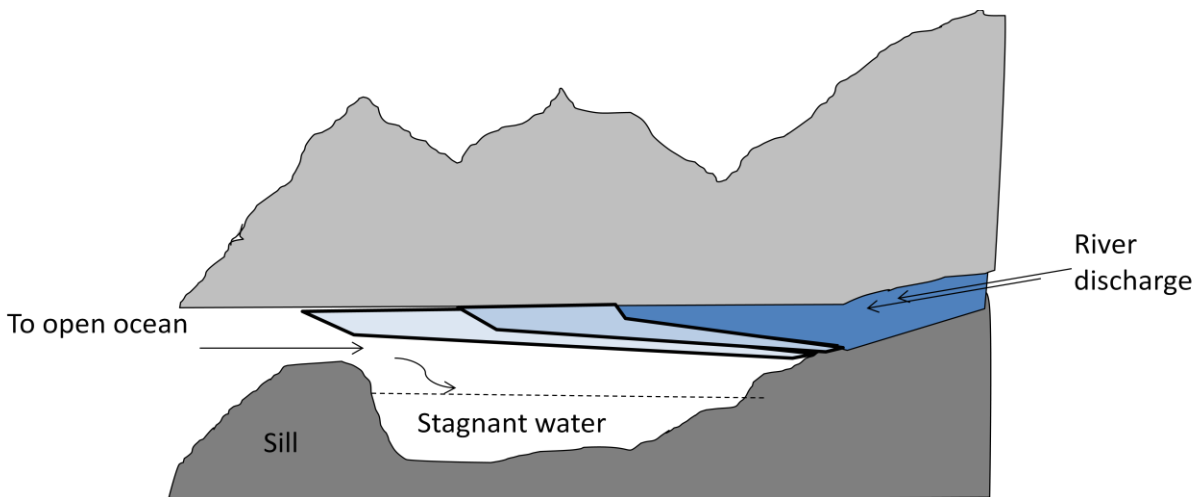


### Fiords and water movement

- As glaciers scoured out the deep valleys that bisect the BC coast, they often deposited a wall of rubble at the mouth of the fiord, forming a terminal moraine, also called a sill.
- This geologic formation controls the flow of water into and out of coastal fiords.
- Tidal currents move marine water in and out of fiords.
- Stagnant low oxygen water can get trapped in the fiords.
- Rivers input a surface layer of fresh water that gradually gets mixed into the ocean.



### The BC coastal marine ecosystem is productive

- Oceanic currents, tides, and winds drive movement of more oceanic water
- This water turbulence brings nutrient-rich water up from the depths to fuel plant growth
  - Why would the surface waters have depleted nutrient levels?

### Exposed marine ecosystems

- The base of the food web
  - Phytoplankton—tiny plants growing up in the water column
  - Benthic algae—often macroalgae (large), these only live in the shallower water due to light limitation. Some species can grow almost 1 m per day!
    - Bull kelp
    - Giant kelp
    - Kelp forests are incredibly productive habitats that support many different species.
      - Structure for species (e.g., juvenile rockfish rearing habitat)
      - Food for grazers, herbivores (e.g., abalone and sea urchins)
- These plants are then eaten by herbivores or . .
- becomes detritus:
  - Marine snow—constant rain of dead materials from the upper lit zone where virtually all of the production happens down to the bottom of the ocean.

### Sea otters and kelp forests

- Sea otters eat sea urchins (and basically everything else)
- Sea urchins eat kelp
- Thus, when there are sea otters, there are more kelp forests
- When there are no sea otters, there are fewer kelps forests
- Sea otters were wiped out from most regions of BC
- Re-colonization of Vancouver Island has been happening over the last 3 decades

**Anthropogenic drivers of BC marine change include:**

- **Climate change**
  - Ocean acidification
- **Fisheries**—BC has 100s of different fisheries. They differ dramatically in how much by-catch they have and the overall sustainability of the fish they target.
  - Groundfish—BC largest fishery in tones landed
    - E.g., Halibut, hake, rockfish
    - Bottom trawling
    - Long line
  - Salmon
  - Herring and sardines
  - Marine Protected Areas
- **Coastal development**
  - Wind and tidal farms
- **Pollution**
  - Oil spills?