

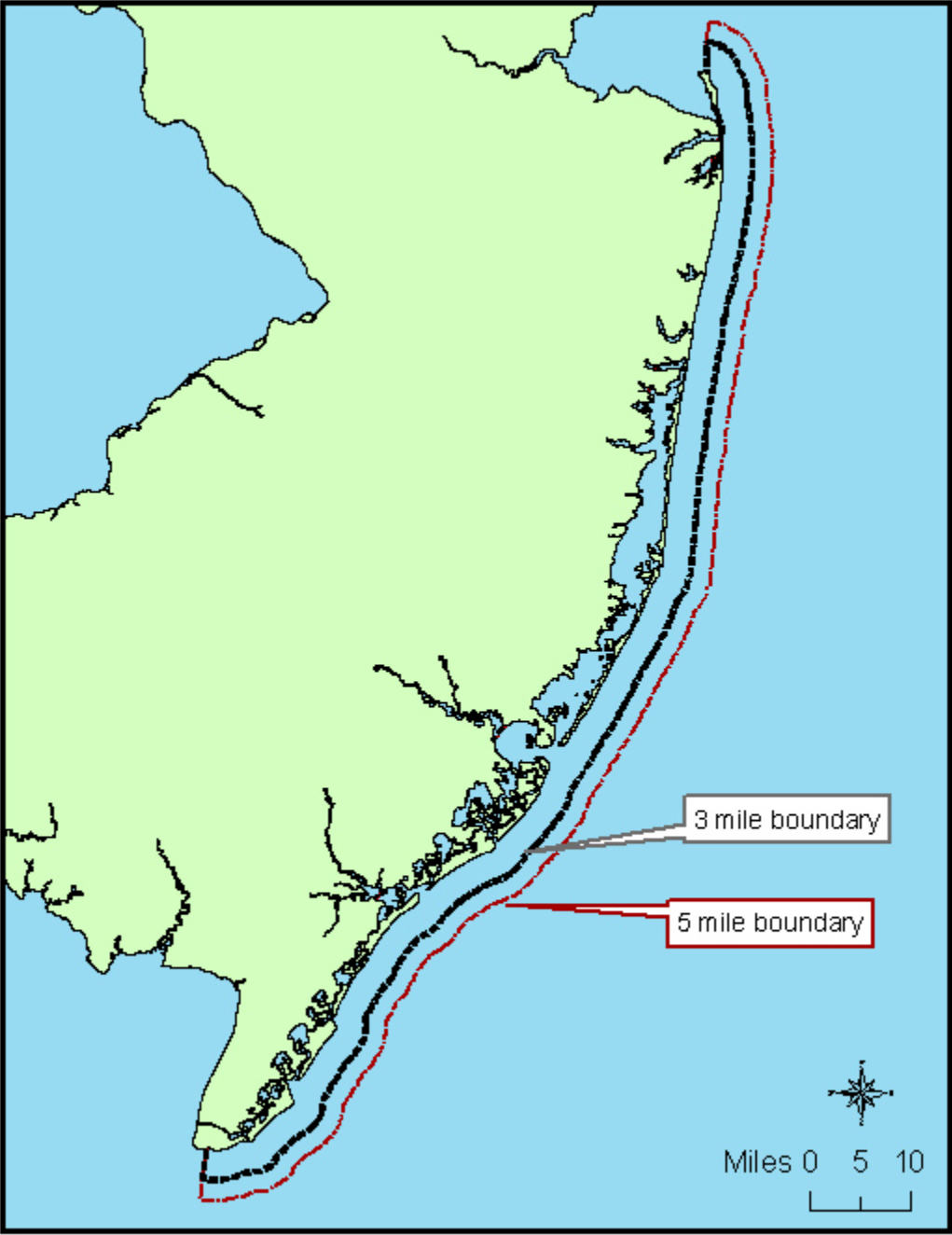
Assessing Ecological Impairment in New Jersey's Estuarine and Coastal Marine Waters: Problems and Solutions

Michael J. Kennish

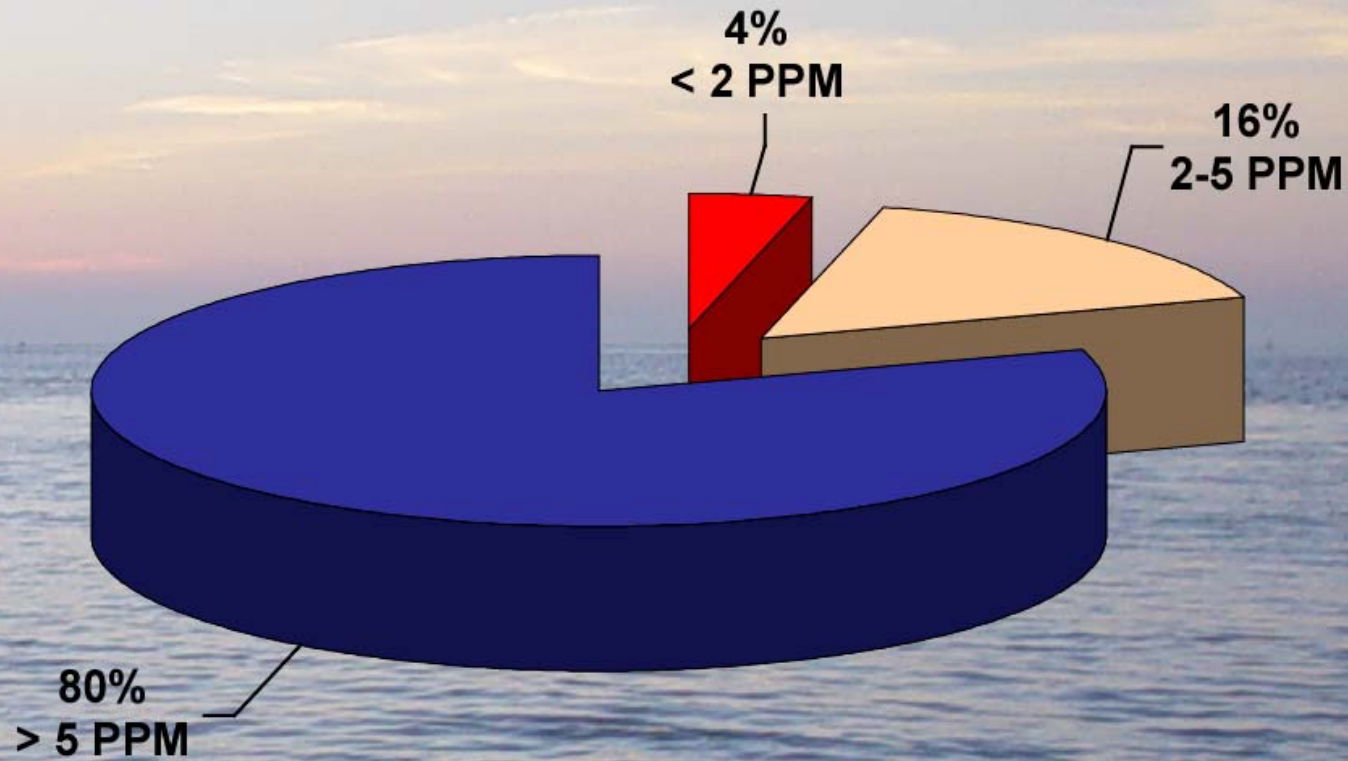


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Dissolved Oxygen US Coast



- **Benthic Communities**
- **Document Biotic Responses**
 - **Contaminant Exposure**
 - **Organic Enrichment**
 - **Hypoxia**
 - **Nutrient Enrichment**
 - **Dredging**



GOAL

Develop an Index to Define Condition

- **Compile Existing Databases**
- **Conduct Field Sampling to Fill Gaps**
- **Assess All Databases**
- **Produce a Benthic Index**





EXISTING DATABASES

NCA

EMAP

USEPA (RARE Samples)

NY/NJ Harbor Estuary

NMFS (12-Mile Dumpsite)

ARMY CORPS

CLAM SURVEYS

BELMAR DATA SET

LEO-15

EPA REMAP SITES
Virginian Province 1990-93

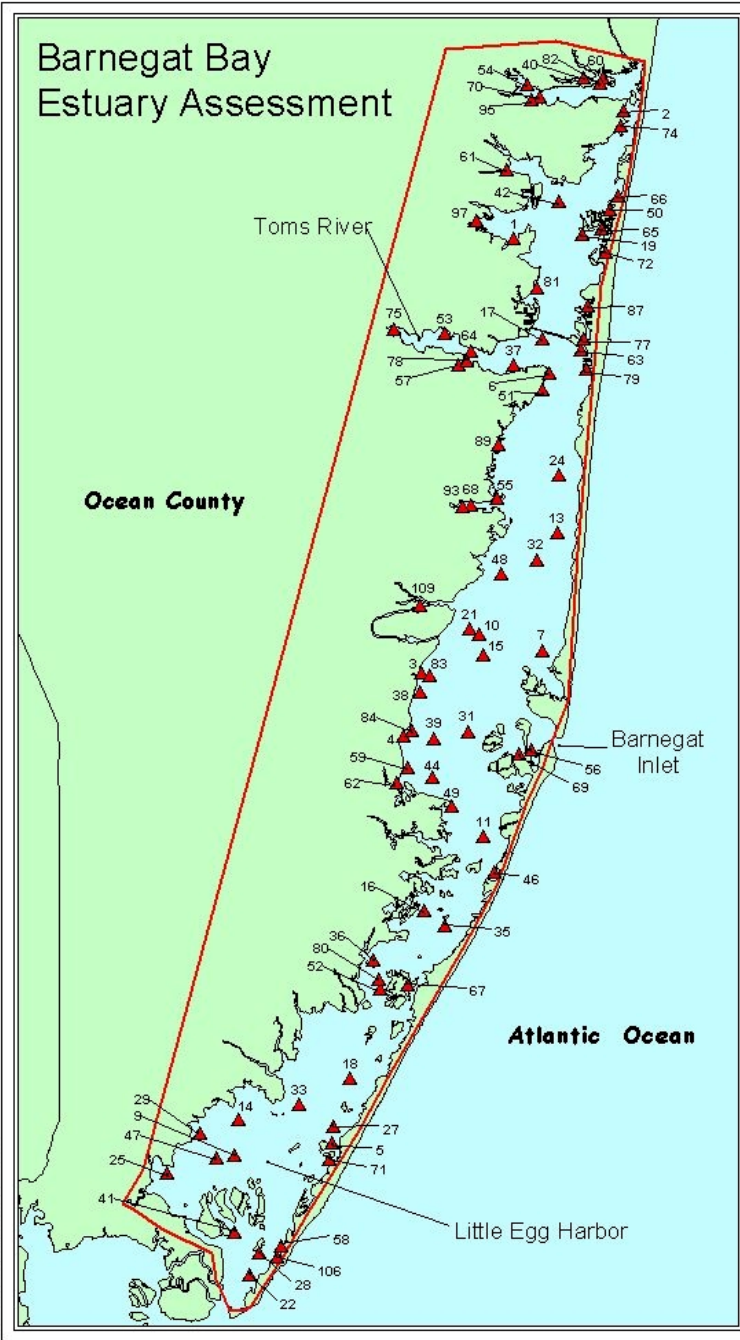


**Regional Environmental
Monitoring and Assessment
Program (REMAP)**

These data include water column data, sediment contaminants and toxicity data, and benthic macroinvertebrate and demersal fish community and contaminant data.

Text taken from
<http://www.epa.gov/emap/nca/html/data/index.html>

Barnegat Bay Estuary Assessment



REMAP 4 Summer 2001

Legend

- ▲ Sampling Locations
- ▭ REMAP Study Area
- ▭ New Jersey

Location Map



Scale 1 : 210,000
0 2 4 Miles

This computer representation has been compiled by the Environmental Protection Agency (EPA) from sources which have supplied data or information that has not been verified by the EPA. The data is offered here as a general representation only and is not to be used for commercial purposes without verification by an independent professional qualified to verify such data or information.

The EPA does not guarantee the accuracy, completeness, or timeliness of the information shown and shall not be liable for any loss or injury resulting from reliance.



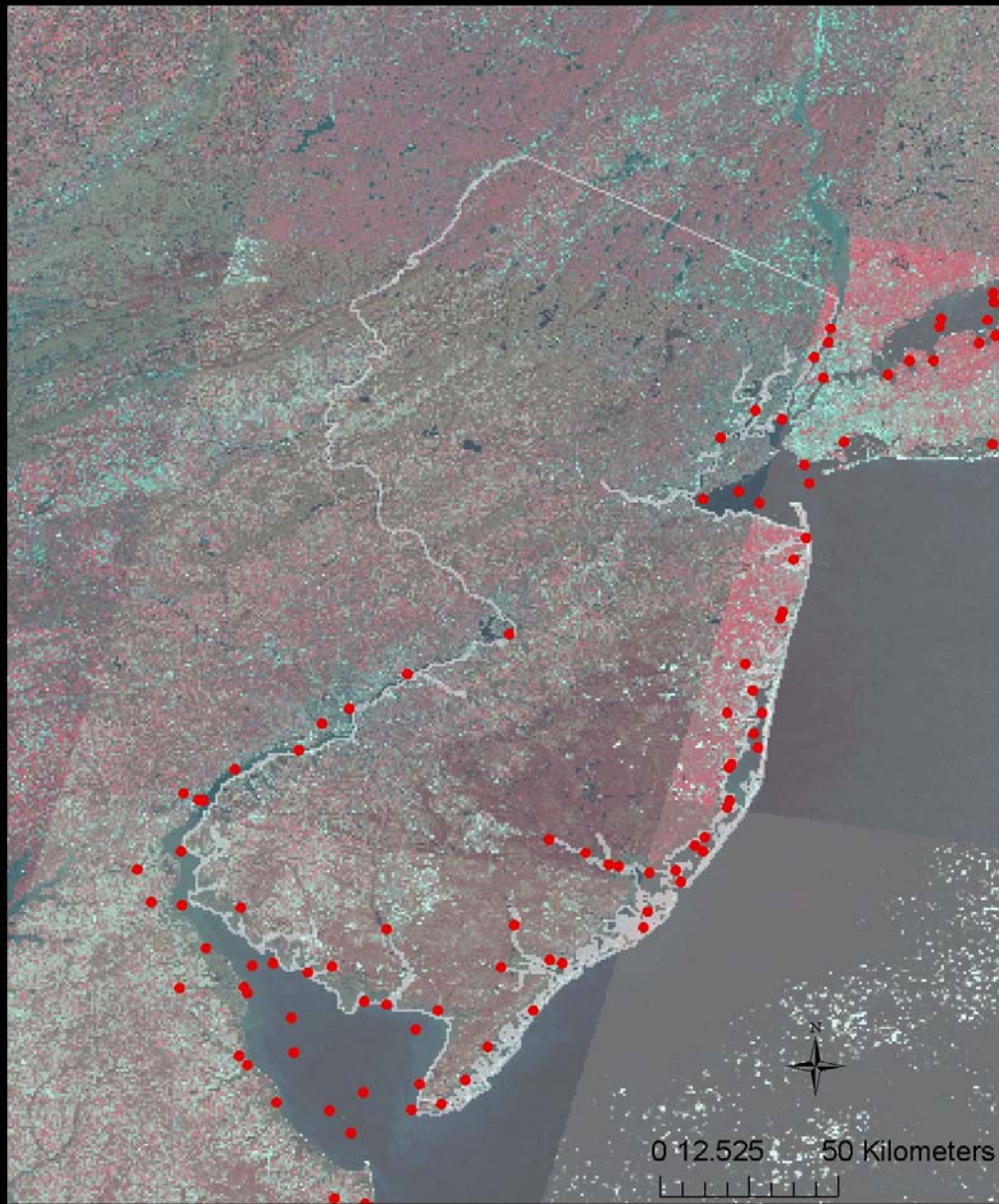
Published October 9, 2001. Revised October 30, 2001.

**NCA SITES
2000**



**National Coastal Assessment
(NCA)**

**NCA SITES
2001**



**National Coastal Assessment
(NCA)**



BASIC STEPS

Define Habitat Types

Select Benthic Attributes (Degraded/Reference Sites)

Measure Metrics

Construct Index

Validate Index

INDICES OF BIOTIC INTEGRITY

**Based on Single or Multiple
Attributes of Benthic Communities**

**Univariate Index (Single Score
Based on a Combination of
Measurements from Benthic
Community Samples)**

**Multivariate Index (Stepwise and
Linear Discriminant Analyses to
Differentiate Reference and Degraded
Conditions)**





INDEX DEVELOPMENT

Multimetric Index

B-IBI

Weisberg et al. 1997

Adams et al. 1998

Van Dolah et al. 1999

Paul et al. 2001

Llanso et al. 2002

CANDIDATE METRICS FOR BENTHIC INDEX

Taxonomic Composition

Diversity Measures (Shannon-Wiener Index)

Faunal Abundance (e.g. Bivalves, Gastropods, Polychaetes)

Biomass and Species Dominance

Percent Abundance of Pollution Tolerant Taxa

Percent Abundance of Pollution Sensitive Taxa

BENTHIC INDEX OF BIOTIC INTEGRITY

- **Multimetric Index**
- **Define Biological Attributes (=Metrics)**
- **Discriminate Between Degraded and Reference Sites**
- **Compare Biotic Condition (Stressed vs. Reference)**
- **Degree of Metrics Deviation Between Sites**
- **Simplicity of Approach**
- **Applicable to a Wide Range of Habitats**

Modified B-IBI (Van Dolah et al., 1999)

- **Define Major Habitat Types**
- **Compare Benthic Attributes (Degraded vs. Reference)**
- **Select Metrics for Inclusion in the Index**
- **Assign an Individual Score for each Metric**
- **Average the Scores for the Metrics**
- **Validate the Index**

A person with a backpack is walking on a sandy beach, looking out at the ocean under a clear blue sky. The text is overlaid on the right side of the image.

Multivariate Index (Weisberg et al., 1992)

Combines Stepwise and Canonical Discriminant Analysis

Factors Index is Normalized to Account for Effects of Natural Environmental Variability on Component Biological Metrics

Normalization Process can be Complex

Applied in Mid-Atlantic Estuaries

Applied in Gulf Coast Regions

