Oregon
Coastal Master Naturalists

Part 1: Onshore (Rocky & sandy shores, Headlands & sea stacks)

Part 2: Offshore (Shallow subtidal to deep sea)

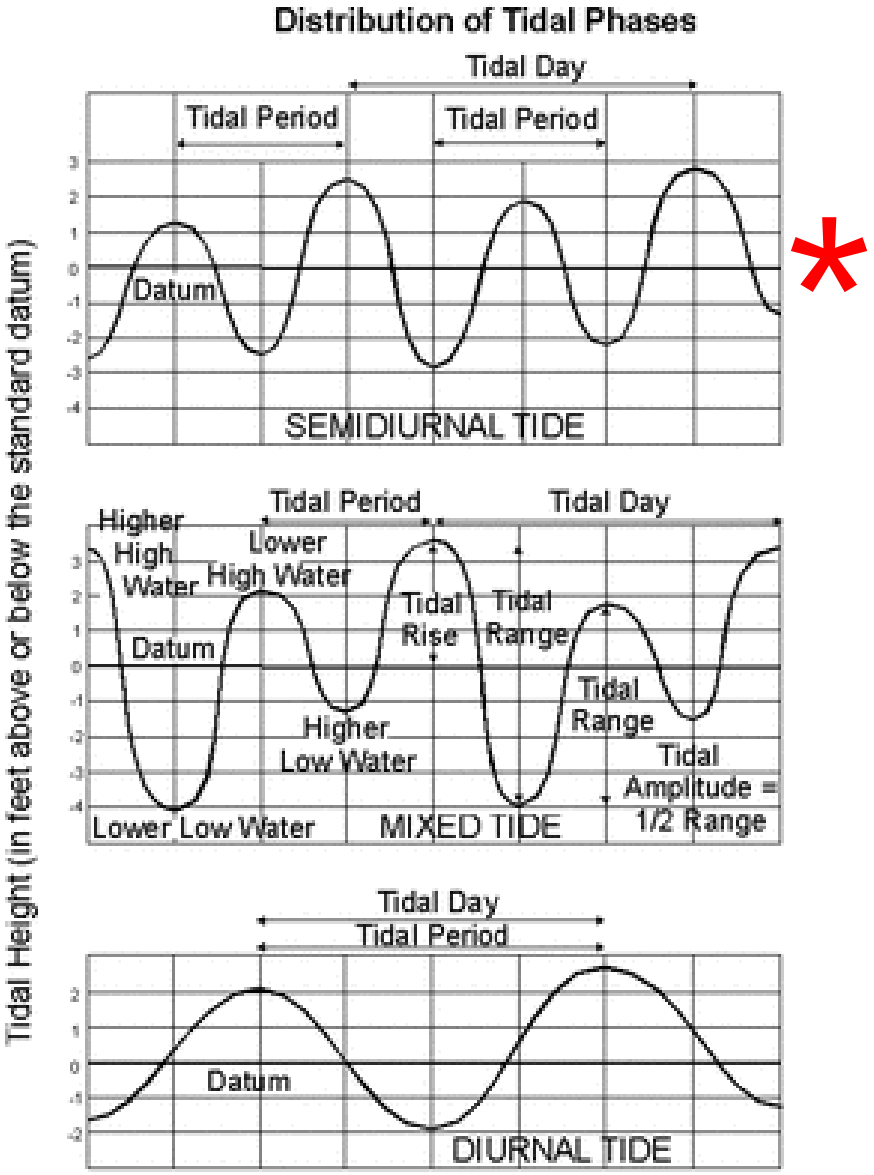
Part 3: Coastal Forests, Streams, & Estuaries

Rocky Shores

Physical Features

- **Tidal patterns**
  - Mixed semi-diurnal
  - 2 highs & 2 lows each day
- **Tidal predictions:**

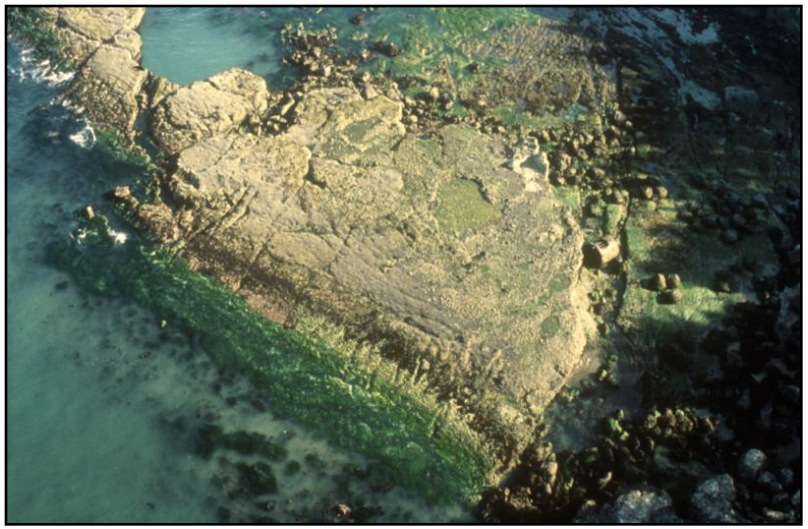
  http://tbone.biol.sc.edu/tide/index.html
- **Tidal range:**
  - about 11 vertical feet



http://www.bing.com/reference/semhtml/Tide, (accessed on 8-26-10)

Physical Features

- **Consequences**
  - **Daily emersion & submergence**
  - **Constraints on:**
    - **Photosynthesis for marine plants**
    - **Feeding & respiration for marine animals**

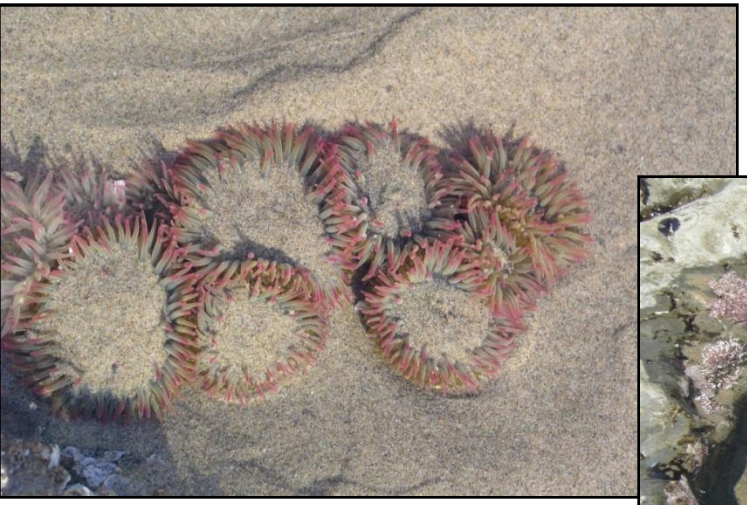


Physical Features

- **Wave action**
  - **Disturbance**
  - **Delivery of larvae, spores, & other propagules**
  - **Delivery of food, oxygen, and other materials**

Physical Features

- **Substrate stability**
  - **Solid bedrock**
  - **Boulders**
  - **Cobbles, shingles, etc.**



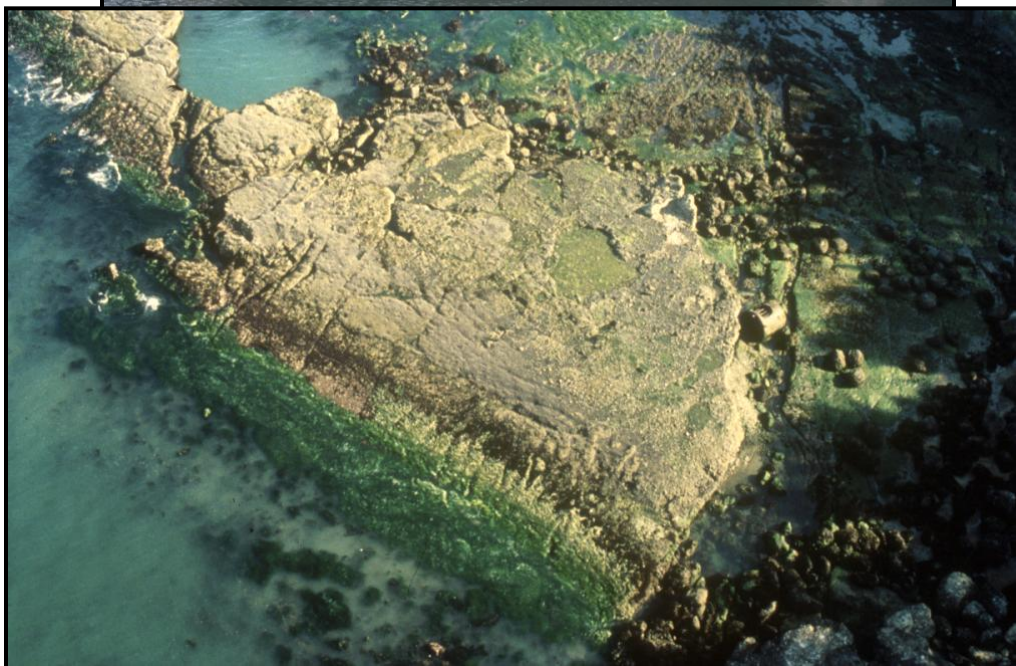
Physical Features

- Composition
  - Basalt
  - Mudstone
  - Sandstone
- Properties
  - Stability
  - Heterogeneity
  - Porosity
  - Temperature

Biological Features

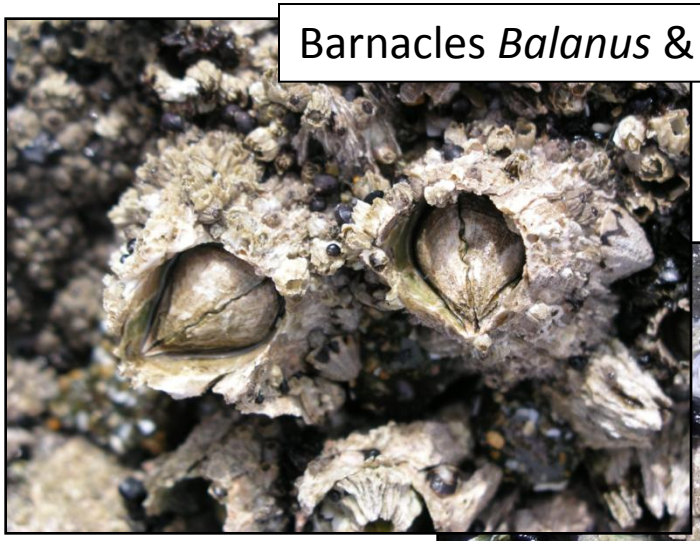
Biological Features

- **Vertical Zonation**
  - **horizontal bands of organisms arrayed along a vertical tidal gradient**
  - **Bands defined by dominant species**



Major Organisms

- **Barnacle zone**
  - **Acorn barnacles**
  - **Tiny snails (periwinkles)**
  - **Microalgae & lichens**
- **Rockweed zone**
  - **Fucoid algae**
- **Mussel zone**
  - **Complex**
  - **High diversity**

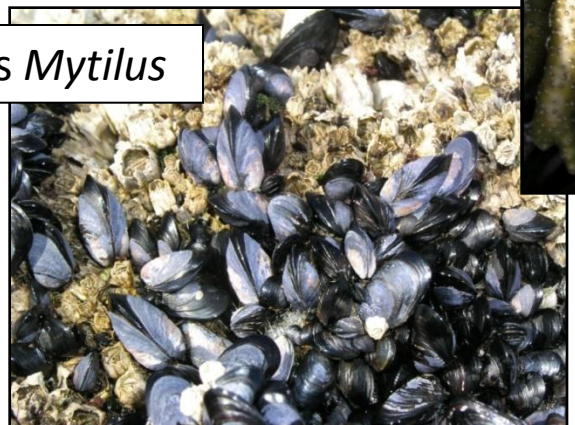


Barnacles *Balanus* & *Semibalanus*

Periwinkles *Littorina*

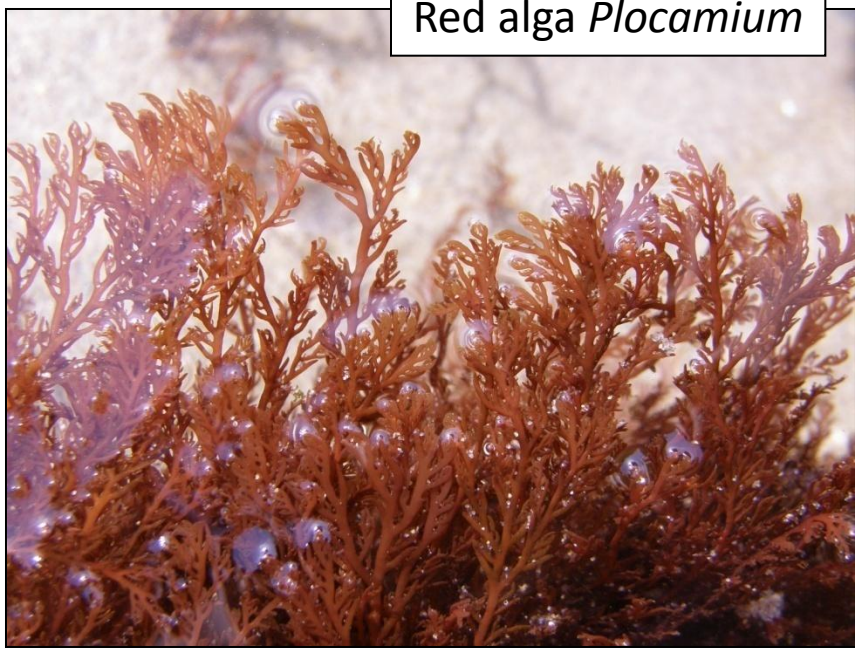
Rockweeds *Fucus* & *Pelvetiopsis*

Mussels *Mytilus*



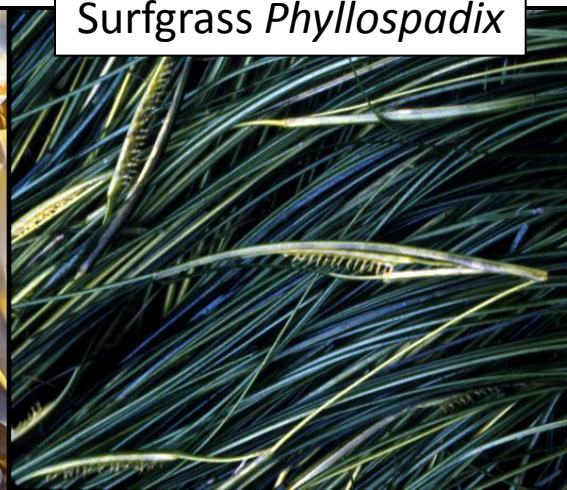
Major Organisms

- **Red algal zone**
  - **High diversity**
- **Kelp & surfgrass zone**
  - **Large brown algae**
  - **Meadows of seagrass**


Red alga *Plocamium*


Red algal turf


Kelp *Laminaria*


Surfgrass *Phyllospadix*

Ecological Processes

- **Competition**
  - **For space**
  - **For food, light, or other resources**

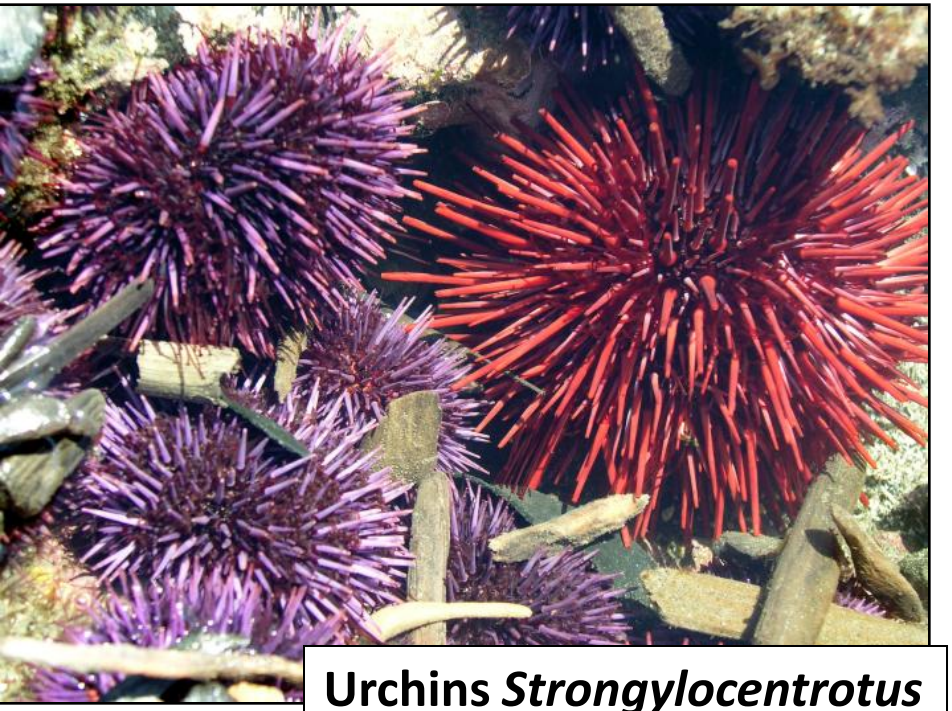
Ecological Processes

- **Predation**
  - ***Pisaster*** **(ochre seastar) → keystone species**
  - ***Nucella*** **(whelks) → secondary keystone species**

Ecological Processes

- **Herbivory/Grazing**
  - **Periwinkle snails & limpets**
  - **Sea urchins**
  - **Chitons**
  - **Mesograzers**

Chiton *Katharina*



Urchins *Strongylocentrotus*

Isopod *Idotea*

Ecological Processes

Red alga *Neorhodomela*

- **Disturbance**
  - **Wave force & wave-borne debris**
  - **Sediment scour & burial**
  - **Human trampling**
  - **Human collection**

Cape Arago

Ecological Processes

- **Larval & algal propagule supply**
- **Controlled by oceanographic processes**

Cultural Geography

- **Human foraging**
  - **Mussels, limpets, & chitons historically**
  - **Mussels, kelp, urchins, etc.**
- **Human collection**
  - **Aquarium industry**
  - **Public aquaria**
  - **School groups**
  - **Scientists**

Major Resource Issues

- **Extraction**
  - **Shellfish**
    - **Mussels & snails**
  - **Seaweed**
    - **Kelp**
    - **Other**
- **Conservation**
  - **Birds**
  - **Marine mammals**
  - **Reserves**

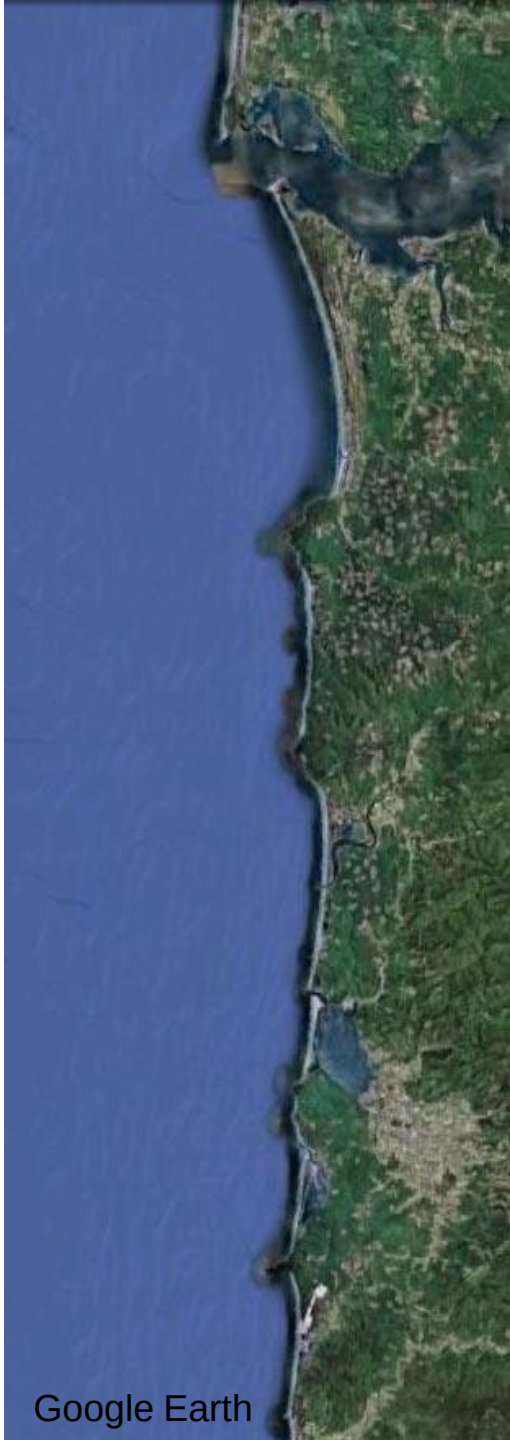

Sand Dunes

Distribution

- **Well developed in Oregon & southern Washington**
- **Oregon Dunes systems include 45% of coastline**

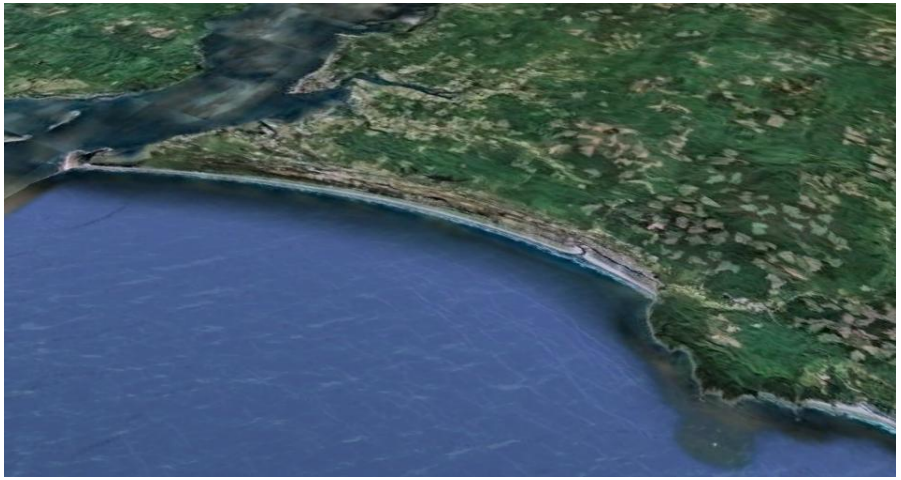
4 Regions

1. **Columbia River to Tillamook Hood (55 miles)**
2. **Tillamook Head to Heceta Head (125 miles)**
3. **Heceta Head to Coos Bay (54 miles)**
4. **Cape Arago to California-Oregon border**



Columbia River to Tillamook Hood

- **Deposition of erosion sediments from Columbia River**
- **Prograding (advancing) shoreline**
- **Characteristic:**
  - **Series of sand ridges parallel to shore**
  - **Unusual in Oregon but common on east coast & Europe**



Google earth image

Tillamook Head to Heceta Head

- **Capes & headlines with dunes in between**
- **Characteristics:**
  - **Large parabola dune or dune complex**
  - **Erosion of seaward end of dunes**

http://www.flickr.com/photos/jo_mclure/2828081819/ (accessed on 8-22-10)

Heceta Head to Coos Bay

- **Extensive dune system: Coos Bay dune sheet**
- **Continuous except where interrupted by rivers & streams**
- **Dunes extended up to 2.5 miles inland and gently slope to offshore**

Cape Arago to California-Oregon border

- **Low, flat dunes**
- **Extend inland about a mile**
- **Best developed around Coquille River**
  - **12 miles system**
  - **North & south**

www.marinas.com, (accessed on 8-22-10)

Major Organisms

- **Shore pine (*Pinus contorta*)**
  - **Pioneer forest tree on dunes**
  - **Understory (salal, huckleberry, rhododendrons)**
- **Beach grass (*Ammophila*)**
  - **Introduced in 1800s**
  - **Stabilized dunes & changed dynamics**
- **Gorse (*Ulex europeus*)**
  - **Introduced in late 1880s**
  - **Changed fire/burning regime**

Ecological Processes

- **Succession**
  - **Pioneers**
    - Vigorous, creeping underground stems & roots
    - stabilization
  - **Early mid-successional species**
    - Shrubs (salal & huckleberry)
    - Seedlings (coast pine & doulas fir)
  - **Late mid-successional**
    - Forests of coast pine
    - Understory (western rhododendron)
  - **Climax forest**
    - Hemlock-cedar

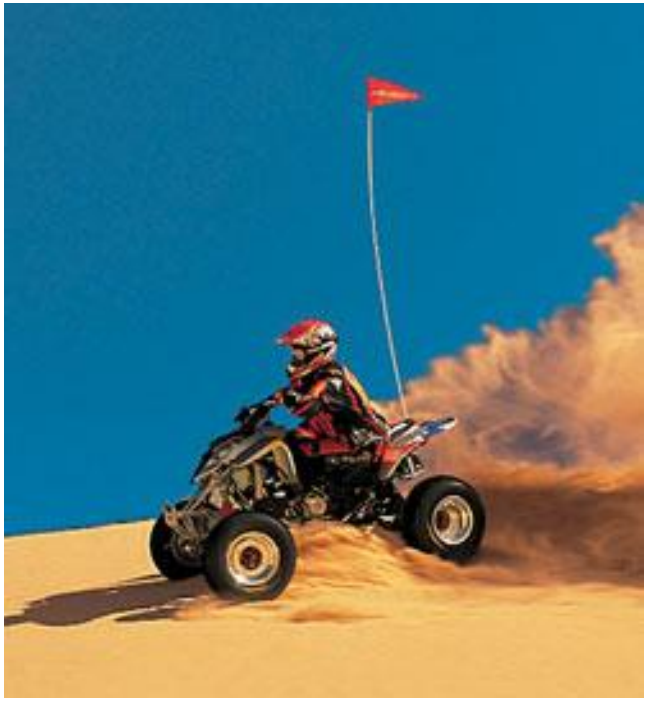
Cultural Geography

- **Sand dune stabilization**
  - Programs since early 1900s
  - European beach grass & scotch broom & coast pines
- **Fire history**
  - Florence fires 1833 & 1853
  - Bandon fires
  - Natural & man-made fires
  - Fire causes renewed sand movement

Resource Issues

- Sand stabilization
  - Development
- Sand collection
  - Cement
- Recreational activities
  - ATVs
  - Sand boarding
  - Hiking

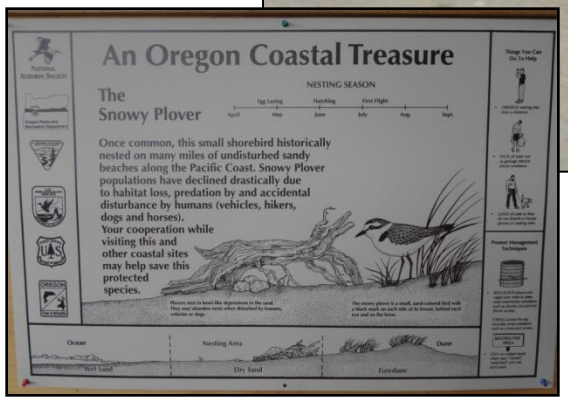
http://www.duneseven.com/, (accessed on 8-22-10)

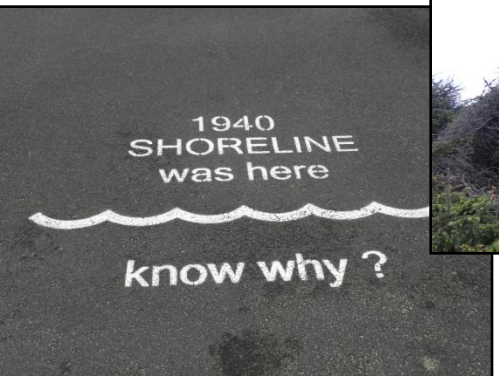


http://www.offroad-ed.com/mi/course/terrain.htm, (accessed on 8-22-10)

Conservation

- Snowy plover nesting
- Introduced species
  - Beach grass removal
  - Gorse removal
  - Scotch broom removal
- Restore “natural” sand dynamics



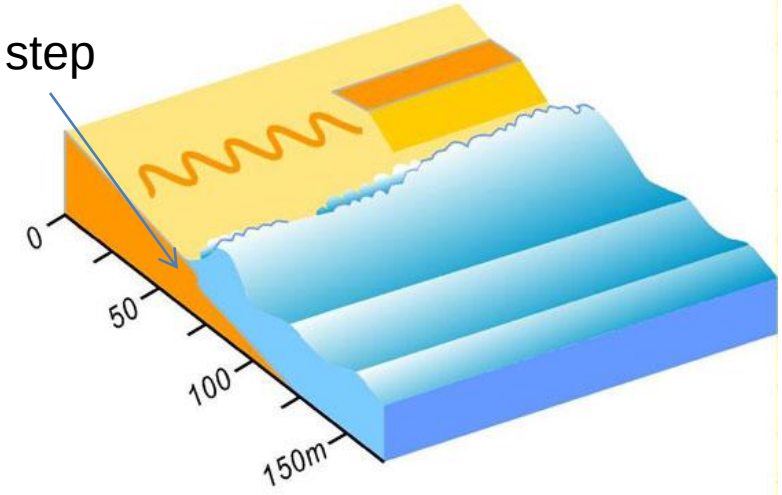



Sandy Beaches

Physical Features:

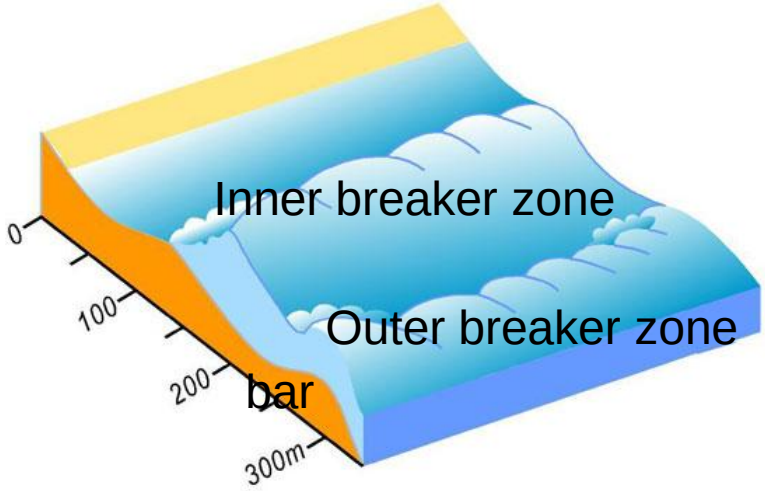
Types of Beaches

reflective



No bar (shore break only)

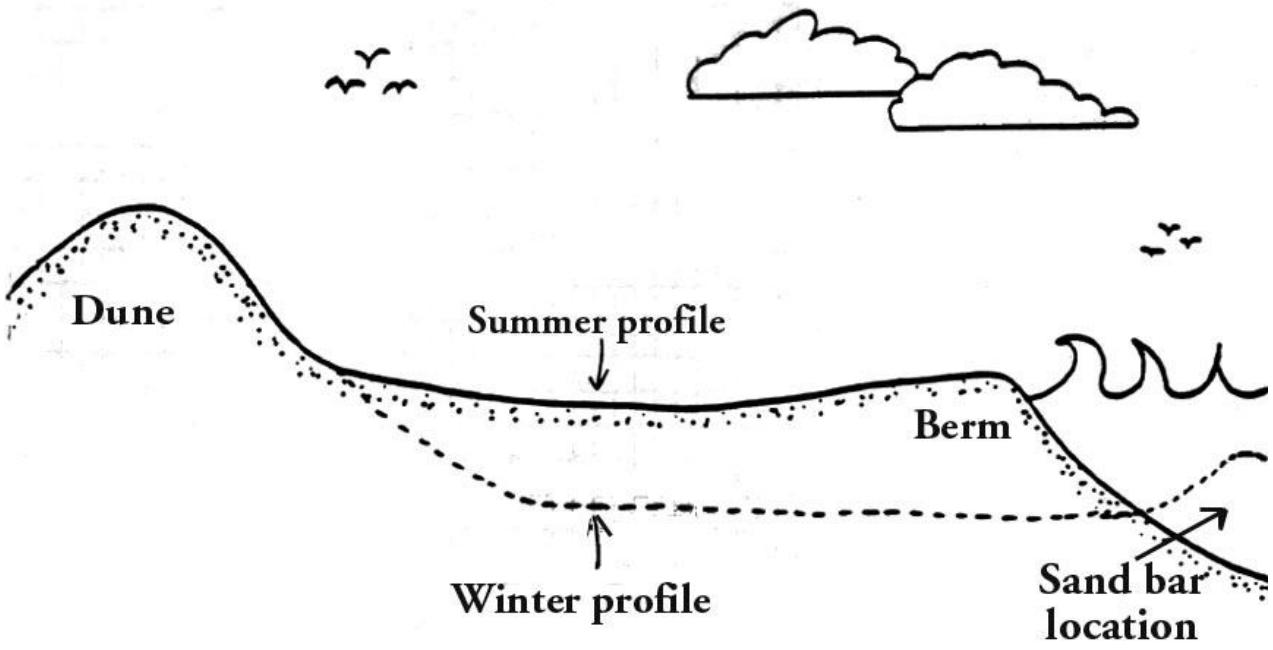
dissipative



http://www.naturalhazards.net.nz/tools/nzcoast/coastal/about/nz_beach_type_classification/beach_types, (accessed 8-22-10)

Temporal Changes

- **Profound changes in shore profile**
  - **Inter-annually**
  - **Seasonally**
  - **Short-term**



http://ux.brookdalecc.edu/staff/sandyhook/tripdata/beaches/profile.html, (accessed on 8-22-10)

Sand Movements

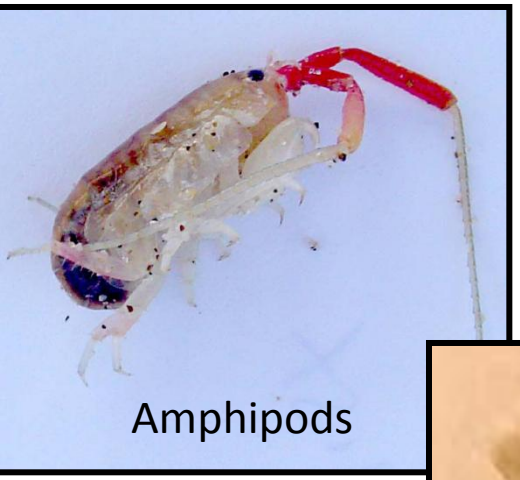
Strawberry Hill

Huge sand fluctuations

Physical Features

- **Large particles**
  - Stable surfaces
  - Epifauna & epiflora predominate
- **Intermediate particles**
  - Inhospitable
- **Fine particles**
  - Unstable
  - Epifauna & epiflora
  - Infauna
  - Macrofauna vs. meiofauna

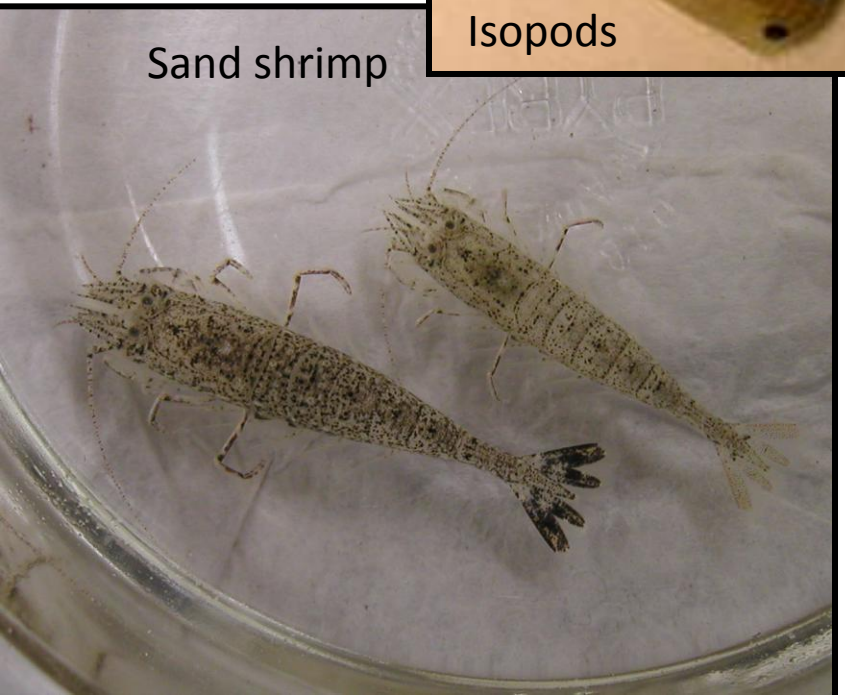
Major Organisms



Amphipods

Isopods

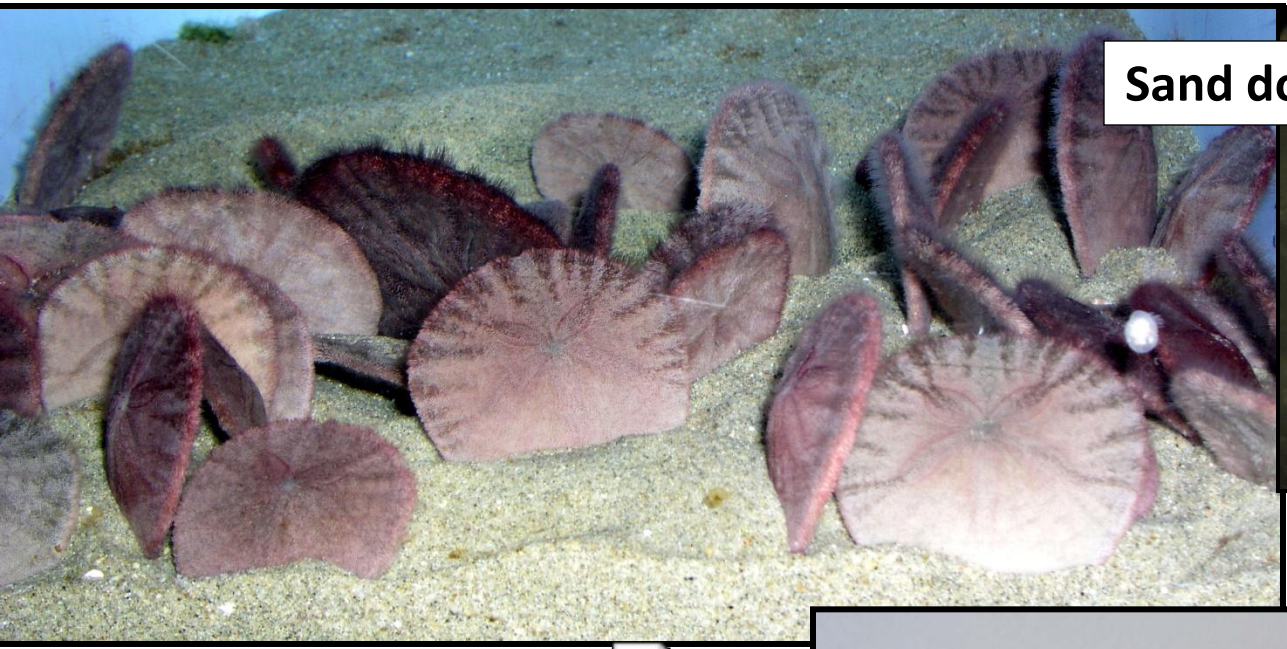
Polychaetes



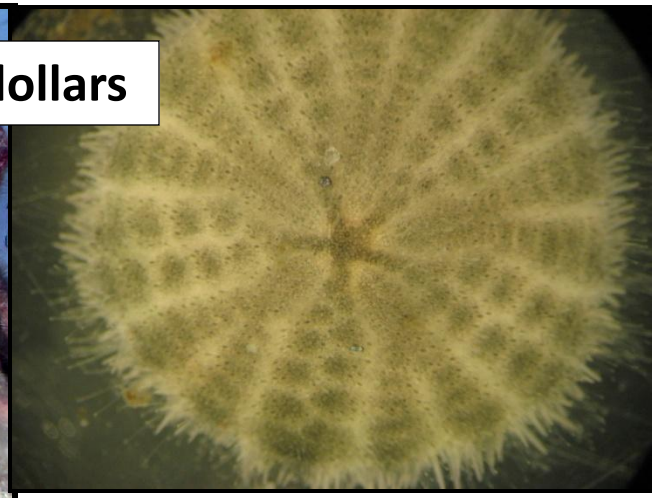
Sand shrimp

Mole crabs

Major Organisms



Sand dollars

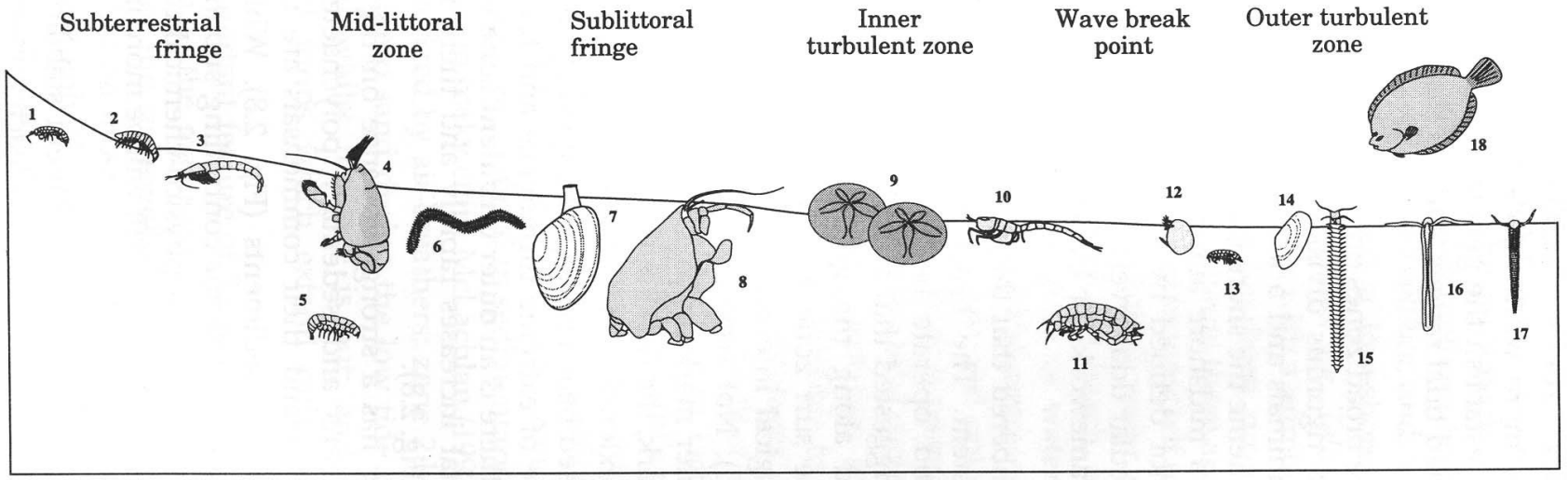


Razor Clam

P7140026.AVI

Polychaete worms

NE Pacific Sandy Beaches



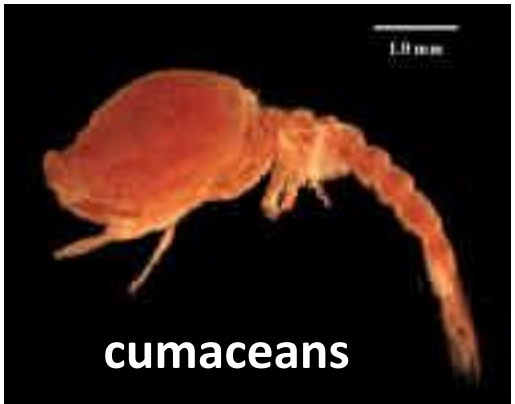
Castro and Huber, 2007

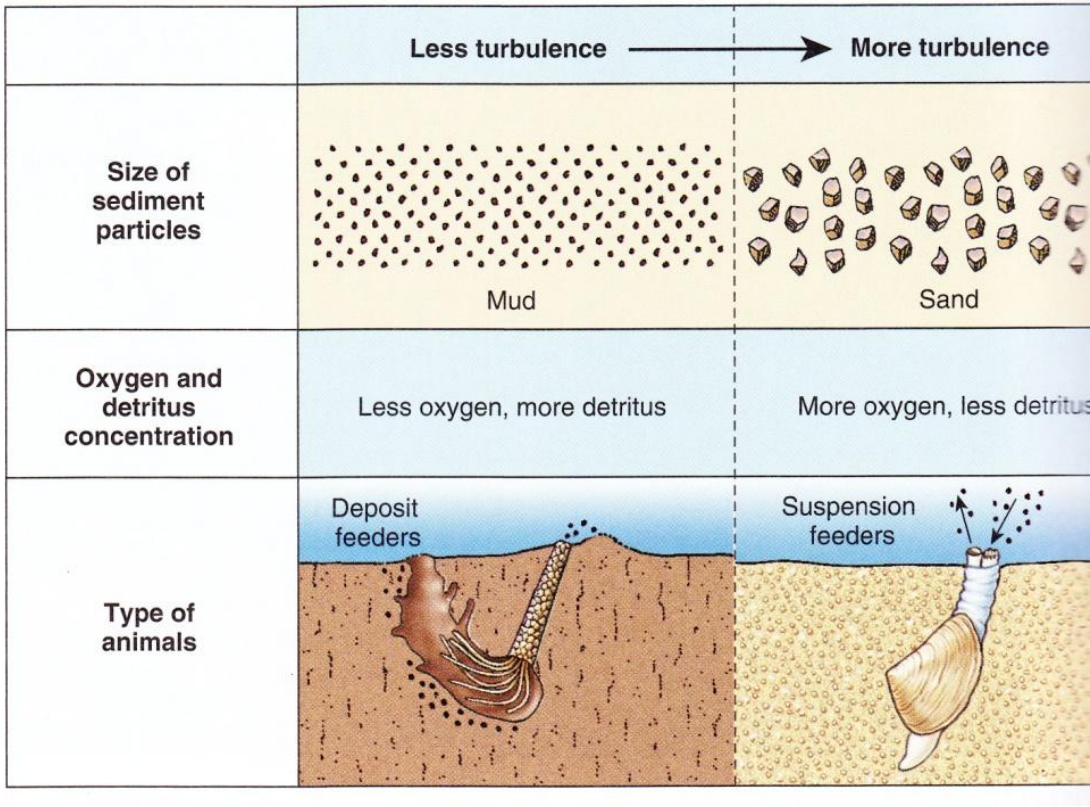
- Amphipods, isopods, mysids
- Mole crabs, amphipods, polychaete worms
- Crustaceans & sand dollars
- Clams, sedentary polychaetes, fish

Food Web

Drift material: <u>trophic subsidies</u>

Major Organisms

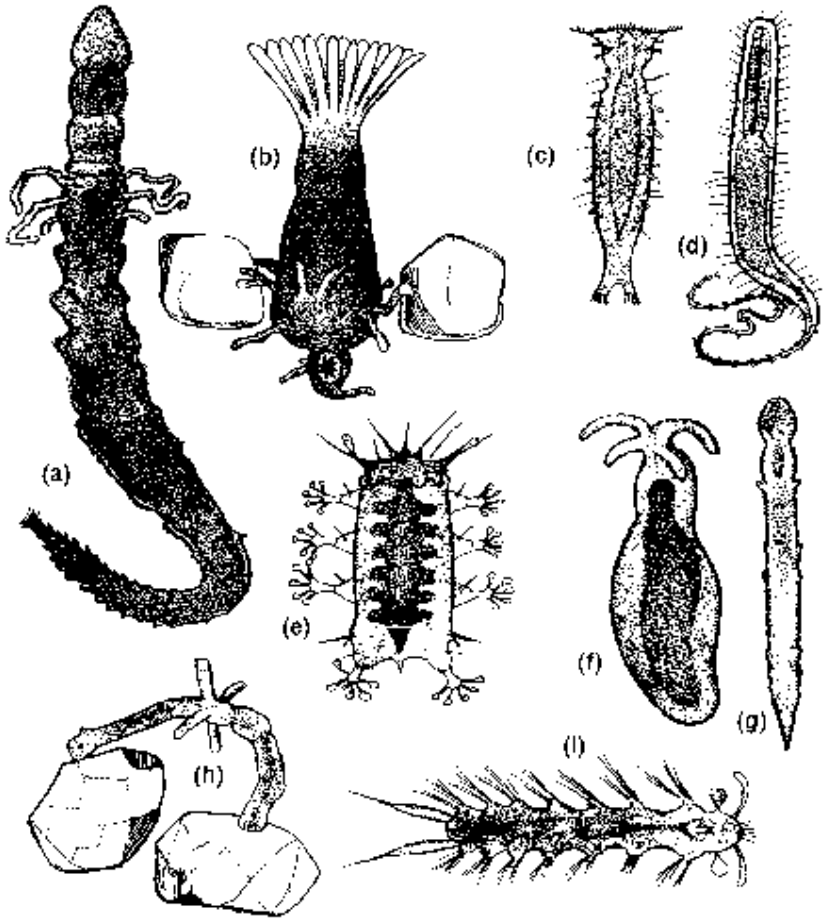




Castro and Huber, 2007

http://www.mbari.org/benthic/cumaceans.html, (accessed no 8-22-10)

Meiofauna



http://www.jochemnet.de/fiu/OCB3043_36.html, (accessed on 8-22-10)

Seal Rock State Park

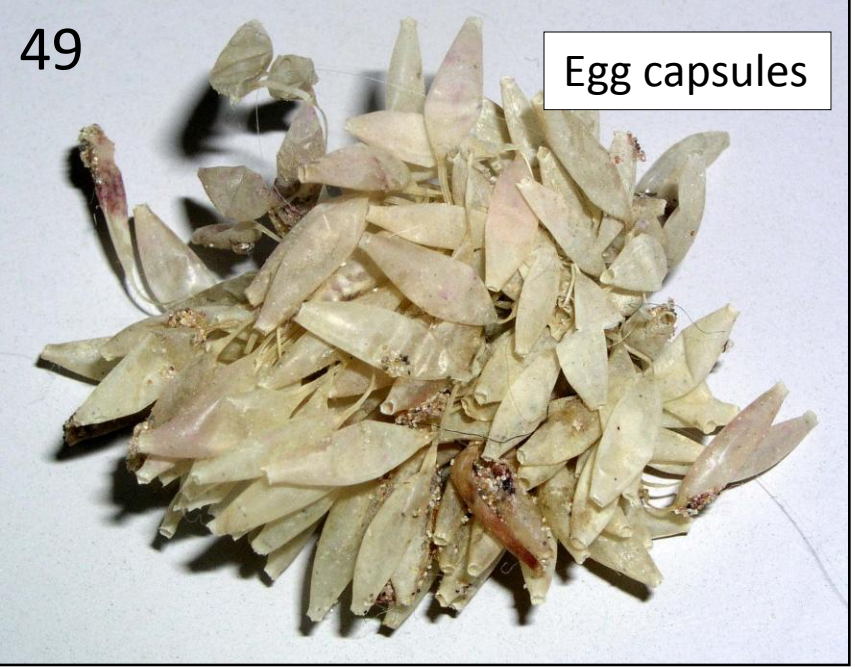
Life in Sand Inundated Areas

Tolerate disturbances

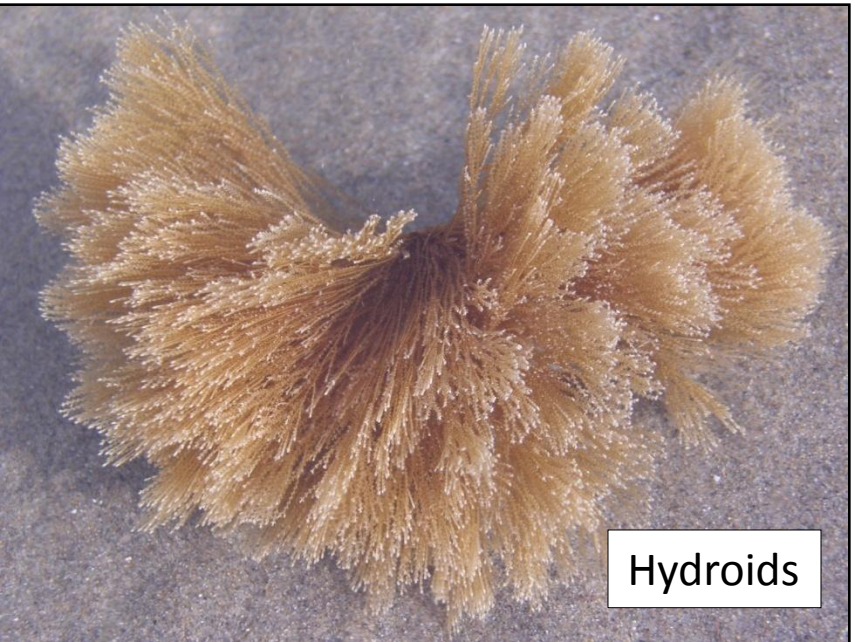
Colonize between disturbances

Black pine (*Neorhodomela*)

Sea lettuce (*Ulva*)



Drift



Cultural Geography

- **Indigenous tribes**
  - Major groups include the Clatsop, Tillamook, Siletz, Alsea, Siuslaw, Coos, & Coquille
  - Middens
- **European explorers**
  - Sir Francis Drake
  - James Cook
- **American Explorers**
  - Robert Gray
  - Lewis & Clark

Clam shell midden

http://www.marinebio.net/marinescience/01intro/behist.htm, (accessed on 8-22-10)

Major Resource Use

- Surf fishing
- Razor clamming
- Recreation
  - Surfing
  - Parasailing
  - Horse riding
- Tourism

http://www.fullfreestuff.com/WallPapers/WallPapers/beach-desktop-wallpapers.shtml, (accessed 8-22-10)

Sea Stacks, Headlands, & Cliffs

Physical Features

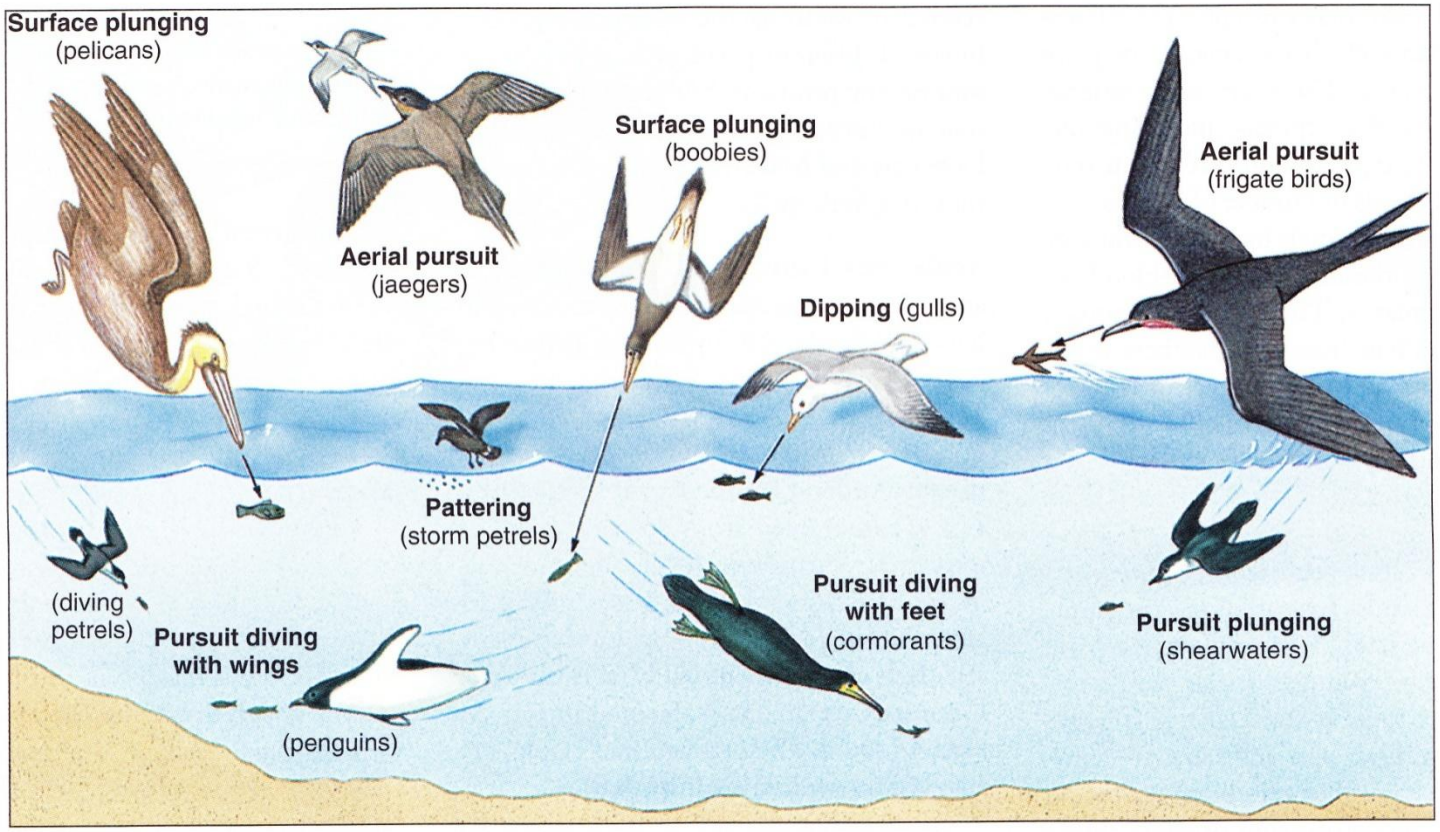
- Steep rocky surfaces
- Usually inaccessible or remote
- Windy
- Updrafts

Biological Features

- Little soil on steep faces
- Limited plant life
- Limited accessibility by mammalian predators
- Extensive nesting bird colonies

Major Organisms

- rocky islands and rugged habitats of the outer Oregon
- about 1.3 million nesting seabirds of 15 species



Castro and Huber, 2007

Nesting Seabirds & allies

- 2 species of storm-petrels (Leach's and Forktailed)
- 3 species of cormorants (Double-crested, Brandt's, and Pelagic)
- 3 species of gulls (Western, Glaucous-winged, and Ring-billed)
- 1 tern species (Caspian)
- 6 species of alcids (Common Murre, Pigeon Guillemot, Marbled Murrelet, Cassin's Auklet, Rhinoceros Auklet, and Tufted Puffin)
- 1 shorebird species (Black Oystercatcher)
- Marbled Murrelets nest solitarily in forest habitats

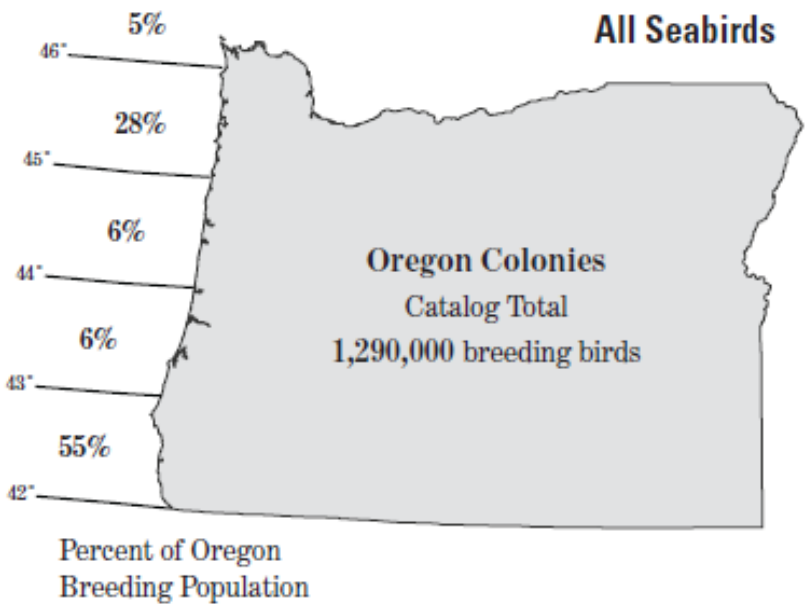
Major Organisms

Common Murres

Leach's Storm-Petrels

Naughton, M. B., D. S. Pitkin, R. W. Lowe, K. J. So, and C. S. Strong. 2007. Catalog of Oregon seabird colonies. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R1009-2007, Washington, D.C.

Breeding Colonies



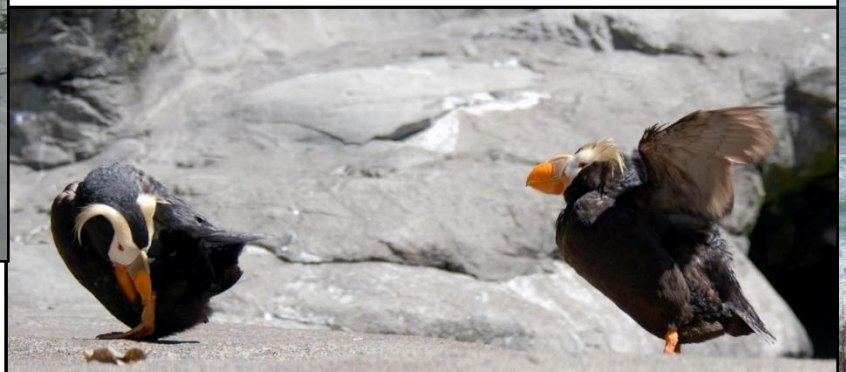
- Oregon Coast National
- Wildlife Refuge (NWR) Complex
- Three Arch Rocks NWR, where over 225,000 seabirds of 10 species nest
- rocky cliffs and nearshore islands from Depoe Bay to Newport and at Heceta Head/Sea Lion Cave
- offshore sea stacks and rocky coastline

Naughton, M. B., D. S. Pitkin, R. W. Lowe, K. J. So, and C. S. Strong. 2007. Catalog of Oregon seabird colonies. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R1009-2007, Washington, D.C.

Some Oregon Hot-spots

Yaquina Head

Haystack Rock



Sources

1. Castro, P. and M.E. Huber. 2007. Marine Biology 7th edition. McGraw-Hill . New York, NY. P.459
2. Naughton, M. B., D. S. Pitkin, R. W. Lowe, K. J. So, and C. S. Strong. 2007. Catalog of Oregon seabird colonies. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R1009-2007, Washington, D.C.
3. Internet sources (accessed 8-22-10):
   http://www.flickr.com/photos/jo_mclure/2828081819/
   hppt://www.marinas.com
   http://www.duneseven.com
   http://www.offroad-ed.com/mi/course/terrain.htm
   http://www.naturalhazards.net.nz/tools/nzcoast/coastal/about/nz_beach_type_classification/beach_types
   http://ux.brookdalecc.edu/staff/sandyhook/tripdata/beaches/profile.html
   http://www.mbari.org/benthic/cumaceans.html
   http://www.jochemnet.de/fiu/OCB3043_36.html
   http://www.marinebio.net/marinescience/01intro/behist.htm
   http://www.fullfreestuff.com/WallPapers/WallPapers/beach-desktop-wallpapers.shtml