells (*Cassis madagascariensis*) are fished in Barbados for their meat and shells. Local conchs are served in restaurants. Although conchs are used primarily as food, they and some Helmet Shells, are also sold as ornaments or made into jewelry. The adults of these species of shell are not reportedly abundant around Barbados. Conchs are most common in seagrass, beds in water less than 10 meters in depth. During shell deposition, spawning and egg laying they are also found on flat or gently sloping sand at similar depths. Eggs are laid from early July to mid-November when adults begin returning to grass beds. In Barbados, Helmet Shells are much rarer than Queen Conchs. Little has been documented about the life histories or abundance of these shells in Barbados.

Conch fishing occurs virtually all along the shallow coastal shelf of Barbados especially along the sheltered leeward coast.

Sea Turtles

The three most commonly seen species around Barbados are threatened with extinction globally, and are protected by national legislation. The three species of sea turtles that occur around the coasts of Barbados are the **hawksbill turtle** (*Eretmochelys imbricata*) the **leatherback turtle** (*Dermochelys coriacea*) and the **green turtle** (*Chelonia mydas*). The Barbados Sea Turtle Project, directed by Dr. Julia Horrocks and WIDECAST have documented the nesting of sea turtles on Barbados for several years.

The abundance of sea turtles around the coast of Barbados may be greatest during the hawksbill breeding season which extends from May to November. Hawksbill sea turtles form part of the coral reef ecosystem and are an integral part of the reef community. Hawksbills and green turtles can be observed feeding off the coast of Barbados throughout the year. Leatherback sea turtles are present in the area only during the breeding season February to June. Important sea turtle nesting beaches are noted on the ESI maps, however, any sandy beach can be considered potential sea turtle nesting habitat.

Birds

Because of its long colonial history and relative remoteness Barbados is not as rich in bird life as other Caribbean Islands. The avifauna of Barbados includes a total of 214 species, 147 are rare or accidental and one is endemic. It is however part of the Eastern Flyway and many waterfowl and wading birds are listed as vagrants, migratory or accidental for the island. There are no known large colonies of nesting marine birds in or around Barbados, but Audubon's shearwater was reported as nesting on Bird Rock. The island's natural and man-made wetlands serve as habitat for many species of water fowl and wading birds. Some migrants spend their non-breeding season feeding in Barbados building energy and fat reserves for the breeding season elsewhere. A few birds may also use Barbados as a migration staging area to obtain energy reserves for the flight to their main non-breeding areas further south.

The Barbados Yellow Warbler (*Dendroica petechia petechia*) is subspecies of the yellow warbler found throughout the Caribbean. This variety of yellow warbler occurs only in Barbados, and is categorised as a rare and endangered species. The Barbados Yellow Warbler is found mainly in Graeme Hall Swamp. The Barbados bullfinch (*Loxigilla barbadensis*) is the island's only endemic species and is found throughout the island.

Bird assemblages in this Atlas will consist of the following;

Shorebirds – stilts, plovers, turnstones and sand pipers
Wading birds – herons and egrets
Waterfowl – duck and coots
Sea birds – gulls, boobies, terns, etc

Raptors on Barbados are listed as extirpated or accidental with the exception of the osprey.

Marine Mammals

Marine mammals are not a common sight in the waters around Barbados. This is evidenced by the fact that there are no dolphin and whale watching operations for tourists. Whales and dolphins are incidental in Barbados. Humpback whales are reported in late March to May. The bottlenose dolphins are present year-round, but do not often get closer to shore than a few miles.

Coastal Features

Mangroves

Mangrove ecosystems are rare in Barbados the largest of which are found in Graeme Hall and Chancery Lane. There are some smaller mangrove areas in Holetown used as study areas for students from schools, universities and the Barbados Community College, and by researchers associated with the Bellairs Research Institute. Coastal fisheries benefit from the productivity of these habitats.

Birds find mangrove habitats rich in food and suitable for nesting. Landbirds such as the Grey Kingbird (*Tyrannus dominicensis*) and the Yellowcrowned Night Heron (*Nyctanassa violacea*) may breed there. The Cattle Egrets (*Bubulcus ibis*), one of the most numerous species of birds on the island use the area as a feeding, resting, and possibly breeding area.

Graeme Hall Swamp covers an area of 78 acres on the south coast. The swamp contains the largest remaining stand of mangroves on the island. The white mangrove (*Languncularia racemosa*) is the main mangrove species growing around the seaward edge of the swamp. The swamp also contains stands of red mangrove (*Rhizophora mangle*) which are distinguished from the white mangroves by their prop-roots. Behind the mangroves, a grass and sedge marsh has developed. Some areas of the swamp have been filled and reclaimed. The area contains tarpon "Cuffin" (*Megalops atlantica*), and tilapia which are regularly fished by recreational fisherman; as well as common kinds of aquarium fish.

Chancery Lane and Inch Marlowe Swamps, are both situated inland from Long Bay on the southeast coast. At Long Bay, low sand dunes hold-back intermittent ponds and marshy areas, within which button mangroves (*Conocarpus erectus*) thrive.

Seagrass Beds

Seagrass beds are biologically productive areas which support diverse and abundant arrays of marine life. Inhabitants of seagrass beds include conchs, helmet shells, and juveniles of many fish species, which contribute to fishery catches as adults. Some reef-dwelling species such as the parrotfishes, sea urchins, grunts, snappers, and spiny lobsters, derive a significant proportion of their nutrition from feeding in seagrass beds. Seagrasses contribute indirectly to coral reef production by trapping fine sediments in their interwoven root systems, thereby preventing this sediment from reaching the reefs and smothering them.

Seagrass beds in Barbados are composed mainly of manatee grass (*Syringodium filiforme*) and turtle grass (*Thallassia testudinum*) and are found mainly in calm embayments. The plants form extensive mats which produce large amounts of organic material and contribute to a complex system that includes grazing fishes, snails, green turtles, sea urchins, and numerous small organisms that live on and among the plants. The seagrass *Halodule spp.* occurs in depths of about 40 meters where there is low light.

The most extensive seagrass beds occur on the southwest coast from Oistins to Bridgetown; and in protected bays at Consets, Skeetes, and Martins Bay on the east coast.

Reefs

Coral reefs provide food for many species of marine life. Primary productivity, which is the process by which energy from the sun is used to make plant material, is significantly higher in the vicinity of coral reefs than in the open ocean. Coral reefs also provide a breeding ground and nursery area for many marine species. Juveniles of species such as squirrel fish, parrot fish, and ocean surgeon fish, are common. Coral reefs help to protect the shoreline by acting as barriers to strong waves. The waves break on the reefs before they reach the shore; thus erosion of the beaches is inhibited. Beaches, and living coral reefs, both contribute to the economy of Barbados by attracting tourists and residents.

The caves and passageways between corals shelter marine animals and plants. For example; the shallow forereef of "The Fathom" (see Environmental Sensitivity map -- Coastal Barbados) provides shelter for numerous fishes and lobsters (Proctor and Redfern et. al., 1984).

Fringe reefs and patch reefs are the two basic types of reef in the nearshore waters of Barbados. Fringe reefs extend 100 to 200 meters from the shoreline in 0 to 15 meters of water, and are characterised by a coral rock spur and sand groove structure. They are generally found off small headlands and are separated by sandy bays.
Patch reefs occur in 6 to 15 meters of water. These reefs are characterised by a flat, firm sandy bottom and a high abundance of soft corals. Patch size ranges from a few corals to several hundred corals.

Tidepools

Tidepool act as nurseries and reservoirs for juvenile fishes; both for permanent residents of the pools and for reef fishes. These inshore habitats seem to provide a continuous supply of recruits as living space on the reef becomes available. As with coral reefs, the abundance and diversity of tidepool fishes in Barbados has been found to be high. Tidepools, therefore, contribute to the maintenance of a pool of genetic resources.

In addition, tidepools provide food for fishes and birds, and shelter for numerous organisms. These tidepool organisms are important components of the biological food chain. Some tidepool organisms serve as marine resources for people. For example; the seamoss which grows in the crevices between the tidepools in areas such as Cattlewash, is a source of revenue for some people. Octopus, or "sea cats", are also fished from tidepools on the east and south coasts.

Most tidepools occur along the east coast as pits and holes associated with the exposed wave cut platforms of the eroded limestone plateaus. The surface of these plateaus is covered with a mat of algae and dotted with depressions which become pools at low tide. The sides of the pools are usually vertical with holes and undercuts. In the pools a variety of substrates may occur: bare sand, sand with turtle grass (*Thalassia testudinum*), algal covered rock, and limestone rubble.

Beach Types

Mixed sand-and-gravel Beaches

Mixed sand-and-pebble beaches act as a buffer against the effects of wind and waves. Wide beaches allow the energy of waves to dissipate, thereby conserving the sand on the beaches and the non-sandy areas inland. Beaches are also important recreational areas for Barbadians and visitors, and are included in the stretch of coast which is designated as the Barbados National Park. There are relatively few mixed sand-and-gravel beaches around Barbados, most beaches are fine to medium grain sand.

Sand Beaches

The significance of sandy beaches is recognised daily by the tourist industry. Sandy beaches are also valued as a buffer against the effects of wind and waves. Wide beaches allow the energy of waves to dissipate, thereby conserving the sand on the beaches and the non-sandy areas inland. Beaches on the windward east coast of Barbados, differ greatly from those on the south and west coasts.

The sand of east coast beaches is mainly siliceous (glassy), and contains only 20-25% of calcium carbonate. Individual sand grains are usually rounded. In some places the coral reef reaches to the edge of the sand and is exposed at low tide, and the seaward edge of the beach is covered by blown spray from the pounding

waves. The sand of beaches in the southern and western coralline areas is coarse-grained and consists almost entirely of coral and shell fragments, and minute pieces of coraline algae. Calcium carbonate content is 99 per cent. The beaches tend to be narrower than on the east coast; many are constrained by man-made structures such as seawalls or buildings.

Exposed Rocky Cliffs

The seaside cliffs are found along the northern coast. North of Six Men's Bay on the west coast, the cliffs are towering, and surround the parish of St. Lucy all the way around North Point to Sandy Hill Point (in northeast St. Lucy). At Cluffs (in northwest St. Lucy) and at Cove Bay and Gays Cove (in northeast St. Lucy) the cliffs are comprised of Scotland deposits; they are mostly sandstone.

From Conset Bay in the east to Chancery Lane in the south the cliffs are between 50 and 100 feet high, separated by sandy bays and beaches. These cliffs are mostly limestone.

Protected Areas

The Folkestone Park and Marine Reserve was established in 1981 by the Designation of Restricted Areas Order 1981, and the Marine Areas (Preservation and Enhancement) (Barbados Marine Reserve) Regulation 1981. The National Conservation Commission (NCC), the government agency responsible for the management of marine protected areas in Barbados, manages the Folkestone Park and Marine Reserve. The Folkestone Marine Reserve extends about a third of a mile offshore, along a stretch of the west coast in St. James. The Reserve stretches a total distance of 2.2 km and extends a distance offshore of 950m at its widest point and 660m at its narrowest. The headquarters for the Marine Park is located close to the beach at Folkestone, St. James, and neighbours the Bellairs Research Institute of McGill University.

Carlisle Bay is located on the south western coast of Barbados and is a calm, sheltered area where a variety of recreational activities occur on a daily basis. The bay is popular for diving, the anchoring and sailing of yachts and, to a lesser extent, fishing. The marine biodiversity in Carlisle Bay is extremely rich, with more than three hundred and fifty (350) species of tropical flora and fauna. Among these are organisms such as the frog fish (Antennarius multiocellatus), which is rare in Barbados, and the sea horse (Hippocampus erectus) which is rare worldwide. These, and other organisms, live on the scattered patch reefs and artificial reefs in the form of sunken ships which make up the primary ecosystems in the area. At present there are five (5) major wrecks in the bay: the Berwyn, the Fox, the C-Trec, the Bajan Queen and the Eillon, which attract more than forty (40) dive boats and glass bottom boats on a weekly basis.

Heritage Sites

Coastal heritage sites include the remains of old forts, other historical buildings and archaeological sites. The forts of Barbados once lined the entire west and south coasts from Kendall Fort near South Point to Maycock's Fort in St. Lucy. The most visible areas would include the seawalls at Speightstown, and at Fort Charles (Needhams Point); and the Bandstand area at Hastings Rocks on the south coast.

There are 64 archaeological sites in Barbados, 57 of these are coastal. Notable sites that are less than 2 meters above sea level have been identified at Chancery Lane and Welches in Christ Church; at the Shell Oil Depot and Freshwater Bay off the Spring Garden highway; at the Pineapple Beach Club, Sunset Crest, St. James; at Mullins Bay, Heywoods, and Littlegood Harbour in St. Peter; and at Conset beach on the east coast.

Human Use Resources

Human use resources in the atlas are mostly shown as point data. Boundaries of parks and other protected areas are mapped as polygons with dashed boundaries. Human use resource information was gathered during two working sessions with cooperators. Tourist maps and other information showing local dive sites, public beaches, etc. were also incorporated into this atlas.

Oil Production

Barbados does possess a history of oil production dating as far back as the eighteenth century where oil was collected from hand dug pits. While Barbados does not have significant crude oil reserves, it does maintain a small domestic production averaging over 1000 bbl/day vs the country's demand of 9000 bbl/day. There are about 240 oil and associated gas wells onshore Barbados of which 80 to 100 produce at any one time these wells are located in the Woodbourne Development Area (WDA) in St. Phillip. Refining in Barbados ceased in 1998 the oil is now sent to Trinidad for processing. The oil terminal is in Carlisle Bay. Off shore oil exploration is slowly starting. Natural gas production is distributed by pipeline to various parts of the island for local consumption.

SHORELINE DESCRIPTIONS

EXPOSED ROCKY CLIFFS **ESI=1A**

Description

- Steep intertidal zone with very little width
- Commonly exposed to high wave energy with strong wave reflection patterns
- Sediment accumulations is not common since wave energy removes debris from eroding cliff face
- Because of the environment, organisms that live in this habitat are hardy and accustomed to strong hydraulic impacts and pressures
- Substrate is impermeable with no oil penetration
- Not usually found in combination with other shoreline habitats, but may be associated with gravel beaches and wave cut platforms
- Very common along the east and north shore of Barbados

Predicted Oil Behavior

- Oil is usually held offshore by waves refracting off cliffs
- Any oil deposited is quickly removed by the constant wave energy
- The more resistant oils remain as a patch band at or above the high tide line
- Impacts to intertidal communities is usually short lived, unless if a light refined product come ashore quickly

Response Considerations

- Response options are very limited, because of high energy, clean up is usually not necessary
- Access is difficult and dangerous

EXPOSED SOLID MAN-MADE STRUCTURES **ESI=1B**

Description

- Typically composed of concrete or metal bulkheads
- May be exposed to high wave energy with strong wave reflection patterns
- Organisms such as barnacles and algae are common on lower levels
- Because of the environment, organisms that live in this habitat are hardy and accustomed to strong hydraulic impacts and pressures from waves
- Occurs at fishery centers, public and private dockage areas

Predicted Oil Behavior

- Most of the oil will be held off shore by wave refraction
- Oil could penetrate joints in concrete or metal
- Oil may coat intertidal area if heavy accumulations are present

Response Considerations

- High pressure wash may be required to remove oil, allow for re-colonization of marine organisms, minimize aesthetic damage and prevent chronic leaching of oil

EXPOSED WAVE-CUT PLATFORM IN BED ROCK ESI=2A

Description

- Regularly exposed to high wave energy and wave reflection patterns
- Intertidal zone a flat rock bench of varying width
- Rock can consist of bed rock, lava flow, calcareous beach rock or sedimentary rock
- May backed by steep scarp
- A perched beach of coarse sand or gravel may be present at scarp
- Surface is irregular, may have tidal pools associated
- Substrate is impermeable except where beach deposits occur
- May support rich tidal pool community
- Common along cliff faces and rock outcrops

Predicted Oil Behavior

- Oil will not penetrate rock platform but will move across it and impact beach deposits or high tide line
- Persistence of oiled sediments is usually short termed except where beach deposits occur. In the event of oiled beach deposits, oil can persist from weeks to months depending on how those deposits are worked by the wave action
- Biological impacts can be immediate and severe in tidal pool areas

Response Considerations

- Cleanup is usually not required because oil is removed by constant wave action
- Access may be difficult and dangerous
- If access to high tide line is available, it is recommended to remove oiled debris and any heavy accumulations of oil in order to protect shore birds and other wildlife that may use the area

FINE TO MEDIUM GRAIN SAND BEACH **ESI=3A**

Description

- Usually found throughout Barbados, can be calcareous or mineral sand color may vary
- Generally flat (< 5 degree slope) wide and hard-packed
- Surface sediments subject to regular reworking by wave action
- Used by sea turtles for nesting

Predicted Oil Behavior

- Light oil impacts will be deposited as bands or swashes along the high tide line
- Heavy oil accumulations will impact entire beach face. The rising tide will lift oil off lower areas and redeposit the oil elsewhere along the beach
- Maximum oil penetration is about 5 to 10 inches
- Burial of oil by clean sand can occur within hours, maximum burial will occur along the upper beach face
- Organisms living on the beach will be killed by smothering or lethal oil concentrations in the intertidal zone
- Direct and indirect impacts to sea turtle nesting habitat, eggs and hatchling may be severe

Response Considerations

- The easiest beach type to clean because hard substrate can support vehicular and foot traffic. Depths of oil penetration and burial are minimal
- After all the oil has come ashore, cleanup concentrate on removing first the oil on the upper swash zone
- Vehicular and foot traffic through the oiled areas should be limited to avoid contamination of clean beach areas and mixing of sand and oil. Beach entry and exit points should be established
- Vehicular and foot traffic as well as mechanical beach cleanup should be carefully planned and monitored to avoid impacts to sea turtle nests or hatchlings
- Manual cleanup is preferred versus the use of graders or excavators to avoid excessive sand removal
- Mechanical reworking of sand into the surf zone (surf washing) may be considered on a case by case basis to remove oil from sand without removal

MIXED SAND-GRAVEL BEACH **ESI=5**

Description

- Moderately sloping beach (8-15 degrees slope) with a mixture of sand and gravel
- Sandy areas can be soft with low trafficability
- Sediment mobility is high during storms
- Sediment distribution may vary significantly with bands of pure sand or gravel as well as areas of mixed sand/gravel
- Gravel is mainly composed of coral rock
- Substrate can be medium to high permeability
- Beach fauna can vary depending on beach composition
- Sea turtles utilize the areas dominated by sand for nesting
- Second most common beach type

Predicted Oil Behavior

- Oil will be deposited along high tide line in smaller spills
- During larger spills oil will cover the entire beach face
- Oil can penetrate gravel areas up to 20 inches or more, if the area has more sand than gravel, the behavior of the beach will be more attune to a sand beach
- Significant amounts of oil can be eroded away during storms
- Burial of oil up to 36 inches can occur if oil comes ashore during the period of beach buildup after a storm
- Pavements of asphalted sediments can form if heavy oil deposits are not removed from sheltered areas on the beach. Once formed these pavements can persist for years
  - Organisms living on the beach will be killed by smothering or lethal oil concentrations in the intertidal zone
- Direct and indirect impacts to sea turtle nests, eggs and hatchlings can be severe

Response Considerations

- Remove heavy accumulations of pooled oil as soon as possible
- All oil debris should be removed
- Vehicular and foot traffic through oiled areas should be controlled, beach entry and exit points should be established
- Sediment removal should be kept to a minimum to avoid loss of sand and possible beach erosion
- Vehicular and foot traffic as well as mechanical beach cleanup should be carefully planned and monitored to avoid impacts to sea turtle nests or hatchlings
- Low pressure flushing should be used to remove heavy oil deposits if collection is feasible. High pressure wash should be avoided
- Mechanical reworking of sand into the surf zone (surf washing) may be considered on a case by case basis to remove oil from sand without removal
- Deep tilling or plowing of beach could be used to expose buried oil layers to wave re-working in areas of heavy wave action

GRAVEL BEACHES **ESI = 6A**

Description

- This beach type is not common in Barbados, usually made up of sediments larger than 2 mm usually made up of coral rock
- The most permeable of all beach sediment types
- Lowest trafficability of all beach types
- Rapid erosion and or burial of oil possible during storms
- Slope can be intermediate to steep with multiple wave built berms on the upper beach
- Sediment replenishment rates can be the lowest of all beach types
- Attached animals or plants are restricted to lowest part of the beach where sediments are less mobile
- Found in isolated areas that are subject to high erosion rates or some pocket beaches

Predicted Oil Behavior

- Deep penetration and rapid burial of stranded oil is likely; penetration of over 36 inches can extend oil to depths where natural re-working would occur only in the most severe storm conditions
- Long-term persistence is governed by the depth of penetration versus the depth of normal natural storm waves
- Oil can be carried over the normal high tide line and deposited above the range of natural re-working by storm surge or abnormally high tides where it can pool and persist
- In more sheltered areas, the formation of asphalt pavements is likely if oil accumulations are heavy

Response Considerations

- Because of the low trafficability, rapid rate of burial and deep penetration of oil, this is one of the most difficult beach types to clean
- Heavy accumulations of oil should be removed quickly
- All oiled debris should be removed
- Because of the slow replenishment rates of these beaches, removal of sediments should be kept to a minimum
- Flushing with ambient water could be used to remove heavy oil deposits if collection is feasible.
- Mechanical reworking of gravel from the high-tide line into the surf zone (berm relocation) may be considered on a case by case basis to remove oil from gravel without removal
- Deep tilling or plowing of the lower beach could be used to expose buried oil layers to wave re-working in areas of heavy wave action

RIP-RAP **ESI=6B**

Description

- Composed of large concrete or coral rock fragments
- Used for shoreline stabilization and protection
- Relatively common along fast eroding beaches, seawalls and port areas
- Middle and low intertidal zone biota may be plentiful and varied

Predicted Oil Behavior

- Deep penetration of oil because of the permeability of the rip-rap
- Oil adheres readily to the rough surfaces
- If left uncleaned, oil may cause chronic leaching for weeks or months, until it turns to asphalt
- Resident infauna may be killed by oil

Response Considerations

- Flushing can be effective in removing mobile oil, however, large amounts of residue can remain after flushing, especially if the product is a heavy oil

- High pressure or hot water wash may be needed to remove residual oil. Collection for washed oil needs to be in place.

SHELTERED MAN-MADE STRUCTURES **ESI=8B**

Description

- Includes seawalls, piers, and docks typically constructed of impermeable materials such as concrete
- Found inside harbors typically away from direct exposure to wave

Predicted Oil Behavior

- On impermeable surfaces the oil will form a band along the high tide line
- On rip-rap oil will soak into the pores and spaces
- If the oil is not removed it may cause chronic leaching until it weathers into asphalt

Response Considerations

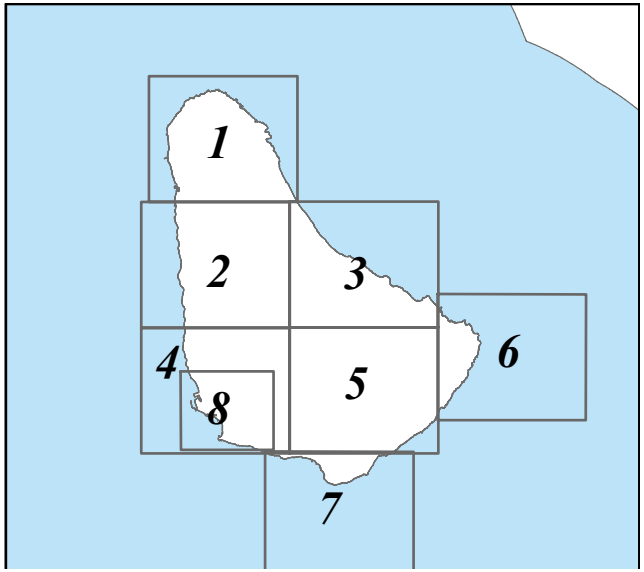
- Cleanup is frequently required because of public use and the slow rate of natural removal
- High pressure or hot water wash may be needed to remove residual oil. Collection for washed oil needs to be in place
- Clean up crews need to recover all released oil
- An oil stain may be left in the concrete
- All pooled oil and oily debris should be removed as soon as possible

Barbados Environmental Sensitivity Index Mapping

BARBADOS ESI INDEX MAP

The following index includes the maps developed for the Dominica ESI mapping based on the number depicted on the map (see below):

- **ESI-1-North, Barbados ESI Map**
- **ESI-2-Midwest, Barbados ESI Map**
- **ESI-3-Mideast, Barbados ESI Map**
- **ESI-4-Southwest, Barbados ESI Map**
- **ESI-5-Southeast, Barbados ESI Map**
- **ESI-6-East, Barbados ESI Map**
- **ESI-7-South, Barbados ESI Map**
- **ESI-8-Bridgetown, Barbados ESI Map**



BARBADOS ESI MAPS LEGENDS AND SYMBOLS

The following legend and symbols were used in the development of the Barbados ESI mapping.

ESI

The legend for the Shoreline Habitats (ESI) depicts the shoreline ranking types were that identified in order of increased sensitivity to oil spills.

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

HUMAN-USE RESOURCES AND BIOLOGICAL RESOURCES SYMBOLS

Under the Environmental Sensitivity Index (ESI) method, Biological Resources and Human-use Resources that can be either negatively impacted by an oil spills or used as access points for oil spill cleanup are typically marked on ESI maps with a symbol. The number included with the biological resources represents the Resource at Risk number (RAR) and it can be correlated with the biological resources table for each map.

Human-use Resources Symbols and Description Table

Category	Symbol	Comments
Access		Vehicular access to the shoreline
Airport/Heliport		
Aquaculture		Hatcheries, ponds, and pens
Archaeological Site		Water-, coastal-, or wetland-associated
Beach		High-use recreational beaches
Boat Ramp		
Camping		
Commercial Fishing		
Critical Habitat		
Diving		High-use recreational areas
ESI/RSI Change		
Equipment		
Facility		
Factory		
Ferry		
Hazardous Waste Site		
Historical Site		Water-, coastal-, or wetland-associated
Hoist		
Indian Reservation/Tribal Land		
Lock/Dam		
Management Area		Managed areas (including nature conservancy)
Marina		
Marine Sanctuary		
Mining		Intertidal/subtidal mining leases
National Park		
Park		State and regional parks
Pipeline		Oil or Gas Pipeline
Recreational Fishing		High-use recreational areas
Special Management Areas		Usually water-associated
Subsistence Fishing		Designated harvest sites
Surfing		
Village		
Water Discharge		
Water Intake		Industrial; drinking water; cooling water, aquaculture
Water Quality		
Water Supply		
Wildlife Refuge		

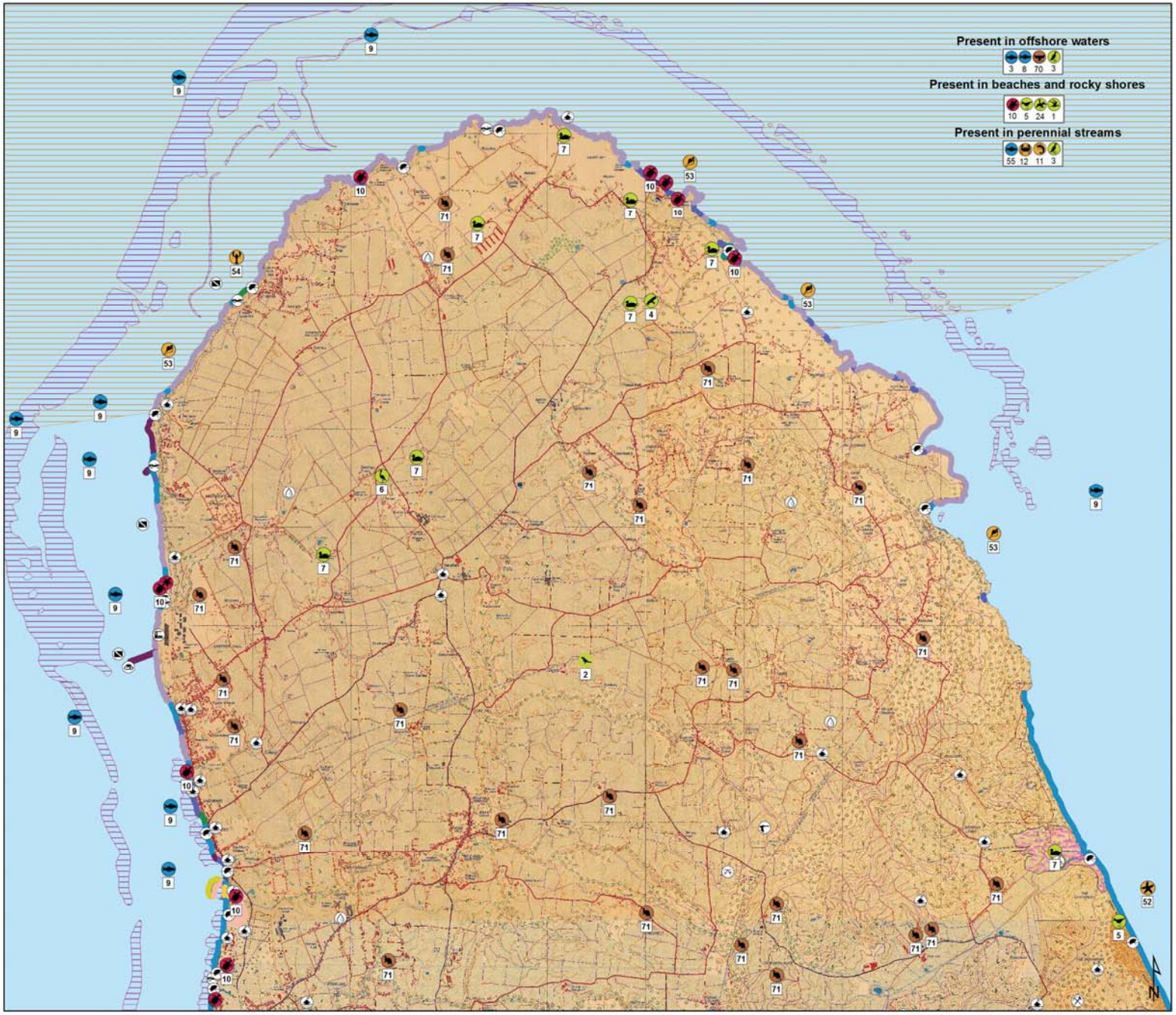
*Human-use resources table of symbols and description courtesy of the Office of Response and Restoration, National Ocean Service of the National Oceanographic and Atmosphere Administration (NOAA).

Biological Resources Symbols and Description Table

Category/Sub-Category	Symbol	Locations Shown on Maps
Marine Mammal		
Whale		Migratory or other concentration areas
Terrestrial Mammal		
Monkey		
Bird		
Alcid/Pelagic Bird		Rookeries, roosting, and other concentration areas
Diving Bird		Rookeries; forage/wintering areas; roosting concentration areas
Gull/Tern		Nesting sites; other concentration areas
Passerine Bird		Locations of threatened, endangered, or rare species, especially nesting areas
Raptor		Nesting sites; migratory/feeding concentration areas
Shorebird		Nesting sites; migratory, wintering, and roosting concentration areas
Wading Bird		Rookeries; feeding and roosting concentration areas
Waterfowl		Wintering and migration concentration areas; nesting sites
Reptile/Amphibian		
Other Reptiles/Amphibians		Locations of threatened, endangered, or rare species, especially aquatic/wetland concentration areas
Turtle		Nesting beaches; concentration areas
Fish		
Anadromous Fish		Spawning and nursery areas; locations of threatened, endangered, or rare species
Diadromous Fish		Spawning and nursery areas; locations of threatened, endangered, or rare species
Freshwater Fish		Spawning and nursery areas; locations of threatened, endangered, or rare species
Marine Benthic Fish		Spawning and nursery areas; reefs, kelp beds, or other concentration areas
Marine Pelagic Fish		Spawning or other concentration areas
Shellfish/Insect		
Bivalve		Harvest areas; abundant beds; locations of threatened, endangered, or rare species
Crab		Nursery areas; areas of high concentrations
Echinoderm		Harvest areas
Lobster/Crayfish		Nursery, spawning, and harvest areas; locations of threatened, endangered, or rare species
Shrimp		Nursery areas; locations of high concentrations
Squid/Octopus		Harvest areas; areas of high concentrations
Habitat/Rare Plant		
Coral/ Hardbottom Reef		Generally restricted to water and tidal flats
Rare Plant/Terrestrial Plant/Native Plant		Locations of threatened, endangered, or rare species or communities
Submerged Aquatic Vegetation		Areas of submerged aquatic vegetation; seagrass beds, kelp, algae

*Biological resources table of symbols and description courtesy of the Office of Response and Restoration, National Ocean Service of the National Oceanographic and Atmosphere Administration (NOAA).

Environmental Sensitivity Index Map



North Barbados ESI Map
ESI 1 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

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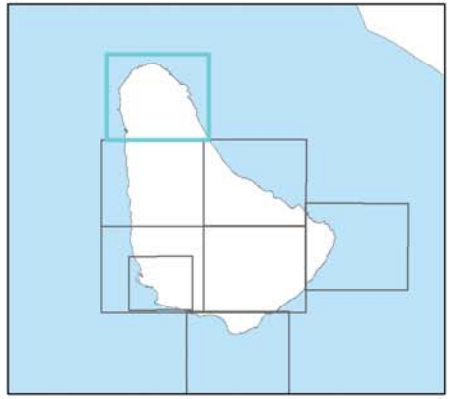
through the
Regional Activity Center/Regional Marine Pollution
Emergency, Information and Training Center
(RAC/REMPEITC-Carib)
in cooperation with the
Environmental Protection Department
and the Coastal Zone Management Unit
Government of Barbados
2011



BARBADOS ESI MAP 1 (NORTH) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

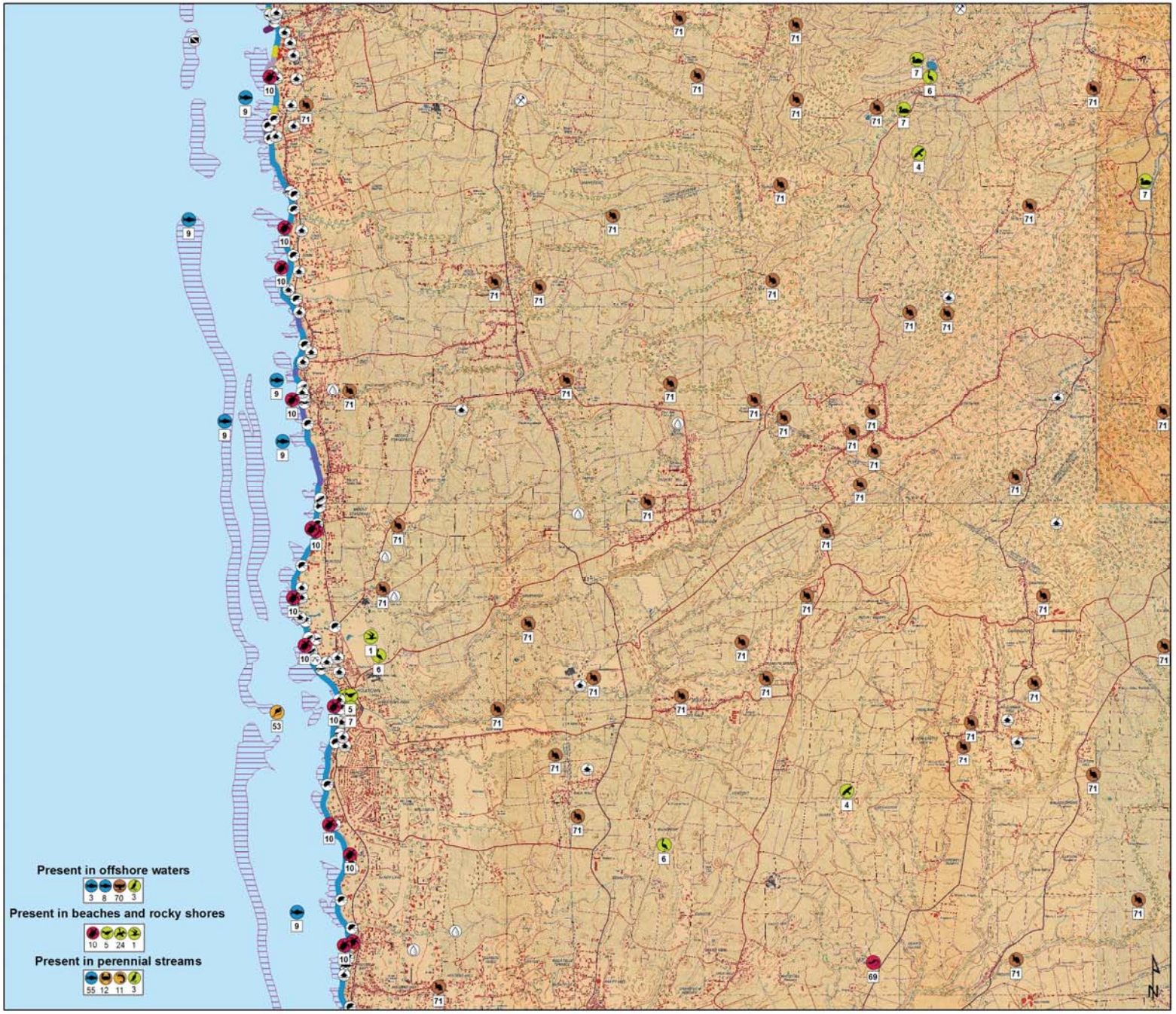
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



Midwest Barbados ESI Map
ESI 2 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

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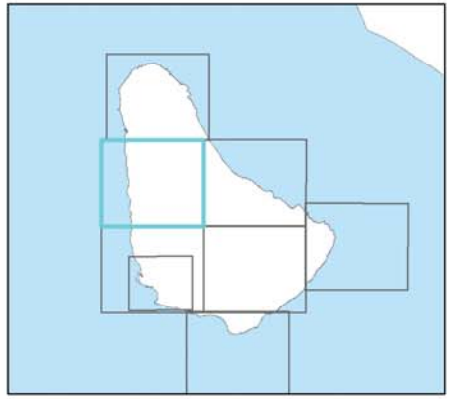


BARBADOS ESI MAP 2 (MIDWEST) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

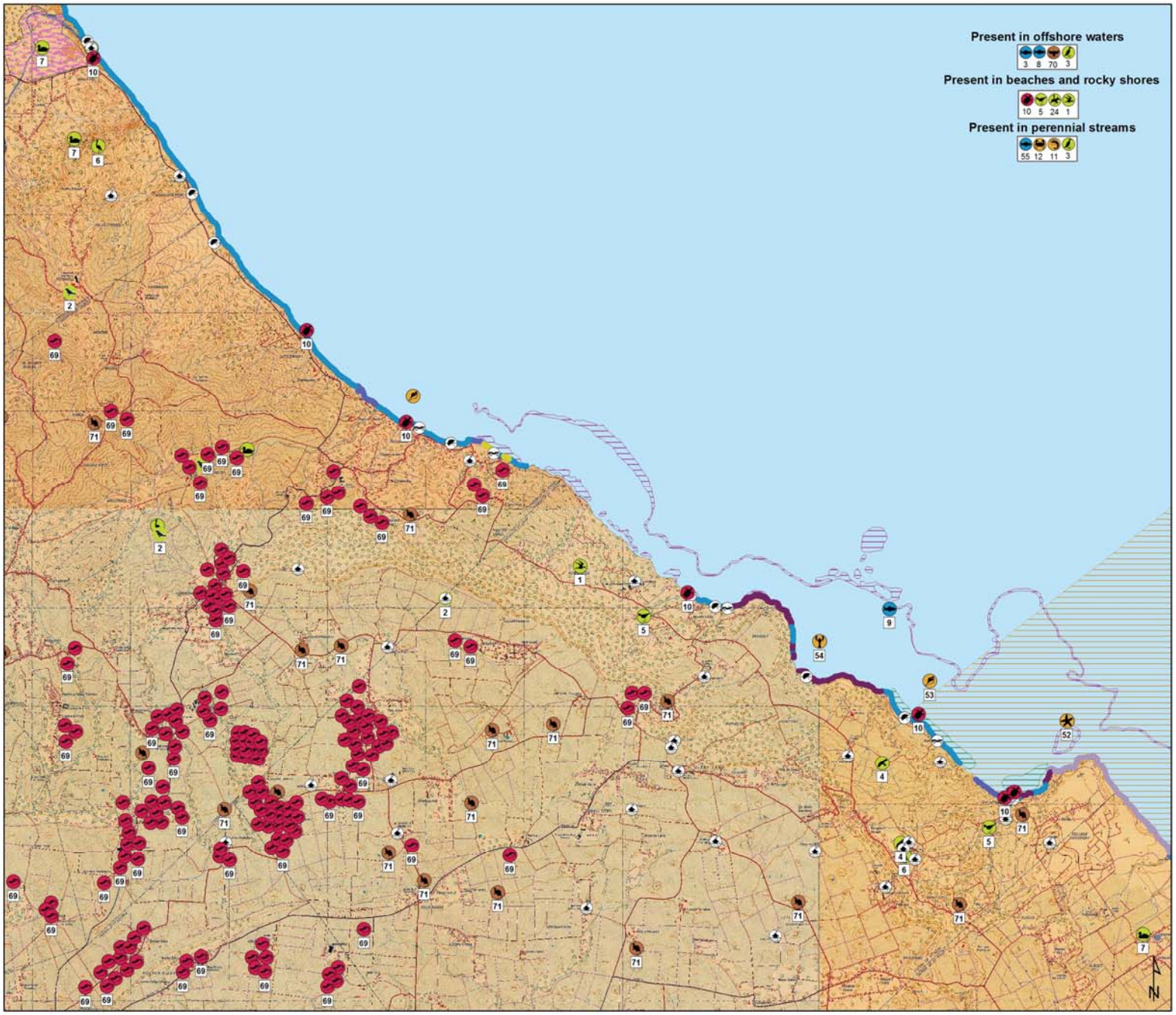
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



Mideast Barbados ESI Map
ESI 3 (2011)

Legend

Shoreline Habitats (ESI)

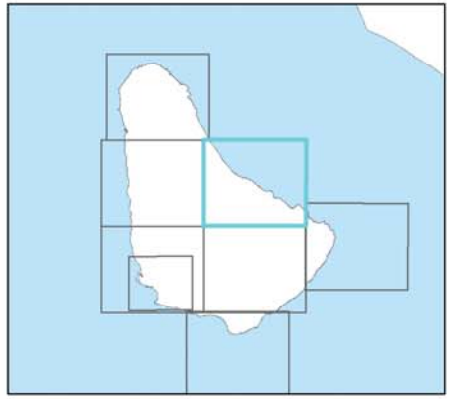
- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

Sponsored by the
International Maritime Organization (IMO)
through the
Regional Activity Center/Regional Marine Pollution
Emergency, Information and Training Center
(RAC/REMPEITC-Carib)
in cooperation with the
Environmental Protection Department
and the Coastal Zone Management Unit
Government of Barbados
2011



BARBADOS ESI MAP 3 (MIDEAST) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

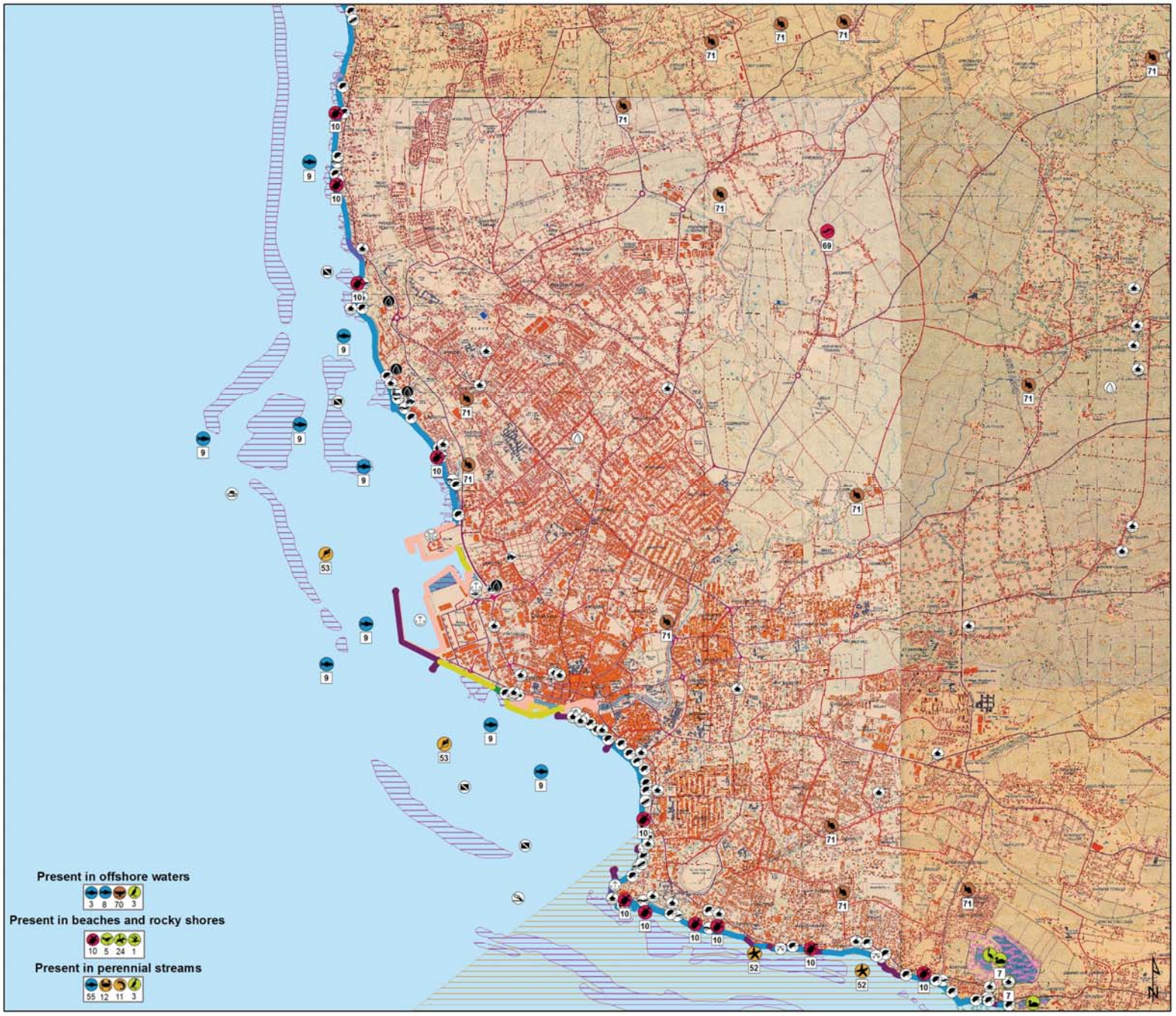
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



Southwest Barbados ESI Map
ESI 4 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

Sponsored by the
International Maritime Organization (IMO)
through the
Regional Activity Center/Regional Marine Pollution
Emergency, Information and Training Center
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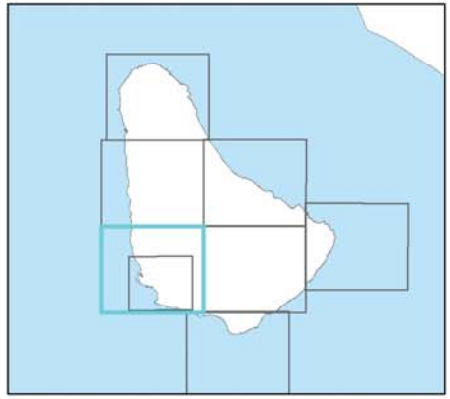
Government of Barbados
2011



BARBADOS ESI MAP 4 (SOUTHWEST) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

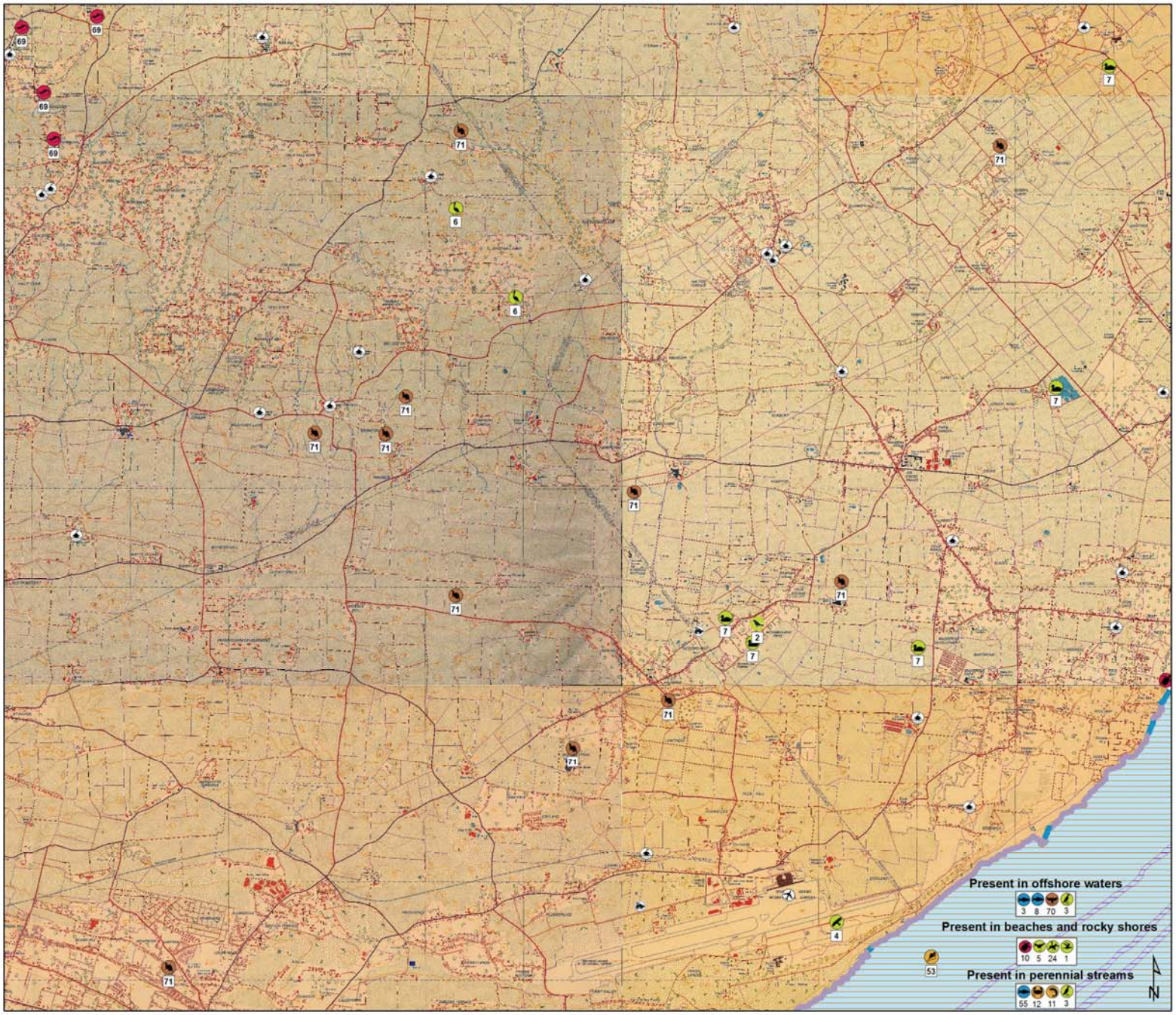
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



Southeast Barbados ESI Map
ESI 5 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

Sponsored by the
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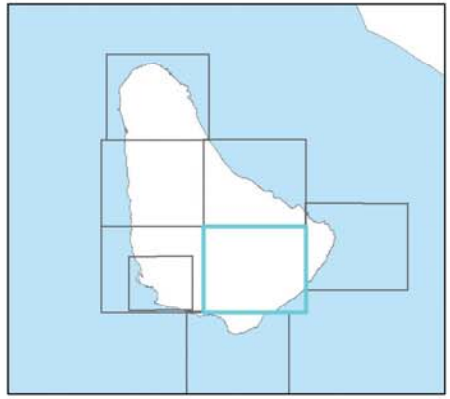
2011



BARBADOS ESI MAP 5 (SOUTHEAST) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

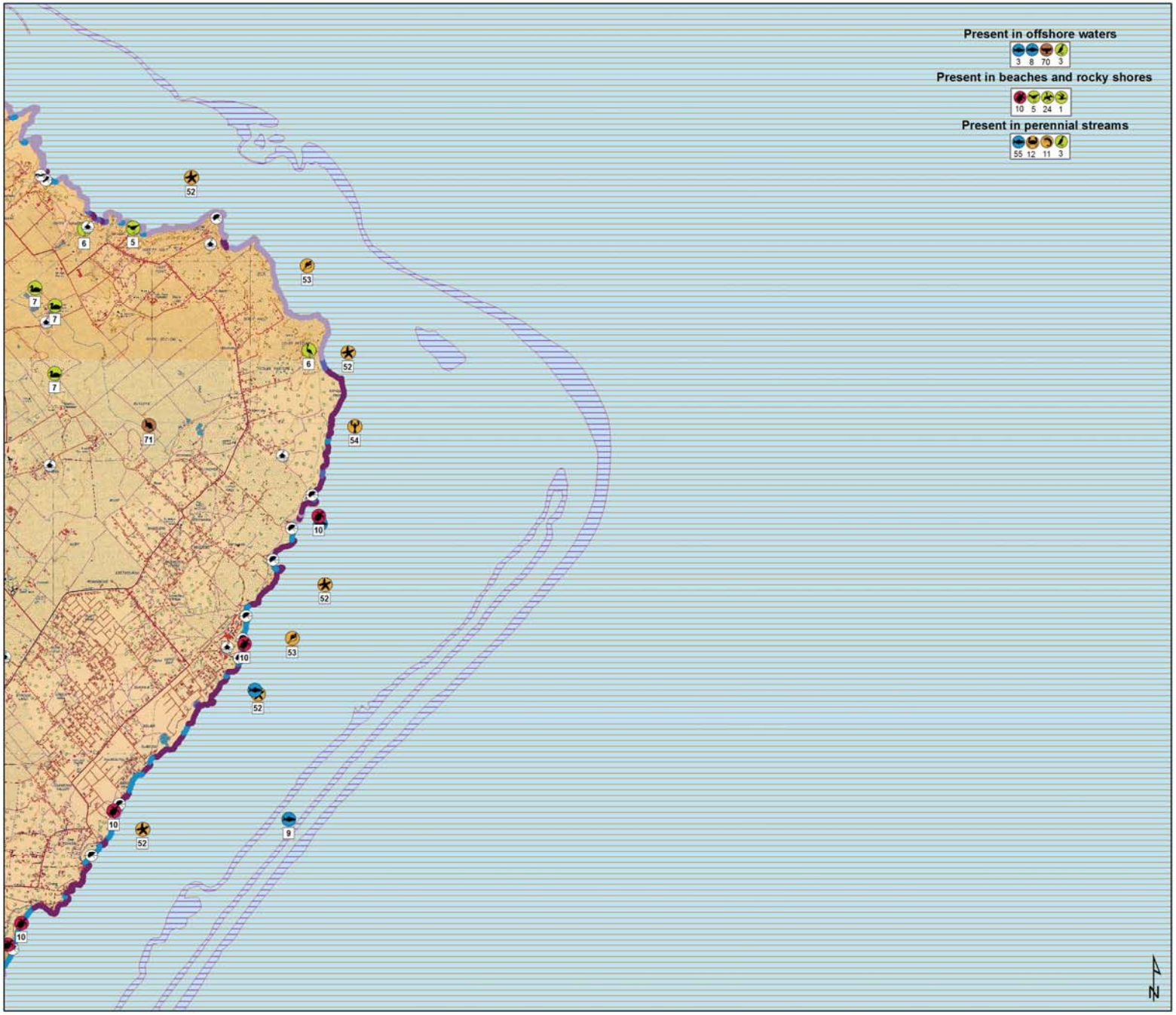
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



East Barbados ESI Map
ESI 6 (2011)

Legend

Shoreline Habitats (ESI)

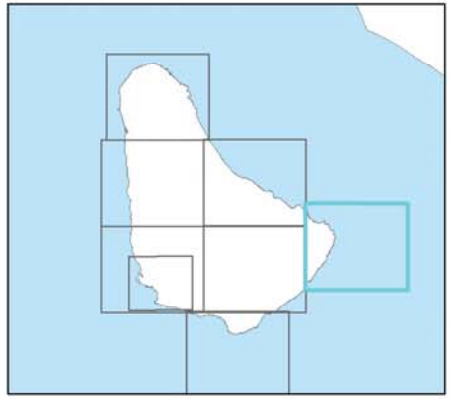
- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platflorms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

Sponsored by the
International Maritime Organization (IMO)
through the
Regional Activity Center/Regional Marine Pollution
Emergency, Information and Training Center
(RAC/REMPEITC-Carib)
in cooperation with the
Environmental Protection Department
and the Coastal Zone Management Unit
Government of Barbados
2011



BARBADOS ESI MAP 6 (EAST) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

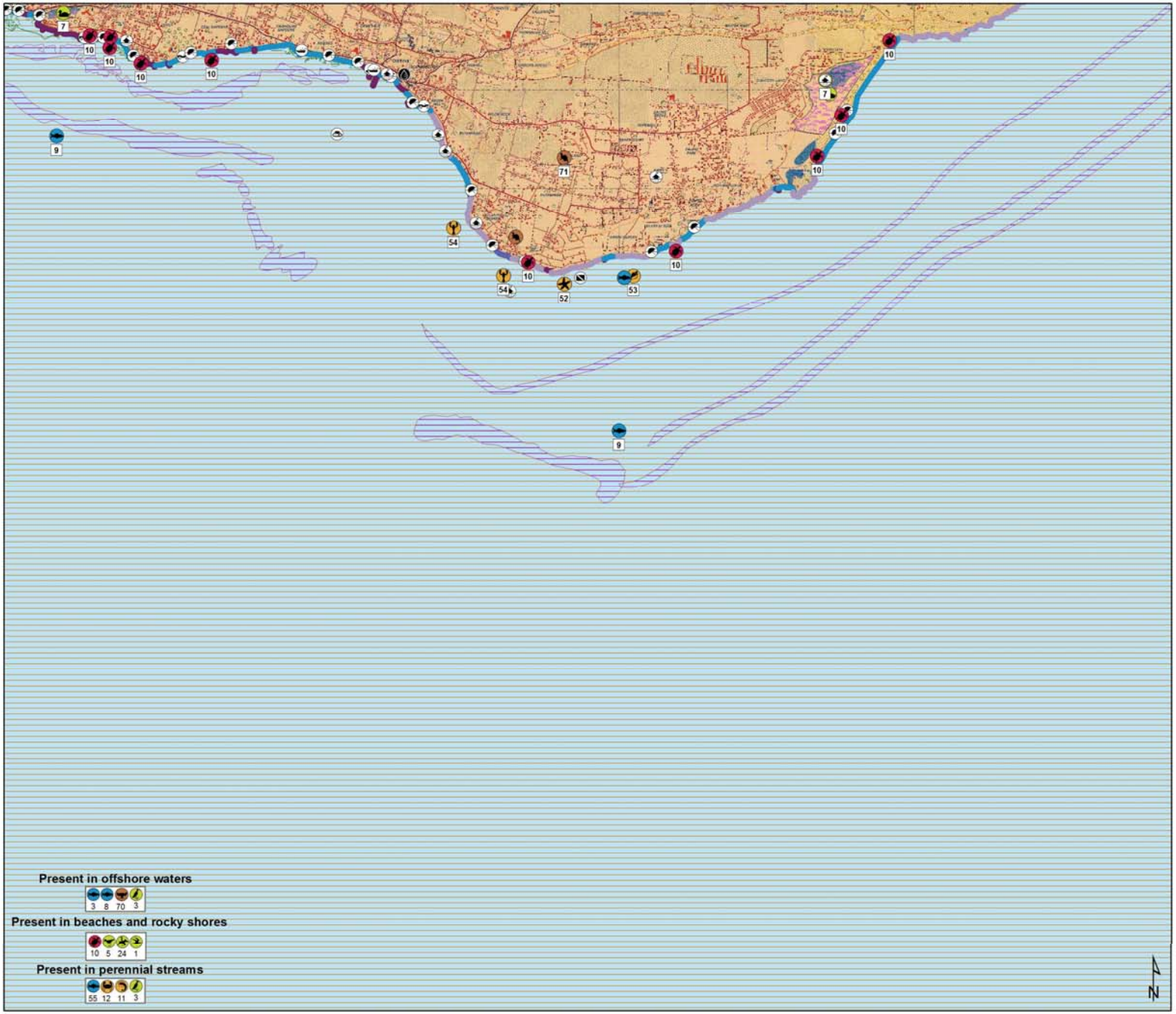
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



South Barbados ESI Map
ESI 7 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platforms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.5 1 2 Kilometers

0 0.25 0.5 1 Miles

1:40,000

Sponsored by the
International Maritime Organization (IMO)
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Regional Activity Center/Regional Marine Pollution
Emergency, Information and Training Center
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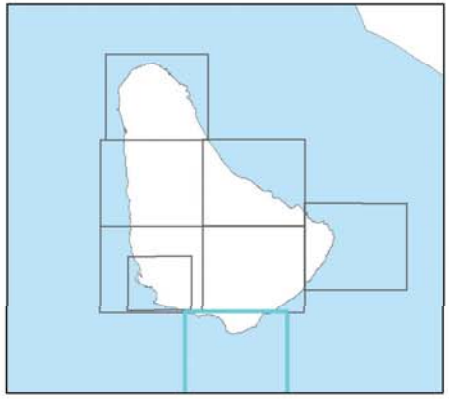
Government of Barbados
2011



BARBADOS ESI MAP 7 (SOUTH) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

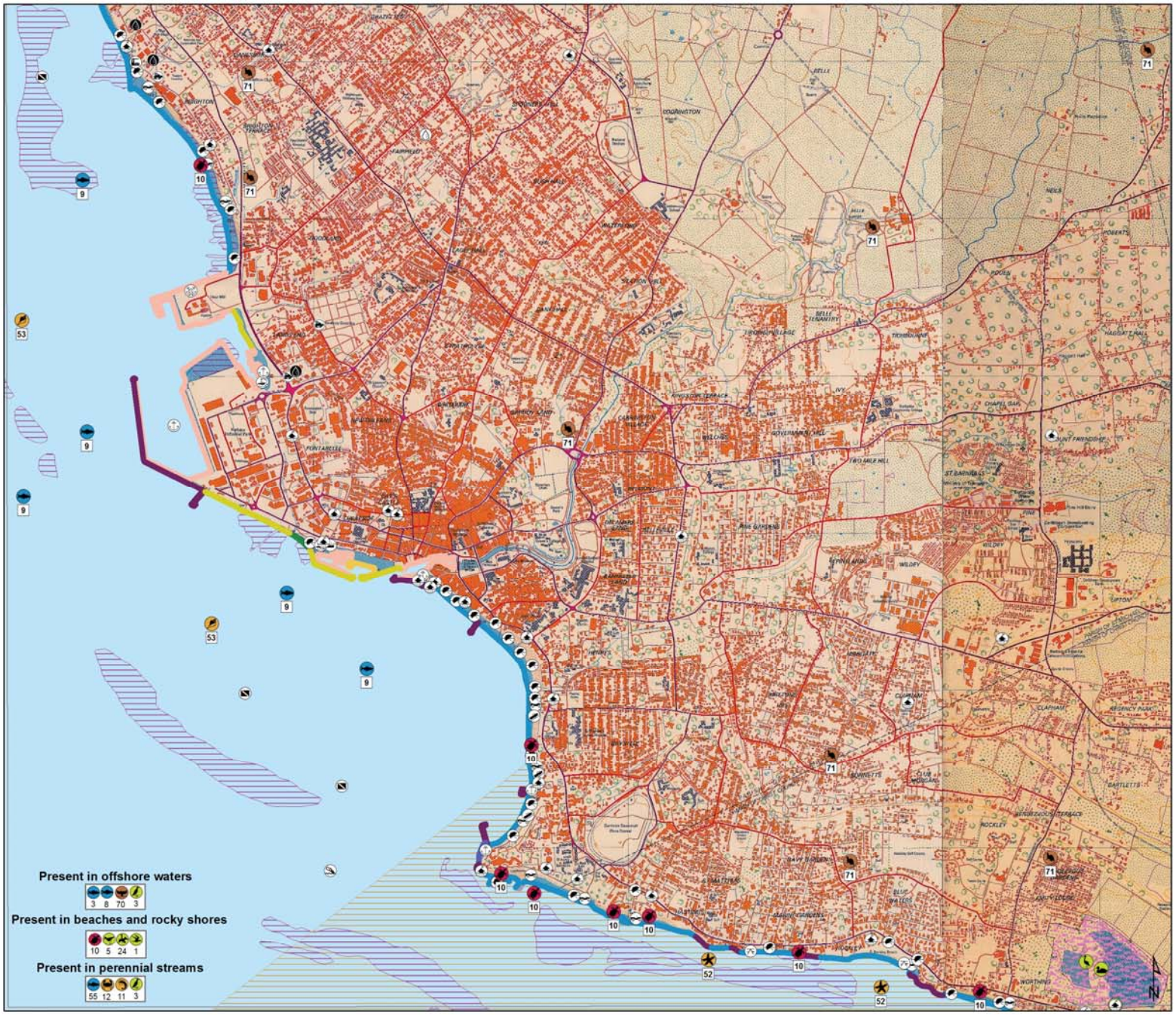
TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

Environmental Sensitivity Index Map



Bridgetown Barbados ESI Map
ESI 8 (2011)

Legend

Shoreline Habitats (ESI)

- 1A Exposed rocky cliffs
- 1B Exposed, solid man-made structures
- 2A Exposed wave-cut platforms in bedrock
- 3A Fine- to medium-grained sand
- 4 Coarse-grained sand
- 5 Mixed sand & gravel
- 6A Gravel beaches
- 6B Riprap
- 8B Sheltered, solid man-made structures
- 8C Sheltered Riprap

0 0.25 0.5 1 Kilometers

0 0.25 0.5 1 Miles

1:25,000

Sponsored by the
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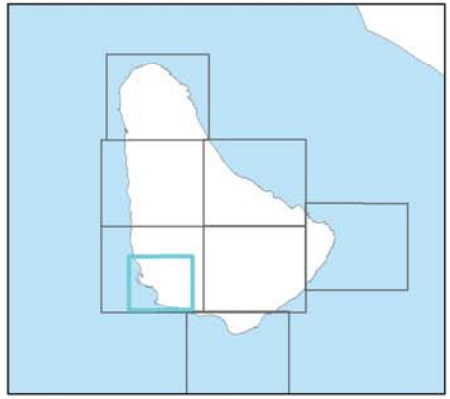

BARBADOS ESI MAP 8 (BRIDGETOWN) - BIOLOGICAL RESOURCES

BIRDS:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
24	Green Heron																		
1	Magnificent Frigatebird			x	x	x	x	x	x	x	x	x	x	x	x				
	Roseate Tern																		
2	American Kestrel			x	x	x	x	x	x	x	x	x	x	x	x				
	Barbados Bullfinch			x	x	x	x	x	x	x	x	x	x	x	x				
	Yellow warbler																		
3	Audubon's shearwater			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Oct	May-Oct
	Broad-winged Hawk			x	x	x	x	x	x	x	x	x	x	x	x				
	Laughing Gull			x	x	x	x	x	x	x	x	x	x	x	x				
	Merlin			x	x						x	x	x	x	x				
4	Belted Kingfisher																		
	Common Moorhen			x	x	x	x	x	x	x	x	x	x	x	x	Mar-Jul	Mar_Jul	Apr-May	Jun-Jul
	Osprey			x	x				x	x	x	x	x	x	x				
	Yellow-cronned Night Heron																		
5	Least Sandpiper			x	x						x	x	x	x	x				
	Lesser Yellowlegs			x	x						x	x	x	x	x				
	Ruddy Turnstone			x	x						x	x	x	x	x				
	Semipalmated Plover			x	x						x	x	x	x	x				
	Spotted Sandpiper			x	x						x	x	x	x	x				
6	Black-crowned night-heron			x	x						x	x	x	x	x				
	Brown Pelican			x	x	x	x	x	x	x	x	x	x	x	x				
	Little Blue Heron			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Jul	Apr-Jul	May-Aug	May-Aug
	Royal Tern			x	x	x	x	x	x	x	x	x	x	x	x				
	Snowy egret			x	x	x	x	x	x	x	x	x	x	x	x	Apr-Aug	Apr-Aug	May-Sep	May-Sep
	White-tailed Tropic Bird																		
7	Black-bellied whistling-duck			x	x	x	x	x	x	x	x	x	x	x	x	Feb-Aug	Mar-Jun	May-Jun	Jul-Aug
	Brown Booby			x	x	x	x	x	x	x	x	x	x	x	x				
	Caribbean Coot			x	x	x	x	x	x							Jan-Jun	Mar-Jun	Apr-Jun	Apr-Jun
	Masked duck			x	x						x	x	x	x	x				

FISH:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Laying	Juveniles	Adults
55	Mountain Mullet			x	x	X	x	x	x	x	x	X	x	x	x				
8	Marlin																		
	Sailfish																		
	Tuna																		
	Blackfin tuna																		
9	Blue marlin																		
	Flying fishes																		
	Skipjack tuna																		
	Swordfish																		
	Wahoo																		
	Yellowfin tuna																		

HABITAT:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
72	Coral reef																		
73	Seagrass																		

INVERTEBRATES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Breeding	Juveniles	Adults
11	Atya innocous			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Atya scabra			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium carcinus (crayfish)			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium acanthurus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium crenulatum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium faustinum			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
	Macrobrachium heterochirus			x	x	x	x	x	x	x	x	x	x			Feb-Aug	Aug-Sep	Jan-Dec
12	Freshwater Crab			x	x	x	x	x	x	x	x	x	x			Mar-May	Jul-Sep	Jan-Dec
	White Crab (Corbo)			x	x	x	x	x	x	x	x	x	x					Jan-Dec
	Black Crab			x	x	x	x	x	x	x	x	x	x			Mar-May		Jan-Dec
52	Sea urchins																	
54	Gastropods																	
53	Caribbean spiny lobster																	

MARINE MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
47	Sperm whale			x	x	x	x	x						x	x				

TERRESTRIAL MAMMAL:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Laying	Hatching	Fledging
71	Green monkey																		

REPTILES:

RAR#	Species_Name	Conc	T-E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nesting	Hatching	Juveniles	Adults
69	Barbados Threadsnake																		
	Green Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
10	Hawksbill Sea Turtle			x	x	x	x	x	x	x	x	x	x	x	x	May-Oct	July-Dec	Jan-Dec	Jan-Dec
	Leatherback Sea Turtle				x	x	x	x	x	x	x	x				Feb-Jul	Apr-Sep	Apr-Sep	Mar-Aug

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