# Potential New/Expanded Uses

## Marine Spatial Planning

NOAA

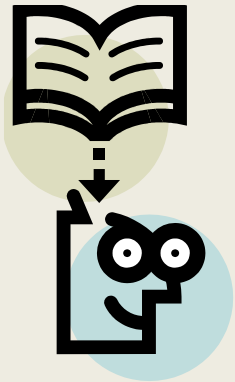
Corps

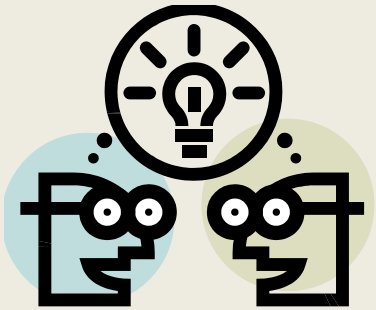
NOAA, 2014

NOAA

# Goals and Expectations

- Provide information about potential new uses to the WCMAC
- Future trends and factors in WA
- Any additional resources?
- Next session: share concerns





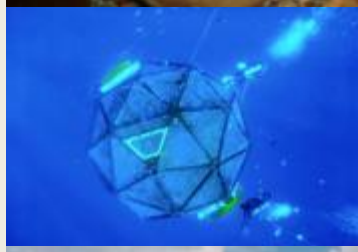
# Research Methods

- Literature review
  - Journal articles, government documents, reports, plans, conference proceedings
- Regulatory, Science, and Industry interviews

# Potential New & Expanded Uses

## Marine Spatial Planning

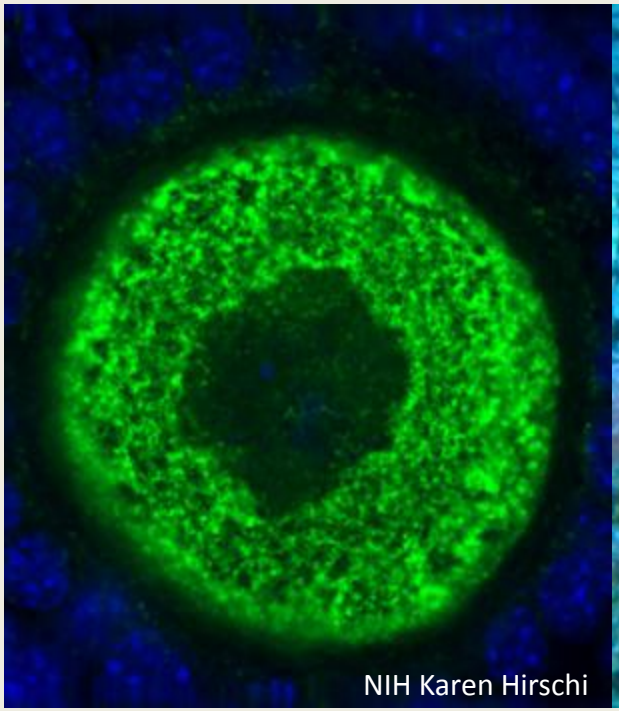
- Marine Product Extraction
- Offshore Aquaculture
- Dredge Disposal in New Locations
- Mining



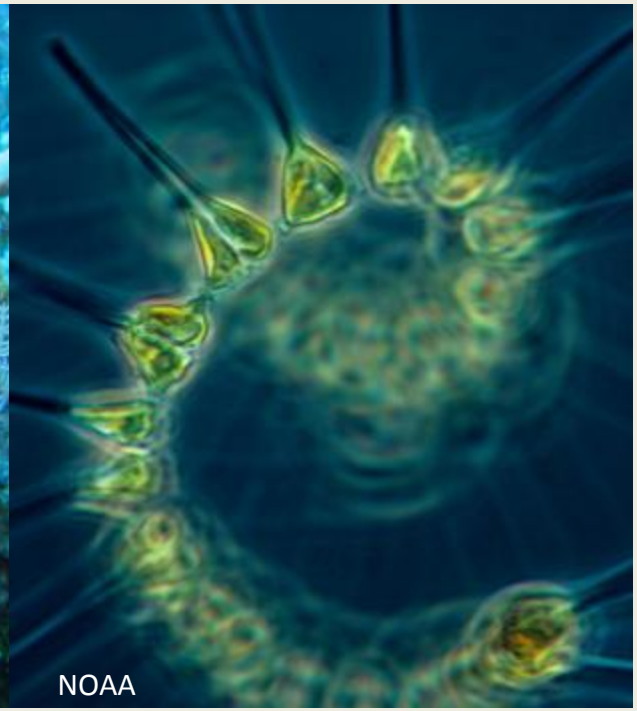
*Marine Renewable Energy not discussed here

# Potential New Use:

# Marine Product Extraction


NIH Karen Hirschi

NOAA


NOAA

# What is Marine Product Extraction?

## Discovery

- Genome Sequences
- Chemicals

## Uses

- Anti-viral medicines
- Anti-tumor
- Anti-cancer
- Biomedical
- Cosmetics
- Nutritional supplements

# Examples

- Sponges
- Microalgae
- Corals
- Deep-sea hydrothermal vent bacteria
- Bioluminescent jellyfish
- Red algae
- Snails and limpets
- Sea hares

Photos from NOAA

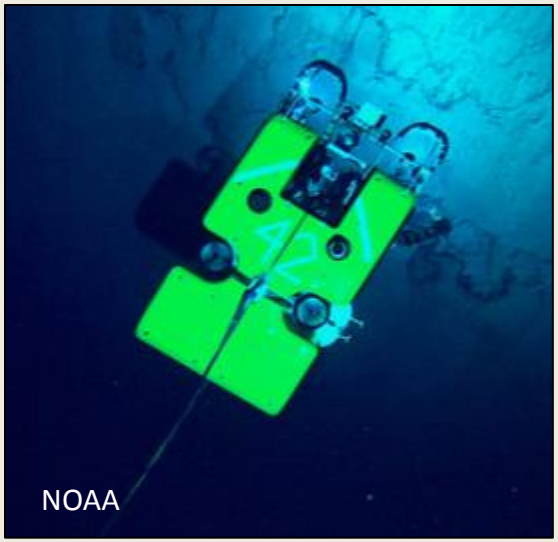
# Bioprospecting

## Who:

- Researchers
- Universities
- Government
- Private companies

## How:

- SCUBA
- Submerged vehicles



# Product Supply

## "Products"

- Genome Sequences
- Enzymes
- Medicine
- Cosmetics

## Supply

- Wild harvest
- Bio-technology
- Aquaculture

NOAA

# Why Marine Product Extraction?

- Human health benefits
- High potential for new products:
  - 300 to 500 times higher compared to terrestrial sources
  - Growing by 4% per year
- Multi-billion dollar industry

# Potential Benefits and Compatibilities

- Marine Protected Areas
  - Protect genetic and habitat sources

Claire Fackler, NOAA

# Environmental Concerns

- Sustainable harvest
- Habitat degradation
- Dependent on:
  - Intensity/Frequency
  - Method
  - Life histories

# Potential Use Conflicts

- None in the literature….
- Difficult to forecast

# Future Trends and Factors in WA

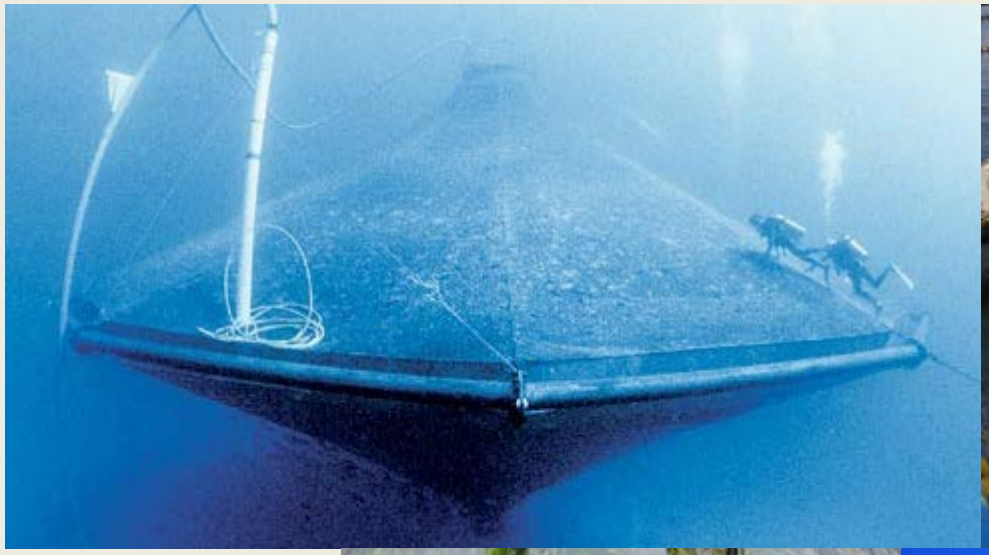
- WA not a likely target for bioprospecting
- WA unique environments:
  - Hydrothermal vents
  - Deep-sea corals
  - Seamounts

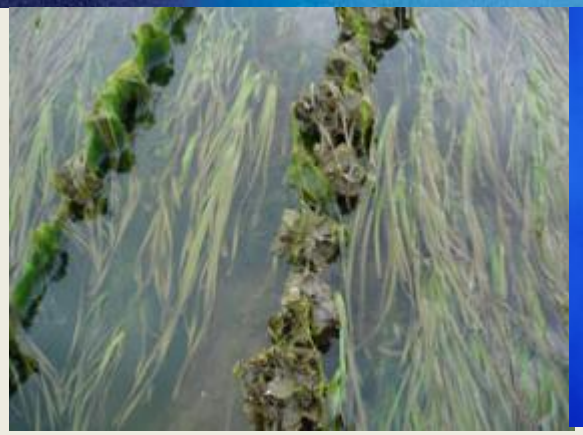
Keyhole Limpet, California

- Discoveries can occur anywhere…

# Potential New Use:

# Offshore Aquaculture





Photos from NOAA

# What is Offshore Aquaculture?

## Exposed Conditions

- Intense waves and Swell
- Currents
- Storms
- Deep water
- Distance from shore

**Washington Offshore Aquaculture:**

Any new aquaculture outside of coastal estuaries

# Current and Emerging Technologies

## Finfish

- Surface cages

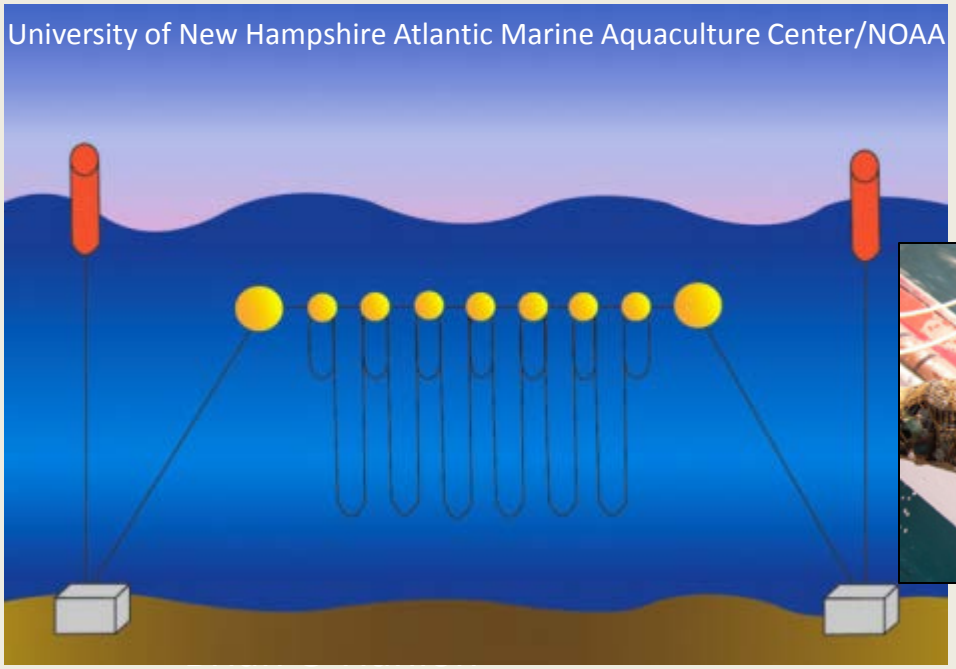
- Submersible cages

Photos from NOAA

# Current and Emerging Technologies

## Shellfish & Marine Plants

- Longlines, net bags


University of New Hampshire Atlantic Marine Aquaculture Center/NOAA

Claire Fackler, CINMS, NOAA

# Why Offshore Aquaculture?

NOAA interested in expanding domestic aquaculture

- Seafood great source of high quality protein
- Growing demand for seafood
- Limited space and site suitability for coastal aquaculture

Dr. Dwayne Meadows, NOAA/NMFS/OPR

# Potential Benefits and Compatibilities

- Well-flushed, clean waters
  - Minimizes environmental impacts
  - Reduce disease risk
- Jobs, support working waterfronts
- Decreased visual impact (from shore)
- Marine renewable energy
- Areas restricted from other uses?

# Environmental Concerns

- Benthic effects (finfish)
  - Waste accumulation on the seafloor
  - Changes to chemistry and community
  - Potential cumulative effects
- Animal interactions
  - Predation
  - Entanglement
  - Behavior changes

Claire Fackler, CINMS, NOAA

NOAA photo David Burdick

# Environmental Concerns cont…

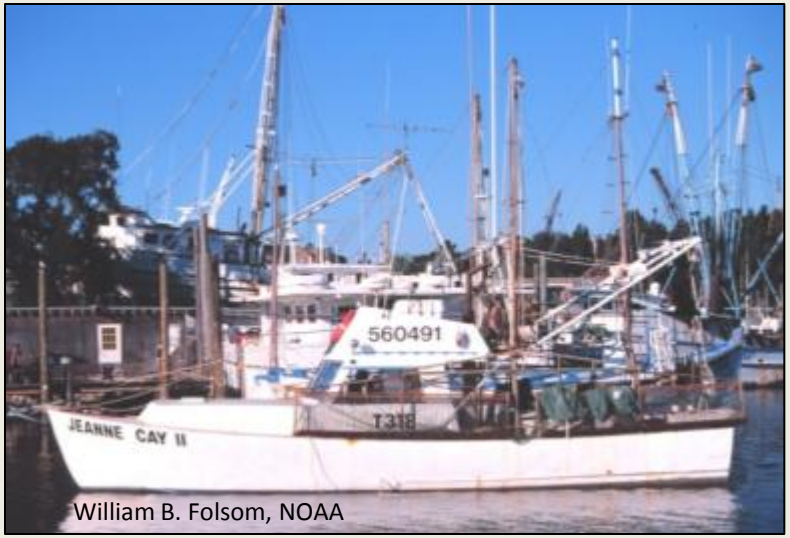
- Chemical contaminants (finfish)
  - Antibiotics
  - Anti-foulants
- Water Quality (finfish)
  - A low concern for offshore aquaculture at the right sites
- Disease transmission (finfish)
- Sensitive habitats

Dr. Dwayne Meadows, NOAA/NMFS/OPR

# Potential Use Conflicts

## Spatial conflicts listed in the literature

- Commercial and recreational fisheries
- Recreational activities
- Shipping
- Military uses
- Cable installation
- Mining
- Dredge disposal
- Marine sanctuaries
- Mammal migration routes



William B. Folsom, NOAA

# Future Trends and Factors

Key Factors:

- Depth
  - Moorings; environment
- Space conflicts
- Husbandry requirements
- Access to ports, facilities, and markets
- Proximity to sensitive habitats
- Well-flushed, erosional sediments

# Future Trends and Factors

## Potential in Washington

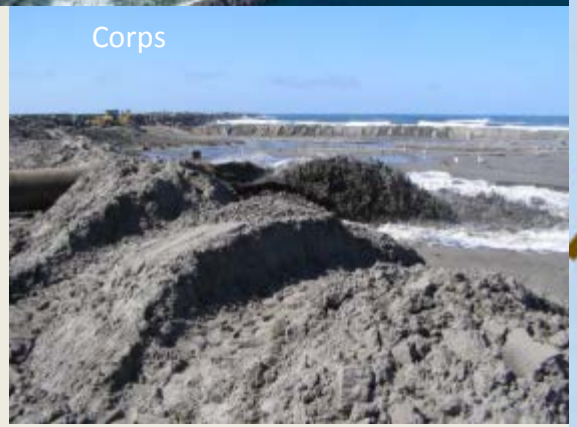
- Clean, productive waters
- Strong husbandry and aquaculture skills
- Established infrastructure

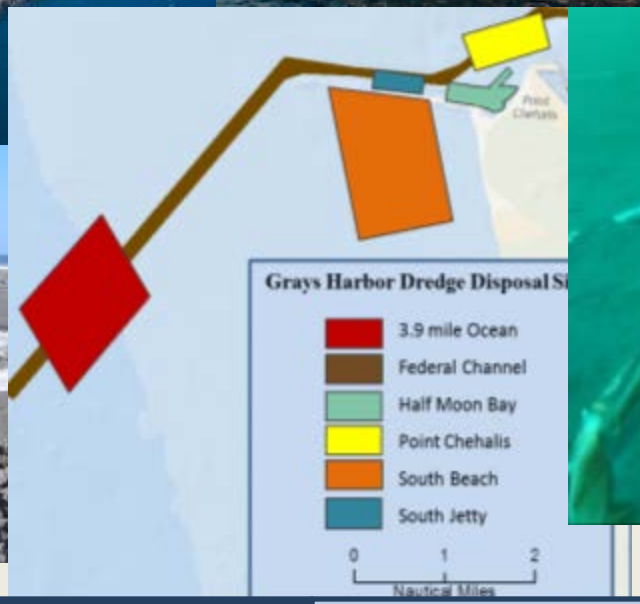
## Challenges and Barriers

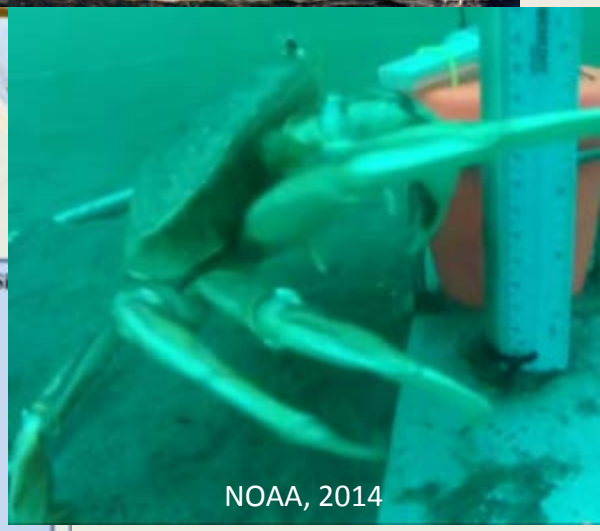
- Technology to withstand physical conditions
- Profitability
- Safe access for workers
- More research needed
- If there is space close to shore, then little incentive to go offshore

# Potential Expanded Use:

# Dredge Disposal in *New* Locations



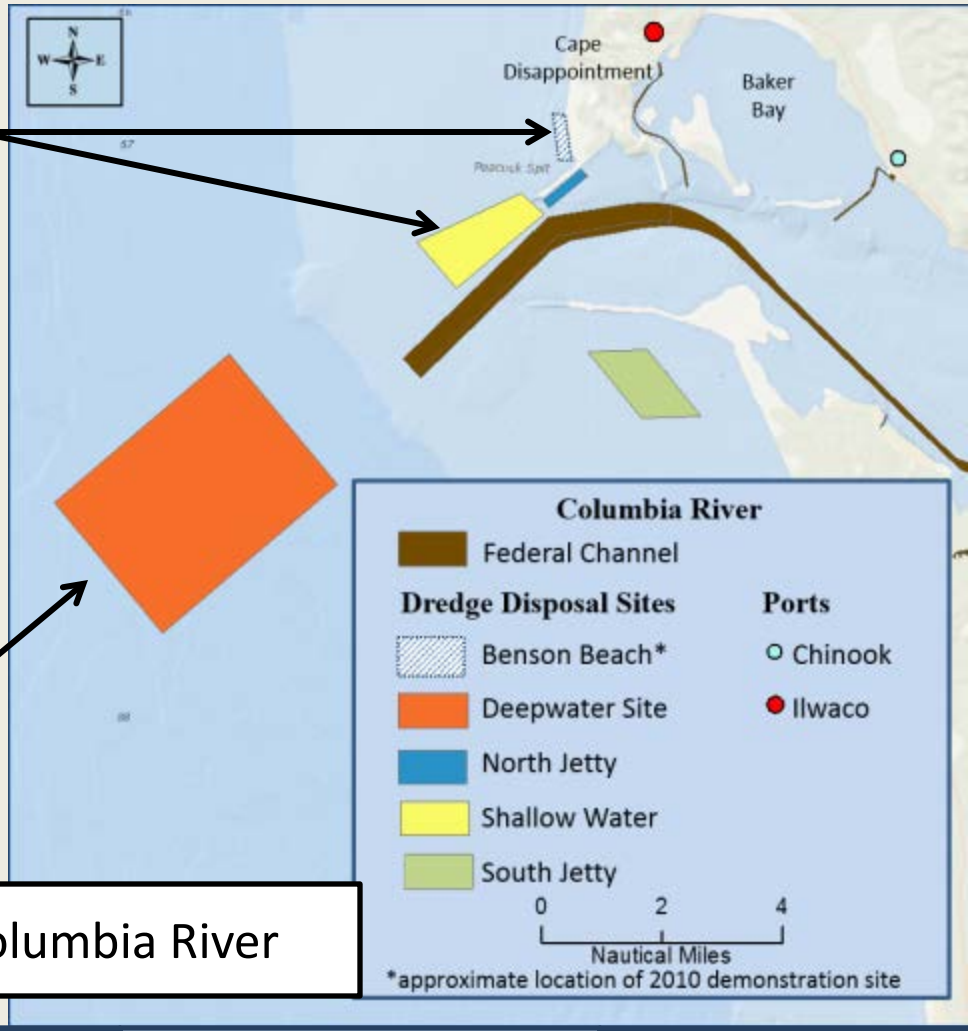



# Navigational Dredging

- Federal navigation channels
  - Mouth of Columbia River
    - ~4 million cubic yards per year
  - Grays Harbor
- Ports and Marinas
- In-Water vs. Upland Disposal

# In-water Dredge Disposal

- Nearshore and on-shore beneficial use
- Flow lanes
- Deep water sites




Mouth of Columbia River

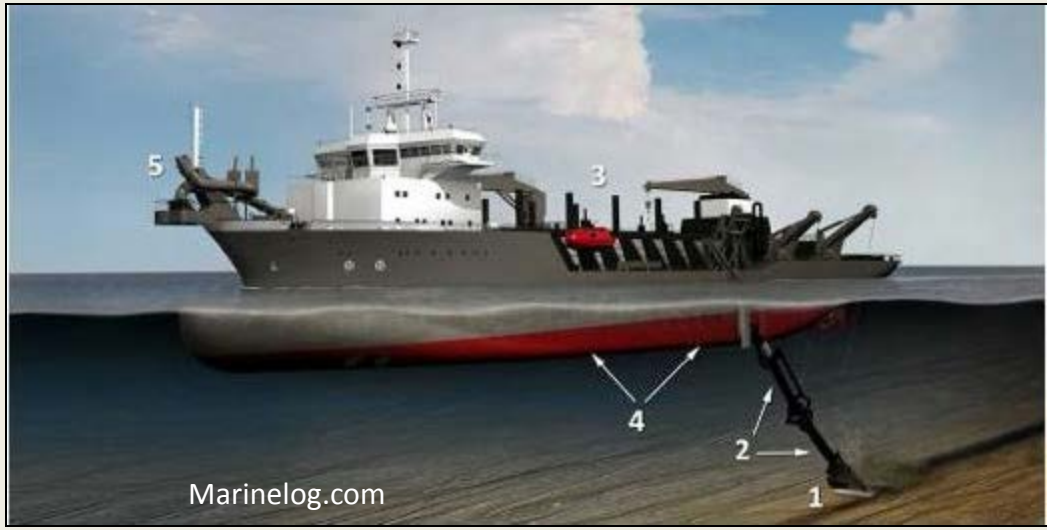
# Dredge Disposal Equipment & Methods

## Equipment

- Hopper Dredges
- Barges

## Methods

- <u>Bottom-dump</u>
- Pump-ashore disposal
- “Rainbow spray”



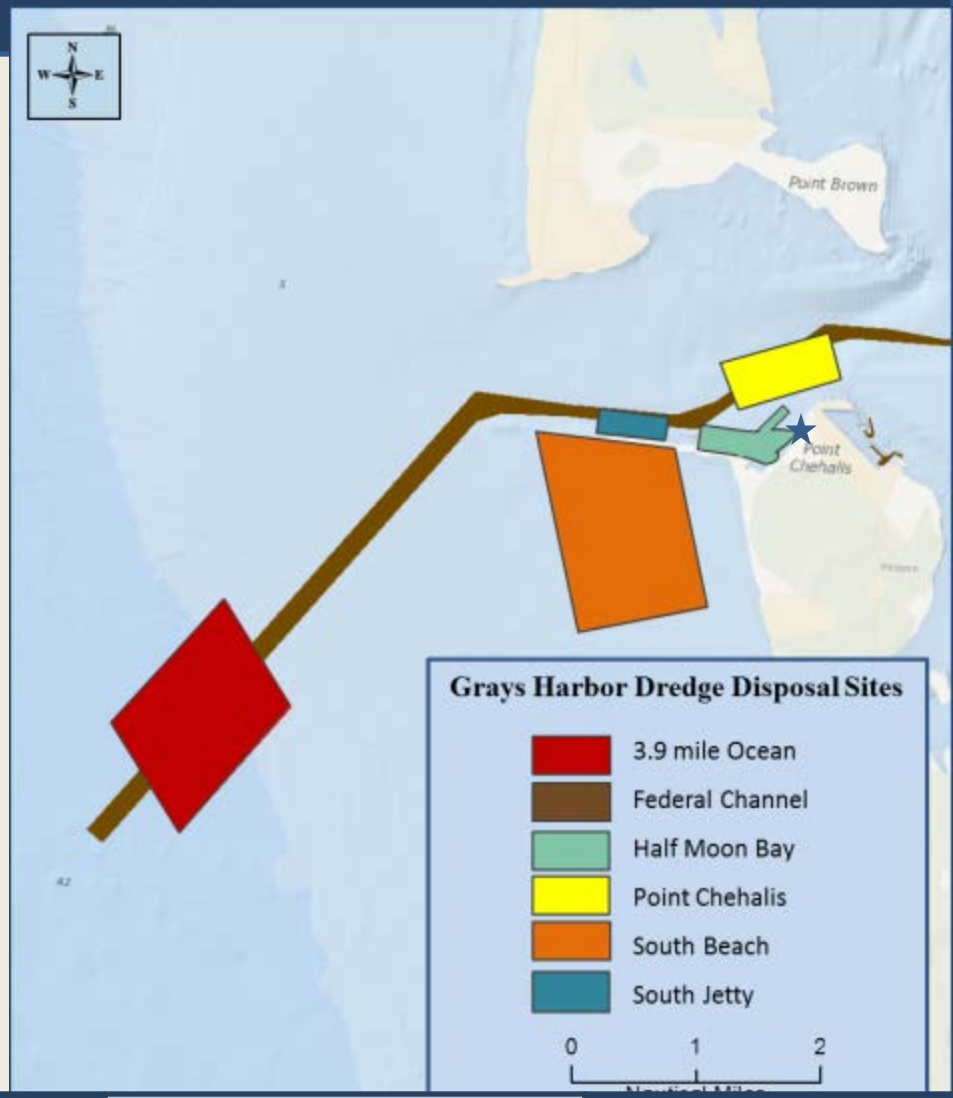
Marinelog.com

Benson Beach; Corps, 2014

BOEM, 2007

# Current Disposal Sites

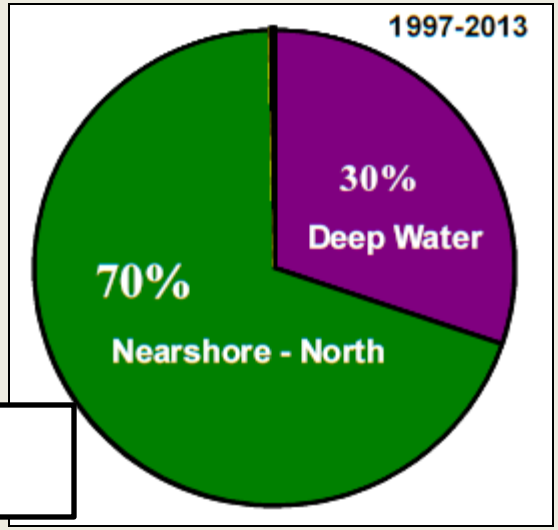
- Grays Harbor
- Mouth of Columbia River
- Willapa Bay
- La Push



# Why new disposal locations?

- Site capacity
- Limit use of deep water sites
- Keep sediment within the nearshore system
- Jetty protection
- Cost

Corps, 2014




Mouth of Columbia River

# Potential Benefits and Compatibilities

- Maximize beneficial use and minimize erosion
- Infrastructure protection
- Recreation and Tourism
  - maintaining beaches
- Ports

# Environmental Concerns

- Dungeness crab
  - Direct burial
  - Behavioral effects
  - Ongoing studies: https://www.youtube.com/user/Fish00Head
- Benthic species
  - Rapid recovery anticipated
- Marine fish, bird, and mammals
  - Not much info; avoid whale migration

NOAA, 2014

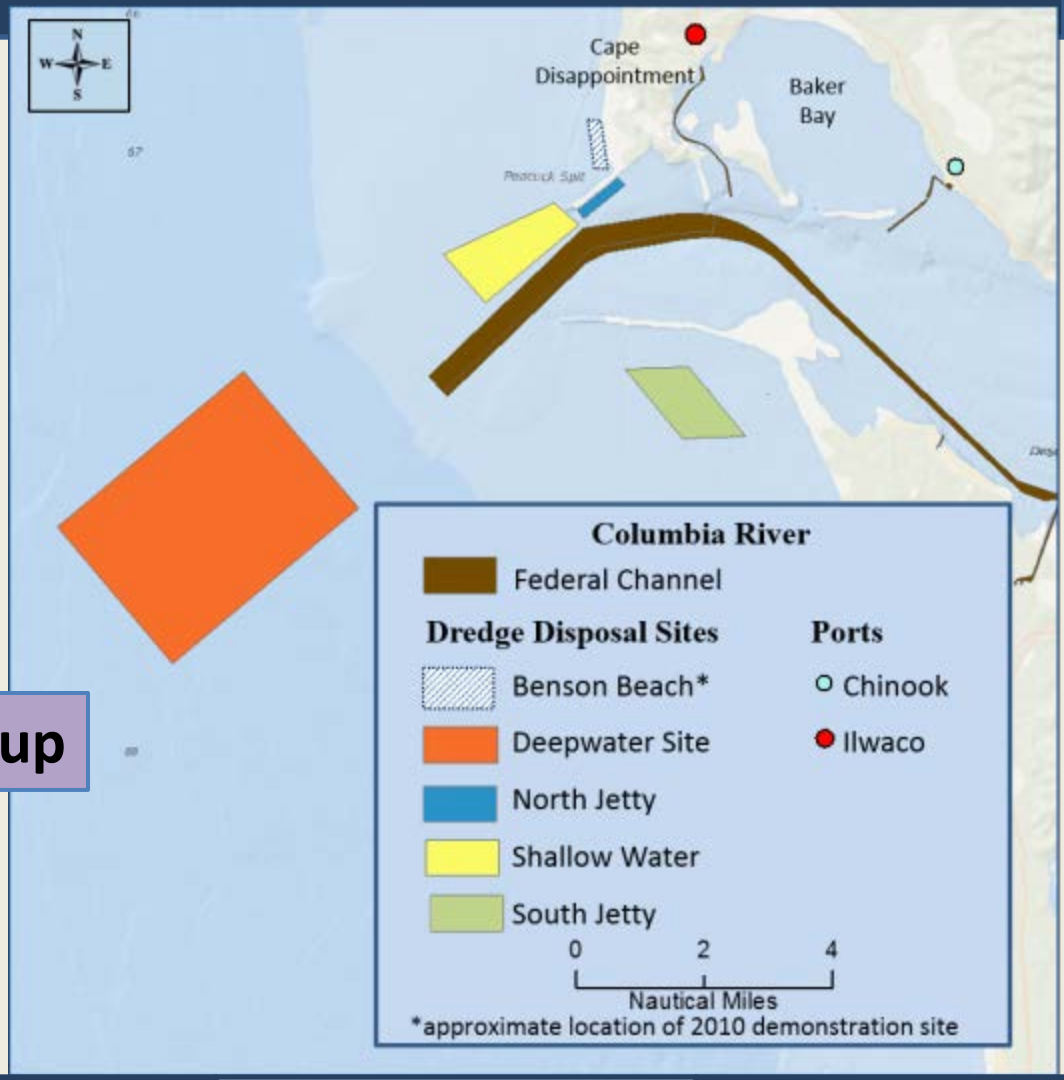
# Potential Use Conflicts

- Dungeness crab fishery
  - Potential reductions in catch
  - Loss of crab pots
  - Displacement
  - Crab and pot monitoring
- Navigational Safety
  - Mounding can cause wave amplification
  - Thin layer dispersal; site management

# Future Trends and Factors

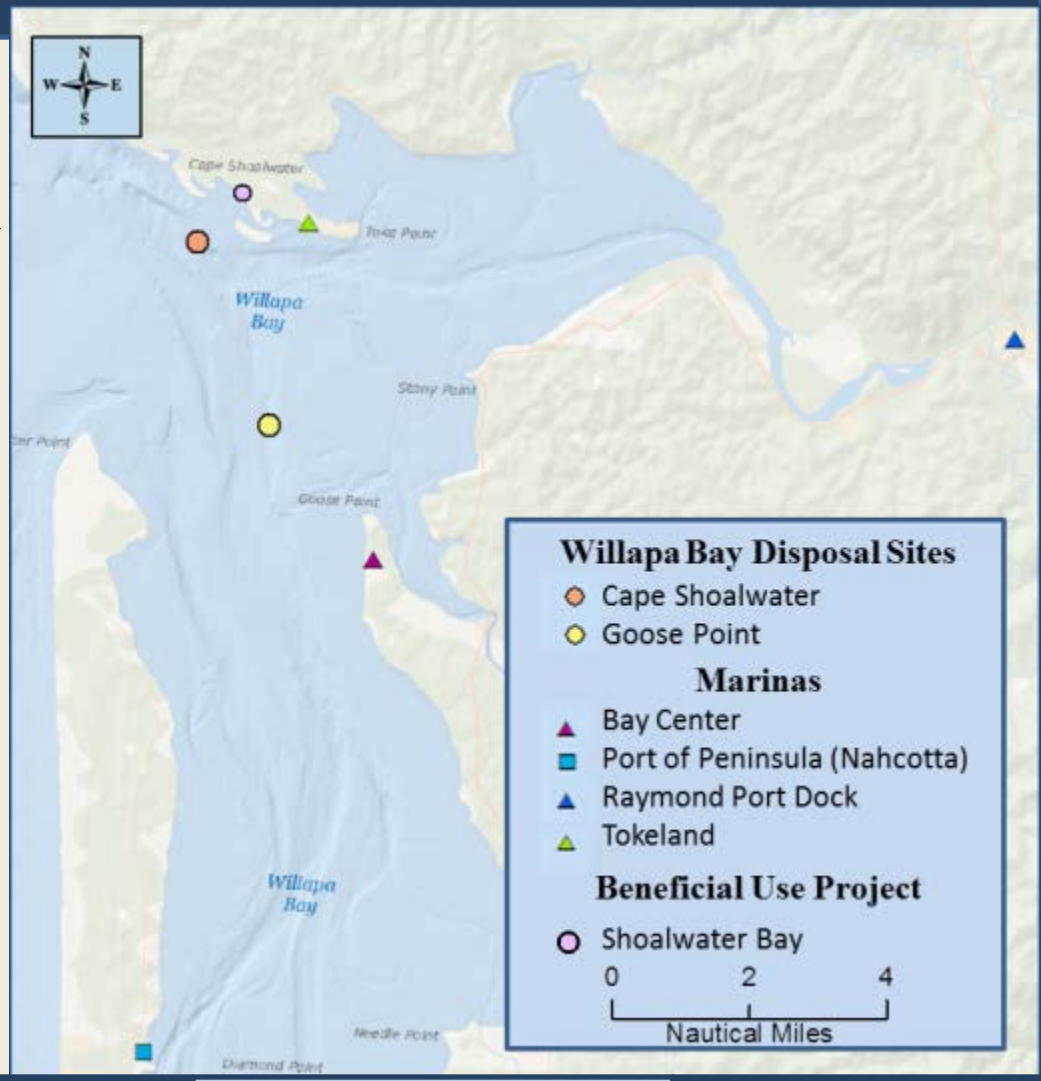
- Mouth of Columbia River
  - Proposed North Head site
  - Benson Beach

**Lower Columbia Solutions Group**



# Future Trends and Factors

- Willapa Bay
  - Flow lanes
- Grays Harbor
  - Minor shifts in site locations



# Potential New Use:

# Sand and Gravel Mining

Corps

Great Lakes Dredge and Dock

# What is Sand/Gravel Mining?

- Dredging!
- Uses
  - Beach nourishment
  - Coastal Defense
  - Upland construction

- Shoalwater Bay

# Why Mine for Sand/Gravel?

- Limited global resource
- Climate change
  - Storms and sea level rise

Sheri Phillips, NOAA/NESDIS/NODC

# Potential Benefits and Compatibilities

- Recreation and tourism
- Coastal infrastructure protection
- Habitat protection

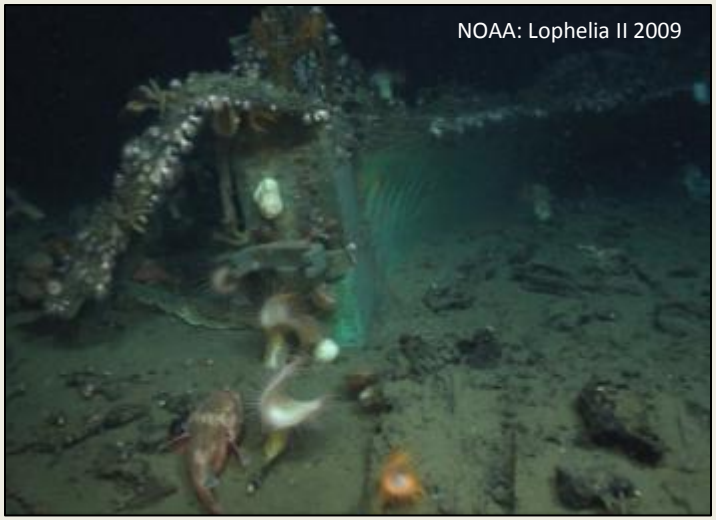
# Environmental Concerns

- Benthic species and habitats
  - Direct impact by entrainment
  - “Pit” habitats
- Bottom fish
- Noise
- Vessel strikes
- Water quality
  - Turbidity, dissolved oxygen
- Food chain and ecosystem effects

NOAA Okeanos Explorer Program

# Potential Use Conflicts

- Commercial and recreational fisheries
  - Increased vessel traffic
  - Restricted access to fishing grounds
  - Loss of fixed gear
  - Changes to fish ecology
- Marine Infrastructure
- Archaeological sites
  - Shipwrecks
  - Pre-historic sites



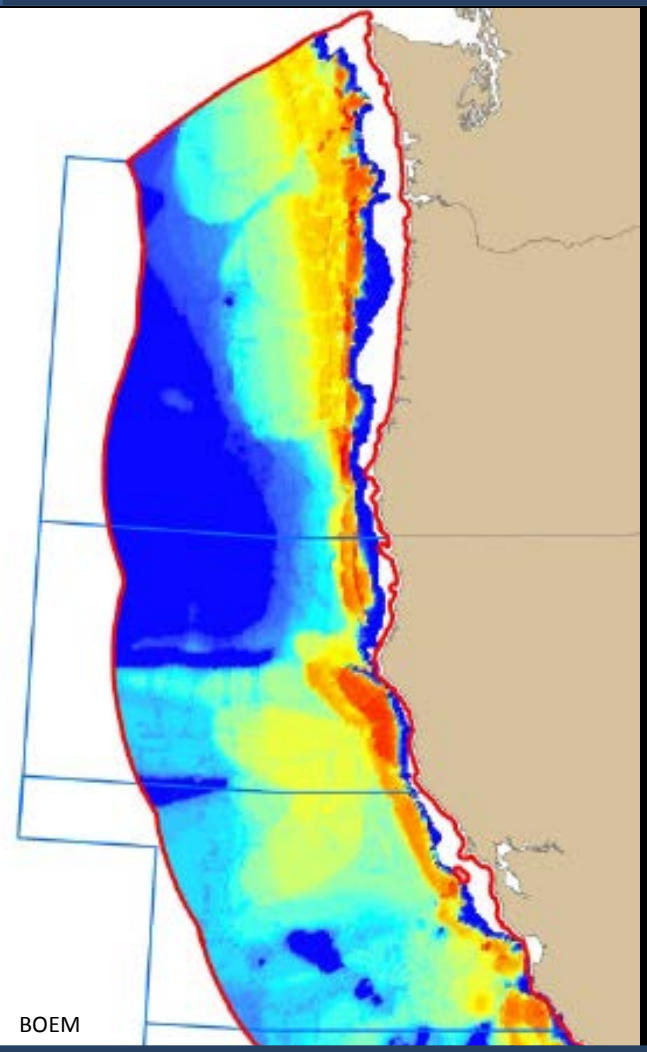
# Future Trends and Factors

- WA waters have a lot of sand and gravel
- Climate change and land development may increase demand
- Currently, local demand relatively low
- BOEM has yet to assess lease blocks

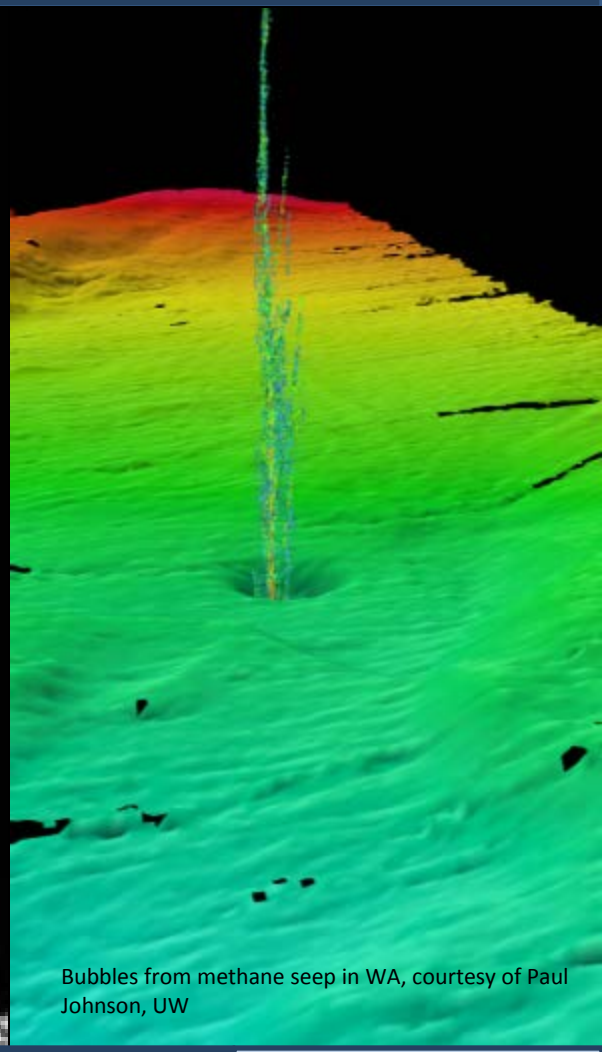
What about sand from **Navigation Dredging**?

# Potential New Use:

# Mining Gas Hydrates



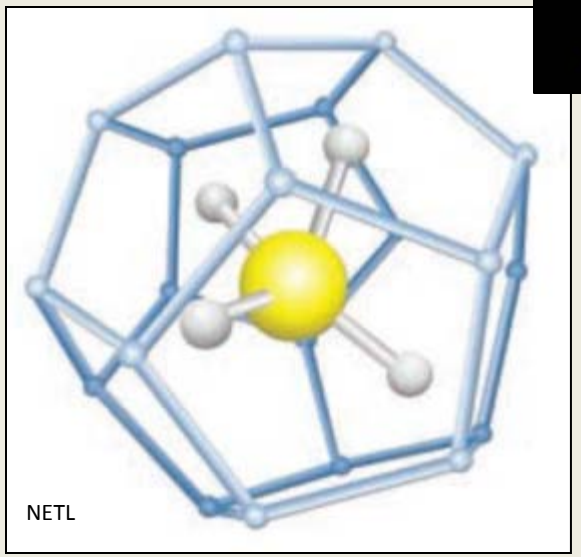
BOEM



Bubbles from methane seep in WA, courtesy of Paul Johnson, UW

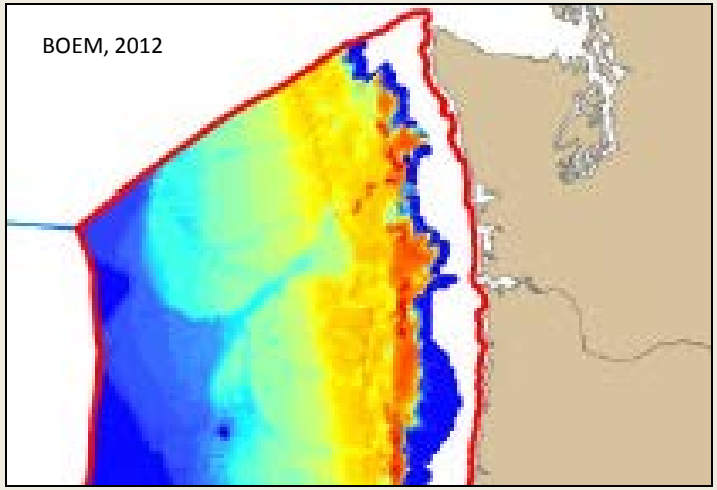
# What are Gas Hydrates?

- Gas and Water
- High pressures
- Low temperatures
- Solid ice-like

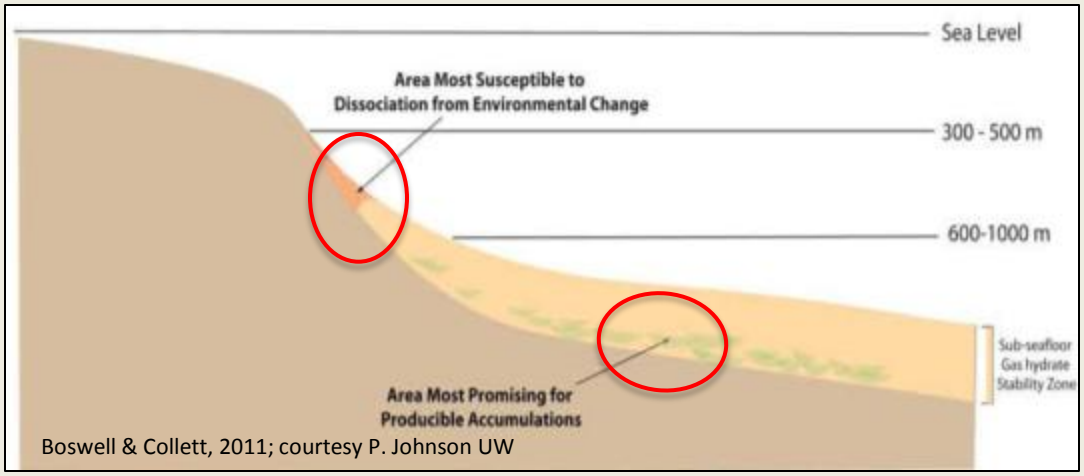


# Gas Hydrates along Washington

- Substantial amounts
  - Make up about 5% sediment pore space
- Hydrate stability zone starts at about 1650 feet water depth



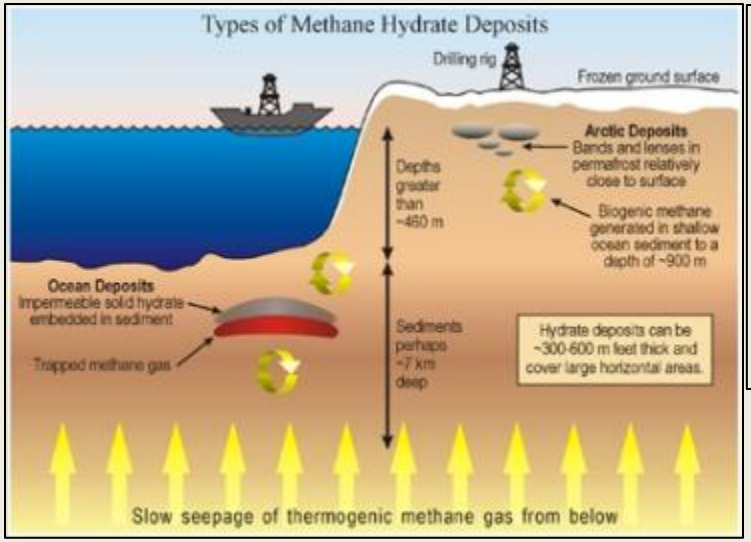
USGS




Boswell & Collett, 2011; courtesy P. Johnson UW

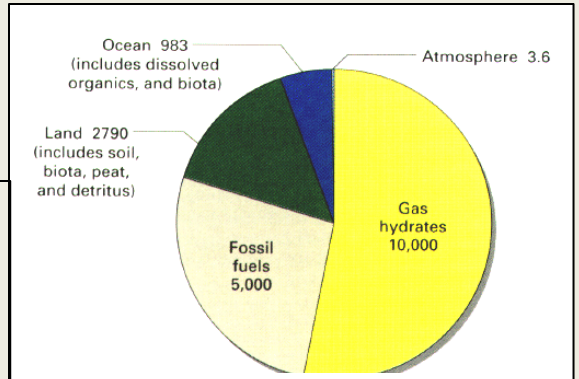
# Why Mine for Gas Hydrates?

- Energy Source
- Research phase
- Adapting current offshore oil and gas infrastructure




Office of Fossil Energy

NOAA




Distribution of organic carbon on Earth. Gigatons of carbon.

courtesy P. Johnson UW

# Potential Benefits and Compatibilities

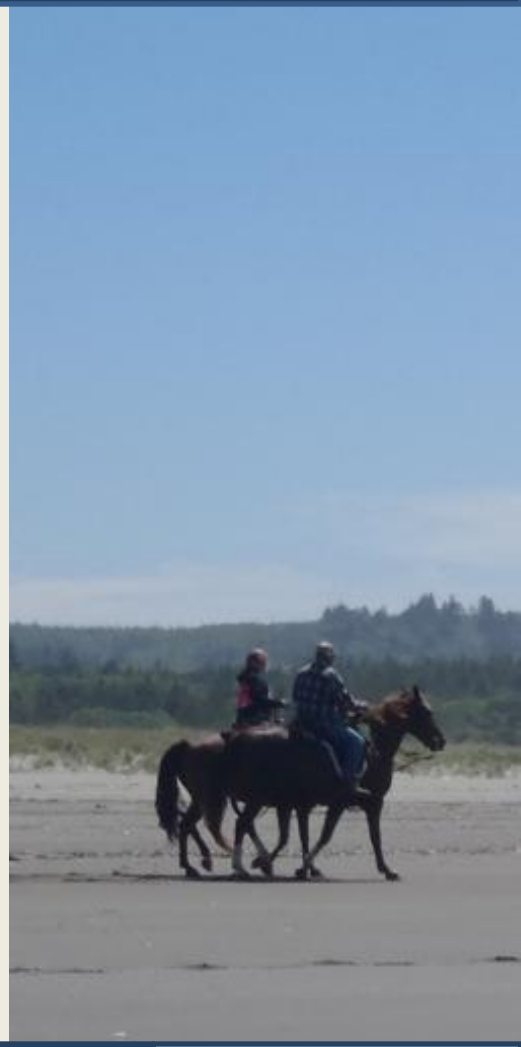
Recreational fisheries

# Environmental Concerns

- Noise
- Water quality
- Air quality
- Benthic habitat disturbance
- Hazards
- Marine mammals, birds, fish, sea turtles

# Potential Use Conflicts

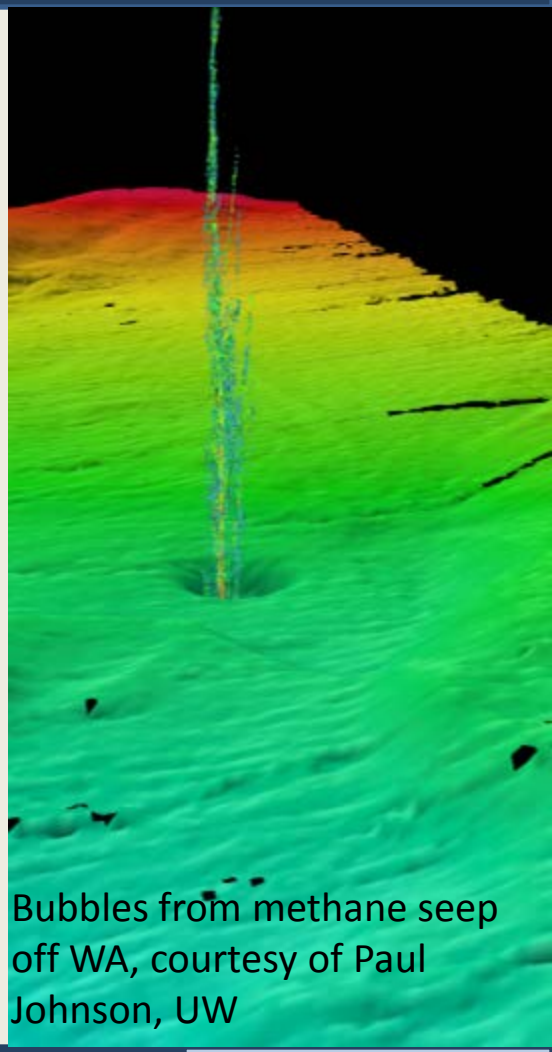
- Commercial and recreational fisheries
- Tourism and recreation
- Archaeological sites



# Future Trends and Factors

- Washington has Gas Hydrates
  - But not a current target for energy
  - Estimated average 5% saturation of sediments along Cascadia margin

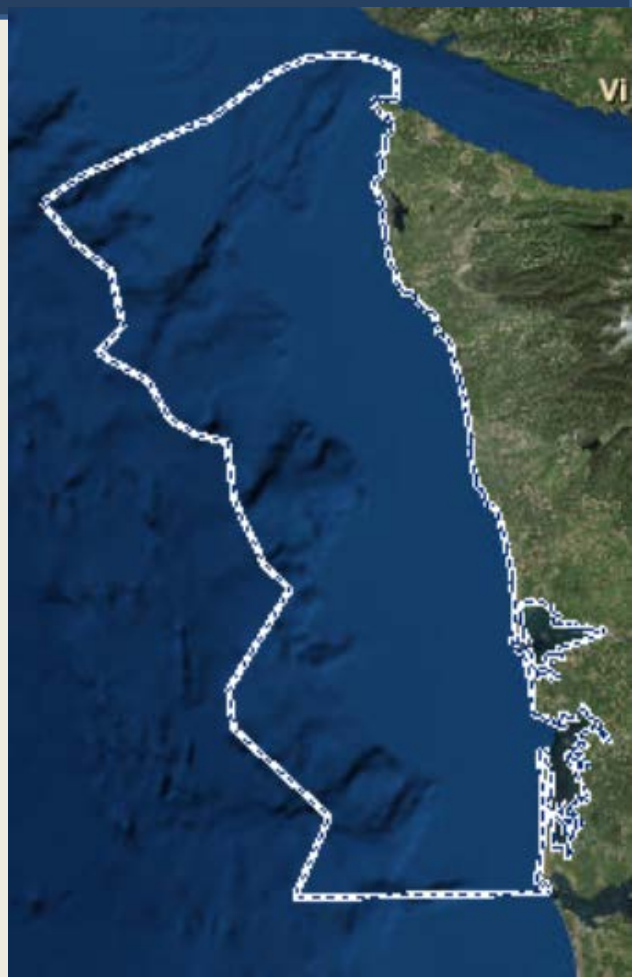
- Current Priorities
  - Gulf of Mexico
    - 50-90% saturation of sediments
  - Atlantic Margin
    - New Jersey



Bubbles from methane seep off WA, courtesy of Paul Johnson, UW

# Follow-up and Contact

- Any resources?
- Further questions?



**Kelsey Gianou**
WA Dept of Ecology
(425) 649-7007
kgia461@ecy.wa.gov