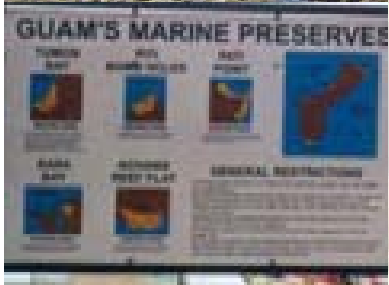
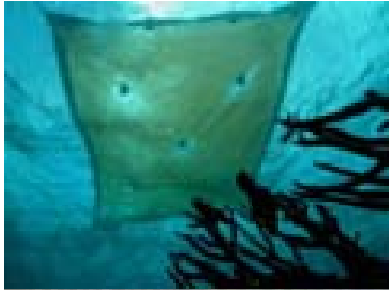


Building Resilience Into Coral Reef Management

Section 2:

Implementing Management Interventions



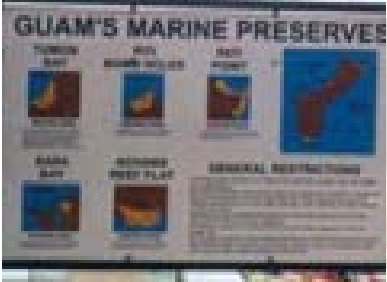


Implementing Management Interventions

When should you act?

What can you do?

-
- A large crane is shown lifting a massive, rectangular concrete structure from the water. The structure is being hoisted by a thick cable. The water is a deep blue, and the background shows a hilly coastline under a clear sky.





When Should You Act?

Before Bleaching?

When Bleaching is Imminent?

During Bleaching Event?

After Bleaching Event?

Before Bleaching

Prepare for the possibility of a bleaching event

- Bleaching Response Plans
 - Legislation necessary?
 - Special Materials Required?
 - Train Staff / Volunteers
 - Cultivate Community and Media
- Reduce Other Stressors



Water Quality Issues

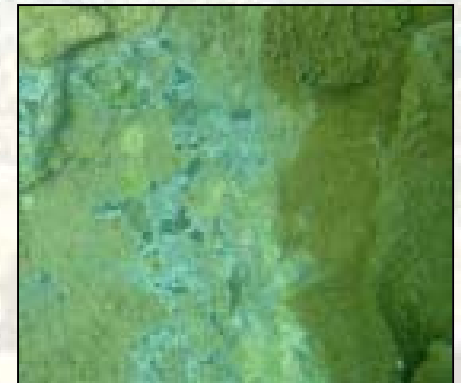
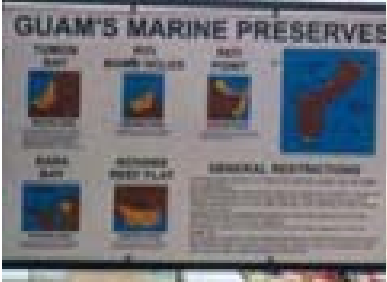
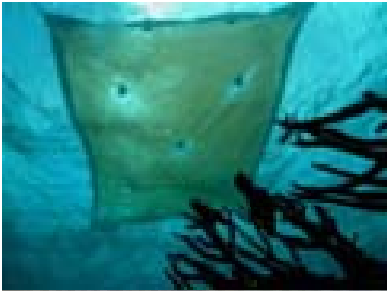
- Sedimentation/turbidity
- Nutrients
- Thermal Discharges
- Other Pollutants



Water Quality Issues

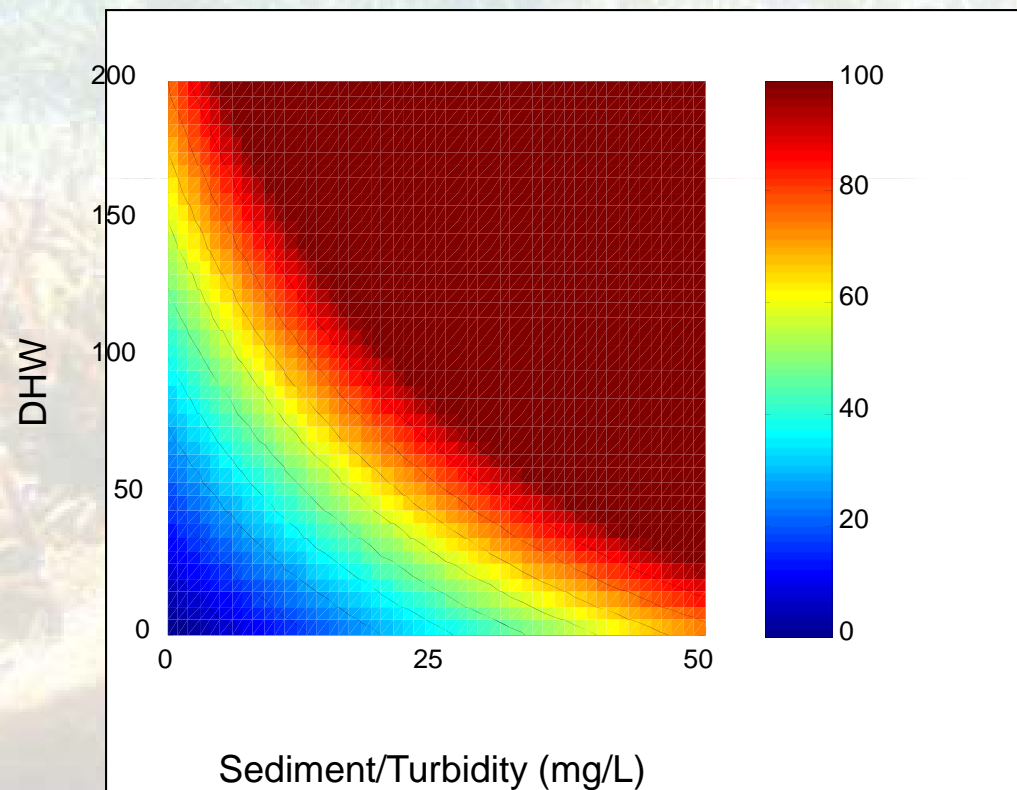
Manage development activities

- Coastal construction
- Dredging
- Reducing stress
- Benefits to developer



Water Quality Issues

Managing Turbidity Stress



Ken Anthony (UQ)



When Bleaching is Imminent?

Activate Bleaching Response Plans

- Initial Monitoring
- Alert Media / Community
- Consider Potential Actions



When Bleaching is Imminent?

Follow Bleaching Response Plans

- Monitoring
- Keep Media / Community Informed
- Consider Potential Actions
 - Development Restrictions
 - Water Quality
 - Shading
 - Area Restrictions
 - Activity Restrictions



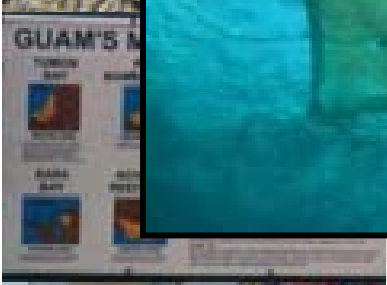
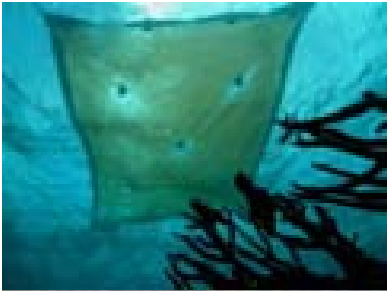
Impeding the Cause

Limiting Exposure

- Light
- Temperature
- Mixing

Shading high value sites

- Effectiveness
- Scale
- Cost-effectiveness
- Practicability
- Opportunities for collaborative testing



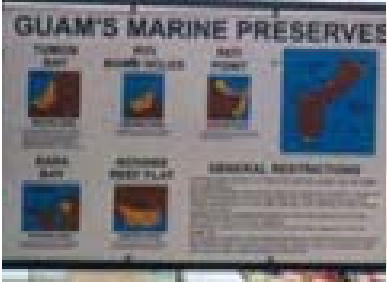
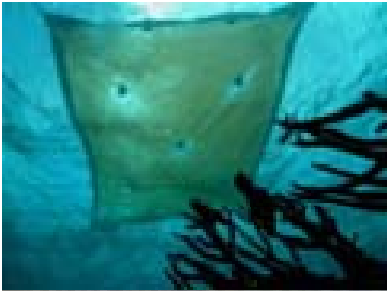
Manage Recreational Impacts

Diving / Snorkeling

Anchoring

Community Monitoring

Fishing



Building Resilience Into Coral Reef Management

Section 3: Restoration





Restoration: When all Else Fails...

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.

Restoration includes passive or indirect management measures to remove impediments to natural recovery as well as active or direct interventions such as transplantation.

Can ecological restoration practices be applied to damage caused by climate change?

Types of Restoration:

Direct Action: Most projects undertaken in the past fall into this category.

Techniques for active intervention include:

- reef repair,
- coral transplants / seeding,
- creating habitat for coral colonization:
 - construction of artificial reefs,
 - placement of ship wrecks,
 - or placement of boulder fields.



Types of Restoration:

Indirect Action: Removing stressors.

- Removal of sewage outfalls
- Re-establishing upland vegetation
- Removal of derelict nets, fishing gear, etc
- Removal of abandoned vessels from reefs



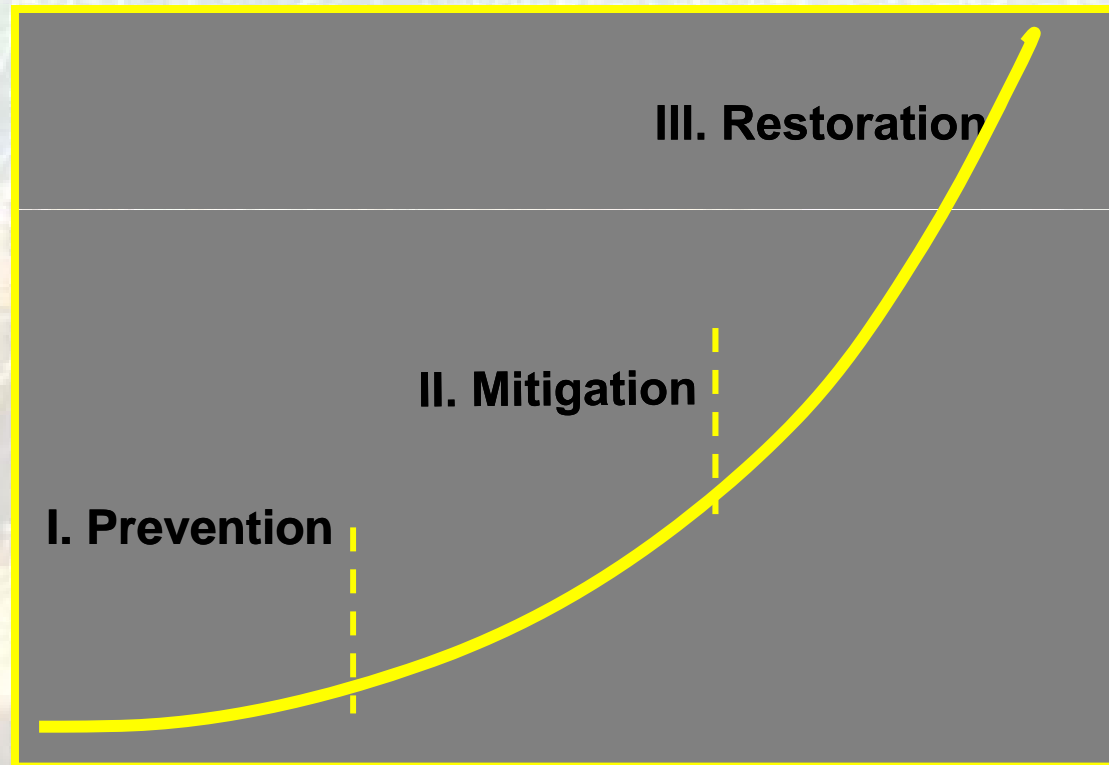
Overarching Principals

- Be sure that the cause of reef damage (e.g sewage, sediment runoff, repeated anchor damage) has been eliminated before initiating restoration and mitigation attempts.
- Recognize the option of letting nature take its course.
- Emphasize that a restored reef is not a natural reef – it is still an artificially modified community.
- None of the above are possible in controlling damage caused by increasing levels of CO₂, unless we reduce emissions.
- We can work to slow decline of reefs until anthropogenic gas emissions are stabilized.
- End point will be reefs that are a shadow of present day reefs



Relative Cost of Various Management Actions

Increasing Cost ↑

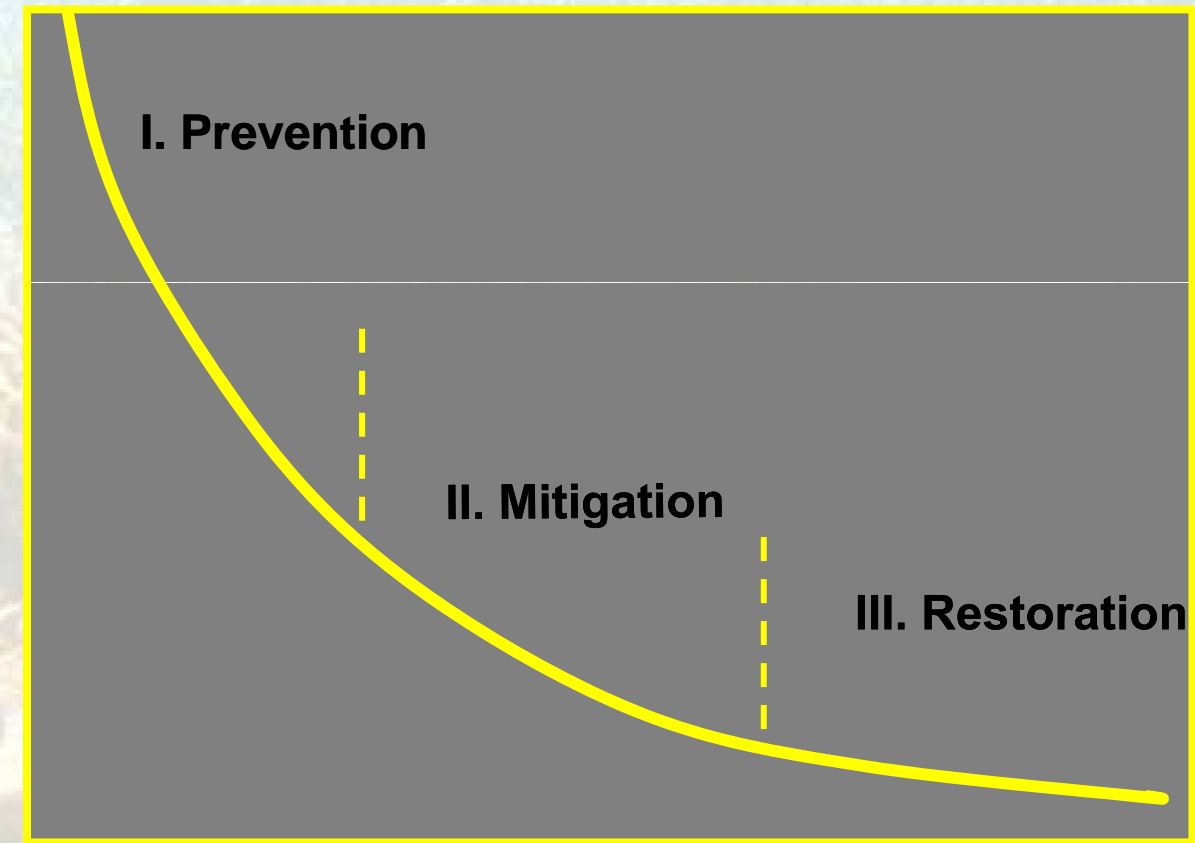


Increasing Reef Degradation →



Relative Effectiveness of Various Management Actions

Effectiveness ↑



Increasing Reef Degradation →





Conclusions

- Reef protection (avoiding damage) is the most cost effective method of achieving sustainability.
- “Real world” situations will develop that require use of mitigation techniques.
- Before undertaking any restoration activity the cause of damage must be identified and eliminated.
- Watershed management is inseparable from coral reef management, especially in cases involving chronic degradation of reefs due to sedimentation, eutrophication or shoreline construction activities.

Conclusions (cont)

- Effective research and monitoring is a vital component of mitigation or restoration efforts. The research component should evaluate the success and cost effectiveness of the effort.

