

Diversity

Diversity depends on the number of species (species richness of a community) in an ecosystem and the abundance of each species – the number of individuals of each species. The populations of an ecosystem can support demands on abiotic and biotic factors. The growth of populations depends on limiting factors:

- Abiotic factors
 - physiological adaptations of organisms only allow them to live in a certain range of pH, light, temp etc – it is part of what defines their niche.
- Biotic factors (interactions between organisms)
 - Intraspecific competition occurs between individuals of the same species eg for a patch of soil to grow on, or a nesting site or food.
 - Interspecific competition occurs between different species needing the same resource – at the same trophic level.
 - Plant species compete for light, herbivore species compete for plants or carnivore species compete for prey
 - Predation – a predator is a limiting factor on growth on the population of its prey and the prey is a limiting factor on the predator population

An index of diversity is used as a measure of the range and numbers of species in an area. It usually takes into account the number of species present and the number of individuals of each species. It can be calculated by the following formulae:

$$d = \frac{N(N-1)}{\sum n(n-1)}$$

Where: N = total number of organisms of all species in the area

d = index of diversity

n = total number of organisms of each species in the area

e.g.

violet	8
Narrow leaved grass	20
Broad leaved grass	15
Thyme	20
Ladies bedstraw	2
Fairy Flax	10
Moss	6
Salad Burnett	30
N =	111

$$d = \frac{111 \times 110}{(8 \times 7) + (20 \times 19) + (15 \times 14) + (20 \times 19) + (2 \times 1) + (10 \times 9) + (6 \times 5) + (30 \times 29)}$$

$$d = \frac{12210}{2018} \text{ therefore } d = 6.05$$

On another site there were:

Narrow leaved grass	45	d = 2.6 Comparing both indices, 6.05 is an indicator of greater diversity. The higher number indicates greater diversity
violet	4	
Thyme	18	
Ladies Bedstraw	10	



In extreme environments the diversity of organisms is usually low (has a low index number). This may result in an unstable ecosystem in which populations are usually dominated by abiotic factors. The abiotic factor(s) are extreme and few species have adaptations allowing them to survive. Therefore food webs are relatively simple, with few food chains, or connections between them – because few producers survive. This can produce an unstable ecosystem because a change in the population of one species can cause big changes in populations of other species.

In less hostile environments the diversity of organisms is usually high (high index number). This may result in a stable ecosystem in which populations are usually dominated by biotic factors, and abiotic factors are not extreme. Many species have adaptations that allow them to survive, including many plants/producers. Therefore food webs are complex, with many inter-connected food chains. This results in a stable ecosystem because if the population of one species changes, there are alternative food sources for populations of other species.