The Massachusetts Estuaries Project

A Collaborative Effort to Protect and Restore Southeastern Massachusetts Embayment's

MassDEP

(TMDL/NPS Conference 5/26/09)

Overview

Project Background

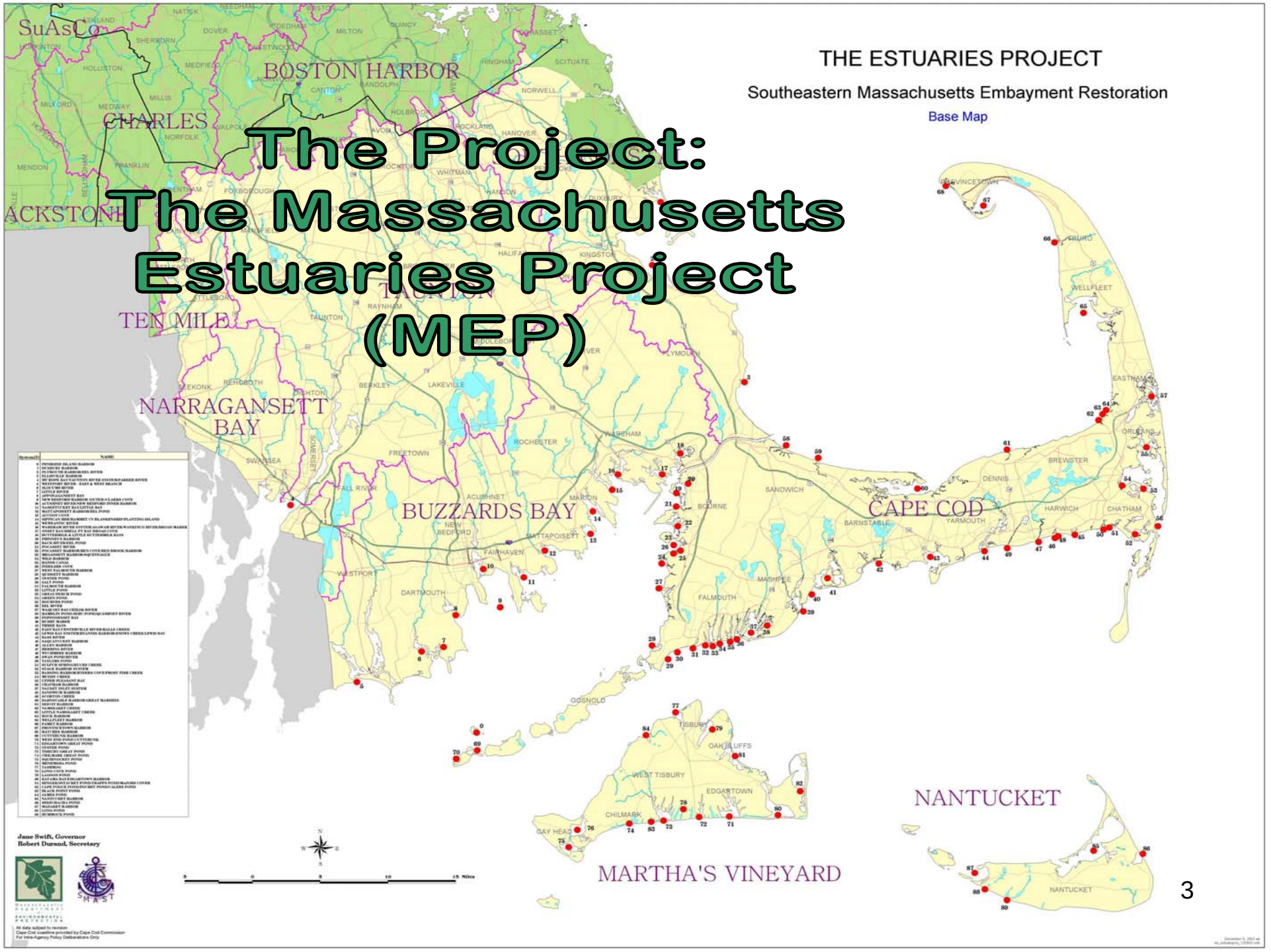
- Environmental and Social Impacts
- Project Scope/Size
- The "Players" Involved
- The Approach and Process Used

Institutional Structures & Mechanisms

- Internal Structure and Maximizing Internal Resources
  - Integration of Results into WQS and 303-d lists
- Use of External Resources (Local, State, Federal)

Implementation Approach

- Authority (Enforcement VS Voluntary Actions)
- Use of Models to Evaluate Solutions
- Use of Grant Programs (319, SRF)


THE ESTUARIES PROJECT
Southeastern Massachusetts Embayment Restoration
Base Map
The Project:
The Massachusetts
Estuaries Project
(MEP)
BOSTON HARBOR
CHARLES
TEN MILE
NARRAGANSETT
BAY
BUZZARDS BAY
CAPE COD
NANTUCKET
MARTHA'S VINEYARD
Jane Swift, Governor
Robert Durand, Secretary
SMAST

The Problem:

Declining coastal habitat quality due to

increased nitrogen loading resulting from

changes in watershed land uses

The Impact

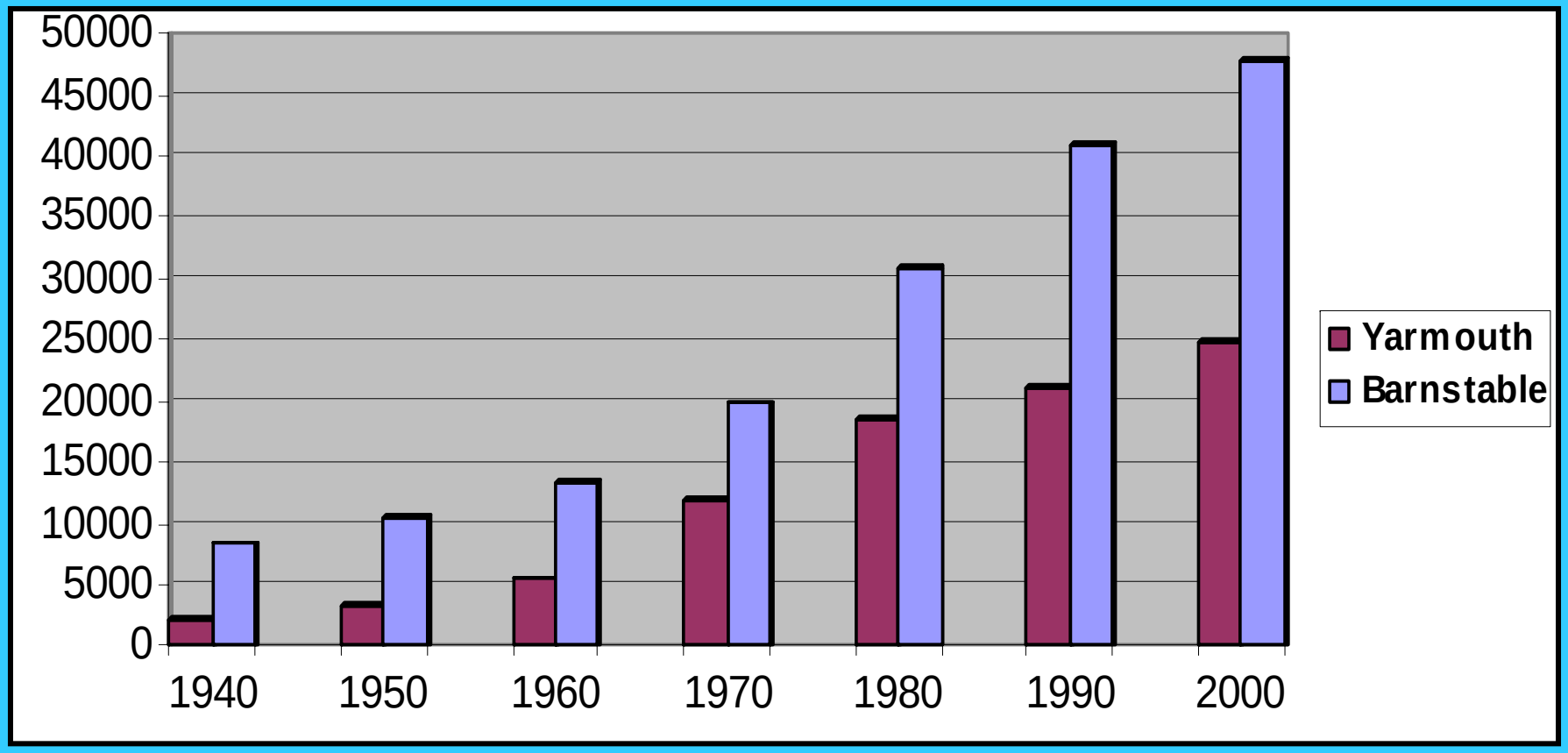
Environmental Impacts

- Loss of Eelgrass/ Increased Macro-algae
- Adverse Changes in Plant & Benthic Animal Diversity
- Algae Blooms
- Low Dissolved Oxygen
- Organic Enrichment of Sediments

Social Implications

Potential Economic Impact from Loss or Declining Tourism

"The Primary Reason" Population



MEP Goals:

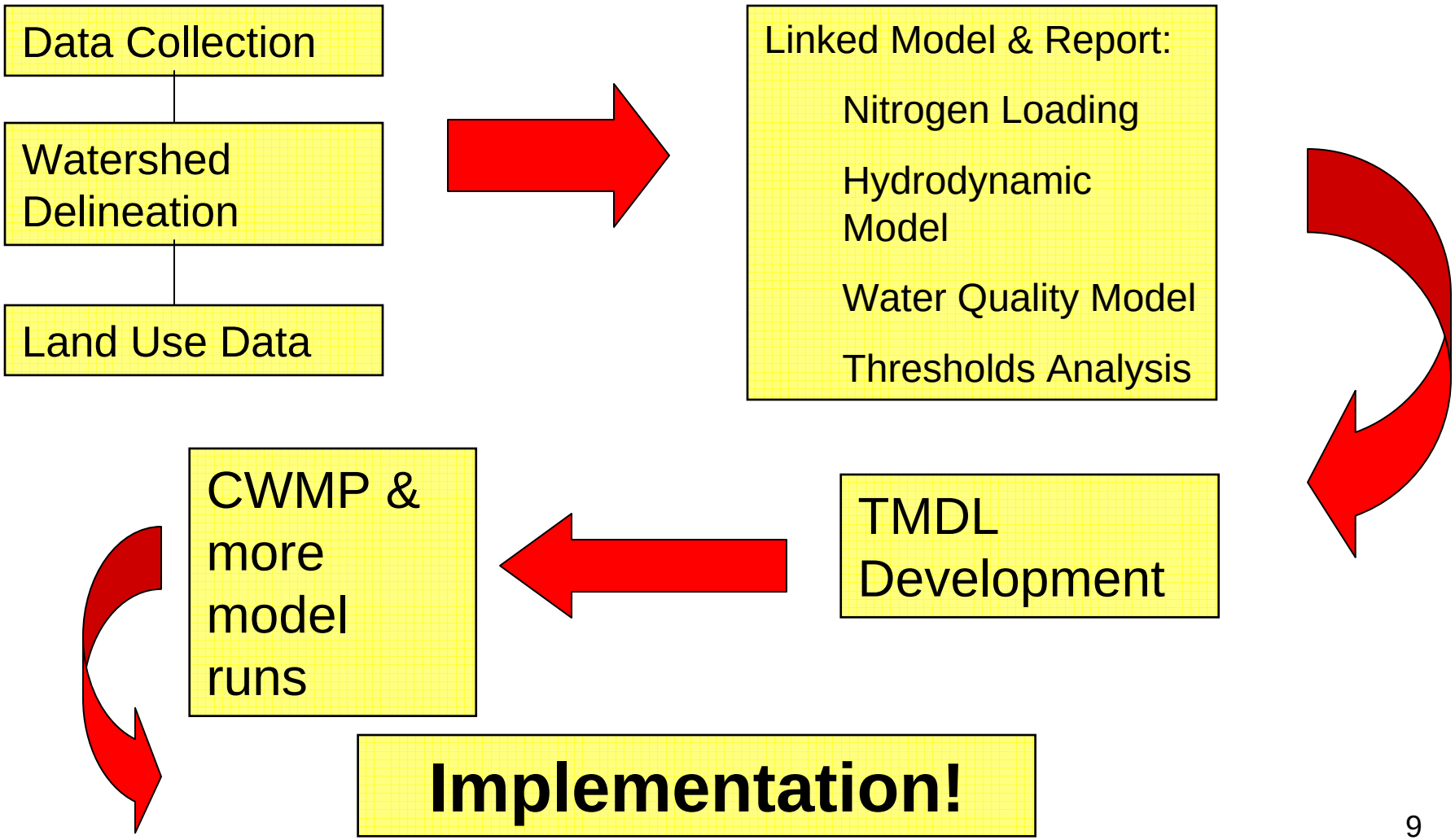
Nitrogen loading limits specific to individual estuarine systems in southeastern Massachusetts

Nitrogen management strategies

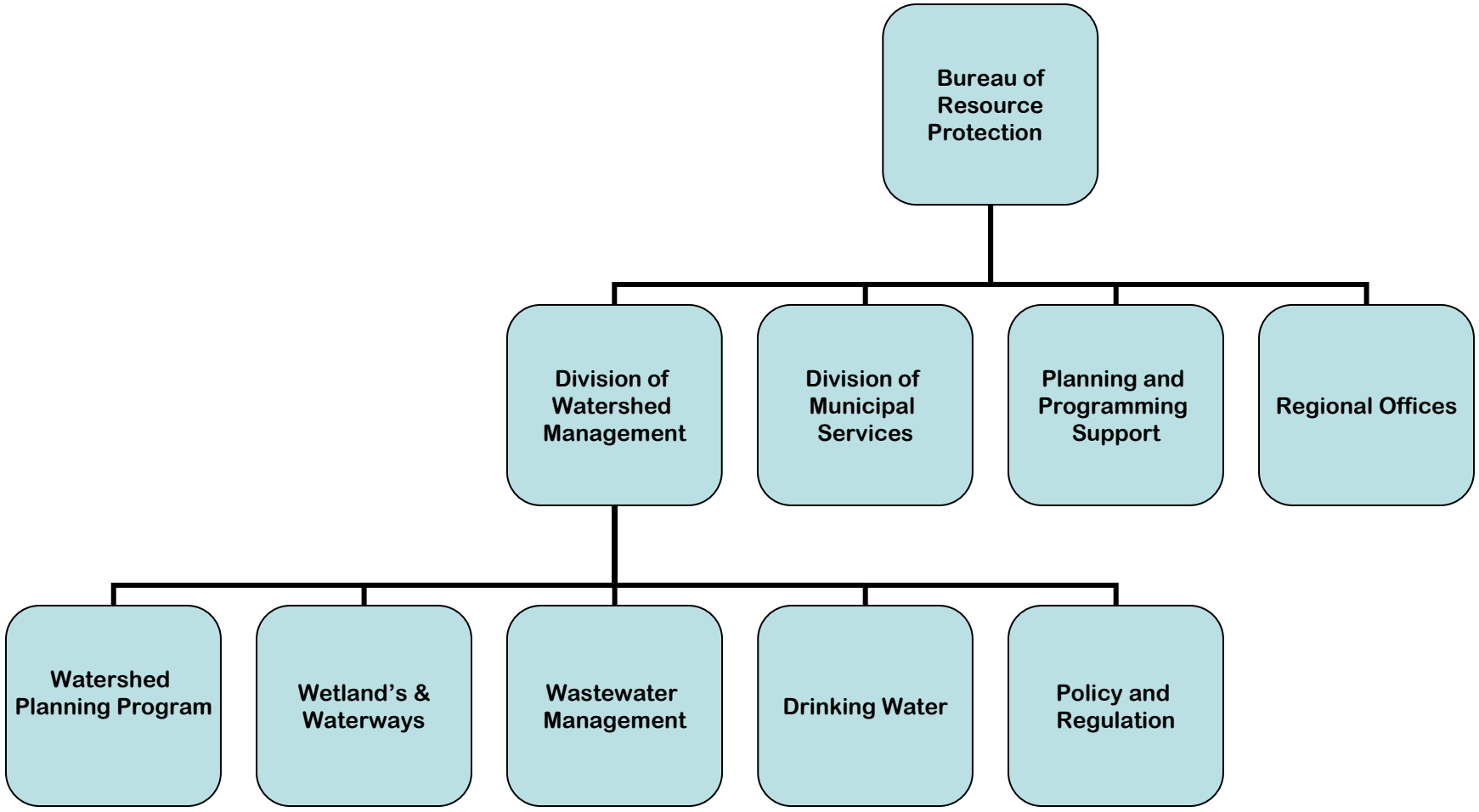
The Players:

- Towns
- MassDEP
- SMAST (UMASS-Dartmouth)
- Applied Coastal Research and Engineering, Inc.
- Cape Cod Commission
- USGS
- US EPA
- Mass Coastal Zone Management
- MA Division of Marine Fisheries

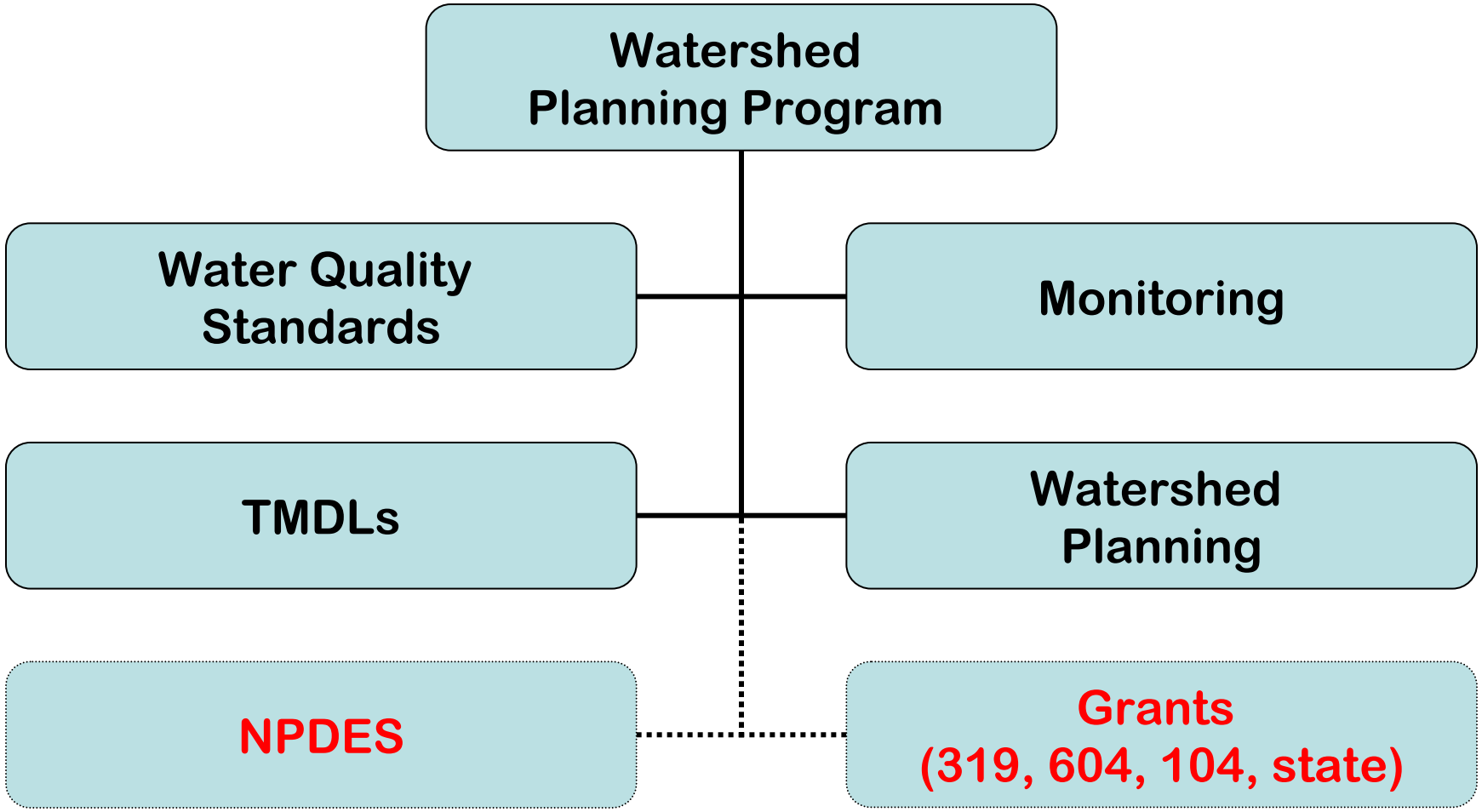
The Process


Data Collection
Watershed Delineation
Land Use Data
Linked Model & Report:
Nitrogen Loading
Hydrodynamic Model
Water Quality Model
Thresholds Analysis
TMDL Development
CWMP & more model runs
Implementation!

Maximizing Internal Resources "Structure"



Functional Design to Address both Point and Nonpoint Sources

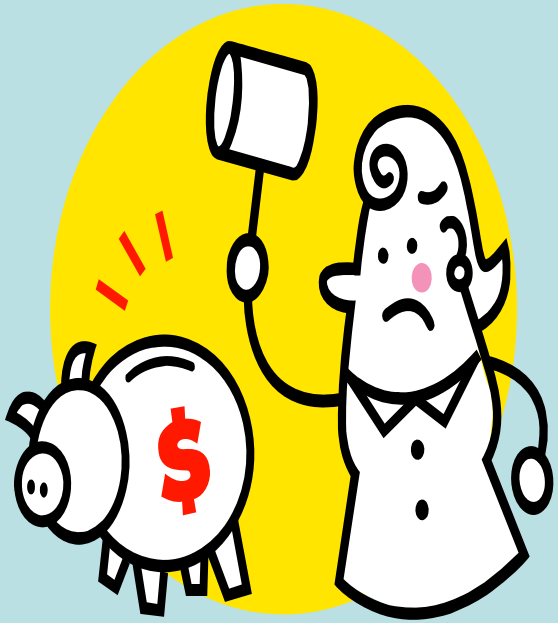


Maximizing External Resources

- Multiple Players
- Funding
  - Local/University Match (~50%)
  - Federal 319 to jump start
  - State Match (50%)
  - USGS match for groundwater evaluations
  - Cape Cod Planning Commission (GIS support)
  - Technical Analysis/TMDL Development (University & MassDEP)
  - CWMP (Towns)

Implementation Approach?

vs



Authority

Massachusetts Clean Waters Act, M.G.L. Chapter 21, §§26-53
(broad authority over point and non-point sources).

- **§26A defines "pollutant" as "any element or property of sewage, agricultural, industrial, or commercial waste, runoff, leachate, heated effluent, or other matter, in whatever form and whether originating at a point or major nonpoint source, which is or may be discharged, drained, or otherwise introduced into any sewage system, treatment works, or waters of the commonwealth".**

- **§ 27 places the duty and responsibility on the Department "to enhance the quality and value of water resources and to establish a program for prevention, control, and abatement of water pollution."**

- **§27(6) requires the Department to "[p]rescribe effluent limitations, permit programs and procedures applicable to the management and disposal of pollutants, including, where appropriate, prohibition of discharges."**

Authority

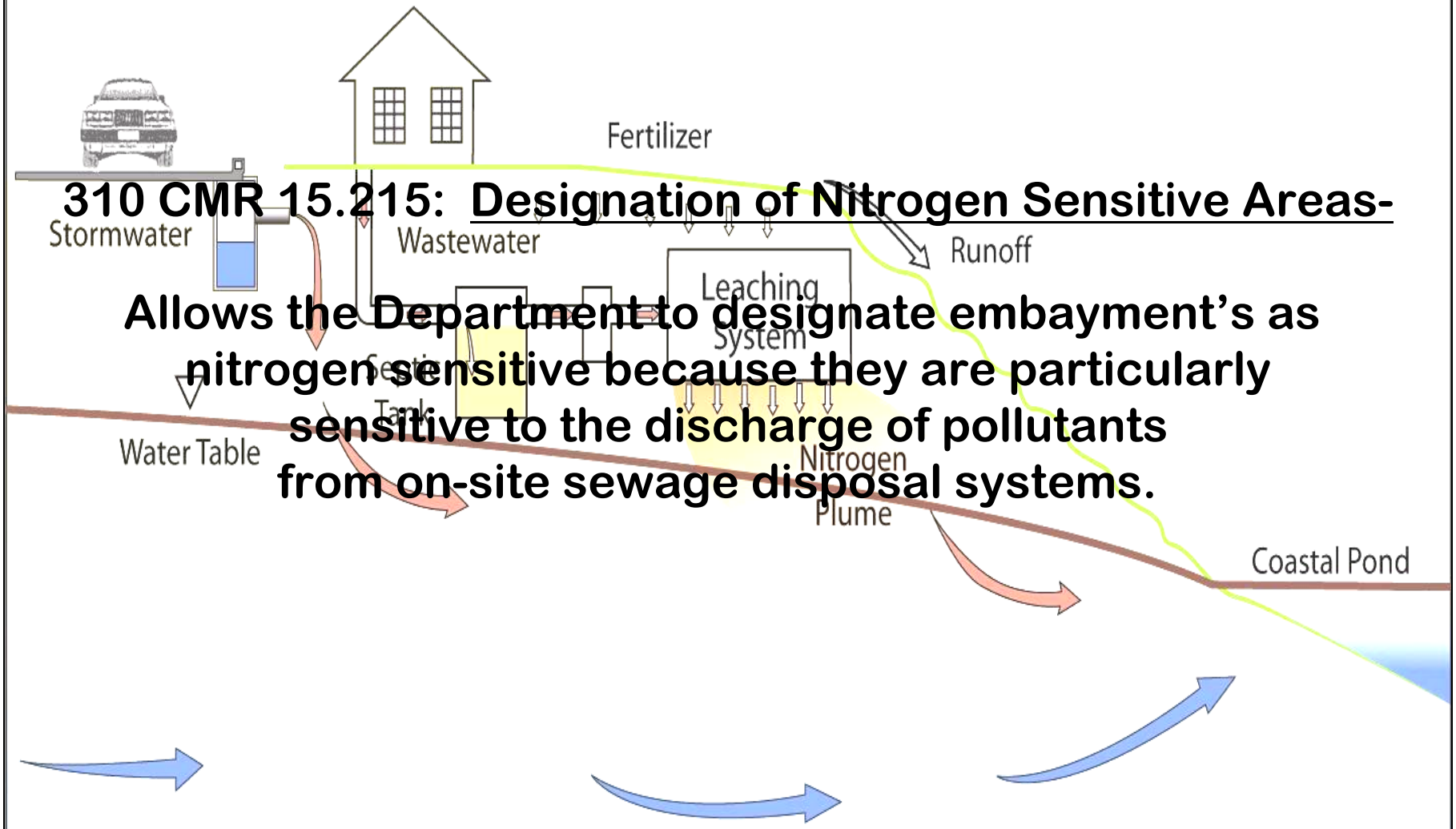
314 CMR 4.00 - MA Water Quality Standards (authority over point and non-point sources).

- 314 CMR 4.02 defines "pollutant" as "any element or property of sewage, agricultural, industrial, or commercial waste, runoff, leachate, heated effluent, or other matter in whatever form, and whether originating at a point or nonpoint source, that is or may be discharged, drained, or otherwise introduced into any sewage system, treatment works, or waters of the Commonwealth".

- 314 CMR 4.03 states that the Department will limit or prohibit discharges of pollutants to surface waters to assure that the quality of the receiving waters are protected and maintained or attained.

- Additionally, DEP in the last round of revisions included new provisions to the WQS to provide more explicit language to establish and enforce TMDL's.

The State Environmental Code, Title 5, 310 CMR 15.000



310 CMR 15.215: <u>Designation of Nitrogen Sensitive Areas-</u>

Allows the Department to designate embayment's as nitrogen sensitive because they are particularly sensitive to the discharge of pollutants from on-site sewage disposal systems.

Providing Necessary Tools to Assess Options

Conventional Approaches:

- Sewering
- Stormwater controls
- Fertilizer use reduction bylaws

Non-traditional Approaches:

- Improved flushing
- Enhance natural attenuation

Implementation Guidance

MassDEP has Developed an Implementation Guidance Manual

- Companion to technical reports
- Provides an overview of tools that can be used
- Looks at technical and institutional options

http://www.mass.gov/dep

Use of Grant/Loan Programs

- 319 Funding and process good for small projects and BMPs but not sufficient for projects of this magnitude.
-
- SRF only other vehicle but primarily designed for large scale point source projects.

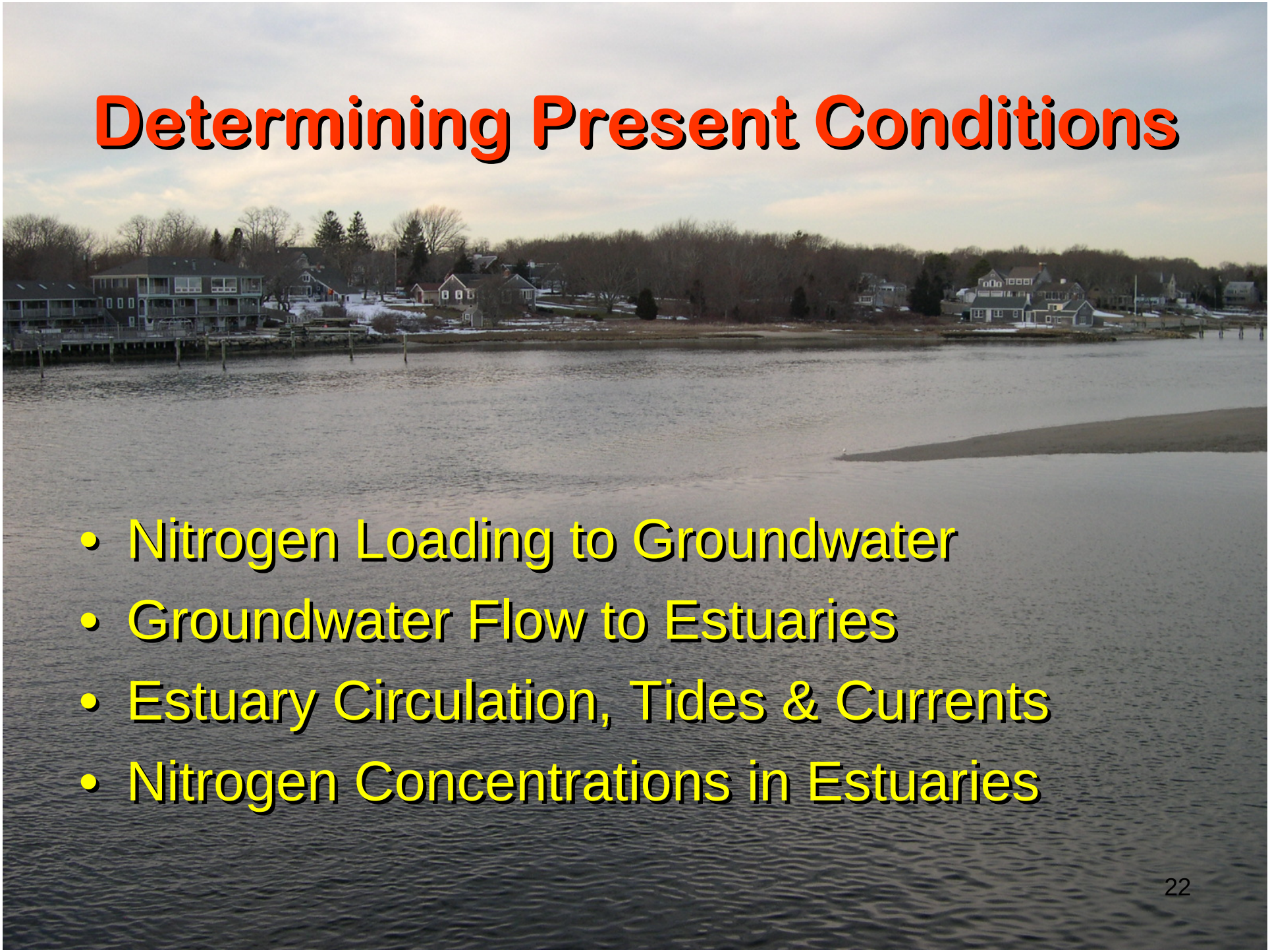
- Ranking system revised to emphasize 303d list, TMDL areas, or where watershed plans have been developed.


Questions?

Predicting Target Threshold Concentrations & Loads

- "Trial" nitrogen load applied to groundwater
- Groundwater nitrogen flows to estuaries
- Estuary circulation, tides, & currents
- Estuary nitrogen concentration is "Predicted"

Determining Present Conditions



- Nitrogen Loading to Groundwater
- Groundwater Flow to Estuaries
- Estuary Circulation, Tides & Currents
- Nitrogen Concentrations in Estuaries

Target Threshold Concentrations & Loads

N Concentration Targets are Linked to Restoration of:

- Chlorophyll
- Dissolved Oxygen
- Benthic Animals
- Eelgrass

Predicting Target Threshold Concentrations & Loads

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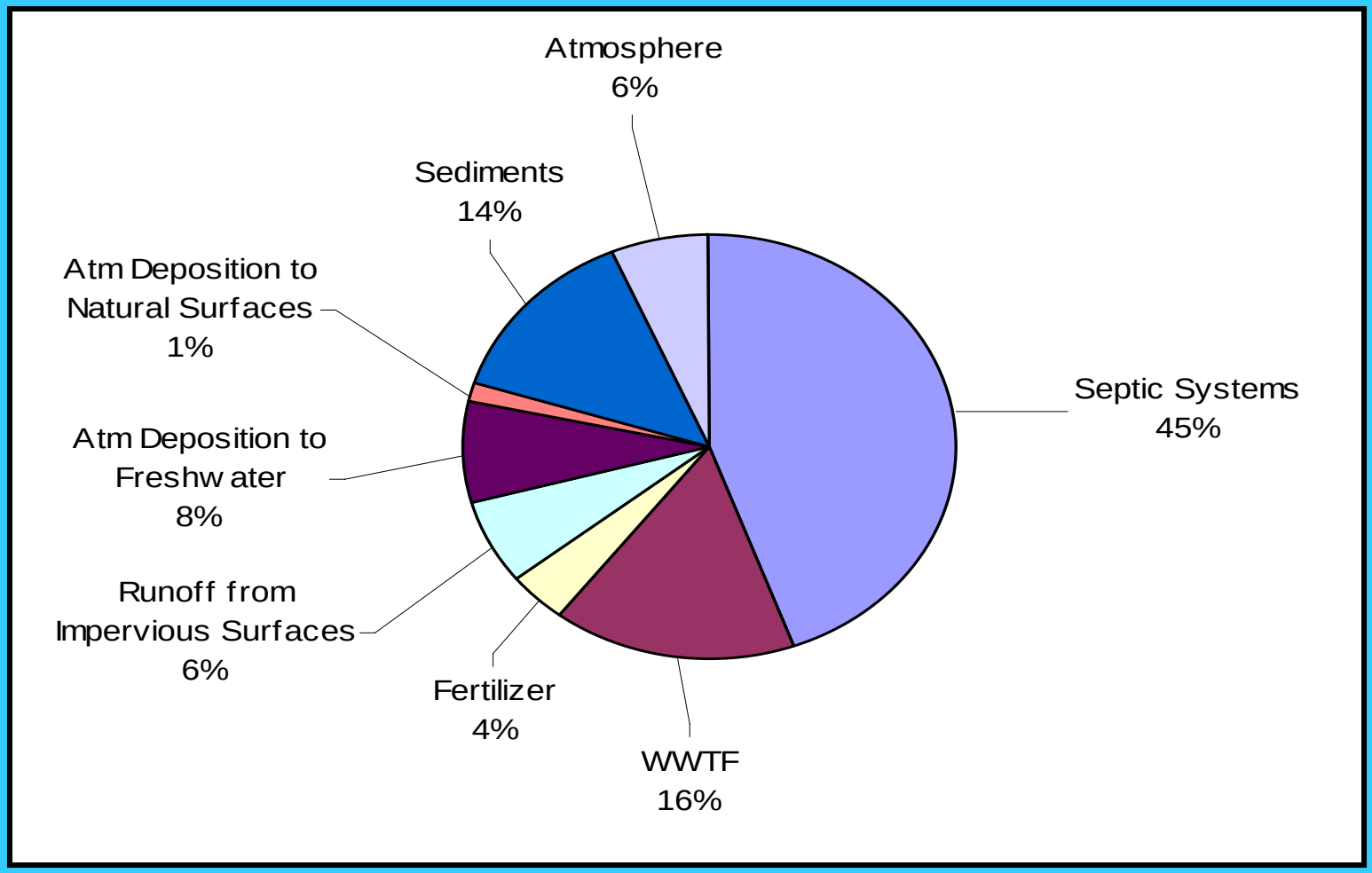
Comprehensive Wastewater Management Planning (CWMP)

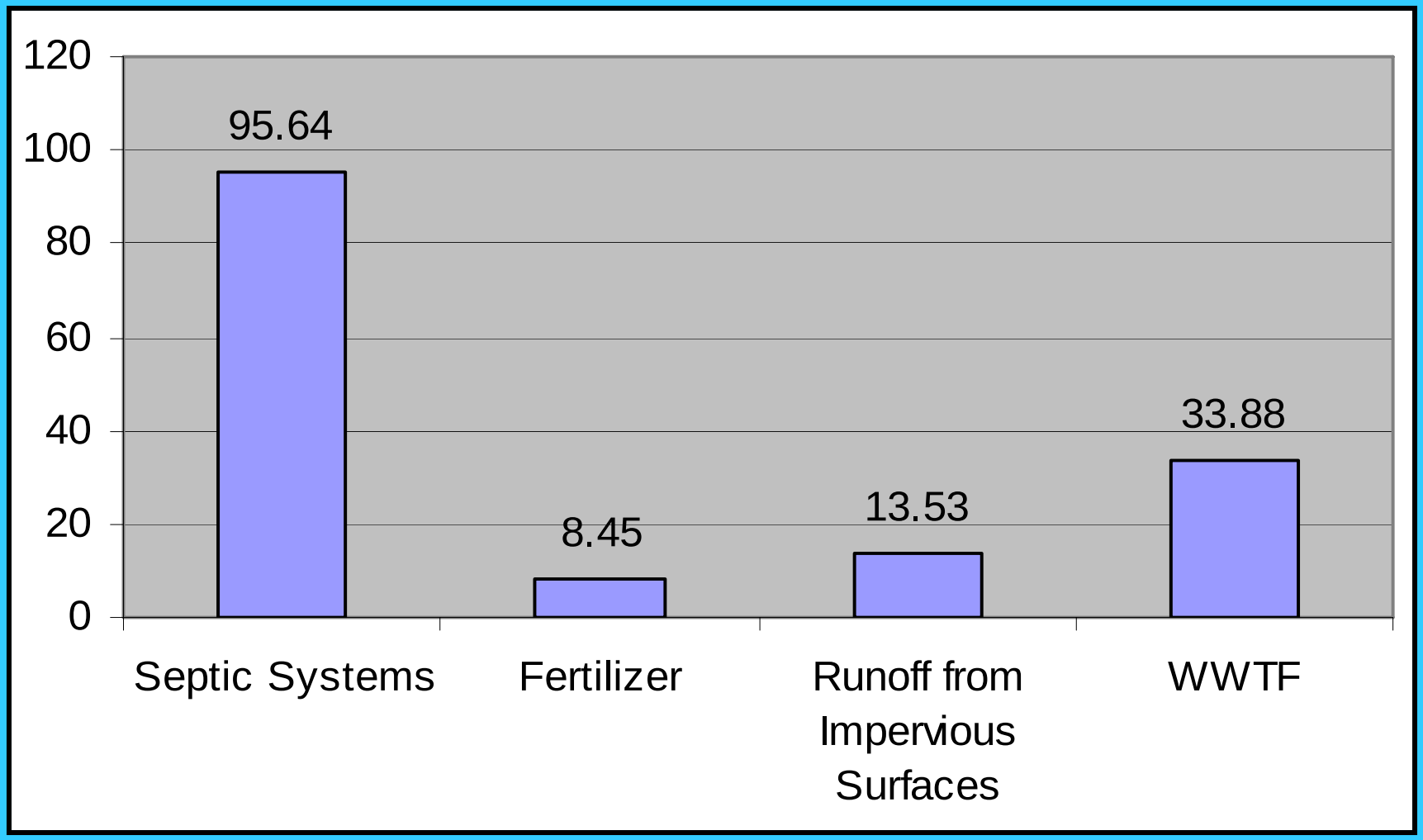
- Based on acceptable nitrogen loading
- Identifies wastewater management options
- Schedules implementation
- Watershed-wide approach


TMDLs for the
Lewis Bay System

Percent Total Nitrogen Loading



Controllable Nitrogen Load (kg/day)



Sediment Nitrogen

- Indirectly controlled by watershed nitrogen load
- A “pass through” from other sources
- Will return if other sources are not controlled

Observed Existing Nitrogen Concentrations and Target Threshold Concentrations for Lewis Bay

Embayment	Observed Nitrogen Concentration (mg/L)	Target Threshold Nitrogen Concentration (mg/L)
Hyannis Inner Harbor	0.43-0.60	
Snows Creek	1.57	
Lewis Bay	0.41	0.38
Stewarts Creek	1.25	
Uncle Roberts Cove	0.41	
Mill Creek	0.52-0.56	

Total Watershed Nitrogen Load, Target Load, and Percent Reduction Needed to Meet the Target Load

Embayment	Present Total Watershed Load (kg/day)	Target Threshold Watershed Load (kg/day)	Percent Load Reduction
Hyannis Inner Harbor	35.26	7.10	80%
Snows Creek	26.68	16.23	39%
Lewis Bay	70.37	9.66	86%
Stewart's Creek	58.72	31.20	31%
Uncle Roberts Cove	14.07	0.54	96%
Mill Creek	17.24	4.32	75%

Total Maximum Daily Load

Embayment	Target Threshold Watershed Load (kg/day)	Atmospheric Deposition (kg/day)	Load from Nutrient Rich Sediments (kg/day)	TMDL (kg/day)
Hyannis Inner Harbor	7.10	0.63	16.62	24.35
Snows Creek	9.66	-	0	16.23
Lewis Bay	31.20	0.24	0	31.44
Stewarts Creek	0.54	0.76	10.99	12.29
Uncle Roberts Cove	0.54	0.76	10.99	12.29
Mill Creek	4.32	0.63	0	4.95

Summary of Findings

- This water body has impaired water quality due to excessive nitrogen loading
- Watershed-wide solutions are needed
- Up to a 96% reduction is needed in present nitrogen loadings to Lewis Bay
- Title 5 alone is not adequate protection


Implementation

Implementation

- Watershed-wide focus
- Multiple Watersheds (Prioritize Efforts)
- “Technical” Approaches
- “Institutional” Approaches

Technical Approaches

- Enhanced Wastewater Treatment
- Storm Water Runoff Control & Treatment
- Flushing Enhancements
- Enhanced Groundwater Nitrogen Attenuation

Institutional Approaches

- Local Zoning (guided development)
- Bylaws
- Creative Financing
  - State Revolving Fund (SRF) Can Cover Planning & Construction
    - Centralized
    - I/A – if Part of the Overall Management Plan
- SRF Points for a Wastewater Management District

Questions/Comments on TMDL

By Friday (date XXXX time XXXX)

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