Aquatic biomes: read the water

Freshwater has low dissolved salt content; marine water is saline. Aquatic communities also depend on depth, turbidity, nutrients, temperature and water movement.

1. FIVE CONTROLS ON AQUATIC LIFE

Salinity	Salt concentration affects water balance and which species can tolerate the habitat.
Depth	Light generally decreases downward, limiting where photosynthesis can occur.
Turbidity	Suspended particles make water cloudy and can reduce light penetration.
Nutrients	Nitrogen and phosphorus availability can limit producer growth; more is not always better.
Temperature	Influences metabolism and oxygen solubility. Cold water can hold more dissolved oxygen than warm water under comparable conditions.

2. STREAMS AND RIVERS: FLOWING WATER

Currents move water downstream and transport sediment and nutrients. Organisms must tolerate flow. Turbulence can help replenish dissolved oxygen; oxygen levels still depend on temperature, photosynthesis and respiration.

3. PONDS AND LAKES: STANDING WATER

Water movement is generally slower. Shallow margins may support rooted plants; deeper water receives less light. Freshwater habitats occur worldwide and supply drinking water, but untreated freshwater is not automatically safe to drink.

Habitat structure and light: OpenStax, Biology 2e 44.4.
Temperature, flow and dissolved oxygen: USGS, Water Science School.

Scope: College Board AP Environmental Science CED (2025), Topic 1.3, p. 38.

Marine habitats are not all alike

The ocean spans all latitudes, but coastal habitats occur only where physical conditions allow them. Compare open water, reef-building communities and sheltered shorelines.

1. OCEANS: VAST, BUT UNEVENLY PRODUCTIVE

Sunlit surface waters support phytoplankton. Much of the open ocean has low nutrient availability, while coastal and upwelling regions can be more productive. Depth, temperature and food supply help determine where different fish species occur.

2. CORAL REEFS: CLEAR WATER, TIGHT RECYCLING

Tropical shallow-water reefs are associated with warm, clear, sunlit seas. Reef-building corals are animals; their algal partners supply photosynthetic food. Efficient nutrient recycling supports diverse communities even in nutrient-poor surrounding water. Deep-water corals also exist.

3. ESTUARIES: A COASTAL MIXING ZONE

Freshwater from land mixes with seawater in partly enclosed coastal waters. The resulting brackish water has variable salinity as tides and river flow change. Sheltered habitat and food support nurseries for many fish and shellfish; organisms must tolerate changing conditions.

4. SALT MARSHES: TIDAL WETLANDS

Salt-tolerant grasses and other nonwoody plants grow along sheltered coasts, often within estuaries. Tides flood and drain the habitat. Marshes trap sediment, buffer waves and support wildlife. Waterlogged sediments may have little oxygen; marshland can also be freshwater.

Estuarine mixing and nursery habitat: NOAA, What is an estuary?
Coral-algal partnership: NOAA, Corals Tutorial.
Tidal salt marshes: NOAA; wetlands can be fresh or saline: EPA.

Scope: College Board AP Environmental Science CED (2025), Topic 1.3, p. 38.

Light, nutrients and living resources

The distribution of marine resources, including fish, reflects environmental conditions and food supply. Follow the process linking a physical change to a biological response.

1. LIGHT DECREASES WITH DEPTH



The photic zone receives light; photosynthesis requires sufficient light. Turbid water can have a shallower productive layer than clear water. The boundary varies, so a single depth is not valid for every lake or ocean location.

Schematic, not to scale. Darkness limits photosynthesis, not all life: deep-water consumers can use organic matter produced elsewhere.

2. UPWELLING CAN SUPPORT FISHERIES

When surface water is displaced, deeper water can rise to replace it. This water is often cold and nutrient-rich. In sunlit waters, added nutrients can stimulate phytoplankton growth, supporting food webs and productive fisheries. Nutrients alone do not guarantee abundant fish.

3. MARINE PRODUCERS CONNECT CARBON AND OXYGEN

Photosynthetic algae and cyanobacteria use carbon dioxide and release oxygen. Ocean photosynthesis contributes a large share of global oxygen production, but marine respiration and decomposition consume much of it. Oxygen production is not the same as net oxygen accumulation.

Related distinction: wetlands are defined by water saturation and adapted vegetation, not by salinity alone. They can occur inland or along coasts.

Upwelling and fisheries: NOAA, What is upwelling?
Oxygen production and consumption: NOAA, Ocean oxygen.
Wetland definition: US EPA, What is a Wetland?

Scope: College Board AP Environmental Science CED (2025), Topic 1.3, p. 38.