CORAL REEF BIOLOGICAL CRITERIA
Using the Clean Water Act to Protect a National Treasure

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Coral Reef Ecosystems

- Ecological foundation for diverse communities
- Support multibillion dollar fishing & tourism industries
- Threatened by pollution, over-exploitation, climate change
Ecosystem Services

Ecological value

Habitat for fish and invertebrates
Biodiversity
Primary production

Economic value

Tourism
Fishing
Shoreline protection
Bio-mining (drugs)
Management Options

Marine Protected Areas
  – fishing, boating, tourism restrictions

Biocriteria and other CWA regulations
  – watershed and waterbody pollutants

Managing for ‘resilience’
  – resilient populations and habitats
  – seed areas
  – spatial connectivity
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Biological Assessments for CWA

- Applicable in many CWA programs

404 permits & mitigation plans
401 certifications
Dredging and ocean dumping permits
NPDES permits & 301(h) decisions
Permits for coastal development
Biocriteria (water quality standards)
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• Applicable to anthropogenic stressors only

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- Requires valid indicators (metrics) and a long-term monitoring program
- Thresholds (criteria) are designated based on expected or desired condition of the resource

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Biocriteria (water quality standards)
**Biological Criteria:**

*CWA water quality standards*

Numeric values or narrative descriptions (i.e., thresholds) that are established to protect the *biological condition* of aquatic life inhabiting waters of a given designated use.
**Biological Criteria: CWA water quality standards**

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*Like physical and chemical water quality criteria, biocriteria are enforceable by States and Territories under the CWA*
Technical guidance for development of coral reef biological criteria

Why we care
What should be protected
What should be measured
Assessment protocols
Setting thresholds
Accounting for variability
Causes of change
Means to protect reefs
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Biological Assessments

Requirements

- Relevant to management questions
- Scientifically (and legally) defensible
- Technically and financially feasible
- Provide direct link to regulatory action

Rapid Bioassessment Protocols

- Rapid and cost-effective
- Scientifically valid and defensible for regulatory action
- Quick turnaround for management decisions
- Easy translation to management and public values
- Environmentally benign data collection
Bioassessment Protocol

Assessment procedures for application to biocriteria and other CWA regulatory activities

http://www.epa.gov.bioindicators/coral/coral_biocriteria.html
Bioassessment Indicators

- Responsive to anthropogenic disturbances (CWA)
- Sufficient precision to distinguish change at the desired level
- Meaningful biological information
- Transparent to stakeholders
- Directly linked to regulatory decisions (e.g. biocriteria)

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Screening for Metrics

Metrics indicators that respond only to human disturbance

Area of disturbance ~100 m

Industrial area

Land

Water

Stations

Replicates

Different habitat

Office of Research and Development
National Health and Environmental Effects Research Laboratory, Gulf Ecology Division
St. Croix, U.S. Virgin Islands

Industrial docks = center of human disturbance
Candidate Metrics

Total SA

Average Colony Size

Center of disturbance
# Taxa

Total SA

Live SA

Colony SA

Distance from Center of Disturbance
Coral Condition and Land Use
Are indicators valid at the watershed scale?

Fig. 1. St. Croix watersheds and associated coral stations from 2006 (circles with dots) and 2007 (circles without dots).

Land Use / Land Cover converted to Landscape Development Intensity (LDI)
Coral Condition and Land Use

Relation of watershed land use (LDI) and coral metrics

Metrics showing this significant trend:
- Colony SA
- Coral density
- Taxa richness
- 3D Total cover

Oliver et al, MEPS 427: 293–302, 2011
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Probabilistic Surveys in USVI
to satisfy CWA reporting requirements
Cumulative Distribution Functions
Summary

• Biological criteria are enforceable water quality standards under CWA
• Require indicators and assessment methods that detect anthropogenic disturbances
• Several coral reef measurements capture human disturbances on local and watershed scales
• Methods can be used in regional monitoring programs to satisfy CWA reporting requirements
• Data are further used to determine reference conditions and thresholds for water quality impairment (criteria)
Thank you!

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