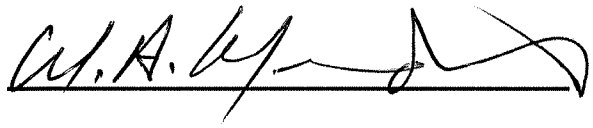
Commonwealth of the Northern Mariana Islands
Division of Environmental Quality
Office of the Governor

Talakhaya/Sabana Conservation Action Plan

January 2012

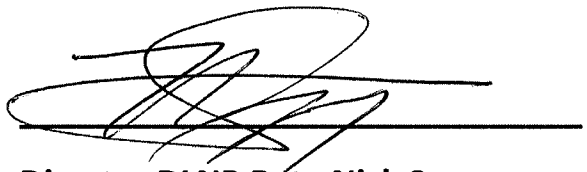
Note: This plan was compiled by Aric Bickel. Much of the information contained in this plan was taken directly from existing CNMI Government planning documents obtained from DEQ, CRM, and DFW, as well as U.S. federal documents from NRCS. Extremely aluable assistance with the development and revisions of this plan has come from non-governmental organizations and specifically from the Luta Soil and Water Conservation District.

Approved by:



5.30.12

Rota Mayor Melchor Mendiola **Date**



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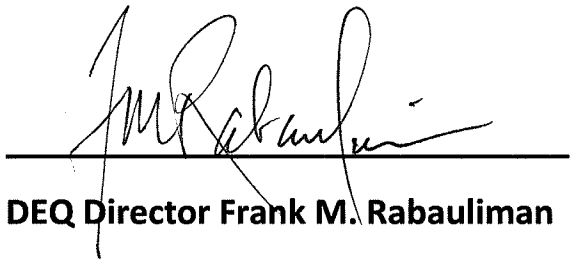
Director DLNR Rota Nick Songsong **Date**

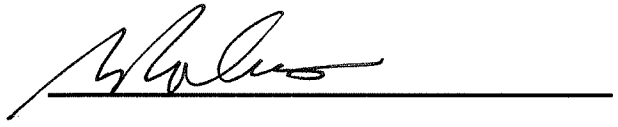


APRIL 3, 2012

DEQ Director Frank M. Rabauliman **Date**

3 April 2012

CRM Administrator Rita C. Chong-Dela Cruz **Date**



3/22/2012

DLNR Secretary Arnold Palacios **Date**

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Executive Summary

The Talakhaya/Sabana Watershed Conservation Action Plan (CAP) was completed between March 2010 and December 2011. Two workshops were held with members of the CNMI Division of Environmental Quality (DEQ), Coastal Resources Management (CRM), Department of Lands and Natural Resources (DLNR), and Division of Fish and Wildlife (DFW) as well as representatives from the U.S. National Oceanic and Atmospheric Administration (NOAA), Rota Mayor's office, U.S. Natural Resources Conservation Service (NRCS),The Nature Conservancy (TNC), Pacific Marine Resources Institute (PMRI) and other community stakeholders. Through these workshops the outline of a management plan was developed and later used to generate a draft management plan by agency staff. This plan was taken to the regional TNC CAP meeting where it was reviewed by other regional partners. The plan was then circulated for comment and approval from the CAP team members and local agency directors.

Through the process, eight natural resource targets were selected as being integral to the health of the watershed: 1) Forests, 2) Birds, 3) Targeted Wildlife, 4) Endangered and Medicinal Plants, 5) Fish and Invertebrates, 6) Soil Quality, 7) Freshwater, and 8) Coral Reefs. Three threats to these targets were identified as having a high priority for management attention: 1) Soil erosion (and the sedimentation caused by it), 2) Incidences of fire and poaching in the project area, and 3) overharvesting of targeted species.

Five strategies to address the identified threats were laid out during the process:

A) Revegetation of critically eroding areas in the Talakhaya/Sabana.

B) Implementation of engineering actions that would decrease erosion in the watershed.

C) Raising awareness and education of the Rota community about how fires and poaching are affecting the watershed.

D) Creation of effective enforcement measures for local laws.

E) Collection of necessary species population information in the area to allow for more informed policy decisions.

Strategic objectives and actions necessary to carry out these strategies are outlined and can be found in the "Management Approach" section beginning on page 25.

Environmental change in the marine environment in the Talakhaya/Sabana watershed is monitored as part of CNMI's long-term monitoring program and has been surveyed consistently at several sites since 2000. To support CAP activities, these surveys will be continued and expanded to ensure management activities have the desired effect on the natural resource targets.

An annual workplan will be developed prior to the beginning of each fiscal year that will prioritize the projects to be implemented from the plan as well as to guide funding requests. This document is not planned to be static, but rather a dynamic plan that will be updated as threats change and more information becomes available.

Introduction

This plan is a cooperative effort between the resource management agencies with both federal and local mandates to manage resources in the Talakhaya/Sabana watershed including: Division of Environmental Quality (DEQ), Coastal Resources Management Office (CRM), Division of Fish and Wildlife (DFW), and Department of Lands and Natural Resources (DLNR). Several of our federal and NGO partners have also assisted with the development of this plan, including Natural Resource Conservation Service (NRCS), various representatives from the National Oceanic and Atmospheric Administration (NOAA), the Nature Conservancy (TNC), and the Luta Soil and Water Conservation District (LSWCD).

Increased population and development over the past two decades in the CNMI has exacerbated the threats to our coral reef ecosystems. Reduced health of coral reef and coral-reef associated habitats has been documented (MMT Data). From a long-term perspective, the decline in coral-reef coverage and 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. (2005 CRI Grant)

In 2008, the CNMI was approached by TNC Micronesia program and offered assistance in developing site specific management plans through the Conservation Action Plan (CAP) format. The CAP process was designed 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 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: Laolao Bay and Garapan watersheds on the island of Saipan, and Talakhaya/Sabana watershed on the island of Rota. A CAP for Laolao Bay was completed in January of 2009, laying out the conservation priorities for the area. It was decided that the Talakhaya area would benefit from a similar process, through which the following management plan was developed.

Site Description

(a) Location and Governance

The 466-mile long Mariana Island archipelago includes 14 islands within the U.S. 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 slightly less than 3½ hours by air. Saipan, Tinian, and Rota are the three developed islands of the CNMI with 90% of the population based on Saipan (2005 CRI Grant). All watersheds on the islands are considered coastal watersheds. Under CNMI law, the Coastal Resource Management Office (CRM) has regulatory jurisdiction over all lands of the Commonwealth. The Talakhaya/Sabana watershed is located on the southern portion of the island, as illustrated by the diagram below.

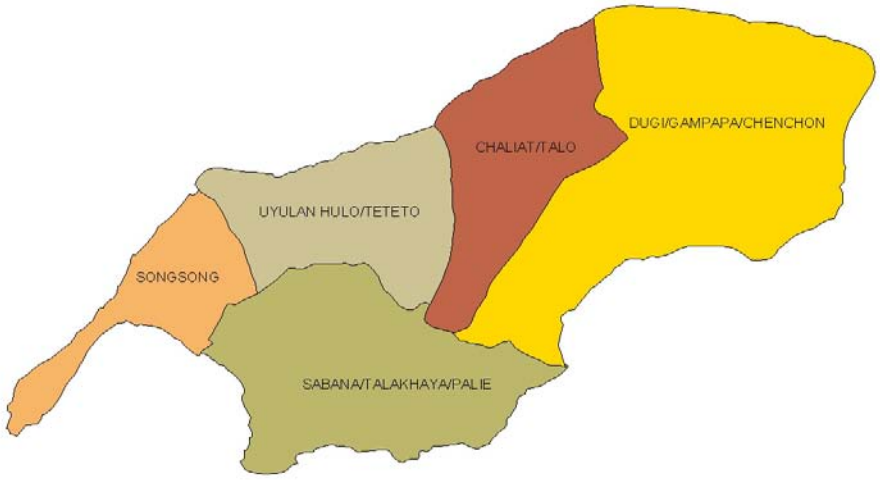


Figure 1: the watersheds of Rota (Luta)

Rota, or Luta as it is know in the Chamorro dialect, is one of 15 islands in the Mariana archipelago, approximately 3,750 miles southwest of Hawai'i. It is the southernmost and third largest island in the CNMI, after Saipan and Tinian. Rota is located at approximately 14° 10' north latitude and 145° 10' east longitude. Songsong village is the largest and most populated urban area followed by Sinapalo village.

Dimensions:

- Area: 85.38 square kilometers (32.967 square miles)
- 16.9-kilometers (10.5-miles) long
- 4.8-kilometers (3-miles) wide
- Coastline: 61.6 kilometers (38.3 miles)
- Highest point: Mt. Manira - 495 meters (1,625 ft)
- Population: 2527 (2010 - U.S. Census Bureau)

Distances:

- Guam - 76 kilometers (47 miles; south)
- Tinian - 101 kilometers (63 miles; north)
- Saipan - 117 kilometers (73 miles; north)
- Hawaii – 6,035 kilometers (3,750 miles; northeast)

Three local government agencies partner to manage the project area including: the Division of Environmental Quality (DEQ), the Coastal Resources Management Office (CRM), and the Department of Lands and Natural Resources (DLNR), which houses the Division of Fish and Wildlife (DFW). The 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. The CRM program was established in order to promote the conservation and wise development of coastal resources. DLNR was established by Public Law 1-8 and was empowered by that law "To be responsible for the protection and enhancement of the natural resources of the islands ... " The DFW was created by Public Law 2-51 which was later revised by Public Law 10-57. The DFW is housed within DLNR and its purpose is to conserve fish, game, and wildlife and to protect endangered and threatened species. Through research, monitoring, regulation, enforcement, planning, and management, DFW seeks to ensure long-term survival and sustainability of CNMI's resources.

In order to own land in the CNMI, individuals must prove a certain degree of indigenous lineage. 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.

Most private lands on Rota are on flat or low sloping ground (less than 30 percent slope). These lands comprise approximately 66 percent of Rota's land base, and at least 75 percent of that land is now or will soon be committed to private land uses. The 34 percent of Rota that is less suitable for development primarily consists of cliffs or steep slopes. These are also the areas with the remaining undisturbed native forests. CNMI government programs call for the transfer of portions of public lands from public to private ownership via agricultural or village homestead programs.

Title to public land in the CNMI is vested in DPL. DPL, as directed by the Board of Public Lands, 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.

DPL retains authority over the homestead lots until the three-year permit requirements are met whereupon the land is then legally transferred to private ownership through a deed of conveyance. This process is ongoing. (Reconnaissance Survey, 2005)

Project Scope

For the purposes of this plan, the scope of the Talakhaya/Sabana watershed will be defined as the coast line between latitude 14° 6'44.69''N, longitude 145° 10'40.62''E and latitude 14°6'58.62''N, 145°12'19.65''E and all the lands draining into that coastlines' waters extending inland into the Sabana Conservation Area.

Large portions of Rota's public lands are currently protected under Rota Local Law 9-1 due to their high resource value; examples include sea bird sanctuaries and conservation areas for forests and wildlife (areas are shown in figure 2). Additionally, Rota Local Law 9-2 established a marine protected area in Sasanhaya Bay on the southern portion of the island (also shown in figure 2). The Department of Land and Natural Resources (DLNR) manages these public lands and waters designated as conservation areas. Two of these areas fall within the vicinity of the Talakhaya/Sabana project area:

Sasanhaya Bay Fish Reserve (Coral Gardens Marine Conservation Area)

The reserve, created in 1994 under Rota Local Law 9-2 and regulations promulgated under public law 2-51, was the first established marine protected area in the CNMI. It is located in the Sasanhaya Bay of Rota, between and including Puña Point and the Coral Gardens; it sits directly adjacent (to the west) of the marine areas associated with the project area. The reserve, by Rota Law, is a no-take zone and also prohibits any "activities which are exploitive or destructive to the marine life and/or the World War II wrecks…within the reserve" (Rota Local Law 9-2).

Additionally, it should be noted that the United States does not recognize the CNMI as having sovereign waters. The DFW is allowed to manage native marine species which occur within three miles seaward of the low water mark on the CNMI's coastlines, this being the current area allowed to the CNMI for enforcement of local laws applicable to fish, wildlife, and coral reef protection by Order Partially Staying Judgment Pursuant to Stipulation of Parties, CNMI v. USA, Civil Action CV 99-0028, U.S. District Court for the 21 District of the Northern Mariana Islands.

Sabana Protected Area

This high plateau area in the southwestern portion of the island was established as a protected area in 1994 under Rota Local Law 9-1 to provide watershed protection, wildlife and forest conservation, as well as for community farming, hunting, and medicinal plant gathering.

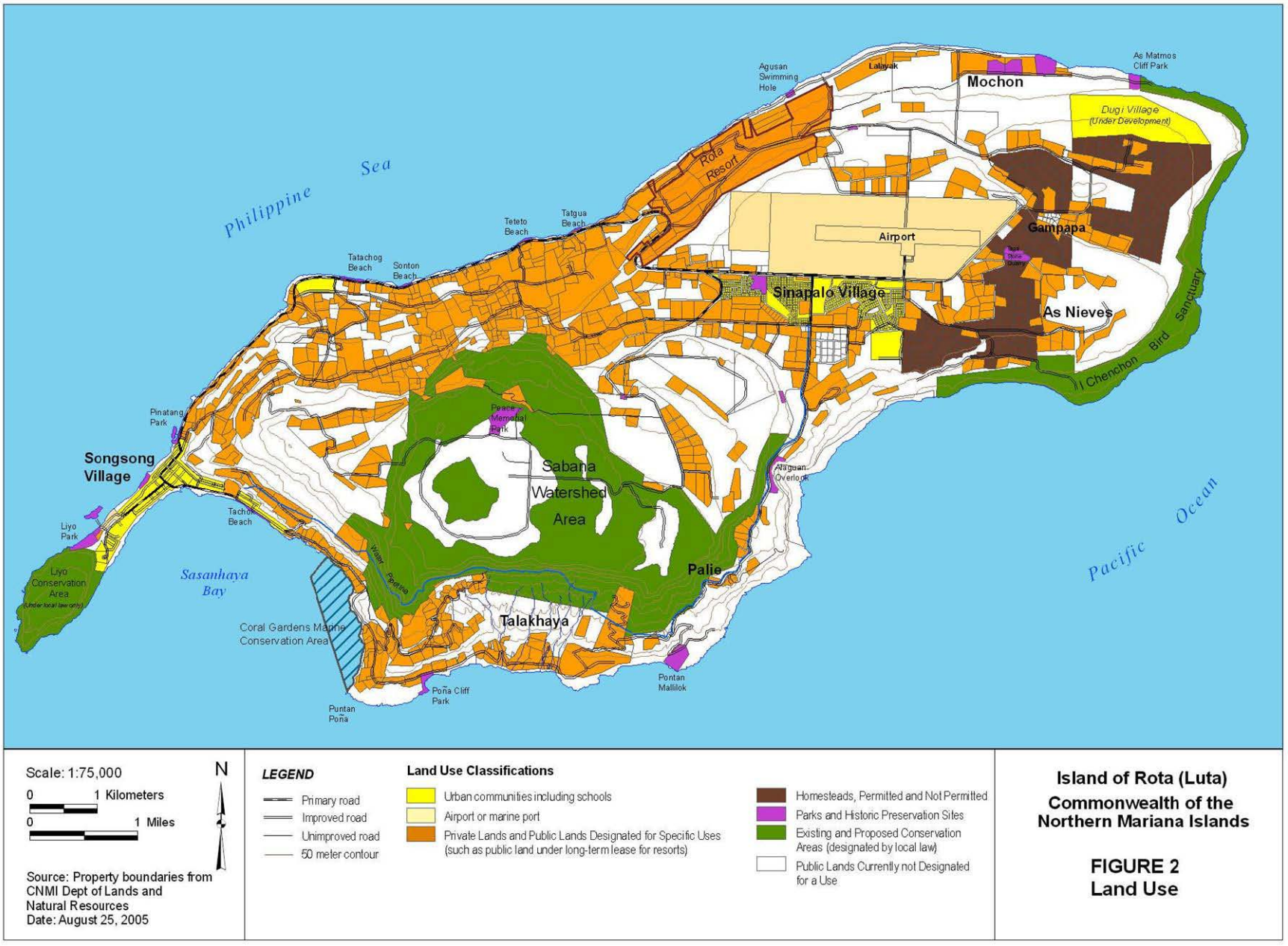
Within the designated area "all persons are hereby prohibited from taking or in any way harassing or disturbing all varieties of non game wildlife, including but not limited to fruit bats and Marianas Crow; all plant life , including any fungi, forest vegetation or grasses, with the exception of those plants that possess medicinal properties and/or those that have been used in traditional healing practices and/or those that are being utilized through normal agricultural activities; and any soil, including soil, sand or

rock, within or from the area in Rota known and referred to as Sabana Heights and I Chenchon Park" (Rota Local Law 9-1).

In 2007, the Talakhaya portion of the project area was added to the Sabana Conservation Area under Rota Local Law 15-8 and is given the same status and protection as the initially established area (the addition of Talakhaya to the Sabana Watershed Area is not show in figure 2).

As of the writing of this report, Rota managers are exploring the designation of the Sabana Conservation Area as an "organic farming only" agricultural area, where the use of agricultural chemicals would be prohibited. The designation is in response to worries of pesticide, fertilizer, or other chemicals leaching into the island's water source from the Sabana. Nearly 100% of the drinking water supply on Rota is pumped from a water pooling cave, which sits just below the cliff line of the Sabana within the Talakhaya/Sabana watershed (UWA 1998).

Figure 2: land use and conservation areas in Rota, CNMI (source NPS)



(b) Biophysical Setting

i. Physical Features:

The geology of the three most Southern and populated Mariana Islands suggest that they were once submerged below sea-level, allowing a layer of coral reef to form over the volcanic rock. This resultant limestone rock is extremely porous in nature and groundwater discharges unknown amounts of sediment or agricultural pollution that can enter the basal aquifer and marine system. Lack of knowledge about groundwater flow and water quality is a major impediment to improving conditions for many of CNMI nearshore marine systems (LAS).

There is no published information on Rota's bedrock, but it is likely to be similar to Saipan and Tinian because of their common origins. These islands are underlain with volcanic rock resulting from eruptions approximately 60 million years ago. The volcanic cores, which were formed below sea level, have slowly uplifted and emerged from the ocean's surface, and a series of limestone plateaus formed as coral reefs. Ninety-eight percent of Rota's area is covered with limestone plateaus of coral reef origin. (NRCS, 2007)

Rota's topography has five geomorphic subdivisions: the coastal lowlands, a northern plateau, a southern plateau (the Sabana), a volcanic area, and the western peninsula. On the island's north shore, coastal lowlands dominate and are bounded on the seaward side by a narrow reef margin. Sandy soils with coconut palms occur in the inland areas, and strand vegetation dominates the coastal margin. The northern plateau, at an elevation of approximately 450 ft (137 m), comprises the eastern part of the island, with its south and east sides terminating in cliffs with rocky shoreline below. On the north side, the plateau slopes gradually toward the sea; this is the location of Mochong Beach, the largest beach on Rota. The Sabana plateau has an elevation exceeding 1,400 ft (426.7 m). Its western side is marked by cliffs that form low plateaus. On the northeast side, less pronounced cliffs and slopes lead gradually to the northern plateau. The southern and a portion of the northern boundaries of the Sabana terminate in dramatically shaped precipitous cliffs. In the northern part of the Sabana, Mt. Manila is the highest point at 1,627 ft (495.9 m). The volcanic area of the island is very different in appearance from the other geomorphic subdivisions. Streams have eroded the area into deeply etched ridges and valleys predominately covered by sword grass *(Miscanthus floridulus)*. The western peninsula is a narrow isthmus that connects Mt. Taipingot with the remainder of the island. Mt. Taipingot rises in terrace formations to approximately 460 ft (140.2 m), and the peninsula is bounded by precipitous cliffs. (NRCS 2007)

Rota has a tropical marine climate with average annual temperatures of approximately 80 degrees Fahrenheit, 80 inches of rainfall and about 80 percent humidity. Rainfall averages 10.7 inches per month during the wet season and 3.8 inches per month during the dry season. The trade winds are strongest and most constant during the dry season, when wind speeds of 15 to 25 miles per hour are common. During the rainy season there is often a breakdown of the trade winds, and on some days the weather may be dominated by westerly storm systems that bring heavy showers, or steady, and sometimes torrential, rains. (NRCS, 2007)

Two distinct climatic seasons occur in the CNMI: wet and dry (Duenas & Associates, 1996). The months of July through November are considered to be the wet season and the months of January through May are considered to be the dry season (Carruth, 2003). December and June are considered to be the transitional months. On Saipan, 67% (about 53 inches) of the rain falls during the wet season, and 21% (about 17 inches) of the rain falls during the dry season. The transitional months receive the remaining 12% (about 10 inches) of the annual rainfall.

The Talakhaya area is located along steep terrain with slopes ranging from 5 to 99 percent. There are approximately twelve different soil map units within the watershed area. Much of the Talakhaya region is considered badlands, areas of saprolite (weathered volcanic bedrock) where soil has been nearly or completely eroded. As badlands support little or no vegetation, they are actively eroding. Runoff is rapid and the hazard for water erosion is severe (Gavenda, 2006, via NRCS 2007).

The upper plateau, or Sabana, consists of existing and historical agricultural areas within a mosaic of native forest. The Sabana was also the site of phosphate and manganese oxide mining prior to World War II. Rainfall percolates through the Sabana's coral limestone mantle and exits as springs and seeps along the limestone interface with the volcanic core.

Talakhaya, a 1,100-acre limestone cliff and terraced formation below the Sabana, is highly dissected by streams that have eroded the volcanic soils at the cliff base. The streams are fed by springs and runoff sources originating from rainfall on the Sabana. Steep cliffs and benches surround the Sabana / Talakhaya area and are dominated by the native limestone forest community. Talakhaya contains the island's only streams and wetland areas exist within a riparian network.

The caves and springs at Matan Hanom and As Onaan are presently supplying all domestic water on Rota via pipeline. The stream flows are perennial and intermittent with flows diminished during the dry season. Flows have been substantially curtailed and possibly eliminated by increased use of the water for community water supply (WRAS 2003).

The Akina series is the predominant soil at the site. It comprises about 60 percent of the soils in the project area. The Akina soil series has 20 to 40 inches of soil over highly weathered rock (saprolite). It is acidic, has few nutrients, little ability to hold on to nutrients and may have plant-toxic levels of soluble aluminum. The Akina series consists of moderately deep, well drained soils on volcanic uplands. These soils formed in residuum derived from tuff or tuff breccia. (Gavenda, via NRCS 2007)

ii. Biological features:

Vegetation on Rota consists of mixed second-growth forests, grassy savannas, and dense thickets of introduced tangantangan (*Leucaena leucocephala*). Approximately 60 percent of Rota's land area still remains in native forest, although much is altered and not pristine. The best developed and most pristine native forest (including limestone forest) is on the slopes and cliffs of the Sabana (NRCS 2007).

A vegetation map and a map of limestone forest coverage for Rota are included in Figures 11 and 12 in appendix 2.

The Talakhaya area is dominated by introduced grasses with thickets of native vegetation surrounding some of the stream areas. As noted further in section e, *Chrysopogon zizanioides* (vetiver grass), *Paspalum notatum* (bahia grass), and *Acacia* species are currently being introduced to the area by natural resource agencies through the revegetation program.

The Talakhaya/Sabana area is home to some of the largest populations of introduced Philippine Sambar Deer (*Rusa mariannus*) in the CNMI. Hunting for the species is prohibited seasonally. The deer's grazing habits are thought to be contributing to the deterioration of the native forest under-story and have made the re-introduction of native plants significantly more difficult; however, the continued health of the deer populations is a conservation priority of the local community.

Coconut crabs (*Birgus latro*) also exist within the watershed. The crabs are a highly sought food source for both personal consumption and commercial sale; their hunting is permitted seasonally. The health of the island's populations is not known at this time.

The Marianas Fruit Bat (*Pteropus mariannus mariannus*), Marianas Crow (*Corvus kubaryi*), Rota Bridled White-eye (*Zosterops conspicillata rotensis*), Green Sea Turtle (*Chelonia mydas*), the fern disciplina (*Lycopodium phlegmaria* var. *longifolium*) and the fire tree (*Serianthes nelsonii*) exist within the watershed and are all listed under the Endangered Species Act. Additionally, the critically endangered Hawksbill Turtle (*Eretmochelys imbricata*) has been tagged in the area and is thought to be present (UWA 1998). Habitat for the listed threatened and endangers species can be found in figure 9 in appendix 2 (habitat for the Marianas Crow is separately shown in figure 10).

The coral reefs adjacent to Talakhaya watershed appear to be heavily impacted by sedimentation from roads and highly eroding soils, based upon comparisons with other sites around Rota. Unfortunately, no scientifically-sound, historical data exists to judge or date the perceived declines in coral reef resources as monitoring efforts started in 2000 when conditions were already compromised. Figures are briefly expounded upon in the next section, but current coral cover sits between 5 and 7% in these areas. (Rodney Camacho, personal communication, 2011)

Limited data exist to improve our understanding of the fish assemblages in the Talakhaya region. Standard belt transects from monitoring efforts started in 2000 show low abundances of higher trophic level fish (i.e., carnivore and invertivores), and suggests a steady decline in herbivorous fish over the same period (Figure 3)(MMT Data 2010).

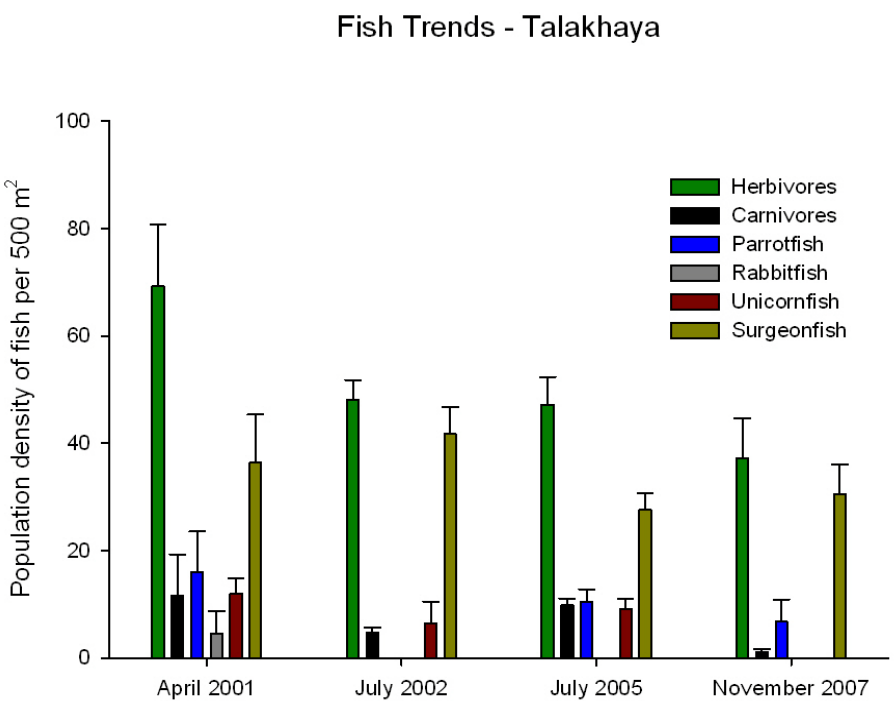


Figure 3: Summarized fish survey results for the waters associated with the project area (source: PMRI, CNMI MMT)

Improved datasets are needed to unequivocally substantiate the trends shown in the existing data set, however this process indicated that fishing occurs regularly, yet the exact amount of fishing pressure in the area remains unknown. The area may be heavily utilized by fishers due to the… As noted in figure 3, several subsistence and commercially favored species are present in the area, including parrot fishes (generally *Scarus* and *Chlorurus*), rabbit fishes (*Siganus*), and unicorn fishes (*Naso*). Any spillover effects for the area related to the existence of the Sasanhaya Bay Fish Reserve are unknown.

(c) Benthic Habitat

Benthic monitoring of this site has been done since 2000. Summaries of the 2000 to 20011 data are summarized below.

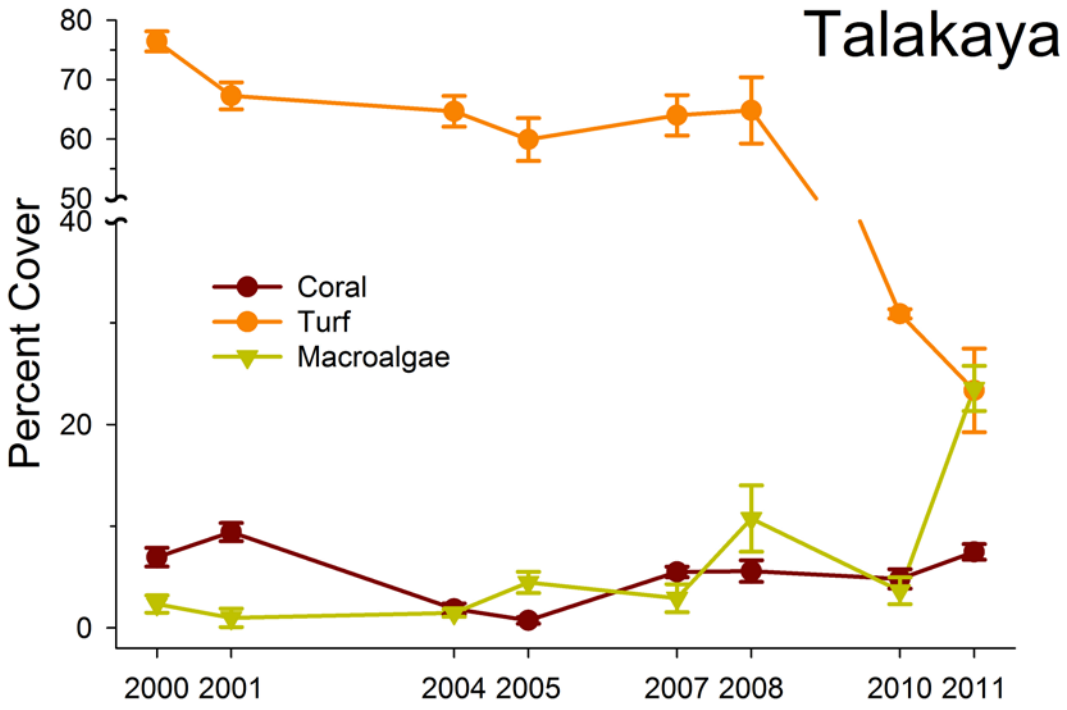


Figure 4: Summarized benthic data at Talakhaya since 2000 (source: PMRI, CNMI MMT)

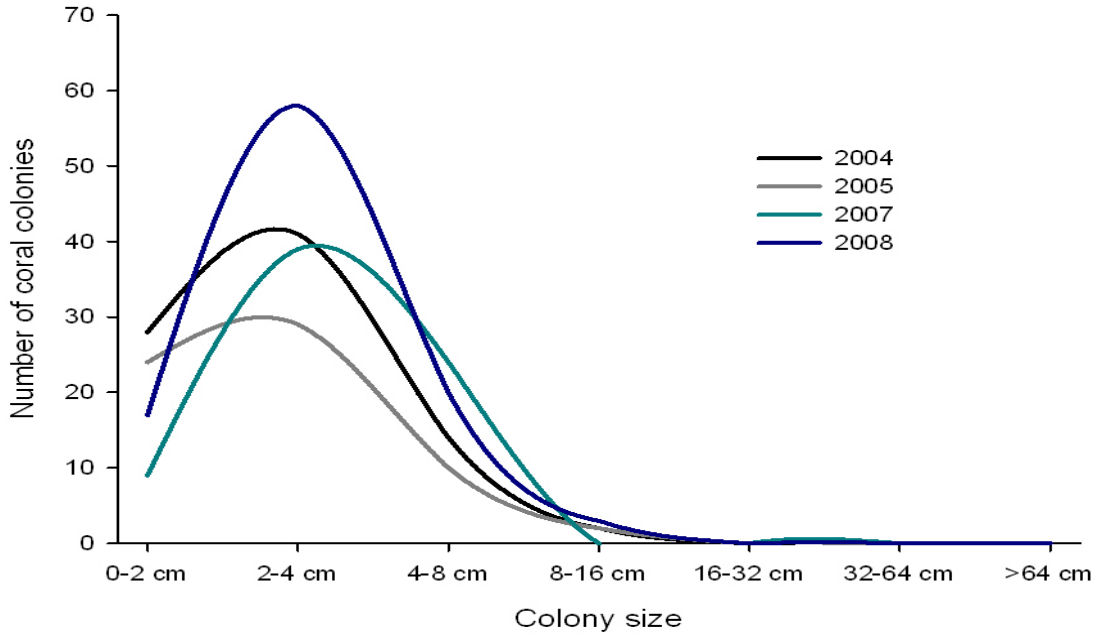


Figure 5: Coral colony size data at Talakhaya since 2004 (source: PMRI, CNMI MMT)

Benthic data show a steady decline in coral cover from 2000 to 2005, and a small increase in cover

beginning in 2007. Throughout CNMI coral monitoring data show high Crown-of-Starfish (i.e. coral predator) activity from 2003 to 2006. The initial decline in coral cover is probably linked with this phenomenon, however subsequent recovery, although slow, has been steady. Recovery has been observed at differential rates throughout the CNMI, and the difference is currently being tied with land-based pollution and herbivory levels. The coral colony size data show an increasingly skewed population developing since 2004. This is also a sign of initial recovery, whereby new coral colonies (i.e. small size corals) recruit back onto the reef. Only continued monitoring can show if these initial, seemingly favorable trends, are valid. It is strongly recommended to continue ecological monitoring as part of this project. (MMT Data)

A map detailing the benthic habitats for the island of Rota can be found in figure 8 in appendix 2.

(d) Cultural and Socioeconomic Setting

The Talakhaya/Sabana area contains the only perennial streams and some of the most pristine forest in the CNMI. The use of the area is additionally important and highly valued within the community for passing on of traditional farming practices and medicinal plant collection. The endangered trucos faia also known as “fire tree” (*Serianthes nelsonii*) and *Osmoxylon mariannense* both exist in these areas and are culturally important. There are ancient Chamorro settlement sites in the area, particularly near the perennial streams. Spanish and Japanese historical sites are also present in the watershed. (UWA 1998)

The Sabana area and the lower parts of the Talakhaya area contain some of the more productive and economically important farms on the island. They contribute largely to both the commercial and the subsidence agricultural trade.

Additionally, nearly all of the fresh water on the island comes from the water cave and the adjacent springs that sit within the project area (UWA 1998). Aside from the obvious importance of this water source, the cave itself has a specific cultural importance that is recognized by the community.

(e) Conservation Status

The project area stands removed from the two major urban areas of Rota, Songsong and Sinapalo. Industry in the area is limited to small scale farming and ranching operations, the majority of which exist near the closer to the shoreline where the land flattens or on top of the plateau in the Sabana area. Some of the farming plantations do run up the hillside of the watershed near the current revegetation areas; these consist mainly of *Areca catechu* (betelnut) tree plantations. Hunting in the Sabana area is prohibited, however hunting for both the Sambar deer (*Rusa unicolor*) and coconut crabs (*Birgus latro*) in the Talakhaya area is a regular occurrence (exact figures are unknown, knowledge based on user conversations). The marine areas associated with the watershed are used for fishing, but are not considered to be an important or highly productive fishing area for the island However, there is no accurate data on fish stock health or fishing pressure at this time.

The majority of the watershed is on public land (80%), the remainder of which is private land (UWA 1998). To this date, some private landowners have been supportive of and amenable to management actions in the watershed. However, support level may change if owners or management actions change. Managers should consider these issues before implementing any new actions.

Revegetation work was been done in this area on small scales for roughly 10 years. The efforts have greatly increased through the Luta Livelihoods/Talakhaya Revegetation Project implemented in 2006. Since the beginning of the project, volunteers and agency personnel have planted over 25,000 seedlings each year in the highly eroding areas of the watershed. Due to the poor quality of the soil and the large loss of top soil, a mix of non-native species adapted to these conditions have been used, primarily: *Chrysopogon zizanioides* (vetiver grass), *Paspalum notatum* (bahia grass), and *Acacia Confusa*. Managers from the DLNR forestry program have mapped out long-term strategies to reintroduce native forest to the area as these revegetated areas mature. Pilot sites have been identified and methods for achieving these goals are being tested within them. These efforts focus mainly on thinning and lifting mature Acacia and inter-planting native trees and shrubs that, through continued thinning, will come to dominate the area.

Revegetation efforts have been hampered significantly by intentionally set fires. Many of these fires are thought to be set by residents to reduce the protective cover favored by the introduced Sambar deer. The deer are attracted to new grass shoots in the open areas created by the burning; here they are more easily taken by poachers. These fires have resulted in damage to areas actively being revegetated, encouraged growth of clump grasses that increase fire risks, and have created more highly eroding areas. Reducing (and if possible eliminating) these fires have been set as a management priority for the last several years.

Prior to this document, two conservation plans were developed for the Talakhaya/Sabana area aimed at conservation. The Unified Watershed Assessment was completed by the Watershed Working Group in 1998. The assessment aimed to prioritize watersheds within the jurisdiction needing management action. The Talakhaya/Sabana/Palie watershed was listed as a category 1 watershed in the report, meaning it requires restoration because its waters do not meet clean water requirements and other resource goals (UWA 1998).

NRCS developed a soils conservation plan for Rota (entire plan can be found in appendix 4) in July 2007. This plan aimed to evaluate the threats facing the soils in the watershed and mapped out strategic actions recommended to be taken to conserve them. The current revegetation and management program is based primarily on this plan as well as on-the-ground assistance from NRCS staff.

(f) Viability of Conservation Targets

Through the CAP process, conservation targets were identified. These included: 1) birds, 2) coral reefs, 3) endangered/medicinal plants, 4) fish and invertebrates, 5) forest, 6) freshwater, 7) soil quality, and 8)

targeted wildlife. The Miradi program introduced to us by TNC for development of much of this plan, defines targets as:

> "a limited suite of species, communities, and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area. They are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. In theory - and hopefully in practice - conservation of the focal targets will ensure the conservation of all native biodiversity within functional landscapes".

Each of our targets was then assigned a viability or health ranking based on the following scale:

- **Very Good** – The factor is functioning at an ecologically desirable status, and requires little human intervention.
- **Good** – The factor is functioning within its range of acceptable variation; it may require some human intervention.
- **Fair** – The factor lies outside of its range of acceptable variation & requires human intervention. If unchecked, the target will be vulnerable to serious degradation.
- **Poor** – Allowing the factor to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.

The viability of each of these target natural resources were rated by the multidisciplinary CAP planning team. Birds, freshwater, and targeted wildlife received a ranking of "good", while the others were all designated "fair". Descriptions of the ranks as well as the ranking table are found below:

Table 1: Viability Rank of Conservation targets

Conservation Targets	Viability Rank	Based on:
Birds	Good	Species diversity
Coral Reefs	Fair	Population structure and recruitment; size class distribution
Endangered/Medicinal Plants	Fair	Abundance of important species
Fish and Invertebrates	Fair	Population size dynamics; density of specific species;
Forest	Fair	Community structure
Feshwater	Good	Water quality
Soil Quality	Fair	Organic matter content
Targeted Wildlife	Good	Wildlife abundance
Talakhaya/Sabana	**Fair**	**Above rankings**

Watershed		

The Management Approach

Description of the Management Planning Process:

The planning process for this management plan was done during an initial workshop in March of 2010, a follow-up meeting in May of 2010, and several subsequent one-on-one meetings. The planning process followed the Conservation Action Planning (CAP) model established by TNC, using the Miradi adaptive management software tool developed by the Conservation Measures Partnership and Beneficent Technology, Inc.

The initial CAP workshop was held March 12-14 on the island of Rota, CNMI. The workshop was facilitated by TNC staff and was attended by representatives from DEQ (Saipan and Rota), CRM, NRCS, PMRI, NOAA, DFW, Rota Mayor's office, Forestry, DLNR, and other public stakeholders and technical advisors (see appendix 1 for complete list of attendees). The workshop focused on establishing targets, identifying threats, prioritizing conservation goals, and creating strategies to reach conservation goals. Workshop attendees developed intermediate steps necessary to reach threat reduction priorities and set initial indicators to measure the success of the conservation strategies. Deliverables produced at this workshop include draft conceptual models, SWOT analysis (listing out strengths and weaknesses) of the management team, and a prioritization of strategic goals and objectives.

Following the initial workshop, meetings were held with Saipan resource managers with technical knowledge relating to the targets of the Talakhaya CAP. These meetings either engaged managers that were unable to attend the initial workshop or whose specialties related to gaps in the management plan framework that was developed at that workshop (or both). Through this process several of the objectives were clarified or changed to be more realistic and comprehensive, and success indicators were further detailed for relevant conservation strategies.

On May 12, 2010 a meeting was held with the Rota management team and available technical advisors and resource managers from Saipan (a complete list of attendees can be found in appendix 1). During the meeting, changes made to the conceptual model and management plan framework were discussed with the Rota team and were approved or changed as needed. In addition, monitoring plans were developed for each strategy objective and intermediate result objective within the conceptual model. Deliverables included draft monitoring plans and a second draft conceptual model of the management plan.

Following the May 12 meeting, further follow-up meetings were held with individual stakeholders as needed for the finalizing of the conceptual model and drafting of the plan.

Vision:

The vision for the Talakhaya/Sabana watershed developed by the management team is:

"Protehi i rikesan i tano yan i tasi"

Which can be translated as:

"Protect the wealth of our land and water"

Conceptual Model:

The conceptual model below (figure 6) shows conservation targets in the green bubbles (on far right), the threats linked to relevant conservation targets in red boxes (in middle) and the contributing factors linked to relevant identified threats in orange (on far left).

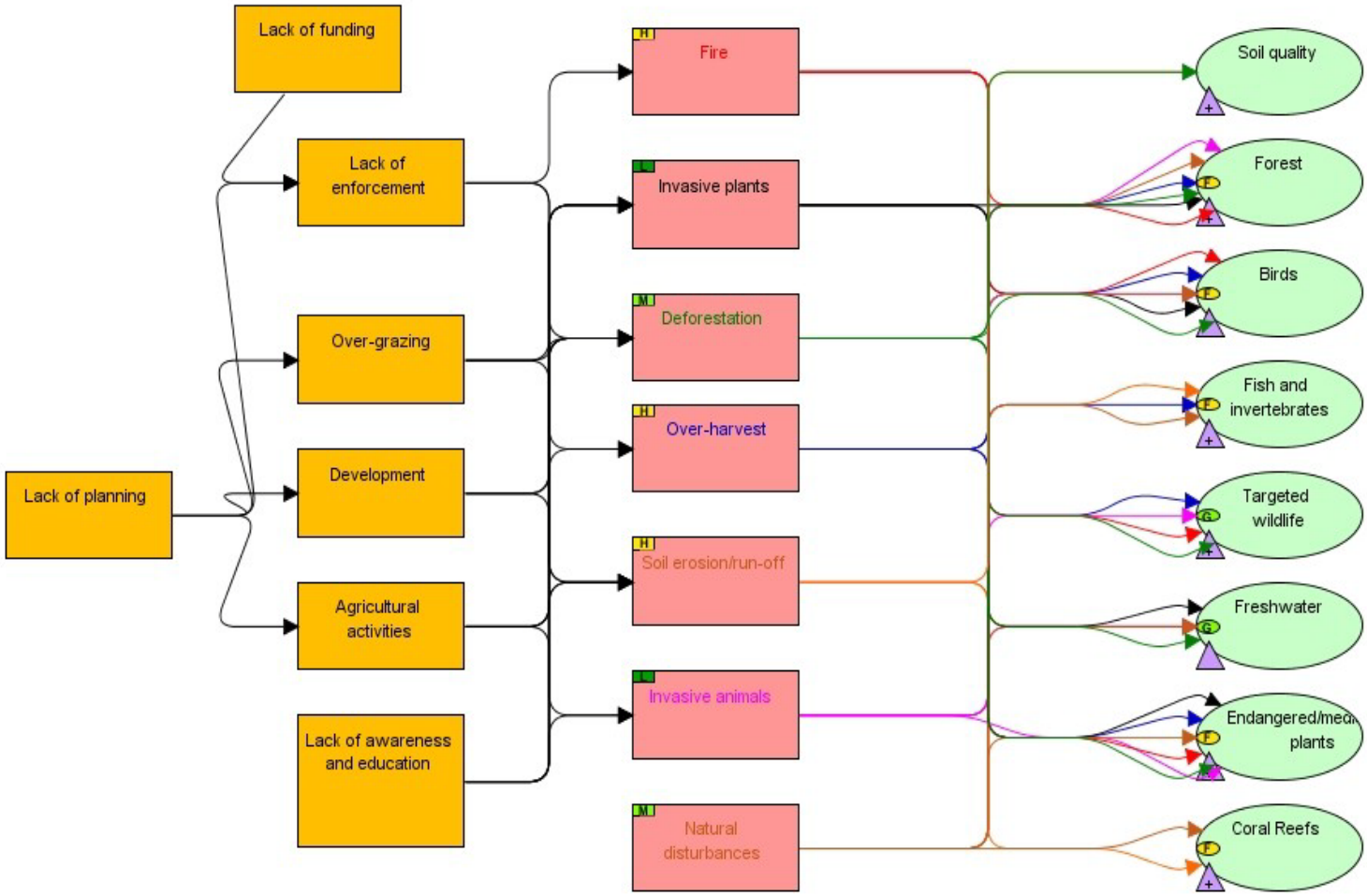


Figure 6: Conceptual model

The threats identified in the above diagram were ranked according to their scope, severity, and irreversibility in relation to each conservation target it was believed to affect. These ranks were compiled to give an "Overall Threat Rating" (on the far right of the table), that listed the threat as either having a high, medium, or low effect on the project area. Additionally, compiling these ratings allowed us to look at what degree each conservation target is at risk to these threats. The results of these rankings are shown in the table 2 below.

Table 2: Threat Rating

Conservation Targets	**Birds**	**Coral Reefs**	**Endangered/ medicinal plants**	**Fish and invertebrates**	**Forest**	**Freshwater**	**Targeted wildlife**	**Soil quality**	**Overall Threat Rating**
Project-specific threats	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Over-harvest	Low	-	Medium	High	Med	-	High	-	**High**
Soil erosion /run-off	-	High	-	Medium	-	Low	-	High	**High**
Deforestation	Medium	-	Low	-	Low	Low	Medium	Med	**Medium**
Invasive plants	Low	-	Medium	-	Low	Low	-	-	**Low**
Invasive animals	Low	-	Medium	-	Low	Low	Low	-	**Low**
Fire	High	-	Medium	-	High	-	Medium	-	**High**
Natural disturbances	High	Medium	Medium	Low	Medium	Medium	-	-	**Medium**
Threat Status for Targets and Project	**High**	**Medium**	**Medium**	**Medium**	**Medium**	**Low**	**Medium**	**Medium**	**High**

Through the threat ranking exercise, three threats were given a rating of "High" (shown above): Fire, Soil Erosion, and Over-harvesting. For these threats, results chains were developed to link conservation

strategies developed during the planning process to the reduction of these prioritized threats (see below).

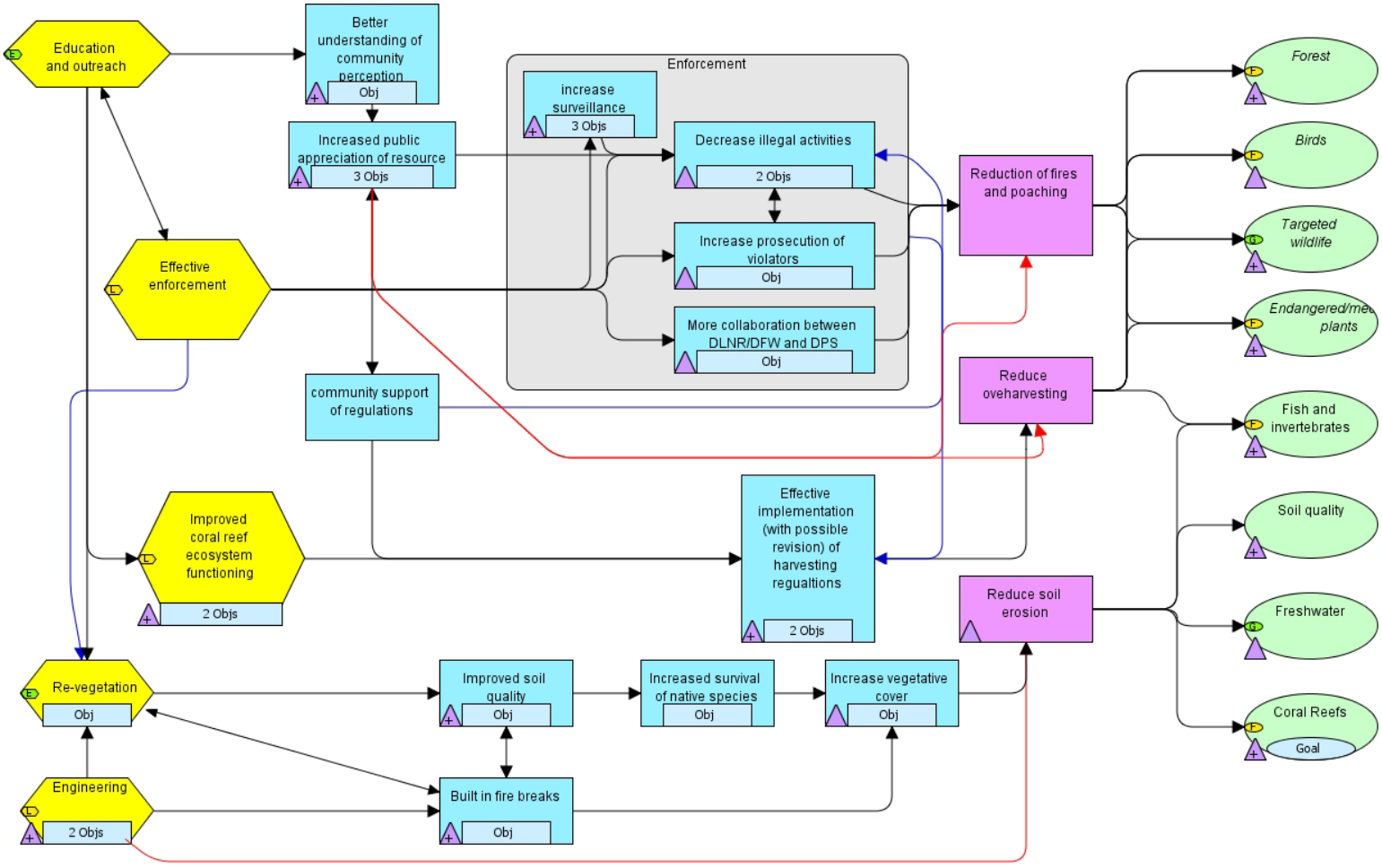


Figure 7: Overall results chain

Goals and Objectives and Strategies:

The tables below show the goals and objectives identified by our planning team for the project, followed by a priority ranking for each.

Goal 1: Reduce Soil Erosion in the Talakhaya badland area:

Strategy A: Revegetation of Critically Eroding Areas in the Watershed

Table 3: Strategy A objectives

Item	Description		Priority
Objective A1	**Increased Vegetative Cover**	**By 2015, revegetate all critically eroding areas in the watershed (defined as bare areas 15sq meters in size and above) using the NRCS Soils Conservation Plan.**	**High**
Strategic Action A1a	Hire one fulltime and one seasonal employee to assist with the propagation of species and the annual planting season.		**High**
Strategic Action A1b	Hire three full time staff and 3 seasonal staff to organize the Talakhaya watershed revitalization programs, including the revegetation, surveillance, and maintenance.		**Medium**
Strategic Action A1b	Purchase materials and provide volunteer stipends for an annual mass planting event aimed at planting 40,000 seedlings annually in the project area.		**High**
Strategic Action A1c	Purchase two ATVs and trailers to improve the transportation of revegetation materials to the revegetation site.		**Medium**
Strategic Action A1d	Identify location for vetiver (*Chrysopogon zizanioides*) plantation on Rota, and plant seed crop of vetiver.		**Medium**
Strategic Action A1e	Expand DLNR nursery (or identify other source for seedlings) to accommodate at least 60,000 seedlings.		**High**
Strategic Action A1f	Conduct study evaluating native Rota flora for use in revegetation work.		**Medium**
Objective A2	**Increased SCI**	**By 2015, see a positive Soil Conditioning Index (SCI) in Talakhaya revegetation area soils during annual assessments**	**Medium**

Strategic Action A2a	Establish Acacia confusa seedlings in the critically planting areas to build top soil layers.		
Strategic Action A2b	Establish MOU with NRCS to conduct SCI assessments annually in the watershed - or – train and outfit Rota DLNR staff with materials and knowledge to conduct these assessments on an annual basis.		**Medium**
Objective A3	**Reduce soil loss**	**By 2015, reduce soil loss in Talakhaya highly eroding areas by 25%**	**High**
Strategic Action A3a	Establish methodologies, and purchase equipment if necessary, to assess the rate of soil loss off of the Talakhaya/Sabana watershed.		**High**
Strategic Action A3b	Train at least two DLNR Rota Staff and/or stakeholders to assess rate of soil loss using established methodology.		**Medium**
Strategic Action A3c	Explore the purchasing of equipment and training of staff or stakeholders to meet mulching recommendations laid out in the NRCS soil conservation plan.		**Medium**
Strategic Action A3d	Incorporate Talakhaya sites into the new DEQ water sampling protocol		**High**
Strategic Action A3e	Annually assess rate of soil loss in the watershed.		**High**
Strategic Action A3g	Re-evaluate reduction of soil loss goal (25%) based on on-the-ground measurements of total soil loss and what the reduction would mean for conservation targets downstream.		**High**
	* Also see Strategic actions A1b and A2a		**High**
Objective A4	**Increase survival of native species**	**By 2020, have created a soil environment in 25% of the revegetated areas where native species can be re-established.**	**High**
	*see Strategic actions A1b and A2a		**High**

Strategy B: Implement engineering actions that will decrease erosion in the watershed.

Table 4: Strategy B objectives

Item	Description		Priority
Objective B1	**Evaluation of engineering alternatives**	**By 2013, produce an engineering design plan that if implemented would reduce soil erosion by an estimated 25% in the Talakhaya watershed.**	**Medium**
Strategic Action B1a	Establish MOU with NRCS to produce an engineering design plan for the watershed - or – contract another firm to conduct said work.		**Medium**
Strategic Action B1b	Conduct field survey of topography. (to be done by NRCS or contracted firm)		**Medium**
Strategic Action B1c	Evaluate access road, including seeking the permission of the relevant property owners to make improvements on the road. (to be done by NRCS or contracted firm)		**Medium**
Strategic Action B1d	Evaluate sediment basins. (to be done by NRCS or contracted firm)		**Medium**
Strategic Action B1e	Evaluate hillside ditches. (to be done by NRCS or contracted firm)		**Medium**
Strategic Action B1f	Evaluate trails, walkways, and staging areas (i.e. heavy use areas). (to be done by NRCS or contracted firm).		**Medium**
Strategic Action B1g	Re-evaluate reduction of soil loss goal (25%) based on assessment of the engineering alternatives and their estimated reduction of sedimentation in the watershed.		**Medium**
Objective B2	**Implementation of engineering alternatives**	**By 2015 have begun the process to install engineering alternatives outlined in the engineering design**	**Medium**
Strategic Action B2a	Develop a methodology for implementing the engineering plan developed by NRCS or the contractor.		**Medium**
Strategic Action B2b	Prioritize engineering actions based on available manpower and materials against effectiveness for reducing erosion in the watershed		**Medium**

Strategic Action B2c	Begin installing high priority alternatives as possible.		**Medium**
Objective B3	**Decreased amount of vegetation affected by grassland fires**	**By 2015, have installed 1000ft of firebreak into the highly eroding areas of Talakhaya (in accordance with NRCS Soil Conservation Plan).**	**Medium**
Strategic Action B3a	Evaluate locations where firebreaks could be used.		**Medium**
Strategic Action B3b	Begin installing firebreaks in recommended locations.		**Medium**

Goal 2: Reduction of intentionally set fires and incidences of illegal hunting in the project area.

Strategy C: Raise awareness and education of the Rota community about how fires and poaching are affecting the watershed.

Table 5: Strategy C objectives

Item	**Description**		**Priority**
Objective C1	**Gain a better understanding of knowledge, attitudes, and behaviors regarding resources of concern and intentionally set fires.**	**By 2013, have assessed the attitudes, behaviors, and knowledge of the Rota population regarding identified resources and intentionally set fires.**	**High**
Strategic Action C1a	Develop and test a survey that will allow managers to better understand the attitudes, behaviors and knowledge of the Rota community regarding environmental issues		**High**
Strategic Action C1b	Recruit and train 10 enumerators from the Rota community to conduct the survey.		**High**
Strategic Action C1c	Conduct survey with a statistically representative sample of the Rota population and analyze data gathered.		**High**
Strategic Action C1d	Create final report detailing recommendations for moving forward with outreach campaigns in the Rota community		**High**

Strategic Action C1e	Present results to resource managers and the Rota community.		**High**
Objective C2	**Conduct a fire prevention campaign.**	**By 2014, see a 40% increase in community knowledge and appreciation of resources and the threats that fire poses to them (based off survey results from Objective C1).**	**High**
Strategic Action C2a	Develop campaign project plan and materials.		**High**
Strategic Action C2b	Recruit individual or group from Rota community to head the project on the island.		**High**
Strategic Action C2c	Conduct the year-long campaign.		**High**
Strategic Action C2d	Develop and conduct post campaign survey.		**High**
Strategic Action C2e	Generate final report on the campaign; present results to managers and the Rota community.		**High**
Strategic Action C2f	Identify next steps (if any) to meet the updated goals of the objective.		**High**
Objective C3	**Increase public awareness.**	**By 2014, increase public awareness of Rota community to natural resources use and importance by 35% (or as recommended from knowledge survey).**	**Medium**
Strategic Action C3a	Evaluate knowledge survey and design public awareness program based on evaluation.		**Medium**
Strategic Action C3b	Implement awareness program.		**Medium**
Strategic Action C3c	Assess success of programs and write exit report including recommendations on improvements for future programs.		**Medium**
Objective C4	**Provide Environmental learning opportunities**	**By 2014, implement week long summer camps focused on conservation efforts on island and conduct fourth grade outreach programs (or at least 2 other outreach programs focused on school age children).**	**Medium**

	for school age children.		
Strategic Action C4a	Identify agency, group, or NGO to run summer camps and 4th grade outreach programs.		**Medium**
Strategic Action C4b	Organize speakers and activities for summer camps.		**Medium**
Strategic Action C4c	Establish outreach curriculum for fourth grade programs.		**Medium**
Strategic Action C4d	Assess success of programs and write exit report including recommendations on improvements for future programs.		**Medium**

Strategy D: Creation of effective enforcement measures for local laws.

Table 6: Strategy D objectives

Item	**Description**		**Priority**
Objective D1	**Complete the training and hiring of two seasonal field agents.**	**By 2012, have two seasonal part-time agents surveying that project area during peak burning season.**	**High**
Strategic Action D1a	Recruit and interview candidates from the Rota community for the positions.		**High**
Strategic Action D1b	Train hired agents on necessary skills for position, including surveillance techniques, scene reporting, and basic science behind the project.		**High**
Strategic Action D1c	Agent supervisor will provide a monthly report on the agent's activity during the time period as well as a season report detail strengths and weakness of the positions.		**High**
Objective D2	**Increase surveillance infrastructure.**	**By 2014, construct a surveillance tower and procure adequate equipment for surveillance agents (equipment to include ATV, cameras, binoculars, etc).**	**Medium**
Strategic Action D2a	Conduct needs assessment for necessary equipment		**Medium**
Strategic	Assess possible locations for surveillance tower and choose most		**Medium**

Action D2b	advantageous.		
Strategic Action D2c	Contract construction work and procure equipment.		**Medium**
Strategic Action D2d	Establish stringent maintenance and inventory systems to ensure maximum life of equipment.		**High**
Objective D3	**Increase surveillance presence in the area.**	**By 2015, have one full time agent (logging 40hrs week in surveillance and support of the project goals) on staff.**	**Medium**
Strategic Action D3a	Recruit and interview candidates from the Rota community for the position.		**Medium**
Strategic Action D3b	Train hired agent on necessary skills for position, including surveillance techniques, scene reporting, basic science behind the project, nursery care, planting techniques, etc.		**Medium**
Strategic Action D3c	Agent supervisor will provide a bi-monthly report on the agent's activity during the time period as well as a semi-annual report evaluating the agent's work and detailing recommendations for the next period of the program.		**Medium**
Objective D4	**Increase knowledge of Fires started per year.**	**By 2012, have specific annual record of fires started and the extent of their damage.**	**High**
Strategic Action D4a	Maintain a detailed report of annual fires that will be submitted to managers at end of each year.		**High**
Strategic Action D4b	Comare burning in Talakhaya to the rest of the island of Rota.		**High**
Objective D5	**Conservation officer training.**	**By 2012, have at least one conservation officer trained in evidence collection, report writing, etc that will assist in the building of a case against offenders.**	**Medium**
Strategic Action D5a	Conduct an assessment of current conservation officer needs.		**Medium**
Strategic Action D5b	Organize and conduct training to address priority needs found in assessment.		**Medium**

Objective D6	**Increase cooperation between DLNR and Department of Public Safety.**	**By 2012, establish a MOA between DLNR and DPS to improve enforcement cooperation.**	**Medium**
Strategic Action D6a	Schedule meeting between representatives of DLNR, DPS, and other managers to draft MOU that meets goals of all.		**Medium**
Strategic Action D6b	Have MOU signed by all sides including Rota Mayor and agency heads.		**Medium**

Goal 3[1]: Reduction of over harvesting in the lands and waters associated with the project area.

Strategy E: Collect necessary information about populations in the area to make more informed policy decisions.

Table 7: Strategy E objectives

Item	**Description**		**Priority**
Objective E1	**Increase baseline data for targeted fish and invertebrates.**	**By 2013, DFW and MMT will collect detailed baseline data on targeted fish and invertebrates in the waters associated with the project area.**	**High**
Strategic Action E1a	Conduct assessment of baseline needs.		**High**
Strategic Action E1b	Develop surveying plan according to needs assessment.		**High**
Strategic Action E1c	Conduct survey and analyze data.		**High**
Strategic Action E1d	Detailed report on survey results presented to managers and Rota officials.		**High**
Strategic Action E1e	Incorporate targeted fish and invertebrate species surveys into annual DFW/MMT surveys.		**High**
Objective E2	**Begin Creelsurveying on Rota.**	**By 2015, Creel 50% of shore-based fisherman annually in Rota.**	**Medium**

Strategic Action E2a	Hire 1 fulltime employee to head the Rota CREEL program.		**Medium**
Strategic Action E2b	Train program managers and interviewing personal on conducting CREEL surveys.		**Medium**
Strategic Action E2c	Program manager to submit quarterly reports detailing staff CREEL activities and results.		**Medium**
Strategic Action E2d	Annual report of analyzed data to be submitted to fishery managers and to the public.		**Medium**
Objective E3	**Conduct Rota community survey on possible LMMA**	**By 2015, have conducted a community survey to assess attitudes and motivations toward developing a locally managed marine area within the project area. [Could be coupled with objective C1]**	**Medium**
Strategic Action E3a	Develop and test a survey that will allow managers to better understand the attitudes and motivations of the Rota community regarding a possible LMMA.		**Medium**
Strategic Action E3b	Recruit and train 5 enumerators from the Rota community to conduct the survey.		**Medium**
Strategic Action E3c	Conduct survey and analyze data gathered.		**Medium**
Objective E4	**Incorporate collected data into policy considerations**	**By 2015, have process in place to incorporate collected scientific data into management decisions.**	**High**
Strategic Action E4a	Synthesize data to provide recommendations.		**High**
Strategic Action E4b	Assemble committee of scientists and managers to meet semi-annually to discuss new results and possible changes in policies.		**High**
1: The following objectives are also thought to assist in reaching Goal 3: C3, C4, D1, D2, D3, D5, D6. Their descriptions can be found with the designated objective in the tables above.			

Implementation

An annual workplan will be developed each year to prioritize the projects to be implemented from the plan for that year as well as to guide the grant funding process. The first annual workplan will be developed in early 2012.

Some of the funding for the actions listed above is expected to come from the Coral Reef Initiative grant that the CNMI applies for on a bi-annual basis. The workplan for FY2012 and 13 for project related to this plan in the CRI grant can be found in appendix 3. However, other funding sources are expected to be identified to meet the goals of this plan.

Success of the Talakhaya/Sabana CAP will be dependent on the long-term allotment of both financial and human resources, as many of the objectives will take many years to meet. Successful implementation of this plan, however, will provide many benefits to ecosystems of the Talakhaya/Sabana region and for the people of the CNMI.

Works Referenced

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MMT Data, CNMI Government & Pacific Marine Resources Institute, 2000 – 2011.

Reconnaissance Survey: Significant Natural Areas and Cultural Sites in Rota, CNMI, National Parks Service, 2005.

Rota Local Law 9-1, 1994.

Rota Local Law 9-2, 1994.

Rota Local Law 15-8, 2007.

Unified Watershed Assessment (UWA), Interagency Watershed Working Group, 1998.

Watershed Restoration Action Strategy (WRAS), Division of Environmental Quality, 2003.

Appendix 1: CAP workshop Participation List:

March 12-14, 2010 Rota, CNMI

Name	Organization
Gary Toves	DEQ Rota
James Manglona	DLNR Rota
Antonio Reyes	DLNR Rota
Robert Ulloa	DFW Rota
John Taisacan	DFW Rota
Gardner Barcinas	DLNR Rota
Brooke Nevitt	CRM Saipan
Aric Bickel	DEQ Saipan
John Starmer	CRM Saipan
Umiich Sengebau	TNC
Trina Leberer	TNC
Kathy Chaston	NOAA
Geen Barcinas	Rota Mayor's Office
Isaac Calvo	DLNR Rota
James Eller	NRCS
Steven Victor	TNC
Mike Tenorio	DFW Saipan
Fran Castro	DEQ Saipan
Peter Houk	PMRI
Lisa Eller	DEQ Saipan
Steve Mckagan	NOAA

May 12, 2010 Rota, CNMI

Name	Organization
James Manglona	DLNR Rota
Antonio Reyes	DLNR Rota
Robert Ulloa	DFW Rota
John Taisacan	DFW Rota
Gardner Barcinas	DLNR Rota
Rachel Zuercher	CRM Saipan
Aric Bickel	DEQ Saipan
Isaac Calvo	DLNR Rota
Fran Castro	DEQ Saipan
Lisa Eller	DEQ Saipan
Julia Boland	DFW Rota
Steve McKagan	NOAA

Appendix 2: SWOT Analysis

A Strength, Weaknesses, Opportunities and Threats Analysis was conducted at the March CAP Workshop to supplement the existing planning and specifically to support finalizing the management objectives for the site. The following bullet list provides a summary of this SWOT analysis and outlines both internal and external threats and opportunities.

Internal Strengths

- Rota Community willing to cooperate
- Planting team strong and able
- Experience in revegetation/planting
- Department/agency cooperation (partners)
- Funding through CRI
- Water quality & near shore benthic monitoring

Internal Weaknesses

- Inadequate funding
- Manpower
- Transportation
- Lack of engineering plan
- Political will
- Lack of enforcement
- Staging area for revegetation
- Access road
- Inadequate supplies for plants
- Difficulty in introducing native plants
- Lack of scientific baselines for many of our targeted species

External Opportunities

- Potential funding
- Completing the CAP
- Inter-agency collaboration
- Public awareness & increased appreciation
- Awareness at national level (US Coral Reef Task Force)
- Eco-tourism potential
- Enhanced diversity(terrestrial & marine)
- Reducing soil erosion
- Increase real estate value (land)
- Land acquisition
- Model project (educational sanctuary)

External Threats

- Irreversible soil loss
- Overfishing
- Lack of future funding
- Natural calamity
- Political pressure (political interference)
- Fire
- Hunters/poachers

Appendix 3: Maps

Figure 8: USGS Topographical Map

Figure 9: Benthic Habitat Map

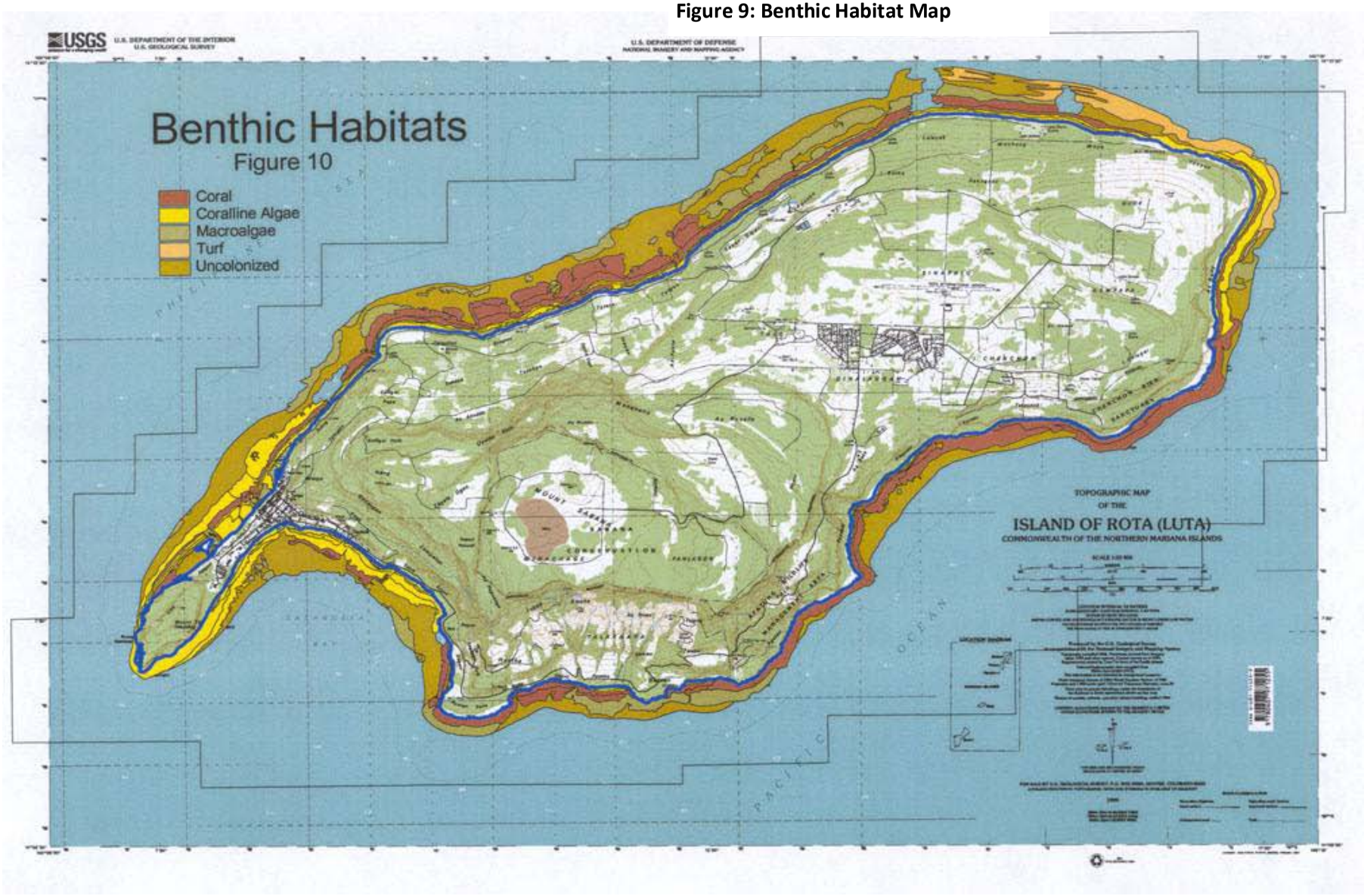

Figure 10: Threatened/Endangered species habitat map

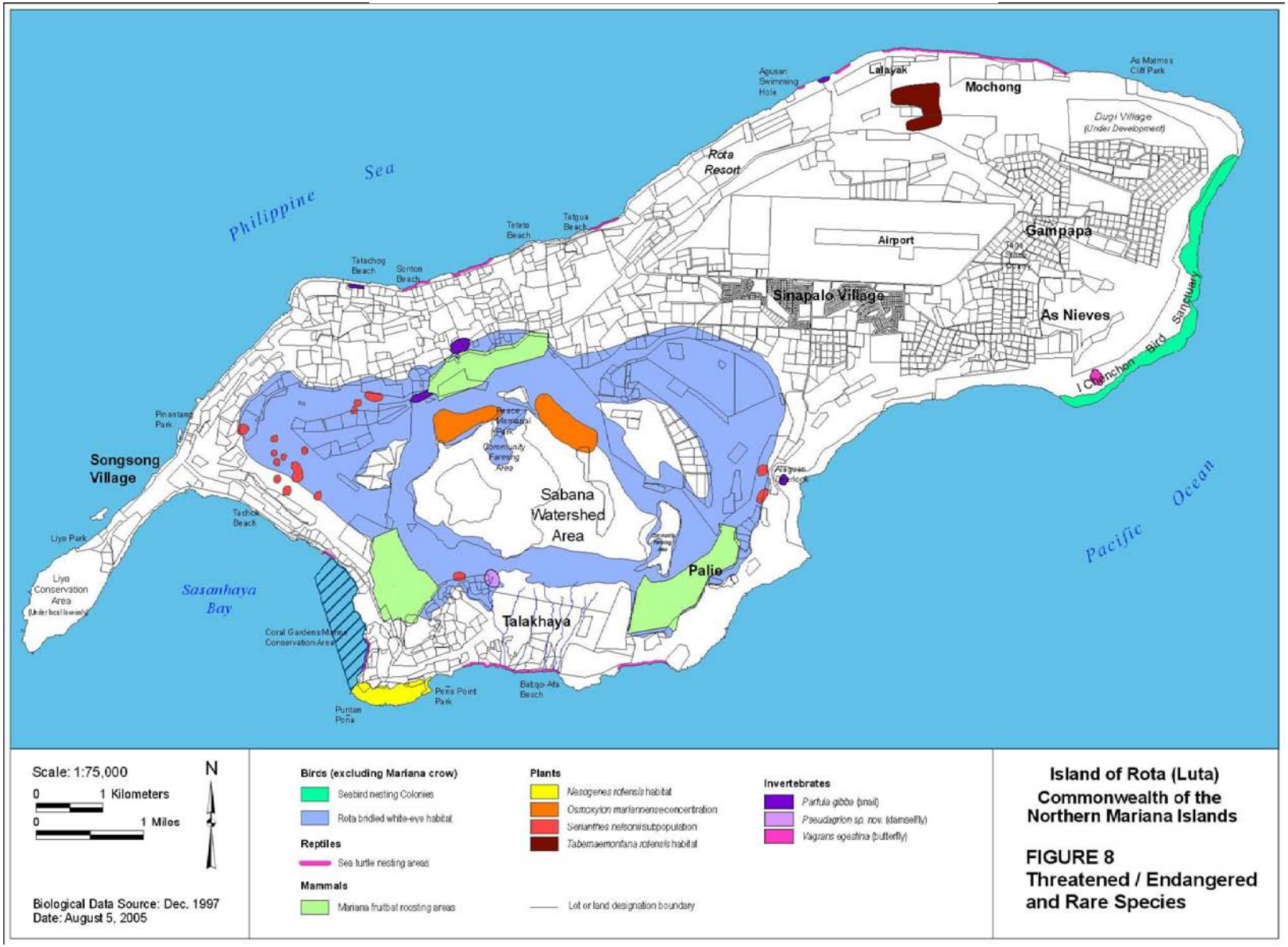

Figure 11: Marianas Crow Critical Habitat Map

Figure 12: Rota Vegetation Map

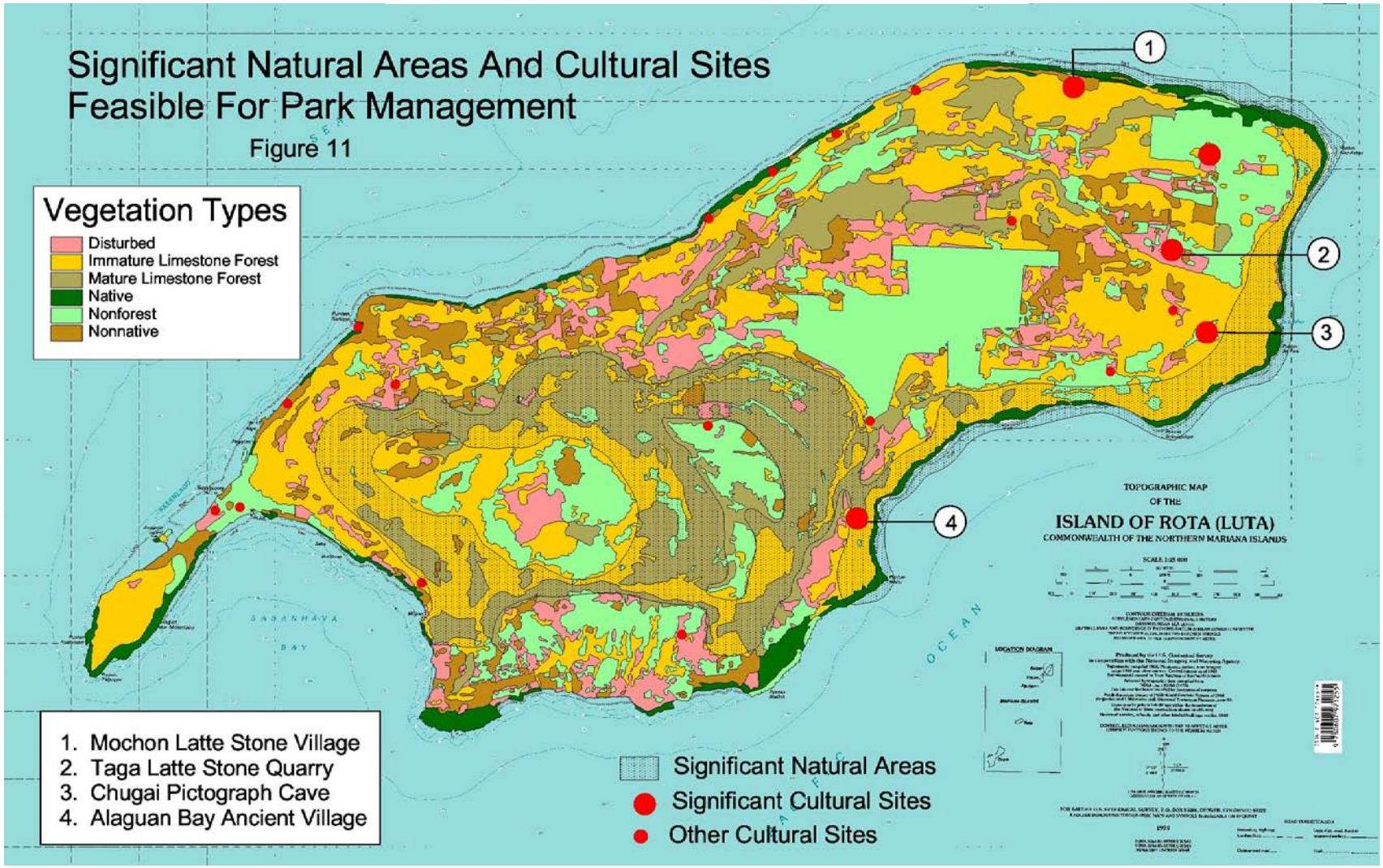

Figure 13: Limestone forest cover map

Appendix 4: Workplan for CRI Funded Projects (FY2012 &2013)

Attitudes and Perceptions Survey

Projects/Tasks	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
Develop Survey												
Recruit and train enumerators on Rota												
Survey conducted												
Survey results inputted and analyzed												
Develop final report												
Results presented to Rota community												

No Burning Campaign												
Projects/Tasks	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
Develop campaign project plan												
Development of campaign materials												
Conduct campaign												
Conduct post-campaign survey												
Write campaign final												

report												
Results presented to Rota community												

Seasonal Field Agents

Year 1 Projects/Tasks	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
Update position description												
Design signs and hand-out materials, designate location of signs.												
Install signs; print handout materials.												
Advertising of position, interview of candidates, selection of agents.												
Two day training of agents at the DLNR office and in the field.												
Duties listed in position description												

carried out by agents.												
Evaluation of program at completion of season.												

Year 2 **Projects/Tasks**	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
Update position description												
Advertising of position, interview of candidates, selection of agents.												
Two day training of agents at the DLNR office and in the field.												
Duties listed in position description carried out by agents.												
Evaluation of program at completion of season.												

Revegetation of Critically Eroding Areas												
Year 1 Projects/Tasks	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
Evaluate previous years planting and generate planting plan for upcoming season.												
Ordering supplies for propagation and planting event.												
Propagation of seedlings.												
Recruitment of volunteers.												
Orientation of volunteers.												
Planting event.												
Planting Festival.												
Map planted areas and enter in database.												

Continue stream and marine water sampling and benthic monitoring.												
Year 2 Projects/Tasks	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
Evaluate previous years planting and generate planting plan for upcoming season.												
Ordering of supplies for propagation and planting event.												
Propagation of seedlings.												
Recruitment of volunteers.												
Orientation of volunteers.												
Planting event.												
Planting Festival.												

Map planted areas and enter in database.												
Continue stream and marine water sampling and benthic monitoring.												

Appendix 5: Rota Creel Project Plan (NOAA internal Funded)

Project Description

Project Purpose:*
The Rota Creel Pilot Program (RCPP) will provide invaluable data regarding fishing methods, effort, catch, species composition and fishing pressure that is hitherto unavailable. In 2010 Rota was the first island within the CNMI to overturn the eight year ban on gill, drag and surround nets and the RCPP will provide much needed baseline data as well as comparative data to compare with existing net use exemptions on Saipan.

Project Summary:*
The RCPP will build upon interview, data management and analysis methods currently employed by the DFW Fisheries Data Section Saipan Lagoon Creel Program (SLCP). The initial phase of this project will involve a several month scoping period in which SLCP staff will travel to Rota and work with local staff to assess the locations, methods and fish complex that will need to be addressed within the RCPP. The RCPP, like the Saipan lagoon program, will work closely with NMFS Western Pacific Fisheries Information Network (WPACFIN) program leveraging both technical and analytical support. Due to the remote nature of the study the Division of Fish and Wildlife (DFW) will partner with the Rota Mayors office (RMO) and Rota Division of Lands and Natural Resources (R-DLNR) for project and infrastructure support. Local knowledge will be a prerequisite for the success of this project so one or more Rota residents will be hired on a part time basis to perform interviews, take measurements and record findings in conjunction with the methods and approaches already developed for the SLCP. This will require travel for the training of Rota staff and periodic oversight by project managers and/or team members. Creel staff will also need access to office space, computers with internet access, a vehicle including maintenance and gas, and interview and measurement materials. Some of these will be supplied in-kind by DFW and/or R-DLNR and some will need to be covered by this project.

Project History:
Both Rota and Tinian have been involved with Creel efforts in previous years. Previous efforts received technical support from WPACFIN and were supported by the local mayors office on each island, but the duties were performed by local staff in addition to other responsibilities and without direct funding. It is believed that the previous project lost traction shortly after a large storm struck the islands and forced the mayors office to reallocate capacity and resources. With directed funding and more thorough local over-site we hope to avoid this complication for the duration of the RCPP.

Project Methods:*
(Step 1) Rota scoping by current SLCP staff. (Step 2) Hiring of contractor on Rota to initiate surveys. (Step 3) Implementation of survey protocols. This will include visiting all of the priority survey sites established in step 1 and working with the Rota Mayors office to monitor and study net fishing activities where possible. Data collection will follow the SLCP model including a randomized data collection approach collecting both (1) Participation Counts and (2) Interviews for catch information and details. Data will be entered on an adapted version of the SLCP data forms and include all of the same information. Both surveys will be performed evenly between nights, days, week days and weedends. The schedule for the RCPP will be set by the supervisor of the SLCP. (Step 4) Data entry and quality control will be achieved by having the RCPP contractor enter data daily into spreadsheets to be sent to the SLCP biologist. This will also provide an immediate avenue for questions regarding fish identification and/or project methodologies. (Step 5) Reports will be generated by the RCPP contractor in conjunction with input from the SLCP manager to account for any trends or important details that emerge throughout the project. A more complete outline of these methods can be found in the Saipan Shore-based Creel Survey Documentation document generated by the Pacific Islands Fisheries Science Center in May of 2010.

Project Budget

FY2012$46,000	(Salary) - Funding to cover contract for part time employee(s), which will begin after the initial scoping phase approximately seven months into the project. (Travel) - Funding to cover six SLCP staff scoping trips to Rota for the first six months of the project and 3 days training of contracted employees in Saipan. (Operational Costs) - Funding for a computer, phone, gas, maintenance and office supplies.
FY2013$52,500	(Salary) – Funding to cover contract for employee(s). (Travel) – Funding for travel of team members to Rota for project oversight (Operational Costs) - Funding for phone, gas, maintenance and office supplies
FY2014$52,500	(Salary) – Funding to cover contract for employee(s). (Travel) – Funding for travel of employee to Saipan for project close and team members to Rota for project oversight. (Operational Costs) - Funding for phone, gas, maintenance and office supplies.

United States Department of Agriculture
NRCS Natural Resources Conservation Service

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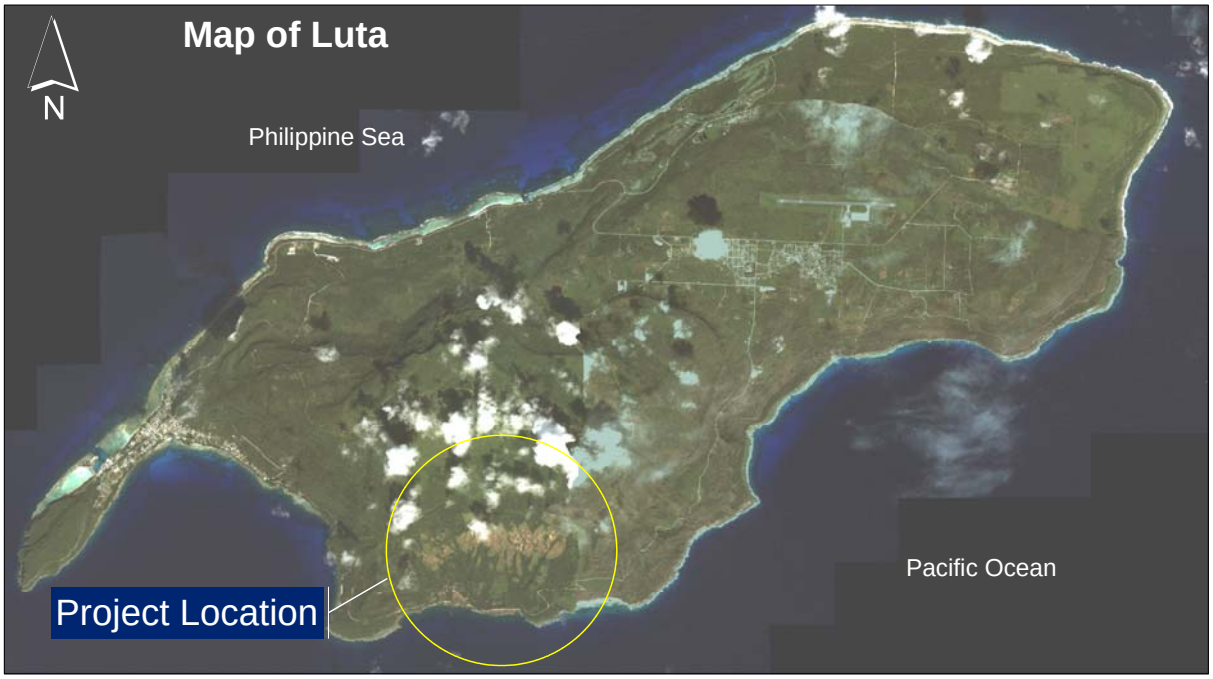
Conservation Plan
Island of Rota
Commonwealth of the Northern Mariana Islands
Project Location Map



No Scale
Talakhaya, Rota

Prepared by
United States Department of Agriculture
Natural Resources Conservation Service
Pacific Islands Area – West
July 2007

BACKGROUND

General information

Rota (Luta) is one of 17 islands in the Mariana archipelago, which is approximately 3,750 miles southwest of Hawaii. Sixteen of these islands are part of the CNMI; Guam is a United States Territory. Rota is the third largest island in the CNMI. Rota is the southernmost and third largest island in the CNMI, after Saipan and Tinian. Rota is located at approximately 14° 10' north latitude and 145° 10' east longitude. Songsong village is the largest and most populated followed by Sinapalo village. Rota has diverse flora and fauna.

- Area: 85.38 square kilometers (32.967 square miles)
- Dimensions (approximately):
    - 16.9-kilometers (10.5-miles) long
    - 4.8-kilometers (3-miles) wide
- Coastline: 61.6 kilometers (38.3 miles)
- Highest point: Mt. Manira - 495 meters (1,625 ft)
- Population: 3,283 (2000 - U.S. Census Bureau)
- Distances:
    - Guam - 76 kilometers (47 miles; south)
    - Tinian - 101 kilometers (63 miles; north)
    - Saipan - 117 kilometers, 73 miles; north)

The climate on Rota is topical marine with average annual temperatures of approximately 80 degrees Fahrenheit, 80 inches of rainfall and about 80 percent humidity. Rainfall averages 10.7 inches per month during the wet season and 3.8 inches per month during the dry season (January to June). The trade winds are strongest and most constant during the dry season, when windspeeds of 15 to 25 miles per hour are common. During the rainy season there is often a breakdown of the trade winds, and on some days the weather may be dominated by westerly storm systems that bring heavy showers, or steady, and sometimes torrential, rains.

There is no published information on Rota's bedrock, but it is likely to be similar to Saipan and Tinian because of their common origins. These islands are underlain with volcanic rock resulting from volcanic eruptions approximately 60 million years ago. The volcanic cores, which were formed below sea level, have slowly uplifted and emerged through the ocean surface, and a series of limestone plateaus formed as coral reefs. Ninety-eight percent of Rota's area is covered with limestone plateaus of coral reef origin.

Rota's topography has five geomorphic subdivisions: the coastal lowlands, a northern plateau, a southern plateau (the Sabana), a volcanic area, and the western peninsula. On the island's north shore, coastal lowlands dominate and are bounded on the seaward side by a narrow reef margin. Sandy soils with coconut palms occur in the inland areas, and strand vegetation dominates the coastal margin. The northern plateau, at an elevation of approximately 450 ft (137 m), comprises the eastern part of the island, with its south and east sides terminating in cliffs with rocky shoreline below. On the north side, the plateau slopes gradually toward the sea; this is the location of Mochong Beach, the largest beach on Rota. The Sabana plateau has an elevation exceeding 1,400 ft (426.7 m). Its western side is marked by cliffs that form low plateaus. On the northeast side, less pronounced cliffs and slopes lead gradually to the northern plateau. The southern and a portion of the northern boundaries of the Sabana terminate in dramatically shaped precipitous cliffs. In the northern part of the Sabana, Mt. Manila is the highest point11

at 1,627 ft (495.9 m). The volcanic area of the island is very different in appearance from the other geomorphic subdivisions. Streams have eroded the area into deeply etched ridges and valleys predominately covered by sword grass *(Miscanthus floridulus)*. The western peninsula is a narrow isthmus that connects Mt. Taipingot with the remainder of the island. Mt. Taipingot rises in terrace formations to approximately 460 ft (140.2 m), and the peninsula is bounded by precipitous cliffs.

Vegetation on Rota consists of mixed second-growth forests, grassy savannas, and dense thickets of introduced tangantangan (*Leucaena leucocephala*). Approximately 60 percent of Rota's land area still remains in native forest, although much is altered and not pristine. The best developed and most pristine native forest (including limestone forest) is on the slopes and cliffs of the high plateau (Sabana).

INTRODUCTION

Purpose and Scope

Figure 1: Talakhaya west

Luta Soil and Water Conservation District along with the Mayor if Luta has requested technical assistance from NRCS to address erosion and sedimentation problems within the Talakhaya watershed area, NRCS has drafted a series of conservation practices that could help address erosion and sedimentation. The Talakhaya watershed is also a chosen site for the Coral Reef Initiatives Local Action Strategies (LAS) for Land Based Sources of Pollution (LBSP). Funding from the Coral Reef Grant managed by Division of Environmental Quality (DEQ) will be used to provide the equipment, plant materials, and labor needed to assist with restoring area by converting fire prone grass land to native forestland.

Talakhaya area consists of an area of approximately 1585 acres and is located along the southern coastline of Rota. Treatment area is approximately 825 acres, consisting of three treatment phases:

1. As Onan: total area = 354acres. Existing treatment area = 78 acres
2. Alesna: total area = 200 acres. Existing treatment area = 61 acres
3. Lupok: total area = 271acres. Existing treatment area = 66 acres

Out of the approximate 825 acres for treatment, 155 acres are denuded of vegetation and is similar to the badlands of southern Guam. Currently

Objectives:

- Surface water runoff
- Community Involvement
- Address annual wildfires
- Address hunting permits
- Gully erosion
- Convert fire prone grass land to forestland
- Enhance endangered wildlife habitat
- Utilize native tree
- Preservation of cultural resources
- Wildlife habitat enhancement
- Recreational enhancement
- Protect coral reef habitat

Soils[1]:

The USDA Soil Survey of the Islands of Aguijan, Rota, Saipan, and Tinian, Commonwealth of the Northern Mariana Islands (July 1989) provides the following general soil map unit information. The soil survey also provides the detailed soil map unit information for identification and mapping.

General Soil Map Units:

General soil map units are broad areas that have distinctive pattern of soils, relief, and drainage. Each general soil map unit is a unique natural landscape. A general soil map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The general soil map unit can be used to compare the suitability of large areas for general land uses.

Area is located along steep terrain with slopes ranging from 5 to 99 percent slopes. Area has been plagued annually by wildfires. Area has exposed badlands and deep gullies. There are approximately twelve different soil map units within the watershed area.

Badlands are areas of saprolite (weathered volcanic bedrock) where soil has been completely eroded or nearly so. Badlands support little or no vegetation and therefore they are actively eroding. Map unit 4, Akina-Badland complex, 30-60 percent slopes generally contains about 30 percent Badland. Runoff is rapid and the hazard for water erosion is severe. Badland areas expand by slippage and by headwall erosion. Stabilization of soil on the upslope margins of Badland scars is crucial for stabilizing these landscapes. (Gavenda, 2006)

The Akina series is the predominant soil at the site. It comprises about 60 percent of most delineations of map unit 4. The Akina soil series has 20 to 40 inches of soil over highly weathered rock (saprolite). Akina soil is acidic, has few nutrients, little ability to hold on to nutrients and may have plant-toxic levels of soluble aluminum. Because of the limited ability of Akina soils to hold nutrients, fertilization should be in relatively small but frequent applications or in a slow release fertilizer. (Gavenda, 2006)

The Akina series consists of moderately deep, well drained soils on volcanic uplands. These soils formed in residuum derived form tuff or tuff breccia. Slope is 5 to 60 percent.

The Chinen series consists of shallow, well drained soils on uplifted plateaus. These soils formed in sediment overlying porous limestone. Slope is 3 to 30 percent.

The Dandan series consists of moderately deep, well drained soils on uplifted limestone plateaus. These soils formed in sediment overlying porous coralline limestone. Slope is 0 to 15 percent.

The Laolao series consists of moderately deep, well drained soils on volcanic uplands. These soils formed in residuum derived from andesitic marine tuff and tuffaceous sandstone. Slope is 0 to 60 percent.

The Luta series consists of very shallow, well drained permeable soils on plateaus. These soils formed in sediment overlying limestone. Slope is 0 to 30 percent.

The Takpochao series consists of very shallow, well drained soils on plateaus, side slopes, and escarpments. These soils formed in sediment overlying coralline limestone. Slope is 3 to 99 percent.

Soil Map Units:

- 3, Akina-Badland complex, 15-30% slopes
- 4, Akina-Badland complex, 30-60% slopes
- 11, Chinen clay loam, 5-15% slopes
- 12, Chinen clay loam, 15 to 30% slopes

[1] Young, 1989

- 20, Dandan-Chinen complex, 5-15% slopes
- 31, Laolao clay, 5-15% slopes
- 32, Laolao clay, 15-30% slopes
- 33, Laolao clay, 30-60% slopes
- 35, Luta cobbly clay loam, 5-15% slopes
- 39, Luta-Rock outcrop complex, 5-15% slopes
- 42, Rock outcrop-Takpochao complex, 60-99% slopes
- 52, Takpochao-Rock outcrop complex, 30-60% slopes

Detailed Soil Map Units

Detailed soil map units represent the soils or miscellaneous areas in the survey area. The detailed soil map unit descriptions can be used to determine the suitability and potential of a unit for specific uses. They can also be used to plan the management needed for those areas. A detailed soil map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A detailed soil map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas (Young, 1988). See appendix A for Map unit descriptions.

METHODS

Conservation Planning Process[2]

The National Planning Procedures Handbook (NPPH) was used in developing the Talakhaya conservation plan. The NPPH provides guidance on the NRCS planning process to help develop, implement, and evaluate conservation plans. Conservation planning is a natural resource problem solving and management process. The process integrates economic, social (cultural resources are included with social), and ecological considerations to meet private and public needs. Resources considered in the planning process include soil, water, air, plant, animals, human economic and social concerns. This approach, minimize conflict and address problems and opportunities.

The conservation plan developed is a progressive plan. A conservation plan is progressive when a client is ready, willing, and able to make and implement some, but not all, of the planned elements. Planning and implementation continues on a progressive basis that meets the client's objectives and management experience. Future assistance will be directed toward planning to achieve full implementation for all planning units.

The planning process used by NRCS is a dynamic three phase, nine step process. This conservation plan completes two phases and seven steps of the process to address sheet and rill erosion on 186 acres of degraded land within the Talakhaya area.

Phase I, Collection and Analysis: This includes identifying all resource problems and opportunities, determining objectives, inventory of resources, and analysis of resource data.

Phase II, Decision and Support: This includes the formulation of alternatives, evaluation of alternatives and making decisions.

Phase III, Application and Evaluation: This completes the planning process with implementation and evaluation of the plan.

Data collected in the field, soil erosion predictions and recommended treatments are recorded on resource checklists. These checklists document very general to very specific resource data for each site. A simple sketch map of the site outlines major features and off-site features that may influence conservation planning decisions.

Field Office Technical Guides -FOTG[3]

Technical guides are the primary scientific references for NRCS. They contain technical information about the conservation of soil, water, air, and related plant and animal resources. Localized technical guides used in each field office apply specifically to the geographic area for which they are prepared. These documents are collectively known as the Field Office Technical Guides (FOTG). Examples include rainfall data, soils, Revised Universal Soil Loss Equation (RUSLE 2), conservation practices, quality criteria for conservation practices, cultural resources information, references, etc.

Global Positioning System

Latitude and longitude for sites was recorded using the Garmin GPSmap76 unit. Waypoints were recorded in World Geodetic System (WGS) 1984 datum. NRCS satellite imagery is projected in North American Datum (NAD) 1983. Imagery projection could not be corrected to accept WGS 1984 waypoints from the Garmin unit. ArcGIS (Arc Geographic Information System) will automatically correct these

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[2] USDA-NRCS, 2003

[3] From http://www.nrcs.usda.gov/technical/efotg/, 2007

different projections. The difference between NAD 1983 and WGS 1984 is in centimeters and insignificant in terms of position.

PHASE I – COLLECTION AND ANALYSIS OF DATA

Problem Identification

Figure 2: Talakhaya north-west

Resource inventory and field collection of data was conducted on 825 acres of degraded land to compile a more complete list of resource issues and opportunities. Several site visits were conducted by a variety of specialist (soil scientist, forester, biologist, and soil conservationist).

Problems:

- Frequent forest fires
- Steep difficult terrain
- Deep gullies
- Lack of firebreaks
- Lack of vegetation ground covers
- Fire prone grass dominant vegetation
- Habitat for endangered wildlife threatened

Problem – Soil Erosion (Splash, sheet and rill, and deep rill)
Splash erosion is the spattering of small particles caused by the impact of raindrops on very vet soils. The loosened and separated particles may or may not be subsequently removed by surface runoff. Sheet erosion is the removal of a fairly uniform layer of soil from the land surface by runoff water. Rill erosion is a process in which numerous small channels of only several centimeters in depth are formed. (Foster 1986) Due to the lack of vegetation and ground cover, sheet and rill erosion is common within the denuded areas.

Problem – Soil Erosion (Mass movement)
Due to the lack of vegetation and ground cover; clayey soil type; high precipitation during rainy season, area is prone to slumping in saturated conditions.

Problem – Soil Erosion (Concentrated Flow/Ephemeral Gully)
Ephemeral gullies are wider and deeper that rills. Tillage operations across an ephemeral gully will fill the gully partially or completely. Ephemeral gullies tend to reappear later at the same location because the depression it forms on the landscape continues to concentrate the runoff.

Problem – Soil Erosion (Classic Gully)
The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths. This gully could be considered a miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and could be smoothed by ordinary tillage. Classic gullies are found throughout the Talakhaya watershed, they are apparent in the USGS topography map and the 1993 Ikonos satellite imagery.

Problem – Soil Condition (Organic Matter Depletion)
Organic matter depletion is the lack of plant and animal residue in the soil in various stages of decomposition. This is caused by the wildfires that burn off any surface and subsurface organic matter. Plant material and ground cover is not able to regenerate quick enough to out-compete the fire prone grass.

Problem – Water Quantity (Excessive Runoff, Flooding, or Ponding)
Area is a watershed, there are several springs and streams within the treatment area. Problem is erosion from steep areas entering surface water and outlets to the Pacific ocean.

Problem – Water Quality (Excessive Suspended Sediment and Turbidity in Surface Water)
Sedimentation to marine area.

Problem – Plant Condition (Noxious and Invasive Plants, Wildfire Hazard)
The areas that are not affected by the fires still have pristine ravine and limestone forest. Areas within the treatment area lack any native species or plant diversity. Area is dominated by fire prone sword grass *(Miscanthus floridulus)*. Conversion from grassland to forestland will help reduce the intensity and frequency of fires in the area. Fire and fuel breaks are a requirement when reforesting an area. Feral deer and pigs should also be excluded from treatment area.

Problem – Animals (T&E Fish and Wildlife Species: Listed or Proposed for Listing under the Endangered Species Act; Habitat Fragmentation)
The area is habitat for marine and terrestrial wildlife. According to the NOAA GIS layers, there are sittings of the green sea turtles (*Chelonia mydas*) within the area. Designated critical habitat exists for the Mariana Crow, Rota Bridled White Eye, and the Mariana Fruit bat. Sighting of the Mariana Fruit Bat foraging along the cliffline was observed April 2007. Wildlife inventory also include the Micronesian starling, the white tern and the white tailed tropicbird.

Current problems are sedimentation; annual wildfires, decreasing cover and shelter, decreasing food source, and native plant diversity.

Problem – Resources Management
Ungulate populations under consideration for this resource concern are introduces species. Evidence of deer (trailing, droppings, and rubs) from Philippine deer (*Cervus mariannus).* (Wiles et.al.1998)

Problem – Economic (Cost Effectiveness)
The location of the site is on uneven, limited accessibility, and steep terrain. Volunteer work is limited because of the hazard of the site. The cost to implement restoration of site will need to consider labor costs. Materials are also limited and are inflated compared to the islands of Guam and Saipan.

Problem – Cultural Resources (Absence/Presence)
Cultural resources are numerous on the island, dating from ancient Chamorro latte stones and quarries to old japanese bunkers and cannons. Area has known latte sites.

Opportunities:

- Enhancing area for wildlife habitat for federally threatened and endangered species
- Enhancing area for cultural resources
- Addressing sediment loaded surface water runoff

PHASE II DECISION SUPPORT

Formulation and Evaluation of Alternatives

Inventory and analysis of resource data available and collected from the field allows the development of treatment alternatives to meet identified objective (s), solve resource problems and prevent additional problems from occurring. The following are examples of conservation practices that could be used based on the resource concerns in the Talakhaya area:

1. Critical Area Planting (342)
2. Mulching (484)
3. Tree and Shrub Establishment (612)
4. Riparian Forest Buffer (391)
5. Vegetative Barrier (601)
6. Nutrient Management (590)
7. Pest Management (595)
8. Upland Wildlife Habitat Management (645)
9. Diversion (362)
10. Forest Trails and Landings (655)
11. Use Exclusion (472)
12. Firebreak (394)
13. Fuel Break (383)
14. Field Border (386)

*Listing is not all inclusive.

RECOMMENDED CONSERVATION PRACTICES

Critical Area Planting (342)

HIGH PRIORITY

Definition

Critical Area Planting is the planting of vegetation, such as trees, shrubs, grasses, or legumes, on highly erodible or critically eroding areas. There are approximately 112 acres of denuded area needing critical area planting.

Purpose

The purpose of critical area planting is to reduce sheet and rill erosion; reduce transport of sediment, on-site or off site; and improve wildlife habitat and visual resources.

Design

Denuded areas will be established with ground cover and tree vegetation to reduce erosion. It is recommended that native species be planted for the critical areas. Ground cover will be applied to exposed areas to cover the exposed soil and therefore minimize the soil erosion. Recommended ground cover includes mulch of organic material locally available or seeding with grass and other species including but are not limited to:

- Bahia grass *(Paspalum notatum)*
- Bermuda grass (*Cynodon dactylon)*:
- Native grass excluding sword grass (*M. floridulus)*

The installation of this practice will be during rainy season (June-November).

Maintenance: Plant material should be available to replace 10% mortality rate.

Mulching (484)

MEDIUM PRIORITY

Definition

Applying plant residues or other suitable materials not produced on the site to the soil surface. Mulching is most important in the critical areas or eroded areas, which need ground cover and soil structure building.

Purpose

The purpose of the mulch is to reduce runoff and erosion, conserve moisture and control weeds to help with the establishment of trees (Tree and Shrub Establishment). To prevent surface compaction or crusting, reduce runoff and erosion, control weeds, and help establish plant cover.

Design

Mulch of organic matter, leaf litter, brush cuttings and / or other organic material such as compost will be used to cover the ground where plants either trees or ground cover can not easily be established. The mulch will be applied to the areas in the critical area planting or barren areas to help protected the soil from erosion.

The mulch should be applied thick enough to protect the soil from erosion. A layer of mulch material approximately three to six inches would be effective in erosion control and help build the microclimate for tree growth. At the time of tree planting cover the soil completely (at least 90% cover) with more than 3 inches of leaves from grass clippings, leaf litter, compost, or cuttings from woody species to improve the soil. That amount of mulch is equal to approximately 200 to 600 cubic meters of mulch per acre. As the mulch decomposes, more should be added periodically as needed.

Tree and Shrub Establishment (612)

HIGH PRIORITY

Definition

Tree and shrub establishment is to establish woody plants by planting of seedling.

Purpose

The purpose of Tree and Shrub Establishment is to establish woody plants for the reforestation of barren areas and grassland, and to provide wildlife habitat. This will also help reduce soil erosion by adding surface leaf litter which is a form of ground cover.

Design

A mixed planting of native trees and shrub species will be established on all (186 acres). See the Conservation Plan map for the location of these reforestation sites.

The selected species will be planted to provide sufficient space and light for proper plant growth with the minimum of ground disturbance. For planting the trees will be alternately spaced at a 10 x 10 foot spacing to provide for sufficient room for the trees to grow and maximum canopy closer in the shortest time period. At this spacing each acre of area to be planted will need 450 trees.

Recommended trees species include da'ok *(callophyllum inophylum)*; fadang *(cycas mircronesica)*; hunik (*Scaevola sericea);* nana'su *(Tournefortia argentea);* tilisai (*Terminalia catappa*); pago (*Hibiscus tiliaceus)*, ladda (*Morinda citrifolia);* and kafu (*Pandanus tectorius).* The actual species for plantings of ground cover and trees will be determined by plant material availability.

Site preparation has two principal benefits. The primary benefit of site preparation is to eliminate or control competing vegetation. The second benefit is to maintain moisture in the soil to ensure enough available moisture to supply the tree seedlings through the first and most critical growth period. Plant residue should be left on the surface both to protect from erosion and to reduce evaporation.

Maintenance will be to control competing vegetation until the woody plants are established. Plant material should be available to replace 10% mortality rate.

Riparian Forest Buffer (391)

MEDIUM PRIORITY

Definition

An area predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses and waterbodies.

Purpose

- Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow

- Restore riparian plant communities

Design
The riparian forest buffer shall be positioned appropriately and designed to achieve sufficient width, length, vertical structure/density and connectivity to accomplish the intended purpose (s).

Dominant vegetation will consist of existing, naturally regenerated, or seeded/planted trees and shrubs suited to the soil and hydrology of the site and the intended purpose (s).

The vegetation will extend a minimum width to achieve the purpose (s). Measurement shall begin at and perpendicular to the normal water line, bank full elevation, or the top of the bank as determined locally.

Use tree and shrub species that are native and non-invasive and locally accepted cultivars or purpose-specific species is allowed. For plantings and seeding, only viable, high quality and adapted plant materials will be used.

Vegetative Barrier (601)

LOW PRIORITY
Definition
Permanent strips of stiff, dense vegetation along the general contour of slopes or across concentrated flow areas.

Purpose

- reduce sheet and rill erosion
- reduce ephemeral gully erosion
- manage water flow
- stabilize steep slopes
- trap sediment

Design
The vegetative barriers will be planted along the access roads and trails. Recommended species is Vetiver *(Vetiveria zizanioides)* or *(Chrysopogon zizanioides),* a tropical grass, that has been used throughout the world as a low cost and effective system for soil and water conservation.

Vetiver will form a dense hedge that will slow down runoff, which reduces erosion by causing more water to be absorbed into the soil and by spreading the water out. The thick hedges also trap sediment and over time create terrace-like benches. The deep, thick roots help stabilize steep slopes and area experiencing undercutting.

Once established it can tolerate drought and is recommended for areas with an annual rainfall of at least 18 inches. It grows best in areas with high rainfall and can tolerate long periods of waterlogged soils. It is resistant to most root know nematodes.

Variance:
The Pacific Islands Area (PI) has received a variance to use Vetiver grass as a vegetative barrier with specific criteria for establishment.

*The Vetiver cultivars **Sunshine** and **Monto** may be used anywhere in the Pacific Islands Area because these cultivars do not produce seeds that sprout.*

Nutrient Management (590)

HIGH PRIORITY

Definition

Managing the amount, source, placement, form and timing application of plant nutrients and soil amendments.

Purpose

- To budget and supply nutrients for plant production
- To properly utilize manure or organic byproducts as a plant nutrient source
- To minimize agricultural non-point source pollution of surface and ground water resources
- To protect air quality by reducing nitrogen and/or particulate emissions to the atmosphere
- To maintain or improve the physical, chemical, and biological condition of the soil

Nutrient management is the effective and efficient use of nutrient resources to adequately supply soil and plants to produce while minimizing environmental degradation. Nutrient management may be a component of a conservation management system. It is used here in conjunction with mulching, pest management, and tree and shrub establishment based on the site specific needs to address to natural resource concerns and landowners objectives. Nutrient management is based on an understanding of what nutrients are presently available to the plant in the soil, what are crop yield expectations, and what are the total nutrient inputs from mulching and organic matter. To understand these variables we need a present soil test, and localized nutrient recommendation for each tree/shrub species.

Periodically, additional soil tests will be done to insure proper application rates in future years. An estimated nutrient budget can be found on the Nutrient Management Job Sheet.

A few general considerations for nutrient management:

- Apply nutrients according to soil test recommendations
- Consider the effects of drought or excess rain on quantities of available nutrients
- Time nutrient applications when rain will not wash away the nutrients
- Maintain records of nutrient application.

Pest Management (595)

MEDIUM PRIORITY

Definition

Manage pest infestations, including weeds, insects, and diseases to reduce adverse effects on plant growth and environmental resources.

Pest management will use an integrated pest management approach. Plant nutrients, soil moisture, and management of competing plants will be kept at favorable levels for reduced plant stress and improved plant vigor. Hand weeding and mulching is utilized as a regular practice for weed control. Approved insecticides are used only when needed to control the insect pests.

Use Exclusion (472)

LOW PRIORITY

Definition

The temporary or permanent exclusion of animals, people or vehicles from an area.

Purpose

To prevent, restrict, or control access to the beach side so that the active turtle nesting sites are not disturbed by foot traffic.

Design

Material to be used could be natural and/or artificial structures such as logs, vegetation, earthfill, boulders, fences, or signs. A jobsheet will be provided prior to the installation of this practice.

Upland Wildlife Habitat Management (645)

HIGH PRIORITY
Definition
Wildlife upland habitat management is the creating, maintaining or enhancing areas for food and cover for upland wildlife. Enhancement emphasis will be for the native forest birds and nesting green sea turtles.

Purpose
Wildlife habitat management is to provide a variety of foods and cover for desired kinds of wildlife species.

Design
The wildlife habitat management applies all areas within the conservation plan (11 ac). Areas within the "Use Exclusion" will be managed for wildlife habitat where possible. Tree species selection will favor native tree species that have multiple values for wildlife, such as those suited for nuts, fruit, and nesting.

Diversion (362)
LOW PRIORITY
Definition
A channel constructed across the slope generally with a supporting ridge on the lower side.

Purpose
- To reduce damage caused by surface water runoff by diverting water offsite into an appropriate outlet
- To divert water away from active gullies or critically eroding areas
- To break up concentrations of water on long slopes

Design
This practice will be a structural practice or vegetated practice utilizing a combination of agronomic practices (Mulching and Tree and Shrub Establishment). Diversions will be placed approximately 50 feet apart See attached schematic of diversion.

Forest Trails and Landings (655)
LOW PRIORITY
Definition
A temporary or infrequently used route, path or cleared area within a forest.

Purpose
- To provide infrequent access to forest stands for management activities including fire suppression
- To provide periodic access for removal and collection of forest products

Design
Plans and specifications shall include the size, number, and locations of trails and landings for each field or management unit. They will be designed to minimize impacts on riparian zones, stream channels, wildlife habitat, erosion and sedimentation, residual trees and advanced regeneration. Slash from construction of trails and landings shall not increase fires hazard. Erosion control measures shall be installed after project completion. A job sheet will be provided for this practice prior to installation.

Firebreak (394)
HIGH PRIORITY
Definition
A strip of bare land or vegetation that retards fire.

Purpose
To prevent the spread of annual wildfires.

Design

Firebreaks should not be installed where slopes exceed 20 percent. The conservation practice Fuel Break (373) shall be considered for installation instead.

The firebreaks will be located near ridge crests and valley bottoms. If winds are predictable, firebreaks should be located perpendicular to the wind and on the windward side of the area to protected. Consider the selection of plant species that will enhance the needs of wildlife in the area. A job sheet will be provided prior to the installation of this practice.

Fuel break (383)

HIGH PRIORITY

Definition

A strip or block of land on which the vegetation, debris and detritus have been reduced and /or modified to control or diminish the risk of the spread of fire crossing the strip or block of land.

Purpose

Control and reduce the risk of the spread of fire by treating, removing or modifying vegetation, debris and detritus.

Design

Fuel breaks strips or blocks will be of sufficient width and length to meet intended purposes. Thin the overstory stand to reduce the tree canopy and the potential of a crown fire.

Maintain vertical separation between fuel layers to remove “ladder” fuels, i.e. lowest layers of flammable vegetation do not connect to upper layers so that a fire cannot “step up” to higher canopies.

Treat or remove slash sufficiently and at a time to minimize fuel loadings to acceptable fire risk levels and reduce incidence of harmful insects and disease.

Manage grass and forbs to minimize fine fuels.

Attempt to locate fuel breaks near ridge crests and valley bottoms. If winds are predictable, fuel breaks can be located perpendicular to the wind and on the windward side of the area to be protected.

Select plant species that will enhance the needs of desired wildlife in the area.

Field Borders (386)

MEDIUM PRIORITY

Definition

A strip of permanent vegetation established at the edge or around the perimeter of a field.

Purpose

- Reduce soil erosion from wind and water
- Soil and water quality protection
- Management of harmful insect populations
- Provide wildlife food and cover
- Improve air quality

Design

Site specific specifications shall document the following, as a minimum:

- Border widths and lengths based on local design criteria
- Location within the field or farm boundary vegetation to be used
- Site preparation
- Planting method
- Liming or fertilizer requirements
- Operation and maintenance requirements

Table 1: Treatment alternatives for Talakhaya = 825 acres / 334 hectares

Treatment Alternatives For Degraded Sites in Talakhaya						
Natural Resource Problem	**Alternative 1**		**Alternative 2**		**Alternative 3**	**Alternative 4**
Soil Erosion (Splash, sheet and rill)	Do Nothing		Tree and shrub establishment and mulching		Critical area planting with grass seed	Combination of Alternatives2 & 3
Soil Erosion (Mass movement)	Do nothing		Tree and shrub establishment and mulching		Critical area planting with grass seed	Combination of Alternatives2 & 3
Soil Erosion (Concentrated flow, ephemeral gully)	Do Nothing		Tree and shrub establishment and mulching		Critical Area Planting with Grass seed	Combination of Alternatives 2 & 3
Soil Erosion (Classic gully)	Do Nothing		Mulching		Diversions	Grade Stabilization Structure
Soil Condition (Organic matter depletion)	Do Nothing		Mulching and nutrient management		Weed management with fire and fuel breaks	Combination of Alternatives 2 & 3
Water Quantity (Excessive runoff, flooding, or ponding)	Do Nothing		Tree and shrub establishment and mulching		Critical area planting with grass seed	Combination of Alternatives 2 & 3
Water Quantity (Excessive sediment and turbidity in surface water)	Do Nothing		Critical area planting with grass seed		Riparian buffers, Field borders and vegetative barriers	Combination of Alternatives 2 & 3
Plant Condition (Noxious and invasive plants, wildfire hazard)	Pest Management					

Treatment Alternatives For Degraded Sites in Talakhaya continued							
Natural Resource Problem	**Alternative 1**		**Alternative 2**		**Alternative 3**		**Alternative 4**
Animals (T&E fish& Wildlife species: listed or proposed ; habitat fragmentation)	Field borders, fire and fuel breaks		Tree and shrub establishment and critical area planting with grass seed		Riparian buffers, Upland Wildlife Management		Combination of Alternatives 1, 2 & 3
Resource Management (Domestic and wildlife – Population/Resource Balance)	Do Nothing		Use exclusion				
Economics (Cost effectiveness)							
Cultural Resources (Absence/Presence)	Present		Use Exclusion				

PHASE III – APPLICATION AND EVALUATION

How to Achieve the Desired Future Condition

TO BE FILLED IN WHEN ALTERNATIVES ARE CHOSEN

WORKS CITED

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U.S. Fish and Wildlife: DRAFT ECONOMIC IMPACT ANALYSIS OF PROPOSED CRITICAL HABITAT FOR THREE ENDANGERED SPECIES ON GUAM AND ROTA REVISED DETERMINATION. 35-37 pp.

Pratt, Bruner, and Berrett. 1987. *The Birds of Hawaii and the Tropical Pacific*.

Raulerson and Rinehart. 1991. *Trees and Shrubs of the Northern Mariana Islands*.

Young, Fred J. 1989. *Soil Survey of the Islands of Aguijan, Rota, Saipan, and Tinian, Commonwealth of the Northern Mariana Islands*. 1-4p.

Appendix A – Soil Map Unit Description

Descriptions for Detailed Soil Map Unit within the Talakhaya watershed

3, Akina-Badland complex, 15-30% slopes

This soil map unit is on volcanic uplands on the islands of Saipan and Rota. Slopes are long and plane. Short, steep dropoffs and ravines are present in the areas of Badland. The vegetation on the Akina soil is mainly grasses and forbs. The areas of Badland support little or no vegetation. Elevation is sea level to 160 meters.

The unit is 60 percent Akina clay and 30 percent Badland. The Akina soil is on stabilized, vegetated ridgelines and side slopes. The areas of Badland are in slumps, ravines, and disturbed areas that are not vegetated. Areas of Badland are throughout the unit but are most commonly on shoulder slopes. The components of this unit are so intricately intermingled so it was not practical to map them separately at the scale used.

4, Akina-Badland complex, 30-60% slopes

This map unit is on volcanic uplands on the islands of Saipan and Rota. Slopes are long and plane. Short, very steep dropffs and ravines are present in the areas of Badland. The vegetation on the Akina soil is mainly grasses and forbs. The areas of Badland support little vegetation. Elevation is seal level to 330 meters.

This unit is 60 percent Akina clay and 30 percent Badland. The Akina soil is on stabilized, vegetated ridgelines and side slopes. The areas of Badland are in slumps, ravines, and disturbed areas that are not vegetated. These areas are throughout the unit but are most commonly on shoulder slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

11, Chinen clay loam, 5-15% slopes

This shallow, well drained soil is on plateaus on all the islands in the survey area. It formed in sediment over porous coralline limestone. Slopes are long and plane. The vegetation is mainly secondary forest. Elevation is 10 to 450 meters.

Included in this unit are small areas of Dandan, Saipan, Takpochao, and Kagman soils; Rock outcrop; soil that have short, steep slopes; soils that are less than 25 centimeters or more than 50 centimeters deep to limestone; vertical cliffs along the coast; and soil that have a very sticky clay subsoil. On Rota there are small areas of Luta soils and areas of very sticky clay soils. Included areas make up about 20 percent of the total hectarage.

12, Chinen clay loam, 15 to 30% slopes

This, well drained soil is on tilted and dissected limestone plateaus on the islands of Saipan, Tinian, and Rota. It formed in sediment over porous coralline limestone. Slopes are long and plane. The vegetation is mainly secondary forest. Some areas are under grasses and forbs. Elevation is 10 to 450 meters.

Included in this unit are small areas of Rock outcrop; Saipan, Dandan, and Takpochao soils; soils that have short, steep slopes; vertical cliffs; soils that have a clay subsoil; and soils that have limestone at a depth of less than 25 centimeters or more than 50 centimeters. On Rota, there are small areas of Luta soils and areas of very sticky clay soils. Included areas make up about 20 percent of the total hectarage.

20, Dandan-Chinen complex, 5-15% slopes

This map unit is on undulating limestone plateaus on the islands of Tinian, Rota and Aguijan. Slopes are long and undulating. The vegetation is mainly secondary forest. Some areas are in pasture grasses. Elevation is 10 to 450 meters.

This unit is 50 percent Dandan clay and 40 percent Chinen clay.

Included in this unit are small areas of Saipan soils and limestone Rock outcrop in places where the surface layer has been removed. Also included are small areas of soils that have short, steep slopes or are nearly level. Included areas make up about 10 percent of the total hectarage.

31, Laolao clay, 5-15% slopes

This moderately deep, well drained soil is on volcanic uplands. It formed in residuum derived dominantly from volcanic tuffs or tuff breccia on the islands of Saipan, Tinian, and Rota. Slopes are long and undulating. The vegetation is mainly secondary forest, although many areas are in grasses and forbs. Elevation is sea level to 200 meters.

Included in this unit are small areas of Akina, Kagman, and Saipan soils; soils that have short, steep slopes; and nearly level soils. Also included are small areas of Badland that consists of soils that have been deeply gullied, exposing saprolite. Included areas make up about 25 percent of the total hectarage.

32, Laolao clay, 15-30% slopes

This moderately deep, well drained soil is on volcanic uplands on the islands of Saipan and Rota. It formed in residuum derived dominantly from andesitic tuff or tuffaceous sandstone. Slopes are long and hilly. The vegetation is mainly secondary forest, although many areas are in grasses and forbs.

Included in this unit are small areas of Akina and Kagman soils, soils that have an eroded surface layer, and Badland, which consists of soils that have been deeply gullied, exposing saprolite. Included areas make up about 25 percent of the total hectarage.

33, Laolao clay, 30-60% slopes

This moderately deep, well drained soil is on volcanic uplands on the islands on Saipan, Tinian, and Rota. It formed in residuum derived dominantly from andesitic marine tuff or tuffaceous sandstone. Slopes are long and very hilly. The vegetation is mainly grasses and forbs, although many areas are in secondary forest. Elevation is sea level to 200 meters.

Included in this unit area small areas of Akina soils, soils that have an eroded surface layer, and Badland, which consists of soils that have been deeply gullied, exposing saprolite. Also included are small areas of soils that are moderately deep to impervious tuffaceous sandstone; gently sloping to moderately steep soils on ridgelines, benches, and foot slopes; and soils that are on short, steep slopes. Included areas make up about 25 percent of the total hectarage.

35, Luta cobbly clay loam, 5-15% slopes

This very shallow, well drained soil is on limestone plateaus on the island of Rota. It formed in sediment over porous limestone. Slopes are long and plane. The vegetation is mainly grasses and forbs, although many areas are forested. Elevation is 20 to 400 meters.

Included in this unit are small areas of limestone Rock outcrop, commonly on slope breaks and in areas where slopes are about 15 percent. Also included are small areas of Chinen soils near volcanic areas, Takpochao soils, and Takpochao Variant soils near the coast. Some areas have less than 15 percent cobbles and pebbles in the soil, and a few small areas are very cobbly. Some areas do not have a layer of soft limestone but are underlain directly with hard limestone. Slopes exceed 15 percent in a few places, and narrow, nearly level benches occur. In areas where the profile is shallowest, the subsoil is

not present or has been completely mixed into the surface by cultivation. Included areas make up as much as 15 percent of some mapped areas.

39, Luta-Rock outcrop complex, 5-15% slopes

This map unit is on limestone plateaus on the island of Rota. Slopes are long and plane. The vegetation is mainly native forest. Elevation is 20 to 480 meters.

This unit is about 60 percent Luta cobbly clay loam and 25 percent limestone Rock outcrop.

Included in this unit are small areas of Takpochao soils. Also included are soils that are similar to the Luta soil but are more than 35 percent pebbles and cobbles, soils that have slopes of more than 15 percent, nearly level soils on narrow benches, and shallow soils that do not have a subsoil. Included areas make up about 15 percent of most of the mapped areas, but they make up as much as 20 percent in some areas.

42, Rock outcrop-Takpochao complex, 60-99% slopes

This map unit is on limestone plateau escarpments and canyon side slopes on the islands of Saipan, Tinian, Aguijan, and Rota. Slopes are broken by vertical cliff faces and narrow ledges. The vegetation is mainly native forest and shrubs. Elevation is 5 to 465 meters.

This unit is 50 percent limestone Rock outcrop and 40 percent Takpochao very cobbly clay. The components of this unit are so intricately intermingled that it was not feasible to map them separately.

Included in this unit are small areas of Chinen soils on Saipan, Tinian, and Aguijan and Luta soils on Rota. Vertical cliffs occupy some areas of this unit. Very cobbly clay loam or very cobbly loam is in many places.

52, Takpochao-Rock outcrop complex, 30-60% slopes

This map unit is on limestone plateau escarpments, canyon side slopes, and knolls on the islands of Saipan, Tinian, Aguijan, and Rota. Slopes are broken by narrow benches and vertical cliffs. The vegetation is mainly native forest.

This unit is 50 percent Takpochao very cobbly clay and 40 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

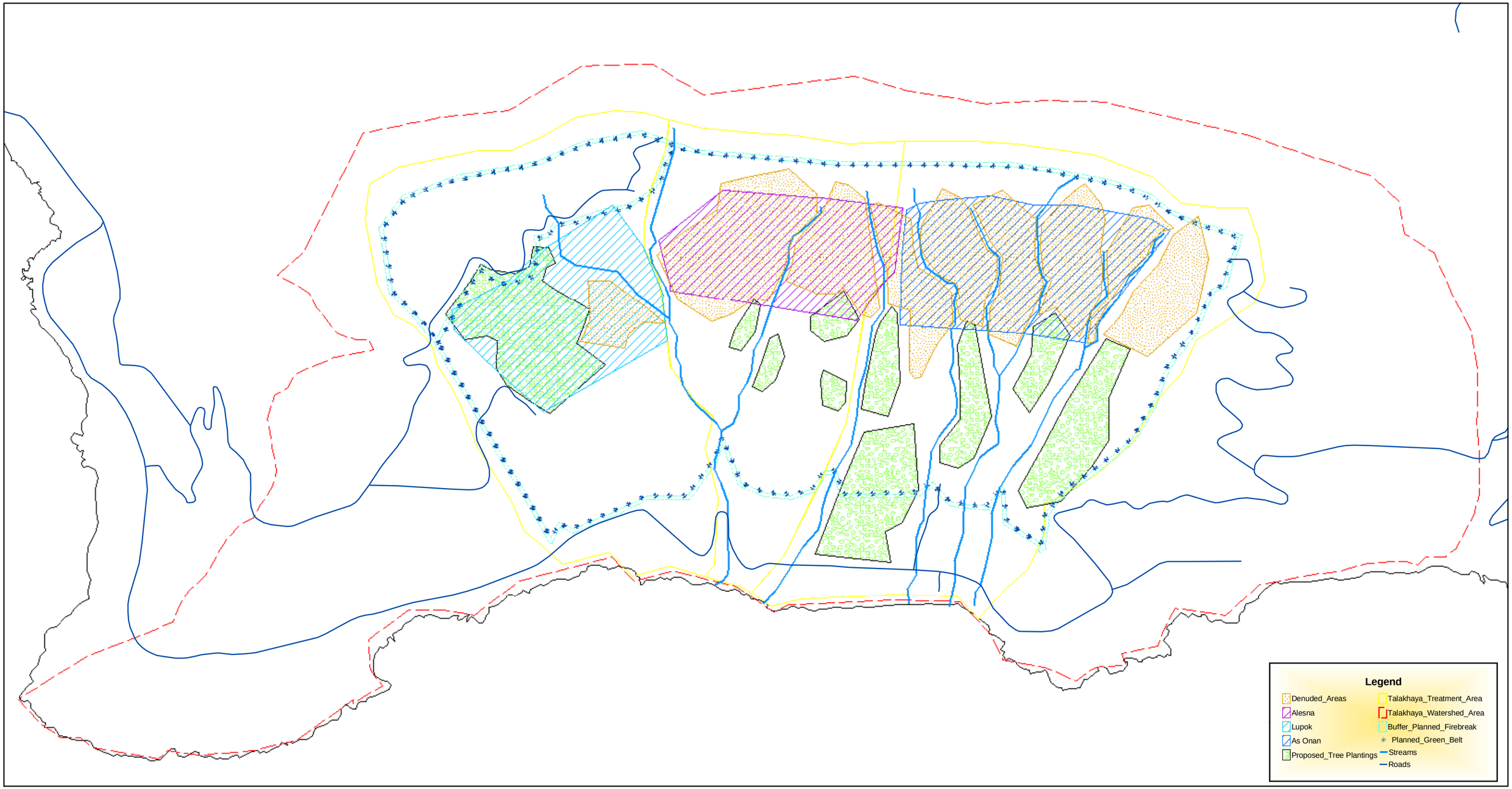
On Rota there are inclusions of Luta and Takpochao Variant soils. Also included are areas of gently sloping soils on benches and areas of soils that have slopes of more than 60 percent. Included areas make up about 10 percent of the total hectarage.

Customer(s): DEPARTMENT OF LANDS AND NATURAL RESOURCES
District: ROTA - SWCD

Conservation Plan Map
Talakhaya, Rota

Field Office: Saipan Field Office

Assisted By: Jacqueline B Flores



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Meters