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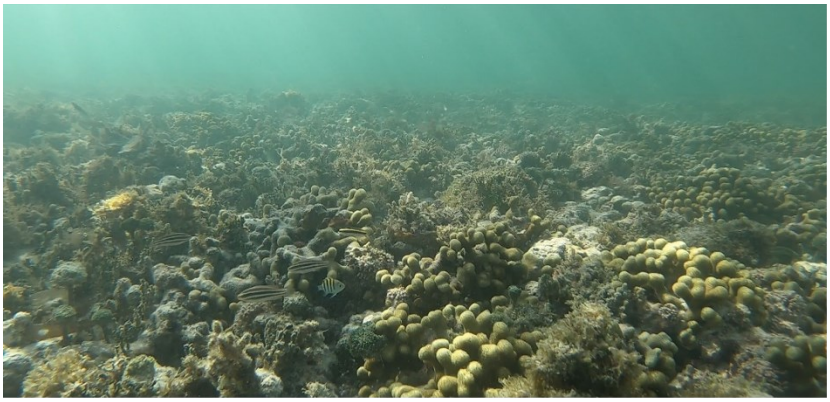
Quick Scan Marine Environment

Ecosystem and Biodiversity Composition and Potential Negative Impacts of the beach development activities in front of the Hilton Embassy Suites, at Eagle Beach.



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Introduction

This is a Quick Scan Assessment Report by Fundacion Parke Nacional Aruba (FPNA) of Ecosystem and Biodiversity Composition and Potential Negative Impacts of the beach development activities in front of the Hilton Embassy Suites, at J.E. Irausquin Blvd. 268, Eagle Beach.

Despite the clearly visible presence of protected species (*Conocarpus erectus* & *Thalassia testudinum*), a beach development project started on the coast in front of Hilton Embassy Suites Aruba without clear indication of impact mitigations to these crucial, vulnerable and protected species. In particular the methods of construction, the proximity and overlap of construction activities to sensitive habitat without noticeable considerations for the environment, and unclarity related to infrastructure will likely result in significant negative impact to what is a relatively healthy and unique marine habitat and ecosystem.

This Quick-Scan was conducted by a team of marine biologists from FPNA to investigate the current marine biodiversity and ecosystem features of this specific area to be able to gauge the potential impacts of beach development in an area of significant natural value that has previously been left untarnished. This pristine little coastal sanctuary is the only remaining coast with seagrass reaching all the way up to the low tide line in the hotel zone, a unique habitat that is only seen in two sites in Aruba.

Background

Mangrove forests, seagrasses, and coral reefs are crucial ecosystems that are interconnected and provide a variety of benefits to humans and the environment:

Mangrove forests: prevent coastal erosion, absorb nutrients, sequester carbon dioxide from the air, filter run-off from and land are a nursery to numerous fish species and crustaceans.

Seagrass beds: bind sediments, absorb nutrients, and support a diverse community of vertebrate and invertebrate communities, including maturing commercially important fish species.

Coral reefs: protect the coastline from storms and erosion, are a source of livelihood and recreation, and have been called ‘rainforests of the seas’ for their high biodiversity.

The health of these three ecosystems is interconnected so when one ecosystem is damaged, it can have a negative impact on the others. For example, if mangroves are destroyed, it can lead to increased erosion and flooding which in turn damages the seagrass and coral reefs.

Numerous marine species depend on all three systems – mangrove, sea grass and coral reef - as they progress through these ecosystems during their different life stages from birth to adulthood and reproduction.

In Aruba, these three systems are under severe threat from coastal development and other associated anthropogenic impacts (1; 2; 3), including but not limited to (land-based sources of) pollution, unregulated and unsustainable recreation and extraction. Therefore, the remaining mangroves, seagrasses and corals are already a fraction of what ecosystems and biodiversity needs for resilience and longevity of Aruba’s natural values.

The area where this Quickscan was conducted is in the hotel area along the west coast of Aruba. This particular beach and sheltered shallow water bay have remained relatively unused for human recreation due to biophysical composition. It forms a specific small body of marine environment bordered on both northern and southern edge by manmade (stone/cement) dikes extending approximately 100 meters into the sea. These dikes serve as barriers to the adjacent more frequented beaches and also keep watersports activities at the outer edge as most marine traffic simply passes by and does not enter the bay.

Methods

The shoreline was surveyed by conducting visual assessments of the present flora and fauna. Surveys in water were performed by conducting visual assessments (including photo analysis) and conducting a roving survey while snorkeling above seagrass meadows, corals, and present bottom cover. The roving survey covered a nearshore shallow area (yellow) of approximately 635 square meters at a depth of 0.2 to 0.5 meters as well as a gradient section (red) of 2700 square meters, varying in depth from 0.5 to 2 meters near the seaward edge of the sheltered bay (Image 1). In total, approximately 10% of the bay between the 2 dikes was surveyed. All observed species were recorded and identified.

Supplementary work included satellite and drone imagery analysis and camera surveys to determine the position of the deeper edge of meadows and mangrove areas. Drone imagery was used to compare the recent changes due to the initial start of beach development before this project was halted.

Image 1: Areal overview of the bay with the two areas covered by the roving surveys.

Results

Mangroves

The shoreline surveyed in this area consists of a narrow beach with lush Buttonwood mangroves (*Conocarpus erectus*) of different sizes and ages growing along the water's edge. These mangroves shelter the beach and immediate marine environment from the road, erosion and other anthropogenic stressors and harbor different bird and invertebrate species.

Seagrasses

Seagrasses are flowering plants that live underwater. Like land plants, seagrasses produce oxygen. Seagrass beds form in shallow coastal lagoon areas as they require high light availability. The main species of seagrass found during the surveys conducted was Turtle Grass (*Thalassia testudinum*).

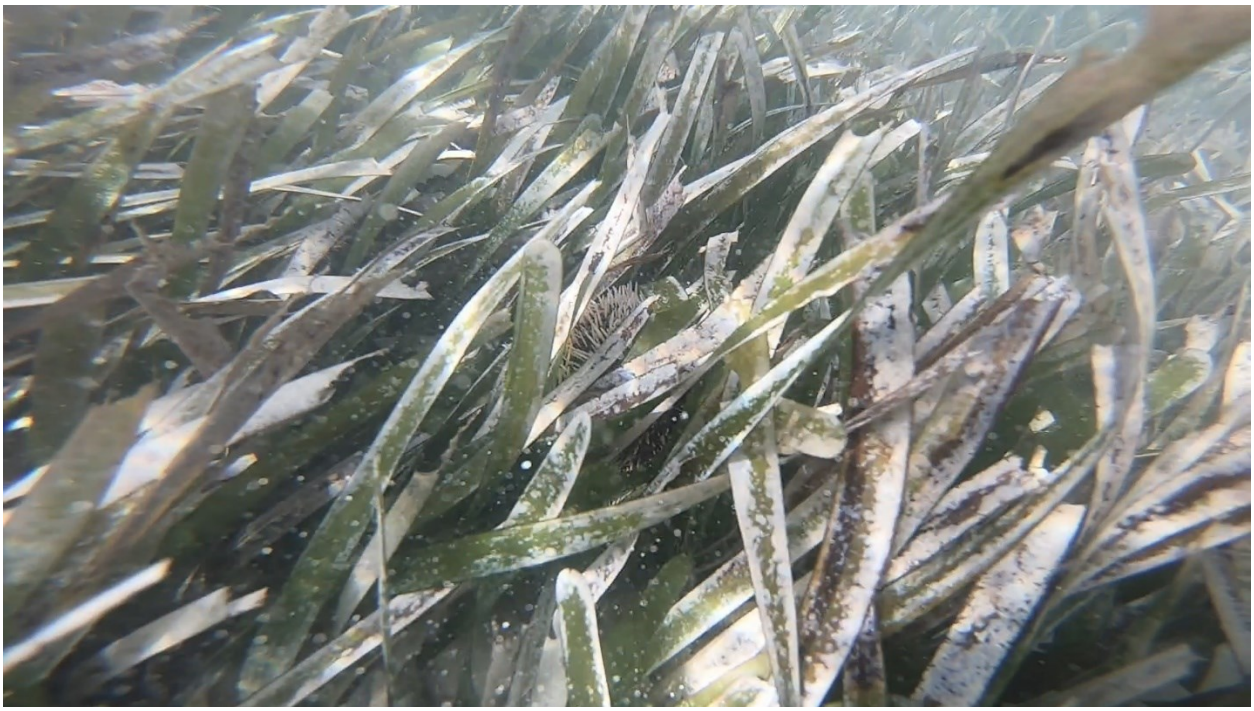

Image 2: Dense seagrass bed of Turtle grass (Thalassia testudinum) is home to many species such as the West Indian sea egg (Tripneustes ventricosus) sea urchin.

Seagrass ecosystems are considered to be amongst the most productive in the world; an average growth rate of seagrass leaves is about 5mm per day, with entire stands of seagrass being turned over every 16 weeks with 3-4 crops annually. In addition to this, the blades of seagrasses provide a huge surface area for settlement of epiphytes (plants that live on the surface of another organism such as calcareous green algae, crustose coralline red algae, cyanobacteria, diatoms and epifauna (animals that live on the surface of another organism such as sponges, hydroids, bryozoans, foraminiferans)). For a square meter of seabed, a dense seagrass stand may have 20m2 of leaf area for other organisms to settle on. The productivity of the epiphytes can be twice that of the seagrasses themselves. Through a succession of growth seagrasses turn vast areas of unconsolidated sediments into highly productive plant dominated, structured habitat with a diversity of microhabitats.

The seagrass stands surveyed at this specific location at Eagle Beach are dominated by Turtle grass (*Thalassia testudinum*) and banks of calcareous alga (*Halimeda sp.*) and other macroalgae (*Penicillus dumetosus, Galaxaura spp., Padina sanctae-crucis, Dictyota spp.*). Turtle grass is the dominant native

seagrass species, where this seagrass is thick and healthy it is not outcompeted by the macroalgae. However, due to high influxes of nutrient runoff (the site is near Aruba's largest sewage water treatment plant), the macroalgae are abundant in the areas that are not covered with seagrass. In this particular bay, the macroalgae cover contributes to the stabilization of the bottom, allowing seagrasses and corals to grow without being hampered by high turbidity that would otherwise reduce the available light (4).

Only the native seagrass, Turtle grass (*Thalassia testudinum)*, was found to be established in the surveyed area. However, some loose floating rhizomes and leaves of the invasive seagrass, *Halophila stipulacea*, were also observed in the water column and washing up on the beach. *H. stipulacea* could displace the native species if human disturbance is allowed to increase in this area as it is known invade disturbed areas (5). The leaves of the invasive *H. stipulacea* are smaller and contain a much lower nutrient value for the species that forage on seagrass (6).

Corals

Corals are diverse groups of invertebrate animals. Coral polyps are tiny, soft-bodied organisms that are related to jellyfish and sea anemones. Different species of coral are found in different habitats and different locations around the world. Hard corals like star corals and brain corals are reef-building corals. Colonial hard corals, consisting of hundreds to hundreds of thousands of individual polyps, are cemented together by the calcium carbonate "skeletons" they secrete. As colonies grow over hundreds and thousands of years, they join with other colonies and become reefs.
Coral reefs teem with life. Although they cover less than one percent of the ocean floor, they support about 25 percent of all marine creatures. Corals are particularly vulnerable to the effects of human activities including pollution, climate change, sedimentation, and fishing. Under the Endangered Species Act, more than 25 coral species are listed as threatened or endangered.

Within the surveyed area 5 species of stony corals were observed, namely the Shallow water starlet coral (*Siderastrea radians*), Symmetrical brain coral (*Diploria strigosa*), Knobby brain coral (*Diploria clivosa*), Thin finger coral (*Porites divaricata*), Mustard hill coral (*Porites astreoides*), and additionally the hydrocoral species Fire coral (*Millepora striata*).

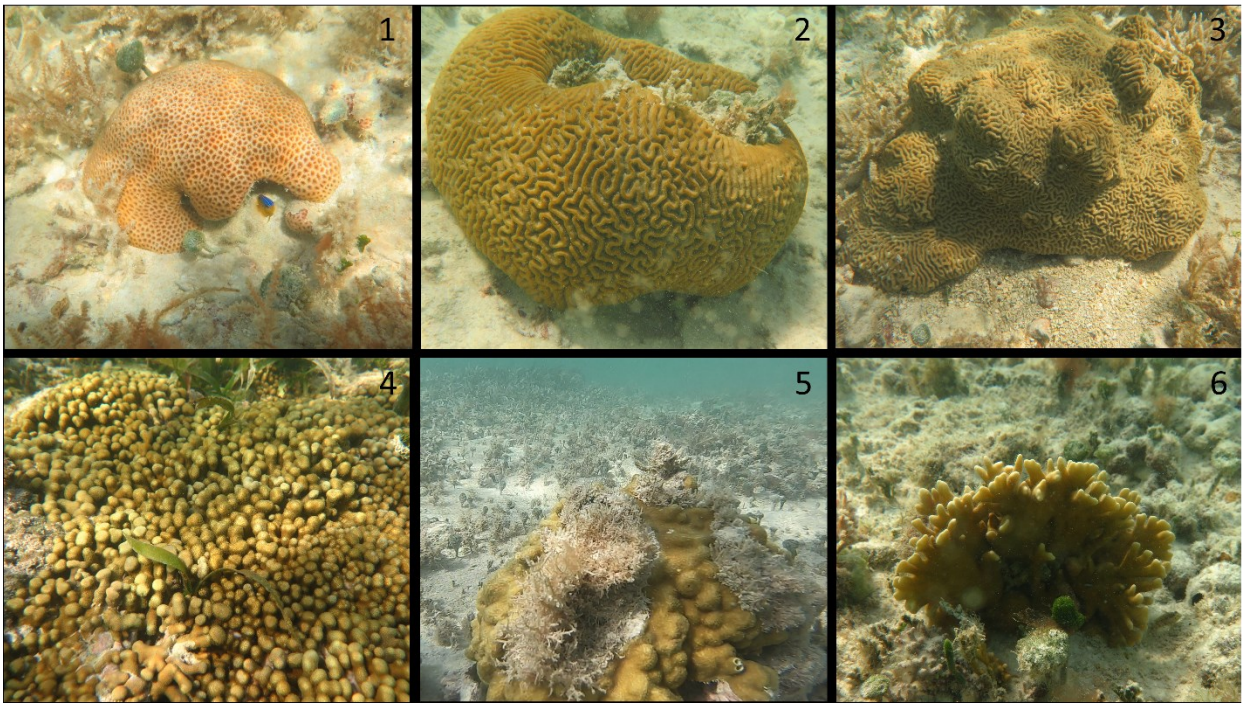

Image 3: The observed corals (1) Shallow water starlet coral (Siderastrea radians), (2) Symmetrical brain coral (Diploria strigosa), (3) Knobby brain coral (Diploria clivosa), (4) Thin finger coral (Porites divaricata), (5) Mustard hill coral (Porites astreoides), and (6) Fire coral (Millepora striata).

Most of these coral species are classified as Critically Endangered (CR), Near Threatened (NT) or Vulnerable (VU) (Table 1) in the IUCN Red List of Threatened Species[1]. While in the rest of the waters around Aruba many stony corals, including the observed Brain coral species, are suffering from Stony Coral Tissue Loss Disease (SCTLD). During the roving surveys none of the stony corals showed signs of SCTLD. The inner bay shape of the area may prevent currents from bringing in this highly virulent coral disease, keeping the corals in the bay isolated from it. In the future this could be one of few remaining areas that can serve as a source for natural recruitment and recovery of corals around Aruba.

Observed biodiversity

Somewhat unexpectedly, this unique 'sectioned-off' marine habitat has a high biodiversity presence. The research team observed over 40 different species (Table 1) during the quick survey. Besides the highly valuable, endangered and protected mangroves, seagrass and corals, essential grazers for coral and ecosystem health were also observed. These include juvenile (initial) stages of three species of parrotfish (Scaridae) and the Long-spined urchin (*Diadema antillarum*), all protected by national decree under the Nature Ordinance (AB 1995 no2, Article 4, 2b). Additionally, Coralline algae (*Corallinaceae*), another protected species (AB 1995 no2, Article 4, 1a) was also observed on several structures. Coralline algae, besides being a valuable food source for grazers, also function as the cement base for coral recruitment, settlement and reef building.

[1] IUCN Red List of Threatened Species (https://www.iucnredlist.org/en)

Table 1: Observed species during Quickscan of 28 June 2023.

Common name	*Scientific name*	Article 4	SPAW Annex	CITES	IUCN Status
Flora					
Buttonwood mangrove	*Conocarpus erectus*	x	III		LC
Turtle grass	*Thalassia testudinum*	x	III		LC
Coralline algae	*Corallinaceae*	1a			NE
Halimeda	*Halimeda sp.*				NE
Bristle Ball Brush	*Penicillus dumetosus*				NE
Tubular Thicket algae	*Galaxaura spp.*				NE
White scroll algae	*Padina sanctae-crucis*				NE
Y-branched algae	*Dictyota spp.*				NE
Stony corals					
Shallow water starlet coral	*Siderastrea radians*	x	III	II	LC
Mustard hill coral	*Porites astreoides*	x	III	II	LC
Symmetrical brain coral	*Diploria strigosa / Pseudodiploria strigosa*	x	III	II	CR
Knobby brain coral	*Diploria clivosa / Pseudodiploria clivosa*	x	III	II	NT
Thin finger coral	*Porites divaricata*	x	III	II	LC
Hydrocorals					
Fire coral	*Millepora striata*	x	III	II	VU
Sponges					
Yellow tube sponge	*Aplysina fistularis*				NE
Lumpy overgrowing sponge	*Desmapsamma anchorata*				NE
Stinker sponge	*Ircinia felix*				NE
Fire sponge	*Tedania ignis*				NE
Fish					
Banded butterflyfish	*Chaetodon striatus*				LC
Foureye butterfly fish	*Chaetodon capistratus*				LC
Ocean surgeonfish	*Acanthurus tractus/bahianus*				LC
Blue tang	*Acanthurus coeruleus*				LC
Blue runner	*Caranx crysos*				LC
Yellowfin mojarra	*Gerres cinereus*				LC
Smallmouth grunt	*Haemulon chrysargyreum*				LC
French grunt	*Haemulon flavolineatum*				LC
Squirrelfish	*Holocentrus adscensionis*				LC
Honeycomb cowfish	*Acanthostracion polygonius*				LC
Smooth trunkfish	*Lactophrys triqueter*				LC
Spotted scorpionfish	*Scorpaena plumieri*				LC
Spotted goatfish	*Pseudupeneus maculatus*				LC
Redband parrotfish	*Sparisoma aurofrenatum*	x			LC
Bluehead	*Thalassoma bifasciatum*				LC
Slippery dick	*Halichoeres bivittatus*				LC

Sergeant major	*Abudefduf saxatilis*				LC
Dusky damselfish	*Stegastes adustus*				LC
Cocoa damselfish	*Stegastes variabilis*				LC
Sand-canyon goby	*Coryphopterus bol / venezuelae*				VU
Striped parrotfish	*Sparisoma viride*	x			LC
Princess parrotfish	*Scarus taeniopterus*	x			LC
French angelfish	*Pomacanthus paru*				LC
Hardhead silverside	*Atherinomorus stipes*				LC
Invertebrates					
Hermit crab					NE
Ciliated false Squilla	*Psuedosquilla ciliata*				NE
West indian sea egg	*Tripneustes ventricosus*				NE
Rock-boring urchin	*Echinometra lucunter*				NE
Christmas tree worm	*Spirobranchus giganteus*				NE
Long-spined urchin	*Diadema antillarum*	x			NE
Bearded fireworm	*Hermodice carunculata*				NE

In the described habitats and in addition to the observed species, there are a number of species that were not observed during the Quickscan, however they have a strong association with the observed biodiversity and ecosystems (Table 2). These include three species of sea turtles, the critically endangered Hawksbill (*Eretmochelys imbricata*) for which the observed sea sponges are a food source, the endangered Green sea turtle (*Chelonia mydas*) that mainly consumes Turtle grass (*Thalassia testudinum*) (7), and the vulnerable Loggerhead (*Caretta caretta*) that eats many seagrass and coral associated invertebrates, such as urchins, conch and shellfish.
Additionally, the protected Queen conches (*Strombus gigas*) (8), Caribbean spiny lobsters (*Panulirus argus*) (9) and Longsnout seahorses (*Hippocampus reidi*) are likely to be found in this ecosystem and may have been observed were a more extensive survey carried out.

Table 2: Species directly or indirectly associated with the observed ecosystems & biodiversity.

Common name	**Scientific name**	**Article 4**	**SPAW Annex**	**CITES**	**IUCN Status**
Hawksbill	*Eretmochelys imbricata*	x	II	I	CR
Loggerhead	*Caretta caretta*	x	II	I	VU
Green sea turtle	*Chelonia mydas*	x	II	I	EN
Queen conch	*Strombus gigas*	x	III	II	NE
Caribbean spiny lobster	*Panulirus argus*	x	III		NE
Manatee grass	*Syringodium filiforme*	x	III		LC
Longsnout seahorse	*Hippocampus reidi*			II	NT

Observed impacts

Based on the drone and satellite imagery, a comparison over time (Image 4, 5 & 6) illustrates the formation of new paths through the Buttonwood mangroves (*Conocarpus erectus*), fragmenting this important mangrove forest. Additionally, mangrove die-off can be observed, especially in the section that is now fragmented from the rest and has additional pressures from increased traffic on the new paths.

During the survey, it was also observed that the south-eastern corner of the bay had been filled with a large amount of white sand (Image 5 & 6), covering seagrasses and corals and inhibiting them from the sunlight they need to survive (Image 7 & 8).

Image 4: Areal view of the bay in January 2022, extracted from Google Earth on 29 June 2023.

Image 5: Areal view of the bay on 3 June 2023, extracted f Google Earth on 29 June 2023.

Image 6: Areal view of the bay taken by drone on 28 June 2023.

Image 5: Turtle grass (Thalassia testudimun) being covered in sand.

Image 4: Shallow water starlet coral (Siderastrea radians) being covered in sand.

Discussion

It is important to note that this Quickscan conducted by the research team of FPNA does not comprise an extensive assessment of this area. Even in such a short time span and without covering the entire bay, a high variety of species was documented, and it is clear that the coastal area in front of Hilton Embassy Suites Aruba is of significant importance to preserve for its biodiversity and ecosystem functions. A complete environmental assessment of the area would result in the documentation of even more species and natural values.

Relocation of seagrasses and corals to prevent harm to these species is not a viable option as these species are unlikely to survive such interventions. Seagrasses have rhizomes and propagate further underground, forming a clonal colony seagrass network that is stabilized the sediments. By fragmenting seagrass for relocation purposes, this severely reduces the resilience to storms and other disturbances, Seagrass transplantation has only been successful if a large mat was relocated (>11m2) as a whole (10). Additionally, the removal of the seagrasses from the shallow water bay at Hilton Embassy Suites would also eliminate their stabilizing function for corals that are present.

Therefore, an adequate environmental impact assessment (EIA) of the hotel and beach development project, as required by international standards for the development of such projects, should have indicated the present biodiversity and at the very least provided recommendations and viable alternatives to prevent or at least reduce the impacts.

Conclusions

The marine sanctuary in front of the Hilton Embassy Suites is likely the last remaining (relatively) undisturbed section of coastline along the hotel-populated western coast of Aruba. It comprises unique ecosystems and biodiversity and is of high value to the marine environment.

Further development of a beach in this location would result in complete biodiversity loss of this area, as can already be seen in the section that was recently filled with sand by the hotel contractors. Additionally, due to the vulnerability of these habitats, increased human activity in these shallow waters will have a high impact on the marine life through trampling, crushing, dragging, increased wave action, and pollutants, ultimately leading to its demise.

Recommendations

Based on the presented findings FPNA recommends keeping this marine sanctuary as pristine as possible and not developing this into a white beach area for recreation. There are already developed beaches and access points to the sea on both sides of the adjacent dikes that can be used for human recreation and enjoyment. FPNA additionally recommends only allowing walking over this section of the coast as a connecting beach, but not to swim or wade in this area as it is very shallow and highly sensitive to trampling.

Through interpretive signs and educational outreach, the unique value of this area can be further highlighted. The Hilton Embassy Suites and neighboring hotels can serve as environmental stewards of the marine area as part of their corporate social responsibility (CSR) and foster this unique highlight of Aruba on their doorstep. However, it is important to inform people of the value of this area without having to physically visit the area. Due to its fragile state, people should be encouraged to not impact the area and appreciate its value from a distance.

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Fundacion Parke Nacional Aruba (FPNA) is an independent conservation management organization, encharged with the conservation of nature, and the management of protected areas in Aruba which as of today encompass just over 24% of Aruba's natural terrain and 0.02% of Aruba's territorial waters in the form of 4 Marine Protected Areas (MPAs) at Oranjestad, Mangel Halto, Sero Colorado and Arikok.

FPNA's conservation management philosophy is characterized by an integrated and inclusive approach to nature conservation with a focus on heterogeneity and island wide connectivity of nature to maintain long term ecological sustainability, integrity of our biosphere, and related ecological processes. At FPNA, by our 8 guiding conservation principles, we apply strategic, evidence-based, precautionary, adaptive, and integrated conservation management to address conservation issues, deliver conservation objectives and critically evaluate all our conservation endeavors. We work according to the principles of Ecosystem-Based Management (EBM) and Biodiversity Conservation, using the Conservation Standards (Theory of Change) to deliver high conservation performance.

Ecosystem-Based Management (EBM) is an integrated management approach applied by FPNA in all conservation efforts. EBM aims to manage in an integrated and precautionary manner human uses and their cumulative impacts on terrestrial, marine and coastal ecosystems functioning on an ecological scale, rather than confined to jurisdictional boundaries or considering single issues, species or ecosystem services in isolation.

Biodiversity Conservation goes hand in hand with habitat and ecosystem conservation. FPNA prioritizes in-situ biodiversity conservation with a strong focus on the conservation of endemic species, keystone species, threatened/endangered species and the mitigation of invasive/alien species.

Whenever and wherever necessary, FPNA will apply the *precautionary principle* as a strategy to cope with possible risks where scientific understanding is yet incomplete, as is often the case for Aruba. Where serious or irreversible damage is imminent, the lack of full scientific certainty should not be used as a reason to continue activities and to postpone measures to prevent degradation of nature and the environment.