Biocriteria Monitoring in the CNMI and American Samoa

Peter Houk
Marine Biologist
CNMI Division of Environmental Quality

Defined in Water Quality Standards

DEQ WQS

- "The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors."

ASEPA WQS

- "the biological integrity of the benthic communities living within waters shall be assessed by comparison to reference conditions(s) with similar abiotic and biotic environmental settings that represent the optimal or least impacted condition for that system."

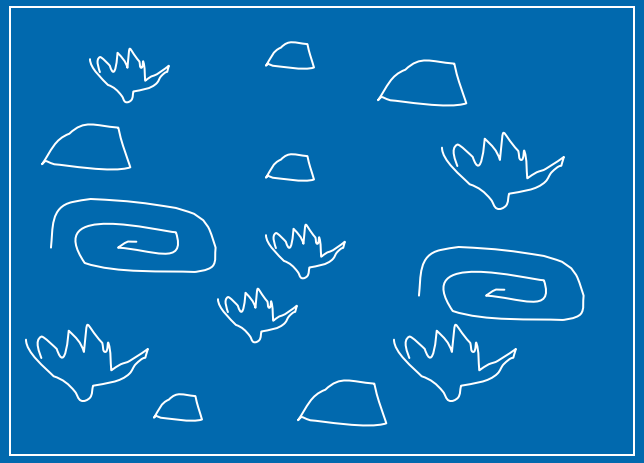
BACI Design

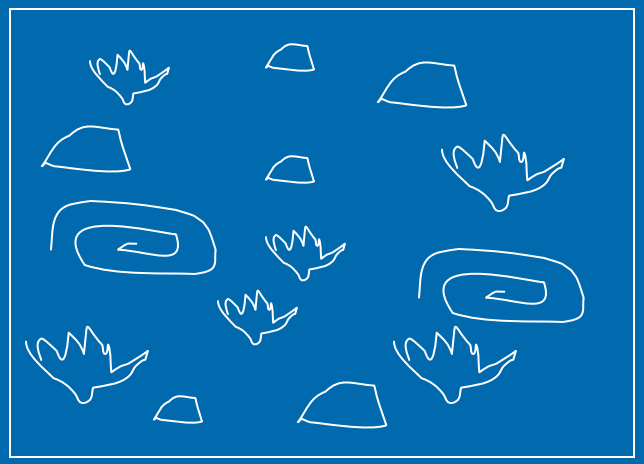
TIME 1

TIME 2

Reference

Site

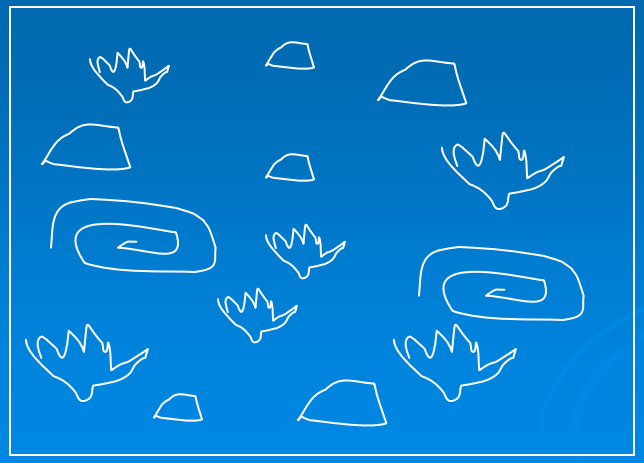




No Violation

Impact

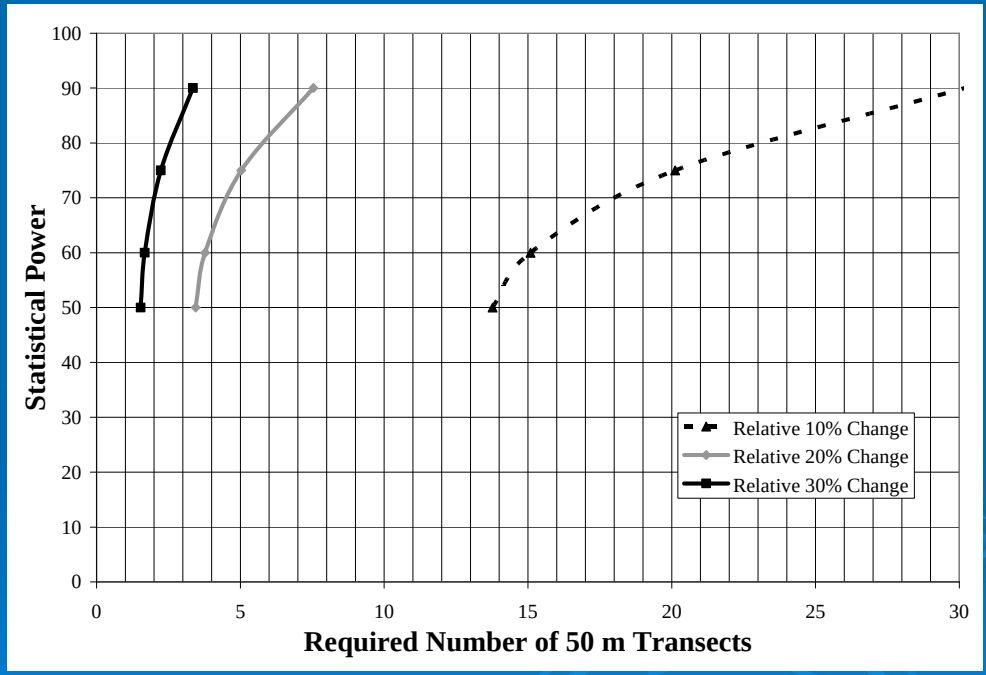
Site



Violation

Methods of Data Collection

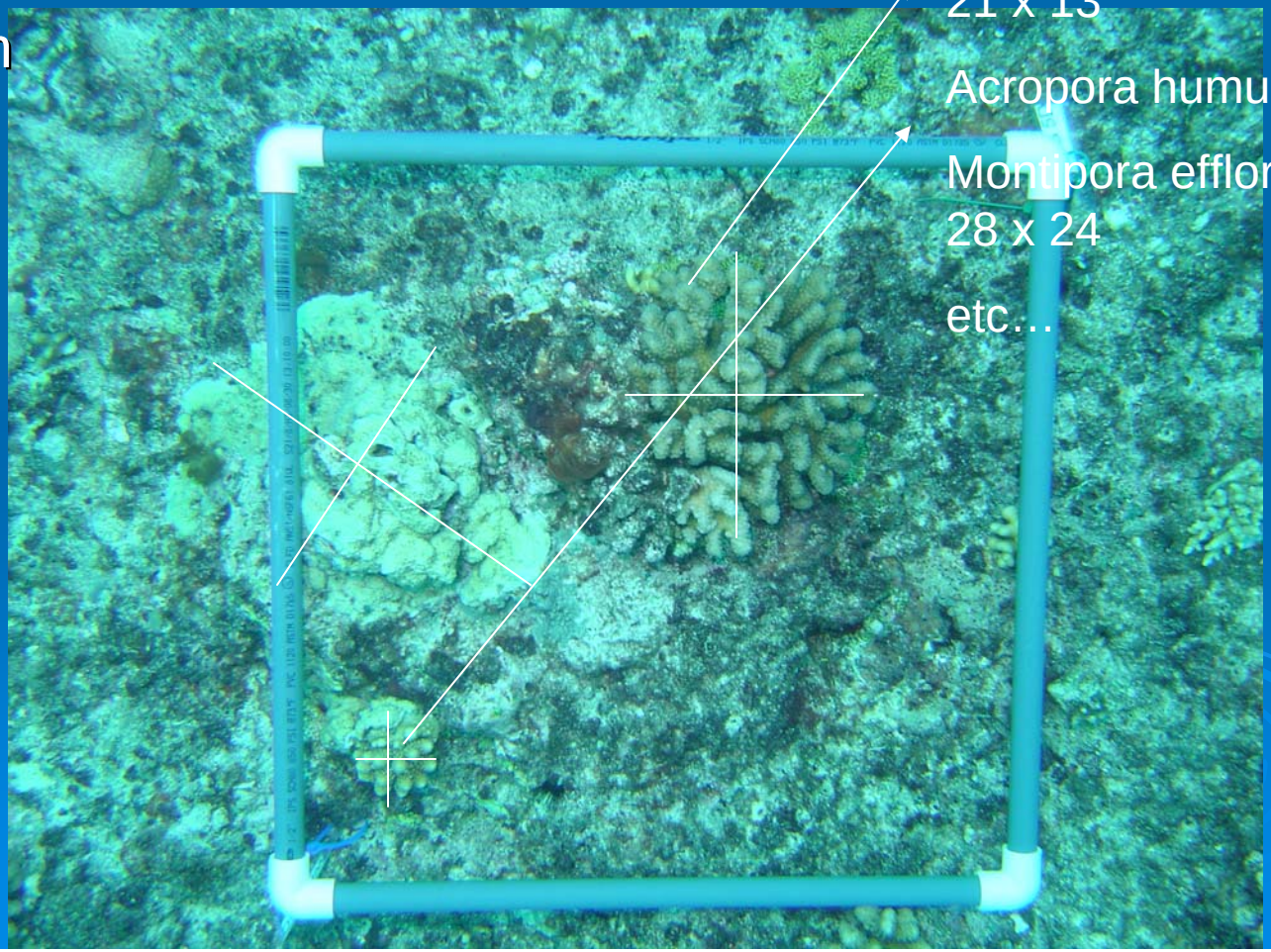
- Detect change over time in benthic community with confidence



Houk et al., 2005

Coral Community Description

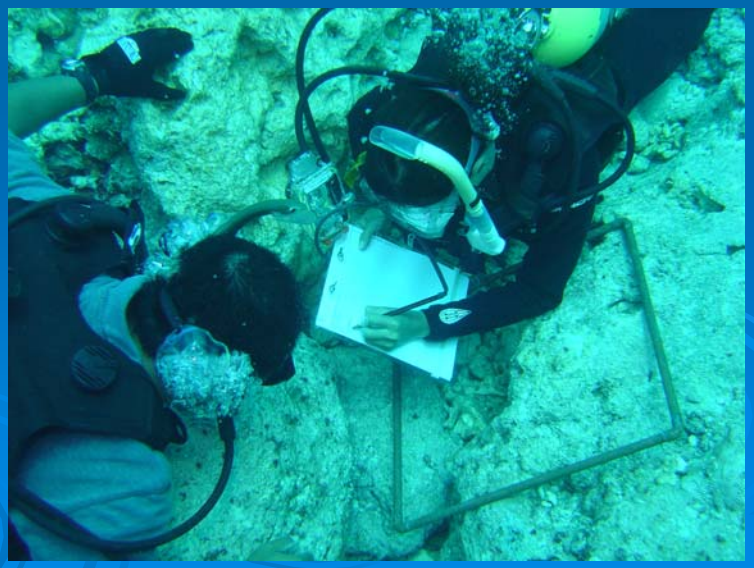
- Coral populations
  - Population density
  - Evenness measures
  - Colony diameters



Methods of Data Collection

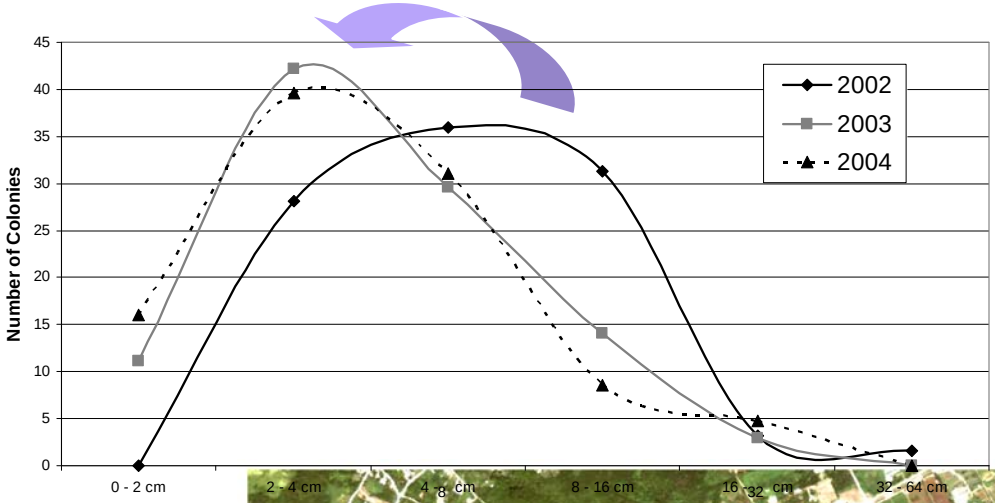
- Recruitment (next generation)
- Invertebrate abundances
- Algae community
- Biodiversity

- Maximize data collection based on available staff and training



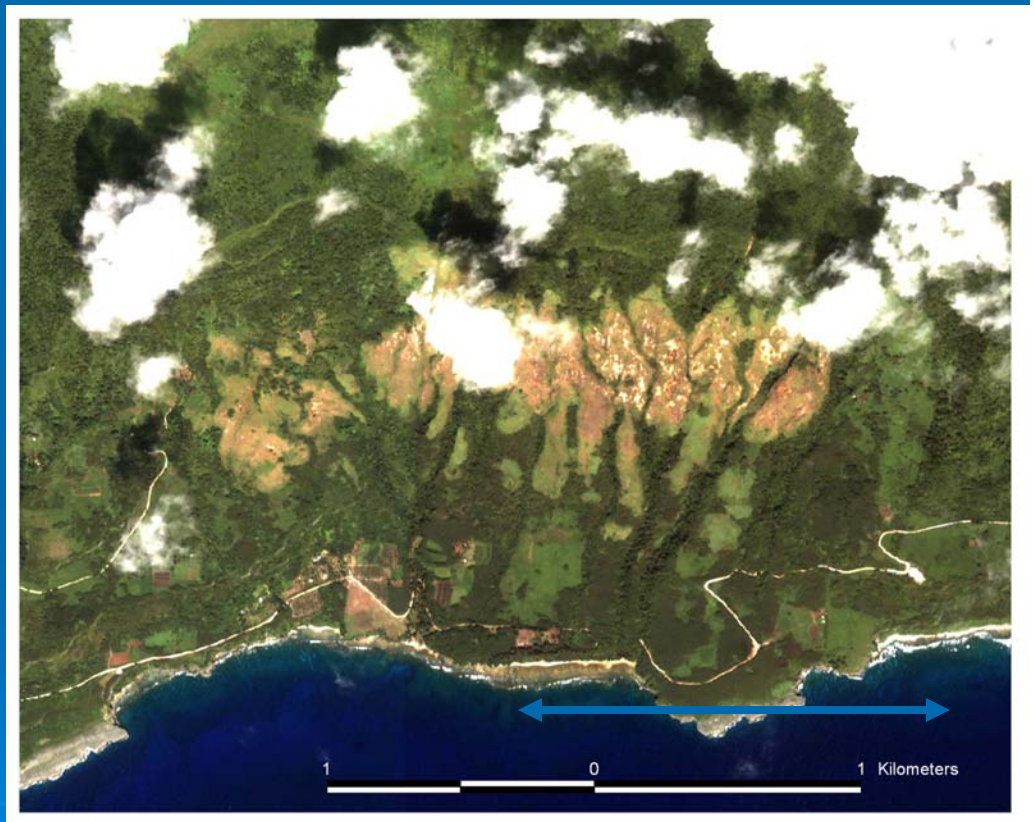
Bioassessment of Lau Lau Bay Reefs

- Site has runoff from burned land, farm plots, and unstabilized drainage banks (each year worse since early 1990's)
- Decrease in average coral size on reefs
- Decrease in community diversity and evenness
- Reference site comparison…
- Thus, watershed is top priority for limited management efforts and funding



Biocriteria and Reference Site Selection

- Biocriteria more powerful than numeric criteria?
- WQ data are
  - Time dependent
  - Weather dependent
  - Tidal dependent
  - Fluctuating
- Benthic community relies upon water quality



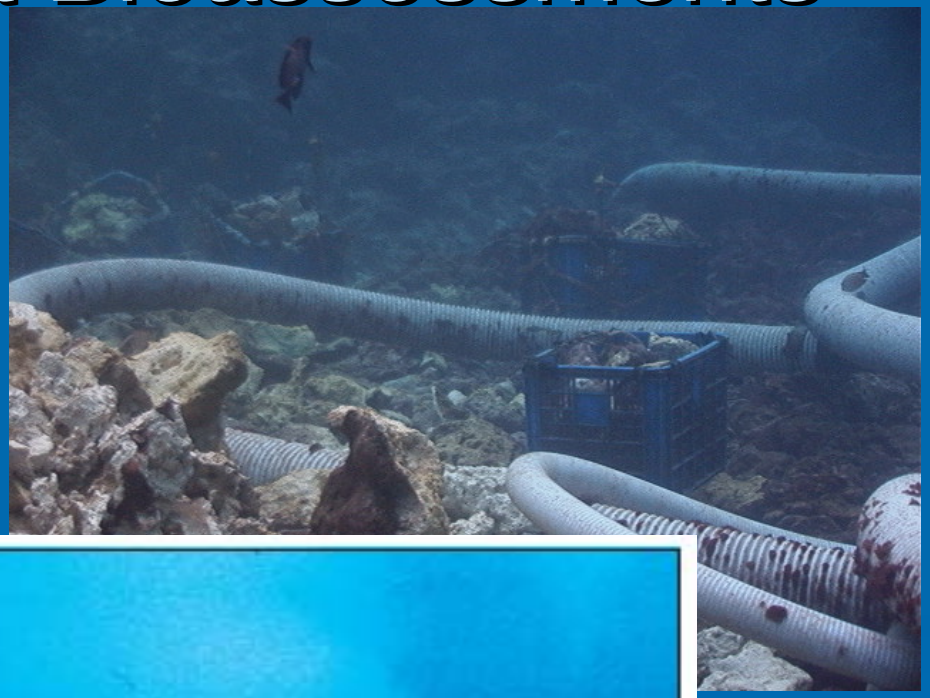
Talakhaya watershed, Rota Island

Scale of Biocriteria Monitoring

- Permitted Project (new development, small scale)
  - Golf course
  - Land clearing
  - Pollutant discharge
- Waterbody Assessments 305(b), 303(d) (Existing development, large scale)
  - Understand impacts of non-point source discharge
  - Usually no true baseline available
- Same coral assessment methods for both

CNMI and American Samoa Permitted Project Bioassessments

- Shipwreck excavation
- Rota, CNMI

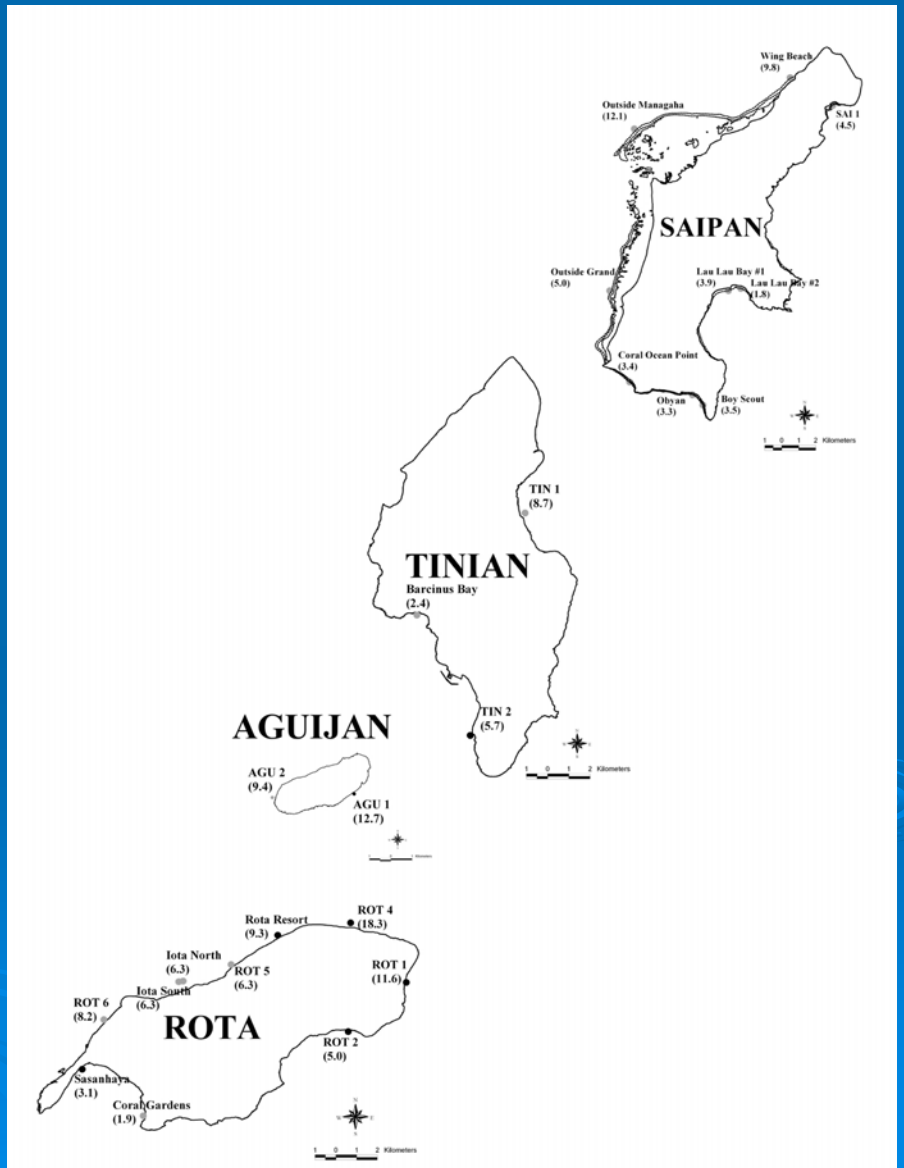


- Sewer outfall
- AS – Many other islands as well

Regional Waterbody Assessment

"Long-Term Monitoring"

- Most pertinent to Pacific island nations
- Big picture approach
- Assess impacts of watershed land use
  - NPS runoff
  - Urban development
  - Golf courses (pesticides)



Before Biocritera can be used to assess….answer

- What types of coral reef ‘habitats’ exist in CNMI?
- What natural, large-scale processes drive the formation and maintenance of ‘habitats’?
- What are the spatial distributions of these ‘habitats’ (where? and how much?)
- Patterns in community development

Regional Monitoring lead to answering….

- In the absence of anthropogenic pollution, why are some reefs ‘well’ developed and others not?

South Coast, Tinian

Northwest Coast, Aguijan

Regional Monitoring lead to answering….

- Why are some communities more diverse than others?

Fagaitua Bay, American Samoa

Dominated by the coral *Lobophyllia corymbosa*

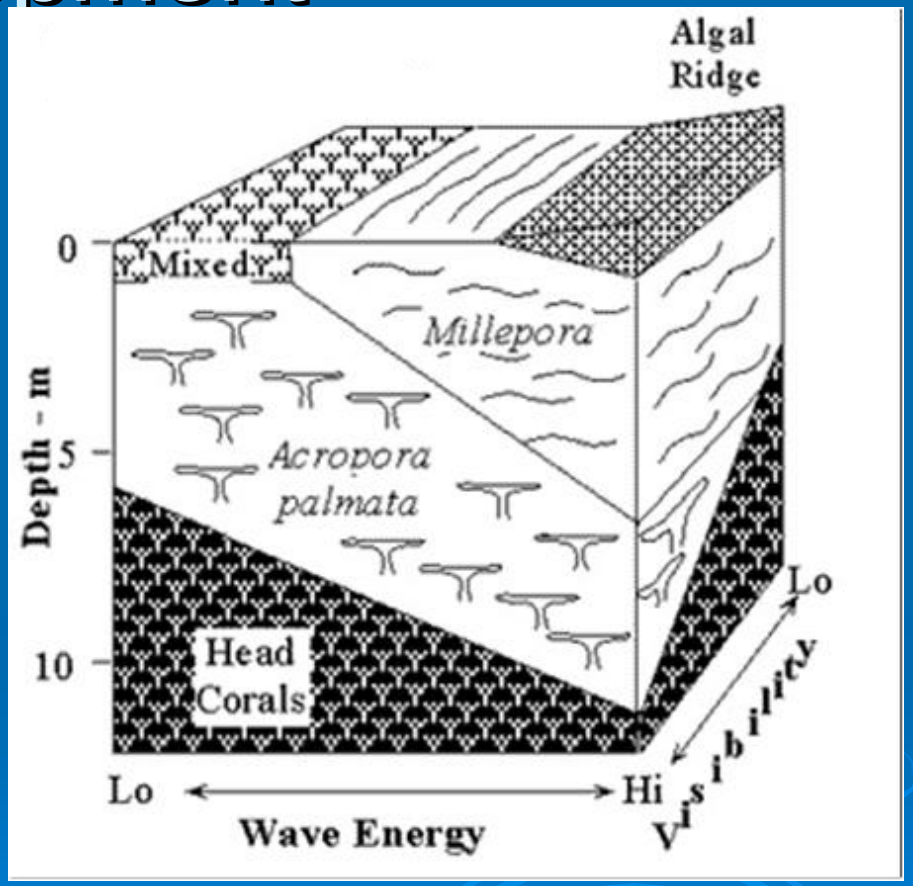
Aoa Bay, American Samoa

High diversity of corals

Controls on Reef Community Development

Macro-Controls - Slope or bathymetry resultant from plate tectonics and sea level

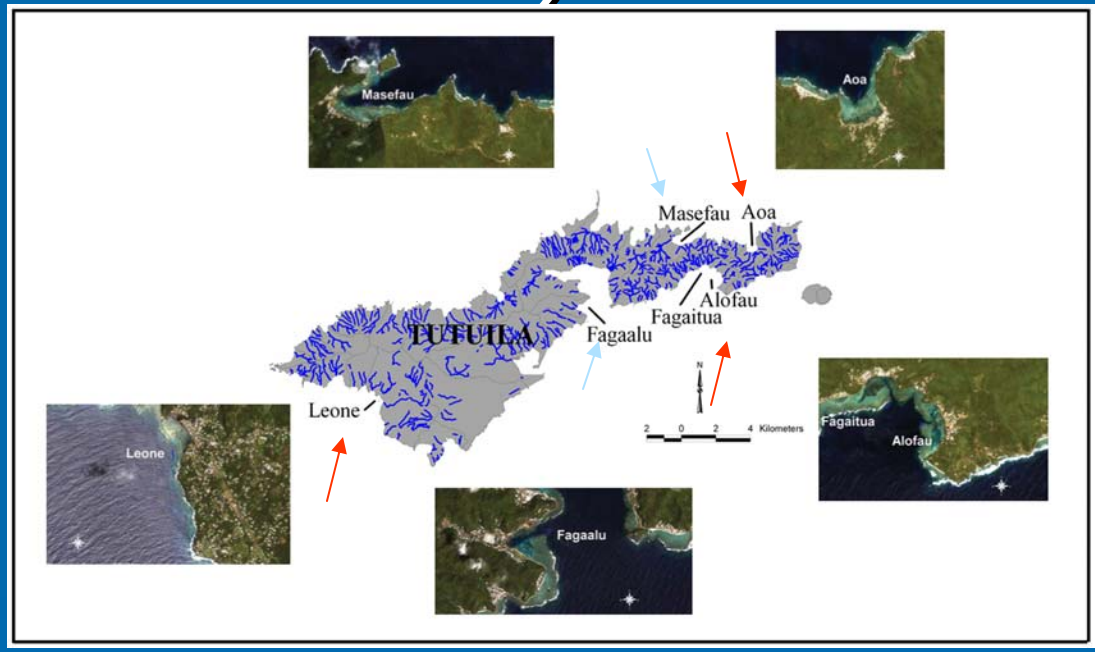
- Meso-Controls - Wave energy and water temperature
  - Micro-Controls - Light, salinity, nutrient levels
  - Managers want these answers!



Geister, 1977

American Samoa (regional approach initiated)

- Watershed based management
- Reefs used as bio-criteria indicators to waterbody health (EPA guidance)
- Simultaneously, initiate long term
  - monitoring
  - baseline



Arrows indicate similar geomorphology

Watershed Name	Area (km^2)	Number of Perennial Streams	Human Population	Human Population Density (per km^2)	Reef Flat Length Between Discharge and Channel (m)	Coral Community Evenness (Margalef's D-statistic)	Coral Population Density (per m^2)	Average Geometric Diameter (cm)	Species Richness
Aoa	2.20	5	507	230.5	404	5.20	27.3	11.1	74
Masefau	3.67	4	435	118.5	139	8.73	31.8	6.8	68
Fagaalu	2.49	1	1006	404.0	22	5.78	21.8	5.7	50
Fagaitua	1.40	4	483	345.0	102	7.00	26.0	8.4	64
Alofau	1.33	4	495	372.2	175	4.05	26.5	11.3	51
Leone	14.69	3	6600	449.3	265	6.80	21.0	10.6	69

Houk et al., 2005

Bioassessment and Long Term Monitoring Programs

- If we recognize the similarity of EPA/NOAA grants, requirements, and goals we add funding and personnel to efforts without any *new $*
- EPA requires reports on “waterbody status”
- NOAA requires “State of the Reef Reports”
- Can be simultaneous and coordinated

Thank You

- Visit us online at

http://www.deq.gov.mp/mmt/marinehome.htm