Benthic Community Science

Case Example: Discovery to Management

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BOEM Science Day

Consortium for Ocean Leadership

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Environmental Studies Program

- Develops and oversees applied scientific studies required for making responsible decisions for managing energy and marine mineral resources on the U.S. Outer Continental Shelf

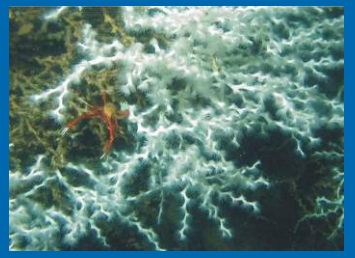
BOEM
Bureau of Ocean Energy Management

Applied Science for Informed Decisions on Ocean Energy

Areas of management concern:
..Benthic communities an issue everywhere..

Pacific

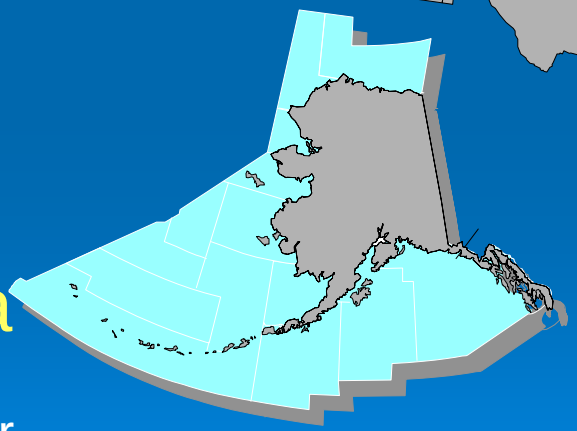
Developed/
Producing
Leases
Renewable Energy



Atlantic

Sand and Gravel
Renewable Energy
Potential New Leasing

Alaska



Northstar
Beaufort Sea & Chukchi Sea Leasing

Gulf of Mexico

Deepwater
Active Leasing
Sand and Gravel

Why Do We Care?

- Protection of the environment; mandated by legislation
  - Outer Continental Shelf Lands Act and many others.
- Protecting the environment explicitly stated as part of BOEM mission
- Ecosystem Services
- The Unknown: We just don't know how valuable it is

Study Process Example

- Overview and example highlighting series of ESP studies
- Adaptive management approach (and challenges) and the need for sound science
- How science information is used

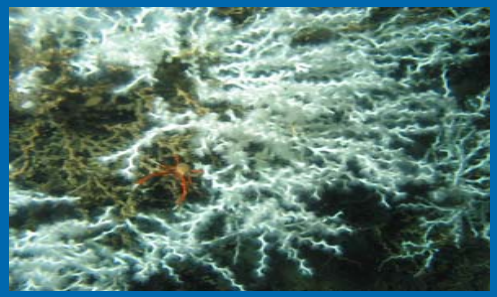
Sequential Decision Making

Adaptive Management Approach

- Discovery of sensitive resource
- Evaluation of impacting sources
- Establish initial avoidance criteria
- Launch of resource studies
- Refinement of avoidance policy
- Study of impacts
- Additional resource discovery and resource studies
- Additional refinement and implementation of avoidance policy
- Monitoring (next step)

Two Important Types of Sensitive Biological Communities in the Deep Gulf of Mexico

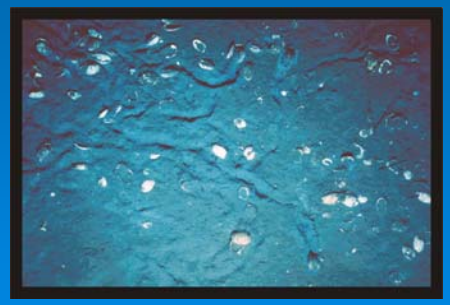
Chemosynthetic Communities



Deepwater Corals

What are chemosynthetic communities?

Three major chemosynthetic animal groups



Clams

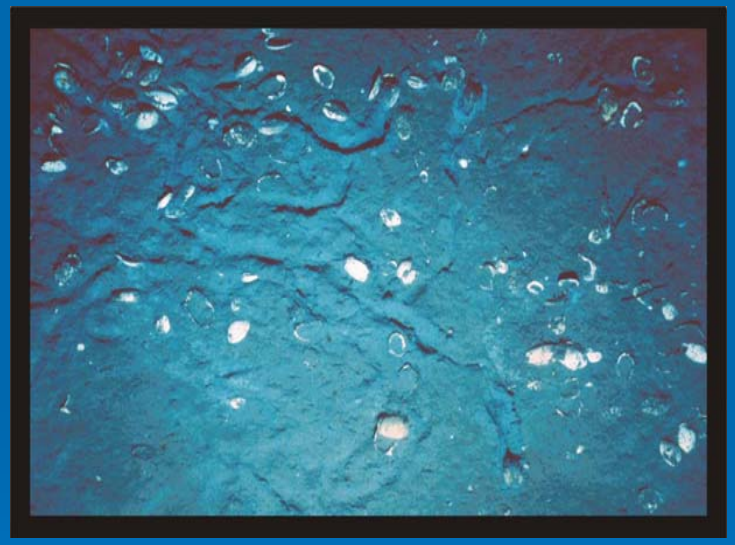
Tube worms

Mussels

Discovery: Central GOM

Challenge of discovery, much like space exploration

BOEM-funded Northern Gulf of Mexico Continental Slope Study

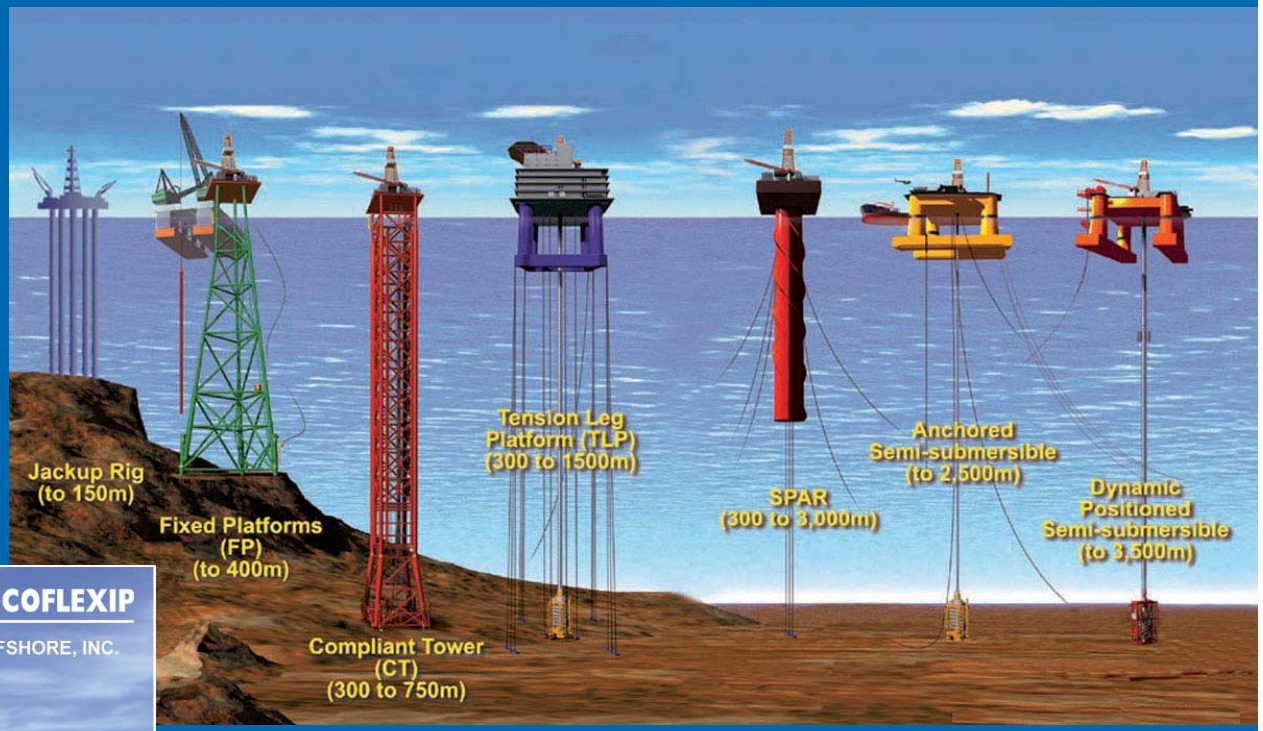


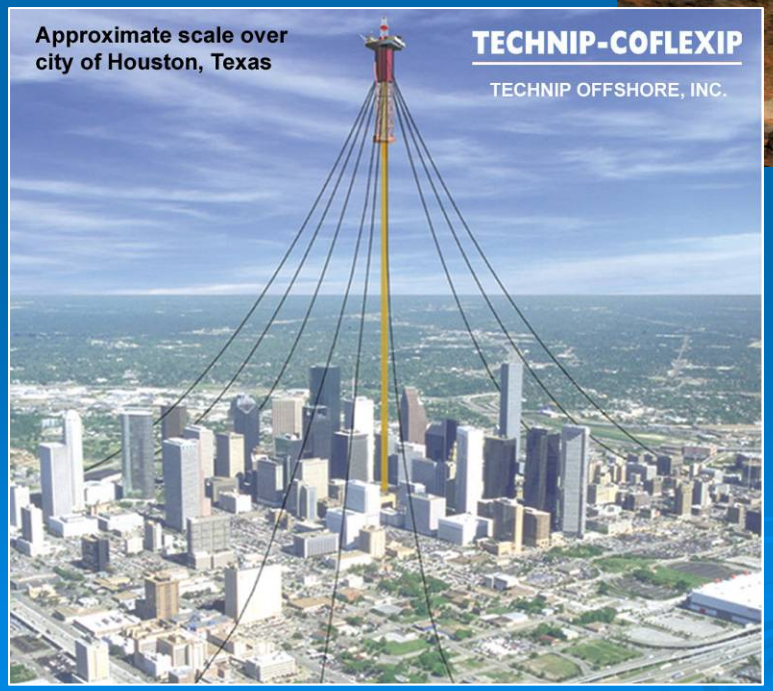
Chemosynthetic clams

Chemosynthetic tube worms

Images from camera sled November 1984:
first evidence in northern Gulf of Mexico

Sources of Impacts: Initial concern; Platforms





HORN MOUNTAIN

Initial Protection and Study

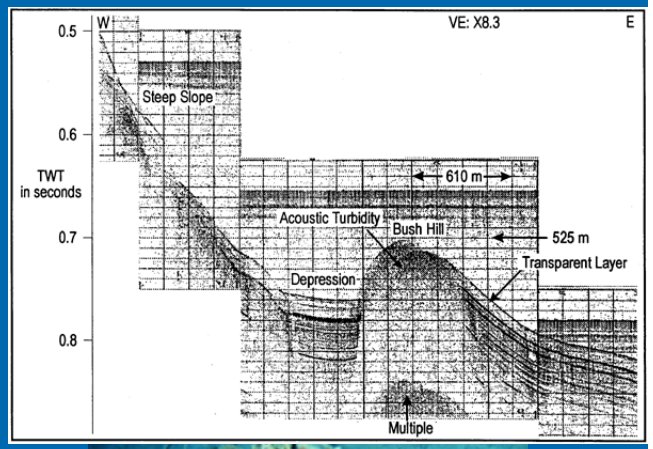
- Soon after the discovery, significance recognized by Bureau requiring protection and further study
- Short-notice policy actions - implemented by Notice to Lessees (NTL's)*.
  - Backed by Code of Federal Regulations Title 40 Protection of the Environment
    Title 30 Mineral Resources

- **First regulatory protection: NTL 88-11 Simple avoidance of physical impact**

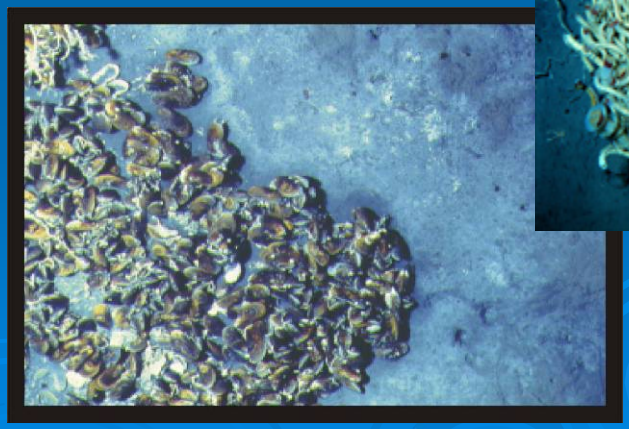
***An NTL or Notice to Lessees supplements regulations that govern operations on the Outer Continental Shelf (OCS) and provide clarification or interpretation of regulations and required guidance to lessees and operators in the conduct of their operations.**

Challenge:
How rare and how old?

Contract modification of ongoing ESP project adding submersible cruise



First sub dive,
September 27, 1986
Discovery of "Bush Hill"



Northern Gulf of Mexico Continental Slope Study
MMS 88-0052, -0053, -0054; MMS 1986-0089, -0090, -0091; MMS 1985 -0058, -0070

Two dedicated chemosynthetic community studies followed

- Chemo I *Chemosynthetic Ecosystem Study*
  - Texas A&M University
- Chemo II *Stability and Change in Gulf of Mexico Chemosynthetic Communities*
  - Texas A&M University

Stained tube worm to measure growth

- Sensitivity to impacts, longevity and growth rates

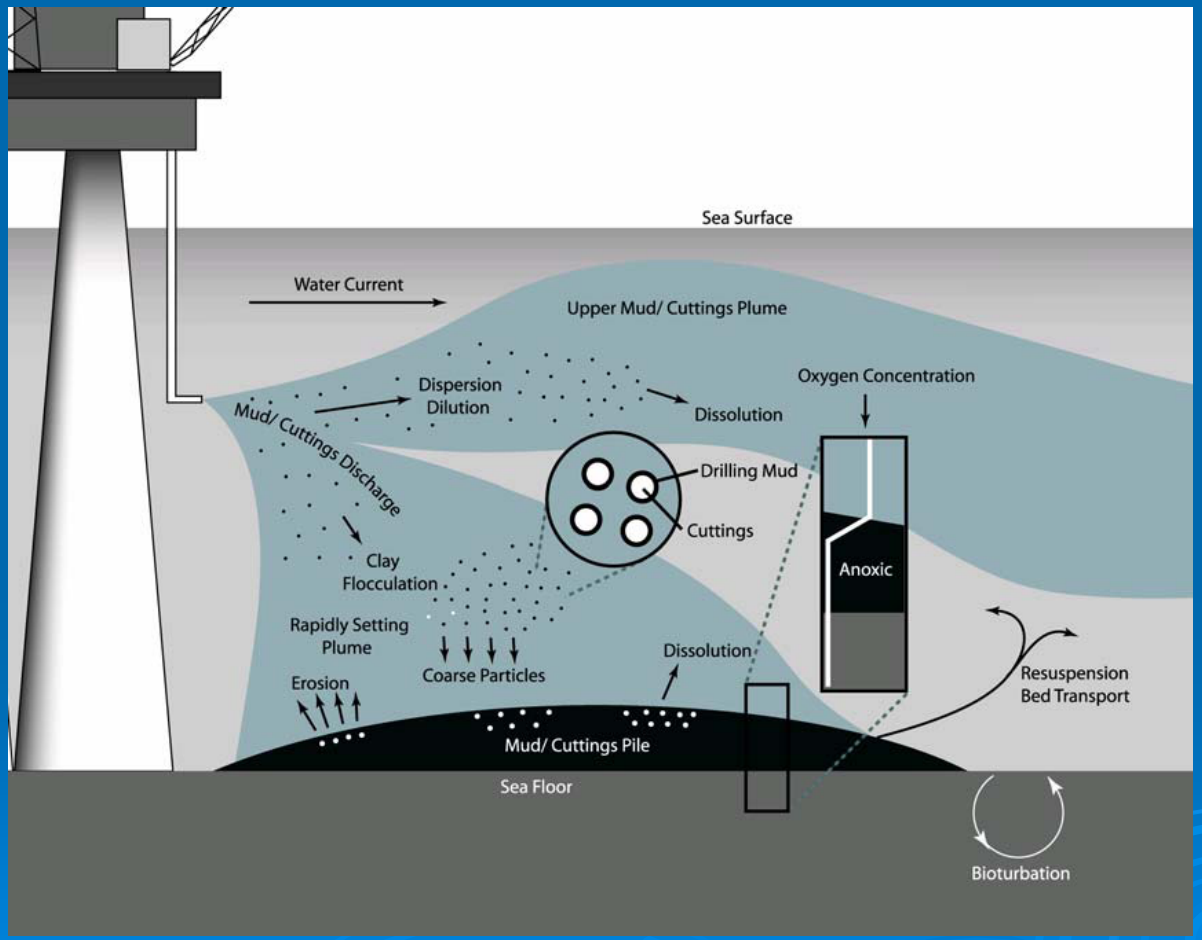
- ***New*** NTL regulatory policy resulted from these studies:

NTL 2000 G20 **Deepwater Chemosynthetic Communities**

- 1,000 foot avoidance for muds and cuttings
- 250 foot avoidance for anchors and templates

MMS-95-0022; MMS-2002-036

Challenge:
How far do discharge impacts reach?



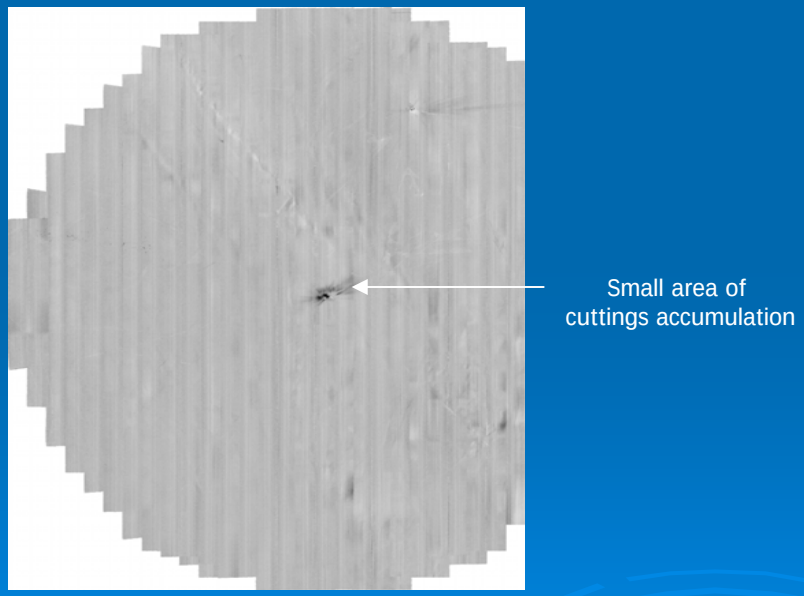
Knowledge gap from shelf studies (GOOMEX, etc) to deepwater

Study designed to address this challenge

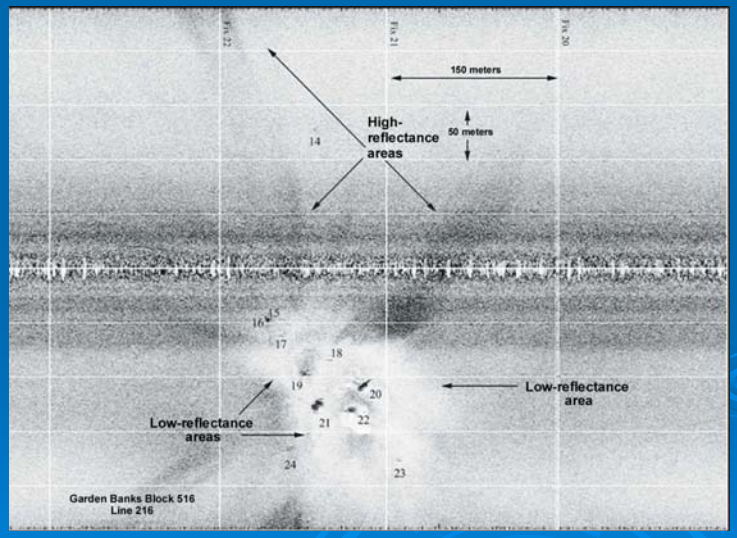
Study: *Effects of Oil and Gas Exploration and Development at Selected Continental Slope Sites in the Gulf of Mexico* (initiated 1999)

Strongly oriented to physical impacts:

- Anchor and cable contact
- Drill cuttings dispersal

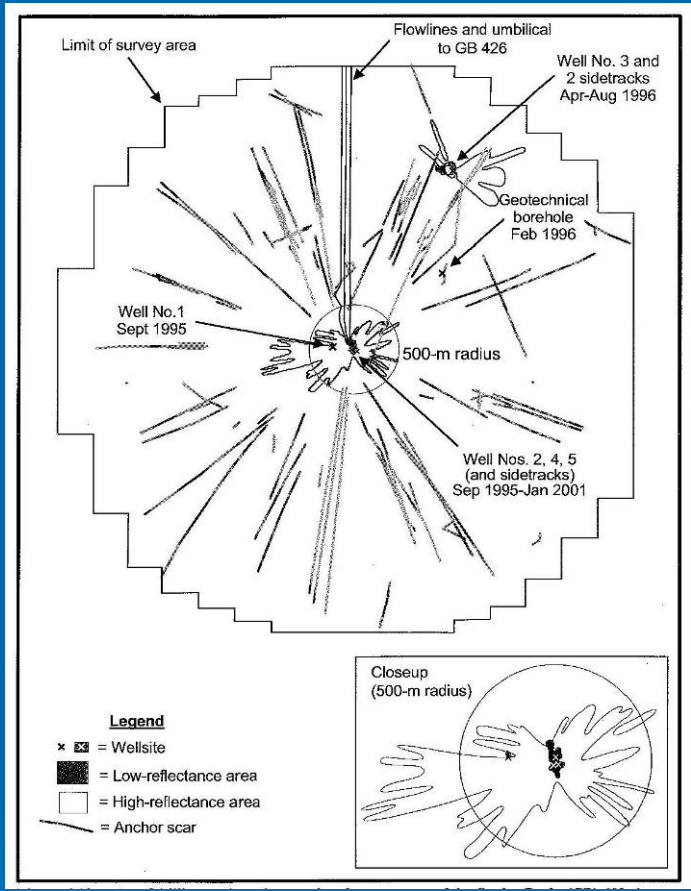


Cuttings splays from single well

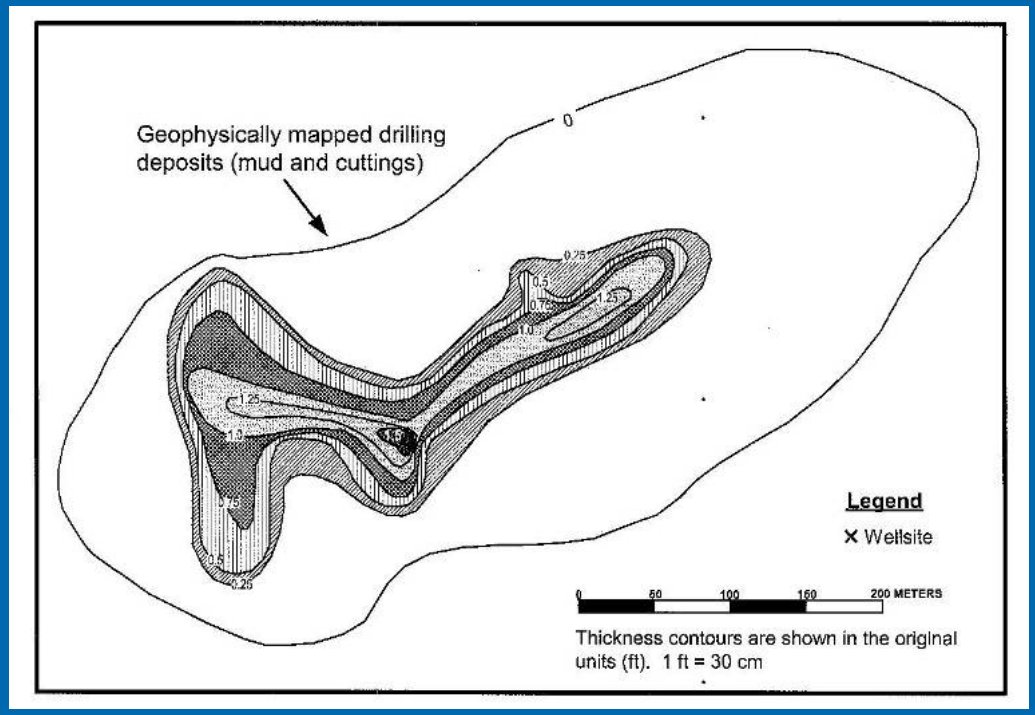


Cuttings splays from multiple wells

MMS-2006-045



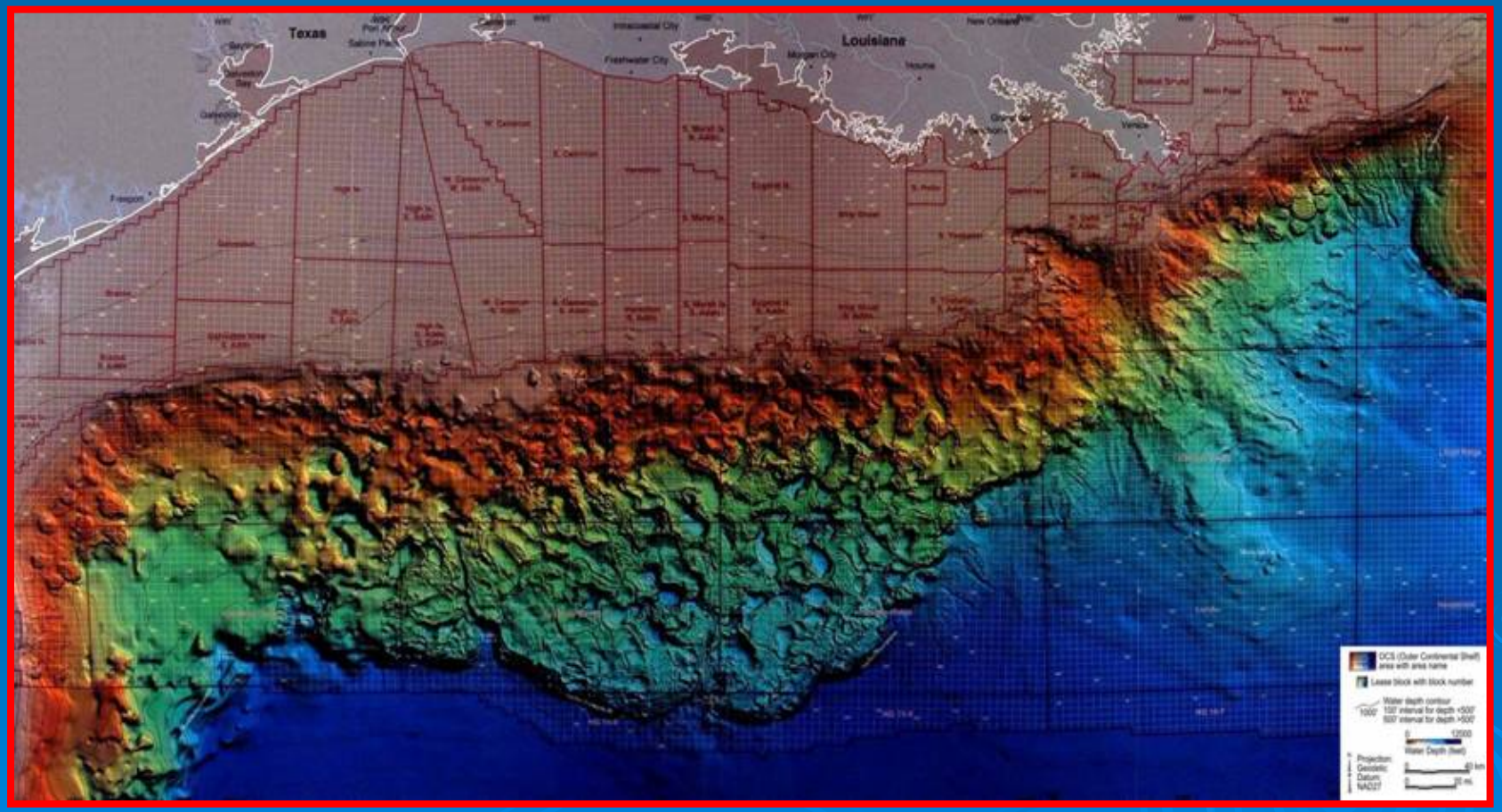
Depiction of cuttings splays and anchor cable impacts



Mapped drill cutting thickness

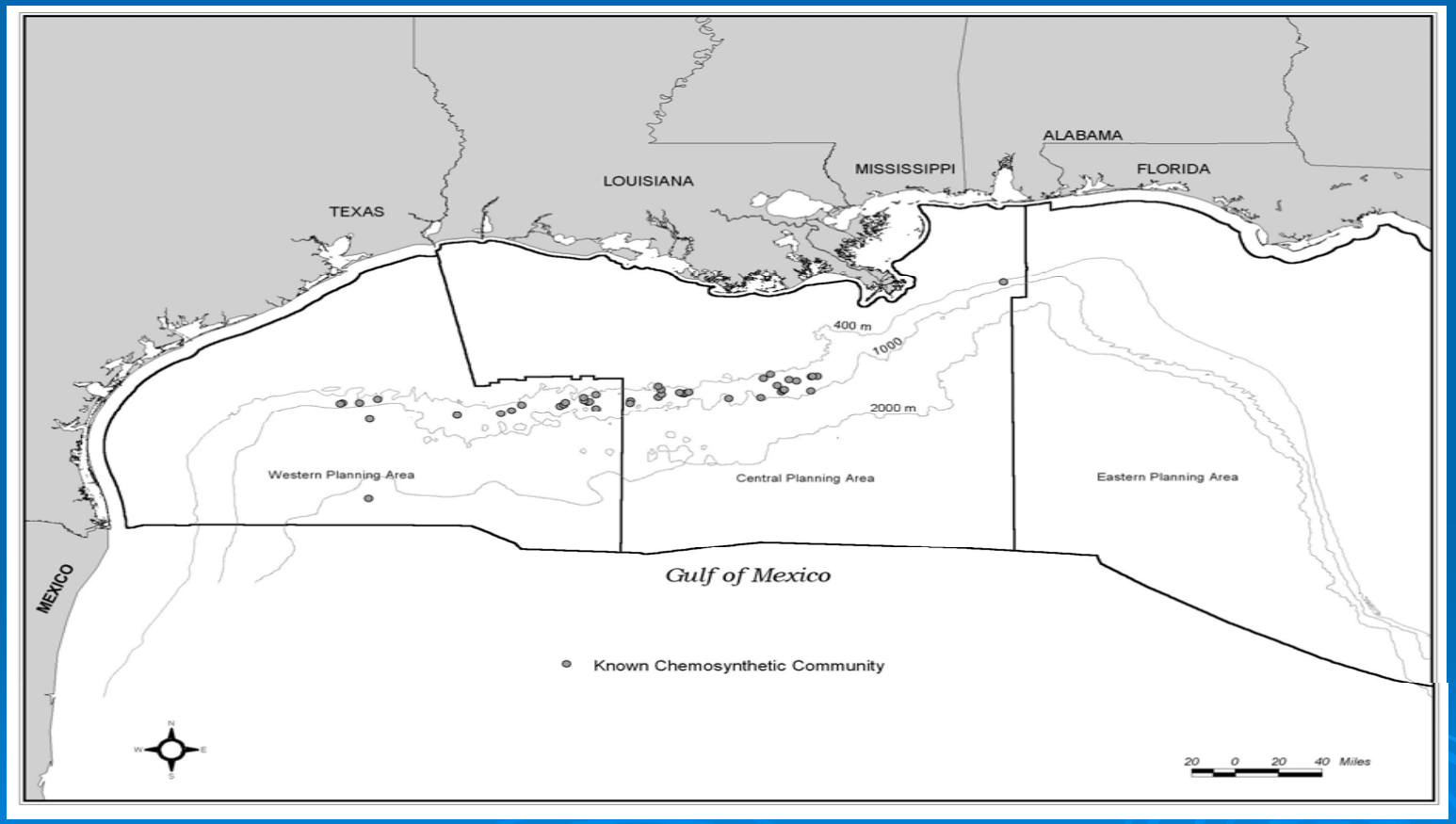
Results from this study used to *further* refine Chemosynthetic Communities NTL

Challenge:
How to predict location of communities?



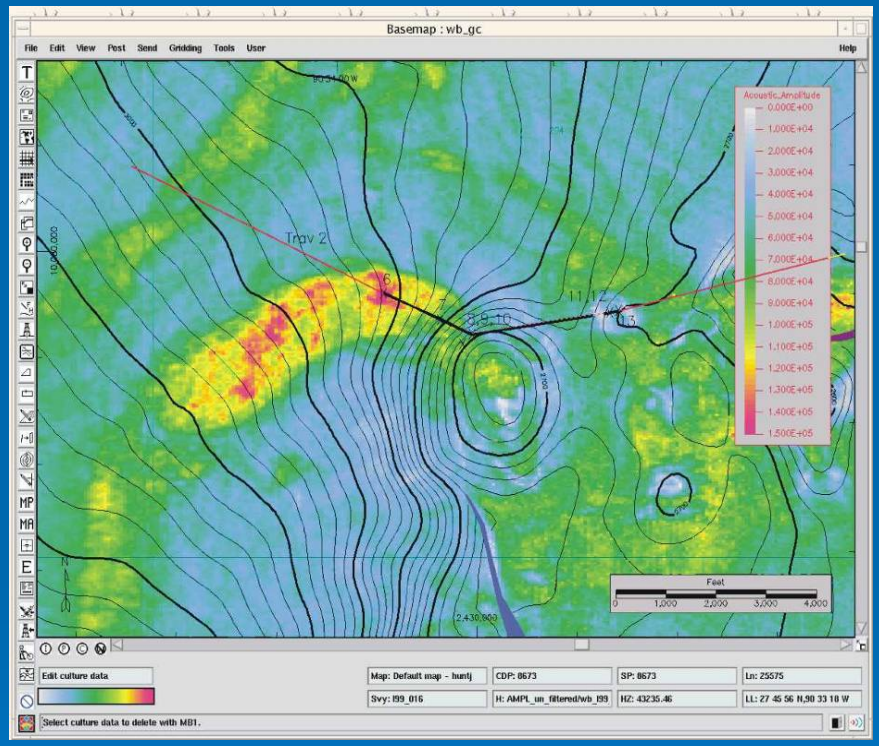
The most complex continental slope in the world

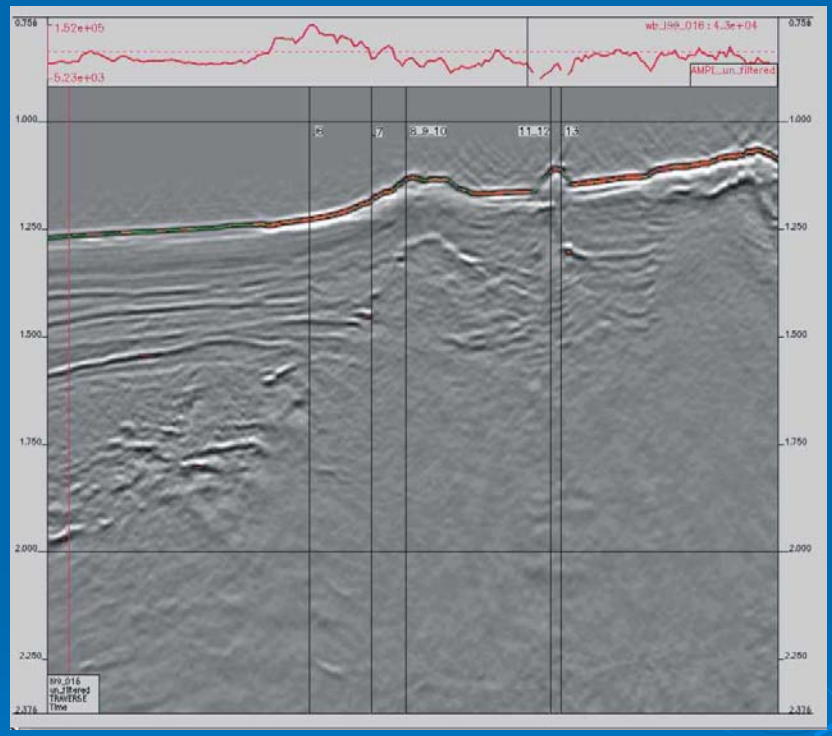
Early Known Chemosynthetic Community Sites in Northern Gulf of Mexico



Determined from trawls or visual methods, less than 50 total around 1999

Major Advancements in use of remote sensing data

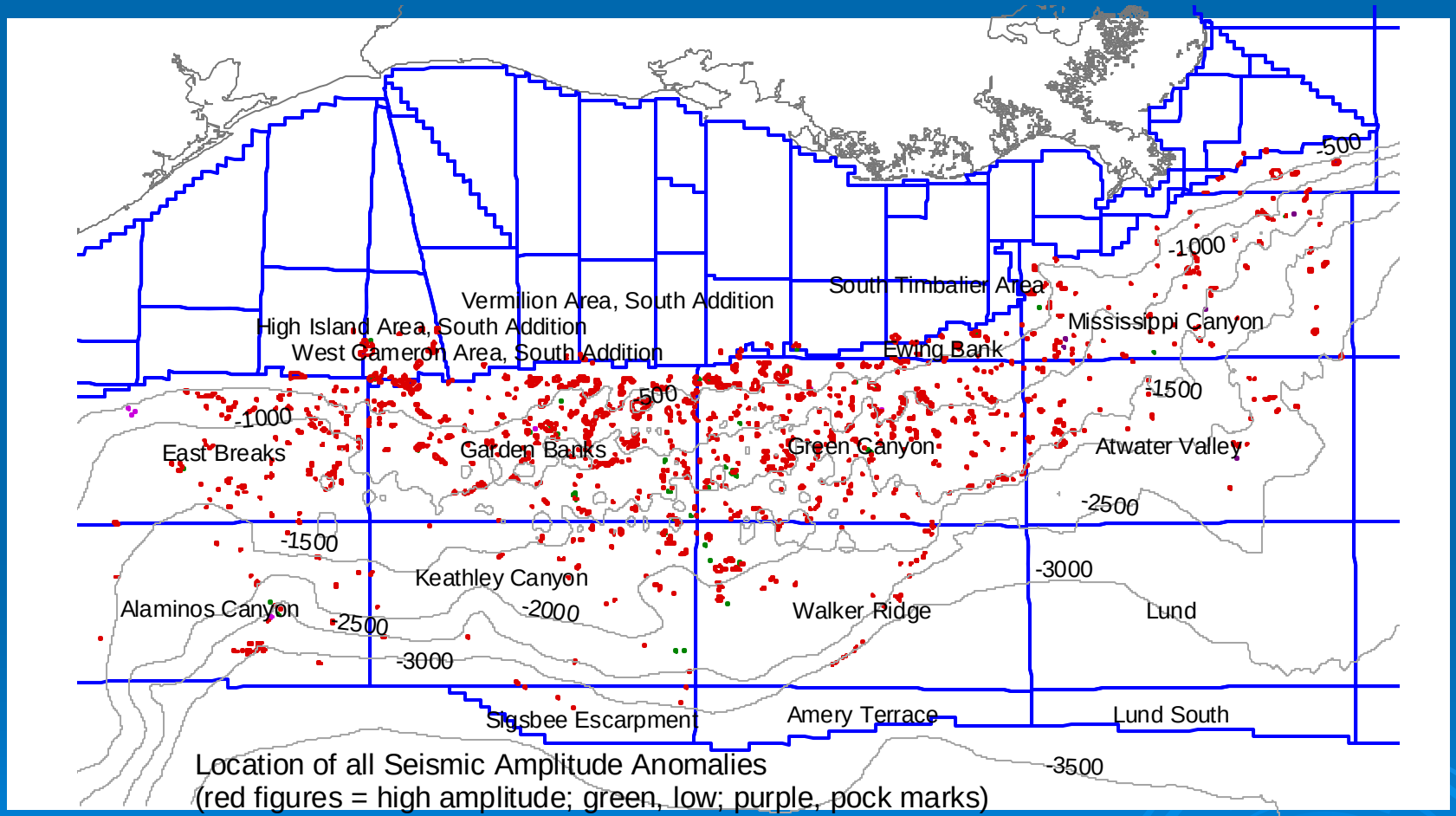




GB 204

- 3D seismic surface amplitude data (in-house BOEM)
- Surface amplitude data created by BOEM staff now publically available

Seabed Acoustic Anomalies



Over 21,000 features = 762 sq miles of acoustic anomalies
Hard substrates represent < 1% total slope area
All considered potential sensitive community until demonstrated otherwise

Study Gaps Addressed

- Chemosynthetic Communities deeper than 1,000 m
- Newly emerging understanding of deep-water corals

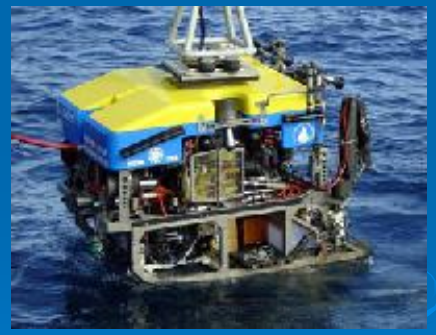
Recent major studies with interagency partnerships:

CHEMO III: Investigations of Chemosynthetic Communities on the Lower Continental Slope of the Gulf of Mexico

- Characterize known and newly discovered chemosynthetic (including corals) in water depths below 1,000 m

Lophelia II: Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs and Wrecks

- Study of deep-water corals including communities created by shipwrecks



Use of Study Results

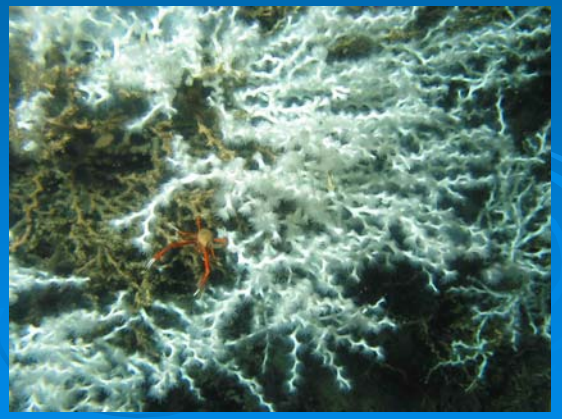
How Information is Used

Current NTL No. 2009-G40

In effect January 2010: Deepwater Benthic Communities

"to provide a consistent and comprehensive approach to protecting high-density chemosynthetic communities"

- **Avoidance distance doubled to 2,000 ft for drilling discharges**
- **Effective water depth of application raised to 300 m from 400 m to encompass newly discovered deepwater coral communities**



Future

- Large-scale, long-term monitoring of all major deep Gulf of Mexico benthic habitats
  - Chemosynthetic Communities
  - Deep-Sea Corals
  - Soft Bottom Habitat (>99% seabed)
  - Shipwrecks

  Other Artificial Structures (platforms)?

- Sampling cruise every 3-5 years
  - Adequate targets to alternate sampling period
    - Some repeated every 3 years, some every 6-10 years
  - Wide geographical range

- Interagency Collaboration! NOAA OER, USGS, NOPP?

Summary

- Strong interagency partnerships combining resources
- Significant science accomplishments that could not have been done otherwise
- Continued effective protection of sensitive deep Gulf of Mexico benthic communities from routine impacts of offshore energy development

- Sound science resulting from studies used for:
  - Mitigations-primarily avoidance
  - Essential information for analysis in NEPA documents

    5-year program EIS to individual exploration and development plan and pipeline application approvals

- Next Steps to large-scale monitoring as continuing adaptive management process

- Results from Environmental Studies Program can be obtained from http://www.boem.gov
- gregory.boland@boem.gov 703-787-1711