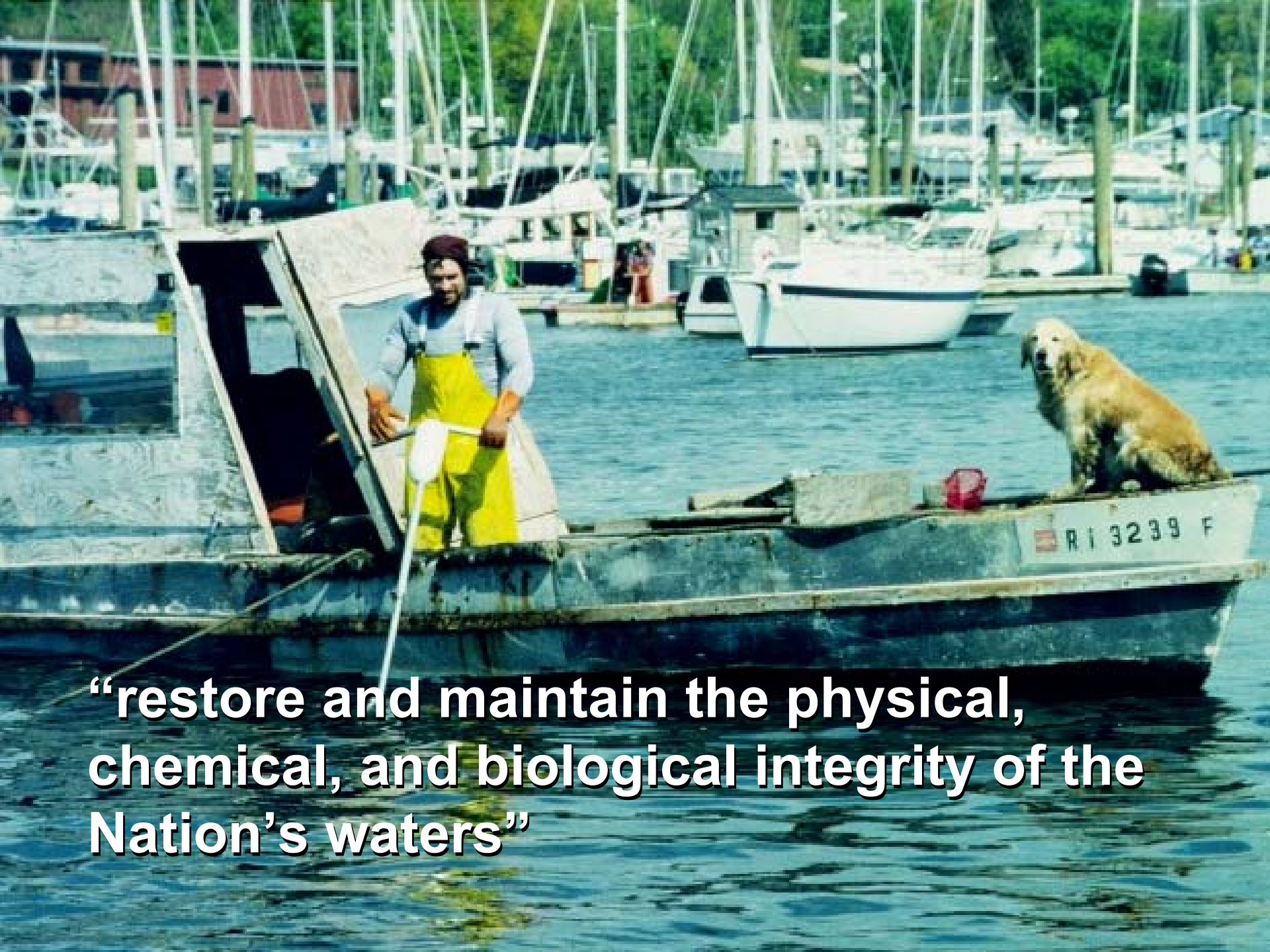
Methods to Integrate Monitoring and Assessment for Clean Water Act Reporting

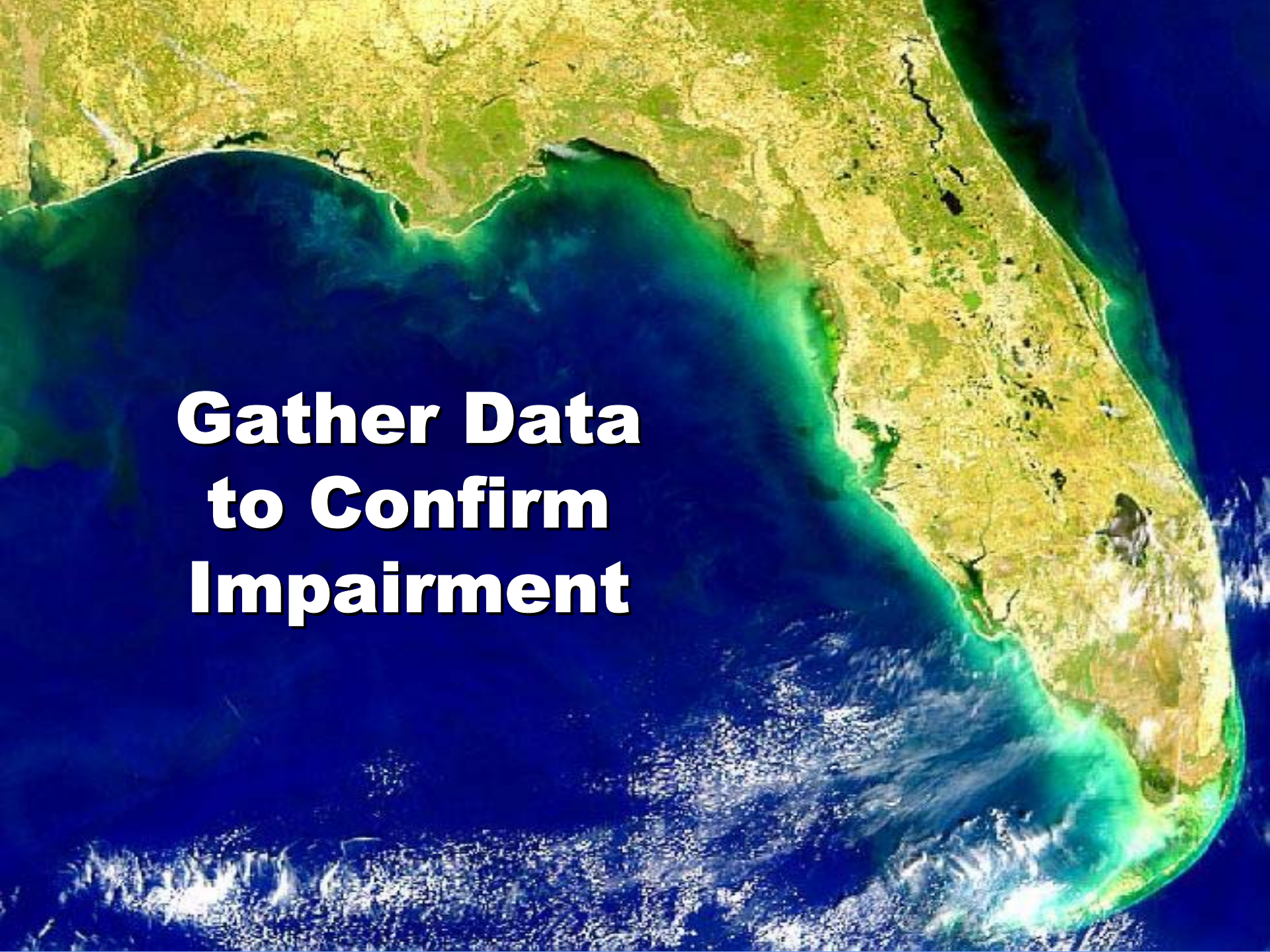
Landscape Characterization and Model-based Approaches for Estimating Conditions or Impairment of Waterbodies



“restore and maintain the physical, chemical, and biological integrity of the Nation’s waters”

303(d) Background

- Assessment of ALL waters – Report 2 Year Cycle
- Each State Creates: Listing Policy, Designated Uses, WQ Standards and Assessment Units (AU)
- Listing Criteria: When Status = Impairment
- Need to Identify Pollutant Caused Impairment
- Evidence to Support Delisting



Gather Data to Confirm Impairment

305(b)

Water Quality Report

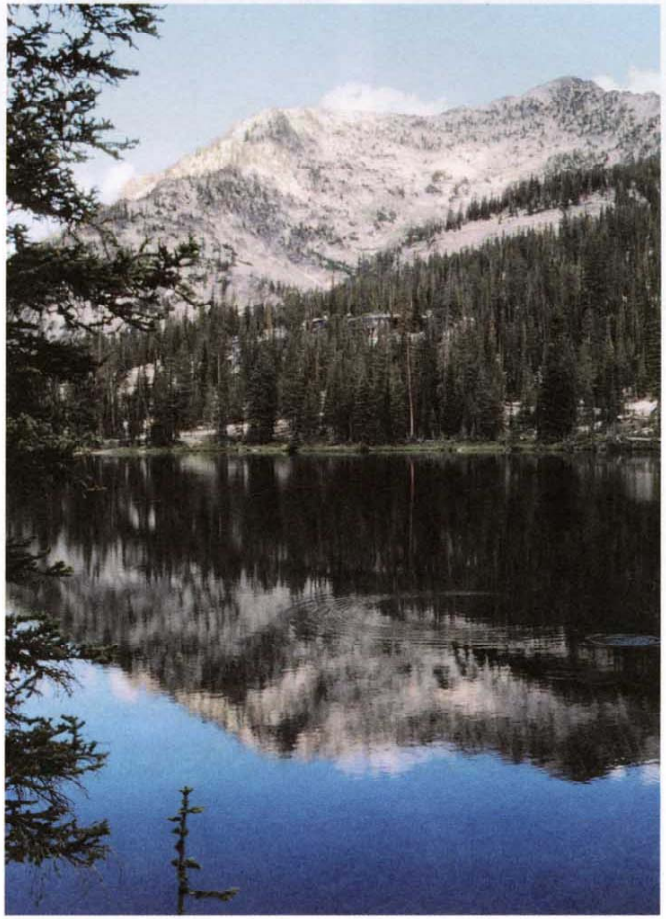
United States
Environmental Protection
Agency

Office of Water
Washington, DC 20460

EPA841-S-97-001
April 1998

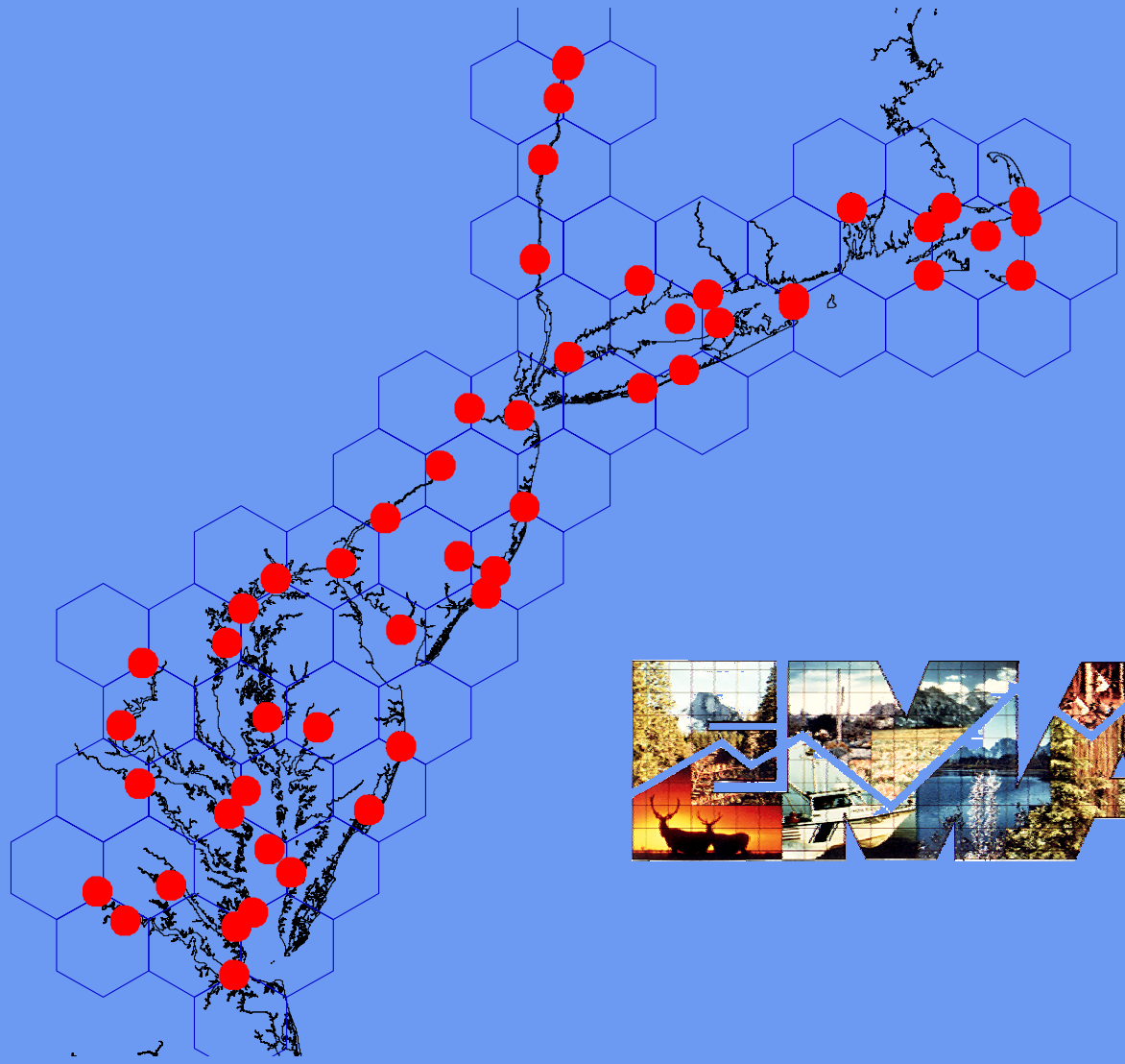
EPA

The Quality of Our Nation's Water: 1996



Executive Summary of the National Water Quality Inventory: 1996 Report to Congress

Assessing Overall Condition

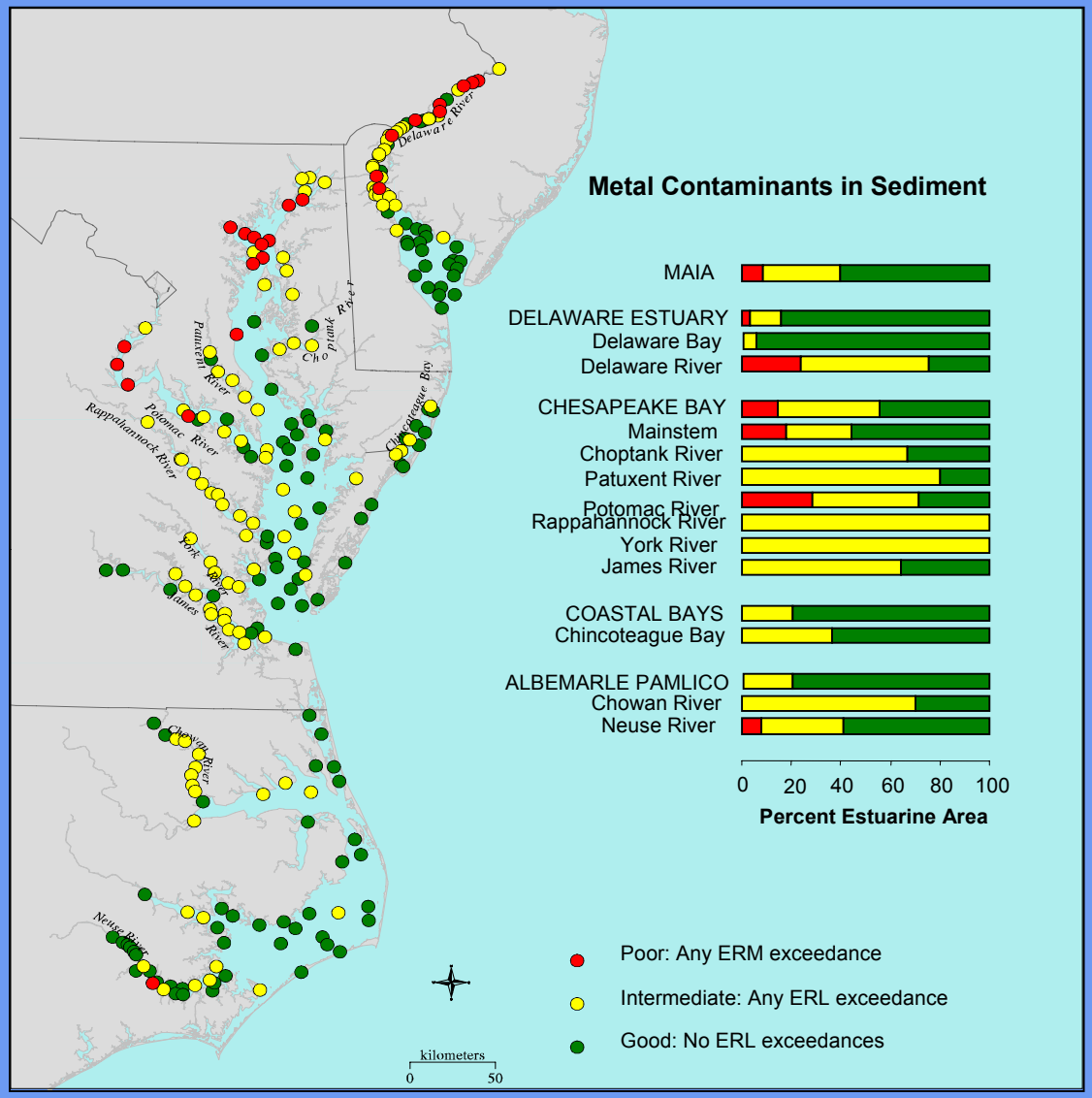


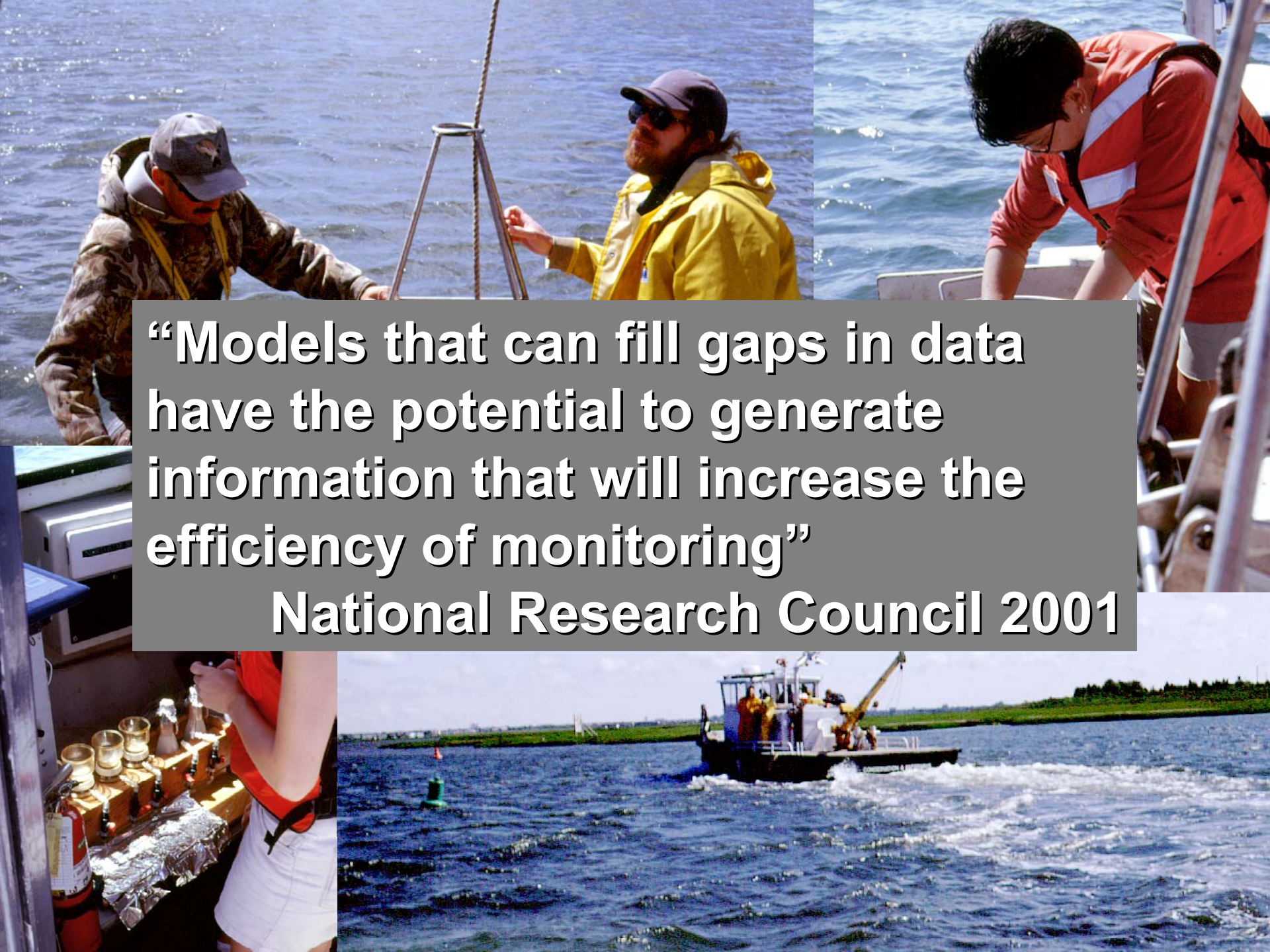
EMAP

305(b) Guidance

- Probabilistic monitoring design - large areas
- Excellent approach to producing, with known confidence, statistical representation
- Extent of waters that may or may not be impaired
- Assist a State or territory in determining monitoring priorities and in targeting monitoring activities

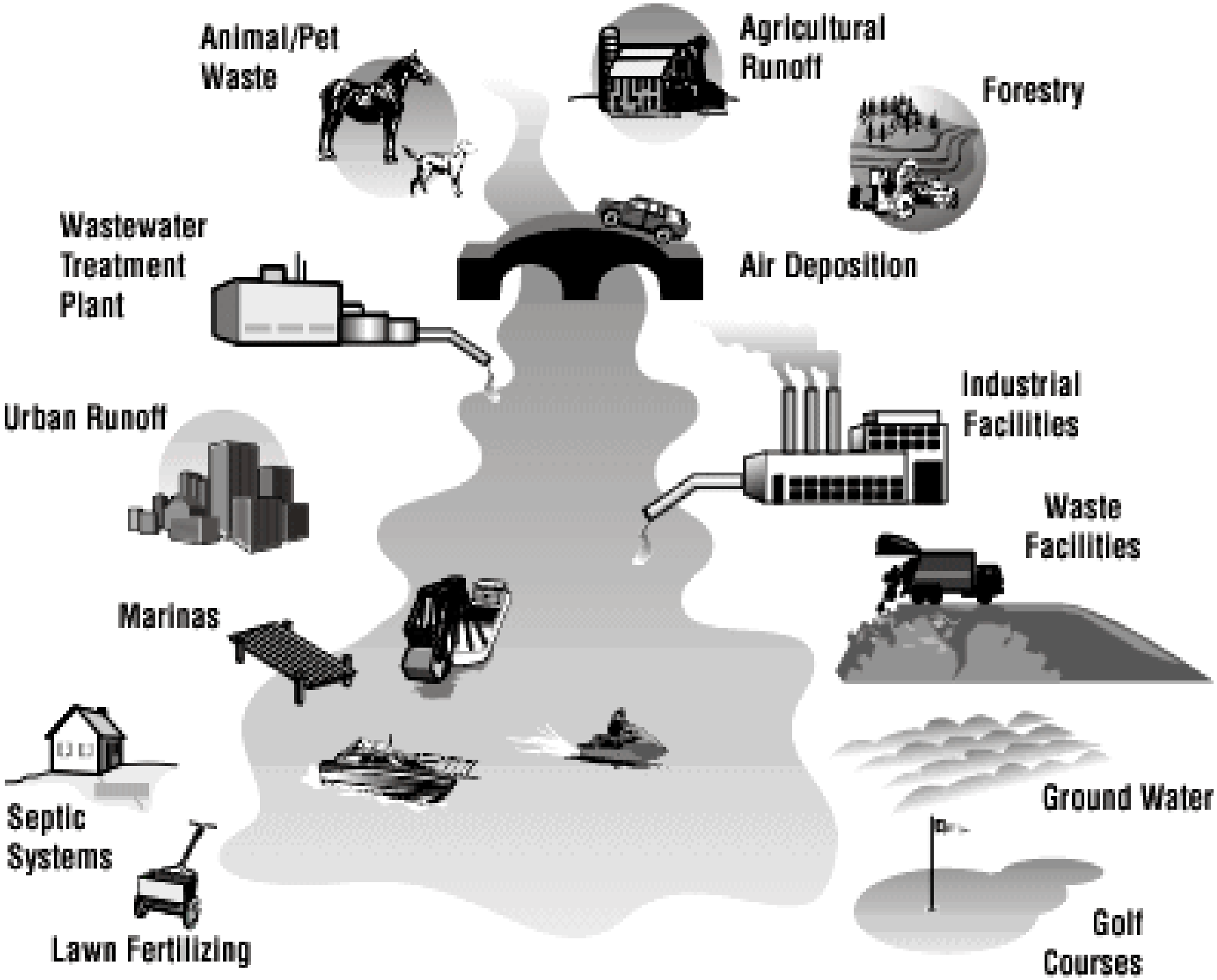
Assessing Overall Condition



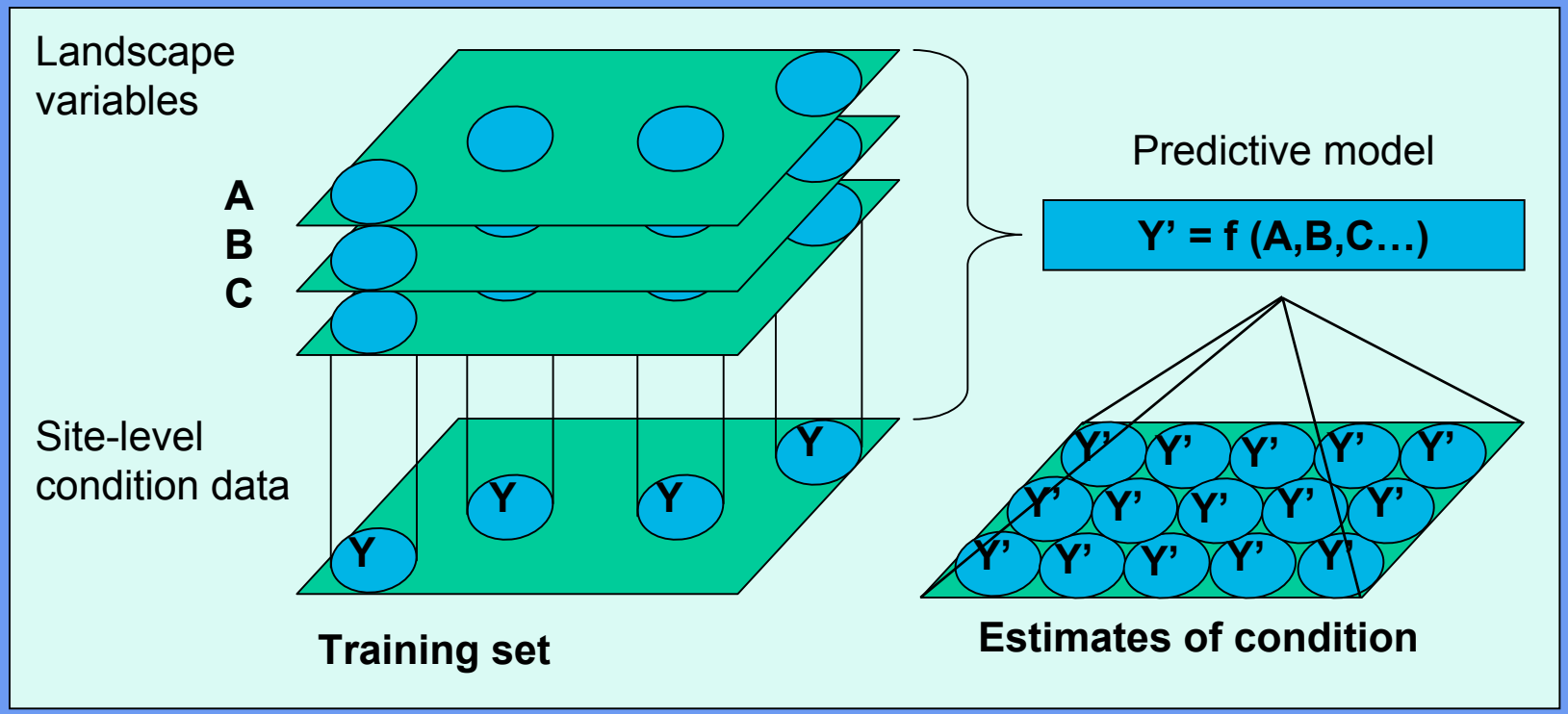


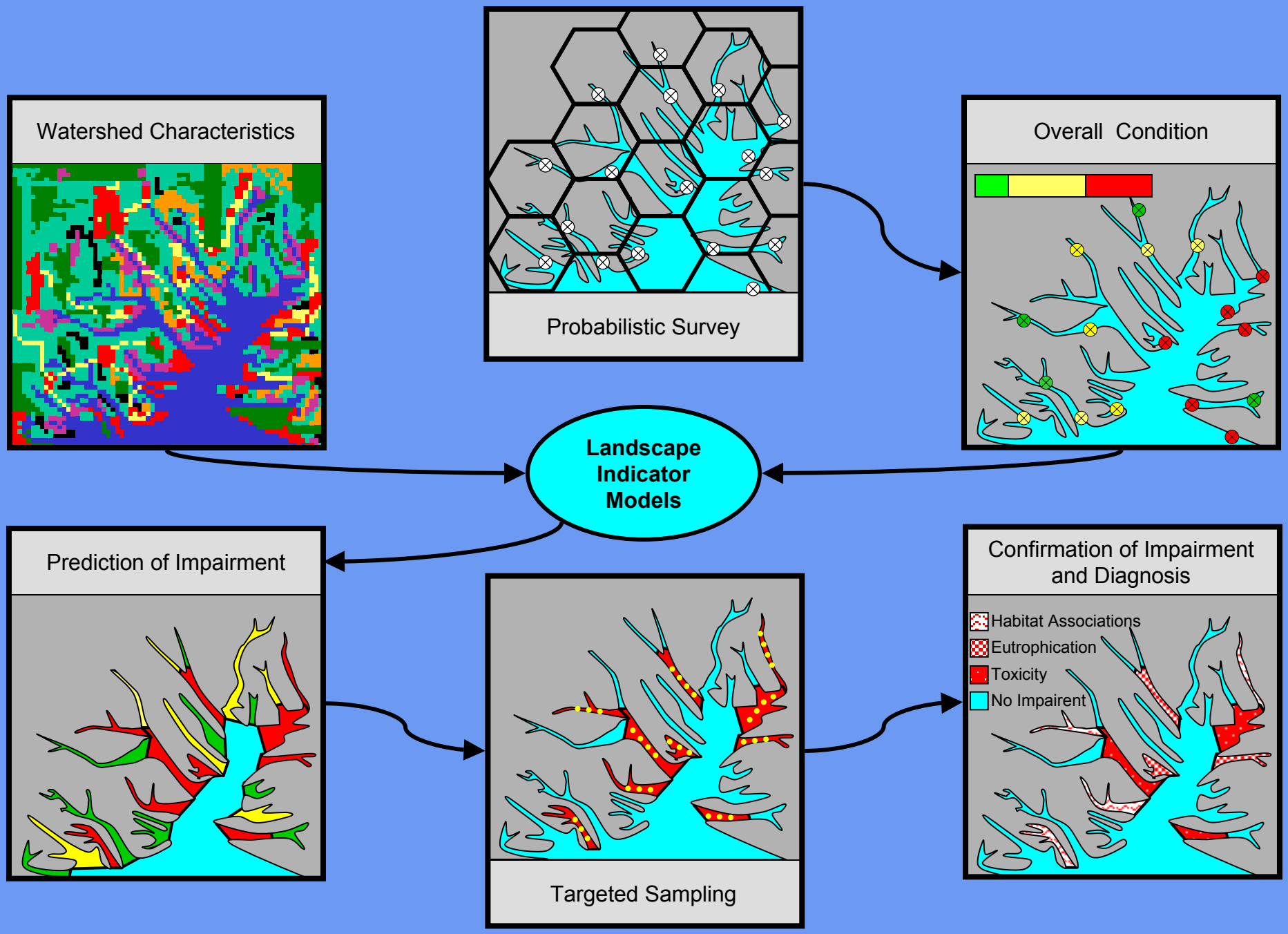
“Models that can fill gaps in data have the potential to generate information that will increase the efficiency of monitoring”

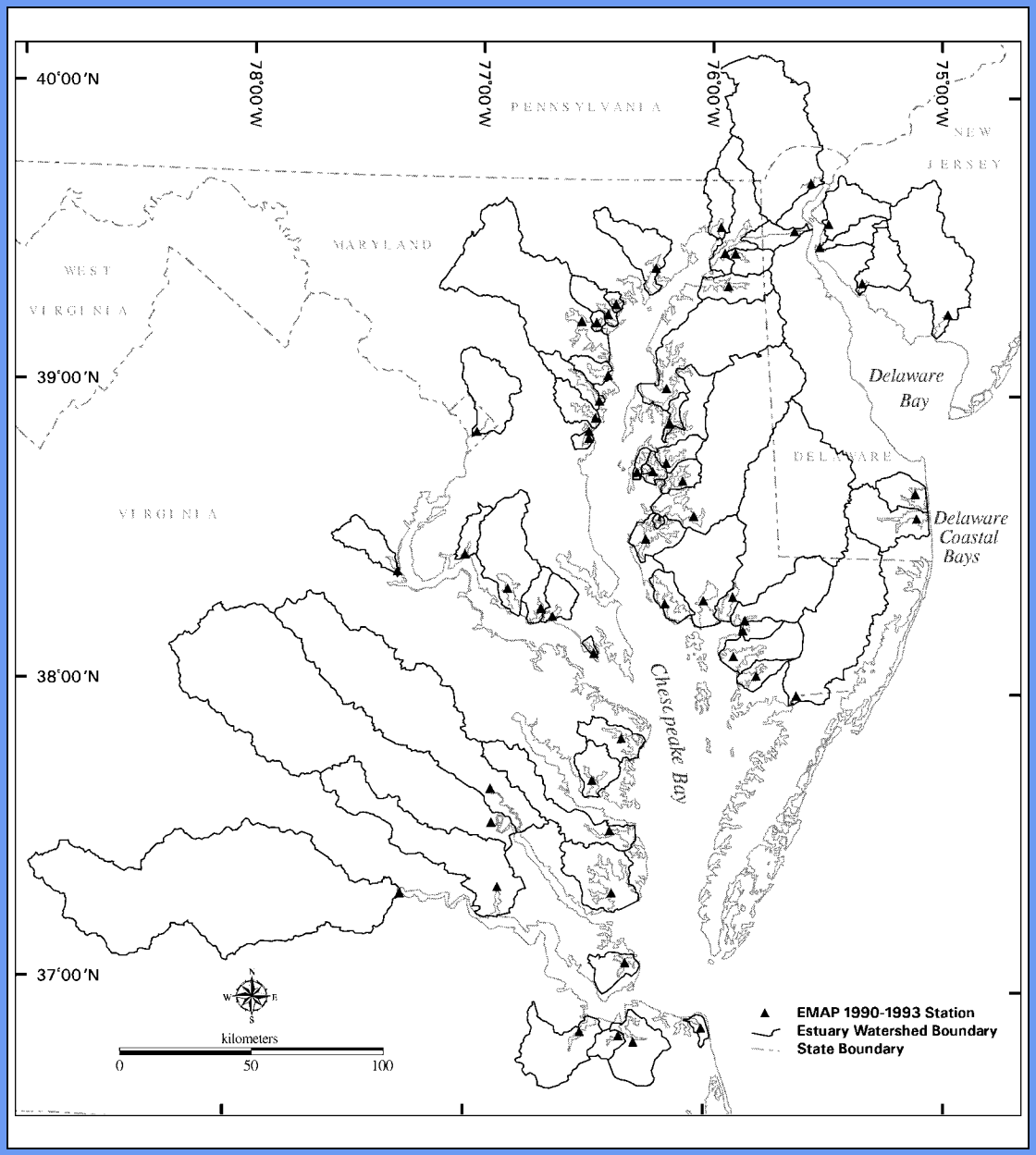
National Research Council 2001

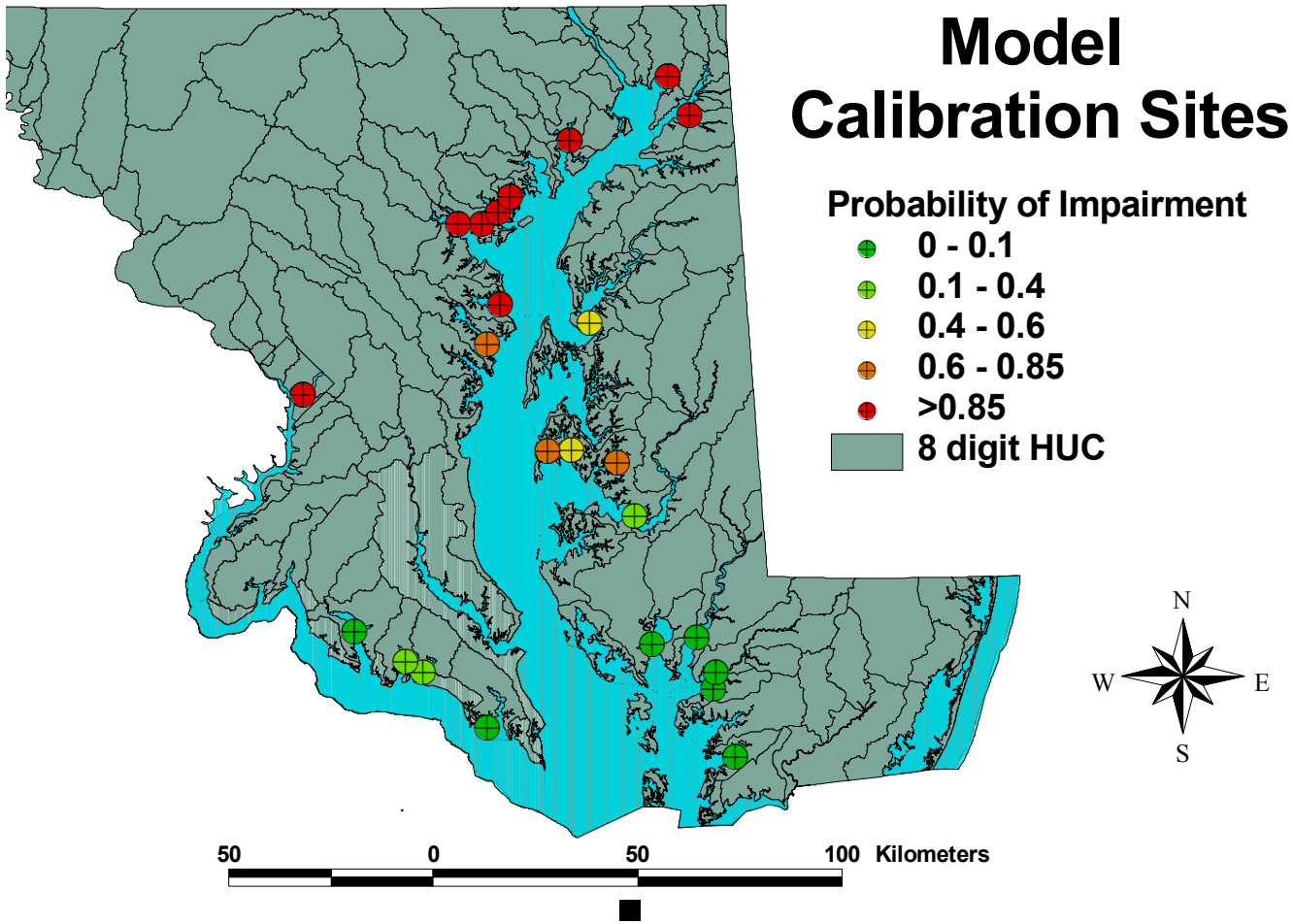

Animal/Pet Waste
Agricultural Runoff
Forestry
Wastewater Treatment Plant
Air Deposition
Industrial Facilities
Urban Runoff
Waste Facilities
Marinas
Ground Water
Septic Systems
Lawn Fertilizing
Golf Courses

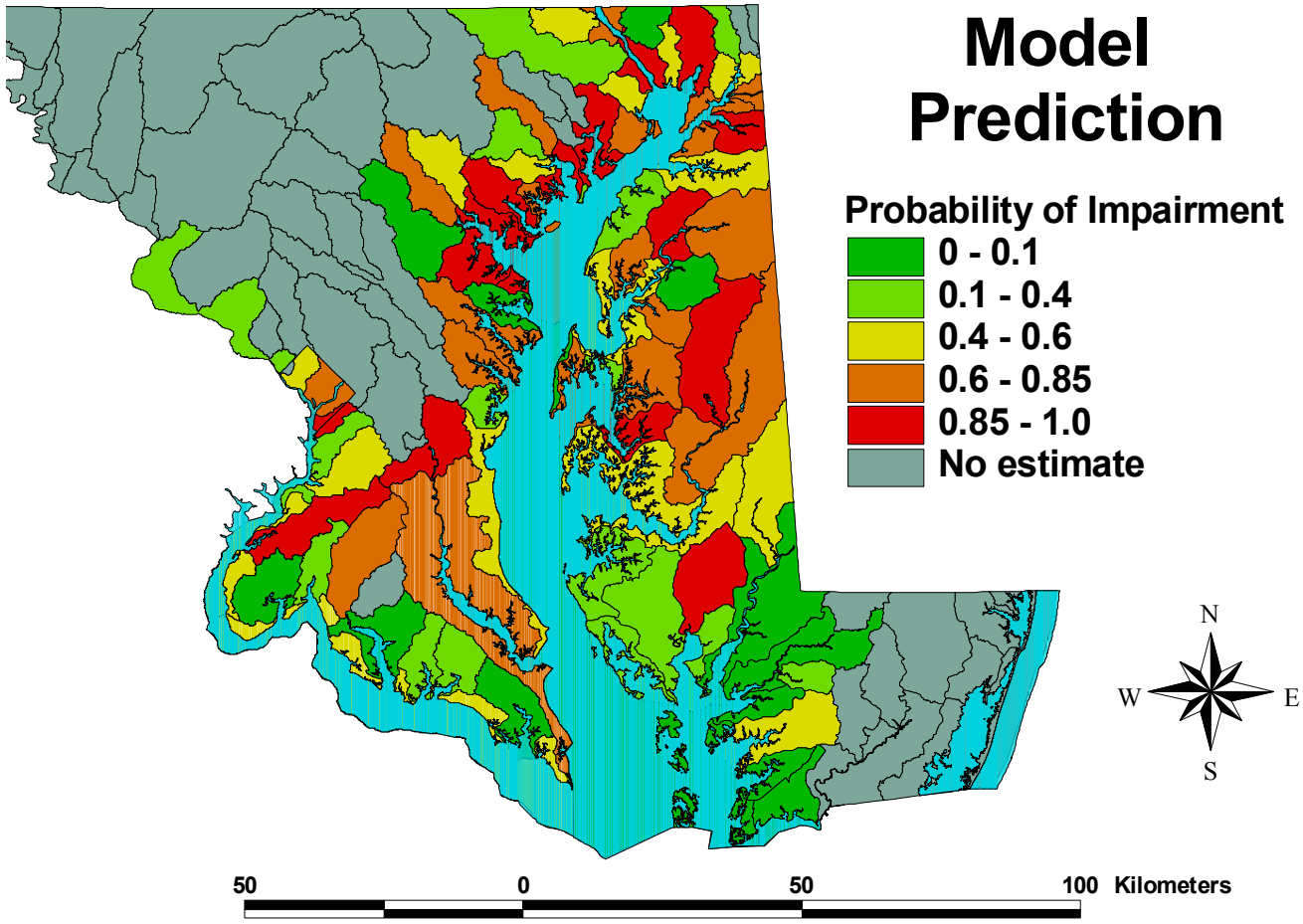
PREDICTING AQUATIC CONDITION




Watershed Characteristics
Probabilistic Survey
Overall Condition
Landscape Indicator Models
Prediction of Impairment
Targeted Sampling
Confirmation of Impairment and Diagnosis
Habitat Associations
Eutrophication
Toxicity
No Impairent

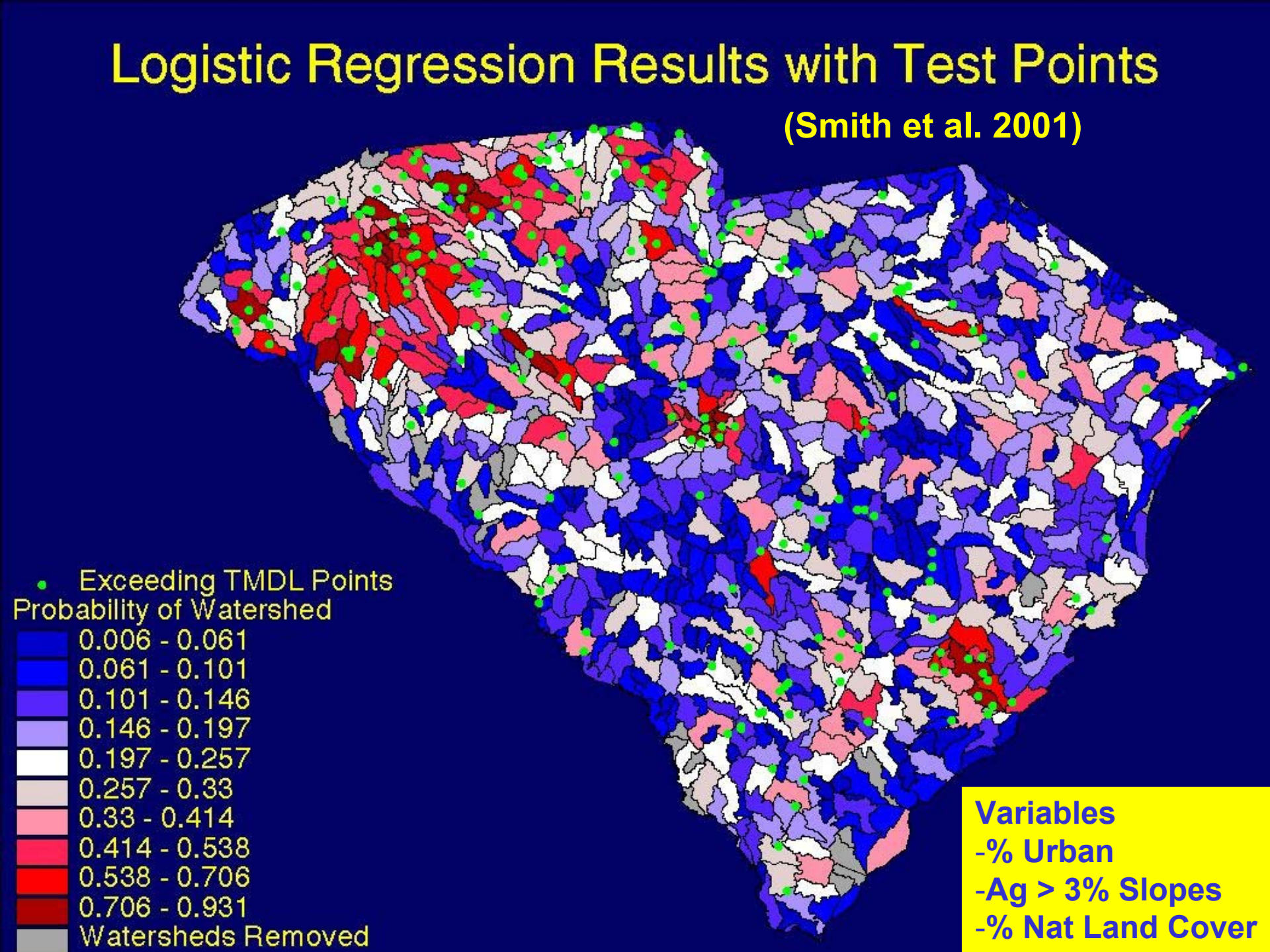

40°00′N
39°00′N
38°00′N
37°00′N
78°00′W
77°00′W
76°00′W
75°00′W
PENNSYLVANIA
NEW
JERSEY
MARYLAND
WEST
VIRGINIA
VIRGINIA
DELAWARE
Delaware
Bay
Delaware
Coastal
Bays
Chesapeake Bay
kilometers
0
50
100
EMAP 1990-1993 Station
Estuary Watershed Boundary
State Boundary


Model
Calibration Sites
Probability of Impairment
0 - 0.1
0.1 - 0.4
0.4 - 0.6
0.6 - 0.85
>0.85
8 digit HUC
N
W
E
S
50
0
50
100
Kilometers


Model Prediction
Probability of Impairment
0 - 0.1
0.1 - 0.4
0.4 - 0.6
0.6 - 0.85
0.85 - 1.0
No estimate
N
W
E
S
50
0
50
100
Kilometers

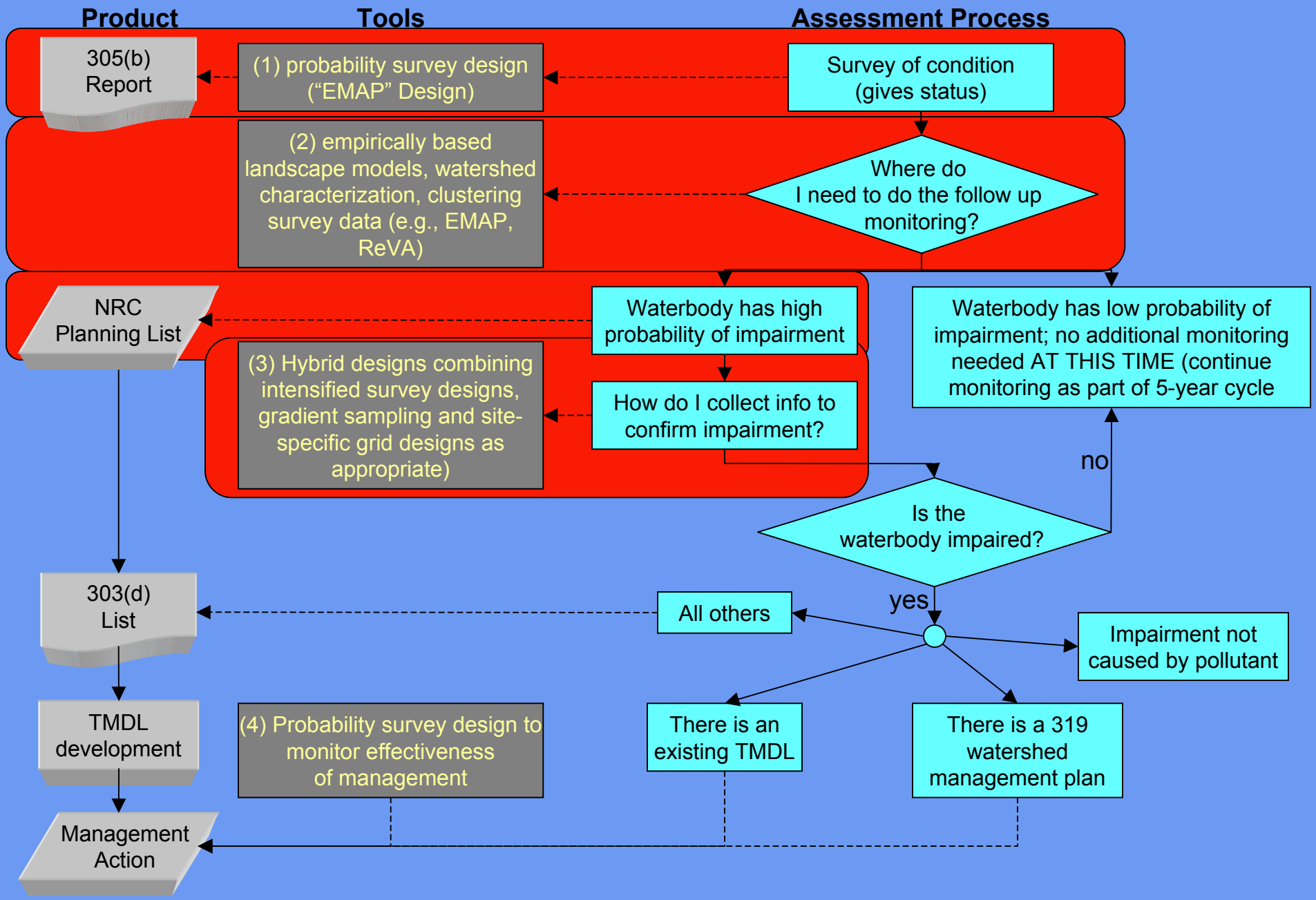
Logistic Regression Results with Test Points

(Smith et al. 2001)



Variables
- % Urban
- Ag > 3% Slopes
- % Nat Land Cover

INTEGRATED MONITORING FRAMEWORK



Anticipated Products

- Tools that can assist states in the 303(d) listing process
- Provide a rationale for targeted sampling of aquatic resources
- Help consolidate 305(b) assessment and 303(d) listing methodologies
- Provide evidence for diagnosing aquatic impairment
- Forecast the impacts of future watershed alterations

Topics

- Implementation Expectations & Experience
- Providing Information on All Waters
  - Large Scale Probability Surveys
  - Estimation Approaches for Condition, Stressors, Impairment
    - Design
    - Modeling
    - Landscape