**Yap Manta Ray Sanctuary Planning Team**
**Yap State**
**Federated State of Micronesia**

# Yap Manta Ray Sanctuary Conservation Action Plan

Photo: http://www.underwater.com.au/article.php/id/7790/

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NOAA CORAL REEF CONSERVATION PROGRAM

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## **Vision** (according to YSL 7-36)

The waters of the State of yap is one of the very few places in the world where the promise of a manta ray sighting is very good all year round. This a rarity of nature, an irreplaceable haven to manta rays, and a priceless treasure for the visitors and the people of Yap State. It is, therefore, the intent of the Yapese people to forever preserve and protect the waters of the State of Yap as a sanctuary for the manta ray.

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# 1. Introduction

## 1.1. A Context for Conservation

Yap's marine ecosystem is one of the few places in the world where a sighting of a manta ray is almost guaranteed all year round. This is a result of abundant planktons and a network of cleaning stations that keeps a resident population of Manta Ray.

While Manta Ray is not an important reef organisms to Yapese, traditionally, it is probably the biggest contributor to Yapese tourism industry in modern time. The promise of seeing a Manta Ray on a given dive has lured visitors from all over the world to Yap.

In order to protect the Manta Ray, an ecosystem approach to the management of the Manta's cleaning station and feeding areas is necessary. While Manta Ray is not a reef dwelling organisms, protection of its food source and cleaning stations are essential for it to have a resident population on Yap.

A healthy coastal and reef ecosystems in Yap is essential for continued existence of a resident population of manta ray in Yap to keep attracting visitors to support local economy. Thus, the management of the Manta Ray Sanctuary will require addressing the impact of land base source of stress that affects mangroves and segrass beds. The degradation of coral reef ecosystems and its associated fauna and flora by sedimentation and impacts of dredging and fishing activities all need to be addressed as well.

## 1.2. Overview of this Report

This report was created to document the results and products of the conservation planning workshops. It is intended to be used by the Yap Manta Ray Sanctuary Team as reference for the development of the management plan for the sanctuary. The report is organized around the steps of the Conservation Action Planning (CAP) Adaptive Management Cycle (Figure 1), which was also used to organize the workshops. Each step will be described briefly and the main products of that step will be discussed. Please refer to the excel workbook for details of the workshops input.

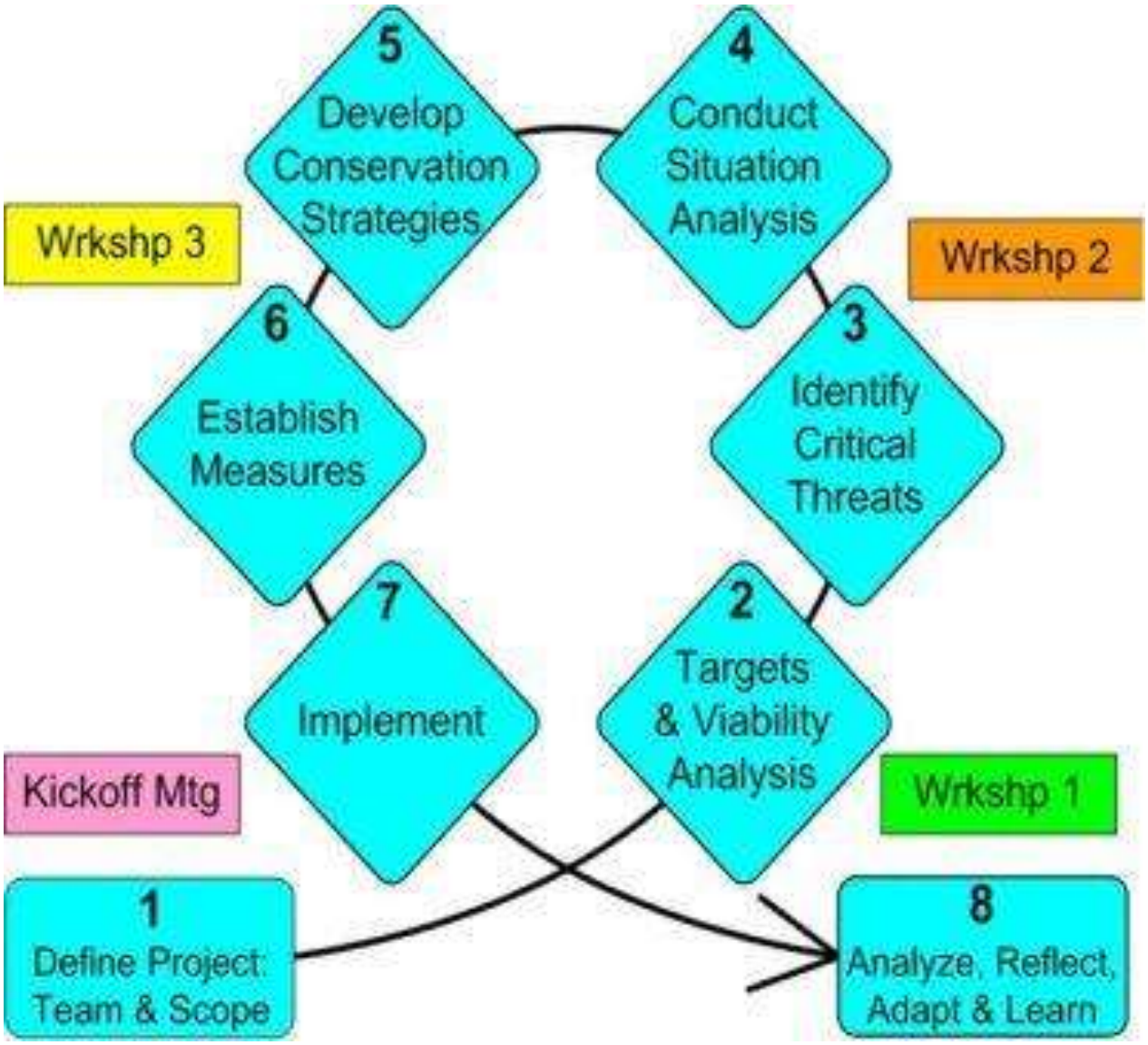


Figure 1. Conservation Action Planning (CAP) Adaptive Management Cycle, the project planning method used to organize the planning workshops and this report.

## 2. Conservation Planning and Adaptive Management

The CAP Adaptive Management Cycle is an iterative process which helps conservation projects develop and implement strategies, and then evaluate and learn from their experiences. The general steps of the process are to 1) define the project team and scope, 2) identify the conservation targets and assess their viability, 3) identify and assess the critical threats, 4) conduct a situation analysis, 5) develop conservation strategies, 6) establish measures, 7) implement the strategies and measures, and 8) analyze, reflect and learn from the results. The use of adaptive management means that the planning is never fully completed, but is continually refined, improved, and adapted over time. Future work will include a re-evaluation and refinement of the products to better reflect our growing knowledge and experience.

## 2.1. Define the Project Team and Scope

The Yap Manta Ray Sanctuary's initial Conservation Action Planning Team was a small group consisted of members of Yap State Legislature, Resource and Development, as well as community representatives from Rumung, Rikken, and Maap. The representatives from the Legislature and Resource and Development were mainly concern about the implementation of Yap State Law No. 7-36 which created the Yap Manta Ray Sanctuary. The community representatives were concerned about management of MPA's within their communities.

The first task for this workshop was to agree on the scope, i.e what area was to be considered in the discussion of the Manta Ray Sanctuary. However, this is clearly defined in YSL 7-36, which includes all Yap State territorial waters. But since community representatives from three villages were included in the workshop, there was a need to include their concern in the discussion of the sanctuary. It was then agreed that we will include all the three MPAs and the Manta Ray in the discussion. So the scope of the project encompasses all the territorial waters of Yap with regards to Manta Ray and the three MPA's would help define focal targets for Yap's main island. Furthermore, because Yap main island is well known for its Manta cleaning stations in the whole of Yap territorial waters, the focus of management discussion will be centered around Yap proper.


Figure 2. Map of Yap territorial waters. Inset, map of Yap proper (Waab).

## 2.2. Identify Conservation Targets and Assess Viability

Conservation targets are species, communities, or ecological systems that represent the biological diversity of the project area and or what communities care about to conserve and protect. A good set of conservation targets should be designed to include those elements of the system that, if properly conserved, will result in the conservation of the full diversity of the landscape. Coarse-filter targets are intended to capture a large amount of smaller-scale biodiversity, both common and rare, within them, while fine-filter targets should include those small-scale elements that "fall through" the coarse filter and require individual attention.

For project management purposes, the CAP process has tended to restrict the number of targets for a project to eight or less in order to facilitate tracking of each target. This restriction has been successful for the vast majority of CAP projects worldwide. For Yap , the team selected six targets through a group process of nomination and consolidation. The six targets for Yap Manta Ray Sanctuary are described below.

**Mantas**

*Manta birostris* is the largest of all rays. It is a filter feeder, which feeds on plankton by passively passing water through their gills as they swim. Mantas often frequent reef sides and channel cleaning station where small wrasse and angelfish swim in mantas gills and over it skin to feed removing the parasites and dead skin (http://en.wikipedia.org/wiki/Manta_ray).

Yap State Law 7-36 Statement of findings states that there is a network of cleaning stations, sufficient plankton density, and pollution free environment that supports a population of yearlong residents of manta ray in Yap. Manta Rays found in Yap have wingspans of 5 to 7 meters that allow them to gently glide through the water despite their up to 1000 kilograms. Typically, the Mantas feed at the Miil and Goofnuw channels.

**Reef Channels**

This target includes all the reef channels where there are known manta ray cleaning stations and channels that are not. Some of these channels are of exceptional coral diversity and are also worthy of enhanced management (Houk and Starmer 2007). Miil and Goofnuw channels are noteworthy for being feeding areas with cleaning stations for Manta Rays.

**Food Fish**

This target includes all the fish species that are caught for subsistence and for commercial purpose. These include species such as: Ngol (*Carnax melampygus*), Gadgad (*Lethrinus obsoletus*), Sabakuw (Epinephelus merra), Gadaw (*Parupeneus heptacanthus*), Numen (*Cheilinus undulatus*), Glanglung (*Scarus rubroviolaceus*), Nguwyee (*Hiposcarus*

*longiceps*),Gumiy (*Kyphosus bigibbus*), Buywood (*Siganus argenteus*), Laf (*Plectrorhincus lineatus*).

**Corals**

This target include the coral animal as well as the associated reef habitat. For purpose of the discussion of the Manta Ray sanctuary, corals and reef habitat represent those that can be found within the main island of Yap, Waab. There are a total of 215 recorded species of corals in the main island of Yap (Houk and Starmer, 2007). Yap main island is surrounded by a fringing reef system with variation of habitat within the reef systems. Houk and Starmer (2007) note that outer reef slopes had the greatest evenness of many coral species while inner reefs and channels had the highest variation in species evenness, abundance, and cover. This variation may be due in part to land sources of stress on the corals.

**Clams**

This target includes all the species of giant clams that are found in Yap's coral reefs. Giant clam is the largest species of all bivalve. Traditionally, several species of giant clams were abundant but because of overharvesting, these species have been depleted. There are current efforts to reseed the reefs as well as control of harvesting.

**Mangroves**

Mangroves are trees and shrubs that grow in saline coastal habitats in the tropics and subtropics. These groups of trees and shrubs forms the mangrove ecosystem, which provides nursery and habitat for fish, mangrove crabs, and birds. Mangrove also protects coastline from erosion and big waves.

Mangroves surrounding Yap provide rich plankton for the island's Manta Ray Population.

In order to assess the targets' viability, or ability to persist over the long term, the CAP process has developed a system to help teams define what they consider a "healthy" state for each target. The benefit of this exercise is in understanding the current status of the targets, as well as having a clearly defined desired status as a measurable objective toward which to work. The process for doing this involves identifying key ecological attributes (KEAs), indicators, ranges of variation, and rating schemes for each target. KEAs are characteristics of the target that are critical to its biology and that if altered would lead to the loss of the target. KEAs tend to fall into the broad categories of size, condition, and landscape context. Since KEAs are often not directly measurable, associated indicators (key characteristic of a target that can be measured)

are selected in order to develop a rating scheme by which to evaluate the target status (Table 1).

Table 1. Summary of viability ranks for Yap's Conservation targets.

| Conservation Targets | | Landscape Context | | Condition | | Size | | Viability Rank |
|---|---|---|---|---|---|---|---|---|
| | | Grade | Weight | Grade | Weight | Grade | Weight | |
| 1 | Mantas | - | 1 | - | 1 | Good | 1 | **Good** |
| 2 | Channels | - | 1 | Good | 1 | - | 1 | **Good** |
| 3 | Fish | - | 1 | - | 1 | Good | 1 | **Good** |
| 4 | Corals | - | 1 | Good | 1 | - | 1 | **Good** |
| 5 | Clams | - | 1 | - | 1 | Poor | 1 | **Poor** |
| 6 | Seagrass | - | 1 | - | 1 | Good | 1 | **Good** |
| 7 | Mangroves | - | 1 | - | 1 | Fair | 1 | **Fair** |
| 8 | | - | | - | | - | | **-** |
| **Project Biodiversity Health Rank** | | | | | | | | **Good** |

Based on information provided by the Yap Manta Ray Sanctuary Team, the overall ranking of the conservations targets is at Good. Giant clams were ranked as poor due to overharvesting. It is now rare to find giant clams on Yap's inshore and outer reefs. Mangroves were ranked as Fair due to existing and future potential impacts of sedimentation resulting from poor land use practices. Fish were ranked as good based on existing monitoring by Yap Marine Resource Management Division in selected Marine Protected Areas within Yap's main island.

## 2.3. Identify and Assess Critical Threats

Fifteen threats were identified as reducing the viability of at least one target (Table 2). The threats were ranked according to two factors, contribution and irreversibility in order to gauge the degree of the threat. Contribution is the level at which the threat acting contribute to the source of stress on a given target. Irreversibility is the likelihood for the target to recover given certain threat to that target (Refer to Table 2 for more clarification).
The overall ranking of the threat is affected by the severity and scope of a given stress on the target. Stress is the impairment of key ecological attribute for a given target. Scope is the extent of an area within the conservation target that could potentially be impacted within 10 given current situations. Severity is the level of damage to the conservation target that can be reasonably expected within 10 years under current circumstances.

Table 2. Description of criteria used to rank contribution of threat to stress on the target.

| Description | Ranking | | | |
|---|---|---|---|---|
| | Low | Medium | High | Very High |
| Contribution -- expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/ conservation situation). | The source is a low contributor of the particular stress. | The source is a moderate contributor of the particular stress. | The source is a large contributor of the particular stress. | The source is a very large contributor of the particular stress. |
| Irreversibility -- reversibility of the stress caused by the Source of Stress (or reversibility of the threat itself if using the alternative threat ranking methodology). | Easily reversible at relatively low cost (e.g., off-road vehicles trespassing in wetland). | Reversible with a reasonable commitment of resources (e.g., ditching and draining of wetland). | Reversible, but not practically affordable (e.g., wetland converted to agriculture). | Not reversible (e.g., wetlands converted to a shopping center). |

Table 3. Descriptions of the criteria used to rank stress of key ecological attribute on the target.

| **Criterion** (Description) | **Ranking** | | | |
|---|---|---|---|---|
| | **Low** | **Medium** | **High** | **Very High** |
| **Scope** - Most commonly defined spatially as the proportion of the overall area of a project site or target occurrence likely to be affected by a threat under current circumstances. | Very localized in scope, affect the conservation target at a limited portion of the target's locations. | Localized in scope, affect the conservation target at some of the target's locations. | Widespread in scope, affect the conservation target at many of its locations. | Very widespread or pervasive in scope, affect the conservation target throughout the target's occurrences. |
| **Severity** - The level of damage to the conservation target that can reasonably be expected under current circumstances. | Slightly impair the conservation target over some portion of the target's occurrences. | Moderately degrade the conservation target over some portion of the target's occurrences. | Seriously degrade the conservation target over some portion of the target's occurrences. | Destroy or eliminate the conservation target over some portion of the target's occurrences. |

After the threats were ranked for each target, the CAP excel workbook consolidated threats that occurred for multiple targets and use an algorithm to roll the individual rankings up to an overall rank for that threat. Table 4 summarizes the target ranks and overall rank for each of the 12 threats identified. The "critical" threats, those with overall ranks of medium or higher, and which ranked high for at least one target, are described in more detail in the following pages. In addition, the targets that had at least a threat ranking of medium are also discussed.

Table 4. Summary of rankings for threats that affects Yap's conservation targets.

| Threats Across Targets | | Mantas | Channels | Fish | Corals | Clams | Seagrass | Mangroves | | Overall Threat Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| Project-specific threats | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 1 | Sedimentation | - | Medium | - | High | Very High | Low | Low | - | High |
| 2 | Subsistence fishing | - | - | Medium | - | Very High | - | - | - | High |
| 3 | Advanced fishing gear and methods | - | - | Very High | - | - | - | - | - | High |
| 4 | Commercial fishing | - | - | Very High | - | - | - | - | - | High |
| 5 | Invasive species | - | - | Very High | - | - | - | - | - | High |
| 6 | Dredging | High | - | - | High | - | Low | - | - | High |
| 7 | Climate Change | - | - | - | High | - | Low | Low | - | Medium |
| 8 | Coral Harvesting | - | - | - | High | - | - | - | - | Medium |
| 9 | Local fishing activities | Low | Low | - | Medium | - | - | - | - | Low |
| 10 | Tourist Activities | Medium | Low | - | Low | - | - | - | - | Low |
| 11 | Crown of Thorns | - | - | - | Medium | - | - | - | - | Low |
| 12 | Purse sein and Long line activities | Medium | - | - | - | - | - | - | - | Low |
| 13 | Clearing for development | - | - | - | - | - | - | Low | - | Low |
| 14 | Logging | - | - | - | - | - | - | Low | - | Low |
| 15 | Pollution | - | - | - | - | - | - | Low | - | Low |
| 16 | | - | - | - | - | - | - | - | - | - |
| **Threat Status for Targets and Project** | | Medium | Low | Very High | High | Very High | Low | Low | - | Very High |

## Critical Threats:

1. Sedimentation. Lack of proper land use practices and increasing infrastructure and urban development has lead to increased soil erosion resulting in increasing levels of sedimentation in near-shore marine environments. This threat was identified as being Very High on giants clams and High on corals. The threat is perceived to affect survival of giant clams at the larval stage and degrade their habitat. Sedimentation is believed to smother corals close to shore.
2. Subsistence fishing. Collection of giant clams by local people for consumption at home was believed to be the highest threat to giant clams. Subsistence fishing was seen as a medium threat to fish.
3. Fishing practices (Advanced fishing gear and method). Use of spear and flashlight to fish at night was perceived to be the highest threat to fish. Some traditional fishing, such as

the breakage of staghorn corals to collect small damselfish, while appropriate many years ago, is viewed as destructive given current trend in coral decline, which contributes to degradation of fish habitats.

4. Commercial fishing. Fishing by local fisherman for selling in local markets and export was considered as a Very High threat to the Fish Target.
5. Dredging. Dredging along coastline for coral materials was considered as a High threat to corals and manta. Dredging results in turbid waters which can affect manta by chasing them away or smothers corals. Dredging removes a solid substrate on the reef creating a soft and unstable reef bottom where corals cannot settle, grow, and survive.
6. Climate Change. Increasing sea surface temperature and rising sea level due to the effect of global warming was ranked as a High threat to corals but the overall ranking as a threat was only at medium level. Potential impact of increasing sea surface temperature may affect corals through coral bleaching. Increase in sea level was not a considerable threat to the Yap main island within the next 10 years, however, this will have a major impact on Yap's out-lying islands, both on the ecosystem and the people.

## 2.4. Situational Analysis

In order to document our understanding of the social and ecological context surrounding threats and targets, the team developed a conceptual model for the targets showing the connections between the threats and the factors assumed to be driving them (Figure 3). The model is by necessity incomplete, and represents the working assumptions of the project team, as opposed to actual ecological relationships. It is intended to be a flexible tool that can be altered over time as our conception of the system develops.

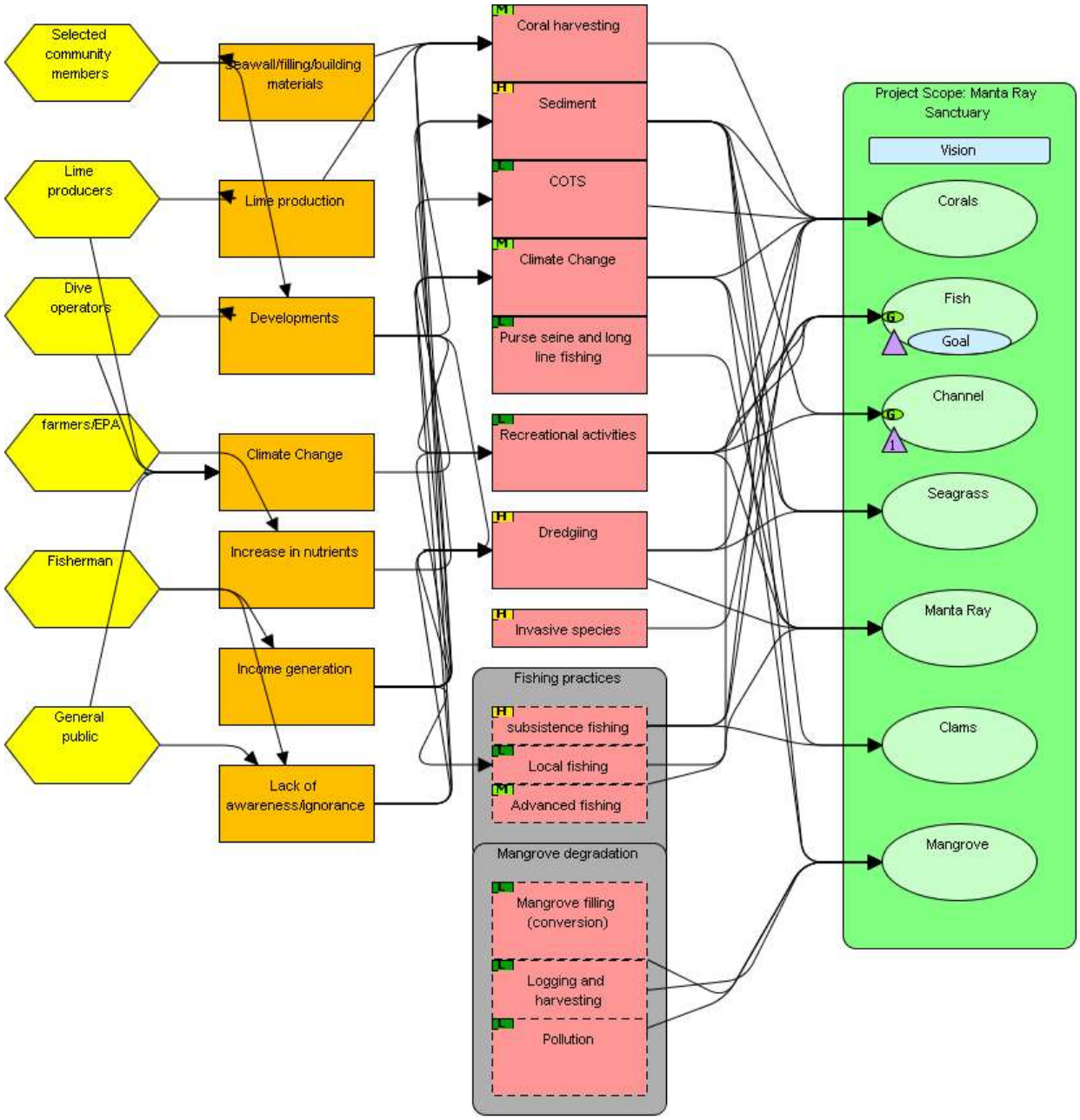



Figure 3. Situation diagram targets (green), direct threats (pink), contributing factor (dark yellow), and stakeholders (yellow).

## 2.5. Conservation Strategies

Strategies consist of one or more measurable objectives, the associated strategic actions, and their action steps. Measurable objectives are detailed statements that describe the desired outcome of the strategy. Strategic actions are the general activities undertaken by the project team to achieve these objectives. Action steps are the specific tasks required to carry out each strategic action. See Table 5 for list of strategies developed by the project team during the workshops. The team decided on three objectives to address the implementation of the Manta Ray Sanctuary, reduce overfishing, and to try to attempt to reduce sedimentation. This objective will address all conservation targets and the main threats to them.

Table 5. List of objectives and strategic actions.

| # | Objectives and Strategic Actions | Cost | Who's responsible |
|---|---|---|---|
| **Objective** | **By 2011, rules and regulations including a management plan has been enacted for the implementation of YSL 7-36** | | |
| Strategic action | Establish a manta ray planning core group through executive appointment | $0 | Governor & Director Mike |
| Strategic action | Assessment of Yap manta ray population and other relevant scientific information | $50,000 | MRMD |
| Strategic action | Second iteration of manta ray conservation action planning | $5,000 | Gaan & Steven Victor |
| Strategic action | Draft and promulgate regulations called for by YSL 7-36 | $10,000 | MRMD |
| Strategic action | Draft and adopt a manta ray management plan | $10,000 | MRMD |
| **Objective** | **By end of 2010, pass a legislation to establish Yap Fishery Act (Napolean wrasse, Humphead parrotfish, other species to be determined by MRMD)** | | |
| Strategic action | Yap State resolution to encourage Governor to impose temporary moratorium on Napoleon wrasse and Humphead parrotfish | $0 | Senators John Mooteb and Ted Rutun |
| Strategic action | Declare temporary moratorium on export and sale of Napoleon wrasse and Humphead parrotfish through an executive order | $0 | Director Mike Gaan & Governor |
| Strategic action | Assessment of current Yap reef fishery to recommend additional reef fish species to be regulated | $50,000 | MRMD |
| Strategic action | Pass a legislation to establish Yap Fishery Act | $5,000 | Senators John Mooteb and Ted Rutun |
| **Objective** | **Reduce sedimentation by x% to coastal waters adjacent to known sources of major soil erosion.** | | |
| Strategic action | Establish a Watershed working group to address issues of land use practices | $0 | Director Mike Gaan |
| Strategic action | Comprehensive Rapid watershed assessment and to gather all available information relating to land use practice and soil erosion | $20,000 | R & D (Agriculture & Forestry) |
| Strategic action | Conservation Action Planning Workshop focused on land based activities | $5,000 | Director Mike Gaan & Steven Victor |
| Strategic action | Draft and adopt recommendations based on rapid watershed assessment and the Conservation Action Planning Workshop | $10,000 | Watershed Working Group |

## 2.6. Measures and Monitoring

The fundamental question facing conservation project team is: “Are the conservation strategies we are using having their intended impact?” To answer this question, the team is collecting data on a number of indicators that gauge how well it is keeping the critical threats in check and, in turn, whether the viability of our conservation targets is improving. At present, the team has developed monitoring framework (See Table 5).

Table 6 . Monitoring -list of targets, indicators and suggested monitoring methods for measuring indicator.

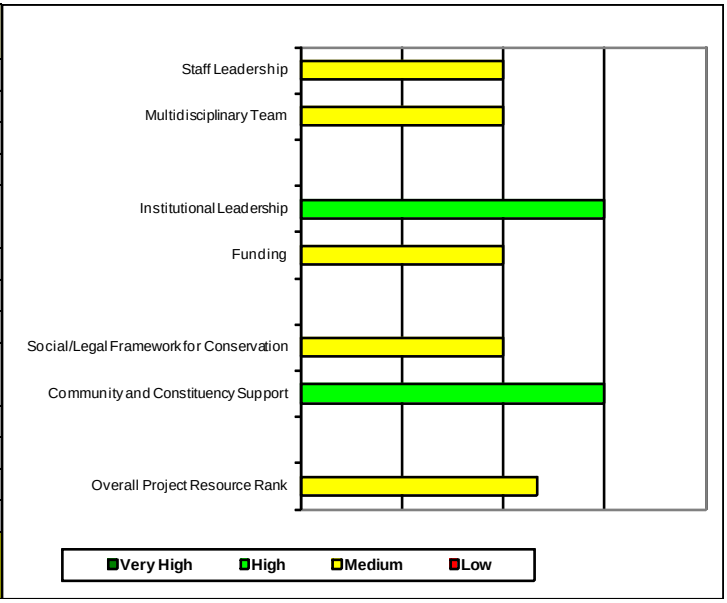
| Conservation Targets | Category | Key Ecological Attribute or Threat | Indicators | Methods | Priority | Status | Frequency and Timing | Location | Who monitors | Annual Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| Corals | Condition | Population structure & recruitment | % Coral Cover | Photo quadrat | High | Planned | Once/year | Site to be selcted by MRMD | MRMD | $4,120 |
| Seagrass | Size | Size / extent of characteristic communities / ecosystems | Aereal extent | GIS with field data validation | High | Planned | Once every 5 years | Sites to be selected | MRMD | $5,000 |
| Mangroves | Size | Size / extent of characteristic communities / ecosystems | Aereal extent | GIS with field data validation | High | Planned | Once every 5 years | Sites to be selected | Forest | $5,000 |
| Fish | Size | Population size & dynamics | Fish abundance | Underwater visual census (UVC) | High | Planned | Once every quarter | Sites to be selected | MRMD | $3,120 |
| Mantas | Size | Population size & dynamics | Number of mantas | Visual census | High | Planned | TBD | Known areas with cleaning station | TBD | $4,080 |
| Channels | Condition | Biological legacies | Number of mantas | Visual census | High | Planned | TBD | Known areas with cleaning station | TBD | $4,080 |
| Clams | Size | Population size & dynamics | Number of clams | Visual census | High | Planned | Once every quarter | Sites to be selected | MRMD | $3,120 |

## 3. Capacity Assessment

An analysis of the local capacity of agency staff was conducted during the workshop and facilitated by the facilitators. The following definitions and tables describe the results of this analysis. The overall project resource rank was determined as “medium”. The following list defines the components that comprise this resource rank:

Table 7: Local Capacity Assessment

| Categories & Measures | Score |
|---|---|
| **People** | |
| Staff Leadership | Medium |
| Multidisciplinary Team | Medium |
| **People Average** | Medium |
| | |
| **Internal Resources** | |
| Institutional Leadership | High |
| Funding | Medium |
| **Internal Resources Average** | Medium |
| | |
| **External Resources** | |
| Social/Legal Framework for Conservation | Medium |
| Community and Constituency Support | High |
| **External Resources Average** | Medium |
| | |
| **Overall Project Resource Rank** | **Medium** |




## 4. Conclusion

This report documents the results and products of the conservation planning workshops. It is intended to be used by the Yap Manta Ray Sanctuary Team as reference for the development of the management plan for the Manta Ray Sanctuary. It is important to keep in mind as Yap State moves forward that the development of the management plan is an important initial step in an on-going cycle of design, implementation and review of management planning, and should view the plan itself as a "working plan," rather than a final, static document.

With Yap's vision for the Yap's territorial water so broad and comprehensive, it will require focused efforts of many agencies, organizations and especially Yapese residents, tour operators and others with vested interest in Yap in order to have a management plan developed and successfully implemented. Additionally, it will be necessary to raise human and financial resources within Yap State Government to the levels required to effectively implement conservation and enforcement programs in Yap.

List of References

Conservation Action Planning Excel Toolkit

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