

# Three Decades of Monitoring and Assessment

Thomas J. Fredette

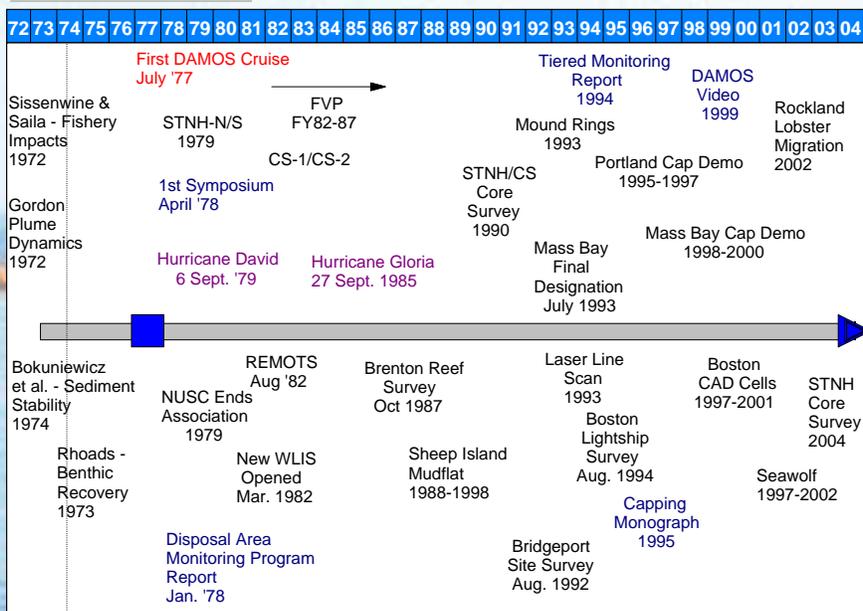


**US Army Corps of Engineers®**  
New England District

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Keywords: Disposal sites, monitoring, capping, recolonization, bathymetry

## DAMOS Timeline



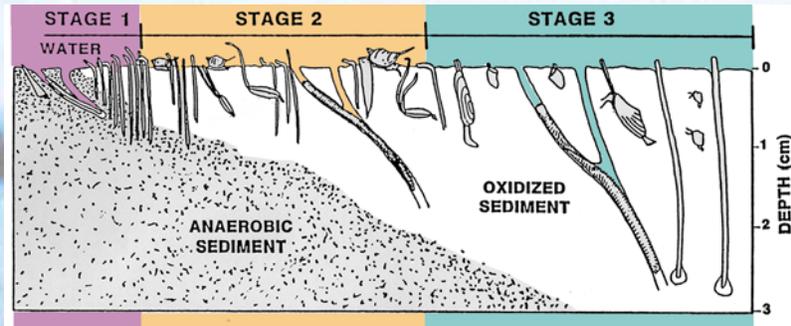
## HISTORICAL BACKGROUND

- Most dredged material disposal sites in New England established prior to the 1940s.
- Little knowledge of ecological impacts of disposal until 1970s and 1980s COE and NSF research in Long Island Sound.

## Historical View of Disposal Impact

- Disposal would have *lasting* negative local impacts similar to mine tailing areas (*spoil* areas) or with upland disposal of saline sediments

## THE COLONIZATION MODEL



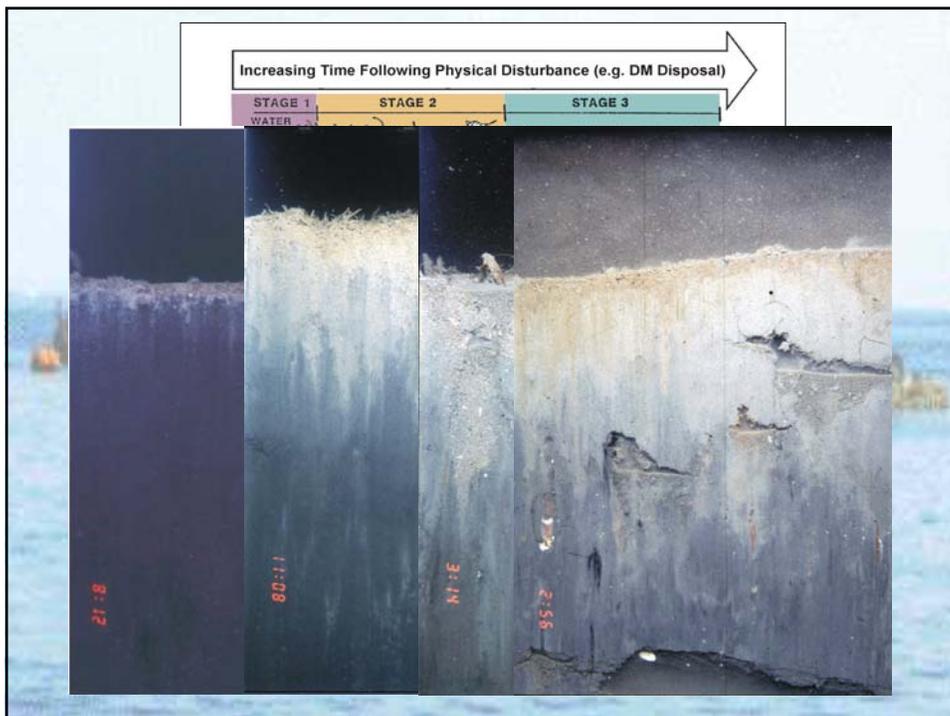
Time/Space: Immediate Post Disposal

Ambient Bottom or Several Years Post Disposal

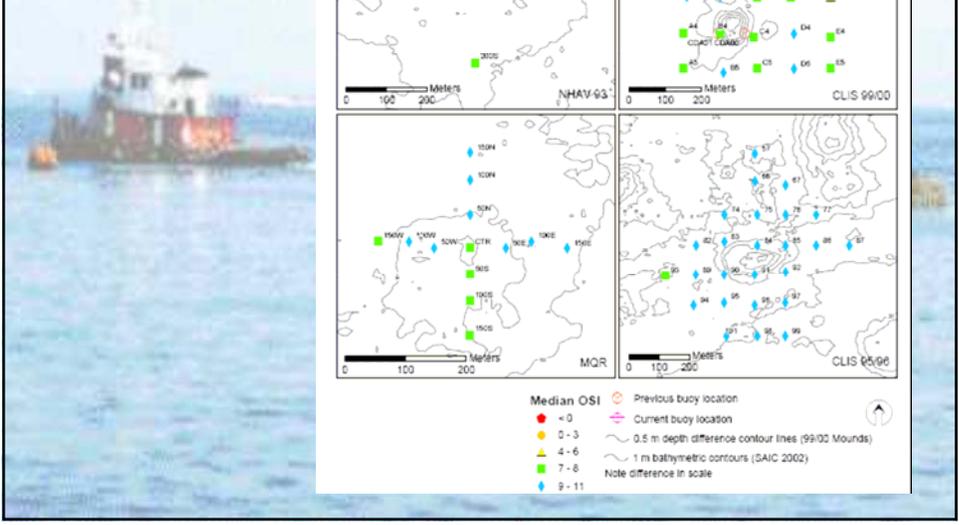
## RATES OF FAUNAL RECOVERY

- Initial faunal recovery of muddy dredged sediment is rapid (within weeks) - pioneering species.
- Mechanisms include larval settlement, immigration of swimming adults, and survival of adults covered by sediment (1 ft or less).
- Full recovery takes about two years.

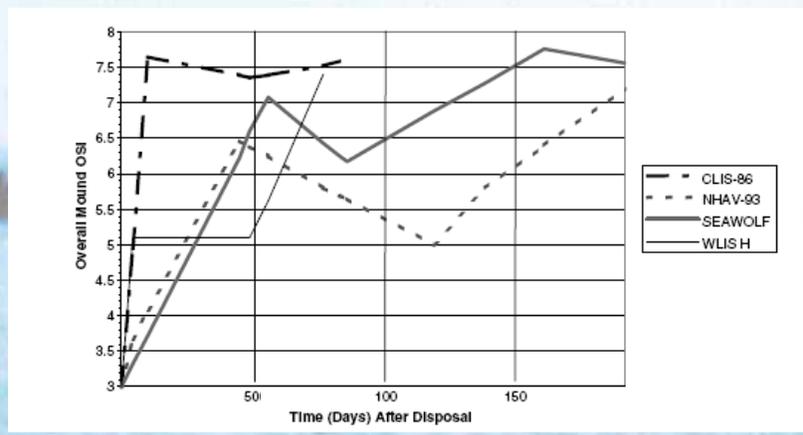
# SEDIMENT PROFILE CAMERA OPERATIONS

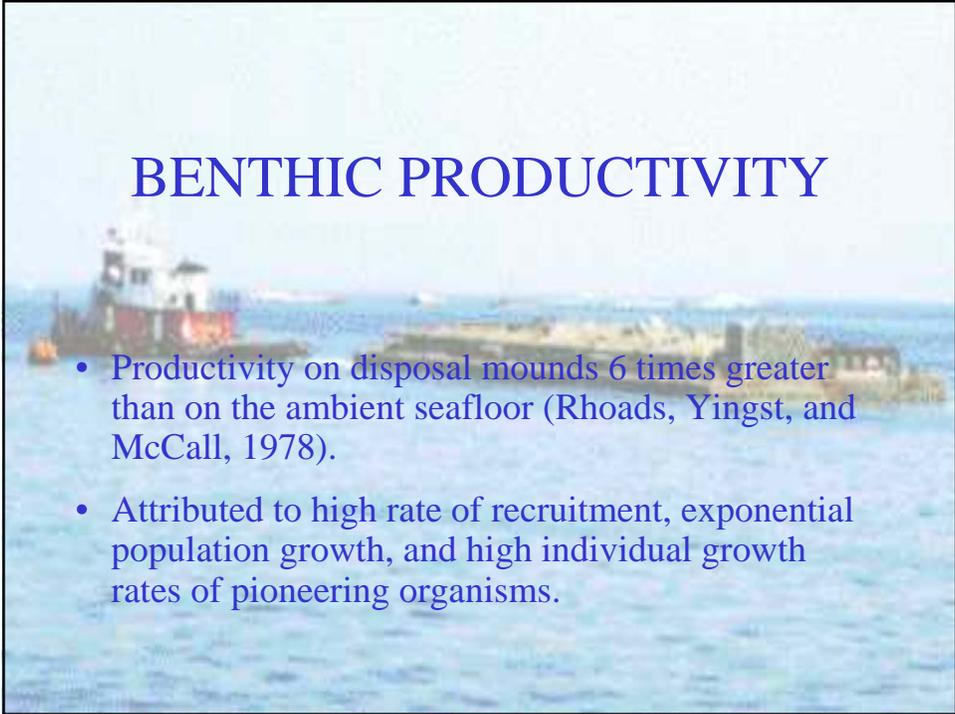


## Sediment Profile Station Arrays



## Mound Recolonization





## BENTHIC PRODUCTIVITY

- Productivity on disposal mounds 6 times greater than on the ambient seafloor (Rhoads, Yingst, and McCall, 1978).
- Attributed to high rate of recruitment, exponential population growth, and high individual growth rates of pioneering organisms.



## RESULTS

- **Faunal Succession**
  - The "universality" of successional model (Rhoads, Yingst, and McCall, 1978)
  - Validated by independent observations in Swedish and Scottish waters (Pearson and Rosenberg, 1976).

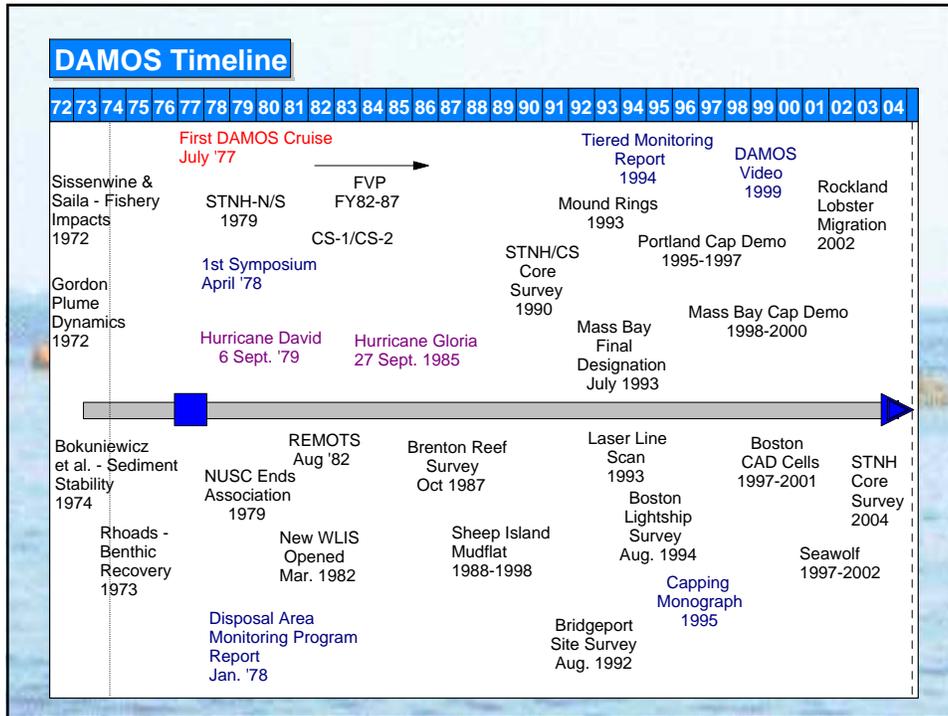
## WORLD-WIDE APPLICATION

- New England
- New York Mud Dump Site
- Gulf of Mexico
- US West Coast (CA, OR, WA)
- Canada
- New Zealand
- Hong Kong
- East China Sea
- Ireland
- France, Italy, etc.

## CONCLUSIONS

Technique allows integration of biological information with physical and chemical parameters observed in profile images.

Data products directly contribute to answering management questions related to environmental impact





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## Understanding the physical and environmental consequences of dredged material disposal: history in New England and current perspectives

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**Abstract**

Thirty-five years of research in New England indicates that ocean disposal of dredged material has minimal environmental impacts when carefully managed. This paper summarizes research efforts and resulting conclusions by the US Army Corps of Engineers, New England District, beginning with the Scientific Report Series and continuing with the Disposal Area Monitoring System (DAMOS). Using a tiered approach to monitoring and a wide range of tools, the DAMOS program has monitored short- and long-term physical and biological effects of disposal at designated disposal sites throughout New England waters. The DAMOS program has also helped develop new techniques for safe ocean disposal of contaminated sediments, including capping and confined aquatic disposal (CAD) cells. Monitoring conducted at many sites in New England and around the world has shown that impacts are typically near-field and short-term. Findings such as these need to be disseminated to the general public, whose perception of dredged material disposal is generally negative and is not strongly rooted in current science.

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*Keywords:* Dredged material; Environmental assessment; Monitoring; Management; New England

## Early Investigations

Table 1  
Selected SR reports and related publications

SR report number	SR report authors	Related publication
4	Sissenwine and Salla (1973)	Sissenwine and Salla (1974)
7	Gordon et al. (1972)	Rhoads (1976)
8	Bokuniewicz et al. (1974)	Bokuniewicz and Gordon (1979, 1980)
12	Fisher and McCall (1973)	McCall (1976)
16	Rhoads (1974a)	Rhoads et al. (1978)
19	Gordon (1973)	Gordon (1974)
21	Bohlen and Tramontano (1974a)	Bohlen et al. (1979)
22	Bohlen and Tramontano (1974b)	Tramontano and Bohlen (1982)
23	Nalswalk et al. (1974)	Paskausky et al. (1974c)
24	Paskausky et al. (1974b)	Paskausky et al. (1974c)
25	Paskausky et al. (1974a)	Paskausky et al. (1974c)
43	Rhoads et al. (1975)	Rhoads et al. (1977)
50	Bokuniewicz et al. (1976)	Bokuniewicz and Gordon (1980)
51	Rhoads and Yingst (1976)	Rhoads et al. (1978), Yingst and Rhoads (1978)
57	Morton (1980)	Morton (1983, 1988)

## Plume Dynamics

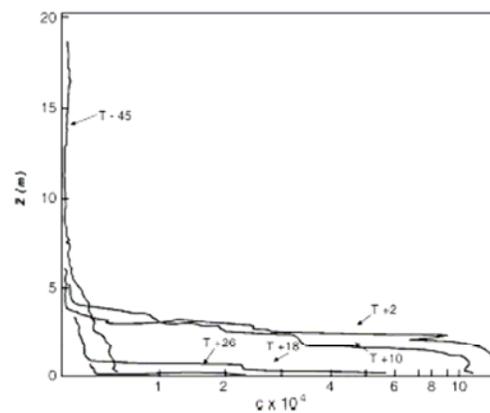


Fig. 1. Example of successive sediment concentration profiles in the water column before ( $T - 45$ ) and after barge disposal used to estimate plume losses.  $T$ , time in minutes;  $z$ , height in m above seafloor;  $c$ , concentration in weight fraction. Redrawn from Gordon (1974).

## Mussel Contaminant Accumulation

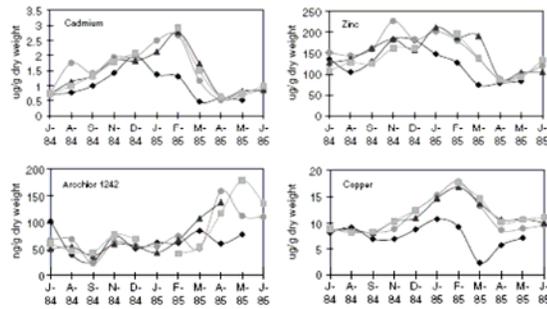
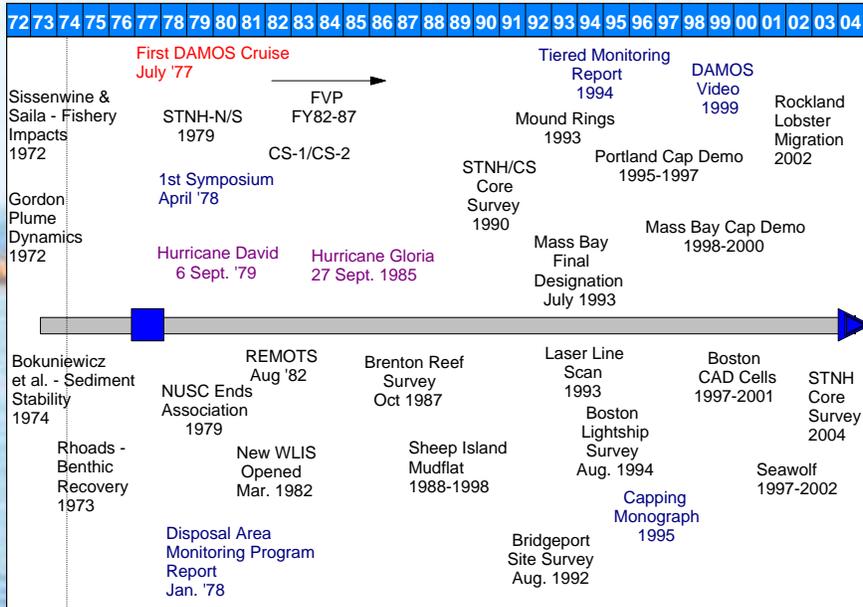


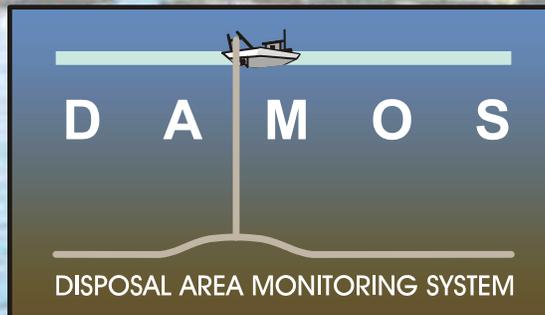
Fig. 3. Contaminant levels (cadmium, zinc, arochlor 1242, and copper) in *Mytilus edulis* tissue before and during disposal at four different locations. ▲ Near disposal mound, ■ 500 m west of mound, ● Nearby reference, ◆ Distant reference. Disposal occurred from January to June 1985. Based on data in Feng (1988).

## DAMOS Timeline



# Disposal Area Monitoring System

## DAMOS



## DAMOS OBJECTIVES

(1979)

- Monitor sites to ensure no unacceptable impacts
- Develop management techniques to minimize impacts
- Improve understanding of processes and mechanisms
- Develop understanding of organism/sediment relations
- Distribute results to improve public understanding of effects

## DAMOS ACTIVITES

### Monitoring

Periodic Site Surveys

Post-storm Surveys

### Management Technique Development

Confinement Berms

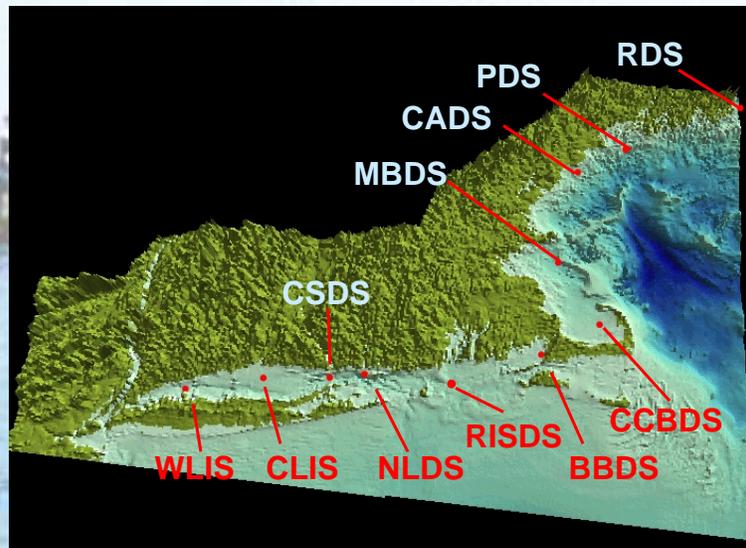
CAD Cells

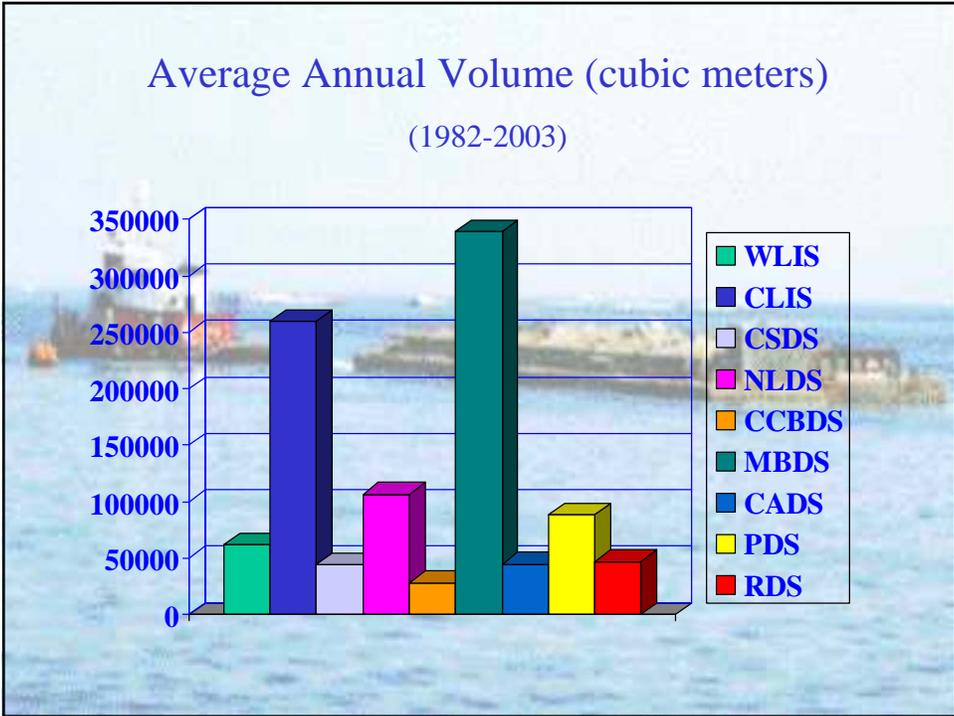
### Monitoring Technique Development

Laser Line Scan

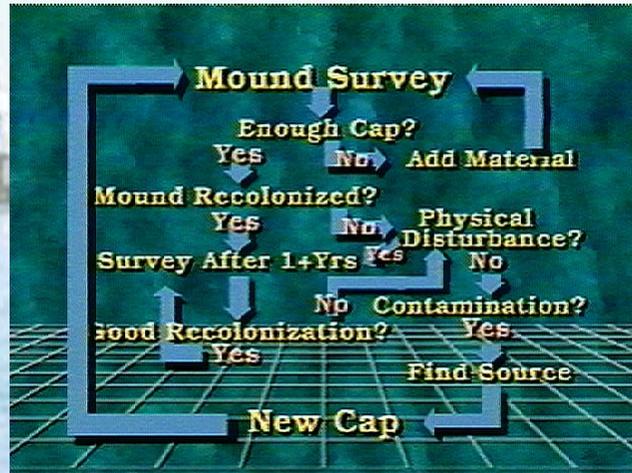
Sub-bottom Profiling

## NEW ENGLAND DISPOSAL SITES

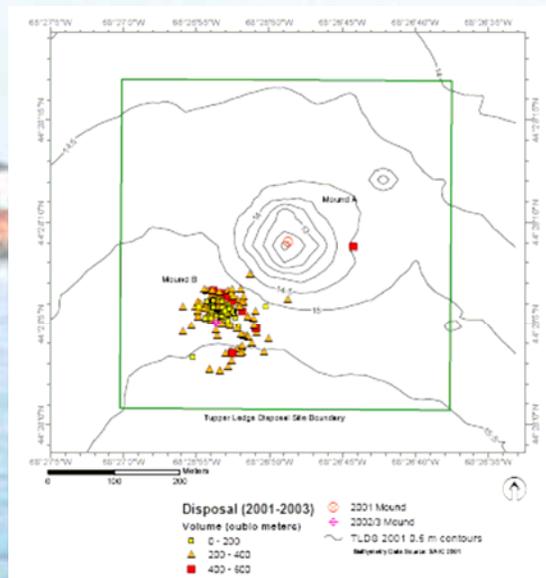




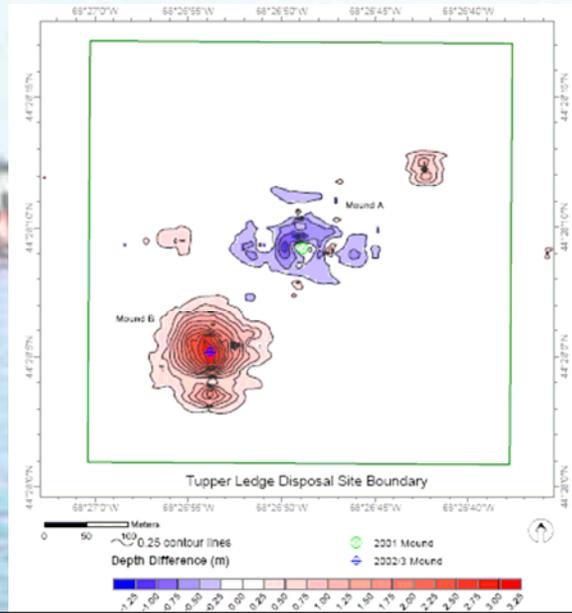
## TIERED MONITORING



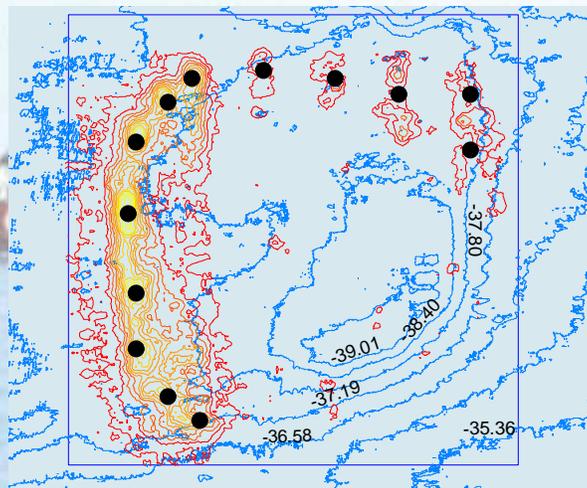
## Disposal Management



## Disposal Mound Changes



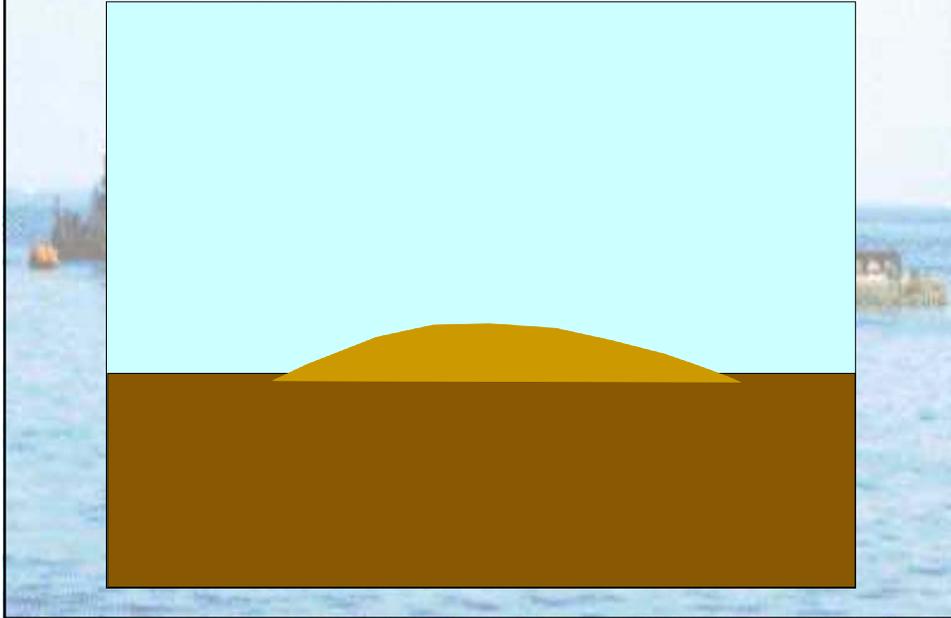
## Bathymetric Changes at Rhode Island Sound Site



Site 1 nautical mile square

Depths in meters ● Targeted Disposal Point

## Level Bottom Capping

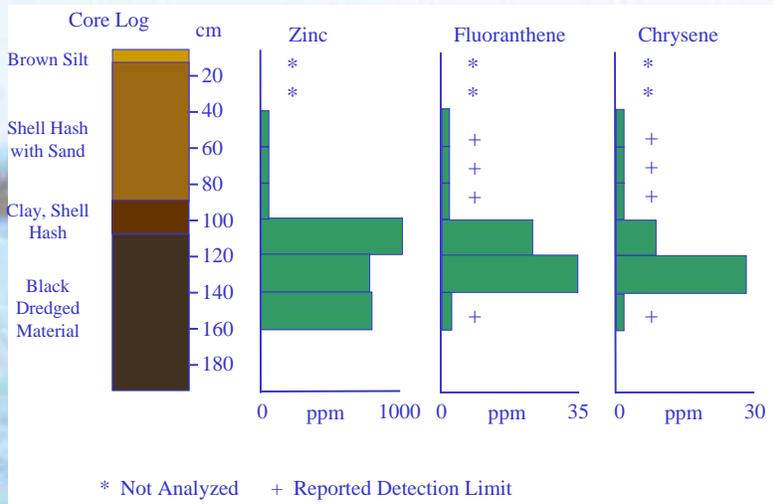


## Coring



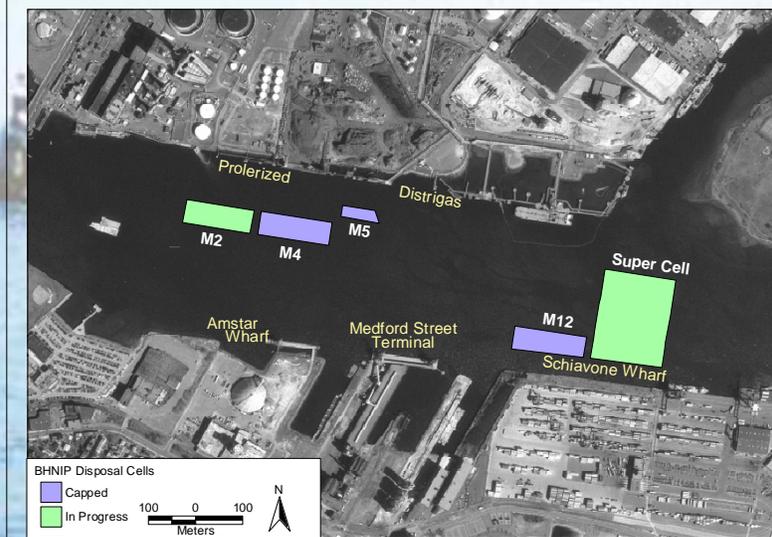
## Capped Mound Core Contaminant Distribution

11 Years Post-Capping



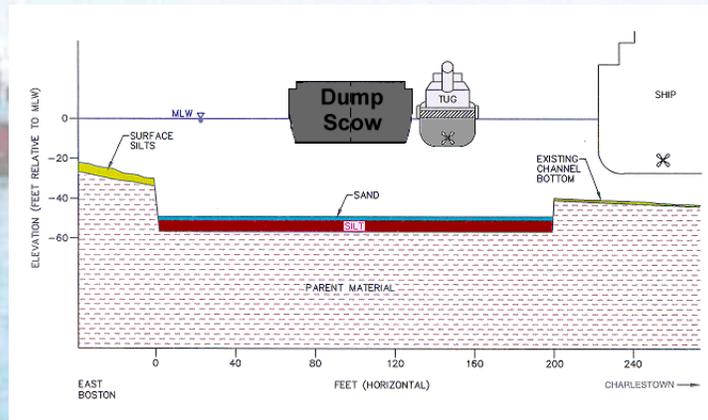
STNH-N Center 1990

## CONFINED AQUATIC DISPOSAL CELLS: PHASE 2



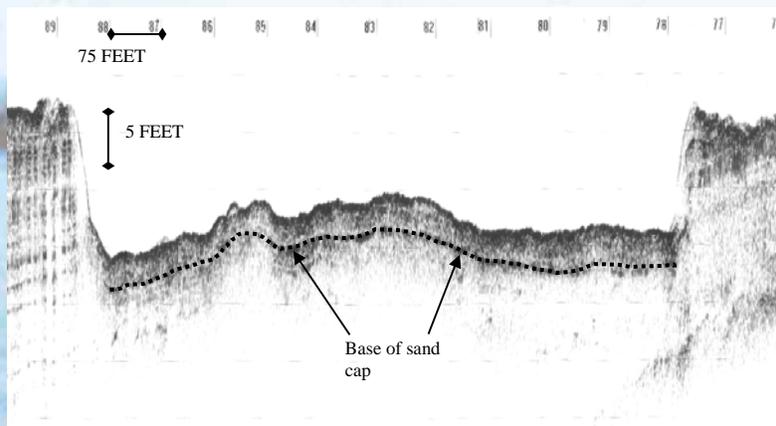
Source: MassGIS / MIT Digital Orthophotos 2.0m pixel resolution, <http://ortho.mit.edu/nsd/index.html>

# SCHEMATIC OF CAD CELL



Courtesy of ENSR

# SUB-BOTTOM PROFILING



# DAMOS Conclusions



Environmental Health of Sites

Site Stability

Chemical Isolation

Sediment Evaluation Assessment

Management Technique Development

**DAMOS**  
DEPOSAL AREA MONITORING SYSTEM

**DAMOS Products**

- Software Interface:** A screenshot of the DAMOS software interface showing the title "DAMOS Disposal Area Monitoring System" and a description of the system's capabilities.
- Report Cover:** A cover for the "Final Reports Contributions 124 - 150 February 2004" published by the US Army Corps of Engineers. The cover features the DAMOS logo and a photograph of a disposal site.
- Technical Drawing:** A technical drawing titled "Disposal Area Monitoring System DAMOS" showing a cross-section of a disposal site with various monitoring points and equipment.
- Book Cover:** A book cover titled "Minimizing the Risk THE STORY of DAMOS" published by the US Army Corps of Engineers. The cover features a photograph of a disposal site and the DAMOS logo.

DAMOS Symposium 2005 - Microsoft Internet Explorer



US Army Corps of Engineers®  
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# DAMOS Symposium 2005



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**Symposium Links**

Brochure (coming soon)

Agenda (coming soon)

[Registration Form \(Word\)](#)

[Registration Form \(PDF\)](#)

[Directions](#)

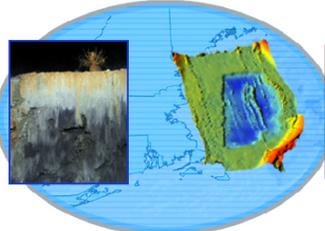
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**Date:**  
June 9, 2005

**Time:**  
8:00am - 5:00pm

**Location:**  
**Connecticut College**  
Blaustein Humanities Center  
New London, Connecticut

**Registration Deadline:**  
May 31, 2005

**Registration Fee:**  
\$45.00

This symposium will provide an opportunity to learn about and discuss recent DAMOS program results, emerging surveying and data processing technologies, and the current status of New England dredged material disposal issues.



# D A M O S

DISPOSAL AREA MONITORING SYSTEM



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New England District

www.nae.usace.army.mil/environment/damos1.htm