

TURTLE HURDLES

OBJECTIVES

Students will be able to: 1) describe the life cycle of sea turtles; 2) identify specific mortality factors related to sea turtles; 3) make inferences about the effects of limiting factors on sea turtle populations; and 4) make recommendations for ways to minimize the factors which contribute to the possible extinction of sea turtles.

METHOD

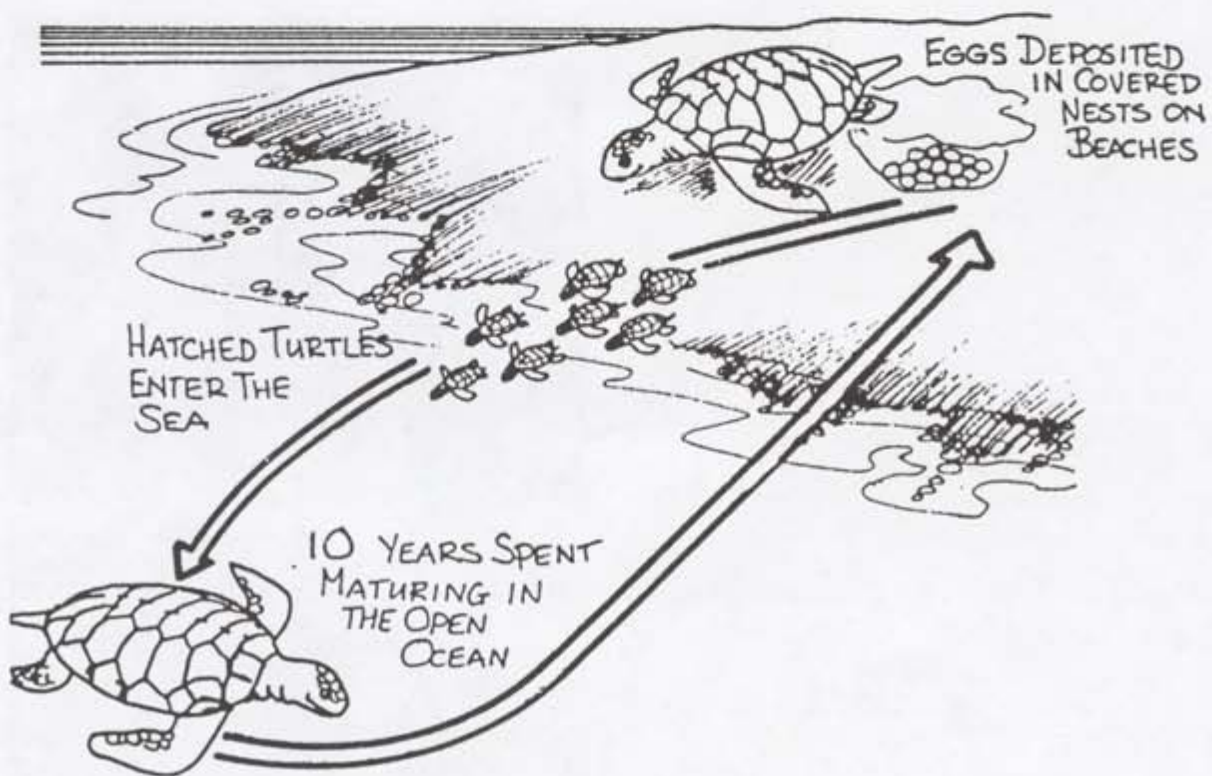
Students become sea turtles and limiting factors in a highly active simulation game.

BACKGROUND

Sea turtles are survivors of the great age of dinosaurs and yet at this time are threatened with extinction. They live in nearly all the oceans of the world and leave the water only during nesting periods. It is during these nesting periods that the turtles and their offspring are the most vulnerable.

As with most reptiles, turtles lay eggs. The eggs look somewhat like wet, pliable, table tennis balls. Female sea turtles dig deep holes on beaches with their rear flippers. They lay and bury their eggs in these holes. Sometimes the females make repeated nesting visits in one season. Mature female sea turtles may deposit several hundred eggs in one season. Once the eggs are buried, the female returns to the sea or seeks new nest sites. The eggs are on their own for nearly two months. If the eggs survive predation by raccoons, ghost crabs, foxes, dogs and humans—the sea turtles hatch, dig their way upward through the sand, and promptly head toward the sea.

The hatchlings' journey across the beach is typically accompanied by predatory crabs, raccoons and dogs, with gulls and frigate birds joining in. Once hatched, only about one to five percent of the turtles survive the first year. In the sea, the turtles must mature for nearly a decade before returning to nesting sites as a natural part of their life cycle. Biologists are uncertain how long sea turtles reproduce and live. They are preyed upon by fish, sharks, killer whales and humans. Here is an illustration of the life cycle of a sea turtle:



The motives for human predation are based predominantly on products that are outlawed in many countries. Jewelry, leather, oil and food are the primary uses. Turtle eggs are seen by some as a boost to longevity and vigor; tens of thousands of eggs are illegally harvested for vanity sales. Evidence suggests that a serious human threat to the turtles is the poaching of their eggs in their nesting sites.

Six of the seven known sea turtle species are officially designated either endangered or threatened. The leathery or Leatherback, Olive Ridley, Kemp's Ridley, Hawksbill, Green and Loggerhead are all either officially endangered or threatened. Only the Australian Flatback is not so designated.

If laws are obeyed protecting the turtles from use for



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There are other, human-caused factors. Dune buggies may break the eggs buried in the sand. More damaging, given the scope of the impact, is commercial and private construction (condominiums, private homes, hotels, etc.) on coastal sites. This may create a barricade that prevents the turtles from reaching their traditional nesting sites and eliminates many nest sites. Entanglement in discarded fishing gear and plastic waste cast into the oceans is a serious hazard, killing many sea turtles each year. Many turtles fall accidental victim to the nets of large fishing trawlers. Once caught in the nets, they drown. Efforts are being made to popularize special trawling devices that will prevent turtles from getting into the nets. One of the turtles' favorite foods is jellyfish. Many turtles mistake the human-produced litter of floating plastic bags for this food. The result is that their digestive tracts become blocked with the discarded plastic and they perish.

commercial and personal products, they are more likely to survive.

The major purpose of this activity is for students to become familiar with some of the limiting factors affecting the survival of sea turtles as well as the role of human beings in contributing to the endangerment of other species.

MATERIALS

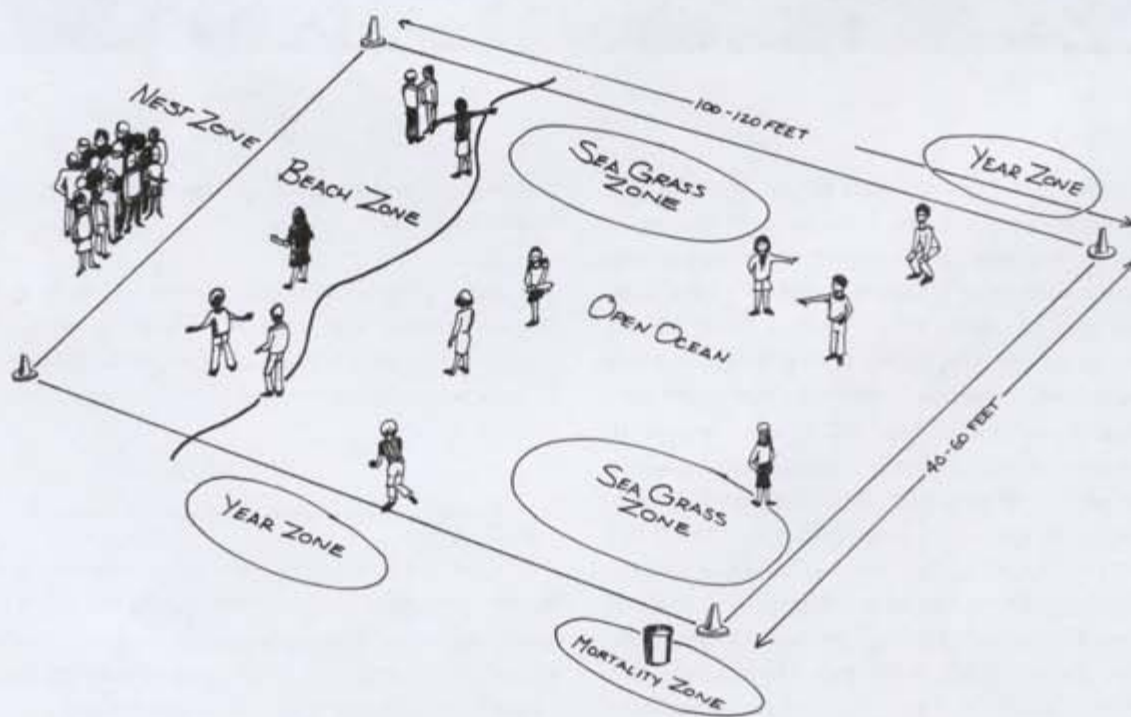
40' to 60' rope or string; two jump ropes or hula hoops; one paper bag per student; identity cards for each predator or limiting factor (can be drawn by students); alligator-style clothes pins to pin identity signs to students' clothing; poker chips; dried beans

Nest Zone: the place where the eggs are laid and hatch. This is the zone to which the surviving turtles will return in ten years. This is where the baby turtles hatch and begin their journey to the sea.

Beach Zone: the zone the hatchlings must cross to get to the sea. It is a place of high predation and other limiting factors. **Sea Zone:** the area where the turtles must mature for a period of ten years before returning to nest.

Year Zones: the two zones that the turtles must visit to get the year cards necessary to "mature" to ten years of age. One card is awarded for each one-way trip between the zones. During the trip between the zones the turtles are vulnerable to predators and other limiting factors. Turtles are safe from other limiting factors when they are inside either year zone.

Sea Grass Zones: places where the turtles are safe until they reach four years of age. At that age they are too large to hide from predators.



PROCEDURE

1. Set up the activity areas as shown. Give each student a bag.

2. Divide the class into two groups.

Group 1 - TURTLES. Each student counts out 50 beans to place in his or her bag. Beans represent turtles. Each bag of beans represents the turtles that hatch from a single nest.

Group 2 - LIMITING FACTORS. Divide this group into two smaller groups, on-land and in-sea.

On-land: predators (e.g., raccoons, dogs, ghost crabs, foxes and gulls) and limiting factors from human activities (e.g., dune buggies, human egg collectors, shoreline development)

In-sea: predators (e.g., sharks, killer whales) and limiting factors from human activities (e.g., entanglement in fishing gear, eating plastic litter, illegal killings by humans)

Give each student a sign that indicates what kind of limiting factor each one represents. Attach these identity signs to students' clothing with clothes pins.

3. Walk the class through the activity and explain these rules:

A. Turtles must hatch, cross the beach and spend 10 years in the open sea. The time in the ocean is simulated by the turtles running between the year zones. They pick up one poker chip at a year zone and then run to the other year zone to pick up another poker chip. Each chip represents two years of successful ocean survival. After collecting five poker chips, turtles return to the nesting area to reproduce.

B. Turtles try to avoid limiting factors and predators. If tagged by a limiting factor, a turtle stops, counts out ten beans and places those ten beans in the limiting factor's bag.

C. The ocean's sea grass areas are turtle safety zones where limiting factors cannot tag them. The teacher may set a time limit for how long a turtle may rest in a sea grass zone. **OPTIONAL:** The teacher may eliminate the safety zones after the turtles have been in the ocean for a while. This simulates the turtles growing too big to hide in the sea grass.

D. Limiting factors must obey the following rules:

- They cannot tag the same turtle twice in a row.
- They cannot tag turtles that are counting out beans to another limiting factor.
- They must stay at least four steps away from any turtle that is transferring beans to another limiting factor.

E. Any turtle that loses all 50 beans is dead. It must go to the beach and become a condominium. If the condominiums (sitting side by side) eventually block the access to the nesting beach, the remaining turtles die without reproducing and starting the next cycle.

F. The activity ends when all turtles are either dead or have returned to the nest area.

4. Review the rules two times to make sure the students understand their roles and the procedures. Become endangered sea turtles and limiting factors and conduct the activity!

5. After completing the activity, encourage the students to discuss the results. It is likely that some students will be disturbed by the high mortality of the turtles and will benefit from the realization that there are groups actively trying to diminish human contributions to such high mortality. However, it is also important to emphasize that natural limiting factors are built into the scheme of things. If all sea turtle eggs survived, there might well be an overabundance of these creatures. Many animals produce more young than will survive, serving as food for other species as a part of nature's dynamic balance. Ask the students to briefly describe the life cycle of sea turtles.

6. Summarize the importance of the high numbers of turtles that result from the reproduction. Identify and discuss the factors that limit the turtles' survival. Since sea turtles are threatened with extinction, the limiting factors affecting their survival seem to be out of balance. What specific recommendations would the students suggest to increase the successful reproduction and survival of sea turtles?

EXTENSIONS

1. Change the ratio of predators and hazards to turtles (1/3 predators or hazards to 2/3 sea turtles) and replay the simulation. Describe and discuss the differences.
2. Set up a sea turtle information center.
3. Where possible, visit sea turtle restoration sites and determine what actions may be taken to enhance the stability of sea turtle populations.
4. Replay the activity with all human factors removed from influence.

EVALUATION

1. Describe and illustrate the major stages of sea turtles' life cycle, beginning with the egg.
2. Name at least four limiting factors that prevent sea turtles from reaching the adult breeding stage.
3. Write a law that would help protect sea turtles. What would the law include? Who would enforce it?

Age: Grades 4-12

Subjects: Science, Social Studies, Math

Skills: analysis, application, computation (limited), description, discussion, evaluation, generalization, identification, inference, interpretation, kinesthetic concept development, listing, observation, psychomotor development, synthesis, using time and space

Duration: one 45-minute period

Group Size: 20 to 40 students or more

Setting: outdoors or large indoor area

Conceptual Framework Reference: VII.A., VII.A.1., VII.A.2., VII.A.3., VII.A.4., VII.B., VII.B.1., VII.B.2., VII.B.3., VII.B.4., VII.B.5., VII.B.6., VII.B.7., VI.A., VI.A.1., VI.A.2., VI.A.3., VI.A.4., VI.A.5., VI.B., VI.B.1., VI.B.2., VI.B.3., VI.B.4., VI.B.5., VI.B.6., VI.C., IV.C., IV.C.1., IV.C.2., IV.C.3., IV.C.4., III.A., III.A.1., III.A.2., III.A.3., III.B., III.B.1., III.B.2., III.B.3., III.E., III.E.1., III.E.2., I.D.

Key Vocabulary: life cycle, endangered species, prey, predator, limiting factors, sea turtles

Appendices: Simulations, Agencies and Organizations