



Estuaries

Hydrokinetic and Wave Energy Technologies

Technical and Environmental Issues Workshop

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Estuaries

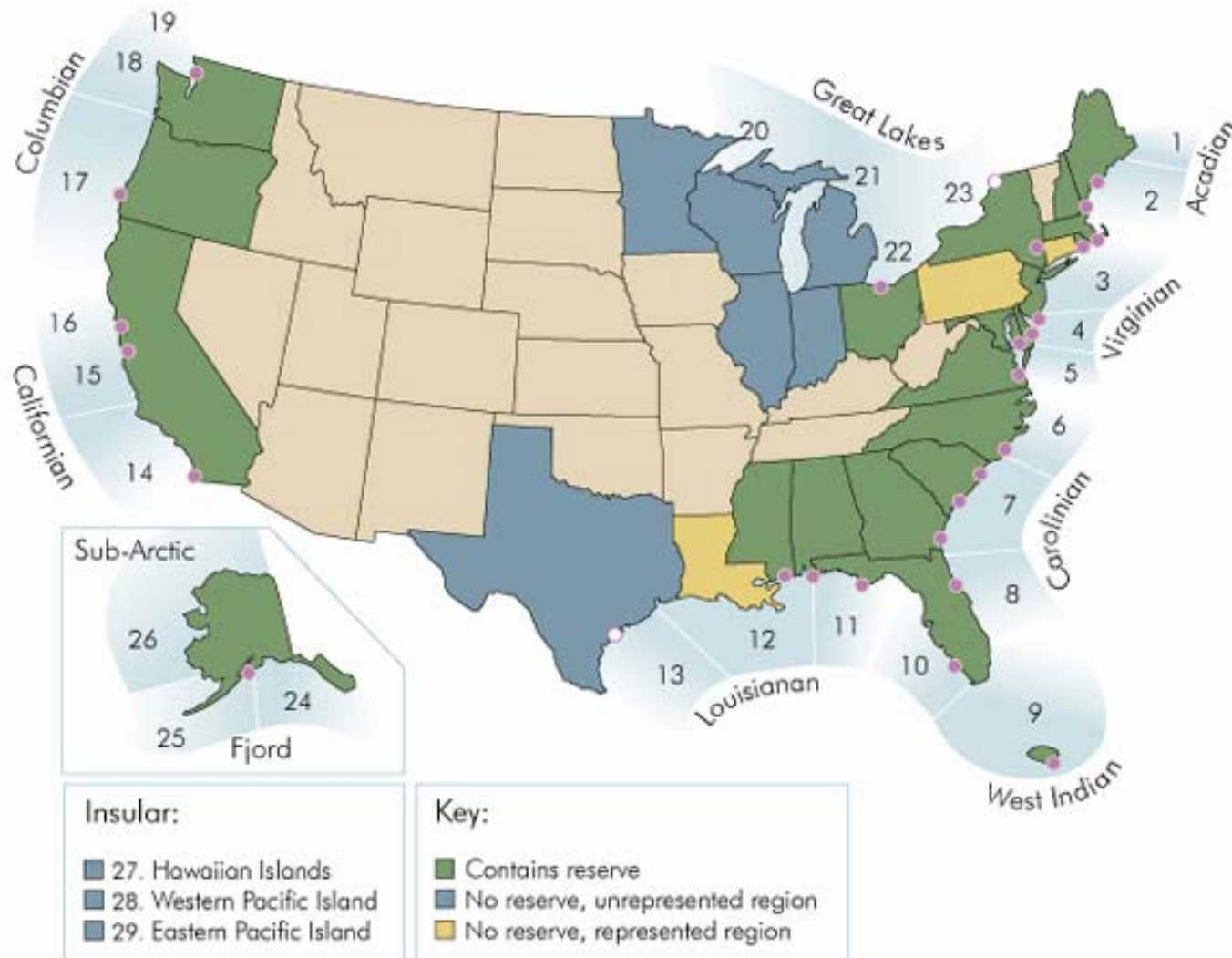
An aerial photograph of a coastal estuary. A wide river flows from the left towards the right, where it meets the ocean. The river's path is marked by a winding, light-colored sandy bar. The surrounding land is covered in dense green vegetation, and the ocean waves are visible in the distance under a clear sky.

Estuary: body of water partly surrounded by land where fresh water from rivers and streams runs into and mixes with salt water from the ocean

102 estuaries in U.S.

28 designated to be of “national importance”

26 protected as National Estuarine Research Reserves



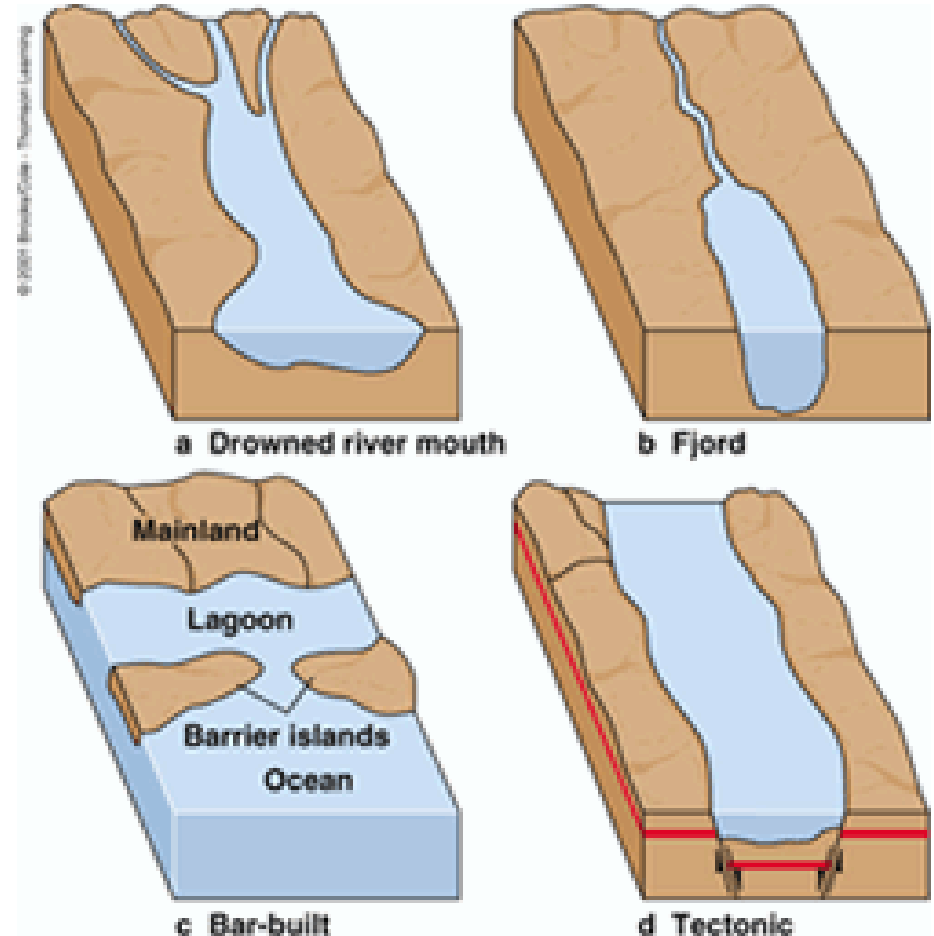
Types of Estuaries

Coastal plain estuaries
(Chesapeake Bay)

Fjords
(Alaskan, Canadian,
Norwegian coasts)

Bar-built (barrier island)
estuaries
(Outer Banks, N. Carolina)

Tectonic estuaries
(San Francisco Bay)



Physical Characteristics

Dynamic

- **Freshwater inflow**
(seasonal, interannual)
- **Tides** (daily, seasonal)
- **Ocean conditions**
(waves, wind)

Spatial variation

- **Area**
- **Water velocity**
- **Tidal excursion**
- **Depth**
- **Water quality (salinity)**

Deposition v Erosion

- **Watershed conditions**



Ecological Characteristics and Significance

Habitats

- Marsh
- Mudflats
- Open water
- Sloughs, channels
- Intertidal v subtidal

Productivity

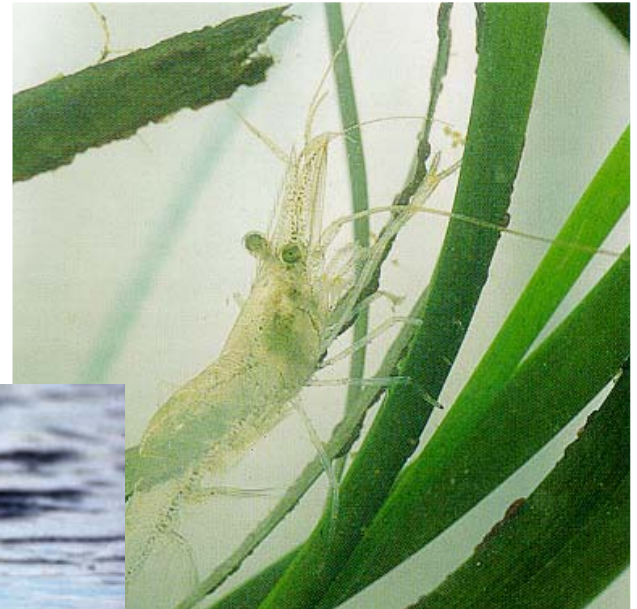
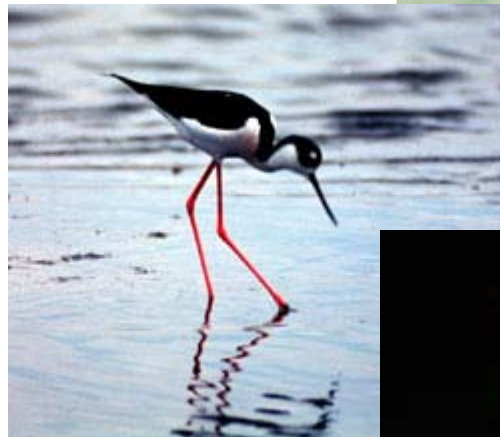
- In-estuary production
- Import of nutrients



Ecological Characteristics and Significance

Biological Resources

- Plants,
- Invertebrates
(terrestrial, aquatic)
- Fish
- Birds
- Mammals



Habitat Use

- Spawning, breeding
- Rearing, nursery habitat
- Resident species
- Migration corridor



Human Uses of Estuaries

- Population centers
- Shipping
- Fishing
- Recreation
- Education

