YR 11 Biology

Biodiversity Activities

When scientists speak of the variety of organisms (and their genes) in an ecosystem, they refer to it as biodiversity. A biologically diverse ecosystem, such as an old growth forest or tropical rain forest, is healthy, complex and stable. Nature tends to increase diversity through the process of succession.

The opposite of biodiversity is referred to as monoculture, or the growing of one species of organism, such as a lawn, a wheat field or corn field. Because all of the species are identical, there are few complex food webs and disease can spread quickly. Monoculture is like a banquet table for disease organisms. Monoculture often requires extensive use of pesticides and herbicides (to fight nature's tendency to diversify communities) and is very labour and energy intensive (fighting nature is tough). Humans often try to reduce diversity because it is easier to harvest a crop (whether it is wheat, corn, a lawn or a secondary forest) if it all contains the same species, but this obviously creates serious problems.

The first activity illustrates how to use math to calculate the diversity index of a selected habitat. The closer to 1 the diversity index is the more diverse and healthy the habitat is. This is a very simplified version of diversity index. The more accurate versions are called the Simpson and Shannon Indexes.

Activity 1

1. You will be given animals that live in a 1 square meter area of a particular habitat (these will represent by different types of objects)
2. The habitat is represented by beakers labelled 1-15
3. Determine which habitat you have
4. Complete the table.
5. To figure diversity index: # species (types) / Total organismss

	# species	# each	Total Organisms	Diversity
Tropical Rain forests				
Coniferous forests				
Deciduous forests				
Deserts				
Grasslands				
Lawn wheat fields				

Biological Diversity-How It Stops Disease From Spreading
(activity 2)

When a habitat is very diverse with a variety of different species, it is much healthier and more stable. One of the reasons for this is that disease doesn't spread as easily in a diverse community. If one species gets a disease, others of its kind are far enough away (due to the variety of other organisms) that disease is often stopped at the one or two individuals.

In this simulation, side one of the card represents the monoculture (the opposite of diversity) of second growth forests. In this case, Douglas Fir trees were planted after an old growth forest was cut down. A disease hits one of the Douglas Firs, and because of the proximity of the other Douglas Firs, disease spreads quickly.

On the other side of the card (side 2), a biological diverse community (an old growth forest) is symbolized. In this scenario, a Douglas Fir still gets a disease, but this time it does not spread because the other Douglas Firs are few and far between.

Side one of the card:

1. All cards marked with D (side 1 of card) tell you have all Douglas firs.
2. Each person gets 1 card.
3. Each person is to meet 3 other people and write their names on the card.
4. Remain standing after you write down the names.
5. The teacher will symbolize the disease and will touch one of you. You must sit down (you are dead) and read names on your card. As the names are read, those students sit too since they have been "touched."
6. Then ask another one of those sitting (dead) to read the names on their card- continue until almost all are sitting.
7. Explain why the disease spread so fast

Side 2 of the card:

1. Flip over card (D's for Douglas fir; N for Noble Fir, C for Western Red Cedar, M for Vine Maples, H for Western Hemlocks, W for White Fir, L for Lodge pole Pine, WP for Western White Pine, B for Bigleaf Maple, WD for Western Dogwood).
2. In some forests (esp. old growth), there are a variety of trees.
3. Repeat steps 2-6 above. This time only those students that are the same variety as the diseased tree that touched them will sit. Different variety trees don't sit (don't die) even if they are touched by a diseased tree.
4. Explain why the disease didn't spread this time

Conclusions

1. What does biological diversity mean?

2. Why didn't all the different trees get the disease?

3. Why didn't the disease spread as fast among the Douglas firs as it did in the first simulation?

4. In which forest would you need to use more chemicals to control disease: the Douglas fir forest or the more diversified, old growth forest? Why?

5. Summarize what this simulation symbolized.

6. Which forest would have more diversity of wildlife? Why?

7. a. If you cut down the variety in a piece of forest you owned and replanted with 1 type of tree, what will happen too much of the wildlife that was adapted to that forest?

   b. Will this fate happen to all the wildlife? Explain.

8. Many species can only live/reproduce in 1 type of forest. The spotted owl is an example - it can only live and successfully reproduce in old growth forests (big, old cedars, hemlocks, etc.). If these old growth forests are cut down, it's unlikely this owl will survive. Environmentalists call it an "indicator" species." What does this mean? Why be concerned about 1 species?

9. Growing one plant, as is the case of growing only Douglas fir, is called monoculture. Give an example of growing one plant a) in your home (obvious)
   b) in farms

10. Why would you need to use more insecticides in monoculture? Is this good or bad?

11. If you wanted to help wildlife, what would you with regards to the landscaping of your own home?