Oil in the Northern Gulf of Mexico

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What is oil?

• Biological Origin
• Mixture of simple and complex molecules
• “Crude” types: light/heavy, sour/sweet
Petroleum Biodegradation in Marine Environments

Shigeaki Harayama*, Hideo Kishira, Yuki Kasai and Kazuaki Shutsubo

Alkanes/Saturates

Aromatics

PAH/PNA
Resins

Wang et al., 2007.
Petroleum Science 4 (4).

Asphaltenes

Altamirano et al.,
IMP Bulletin 1986
Toxicity

Molecule specific
Molecular toxicity + exposure = toxic risk

Exposure:
Paraffin, Vaseline 1870, cooking oils/fats (alkanes)
Machine lubricants: grease, gear oils, motor oil
Coal tar (PAH) therapeutics (*Malassezi globosa*, Psoriasis)
Dispersants

Corexit - two formulations

Surface applied: 1,072,514 gallons
Subsea applied: 771,272 gallons

Sodium doctyl sulfosuccinate (Ducolax)

Increase bioavailability
Decrease "visible" oil

Increases immediate acute toxicity
Increases ability of bacteria to break down the oil

Photo credit: Wade Jeffrey
BP's Oil Spill Analysis. Normalized Detection of Surface Oil.

Percent Count
- 2.47 - 8.41
- 8.42 - 16.29
- 16.30 - 27.33
- 27.34 - 42.15
- 42.16 - 70.87

US Mainland
Deepwater Horizon Oil Rig

Projection: WGS_1984
Date: September 10, 2010
Source: TCNNA
32 Envisat ASAR frame
Surface Horizontal Current (m/s)

00-hour Nowcast
valid 00Z 10 May 2010

Max: 2.27 at 33.3°N 76.8°W
Min: 0.00 at 23.5°N 87.8°W

NCEP/EMCMMA 10 May 2010
Clean up strategies

• Physical removal
• Burning
• Surfactants
• Bag-o-Bugs
• Amendments
• Natural attenuation
UWF Oil Spill Response
Coquina (*Donax variabilis*) as an indicator of oil contamination along coastal intertidal sands
R/V Bellows 15-18 June 2010
Photo credit: Captain Larry Braun, R/V Bellows
“The northeastern Gulf of Mexico is a poorly studied part of the U.S. coast, both biologically and physically.”

MMS, 2001
Societal Response and ethical considerations
Rational or Emotional?

How Much Are Nature’s Services Worth?

Measuring the social benefits of ecosystem functioning is both controversial and illuminating.

Walter E. Westman

To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears.—WILLIAM WORDSWORTH (1)