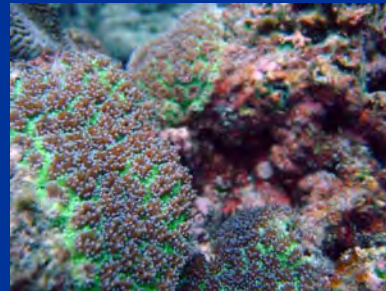


Coral Reef Ecosystem Monitoring in Guam



Val Porter

Division of Aquatic and Wildlife Resources

Coral Reef Biocriteria Workshop
Pacific Islands Environmental Conference

June 21, 2005
Tumon, Guam

Monitoring and Assessment Activities in Guam

- Guam Coral Reef Monitoring Group
- Coordinated Monitoring
- Monitoring for Management
 - Marine Preserve
 - Coastal EMAP
 - War in the Pacific National Historical Park
 - University of Guam Marine Laboratory



Guam Coral Reef Monitoring Group

- Division of Aquatic and Wildlife Resources
- Guam Environmental Protection Agency
- University of Guam Marine Laboratory
- Water and Environmental Research Institute
- National Park Service
- Guam Coastal Management Program

Monitoring For Management

- Monitoring provides data necessary to make informed management decisions
 - Marine Preserves Effectiveness (DAWR)
 - Coastal Environmental Monitoring and Assessment Program (GEPA)
 - Effects of Wildland Fires and Badland Mitigation on Nearshore Environments (NPS)
- Complemented by targeted research to address specific issues
 - University of Guam Marine Laboratory
 - Water and Environmental Research Institute

Coordinated Monitoring

Tumon Bay Preserve

GEPA – EMAP

5 Permanent Sites

45 Random

Comprehensive Assessment

War in the Pacific

DAWR – Fish, Benthic

NPS – Sedimentation, Coral

Piti Bomb Holes Preserve

DAWR – Fish, Benthic

GEPA – Water Quality

UOGML- Algal abundance, Seagrass, Nutrients

Fouha Bay

UOGML – Coral, algae, sediment

Bay

DAWR – Fish, Benthic

Water Quality

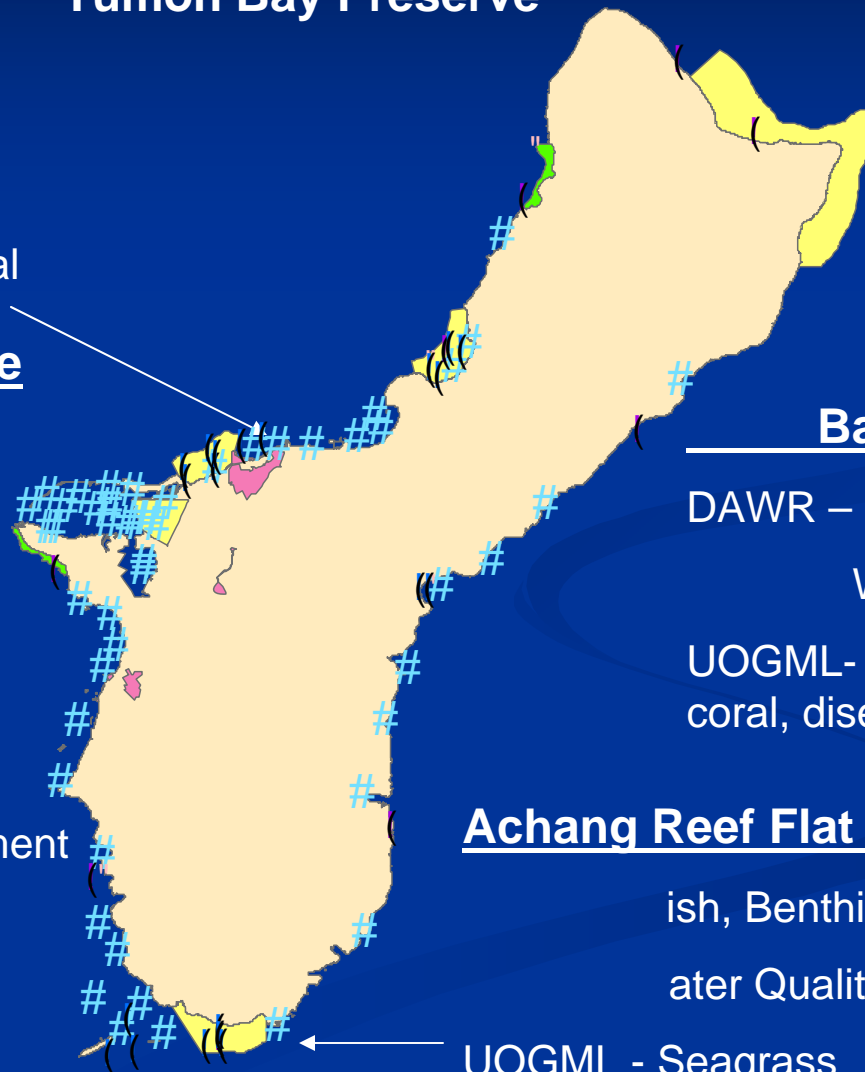
UOGML- Algal abundance, coral, diseases and bleaching

Achang Reef Flat Preserve

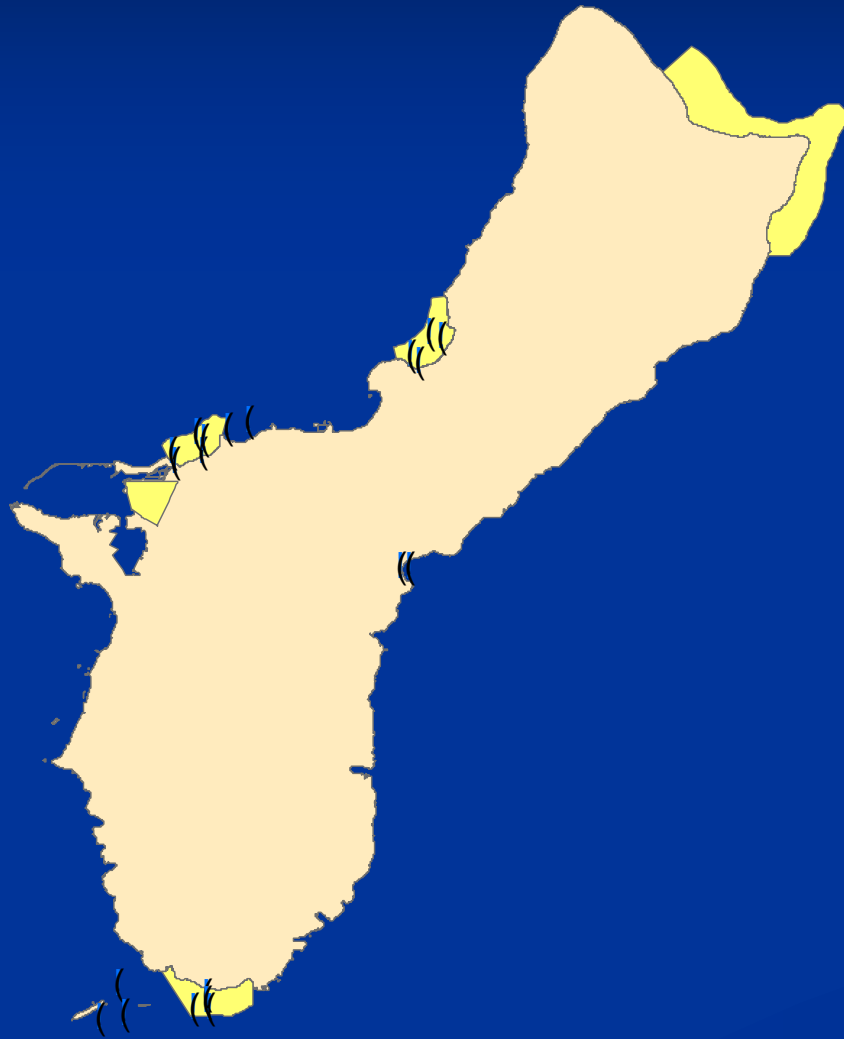
ish, Benthic

ater Quality

UOGML - Seagrass



Marine Preserves



- Monitoring began prior to full enforcement in 2001
 - Achang Reef Flat Marine Preserve
 - Piti Bomb Holes Marine Preserve
- Designed to assess the effectiveness of the marine preserves
 - Monitoring to be expanded in 2005 to include Tumon Bay Marine Preserve and Water Quality Parameters

Marine Preserve

■ Fish Surveys (DAWR)

- Permanent Strip Transects, 50 x 5 m
- Timed Swim Counts 30 minutes
 - Reef Flat - 8 transects
 - Seagrass Beds, Coral/Rubble, Channel
 - Fore Reef Slope – 4 transects at 2 sites
 - 20, 30, 40, & 50 foot contour

■ Benthic Surveys (DAWR)

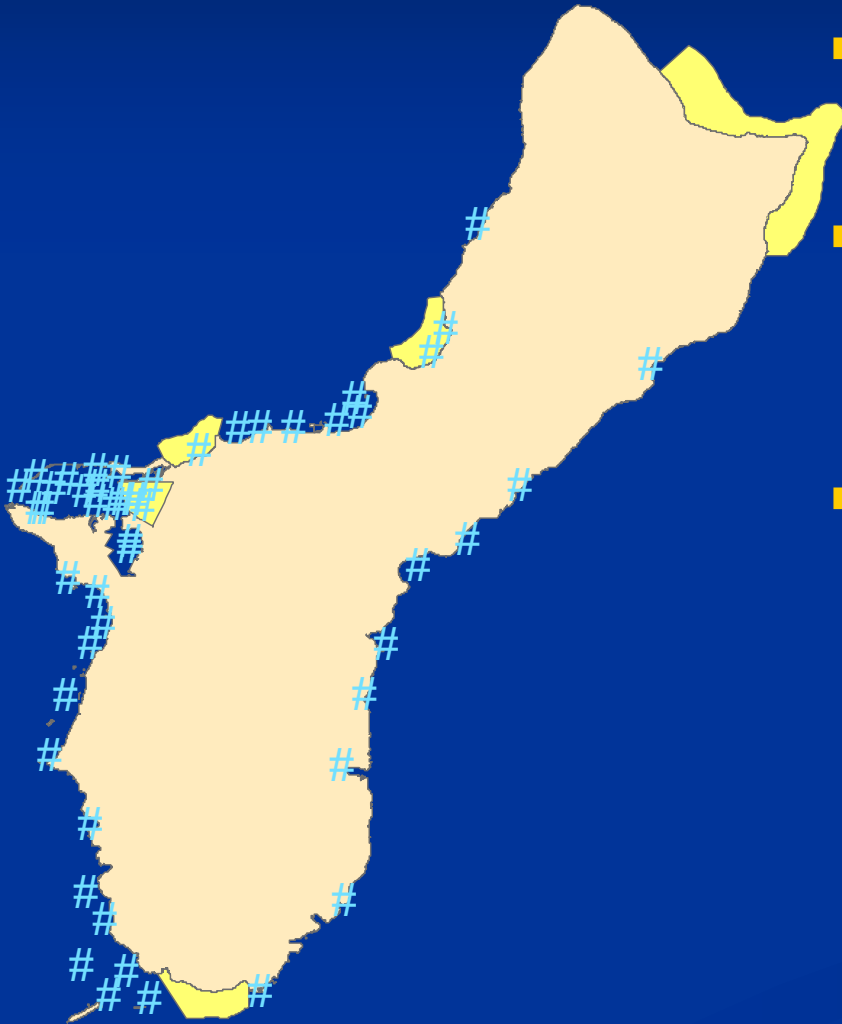
- Video Transects
 - % cover

■ Water Quality (GEPA)

- Grab Samples
 - Bacteria, Conductivity, Nitrate-nitrogen, Chlorophyll-a, Pheophytin-a, Ammonium, Total Nitrogen, Ortho-Phosphate, Total Phosphorous, pH, Total Dissolved Solids, Total Suspended Solids, Dissolved Oxygen
- In Situ Samples
 - Conductivity/Salinity, Depth, Dissolved Oxygen, pH, Temperature, Turbidity (NTU), and Transparency/Clarity



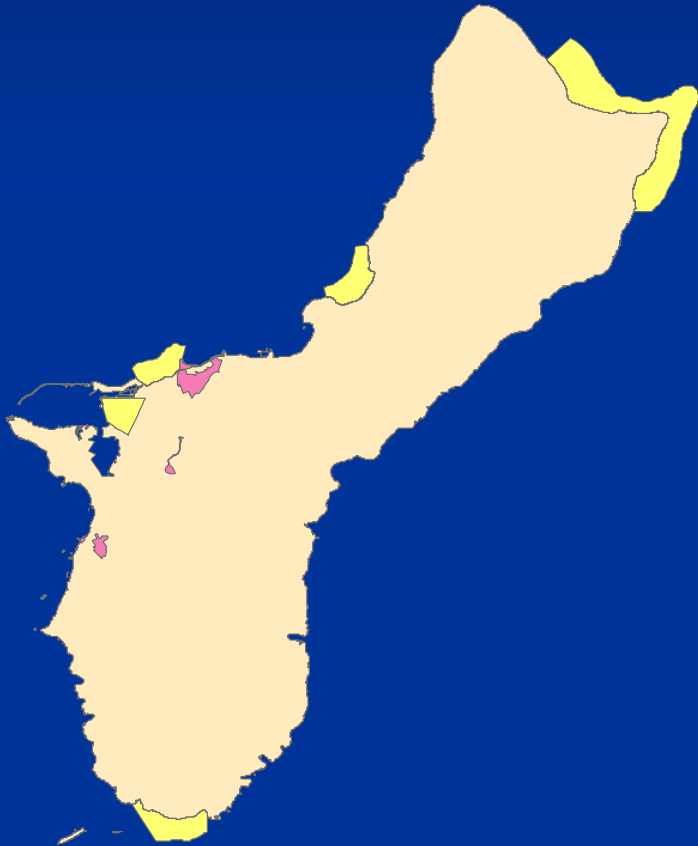
COASTAL EMAP



- Uses a probabilistic, stratified-random sampling design for Islandwide coverage
- Integrates data from multiple indicators
 - Biological
 - Water Column
 - Sediment Chemistry
- Goals:
 - To assess the physical, biological, and chemical condition of Guam's Marine waters
 - To rank relative importance of various stressors on the affected resource types

1. Physical/Chemical	
Water Column Characteristics	
1	Temperature
2a	Transparency/Clarity (Secchi Visibility)
2b	Transparency/Clarity (PAR)
3	pH
4	Salinity
5	Conductivity
6	Dissolved Oxygen
7	Depth
8	Turbidity (NTU)
Water Column Parameters	
9	Bacteria (enterococci)
10	Nitrite Nitrogen
11	Nitrate+nitrite Nitrogen
12	Ammonia-nitrogen
13	Orthophosphorus
14	Chlorophyll a
15	Total Suspended Solids
Sediment Physical Characteristics	
16	Total Organic Carbon
17	Granulometry

War in the Pacific National Historical Park



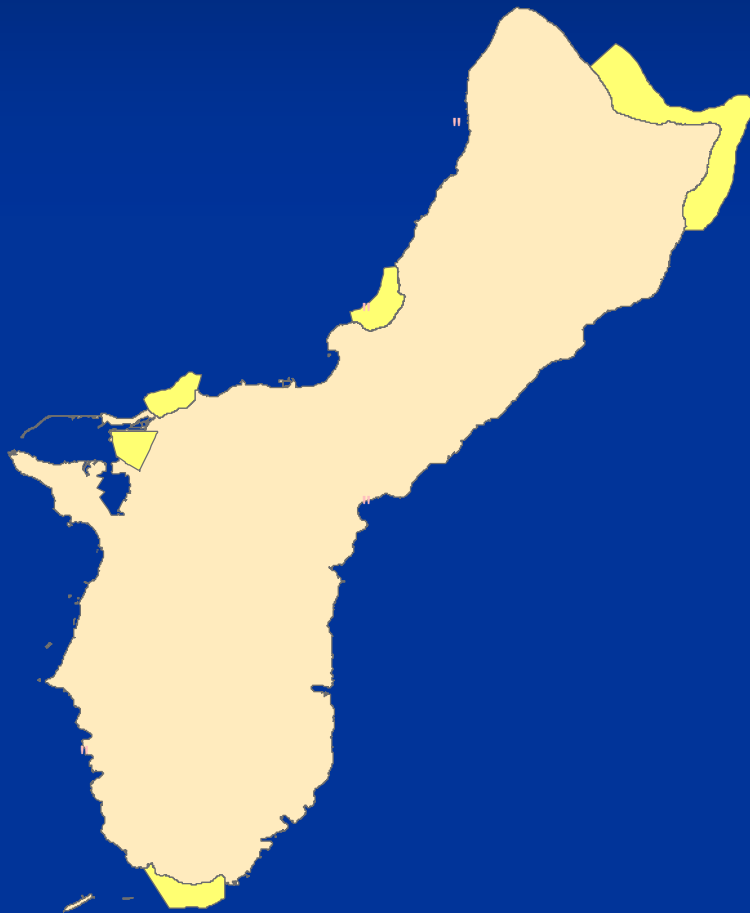
- Monitoring to assess the impact of wildland fires and badland mitigation techniques
- Chemical/Physical Parameters
 - Total Sediments
 - % Organic Content
 - % Carbonate Content
 - Sediment Size
 - Water Temperature
 - Light Penetration
- Biological Parameters
 - Benthic Cover
 - Coral Recruitment
 - Fish Abundance and Diversity

NOAA-MARAMP



- Fish, Turtle, & Marine Mammal Surveys
 - Belt Transects
 - Stationary Point Counts
 - Towed-diver surveys
 - Roving Diver Surveys
 - Hydroacoustic Surveys
- Benthic Surveys
 - Belt Transects
 - Towed Diver Surveys
 - Roving Diver Surveys
 - TOAD Towed Camera Surveys
- Oceanography
 - Closely-spaced CTDs
 - Drifters
 - Subsurface Temperature
 - ADCP Transects
 - CREWS/SST Buoys
 - Current/Wave Moorings

University of Guam Marine Laboratory



- Long-term Monitoring
 - Coral Cover
 - Coral Recruitment
 - Water Quality
- Coral Disease
- Molecular Biomarkers
- Soft-Coral Bioindicators
- Fouha Bay
 - Monitoring sediment input and coral cover

A vibrant underwater photograph of a coral reef. The scene is filled with various types of coral, including large, flat, brownish-orange corals and smaller, more complex, yellowish-orange branching corals. Several small, light-colored fish are visible swimming among the coral. The water is clear and blue, and the sandy ocean floor is visible in the background. The text "Thank You!" is overlaid in the center of the image in a large, white, sans-serif font.

Thank You!