Principle 5:
Grades 6-8

Principle 5:
The ocean supports a great diversity of life and ecosystems.

The ocean provides vast living space and unique ecosystems from the surface through the water column to the sea floor.

Diversity of Ecosystem

A.
Ocean ecosystems vary widely, based on the variety of environmental factors and the community of organisms living there.

Primary Productivity

A.1.
Ocean ecosystems with the greatest abundance of life occur where environmental conditions and/or adaptations allow for high levels of productivity.

A.2.
Most primary productivity in the ocean takes place at the surface where there is plentiful sunlight for photosynthesis and nutrients to support growth.

A.3.
Microbes (photosynthetic algae and bacteria) are important primary producers and support a huge abundance of life.

A.4.
Microbes are the basis of most energy in food webs in the ocean. They are the primary food source for grazers, such as zooplankton and clams. Grazers are in turn the primary food for bigger organisms. such as fish and baleen whales.

See Principle 3: B3

A.5.
Some ecosystems function independent of sunlight energy.

A.6.
Ecosystems, such as deep sea vents and cold water seeps, depend on chemosynthesis—a process similar to photosynthesis, but with a different energy source—for primary productivity.

A.8.
There are six places in the ocean, all on west coasts, with the right environmental conditions to create the most productive areas. These are the coastal upwelling zones.

A.9.
Coastal upwelling occurs when wind and the Coriolis effect push surface water offshore, allowing for cold, nutrient rich water from deeper down to rise to the surface.

A.10.
Kelp forests and other coastal ocean ecosystems in upwelling zones have abundant sunlight, cold water and nutrients, making them some of the most productive ecosystems in the world.

See Principle 1: C7

A.11.
Coral reefs occur where the water is warm and there are not many nutrients in the water, and yet they are very productive ecosystems.

A.12.
A symbiotic relationship between corals and the algae living inside them allows the corals to thrive, even though the environmental conditions do not seem conducive to supporting life.

A.13.
Environmental conditions in estuaries (e.g., shallow, brackish water) and in mangroves (lots of decaying organisms) result in highly productive nursery areas for a great many ocean organisms.

A.14.
At the poles, nutrients flowing into the ocean from melting glaciers, combined with long, sunny days in the summer, result in productivity and abundance unequaled anywhere else in the world.

A.15.
Differences in light, temperature, pressure, density and chemical makeup of this fluid environment lead to distinct vertically and horizontally distributed ecosystems.

A.16.
Ecosystems exist in layers of habitats and microhabitats due to gradients in specific environmental factors, such as temperature, salinity and oxygen within the water column.

A.17.
Ocean organisms are adapted to live in a relatively stable ocean. They are often adapted to tolerate very specific environmental conditions. For example, corals can only live within specific temperature ranges, and some larval fish can only live in very narrow layers of water with particular salinity and temperature.

A.18.
Adaptations to specific environmental conditions can result in vertical and horizontal zonation patterns. For example, in intertidal areas, organisms are adapted to crashing waves and the cycle of the tides, while in the open ocean, many organisms are adapted to a specific temperature and salinity level. Different organisms are found in different density layers.

A.19.
Humans have changed environmental conditions in the ocean, which has had a generally negative impact on organisms adapted to the previous conditions.

A.20.
Changes to the climate will cause further changes to environmental conditions, which will likely have major impacts on many different ocean organisms.

A.21.
Ocean ecosystems are connected to each other via a series of food webs.

A.22.
The diversity of phyla and life history strategies of ocean organisms create complex, interconnected food webs, often with many more levels than in terrestrial ecosystems.

A.23.
Any change in an ecosystem or an organism in the community may have an adverse affect on many other ecosystems.