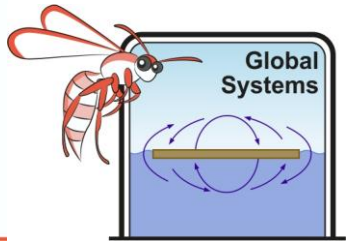
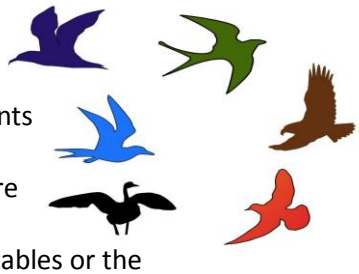


Fire & Biodiversity Loss – Teacher Notes

Communities survive change if they are given time to adapt. It is the increased rate of change in the environment that creates a loss of biodiversity.
Species cannot survive if their numbers fall below the "tipping point" because genetic diversity is reduced limiting ability to combat natural loss and change.

Many Australian plants and animals are well adapted to cope with drought and fire. An enhanced Greenhouse Effect could however result in longer hotter drier summers and an increased frequency of lightning strike. Devastating fires could become more frequent affecting the survival of many species. With the advent of man, however, fires in some places have become more frequent and hotter, and the areas available to the species have become more restricted. The Environmental Protection Authority's *State of the Environment Report 2007* stated that fire is a major factor in the loss of biodiversity in Western Australia. Fire reduces both the numbers within a species and the numbers of species.

Students will be asked to model what happens to a group of six different species living in an area, half of which suffers from fire every year. The creatures give birth to one offspring per pair per year. Species cannot interbreed and produce fertile offspring.



<u>Aim</u> To model the effect of fire on biodiversity

Each colour represents a different species of bird and each toothpick represents an individual bird. Birds can only mate with another of the same species. Mating occurs annually and only one chick survives to grow to be an adult. Fire attack is assumed to be random (at the toss of a coin). The activity may be a teacher demonstration where the class individually note the results on their tables or the table provided might be used.

Materials per group

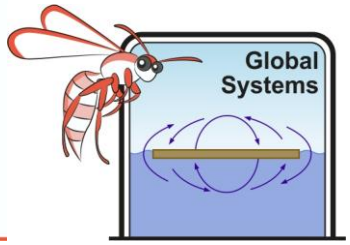
- Six different coloured sets of 15 toothpicks. Alternatively sets could be made of coloured straws cut in sections, beads or confetti. Retain extra toothpicks etc. to use as young.
- A desk top or paving slab divided into two sections marked 'Heads' and 'Tails'
- A coin for tossing
- Table for data (provided)

Method

1. Separate the toothpicks into 5 breeding pairs of each colour. Retain the extra toothpicks for "young" at the end of the breeding season.
2. Mix the breeding pairs and spread randomly across the desk top marked into "Heads" and "Tails"
3. Toss a coin to decide which area is devastated by fire and remove the toothpicks/animals.
4. The surviving birds form pairs, breed and the numbers for each species entered in the table
5. Continue this process for five fires over five years, recording your data.

Students first mix the toothpicks randomly and cast them onto the divided surface. This represents the spread of the creatures over their territory. Toss a coin to decide which area is devastated by fire. These creatures are removed. Note the number of survivors in each group in the data table. Each pair of creatures can produce one offspring per year. Add the offspring numbers to the parent numbers and repeat the process to obtain data for five years.

Fire & Biodiversity Loss – Teacher Notes

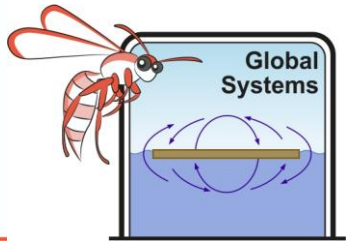


What assumptions were made? The two remaining organisms were male and female.

This is an example of data collected in a trial run

Numbers	Black	Blue	Purple	Red	Brown	Green	Total
Numbers at beginning of year 1	10 5 pairs	10 5 pairs	10 5 pairs	10 5 pairs	10 5 pairs	10 5 pairs	60
Numbers after first fire	7 3 pairs	3 1 pair	5 2 pairs	4 2 pairs	5 2 pairs	3 1 pair	
Young born to each pair	3	1	2	2	2	1	
Numbers at beginning of year 2	10 5pairs	4 2 pairs	7 3 pairs	6 3 pairs	7 3 pairs	4 2 pairs	38
Numbers after second fire	8 4 pairs	4 2 pairs	3 1 pair	4 2 pairs	4 2 pairs	3 3 pairs	
Young born to each pair	4	2	1	2	2	1	
Numbers at beginning of year 3	12 6 pairs	6 3 pairs	4 2 pairs	6 3 pairs	6 3 pairs	4 2 pairs	38
Numbers after third fire	4	5	2	3	4	0	
Numbers born to each pair	2	2	1	1	2	0	
Numbers at beginning of year 4	6 3 pairs	7 3 pairs	3 1 pair	4 2 pairs	6 3 pairs	0	26
Numbers after fourth fire	4 2 pairs	3 1 pair	3 1 pair	4 2 pairs	3 1 pair	0	
Young born to each pair	2	1	1	2	1	0	
Numbers at beginning of year 5	6 3 pairs	4 2 pairs	4 2 pairs	6 3 pairs	4 2 pairs	0	24
Numbers after fifth fire	2	1	2	5	0	0	
Young born to each pair	1	0	1	2	0	0	
Numbers alive after five years	3 2 pairs	1	3 1 pair	7 3 pairs	0	0	14

Biodiversity can refer to variety within a species and between species.
After five years:
Within each species, what percentage of biodiversity lost?
Black birds reduced from 5 breeding pairs to 2 breeding pairs – 60% loss
Blue birds were reduced from 5 breeding pairs to one individual – 90% loss and no chance of breeding. 100% loss when that bird dies – recall last Tasmanian Tiger story
Purple birds were reduced from 5 breeding pairs to 1 pair – 80% loss
Red birds were reduced from 5 breeding pairs to 3 breeding pairs – 40% reduction
Brown birds were reduced from 5 breeding pairs to no birds by the end of the fourth yar. – 100% loss
Green birds were reduced to no birds at the end of the third year. – 100% loss
Why cannot individuals of different species not form pairs? They might form pairs but cannot produce viable offspring.
Why would a reduction to two breeding pairs affect the species chances of survival? One random event could wipe out the entire species. Since these few survivors share the same genes their offspring will be less variable and less able to survive any chance of environment. Inbreeding can cause any weaknesses to become more common. (Relate to zoos swapping animals to widen the gene pool)



Between the species, what percentage of biodiversity was lost? Only three of the original six species remained after five years - 50% loss

Students may wish to discuss the critical numbers to ensure survival and other factors (competition for food, partners, shelter, nesting areas etc) which will affect species numbers.