GARAPAN WATERSHED CONSERVATION ACTION PLAN

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The Garapan/West Takpochao Conservation Action Plan was first compiled in 2012-2013 and updated in 2015 by Kaitlin Mattos, Watershed Coordinator at the Bureau of Environmental and Coastal Quality, Office of the Governor, Commonwealth of the Northern Mariana Islands.

Much of the information contained in this plan was taken directly from existing CNMI Government planning documents obtained from BECQ, DPW, DLNR and other local agencies, as well as US federal government documents from NOAA, USDA-NRCS and others. Valuable feedback and contributions to this document were provided by local and federal government partners, non-governmental organizations and private individuals.

Approved by:

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EXECUTIVE SUMMARY

The Garapan area is part of a subwatershed called West Takpochao Central that drains the area from Mount Takpochao out into the lagoon, between Fishing Base and Smiling Cove (figures 1 and 2, pages 11-12). This area is significant because of its terrestrial forest resources, easily accessed lagoon waters, high population densities, key commercial districts, and important social and community role. Beginning in September 2012, a diverse group of stakeholders including local and federal government agencies, private businesses and contractors, non-profits and college faculty and students formed an advisory group and drafted a Conservation Action Plan (CAP) for the West Takpochao Central subwatershed to preserve and enhance the natural resources within this area. In 2015, the CAP was reviewed and updated to track improvements and changes within the watershed and initiate new conservation projects and programs. Subsequent updates will continue every 2-5 years as determined by the advisory group.

The advisory group brainstormed and compiled a list of nine focal conservation targets for the watershed area: upland forests, urban greenspace, wetlands and mangroves, beaches, water (quality), turtles, food fish, seagrass habitat and coral reef habitat. According to researchers, natural resource managers and specialists in the CNMI, these targets are being heavily affected by unprecedented rates of development and land-based sources of pollution, such as bacteria from human and animal waste, nutrients from agricultural land use, nutrients and chemicals from urban land use, and sediments from unpaved roads or improper land clearing. Marine threats include poor water quality, turtle poaching and recreational or subsistence use of the marine resources. Stakeholders engaged in the Conservation Action Planning process also voiced concerns about trash, invasive species and climate change effects, which will have impacts on both marine and land habitats. The advisory group prioritized these threats by evaluating the health of the targets and the potential impact of each threat on each target. These priorities will help inform management decisions in the future.

In order to respond to these threats, Garapan CAP partners will be collaborating and leveraging their resources to implement a workplan of strategic actions. These actions can be grouped into six general strategies: implementing best management practices, improving engineering and infrastructure, improving regulations and enforcement, conducting education and awareness programs, continuing research and monitoring, and improving community stewardship and incentive programs. Details involving these strategies and objectives that are expected to be achieved as a result of the implementation are outlined in the strategic workplan (page 22).

The goal of the Garapan Conservation Action Plan is to maintain and improve the valuable natural resources that exist in the West Takpochao Central subwatershed and to coordinate efforts between stakeholders to provide the most benefits to the natural resources and the community that uses them. The implementation of the Garapan CAP workplan will assist in realizing the vision statement for the Garapan watershed developed by the advisory group:

The Garapan watershed is the CNMI's "Hafa Adai" and "Tirow" to the world. Garapan is the convergence of our economic, natural and cultural resources. It provides our community with safe and healthy resources to engage in and share with our visitors. It is thriving and resilient from ridge to reef.

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INTRODUCTION

The Garapan Conservation Action Plan (CAP) is a cooperative effort between regional, federal and local partners with mandates or missions to improve, protect, enhance and conserve the many natural, cultural, social and economic resources within the Garapan area of Saipan. In the Commonwealth of the Northern Mariana Islands (CNMI), increased development in coastal and inland areas and increased use of our terrestrial and marine natural resources has exacerbated threats facing our environment. Trends observed by long-time residents include an increase in impermeable surfaces, the localized depletion of fish stocks, increased contamination of beaches and near shore waters, and destruction of coral reefs. These effects are magnified within the Garapan area, which serves as Saipan's center of population, commerce, economic development and tourism, as well as a gathering place for the community.

Garapan and its surrounding villages form a large part of the West Takpochao watershed, and although the majority of the environmental threats are land-based, strong rains during parts of the year and the natural flow of water causes land-based threats to have dramatic effects on the Saipan lagoon. From a long-term perspective, the decline in marine health threatens the CNMI's cultural heritage, traditional ways of life and physical protection from storms. However, this decline also immediately impacts CNMI's tourism and fisheries industries, and thus its economy. As such, the CNMI government places coral reef ecosystem conservation and management as a priority concern (CNMI and NOAA Coral Reef Conservation Program, 2010).

In 2008, the CNMI was approached by The Nature Conservancy (TNC) Micronesia program and offered assistance in developing site-specific management plans through the Conservation Action Planning process. The CAP process was designed by TNC to bring multiple stakeholders to the table and incorporate both scientific and anecdotal information into an overarching set of conservation priorities. The shift of emphasis to site-specific management of threats facing the CNMI's marine environment was further supported by the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) as a way of focusing conservation efforts.

Through the CRCP priority-setting process and the CNMI Coral Reef Management Priorities document developed from it, the CNMI resource management agencies and their federal partners designated three priority watersheds for conservation action: the Laolao Bay and Garapan watersheds on the island of Saipan and the Talakhaya/Sabana watershed on the island of Rota. CAPs for Laolao Bay and Talakhaya/Sabana were completed in January 2009 (updated in 2012) and January 2012 (updated in 2015) respectively, laying out the conservation priorities and a strategic workplan for those areas.

SUMMARY OF THE CONSERVATION ACTION PLAN PROCESS

The Garapan CAP process followed the model established by TNC, using the Miradi adaptive management software tool developed by the Conservation Measures Partnership and Beneficent Technology, Inc. The CAP process is represented by four major steps which work together to form a cyclical analysis of conservation planning. The cycle starts with defining the project, which includes defining the people (stakeholders) involved, as well as the project scope and focal targets. During this initial step, partners examine target viability, rate critical threats to the focal targets, and perform a situation analysis. Then, the project team develops objectives, strategies and actions to be

performed and implemented in order to mitigate threats and improve the health of the focal conservation targets. These steps are followed by the gradual implementation of the strategies and measures, then the use of the results to adapt and improve before beginning the process again. The process helps groups to focus on certain conservation aims, threats and strategies by engaging key stakeholders and team members to achieve desired outcomes, measure their achievements and reevaluate and continue their progress (The Nature Conservancy, 2007).

PROCESS AND MANAGEMENT APPROACH

The planning process for this management plan was initiated during a workshop in September 2012 and several subsequent group and individual follow-up meetings. The Garapan CAP published in 2013 established conservation targets, identified threats, prioritized conservation goals and created strategies to reach those goals. In March 2015, stakeholders met again to evaluate progress of the CAP so far, update the CAP with more recent scientific data, and add and remove strategic actions based on progress and the current status of the natural resources of concern. Every effort was made to include technical staff, resource managers, infrastructure managers and other government, political and community stakeholders in this process. Individual follow-up meetings were held to complete the drafting and final revised version of the Conservation Action Plan in 2015.

This Conservation Action Plan represents the best available information and analyses of the programs and projects that were discussed during meetings. The CAP will be updated every two to five years and includes a strategic workplan that will be reviewed and updated every one to two years. Updates will be done by the advisory group which was initially involved in the CAP workshop, which will be convened in association with the Watershed Working Group. Actions discussed in the workplan are being implemented on individual schedules. Partners are not bound to the actions discussed within the workplan, rather the CAP is a guiding document that integrates information across agencies and organizations to enable partners to work towards common priorities within their own resources and abilities.

EXISTING MANAGEMENT PLANS AND RESOURCES

The Garapan CAP is intended to be a comprehensive natural resource management plan for the entire watershed area. Therefore, current and former projects, studies and plans were included as part of the strategic workplan, and their sponsoring organizations were listed as partners in this process. The advisory group assisted with identifying new and existing projects and plans within their agencies/organizations to be incorporated into the CAP. The plans described on the following page will be accessible to Garapan stakeholders, and project updates will be included in periodic and annual meetings. There is no reason to duplicate efforts or exclude from the plan projects that are already underway. Rather, the Garapan CAP serves to bring all of these projects together and fill in missing pieces with new strategies as outlined in the workplan.

Plan/Project	Agency	Year Published	Summary
Saipan Lagoon Use Management Plan	CRM	1997	CRM guiding document; provides guidance for parks management, multiple use zoning, stormwater pollution control, resource concerns.
NPS 5-15 Year Plan	CRM DEQ	1999	Outlines NPS objectives through 2014, including restoring designated uses of all water bodies. Mentions Garapan drainage improvements as top priority
Garapan Revitalization Project	CIP	2003	Describes projects to improve infrastructure around Coral Tree Ave and other areas that are at least partially funded
Garapan Watershed Study Status Report	USDA – NRCS	2003	Reports preliminary findings and recommendations to address trash, sewage and upland watershed improvements as part of the Garapan Watershed Project, which was discontinued in 2004
Garapan Water Quality Restoration Project	DEQ	2004	Conceptual design for building a stormwater treatment area on the old Samoan housing lot in Garapan to improve water quality in the Fiesta Drainage – project has since been discontinued
Conceptual Stormwater Management Plan for the Garapan II Drainage	DEQ	2005	Recommends watershed (surface water) sampling, major changes and BMPs for areas of stormwater concern; recommends soil stabilization (erosion control) as best cost effective management method.
Aquatic Ecosystem Restoration Study – Drainage designs	CRM, Army Corps	2006	Describes preliminary designs for possible sediment basins near China House, Gualo Rai and Quartermaster to contain stormwater before it reaches the lagoon
Garapan and Beach Road Revitalization Plan	Zoning	2007	Describes tourism vision for Garapan area and recommends short-, medium-, and long-term improvements (mostly aesthetic/tourism-related) to various pieces of infrastructure and natural resources
Garapan Tourism District Stormwater Conceptual Study	CIP	2010	Develops a list of prioritized stormwater improvements for three main Garapan drainages and alternatives -- this is the guidance document for stormwater-related engineering works and BMPs in the Garapan area
CNMI Statewide Assessment and Resource Strategy	DLNR Forestry	2010	Analysis of statewide forest resources and conditions with goals to protect and conserve forests and enhance public benefit from forest resources. Prioritizes upper Garapan watershed for vegetation work to decrease erosion

DESCRIPTION OF THE GARAPAN WATERSHED

LOCATION AND GOVERNANCE

The 466-mile long Mariana Island archipelago includes fourteen islands within the US Commonwealth of the Northern Mariana Islands in the western Pacific. The Mariana Islands are the closest Pacific Island chain to Japan, approximately 1,500 miles from Tokyo or approximately 3 ½ hours by air. The northernmost of the populated islands, Saipan, is located at 15^{o} 10'51 N and 145^{o} 45'21 E. The island is 5.6 miles by 12 miles at its widest parts and covers 44.55 square miles. The highest point is Mount Takpochao which climbs to 1,560 ft in the approximate center of the island. Nearly 90% of the CNMI's population is based on Saipan, with 2010 census figures recording 48,220 people (US Census Bureau, 2010).

Multiple government agencies are partners in managing the natural resources of the CNMI. The primary agencies involved are the Division of Environmental Quality, the Coastal Resource Management Office (CRM) and the Department of Lands and Natural Resources (DLNR), which houses the Division of Fish and Wildlife (DFW) and Forestry (under the Division of Agriculture). DEQ was created through Public Law 3-23 to protect the right of each person to a clean and healthful environment. The Commonwealth Environmental Protection Act defines DEQ's purpose, jurisdiction and authorization to issue regulations and implement programs to protect the air, land and water of the Commonwealth. CRM was established with the implementation of Public Law 3-47 within the Office of the Governor to promote the conservation and wise development of coastal resources. Under CNMI law, CRM has regulatory jurisdiction over all lands of the Commonwealth. DLNR was established by Public Law 1-8 "to be responsible for the protection and enhancement of the natural resources of the islands." DFW was created by Public Law 2-51 which was later revised by Public Law 10-57 with the purpose to conserve fish, game and wildlife and to protect endangered and threatened species. CNMI Forestry was created by Public Law 1-8 and repealed and reenacted by Public Law 10-57 with the duty to promote and develop an agricultural program related to plants. Through research, monitoring, regulation, enforcement, planning and management, these agencies seek to ensure the long-term survival and sustainability of the CNMI's natural resources.

The Mayor of Saipan has various duties that are complimentary to the duties of the Office of the Governor. Duties such as providing road clearing or improvement services, assisting with land clearing or earth-moving activities for village cultural events, licensing domestic animals and providing public recreation programs are enabled by Public Law 1-4, amended by PL4-11, PL 4-23, PL 6-5, PL7-33 and PL11-44. The Office of the Mayor of Saipan has jurisdiction for these and other duties related to environmental conservation and natural resources.

In order to own land in the CNMI, individuals must prove they are of Northern Marianas descent. Land leases are available to other corporations or individuals. All lands in the CNMI fall into one of two categories: private lands or public lands. Private lands are all lands that are alienable by the titleholder. Public lands are those that were transferred into the public domain upon the creation of the Commonwealth. Public lands are freely alienable by the Commonwealth and managed by the Department of Public Lands (DPL). Public lands include government acquired lands that have been purchased by the government for public purposes, the use of which is controlled by deed restriction. DPL has the authority to dispose public lands, including the issuing of village homestead and agricultural homestead permits on lots and the subsequent transfer of these lands to private ownership.

PROJECT SCOPE

The West Takpochao watershed is situated in the western central area of Saipan, from the north-south spine of Mt. Takpochao out to the west coast of the island (figures 1 and 2). The northern boundary is Lower Base east to Capitol Hill and the southern boundary is near Quartermaster Road east to Gualo Rai according to USGS survey lines that were established several decades ago (USDA NRCS, 2003). The West Takpochao watershed, which covers 6.62 square miles (17.14 km^2), contains the villages of Chalan Laulau, I Liyang, Gualo Rai, As Falipe, Takpochao, Garapan, China Town, Fananganam, Maturana Hill, Chalan Galaide, American Memorial Park, As Palacios, Navy Hill, As Rabagau, Puerto Rico, Lower Base, Sadog Tasi and Capitol Hill. The Garapan CAP primarily addresses natural resource concerns for the West Takpochao Central subwatershed, which is 2.2 square miles (5.71 km^2) and covers the Falipe, As Falipe and Fanaganam Lichan drainage areas from Fishing Base north to Smiling Cove, and from the Mt. Takpochao ridgeline west to the coastline.

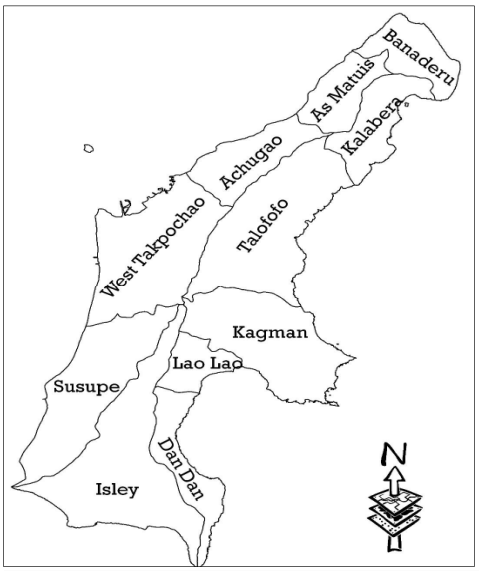

Figure 1: Map of Saipan watersheds (created by DEQ). The intersection of the boundaries in the center of the island is Mt. Takpochao, the highest point on Saipan.

The central subwatershed was chosen as the focus of this plan because it contains the village of Garapan, the most populous village in the CNMI, with nearly 4,000 residents during the 2010 census, and it is the center of economic and community activities on Saipan (US Census Bureau, 2010).

PHYSICAL FEATURES

US Geological Survey (USGS) maps indicate that the western coastal portion of the watershed has 0-5% slopes and consists of urban lands, loamy sand or gravelly soils and muck in the remaining wetland and mangrove areas. Moving inland, slopes increase to 5-15% and soils are gravelly, clay, clay-loam or rock outcrops. Proceeding east and further uphill, slopes increase to 15-30% and become dominated by rock and clay-loam (figure 3, supplemental figures).

As can be observed from casual examinations of the watershed, development within the area is heaviest in the lowland coastal areas and sparser continuing uphill towards the divide. Upland areas are scattered with family compounds, apartment buildings and small farms with piggeries, livestock or crops. The lowland area consists of many businesses, houses and apartments, roads and parking infrastructure and public institutions such as Garapan Elementary School, the Northern Marianas Housing Corporation, and the Commonwealth Healthcare Center. As such, approximately 25% of the West Takpochao watershed is covered with impervious surfaces (DEQ, unpublished data). A variety of ephemeral and intermittent streams flow from the top of the watershed during the rainy season and can cause flash floods and dramatic fluctuations in water level. In the lowland areas, most of the surface water is aggregated into drainage ditches and channeled above- and underground out to the ocean.

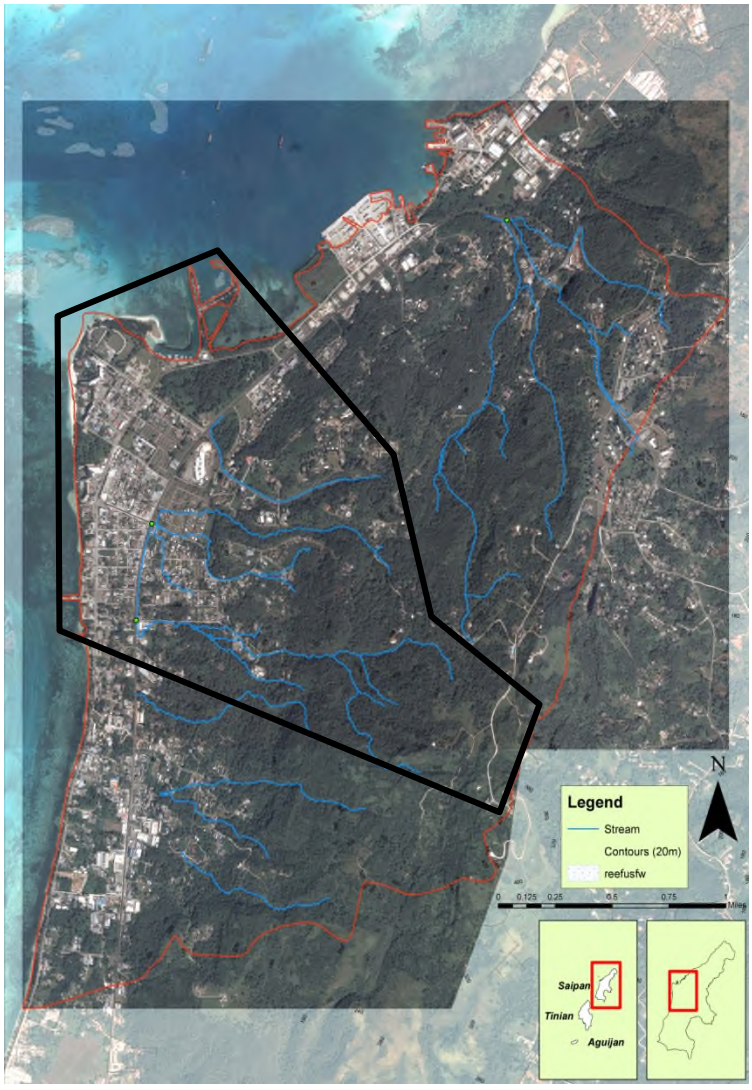

Figure 2: The West Takpochao watershed (outlined in red) can be divided into three segments. Garapan lies within the West Takpochao Central subwatershed (outlined in black), which is approximately 2.2 square miles (5.71 km^2) and covers the Falipe, As Falipe and Fanaganam Lichan drainage areas from Fishing Base at the south to Smiling Cove at the north, and from the Mt. Takpochao ridgeline west to the coastline. (Map created by DEQ.)

The CNMI has three groundwater management zones, all of which are represented in the Garapan watershed area. There are currently five Commonwealth Utilities Corporation (CUC) water tanks and approximately thirty-eight drinking water wells that have access to the groundwater at any given time. Several hotels and other businesses operate eight reverse osmosis (R/O) injection wells in the watershed, used for discharging high salinity brine underground after desalination to produce improved drinking water. A groundwater spring discharges within American Memorial Park on the northwestern corner of the watershed.

Middle Road (Chalan Pale Arnold) and Beach Road (Sunset Drive) are the primary roads within the West Takpochao watershed, while major secondary roads cut through Navy Hill and Chinatown into Lower Base. A variety of small paved and unpaved streets connect to individual neighborhoods. Other important infrastructure includes five CUC sewage lift stations in the subwatershed, where the entire lowland area is connected to the Sadog Tasi sewage treatment plant by underground pipes. The Sadog Tasi Wastewater Treatment Plant outfall pipe discharges treated wastewater into the lagoon in the West Takpochao North subwatershed. The Puerto Rico dump located in Lower Base closed in 2003, but was not properly sealed or cleaned-up. Both groundwater and the lagoon are still contaminated from chemicals leaching out of the dump (Denton et al., 2009).

The Division of Environmental Quality is responsible for regulating and mitigating a variety of point and nonpoint sources of pollution. The West Takpochao watershed has several diesel air stacks permitted by DEQ's Clean Air Program, as well as approximately twenty-six permitted above and underground diesel and fuel storage tanks. The water quality surveillance laboratory at DEQ monitors beaches (weekly), reef flats and sea grass sites (annually) in the lagoon.

The beaches of Garapan constitute one of Saipan's most valuable resources. Most of the West Takpochao Central subwatershed is characterized by sandy, gently sloping beaches that serve as a transition zone between terrestrial and marine ecosystems and a focal point of recreation and economic viability. These beaches enjoy protection from the Saipan lagoon and fringing reefs which prevent significant wave damage and buffer storm surges and tsunami action from the Philippine Sea. According to shoreline erosion mapping and assessments done in the Garapan area, the shoreline extending from the southern boundary of the West Takpochao Central subwatershed area (Fishing Base) to the drainage outlet just south of Fiesta Hotel and Resort have experienced relative stability over the past two decades (US Army Corps of Engineers, 2004). In contrast, the north and northeast extent of Garapan's shoreline is very dynamic. The section that presently includes the beachfronts of Fiesta and Hyatt Resorts and American Memorial Park has been subject to significant change on decadal, annual and semi-annual timescales (US Army Corps of Engineers, 2004; Yuknavage and Palmer, 2010; Krüger et al., 2010). A 2013 study by CRM assessed shoreline data from 2003 through 2011 and confirmed previously identified trends of beach loss along the western shore of American Memorial Park along with significant accretion to the northeast of the park (figure 4, supplemental figures). Although coastlines should be expected to shift over time, significant erosion or accretion could greatly affect natural and cultural resources within the watershed area.

BIOLOGICAL FEATURES

The terrestrial watershed area is dominated by mixed introduced forests, and urban vegetated and urban built-up lands (figure 5, supplemental figures). Native limestone forests segments, named for their unique ancient karst/coral substrate with little soil and little water retention, exist within mixed introduced forested areas. Although these areas are geographically small, they are significant because they contribute to native plant and animal diversity and habitat. These segments have historical and cultural significance for local communities and traditional medicine as well. Plants that make up this forest type include *Premna obtusifolia, Aglaia mariannensis* (mapunyao)*, Elaeocarpus joga* (yoga), *Barringtonia* sp. (fishkill), *Pandanus* spp. (kafu), *Pisonia grandis*, *Trema orientalis*, and *Hibiscus tiliaceus*. DFW bird surveys have identified 21 bird species within the West Takpochao Central subwatershed forest and fringe habitats, which is on par with diversity within other subwatersheds and within Saipan as a whole.

There is a small but important secondary forest, wetland and mangrove area consisting of thirty-five acres (14.14 ha) in the American Memorial Park, the National Park Service's only unit on Saipan. The mangrove tree species *Bruguiera gymnorrhiza* persists in this area. This is the largest and most intact section of mangroves on Saipan (Williams et al., 2007) and was well-studied by National Park Service contractors in the 2000s. The mangrove forests and wetlands are home to fourteen bird species: the Bridled White-eye (*Zosterops conspicillatus*), Collared Kingfisher (*Halcyon chloris*), Eurasian Tree Sparrow (*Passer montanus*), Golden White-eye (*Cleptonis marchei*), Mariana Fruit-Dove (*Ptilinous roseicapilla*), Micronesian Honeyeater (*Myzomela rubratra*), , Micronesian Starling (*Aplonis opaca*), Nightingale Reed Warbler (*Acrocephalus luscinia*), Pacific Reef Heron (*Egretta sacra*), Philippine Turtle Dove (*Streptopelia bitorquata*), Rufous Fantail (*Rhipidura rufifrons*), White Tern (*Gygas alba*), White Throated Ground Dove (*Gallicolumba xanthonura*), and Yellow Bittern (*Ixobrychus sinensis,* Williams et al., 2007), Many of these species also populate the native limestone and Tangantangan (*Leucaena leucocephala)* forest types. The Nightingale Reed warbler was listed as federally endangered in 1970.

The native humped tree snail (*Partula gibba*), listed as a candidate species under the Endangered Species Act, has been identified in the wetlands and mangroves (Williams et al., 2007). Hive snails of the genus *Liardetia* have been observed in these areas as well (Meneses et al. 2013). Other notable species observed include the curious skink (*Carlia fusca*), the Pacific blue tailed skink (*Emoia caeruleocauda),* hermit crabs (*Coenobita brevimanus*), land crabs

(*Cardisoma carnifex*), and the Guardian butterfly (*Hypolimnas anomala,* Williams et al. 2007). These species are also common in the limestone forest and can inhabit other forest and habitat types as well.

According to habitat surveys done by the BECQ Marine Monitoring Team, the marine watershed area includes extensive seagrass beds, a barrier reef, patch reefs, and a small fringing reef adjacent to American Memorial Park. The seagrass beds in the watershed area can be divided into three sub-habitats: thick *Enhalus*; Pleistocene rock – *Gelidiella*/*Halodule* mix; and *Halodule*/macroalgae mix (Houk and van Woesik, 2008; figure 6). Three seagrass species are found throughout the habitats: *Enhalus acoroides*, *Halodule uninervis* and *Halophila minor*. Macroalgae can also be found in abundance throughout these habitats. Dominant species include *Caulerpa racemosa*, *Acanthophora spicifera*, *Laurencia papilosa*, *Halimeda opuntia* and *Halimeda macroloba*. The seagrass beds provide habitat for a number of fish and invertebrate species. Commonly found fish in the seagrass are *Lethrinus harak* (mafuti), Scarinae species (palakse), juvenile *Mulloidichthyes flavolineatus* (tiao), juvenile *Caranx* spp. (I'e') and *Siganus* spp. (sesyon/hiteng/manahak). Common macroinvertebrates include sea cucumbers or balate (*Holothuria atra*, *H. hilla*, *Bohadschia argus, Stichopus horrens*, *Synapta maculate*), pillow urchins (*Tripneustes gratilla*), and sea stars (*Linckia laevigata*).

Patch reefs are the dominant coral reef frameworks in the watershed area. These patch reefs are dominated by massive/encrusting Faviids (e.g. *Goniastrea spp.*, *Favites spp.*, *Favia spp.*, etc.), *Porites* spp., and *Pocillopora* spp. corals. Two coral species listed as threatened under the US Endangered Species Act, *Acropora gobiceps* and *Seriatopora aculeata*, have also been observed on these reefs. Additionally, large staghorn *Acropora* thickets are found within the lagoon associated with the watershed. These reefs are almost exclusively made up of *Acropora aspera* and *A. muricata*. Commonly seen fish around these reefs include *Acanthurus lineatus* (hiyok), *Naso lituratus* (hangon), *Chlorurus sordidus* (palakse), *Halichores hortulanus* (wrasse) and an assortment of damselfishes and butterflyfishes. Important invertebrates on the reefs include the topshell, *Trochus niloticus* (aliling), giant clam *Tridacna sp*. (hima), spider conchs (*Lambis lambis*), and grazing sea urchins (*Echinothrix sp.*, *Diadema sp.* and *Echinometra sp*.).

Sea turtles, including the Hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) sea turtles, use lagoon patch reefs as foraging and resting habitat. Both species are listed as Endangered under the Endangered Species Act throughout the Western Central Pacific distinct population segment. Between August 2006 and August 2016, 813 captures were made of 790 green and 23 hawksbill turtles at a site located within Garapan Lagoon (figure 11). The fringing coral reef habitats of Garapan Lagoon, Saipan were found to provide important foraging and resting areas for both turtle species (Summers et al., under review).

CULTURAL AND SOCIOECONOMIC FEATURES

Garapan and the other coastal areas on the west half of the West Takpochao watershed have historically been important village and community centers for the local indigenous cultures (Chamorro and Carolinian). The villages of the Garapan subwatershed area currently have the highest population density on island and the highest housing unit densities (US Census Bureau, 2010). When the economy and tourism of the Mariana Islands began to build after World War II, Garapan became an important center of commercial development. Today, it is the commercial and population center of the island of Saipan, containing many of the island's large businesses, hotels and tourism industries. The majority of the lowland areas are zoned as commercial (including restaurants, hotels, entertainment, recreational businesses), residential (single-family and apartments) or public (including churches, government services, hospitals, schools, and assembly halls; figure 7).

The National Park Service owns and operates the American Memorial Park just north of Garapan, which serves educational, historical, recreational and natural resource preservation purposes. Local parks and museums including Sugar King Park, Garapan Central Park, and the CNMI Museum also operate in this area. These and other public land and venues (such as the Carolinian Utt or the Fishing Base) provide vibrant community gathering places for events. Annual festivals and events take place in downtown Garapan attracting local families and tourists such as the Taste of the Marianas (May), the Liberation Day Parade (July 4th), and the weekly Farmer's Market (Tuesdays) and Night Market (Thursdays). The easily accessible beaches provide opportunities for fishing, swimming, barbeques and other recreational activities for locals and tourists alike. The lagoon also allows fishing access year-round from the shore, or from boat launches at Fishing Base or Smiling Cove. Furthermore, the presence of fish, seagrass, corals and calm currents make the lagoon an excellent dive or snorkeling spot for tourism businesses (figure 8).

The upland areas are zoned as rural areas which include residential housing, agricultural activities, and some types of businesses. Population becomes sparser moving up in elevation in the watershed. The very top of the watershed contains the coral/gravel road to the top of Mt. Takpochao, which experiences frequent vehicle traffic from tourists seeking sight-seeing or recreational opportunities. The majority of the upper watershed contains only unpaved roads.

Unfortunately, the high population density and high use of resources throughout the watershed causes various sources of environmental degradation. Land-based sources of pollution that mix into stormwater runoff have damaging effects on lowland areas and the lagoon. Recent shipwrecks and derelict World War II barges, as well as metal and plastic debris from the former Puerto Rico dump, impact marine and terrestrial areas (Starmer, 2007). The year-round access by people to west-side beaches has caused local depletion of food fish and concerns about targeted hunting of some species (such as sea turtles). Additionally, feral species (such as "boonie" or feral dogs and cats) and invasive species (such as vines, rats, mice, non-native fish and the Brown Treesnake) that have or will become established pose a threat to native ecosystems and to human use of natural resources. Freshwater invasive species (e.g. sailfin molleys [*Poecilia latipinna],* tilapia) that have been identified in stormwater drainages in Garapan could pose a threat to fisheries or native ecosystems and species, such as the juvenile milkfish [*Chanos chanos]* and Indo-Pacific tarpon [*Megalops cyprinoides]* that also dwell in these drainages (McKagan et al., 2008).

Climate change may cause additional threats to marine life, beaches and nearshore infrastructure (figure 9). Because so much of Saipan's infrastructure and population is located close to the water's edge, it may be affected by rising sea and groundwater levels. Ocean acidification due to climate change may affect marine life, while changes in sea and air temperature and weather patterns can impact agriculture and existing livelihoods on Saipan. Although many international scientists and climate specialists consider it to be too late to curb carbon emissions, there are opportunities to adapt to climate change vulnerabilities by decreasing other threats and stresses (e.g. eliminating sources of pollution, decreasing habitat destruction and modification; IPCC, 2007).

GARAPAN CAP OVERVIEW

VISION STATEMENT

The Garapan watershed is the CNMI's "Hafa Adai" and "Tirow" to the world. Garapan is the convergence of our economic, natural and cultural resources. It provides our community with safe and healthy resources to engage in and share with our visitors. It is thriving and resilient from ridge to reef.

CONSERVATION TARGETS

"Focal conservation targets" are defined as the limited set of species, communities and ecological systems that are chosen to represent the biodiversity in a project area. They are the center of the project, around which goals are set, actions carried out, and conservation effectiveness is measured (TNC, 2007).

Nine focal conservation targets have been identified for the Garapan watershed area:

1. Upland forests
2. Urban greenspace
3. Wetlands and mangroves
4. Beaches
5. Water (quality)
6. Turtles
7. Food fish
8. Seagrass habitat*
9. Coral reef habitat*

*Seagrass habitat and coral reef habitat were new additions to the Conservation Target list from 2015. Previously "Benthic Habitat" and "Invertebrates" were listed as targets, but in 2015, marine resources stakeholders decided to change this grouping to reflect two different classes of benthic habitat: 1) seagrasses and 2) coral reefs. Each habitat has invertebrate metrics included within as an indicator of health. Stakeholders felt this more accurately reflected the nature of the marine system in the Saipan lagoon.

VIABILITY AND HEALTH STATUS

Viability of the targets was assessed to assist in developing relevant objectives and focused strategies, to guide monitoring protocols and measures of success, and to identify knowledge gaps. The viability assessment consisted of three steps: defining key ecological attributes (KEAs), determining indicators for the attributes, and assigning values for the indicators and for the target status as a whole.

Key Ecological Attributes are aspects of the conservation target that clearly define or characterize the target and determine its distribution and variation over space and time. They are characteristics of the target that, if eliminated or altered, would result in the demise of the target or would shift it into something quite different. KEAs are factors that are critical for long-term viability and are likely to be affected by human activities. Indicators are measureable aspects of the KEAs that inform the health or status of the target. Indicators strongly relate to the status of the KEA, are efficient and affordable to measure and provide an early warning to serious stress. Indicator measurements were divided into categories of POOR, FAIR, GOOD or VERY GOOD, whose criteria were defined by specialists within the advisory group (scientists from government agencies and non-governmental organizations). Specialists also helped define the current status and the desired future status of each indicator for each KEA for each target. Wherever possible, indicators that were already being measured were chosen so that each indicator would have baseline data and an existing method of data collection to provide the best information for the management plan. Where data was not available, specialists were asked to give a best guess based on a rapid assessment of the target or KEA, and plans were made to initiate measurements for that indicator in the future.

*Indicates new attribute/indicator added during 2015 revision.

NDCU stands for "new data currently unavailable".

Targets and KEAs	Indicators	STATUS	Data Source
Upland forests – GOOD			
➢ **Vegetation cover**	▪ % canopy cover of limestone forest	Fair	USFS 2006 Land Use dataset, NDCU
➢ **Presence of key species**	▪ Diversity of native birds	Good	DFW 2013 dataset, NDCU
➢ **Population size**	▪ Abundance of native birds*	Good	DLNR 2015 estimate
Urban greenspace – POOR			
➢ **Vegetation cover**	▪ % change of urban area covered by pervious surfaces*	Poor	BECQ 2015 estimate
Wetlands and mangroves – POOR			
➢ **Vegetation cover**	▪ Acreage of wetland/mangrove vegetation	Poor	USFS 2006 Land Use dataset, NDCU
Beaches – FAIR			
➢ **Shoreline profile**	▪ Rate of change at critical points	Fair	BECQ 2012 dataset
➢ **Aesthetic beauty**	▪ Visual survey of trash	Fair	BECQ 2014 estimate from Water Quality sampling
	▪ Visual survey of algae	Poor	BECQ 2014 estimate from Water Quality sampling
Water (quality) – POOR			
➢ **Lagoon water quality**	▪ % Beaches with microbiological violations	Poor	BECQ 2012 beach data
	▪ Concentration of nutrients	Unknown	BECQ beach data not yet available
	▪ Total suspended solids	Unknown	BECQ beach data not yet available
➢ **Surface water (stormwater) quality**	▪ Presence of *E. coli*	Unknown	BECQ SWQAP data not yet available
	▪ Concentration of nutrients	Unknown	BECQ SWQAP data not yet available
	▪ Total suspended solids	Unknown	BECQ SWQAP data not yet available
	▪ Volume	Unknown	Methods not determined

Turtles – FAIR			
➢ **Turtle population size**	▪ CPUE of in-water captures	Fair	DLNR 2013 dataset
➢ **Anthropogenic impacts**	▪ # of stranded, injured or diseased turtles	Poor	DLNR 2013 dataset
Food fish -- FAIR			
➢ **Abundance of food resources**	▪ Catch per unit effort	Fair	DFW 2012 dataset
Seagrass Habitat* -- FAIR			
➢ **Habitat quality**	▪ % cover of seagrass	Fair	BECQ 2014 MMT dataset
	▪ Ratio of seagrass to macroalgae	Fair	BECQ 2014 MMT dataset
➢ **Presence of key species**	▪ Edible shell density	Poor	BECQ 2014 MMT dataset
	▪ Sea cucumber density	Fair	BECQ 2014 MMT dataset
	▪ Grazing urchin density	Poor	BECQ 2014 MMT dataset
➢ **Biodiversity**	▪ Species richness (non-coral macroinverts)	Poor	BECQ 2014 MMT dataset
Coral Reef Habitat* -- POOR			
➢ **Size class distribution**	▪ Coral colony size class distribution	Fair	BECQ 2014 MMT dataset
➢ **Substrate quality**	▪ % cover of reef-accreting substrate	Poor	BECQ 2014 MMT dataset
➢ **Presence of key species**	▪ Edible shell density	Poor	BECQ 2014 MMT dataset
	▪ Sea cucumber density	Poor	BECQ 2014 MMT dataset
	▪ Grazing urchin density	Poor	BECQ 2014 MMT dataset
	▪ Herbivorous fish diversity*	Unknown	BECQ MMT data not yet available
➢ **Biodiversity**	▪ Species richness (inverts)	Poor	BECQ 2014 MMT dataset

THREATS AND CONTRIBUTING FACTORS

A "direct threat" to one of the focal conservation targets is an activity or process that is a source of stress to the target. In 2012, threats were evaluated extensively based on their scope, severity and irreversibility in order to attempt to get a priority rating of the most and least severe threats, however, the stakeholders in 2012 were not confident in the final ratings since there was not adequate data available. In 2015, stakeholders were instead asked to vote on their top two threat priorities based on their knowledge and work within the watershed. The final ratings (high, medium, low) are indicated below, although they are based on rapid assessments and estimation, not necessarily on scientific data.

Contributing factors are activities and events that cause or exacerbate the direct threats, listed below:

Contributing Factors	Targets Affected
Threat: Invasive and feral species	**RANKED: MEDIUM**
Weak marine Biosecurity (vessels, hull-fouling, ballast discharge) Pets Accidental introductions Lack of public knowledge Lack of resources (e.g. $$ for spay/neuter) Poor baseline knowledge Lack of enforcement for existing regulations	Wetlands and mangroves Urban greenspace Upland forests Turtles Food fish Coral reef habitat Seagrass habitat Beaches
Threat: Illegal harvest (hunting/fishing)	**RANKED: LOW**
Lack of data Lack of regulations Out-of-date or unclear regulations Lack of awareness and education Lack of enforcement Lack of resources(money, training or personnel) Poor/weak prosecution or penalties Lack of federal enforcement and prosecution Poor/weak social accountability Lack of community involvement Weak political will	Turtles Seagrass habitat Coral reef habitat
Threat: Legal harvest (hunting and fishing)	**RANKED: LOW**
Lack of data Lack of regulations Out-of-date or unclear regulations Unsustainable fishing practices Lack of awareness and education (community and tourists) Lack of resources Poor/weak social accountability Lack of community involvement Weak political will	Food fish Seagrass habitat Coral reef habitat
Threat: Tourism and recreational impacts	**RANKED: MEDIUM**
Conflicting regulations and uses (e.g. zoning) Lack of awareness and education Lack of or weak regulations Lack of enforcement (including lack of training, resources, money, personnel) Lack of federal enforcement and prosecution	Food fish Coral reef habitat Seagrass habitat Upland forests Water quality

Poor weak prosecution or penalties Poor/weak social accountability Water pollution from marine sports Lack of research into marine sport activities impact on resources No marine zoning Sound pollution changing fish patterns Fish feeding ATV damage to trails Removal of shoreline vegetation Lack of regulatory coordination	Turtles Beaches
Threat: Natural disturbances	**RANKED: MEDIUM**
Ocean acidification (CC) Shifting precipitation patterns (CC) Sea level change (CC) Increased coastal erosion (CC) Thermal stress (CC) Storm surges Acute natural disturbances (e.g. typhoons) Fires Crown-of-thorns Starfish	Wetlands and mangroves Food fish Coral reef habitat Seagrass habitat Beaches Water quality Upland forests Turtles Urban greenspace Infrastructure
Threat: Polluted runoff	**RANKED: HIGH**
Natural disturbance (CC factors) Land-based sources of pollution (pesticides, agrochemicals, animal waste, household and industrial chemicals, heavy equipment leaks (oil and lubricant), failed/improper sewage systems, unpaved roads, trash burning, illegal dumping, channelized stormwater (high volume), poor construction practices, land clearing, unsustainable development, inadequate zoning regulations) Lack of awareness/education Lack of enforcement (training, money, personnel, resources) Lack of or weak legislation/regulations Lack of resources Lack of federal enforcement and prosecution Lack of regulatory coordination Poor/weak social accountability	Water quality Wetlands and mangroves Urban greenspace Upland forests Turtles Food fish Coral reef habitat Seagrass habitat Beaches
Threat: Development impacts	**RANKED: HIGH**
Investors Lack of desired (beach-side) land space Regulatory enforcement issues Lack of transparency/communication with public and inter-agency throughout permitting/review process Political will/influence Lack of regulations Lack of enforcement Poor/weak accountability Conflicting regulations and uses (zoning) Lack of regulatory coordination	Wetlands and mangroves Food fish Coral reef habitat Seagrass habitat Beaches Water quality Upland forests Turtles Urban greenspace
Threat: Maritime disturbances (ship groundings, spills)	**RANKED: LOW**
Ship groundings Spills	Coral reef habitat Seagrass habitat Water quality

PROGRESS UPDATES

The Conservation Action Planning process was introduced to the CNMI by The Nature Conservancy, which has conducted numerous trainings for natural resource staff. The CAP process is iterative, cycling between four steps: 1) defining the project, 2) developing strategies and measures, 3) implementing strategies and measures, and 4) using results to adapt and improve.

After the 2012 Garapan CAP meeting, a final CAP document was produced and distributed in 2013 after being signed by the directors of the three main natural resource agencies at the time – the Division of Fish and Wildlife (DFW), the Coastal Resources Management Office (CRM) and the Division of Environmental Quality (DEQ). The CAP included a workplan of priority strategies and actions to be implemented individually and collaboratively by CAP partners over a 2-5 year period, such as pursuing engineering projects that had been outlined in past plans to manage stormwater within the watershed, to develop and implement community outreach and education programs, and to undertake research to understand the ecology of marine resources. Since 2012-2013, the Garapan CAP has been a valuable resource for interagency collaboration on many projects and as a supporting document to assist agencies with grant applications. Individual implementation on projects listed in the plan began as capacity became available. CAP partners agreed in 2012 to review the Garapan CAP every 2-5 years, therefore a 2-day meeting was scheduled for the first CAP Review on March 10-11, 2015.

Examples of projects undertaken within the Garapan Watershed as a result of the 2012 CAP include the Garapan storm drain clean-out by BECQ and DPW, initiated in March 2014 and removing over 20,000 gallons of sludge from the drainage canal next to Fiesta Resort and disposal of more than 1000 pounds of trash from open dumping sites in Garapan. The Zoning Office, Bureau of Environmental Health (BEH) and BECQ also teamed together to complete trash surveys within the Garapan Core district. CUC has completed sewerline repairs in most of downtown Garapan as part of their master plan. Numerous education and outreach activities were completed with Garapan Elementary School and other students and communities within the area, including the first stage of the Know Your Watershed Campaign (BECQ), the Environmental Expo (BECQ, American Memorial Park, many partners), and the Choose to Reuse plastic bag campaign (MINA). Water quality monitoring is ongoing at beach sites and stormwater drainages, and marine monitoring has been expanded to several new reef sites within the Garapan area. The National Park Service has established a new weather station in the watershed at American Memorial Park that provides real time data through the internet. In the coming months, partners will also cooperate on the redesign of the Paseo de Marianas (lead by MVA), the Beach Road Revitalization (lead by DPW) and many other monitoring and infrastructure projects and programs. The Mayor's Office of Saipan has lead a variety of programs to decrease the stray dog population since 2012, including expanding their kennel facilities in lower base and partnering with veterinarians to provide an inexpensive spay/neuter program for pet owners. NMC CREES's Plant Protection Program has been actively propagating integrated pest management programs, bio-control measures for invasive plants and a crop improvement program to encourage farmers to use the best farming strategies and decrease their use of agro-chemicals. The Aquaculture and Fishery Development Program at CREES has also promoted projects that reduce the need for artificial fertilizers that have negative impacts on our nearshore environment. The natural resource management agencies further participated in the NOAA Coastal Resources Conservation Program's external capacity assessment and enforcement review in 2013, the results of which were unable at the time of this writing.

The "Climate Change Vulnerability Assessment for the Island of Saipan, CNMI" was completed in January 2014 after stakeholder inventories, community mapping, participatory mapping, technical assessments, sea level change mapping, and social vulnerability analyses. The largest threats expected in the CNMI due to climate change are

surface air temperature rising, carbon dioxide concentration rising, rainfall changing, wind and waves changing, storm events changing, sea level rising, ocean chemistry changing, and increasing sea surface temperatures. The three areas with the highest cumulative vulnerability ratings for Saipan were Lower Base, Beach Road (Oleai to Fishing Base) and Garapan. All of these are within the West Takpochao Watershed. BECQ resource managers decided to incorporate climate change adaptation strategies explicitly into the Garapan CAP in order to provide the most comprehensive and accurate information regarding priorities and strategies for protecting the watershed.

Moving forward from the release of the Vulnerability Assessment, climate stakeholders expect to continue to assess vulnerability through other measures and to communicate and share data among the Climate Change Working Group contributors. The CCVA will be used to inform Adaptation Action Plans and regulatory updates and to make adaptation mainstream within other agencies. The Garapan CAP review was the first opportunity to marry climate change adaptation concerns into another existing natural resource and infrastructure plan.

The progress made within the Garapan watershed since partners collaborated on the Garapan CAP has been tremendous, but there is still room for considerable progress to be made in order to protect the fragile resources in Saipan's most visited, most economically important, and most central watershed. Especially in light of new development taking place within West Takpochao, the strategic workplan below outlines strategic actions recommended by different partners to improve the health of natural resources, residents and visitors to the watershed.

STRATEGIC WORKPLAN

The following workplan divides strategic actions into six "strategy" categories (labeled A-F) and lists possible partnerships that may be pursued to implement the actions. Objectives were written by CAP stakeholders as a means of measuring progress over time as actions are implemented and to monitor ongoing conservation efforts within the watershed.

STRATEGY A: BEST MANAGEMENT PRACTICES

Objectives and Strategic Actions	*Partners*	*Priority*
OBJECTIVE 15.A1: By the end of FY2018, water turbidity has been reduced below 2013 ambient levels by 10% on average at all Garapan water quality lagoon monitoring sites		
Continue researching, developing and training farmers on techniques for agricultural areas to decrease reliance on agro-chemicals	NMC-Crees, NRCS, CHCC-BEH	Medium
Conduct FOG campaign to teach residents about proper disposal of waste and contaminants and enforce FOG restrictions	CUC	Medium
Required existing and new building structures proposal to be equipped with centralized with solid waste and effluent containment. i.e., outside centralize trash bin & grease catchment/containment	BECQ, DPW, Zoning	High
Designate accessible waste collection sites for commercial& household waste, i.e. used oil, chemical and other household contaminants	DPW, BECQ, Mayor, SNILD	Medium
Host landowner workshops to encourage proper land-clearing and land stewardship	BECQ, Forestry	Medium
Increase permeable surfaces in the lower watershed using ponding basins, permeable parking lots, rain gardens and permeable pavement	Zoning, BECQ, CIP, DPL (land exchanges)	High

Encourage public and private use of swales and rain gardens to collect and filter stormwater runoff by incorporating stormwater management, green infrastructure, greenspace, and permeable areas (and timelines) into leases (DPL) and permit conditions (other agencies)	BECQ, DPL, Zoning, DFW, DPW, Forestry	High
Create an interagency working group for unpaved roads and prioritize target roads	Mayor's Office, DPW, MVA, Zoning	High
Design and construct the planned stormwater management improvements (retention ponds, wetlands) for drainages leading into the lagoon to help filter water and moderate runoff during storm events (as described in the Garapan Revitalization plan)	Zoning, CIP, DPW	Medium
Implement stormwater retrofits in the Garapan area to decrease and control stormwater and pollutant loading (as described in the 2010 Winzler & Kelly Garapan Tourist District Storm Water Conceptual Study	CIP, DPW, CRM, BECQ	High
Clean and maintain all stormwater drainages including improving, cleaning drainages, clearing open ditch areas, ponds and drainages and cut overgrown vegetation	DPW, Zoning, BECQ	High
Enforce permits and follow-up on BMP installation in order to address maintenance of existing BMPs	BECQ, DPW	Medium
Establish standard practices for maintenance of public infrastructure	DPW, MOS, CUC, BECQ, Parks&Rec, Precinct III	High
Review, reprint and distribute existing resources to encourage "greener" practices (e.g. permeable parking) DEQ -> contractors and engineers DPW -> material strength and building codes Distribute GTD plan	BECQ, DPW	Medium
Construct permeable sidewalks and beautify high-use areas with native vegetation as needed	DPW, Zoning, MVA, MOS	Low
Complete stream inventories to identify pollution sources	BECQ	High
Apply for EPA stormwater grants	BECQ, CUC	Medium
Add green infrastructure into Qualifying certificate requirements	CDA	Medium
Consider allowing variances to permit conditions in exchange for green practices (case-by-case)	BECQ, Zoning	Medium
OBJECTIVE 15.A2: By the end of FY2018, annual "red flag" occurrences at Garapan-area beach monitoring sites have been reduced by 10% from 2013 levels		
Initiate illicit discharge detection and elimination program to identify wastewater violations within the Garapan area	BECQ, CUC, DPW	High
Include animal waste detection methods in IDDE protocol	NRCS, Ag, BEH, BECQ	Medium
OBJECTIVE 15.A3: By the end of FY2020, 30% of trash piles and junk cars have been removed or properly managed as required by zoning and environmental laws		
Issue citations and assist residents in removing junk cars and trash piles to reduce feral animal habitat	Mayor's Office, Zoning, DPL	Medium
Pursue legislation that would allow funds from citations to stay at the	Legislature	High

agencies and support the enforcement programs		
Grant legal authority to the Mayor's Office to assist with issuing Zoning citations	Legislature, MOS, Zoning	Medium
OBJECTIVE 15.A4: By the end of FY2023, feral cat and dog populations in the Garapan watershed area are effectively controlled (as indicated by no increase in numbers of annual captures or wild population counts)		
Provide incentives to the public for capturing and turning in strays	DFW, Parks & Rec	Low
Control and monitor stray cats to prevent depredation and attacks on native birds and other wildlife	DFW, Mayor's Office	Medium
Identify continual support and resources for spay/neuter programs and pet owner education	MOS, DLNR (Parks & Rec)	Medium
OBJECTIVE 15.A5: By the end of FY2015, the quantity of public trash bins in tourist areas has doubled and all public trash bins are secured and maintained (never overfull)		
Maintain existing bins during high volume periods (weekends) and make sure all bins are lidded and secured to protect from feral animals	Mayor's Office, MINA, DLNR Parks and Grounds	High
Support and continue MVA and Chamber of Commerce "Cash for Trash" programs	Chamber, MVA	Medium
Encourage businesses and organizations to sponsor public trash bins for high-use areas	Chamber, MVA, MINA	Medium
Continue surveillance, surveys, reporting and enforcement of trash/litter laws and regulations within the Garapan business district	BECQ, Zoning	Medium
Promote recycling and pursue a bottle bill	BECQ, Legislature	Medium
OBJECTIVE 15.A6: By the end of FY2018, there is a 20% decrease in weight of trash picked-up per participant at BECQ clean-up brigade sites in Garapan compared to 2010-2013 records		
Maintain existing bins during high volume periods (weekends) and make sure all bins are lidded and secured to protect from feral animals	Mayor's Office, MINA, DLNR Parks and Grounds	High
Support and continue MVA and Chamber of Commerce "Cash for Trash" programs	Chamber, MVA	Medium
Encourage businesses and organizations to sponsor public trash bins for high-use areas	Chamber, MVA, MINA	Medium
OBJECTIVE 15.A7: By the end of FY2018, all critical habitat areas affected by invasive vines and aquatic plants have been identified and control plans are being implemented		
Identify critical areas where vines are damaging habitat and define higher and lower priorities	Forestry, DFW, NMC-Crees	Medium
Actively remove/reduce presence of invasive plants (scarlet gourd, chain-of-love, devil's gut vine) in critical habitat areas	Forestry, CUC, NMC-Crees	Medium
Remove invasive vines from forest edges and gaps in American Memorial Park mangroves and wetland areas	Nat'l Park Service	High
Replant trees (targeting natives) to increase bird habitat in American Memorial Park where invasive vines have killed trees	Nat'l Park Service	Medium
Create and implement a plan for water hyacinth control and removal in American Memorial Park wetlands	Nat'l Park Service	High

STRATEGY B: ENGINEERING

Objectives and Strategic Actions	*Partners*	*Priority*
OBJECTIVE 15.B1: By FY2028, construction of the Saipan Lagoon Aquatic Ecosystem Restoration Project (SLAERP) ponding basins are complete according to Army Corps of Engineers recommendations and specifications		
Secure funding from partnering agencies and complete planning and construction of basins (as defined in the SLAERP)	DOT, CIP, CRM, DPW, EPA, DEQ	Low
OBJECTIVE 15.B2: By the end of FY2018, water turbidity has been reduced below 2013 ambient levels by 10% on average at all Garapan water quality lagoon monitoring sites		
Install sediment traps, check dams and infiltration basins at the Sugar King Industrial Park and other key locations (as described in the 2005 Winzler & Kelly Conceptual Stormwater Management Plan for the Garapan II Drainage)	BECQ, DPW, EPA, MOS, DPL (land acq.), DOI&CIP (funding)	High
Expand the grassy swale by Sugar King Road, Garapan Street, and other key locations for use in stormwater treatment and infiltration (as described in the 2005 Winzler & Kelly Conceptual Stormwater Management Plan for the Garapan II Drainage)	BECQ, DPW	Medium
Continue to evaluate sewer line repair needs and replace leaking or damaged lines at the earliest possible opportunity	CUC	High
Implement stormwater retrofits in the Garapan area to decrease and control stormwater and pollutant loading (as described in the 2010 Winzler & Kelly Garapan Tourist District Storm Water Conceptual Study	CIP, DPW, BECQ	High
Incorporate stormwater and climate change considerations into the Beach Road Revitalization Plan and other infrastructure plans near Beach Road	DPW, BECQ	High
OBJECTIVE 15.B3: By the end of FY2018, engineering alternatives or maintenance options have been examined for all unpaved roads within the Garapan watershed		
Create an interagency working group for unpaved roads to address proper maintenance, upgrading and construction of water drainages for unpaved new road projects	DPW, Mayor's Office, Legislature, MVA, Zoning, DPL	High
Discuss collaboration opportunities with Navy pre-positioned ships	DPW, CUC	Low
Complete a Stormwater Management Master Plan using existing plans (GTD 2010, Winzler and Kelley, others)	BECQ, DPW	High

STRATEGY C: REGULATIONS AND ENFORCEMENT

Objectives and Strategic Actions	*Partners*	*Priority*
OBJECTIVE 15.C1: By the end of FY2018, annual "red flag" occurrences at Garapan-area beach monitoring sites have been reduced by 10% from 2013 levels		
Expend CUC sewer connection funds by identifying and reaching out to eligible property-owners	CUC, BECQ, DPH-BEH	High
Initiate illicit discharge detection and elimination program to identify wastewater violations within the Garapan area	BECQ, CUC	High
Issue notices of violation (NOVs) and citations where appropriate. Ensure proper prosecution and follow-up on all cases	BECQ, CUC, AG's office	High

OBJECTIVE 15.C2: By the end of FY2020, 30% of trash piles and junk cars have been removed or properly managed as required by zoning and environmental laws		
Issue citations and assist residents in removing junk cars and trash piles to reduce feral animal habitat	Mayor's Office, Zoning	Medium
Increase enforcement actions in cases of trash burning	DECQ, Fire, USFS	Medium
OBJECTIVE 15.C3: Percent of all environmental infractions recorded by agencies that are resolved in the local court has increased by 20% each year starting in 2018		
Identify funding and fill post of AAG for environmental resource agencies	NOAA, AG	High
Review hearing process for natural resource agencies, identify and fill gaps, monitor change	BECQ, DLNR, NOAA, AG	Medium
Review natural resource enforcement work-plans to identify improvements, updates and needs (training, funding, personnel), specifically regarding turtle poaching, illegal fishing, directed hunting, littering/dumping, trash burning, land clearing, and wastewater elimination	PIMPAC, BECQ, DFW, DLNR, NOAA, DPL, Zoning, DPS	High
Focus agency resources on improving enforcement training, funding and personnel related to turtle poaching, illegal fishing, directed hunting, littering/dumping, trash-burning, land clearing, and wastewater elimination	BECQ, DFW, DLNR, NOAA, DPS	High
OBJECTIVE 15.C5: By the end of FY2016, Forestry consultations are included with DLNR/DFW comments in the one-start permitting process		
Discuss permit requirements and evaluate personnel and capacity to include Forestry consultations in the one-start process with DLNR-DFW	DFW, Forestry, BECQ	Medium
Determine special permitting options for Areas of Particular Concern (APC) related to highly erodible soils	BECQ, Forestry, DFW	Medium
Fill-in capacity and personnel gaps at Forestry to assure smooth integration into the one-start process	Forestry, USFS	Medium
OBJECTIVE 15.C6: By the end of FY2018, there is a 20% decrease in weight of trash picked-up per participant at BECQ clean-up brigade sites in Garapan compared to 2010-2013 records		
Update and introduce new legislation regarding littering fines	BECQ, Zoning, Legislature	High
Continue litter control officer trainings to increase number of officers patrolling and issuing citations in the watershed area	BECQ	Low
Publicize enforcement numbers for the public to report littering (BECQ and Zoning)	BECQ, Zoning	High
OBJECTIVE 15.C7: By the end of FY2015, rigorous environmental and conservation training is incorporated into MVA's tour guide training program and the program is made mandatory for all tour operators involved in outdoor recreational activities with visitors.		
Create curriculum and develop program logistics	MVA, BECQ, NMC	Medium
Pass law or regulations to require tour guide certification program for all operators in the CNMI	MVA, Legislature	Medium
OBJECTIVE 15.C8: By 2017 Urban greenspace requirements will be incorporated into all DPL leases, as well as all DEQ, CRM, and Zoning permits and regulations, and Qualifying Certificate requirements		
Increase enforcement capacity to prevent and stop spread of invasive species	Quarantine, DLNR Forestry, CPA	Low
Promote green infrastructure within the watershed (rain garden, permeable parking)	CDA, BECQ, Zoning, DPL, Legislature	Medium

• Voluntary • Mandatory: include some % requirement for green infrastructure in regulations, qualifying certificate requirements • Continue to research available funding		
OBJECTIVE 15.C9: By 2017, climate smart adaptation strategies are incorporated into the one-start permitting processes (DEQ, CRM, DFW, HPO)		
Increase enforcement capacity to prevent and stop spread of invasive species	Quarantine, DLNR Forestry, CPA	Low

STRATEGY D: EDUCATION AND OUTREACH

Objectives and Strategic Actions	***Partners***	***Priority***
OBJECTIVE 15.D2: Through 2020, continue to conduct targeted environmental awareness campaigns within the Garapan Watershed		
Implement education and outreach through the permitting process to teach property owners about BMPs	DFW, BECQ, HPO, Forestry	Medium
Continue and expand MINA's Plastic Bag Challenge campaign to decrease plastic bag use	MINA, private businesses	High
Create nature trail and interpretive signs at American Memorial Park through wetland and mangrove areas	Nat'l Park Service	Low
Repeat 2003 "Know Your Watershed Campaign" and related activities (tentatively 2014)	BECQ	Medium
Continue "Think Blue" business stewardship campaign to identify BMPs for businesses and help with implementation	BECQ	Medium
OBJECTIVE 15.D5: By the end of FY2018, there are active recycling programs in all public and private schools		
Work with schools, administrators and clubs to initiate programs in all schools using existing models	BECQ	Low
OBJECTIVE 15.D6: By the end of FY2015, rigorous environmental and conservation training is incorporated into MVA's tour guide training program and the program is made mandatory for all tour operators involved in outdoor recreational activities with visitors.		
Create curriculum and develop program logistics	NMC, MVA, MINA	Medium

Strategy E: Stewardship Incentive Programs

Objectives and Strategic Actions	***Partners***	***Priority***
OBJECTIVE 15.E1: Beginning in FY 2015, there will be no net loss of urban greenspace each year due to protection of green areas and conversion of urban built-up land into vegetated area		
Target community groups to get involved in land integration and native area stewardship: *Neighborhood Watch, Village Revitalization, Saipan Municipal Council, Mayor's Office, Homeowner's Associations*	Forestry, BECQ, Mayor's Office	Medium
Conduct tree plantings and offer free trees to private, public, commercial groups	Forestry, Mayor's Office	Medium
Encourage businesses to sponsor large-scale greenscaping projects	Forestry, BECQ, MVA,	Low

	Chamber of Commerce	
OBJECTIVE 15.E2: From 2015-2017, the number of groups participating in MVA's Cash-for-Trash program will increase 10%		
Advertise trash pick-up programs: Cash for Trash, Adopt-a-Beach, BECQ monthly clean-up brigade	MVA, Chamber of Commerce, BECQ	Medium
OBJECTIVE 15.E3: By the end of FY2015, the quantity of public trash bins in tourist areas has doubled and all public trash bins are secured and maintained (never overfull)		
Continue and expand MINA Adopt-a-Bin program	MINA, BECQ	High
OBJECTIVE 15.E4: By the end of FY2018, there is a 20% decrease in weight of trash picked-up per participant at BECQ clean-up brigade sites in Garapan compared to 2010-2013 records		
Design and conduct a watershed- or island-wide anti-litter education and outreach campaign	MVA, MINA, BECQ	High
OBJECTIVE 15.E5: By 2018, 50% of farmers in the Garapan watershed have effectively enrolled in the NRCS EQIP program		
Complete stream inventory and identify EQIP candidates	NRCS, BECQ	
Share NRCS contact information	NRCS, BECQ	
Provide assistance to complete the application process	NRCS, BECQ	

STRATEGY F: RESEARCH AND MONITORING

Objectives and Strategic Actions	***Partners***	***Priority***
OBJECTIVE 15.F1: By the end of FY2016, all high priority water quality problem areas within the watershed have been identified		
Implement the Surface Water Quality Assurance Monitoring Plan created for BECQ in 2013 by collecting water and sediment samples at designated stream sites to evaluate possible land-based sources of pollution and to isolate affected watershed segments	BECQ	High
Explore relative contributions of agrochemicals, trash burning and other land-based pollution to water quality impairments	NRCS, EPA, BECQ	Medium
Measure volume/velocity of stormwater (explore options with John Riegel/CUC), urgency is high because of climate change predictions of increased rainfall	BECQ, CUC	High
Fill open positions in Water Quality program for data collection and analysis	BECQ	High
Work with CUC (and others) to identify rainfall areas for gauges and monitoring equipment	BECQ, CUC	Medium
Continue ongoing monitoring of forest and wetland birds	DLNR, DFW	Medium
OBJECTIVE 15.F2: By 2017 the data and results of ongoing climate change work are used to inform regulations in multiple regulatory agencies		
Continue to support and participate in the Climate Change Working Group	BECQ, Zoning, EMO, NMC, CUC, DPW, NOAA	High
Integrate NMC into the Climate Change Working Group to contribute to models and datasets and to train communities on climate change concerns/issues	NMC, BECQ, DPW, CUC, Zoning	Medium
Implement climate change-specific components of marine monitoring work	BECQ	High

OBJECTIVE 15.F3: By FY2018, funding is secured and capacity identified to support long-term ecological monitoring within the watershed		
Identify and eliminate gaps in scientific data for fisheries management	DFW, NOAA	Medium
Identify and eliminate gaps in scientific data for marine monitoring	BECQ	Medium
Understand algae preference by herbivorous fish	DFW, BECQ	High
Understand watershed impacts on herbivorous fish	BECQ	Medium
Quantify impacts of various recreational activities on marine resources, including direct contact from boats, snorkelers, divers and swimmers and indirect impacts from beach recreational activities)	DFW, BECQ	Medium
Create monitoring protocols for CRM enforcement related to recreational impacts on marine resources	BECQ	Medium
Understand types and coverage of forest areas	Forestry, USFS, Nat'l Park Service	Medium
Evaluate health of wetlands and mangroves periodically and implement management plans	NPS, BECQ, DLNR	High
Implement rapid assessment methods for wetlands and mangroves	DLNR, BECQ	Medium
Review wetland and mangrove plans to make them climate smart	DLNR, BECQ	Medium
Create plans for groundwater monitoring wells related to wetland areas	Nat'l Park Service	Low
Create biosecurity priorities and protocols and begin Biosecurity monitoring	NOAA, DFW, BECQ	Medium
OBJECTIVE 15.F4: By the end of FY2018, effectiveness of current management strategies for herbivorous fish have been maintained and improved		
Assess recruitment of juvenile herbivorous and other fish species (e.g. habitat preference) and consider management options for preferred habitat	BECQ, DFW	Medium

DISCUSSION AND NEXT STEPS

The publication of this document does not represent the initiation of Garapan watershed projects, but the continuation of individual entities working as partners in the preservation of natural resources that are key to the livelihood of the people of the CNMI. Partners have been encouraged to pursue individual implementation of projects and the workplan (above) based on their internal capacity and priorities since the initial meetings were held in 2012 and again during the 2015 update process. The Watershed Working Group which meets quarterly will be an ideal forum for discussion, reporting or progress and further collaboration. The next CAP review for the Garapan watershed will be tentatively scheduled for 2018.

The 2015 CAP review process brought together the key players in achieving a collaborative vision, and the right people were in the room and on-board to accomplish these tasks. Creative and optimistic ideas were share about how to move forward with the CAP strategies and what collaborations are going to be essential in accomplishing our objectives.

Key observations from the CAP update include:

- Almost everyone in the room emphasized the need for additional **inter-agency communication**, especially on collaborative projects.
- A more **centralized planning process** should be explored, and this centralization should allow for a more comprehensive incorporation of various agencies' concerns.

- There is an interest in integrating both **climate change concepts, and holistic watershed management concepts into master plans**, as they develop.
- There was some talk of **legislation that allows funds from citations to stay with agencies** to support these projects!

It is clear that the stakeholders and agencies/organizations that they represent want to coordinate and help each other with resources. The CAP update workshop was a perfect example of our progress toward achieving a more collaborative environment, and implementation of the workplan can continue these positive steps. What is important moving forward is to keep the channel of communication and collaborative planning open, and that the objectives and actions that are highlighted here remain in the foreground of our agencies' work plans. We have essentially updated a collective vision to reflect our current progress, and our changing needs, especially in the face of impending development and climate change. Let's keep working toward that vision.

ACKNOWLEDGEMENTS

This plan was compiled by Kaitlin Mattos, Watershed Coordinator at the CNMI Division of Environmental Quality, in 2012-2013 and updated in 2015-2016. Much of the information contained in this plan came from discussions with natural resource managers, environmental advocates and community members through extensive public and private meetings and workshops. Valuable comments and revisions to this document were provided by Russell Benford, Claus Bier, Jihan Buniag, Frances Castro, Doris Chong, Enrique Dela Cruz, Alfredo DeTorres, Trey Dunn, Mike Gawel, John Gourley, Robert Greene, Avra Heller, Steven Johnson, Lyza Johnston, Bart Lawrence, Steve McKagan, Todd Miller, Brooke Nevitt, Therese Ogumoro, Dana Okano, Pat Rasa, Greg Reyes, Rachel Roque, Nicole Schafer, Becky Skeele, Tammy Summers, John Tagabuel, Geri Willis and Lainie Zarones. The Garapan CAP advisory team is grateful to The Nature Conservancy, especially Steven Victor and Trina Leberer, for guidance throughout the entire CAP process. Figures and maps within this document were created with help from Ana Agulto, Robert Greene, Steven Johnson, Lyza Johnston, Sean McDuff, Ryan Okano, Jose Quan, and Tammy Summers.

REFERENCES

Commonwealth of the Northern Mariana Islands and NOAA Coral Reef Conservation Program. 2010. Commonwealth of the Northern Mariana Islands' Coral Reef Management Priorities. National Oceanic and Atmospheric Adminsitration: Silver Spring, MD.

Denton, G. R. W., Morrison, R. J., Bearden, B. G., Houk, P., Starmer, J. A., Wood, H. R. 2009. Impact of a coastal dump in a tropical lagoon on trace metal concentrations in surrounding marine biota: A case study from Saipan, Commonwealth of the Northern Mariana Islands (CNMI). *Marine Pollution Bulletin,* 58: 424-431.

Houk, P. and van Woesik, R. 2008. Dynamics of shallow-water assemblages in the Saipan Lagoon. *Marine Ecological Progress Series*, 356: 39-50.

Intergovernmental Panel on Climate Change. 2007. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyers (eds). Cambridge University Press: Cambridge, New York, NY.

Krüger, J., Kumar, S., Damlamian, H. and Sharma, A. 2010. Oceanographic Survey, Shoreline Mapping and Preliminary Hydrodynamic Modeling Report, Saipan, Commonwealth of the Northern Mariana Islands. SOPAC Data Release Report 26. Pacific Islands Applied Geoscience Commission: Suva, Fiji.

Maynard, J., McKagan, S., Johnson, S., Houk, P., Ahmadia, G., van Hooidonk, R., Harriman, L., Mcleod, E. 2012. Coral reef resilience to climate change in Saipan, CNMI: field-based assessments and implications for vulnerability and future management. CNMI Division of Environmental Quality: Saipan, MP.

McKagan, S., Herod, J., Johnson, P., Tenorio, M., Trianni, M. 2008. Freshwater Invasive Species Project. CNMI Division of Fish and Wildlife: Saipan, MP.

Meneses, N., Shuster, S., Bulger, B., Greene, R., Benford, R. 2013. Investigator's Annual Report (Final) 2013 Terrestrial Crab & Snail Survey. CNMI Division of Fish and Wildlife: Saipan, MP.

The Nature Conservancy. 2007. Conservation Action Planning Handbook: Developing Strategies, Taking Action and Measuring Success at Any Scale. The Nature Conservancy: Arlington, VA.

Starmer, John. 2007. Assessment of Mangrove Associated Marine Habitats in the American Memorial Park, Saipan, CNMI. National Park Service.

Summers, T. M., T. T. Jones, S. Martin, J. R. Hapdei, J. K. Ruak, and C. A. Lepczyk. 2016. Demographic Structure of Marine Turtles in the Nearshore Environments of the Northern Mariana Islands (manuscript under peer review)

US Census Bureau. 2010. Census for the Commonwealth of the Northern Mariana Islands. www.census.gov.

USDA Natural Resources Conservation Service. 2003. Status Report: Garapan Watershed Study. CNMI Saipan Watershed Council and Garapan Stakeholder's Group: Saipan, CNMI.

U.S. Army Corps of Engineers. 2004. Saipan Lagoon Erosion Study, Saipan Island, Commonwealth of the Northern Mariana Islands. CNMI Coastal Resources Management Office: Saipan, CNMI.

Williams, L., Starmer, J., Jarzen, D., and Dilcher, D. 2007. Ecological Assessment of the Mangrove Habitat in the American Memorial Park, Saipan, Northern Mariana Islands. Ed. J. Starmer. National Park Service: Saipan, CNMI.

Winzler & Kelly Consulting Engineers. 2005. Conceptual Stormwater Management Plan for the Garapan II Drainage. CNMI Division of Environmental Quality: Saipan, CNMI.

Yuknavage, K. and Palmer, A. 2010. Monitoring and Preparing for Shoreline Change at American Memorial Park (2004-2009). CNMI Coastal Resources Management Office: Saipan, CNMI.

SUPPLEMENTAL FIGURES

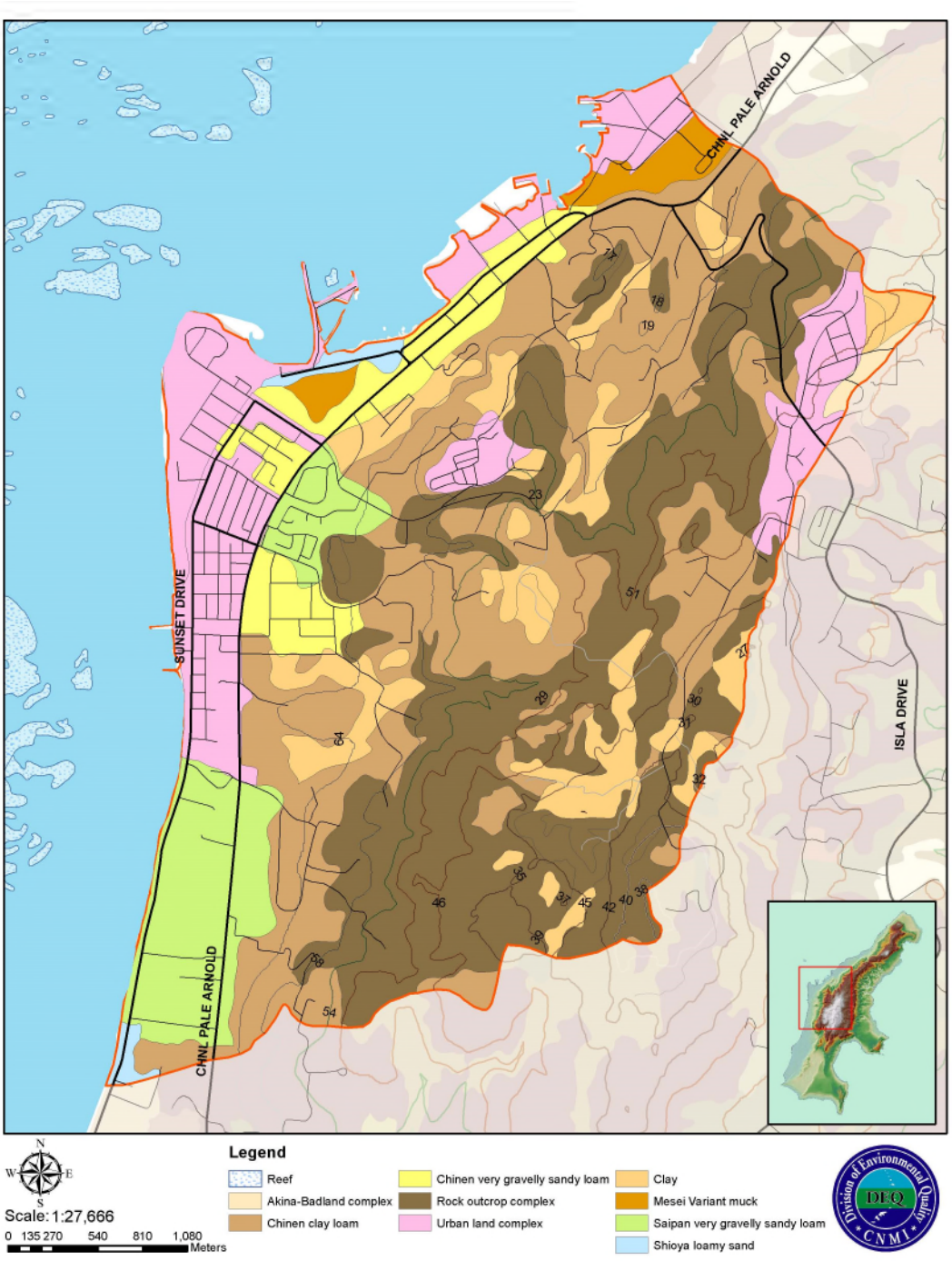

Figure 3: Soil and substrate types in the West Takpochao watershed. Data provided by USGS, map created by the DEQ.

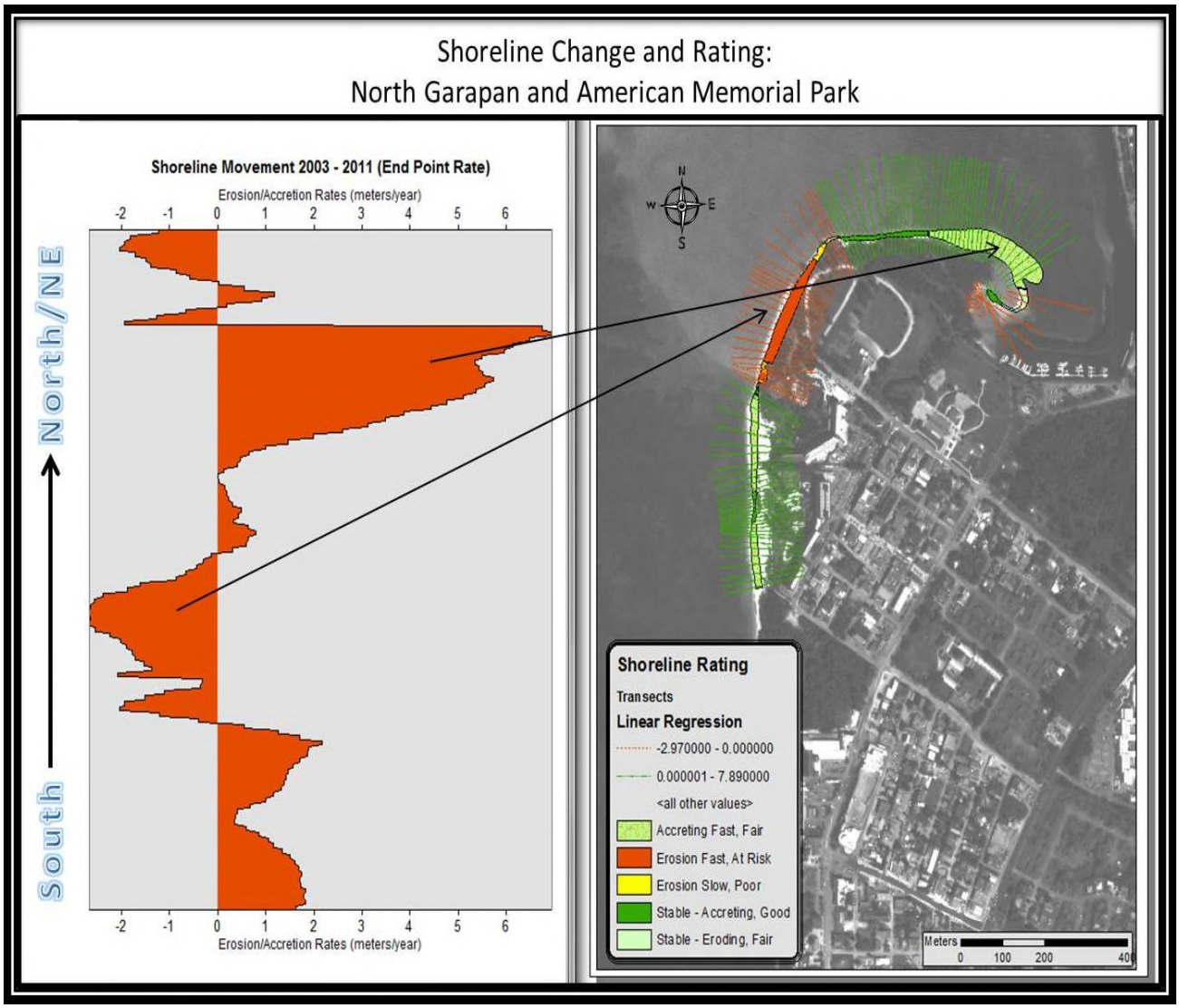

Figure 4: Shoreline erosion and accretion at critical points as assessed by the USGS Digital Shoreline Analysis System and CRM from 2003 to 2011. Shoreline profile is a key ecological attribute, indicated by the rate of change at critical points. Rate of change was ranked fair according to a 2012 BECQ dataset. Data and map provided by CRM.

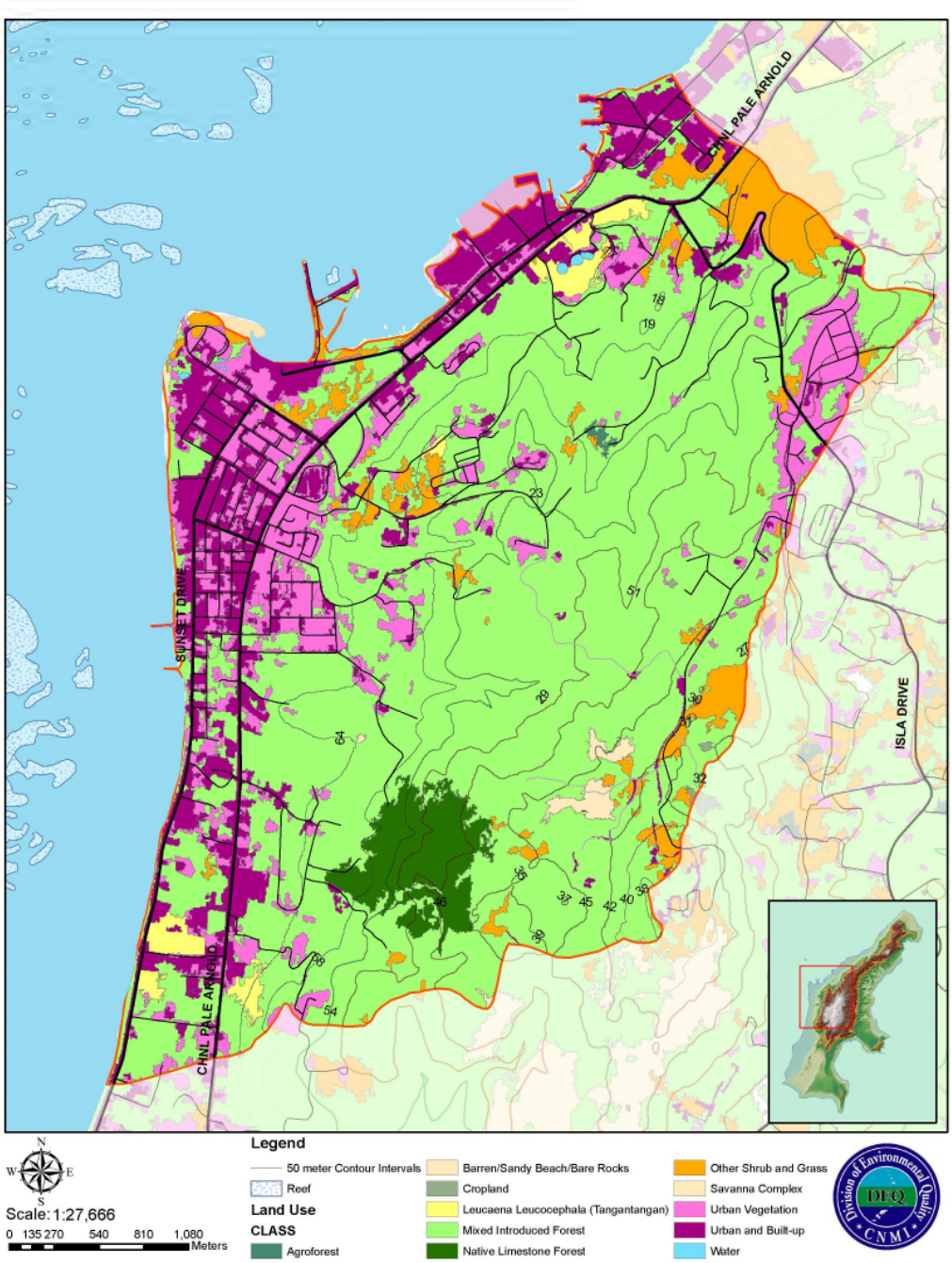

Figure 5: 2006 land use and vegetation map for the West Takpochao watershed. Vegetative cover is ranked as 'fair,' indicated by the percent canopy cover of native limestone forest. Urban greenspace is ranked as 'poor,' indicated by a percent decrease in urban area covered by pervious or vegetated surfaces. Data provided by the US Forest Service, map created by DEQ.

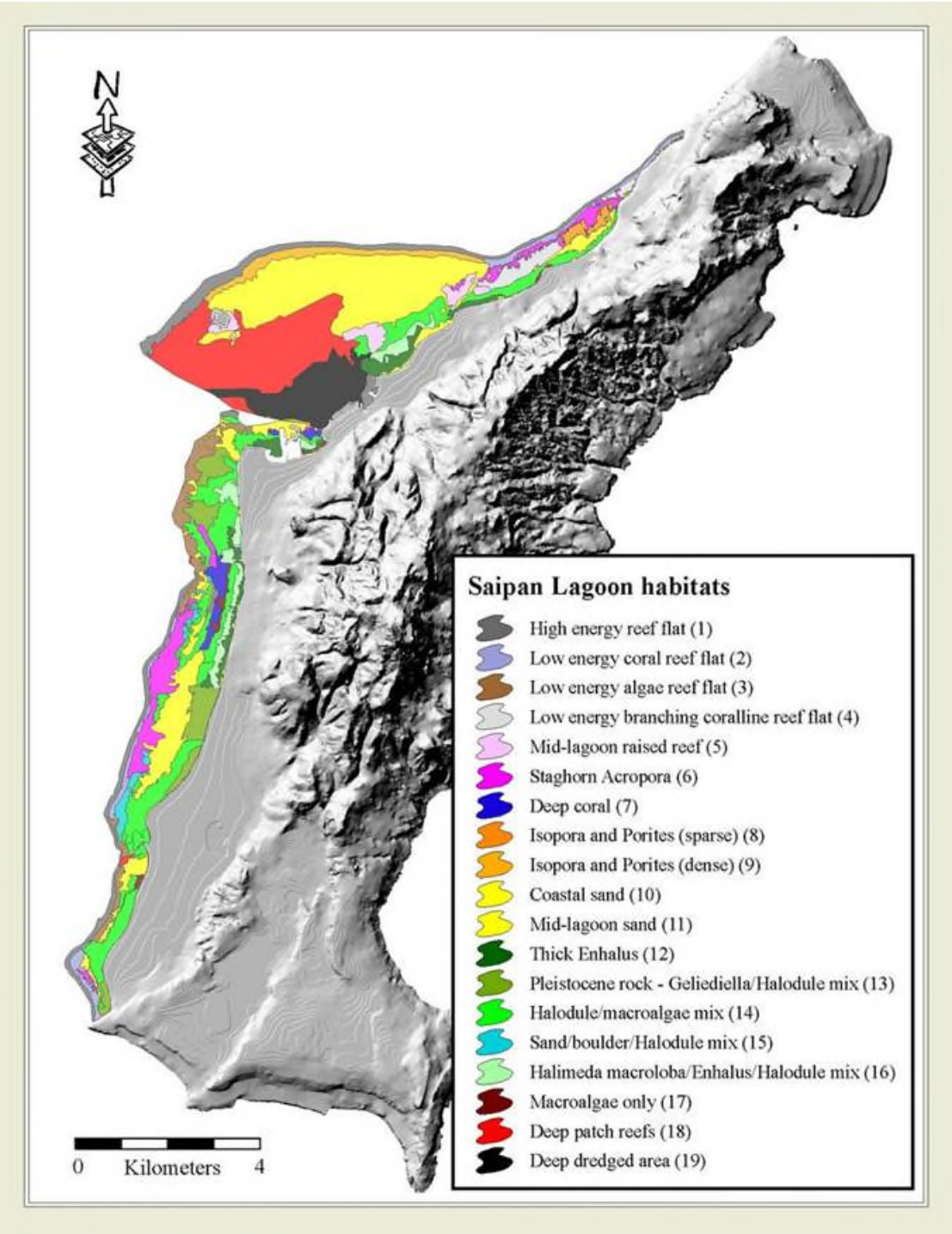

Figure 6: Marine habitat types in Saipan's western Lagoon. Map from Houk and van Woesik (2008).

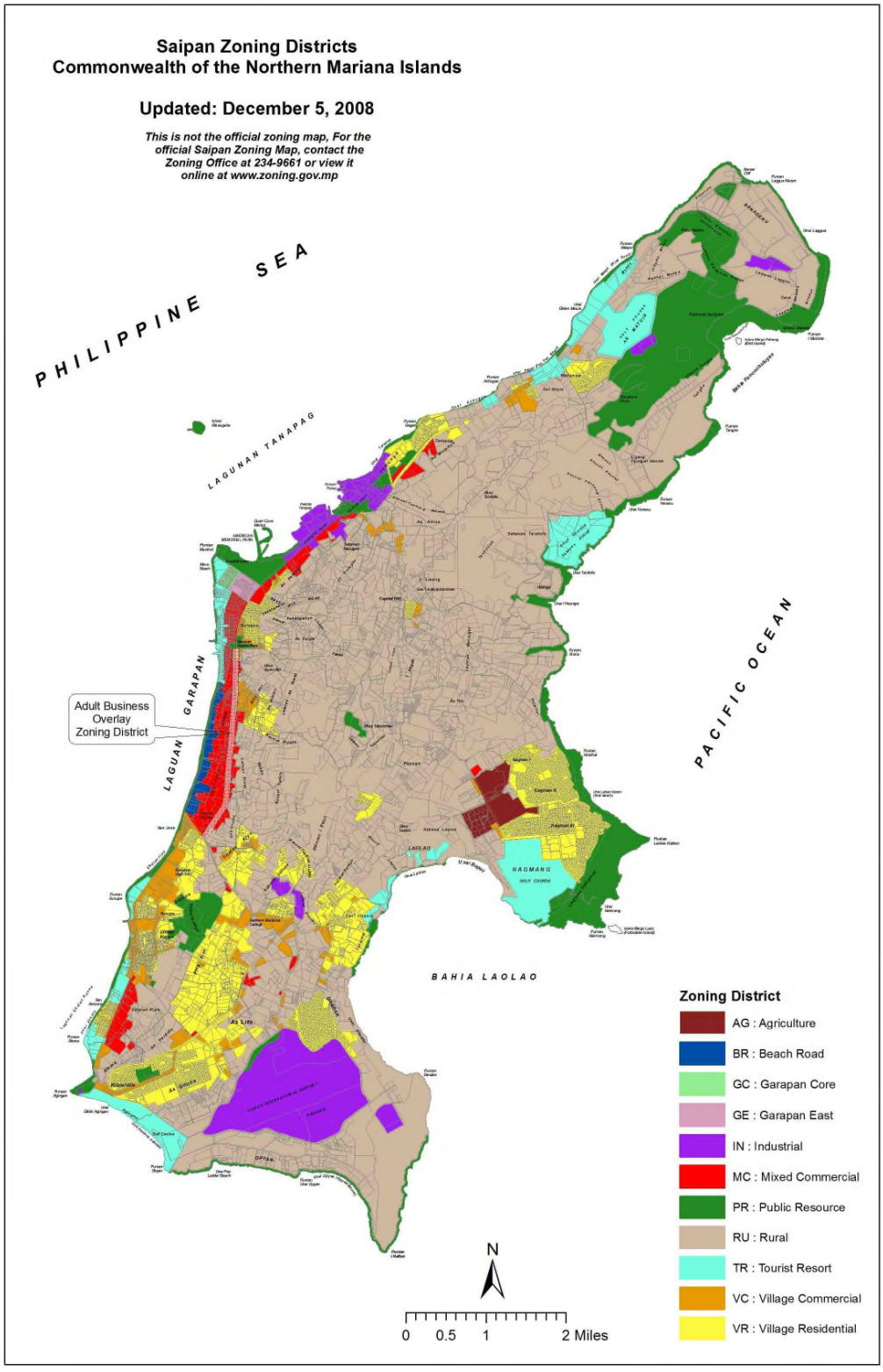

Figure 7: Zoning districts as specified in the CNMI Zoning Code. Map provided by the Zoning office.

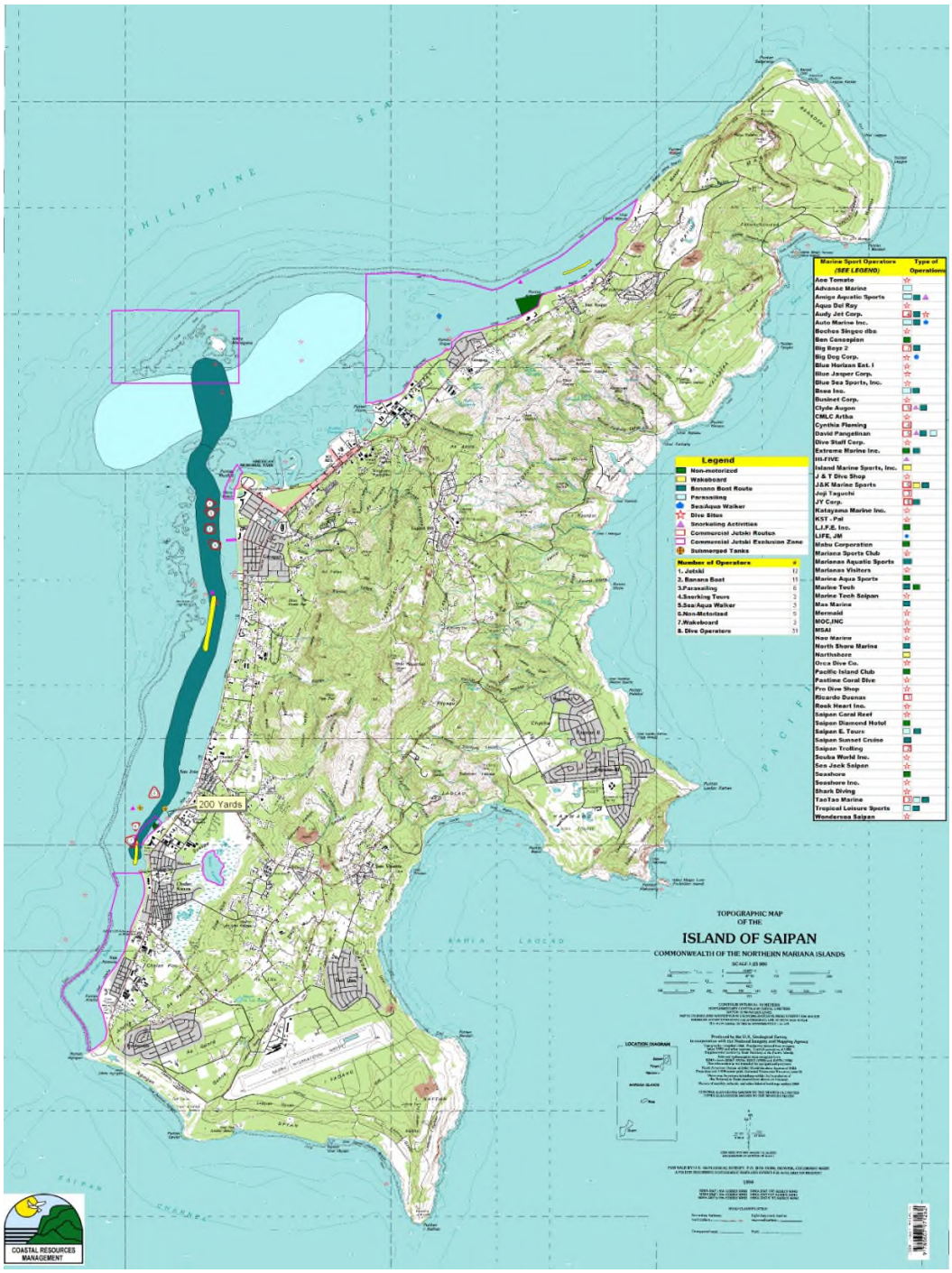

Figure 8: A map of permitted marine sports operators in the Saipan lagoon. Parasailing, banana boats, and diving are important activities along the Garapan coast. Map created by CRM and USGS.

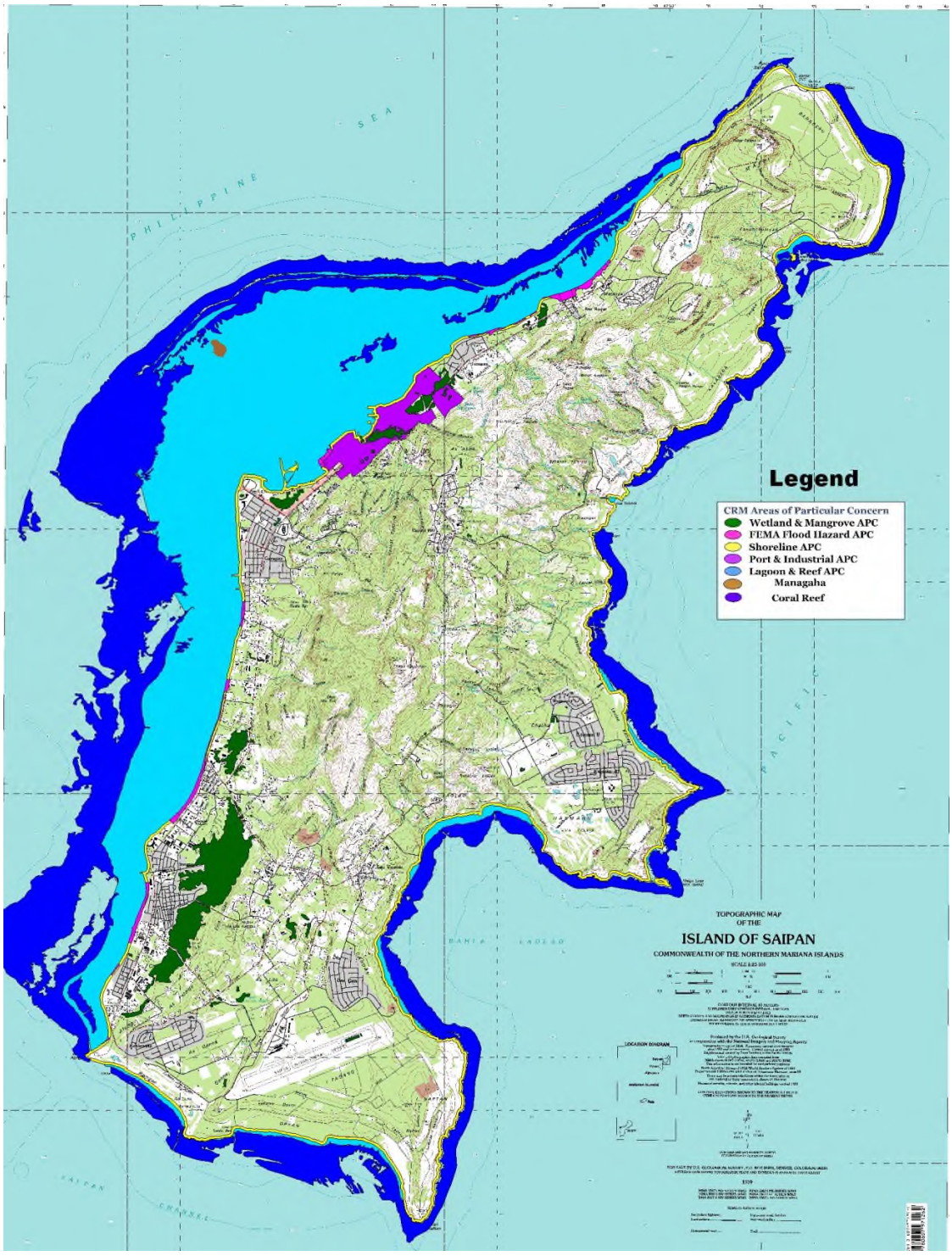

Figure 9: Areas of Particular Concern for the Coastal Resources Management Office. Wetlands and mangroves are a priority ecological target, currently ranked poor based on the acreage of wetland/mangrove vegetation. Map created by CRM and USGS.

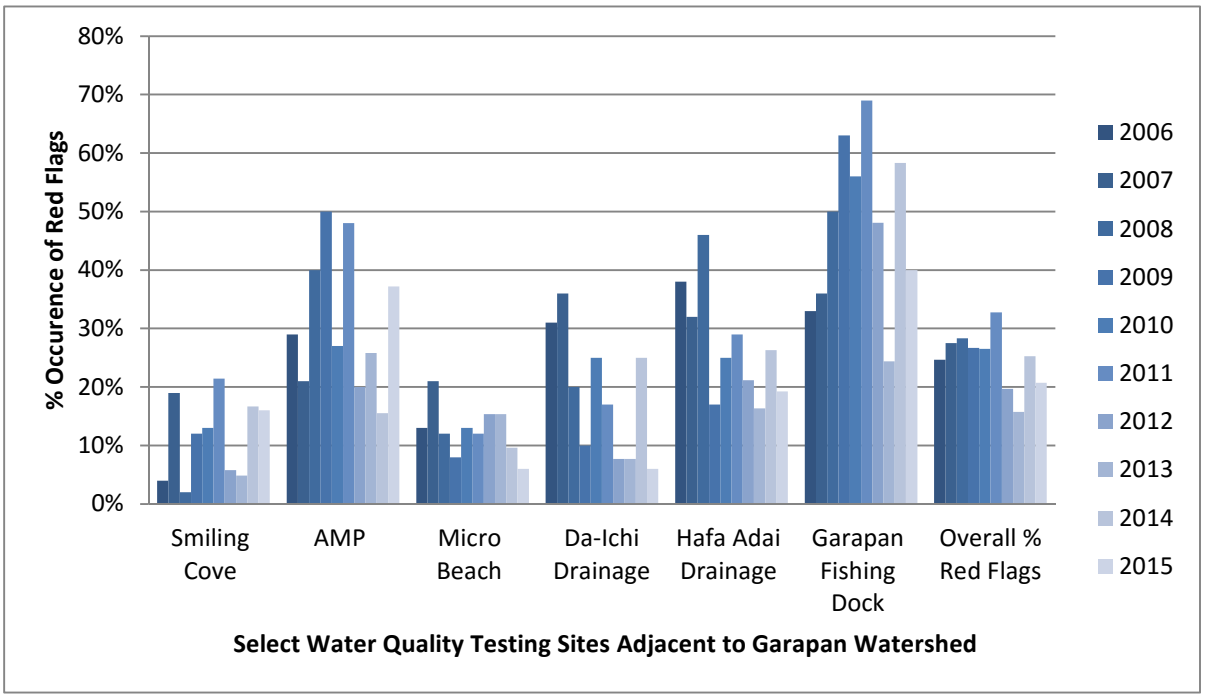

Figure 10: Percent of samples each year with microbiological violations at sites adjacent to Garapan. Each week, the BECQ Water Quality Branch tests the waters adjacent to Garapan Watershed for certain parameters, including indicators of fecal bacteria. A "Red Flag" indicates that the concentration of microbes in the sample exceeds CNMI Water Quality Standards. The "Overall % Red Flags" is an average percentage from all six sites. Lagoon water quality is ranked "poor," indicated by the high percentage of beaches with microbiological violations. Data and graph provided by the BECQ Water Quality Surveillance Laboratory.

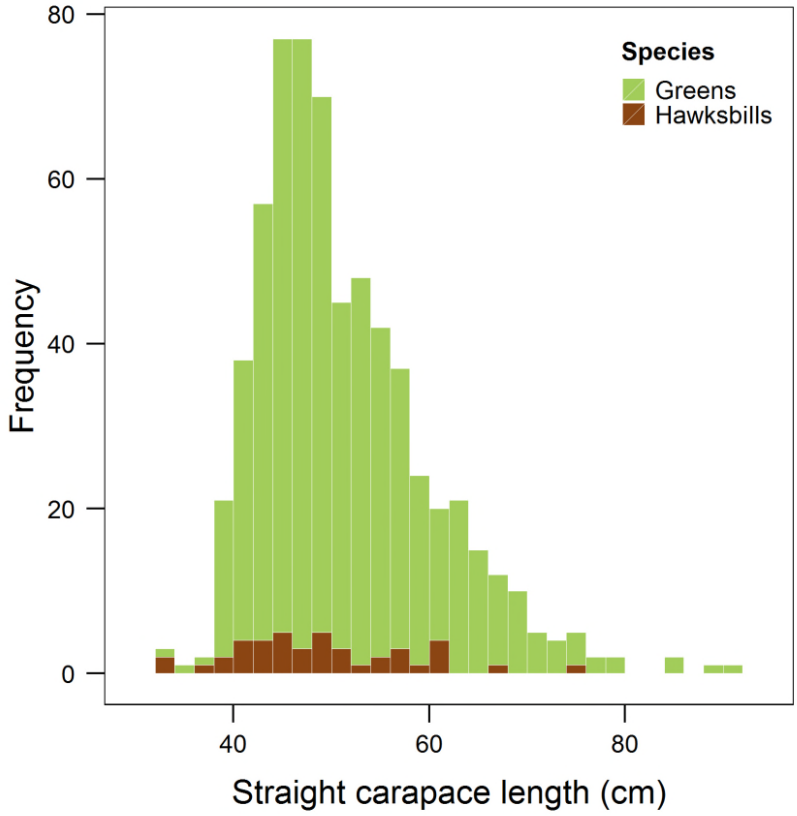

Figure 11: Frequency distribution of straight carapace length for green and hawksbill turtles captured in the CNMI from August 2006 to February 2014. Garapan is one of the main foraging sites on Saipan. Turtle population size is rated as "fair," measured by catch per unit effort of in-water captures. Data provided by the CNMI DLNR Sea Turtle Program. Graph

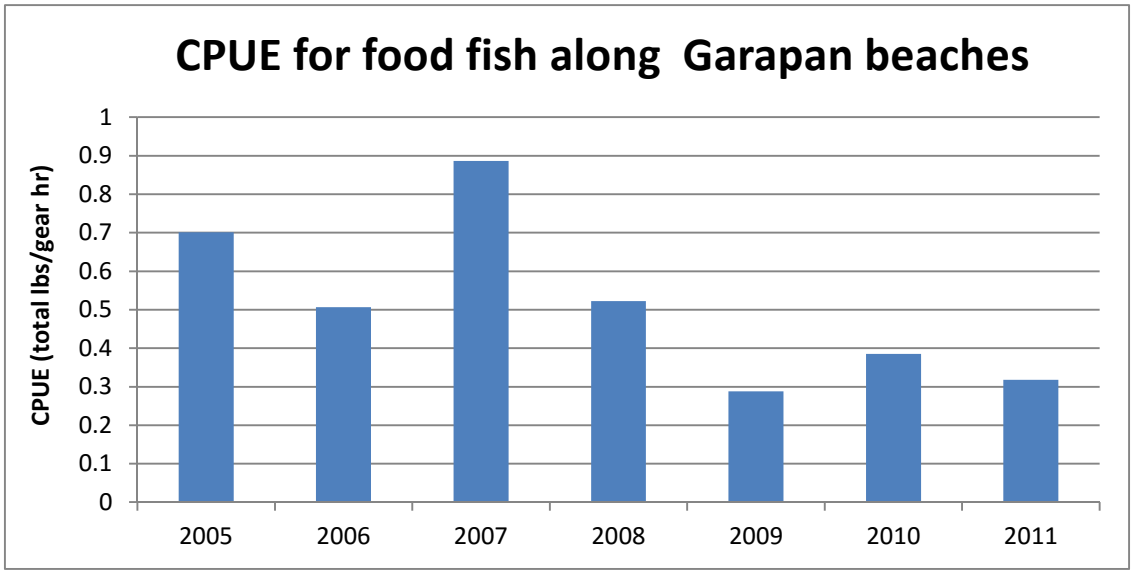

Figure 12: Combined average catch per unit effort (CPUE) of food fish caught during daytime and nighttime from hook & line, cast-net fishing or spearfishing in Garapan area survey zones. The food fish target is rated as "fair" based on a lack of a near-term significant increase or decrease in CPUE. Data provided by DFW creel surveys.

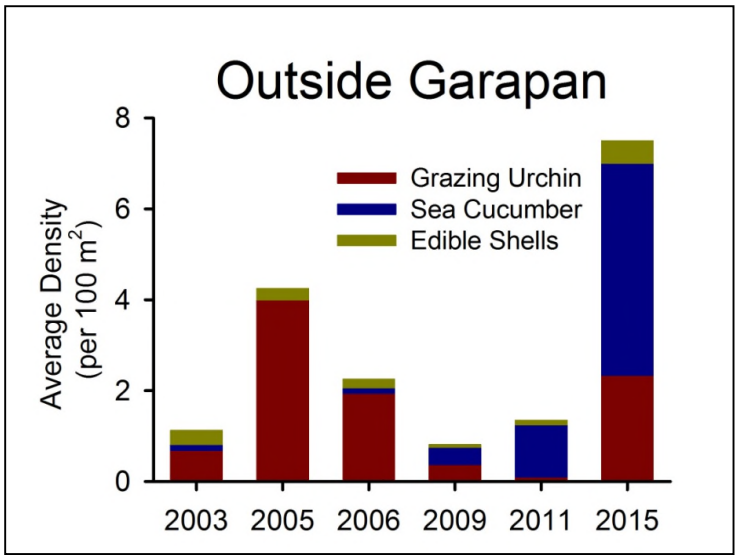

Figure 13: Average density of three different classes of marine invertebrates during sampling years, at a study site outside of Garapan. Relative and overall densities change significantly over time. Density of edible shells and grazing urchins are rated as "poor" while sea cucumbers are rated as "fair", contributing to an overall rating of "fair for the invertebrate target. In 2015, the average density of invertebrates at the site increased significantly, indicating a positive trend. Data provided by the BECQ Marine Monitoring Team.

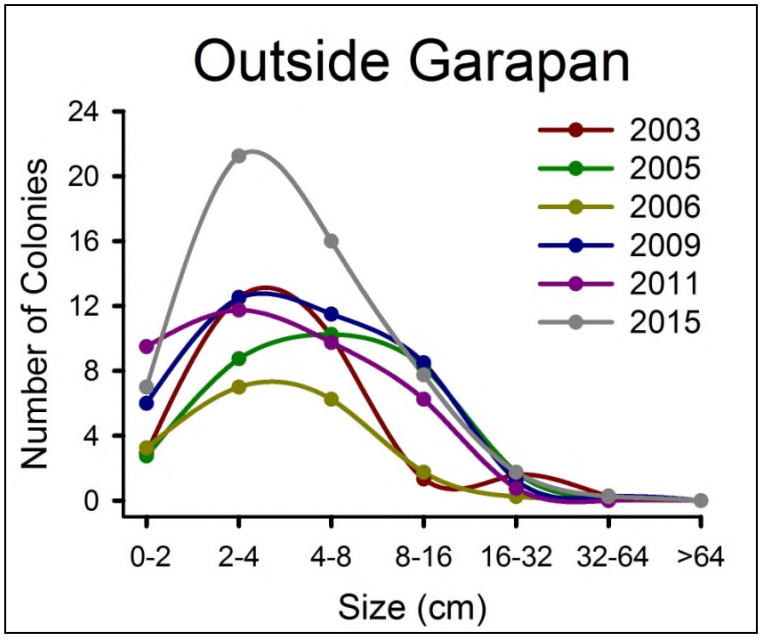

Figure 14: Coral colony size class distribution in a study site outside of Garapan is rated as "fair," contributing to the overall benthic health status of "fair". In 2015, the relatively high presence of colonies from 2-8 cm in size shows an increase in coral recruitment. Data and graph provided by the BECQ Marine Monitoring Team.

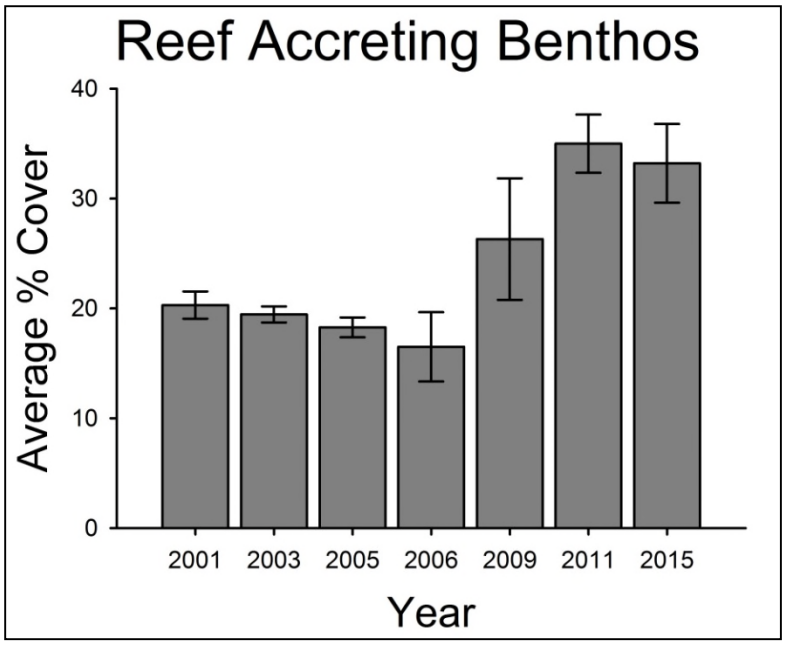

Figure 15: Percent cover of reef-accreting benthic substrate includes coral, coralline crustose algae, and branching coralline algae which are conducive to coral recruitment. This indicator is rated as "poor" contributing to an overall benthic habitat rating of "fair". Data provided by the DEQ Marine Monitoring Team.

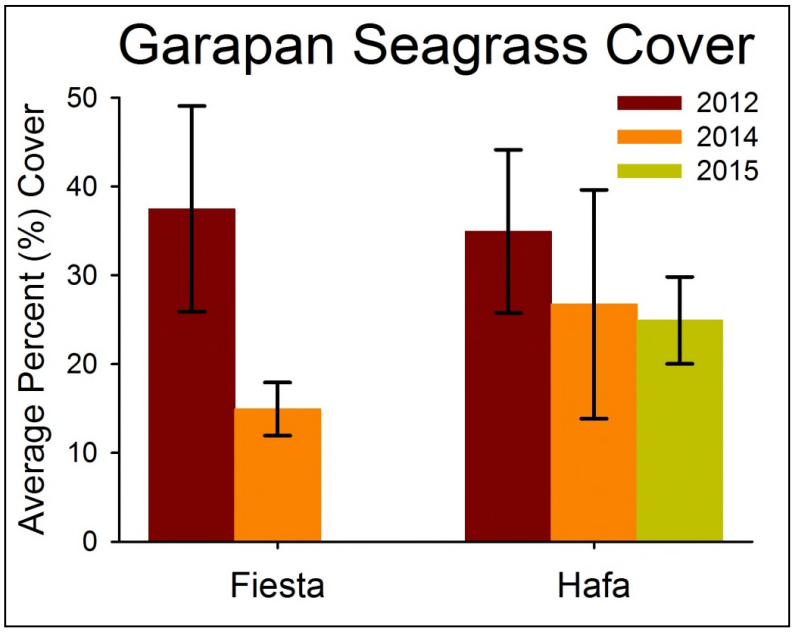

Figure 16: Percent seagrass cover at two Garapan study sites (outside major stormwater drainages) shows a decline in habitat since 2012. Seagrass habitat is ranked 'fair,' measured by (1) percent cover of seagrass and (2) ratio of seagrass to macroalgae. Data and figure provided by the BECQ Marine Monitoring Team.

APPENDICES

APPENDIX 1: CAP WORKSHOP PARTICIPATION LIST (MARCH 10-11, 2015)

DAY 1:

Robert Greene – BECQ-DCRM
Jason Tenorio – Forestry
Mac Chargualaf – MOS
Frank Ada – Forestry
Emanuel Borja – BECQ
Alfredo de Torres – NMC-NRMP
David Apatang – MOS
Pat Rasa – DPL
Clarissa Bearden – BECQ
Lily Kapileo – DPH-BEH
Francisco M. Borja –Senate
James A. Ada – DPW
Shelly Kremer – USFWS
Steve McKagan – NOAA
Lyza Johnston – BECQ
BJ Attao –House of Representatives
Kenneth Gabrido – NMC-ENRO
Maryann Arriola – Zoning
Therese Ogumoro – Zoning
John Riegel – CUC
Margarita Torres Aldan – CHCC
Martin Duenas – MVA
Alan Fletcher – CUC
David B. Rosario – BECQ-DEQ
Edmund Villagomez –House of Representatives
Becky Furey – MINA
Jimmy Blancia – KWAW 100.3
Frank Villagomez – DFW
Derek Chambers – BECQ-DEQ
Gus Aguon – NMC-ENRO
Steven Johnson – BECQ
Fran Castro – BECQ-DCRM
Dana Okano – NOAA-CRCP
David Benavente – BECQ
Rodney Camacho – UoG-ML
Ryan Okano – BECQ
Becky Skeele – BECQ-DCRM
Avra Heller – BECQ
Lainie Zarones – DLNR
Manuel Tenorio – DLNR-DOA
Francisco Q. Cruz – Senate
Jose M. Kaipat – BECQ
Ray Tebuteb – House of Representatives
Ben Castro – DPW
Bart Lawrence – USDA-NRCS
Erin Derrington – BECQ
Dennis Chan – Saipan Tribune

DAY 2:

Maryann Arriola – Zoning
Alfredo de Torres – NMC-NRMP
Erick dela Rosa – NMC-NRMP
Lainie Zarones – DLNR
Lily Kapileo – DPH-BEH
John Riegel – CUC
Martin Duenas – MVA
Brooke Nevitt – MINA
Jimmy Blancia – KWAW FM100.3
Jose M. Kaipat – BECQ
Ben Castro – DPW
Frank Villagomez – DFW
Joma Santos – NMC-ENRO
Frincess Barcia – NMC-ENRO
Harry Blanco – DOI-OIA
Jason Tenorio – Forestry
Frank Ada – Forestry
Pat Rasa – DPL
Emanuel Borja – BECQ
Mac Chargualaf – MOS
Avra Heller – BECQ
Jihan Buniag – BECQ
Lyza Johnston – BECQ
Robert Greene – BECQ
Steven Johnson – BECQ
Gus Aguon – NMC-ENRO
Clarissa Bearden – BECQ
Derek Chambers – BECQ
Steve McKagan – NOAA
Becky Skeele – BECQ-DCRM
David Apatang – MOS
BJ Attao – House of Representatives
Ed Villagomez – House of Representatives

Alan Fletcher – CUC
Bart Lawrence – USDA-NRCS
Fran Castro – BECQ-DCRM
Richelle Ann Cabang –Marianas Variety

APPENDIX 2: CAP WORKSHOP PARTICIPATION LIST (SEPTEMBER 10-13, 2012)

NAME	AGENCY
Alberto Ignacio	PDM Promoters
Alfredo DeTorres	NMC
Angel Palacios	DEQ
Annie Agulto	CRM
Barbara Alberti	NPS
Becky Skeele	CRM
Ben Cepeda	Forestry
Carlos Ketebengang	DEQ
Clarissa Bearden	DEQ
Dana Okano	NOAA
Dave Benavente	CRM
Derek Chambers	DEQ
Doris Chong	CRM
Ed Santos	SNISWCD
Rep. Edmund Villagomez	Legislature
Fran Castro	DEQ
Francis Buniag	DFW
Frank Villagomez	DFW
Gene Weaver	Fisherman's Assoc.
Geralyn Dela Cruz	DPW
Greg Moretti	PMRI/Chamber of Commerce
Ike Cabrera	SWCD
Jessie Camba	PDM Promoters
Jihan Buniag	DEQ
Joe Kaipat	DEQ
John Fraser	DEQ
John Furey	APASEEM
John Gourley	Marianas Conservation
John Iguel	DEQ
John Riegel	CUC
Jose Quan	DEQ
Juan Iguel	NMC Student
Judy Torres	MVA, deputy
Julius Reyes	NMC Student
Kendal Hicks	NRCS
Kodep Ogumoro-Uludong	MINA
Manny Borja	DEQ
Manny Tenorio	NMC Student
Marlyn Naputi	NMC Student
Matthew Crane	NMC, MRC
Mike Tenorio	DFW
Mike Trianni	NOAA
Nicole Schafer	CRM
Pat Rasa	DPL
Perry Tenorio	MVA
Robbie Greene	CRM
Rose Pangelinan	CRM
Ryan Okano	DEQ
Sean McDuff	DFW (Creel)
Severino Alforeza	NMC Student
Shelly Kremer	DEQ
Shirley Tenorio	NMC Student
Sonya Dancoe	DPW
Steve McKagan	NOAA
Steven Johnson	DEQ
Steven Victor	TNC
Susana B. Deleon Guerrero	Forestry
Tammy Summers	DFW
Thomas Borja	Mayor's Office
Timothy Lang	TRL Consultant
Todd Miller	DFW
Tyler Willsey	DFW

APPENDIX 3: ACRONYMS

AG – Attorney General

BEH – Bureau of Environmental Health

BECQ – Bureau of Environmental and Coastal Quality

CAP – Conservation Action Plan

CIP – Capital Improvement Projects (office)

CNMI – Commonwealth of the Northern Mariana Islands

CPA – Commonwealth Ports Authority

CRCP – Coral Reef Conservation Program

CRM – Coastal Resources Management (office)

CUC – Commonwealth Utilities Corporation

DEQ – Division of Environmental Quality

DFW – Division of Fish and Wildlife

DLNR – Department of Lands and Natural Resources

DOT – (US) Department of Transportation

DPH – Division of Public Health

DPL – Department of Public Lands

DPS – Department of Public Safety

DPW – Department of Public Works

EPA – (US) Environmental Protection Agency

HPO – Historic Preservation Office

KEA – Key Ecological Attributes

MINA – Mariana Islands Nature Alliance

MVA – Marianas Visitor's Authority

NMC – Northern Marianas College

NMC-Crees – NMC Cooperative Extension Service

NMFS – (NOAA) National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NRCS – (USDA) Natural Resources Conservation Service

PIMPAC – Pacific Islands Marine Protected Areas Community

PDM – Paseo de Marianas (Promoters)

PMRI – Pacific Marine Resources Institute

SWCD – Soil and Water Conservation District

TNC – The Nature Conservancy

USDA – US Department of Agriculture

USGS – US Geological Survey

APPENDIX 4: ADDITIONAL COMMENTS

The following topics were brought up at the CAP Review Workshop in 2015 but were not ultimately included in the 2015 Update to the Garapan CAP upon discussion and agreement by the stakeholders. However, they should be noted and discussed again in future updates as appropriate.

In addition to the existing targets, three new targets were discussed to be added to the list. Although these are not traditional conservation targets, they should be incorporated into the CAP:

1) Historical/cultural sites – indicator is "# of historical sites protected"
2) Infrastructure – It is impossible to ignore the needs of crumbling infrastructure such as sewerlines, storm drainages, roads and utilities.
3) Air quality – threats to air quality are especially severe in Garapan from idling cars and tour buses, hotel generators and burning trash/yard waste.

In order to incorporate climate change considerations into the Garapan CAP, some participants recommended that we monitor pH and temperature of nearshore waters as indicators of water quality. However, there is concern that these indicators would be misleading if they are only measured within Garapan and not island- or CNMI-wide. Therefore, we recommend that certain climate change indications be included in a separate analysis outside of the Garapan Watershed plan and reported on a regular basis over time.