ODEER TI-73/82/83/84

This program is a model of a student activity from the Western Regional Environmental Education Council that simulates a predator/prey relationship. The survival of the deer depends upon various limiting factors in the environment (habitat) such as food, water, shelter, space, weather, and environmental pollution. These limiting factors contribute to the fluctuation in the size of the deer population from season to season.

Student Activity:

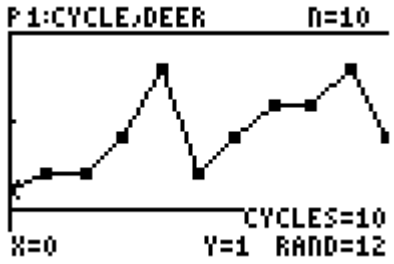
1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive – food, water, shelter and space. For purposes of this activity we will assume that the deer have enough space.
2. Ask students to count off by four's. Have all the one's go to one area and the others go to another area. Mark two parallel lines on the floor ten yards apart separating the two areas.
3. The one's become deer. All deer need good habitat in order to survive. Each deer (student) will decide whether it is searching for water, food, or shelter. When a deer (student) is looking for food, it should clamp its hands over its stomach. When it is looking for water, it puts its hand over its mouth. When it is looking for shelter, it clasps its hands over its head to forming a roof. Each round a deer student may change what it is looking for. Of course, a calculator may be used to randomly select the limiting factor the deer needs. Use **randInt(1,3)** command located in 1 Prb with 1=food, 2=water and 3=shelter.
4. The two's, three's and four's merge as one group of "limiting factors". Their side of the parallel lines is called "the habitat". Each student will decide for himself whether he wants to be food, water or shelter. The students depict which limiting factor they are with the same hand pantomimes the deer do – hands on stomach (food), on mouth (water) or overhead (shelter). Each round, a habitat student may change and be a different limiting factor.
5. The game starts with the students on their own side of the parallel lines with their backs to each other. The teacher directs everyone to show what s/he is looking for or what s/he is by making the appropriate hand pantomime. Lot's of variety should be apparent since each student should decide independently of the others. However, at later stages in the game students may be allowed to confer to set up extreme conditions.
6. When the teacher sees that all have made their decisions, s/he will count "one…two…three…turn". The deer then cross over to "the habitat" area to capture one of the limiting factors it was looking for. If a deer had decided to look for water and there isn't any water left, it cannot change its mind. If more than one deer go after the same student, the one who gets there first survives.
7. Any deer that found the limiting factor it was seeking survived that round. Both the deer and the limiting factor it captured go to the deer side of the parallel lines and become deer for the next round. Any deer that did not find the limiting factor it was seeking, dies. That student then stays on the habitat side of the parallel lines and will be one of the limiting factors for the next round. If a student who was a limiting factor was not needed by any deer, s/he will continue to stay in the habitat and may be whatever limiting factor desired in the next round.
8. Data should be gathered as to how many deer are at the beginning of each round. Each round represents a new year. After 15 rounds the data should be graphed with Year as the X axis and Number of Deer on the Y axis. In discussion, ask the students to summarize some of the things they have learned from this activity. What do animals need to survive? What are some of the "limiting factors" that affect their survival? Are wildlife populations static or do they tend to fluctuate as part

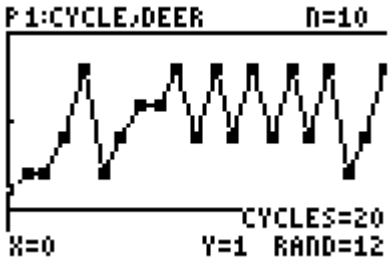
of the overall "balance of nature"? Is nature ever really in "balance," or are ecological systems involved in a process of constant change?

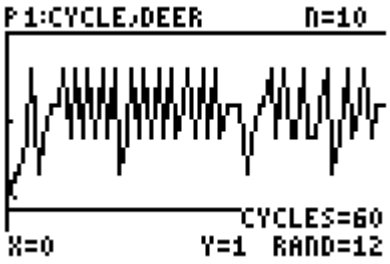
After students have played the game for a while, they can continue to explore what happens when the initial conditions are varied or repeated. The Program ODEER simulates the game. Initially the program asks for a value for the variable **rand** to seed the random number generator, the total number of students in the simulation (**N**),(i.e., the total number of deer and limiting factors together), the number of students who are deer initially, and the total number of cycles/years (**C**) to carry out the simulation. The X axis ranges from 0 to C and the Y axis ranges from O to N, with a scale of 5. The indicated Y value at X=0 represents the initial deer count.

If you want to repeat the exact sequence more than once but extend it for more cycles/years, then the same initial conditions should be identical including the **rand** variable. However, if you want to see what would happen when the same initial conditions are repeated but the number of each type of limiting factor differs randomly, input a different value for **rand**.

Notices that the graphs below in the first row all have identical initial conditions (10 students total with 1 student being designated a deer). However, the number of cycles differs. Therefore they were each seeded with the same value for **rand**. If you look closely, the graphs during the first 10 cycles are identical for all three. It is just that as the number of cycles increases, the graph values are scrunched closer together. After running the simulation for 10 cycles, students might try to predict the next 10 cycles then run the program again for 20 cycles.







The graphs in the second row also have the same initial conditions but different values to seed the random number generator. In each graph the 20 cycles are different though they have some striking similarities.