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18*. BIOLOGICAL AND PHYSICAL AGENTS OF CHANGE ON A CORAL REEF

Background:

A reef is made of coral and coralline algae that form a structure used by other organisms as a dwelling place. A coral reef, like a forest, is a complex community of many associated plants and animals. Organisms act as agents of change to cause the reef to grow or be destroyed. Physical conditions also determine the growth or destruction of the reef.

Biological agents of change include all the plants and animals that build up and destroy reefs. See Table 1. Reef-building agents are organisms that secrete the calcium carbonate skeletons that form the reef. *Crack-filling agents* are organisms that produce sediment or live in the cracks and crevices of the reef. *Passive agents* use the structure of the reef to live and hide in. They do not affect the reef structure but may eat other reef organisms or be eaten by them. *Destructive agents* erode the reef by grinding, chewing, or boring into it.

Physical agents of change—waves, currents, pollution, moving sand, silt deposits, fresh water, and severe shifts in temperature—kill corals and wear away the reef. See Table 1.

Activity:

Compare the agents of change on a coral reef and in a forest.

Materials:

copy of Table 2

Procedure:

1. Fill in Table 2 with examples of specific agents that affect the structure of a forest.
2. Compare Table 2 with Table 1 and discuss the similarities and differences between the agents of change on a coral reef and in a forest.

Questions:

1. What do we mean by the “structure” of a forest? Of a reef? Describe the structure of the reef.
2. In what ways are corals in a reef like trees in a forest? How are they different?
3. What happens to the trees when they die? To the corals?
4. What are the differences between the growth of a tree and the growth of a forest? What are the differences between the growth of a single coral colony and the growth of a coral reef?
5. Compare the biological and physical agents that damage a forest and a coral reef. How are they similar? How are they different?
6. How does the amount of sunlight affect the growth of a coral reef? A forest?

Table 1: Agents of change affecting the growth of a coral reef.

Agents of change	Examples
Constructive agents—reef builders	Calcareous corals Encrusting coralline algae
Crack fillers	Encrusting coralline algae Fragments of corals <i>Foraminifera</i> (one-celled animals that make shells—for example, paper shells) Mollusks Echinoderms
Passive agents	Anemones Crustaceans Many fish Worms Red, green, and brown algae Octopuses Many mollusks
Destructive biological agents (organisms that destroy by chewing, eroding, blanketing, or producing acid)	Boring sponges Coral-eating fish (parrotfish) Worms Sea urchins and sea stars Boring mollusks Rapid-growing algae
Constructive physical agents (builders)	Calm water Adequate sunlight Optimum salinity Clear water Solid substrate Adequate nutrients
Destructive physical agents	Pounding waves Moving sand Smothering sediments (silt) Freshwater rain Very low tides Rising seafloor Sinking seafloor Rising or falling water temperature Runoff from land Excessive nutrients in water Pollution

Table 2: Agents affecting the growth of a forest.

Agents and conditions of change	Examples
Forest builders	
Forest floor organisms	
Passive residents	
Destructive organisms	
Constructive physical agents	
Destructive physical agents	

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Correlation to National Standards from McREL (<http://www.mcrel.org>) :

Life Sciences

6. Understands relationships among organisms and their physical environment

Geography

7. Knows the physical processes that shape patterns on Earth's surface

8. Understands the characteristics of ecosystems on Earth's surface