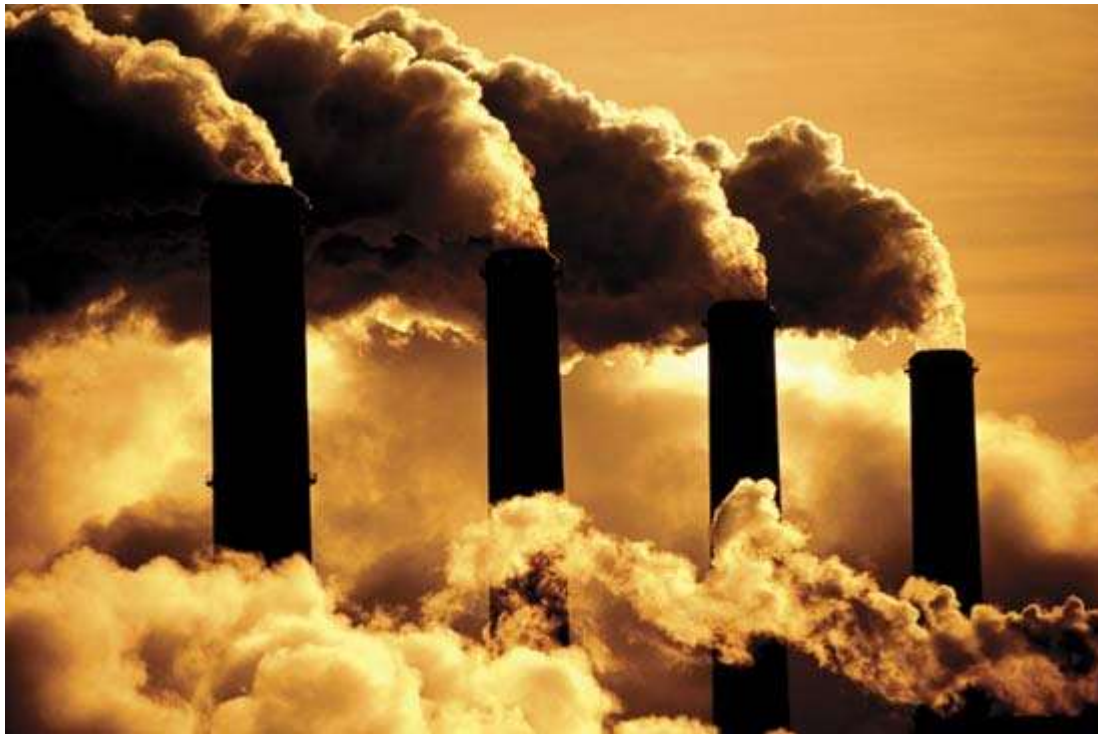


# Human influences on biodiversity

- Human activities can often reduce biodiversity within an ecosystem.
- Our activities often result in **pollution** or habitat destruction.
- What are these sources of pollution? (try breaking it up into air pollution and water pollution)
- Air - Sulphur Dioxide from factory emissions, etc.
- Water - Sewage, Run-off of fertilisers, herbicides and pesticides from farm lands, Thermal pollution from power stations.

# Pollution

- ***Sulphur dioxide*** is a gas released during the burning of fossil fuels.



Lichens are  
indicator  
species for  
the presence  
of Sulphur  
Dioxide

# Polluted Water – Indicator Species

- Learning Outcomes

1. Describe the effects of sewage in water
2. Explain how organisms can describe conditions in our surroundings

**Definition :-**

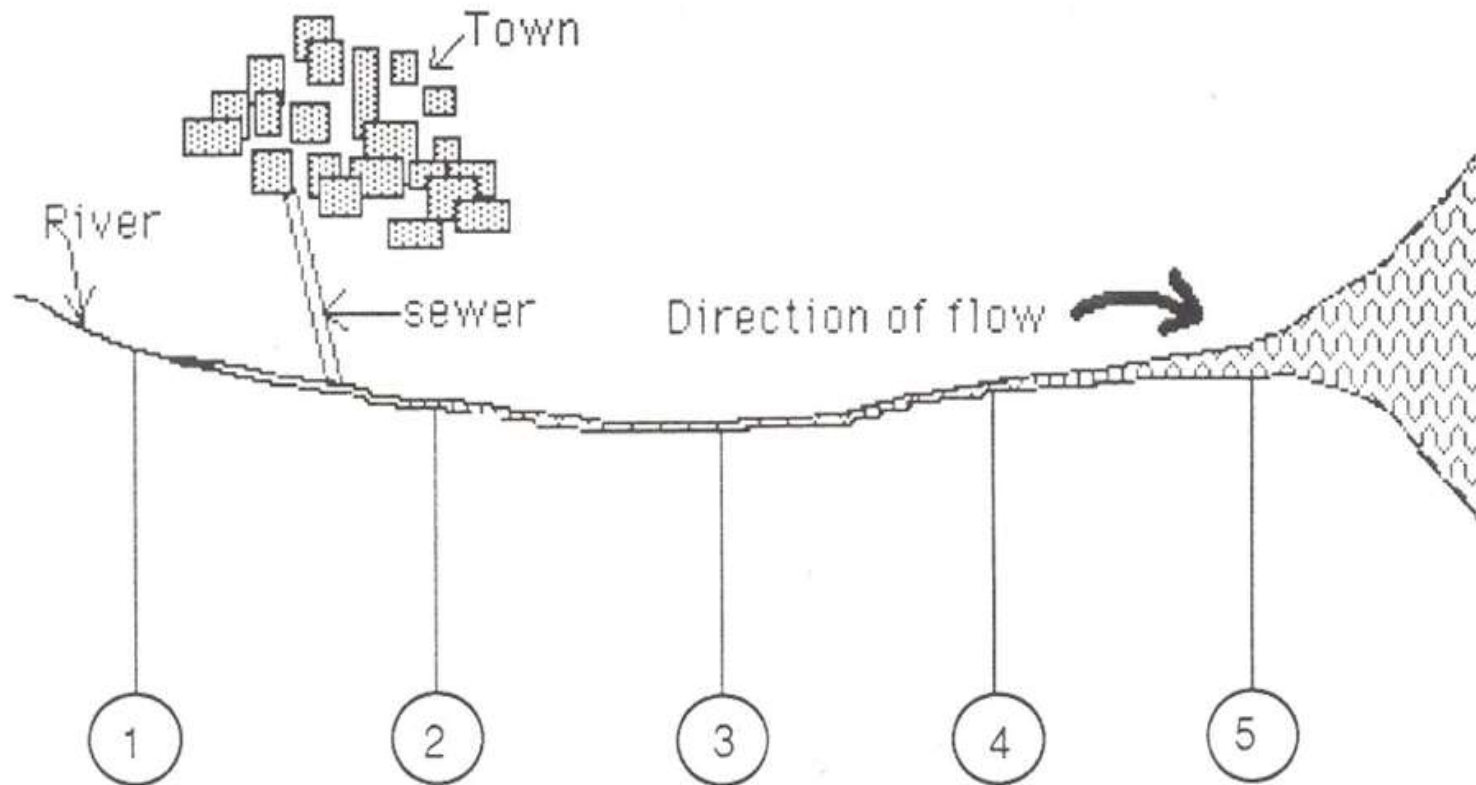
**Indicator Species - An organism whose presence (or absence) tell us about environmental conditions.**

# Polluted Water Indicator Species

- Sewage, which is a rich source of organic waste, is a common pollutant of rivers. Organic wastes can result in considerable changes to the water, and the number and kinds of organisms present. Organic waste provides food for micro-organisms (bacteria).
- If water is polluted by organic waste, such as sewage or paper fibres, bacteria will feed on the organic material, grow and multiply. Like most organisms, bacteria require oxygen which they absorb from the surrounding water. This can cause the death of other aquatic (water living) organisms which require oxygen to survive.

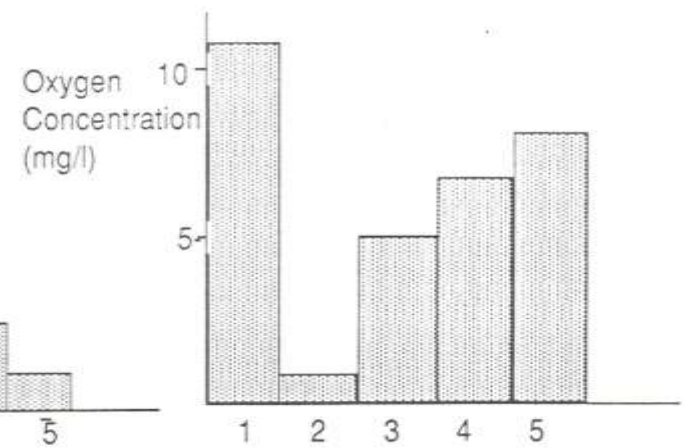
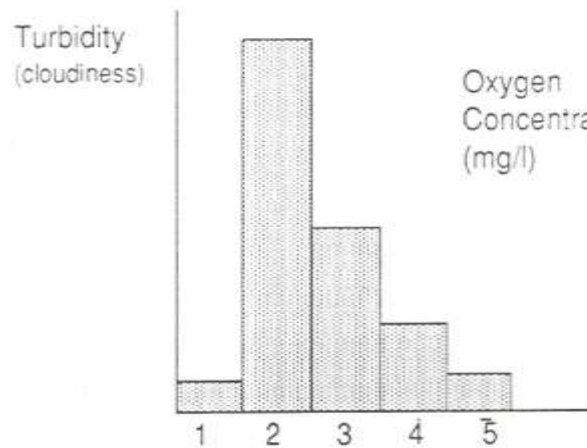
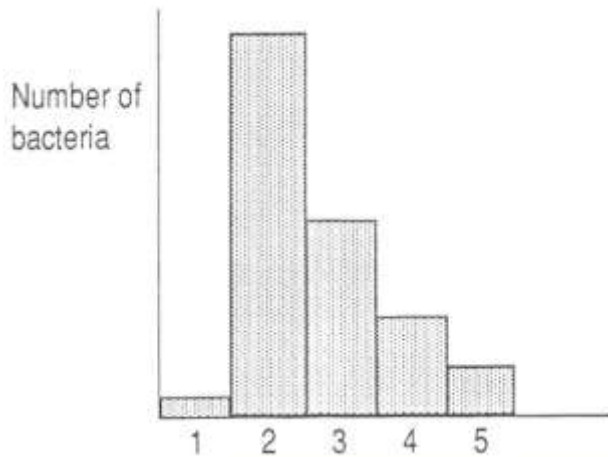
# Sewage Pollution

Map showing location of town and river



# Pollution of Water Indicators

At five places along the river samples of water were taken and tested for turbidity, oxygen concentration and numbers of bacteria. In addition, aquatic invertebrates were collected at each site. The results of this survey of organisms can be seen below.











Activity - Answer questions

# Exercise Answers a

- Turbidity greatest at sample site 2
- Raw sewage has entered the river at sample site 2 and contains a lot of bacteria
- The large number of bacteria use a lot of oxygen up during respiration and so lower oxygen levels at sample site 2
- The numbers of bacteria decrease as you go downstream of sample site 2 as they use up the energy in the raw sewage.
- As the energy content of the raw sewage is used up, there is less foodstuff for bacteria to respire. Their numbers fall causing oxygen levels to rise.

# Pollution Indicator – Results (2)

WATER ANIMALS	SAMPLE SITE				
	1	2	3	4	5
 Stonefly Nymph	55	0	0	0	40
 Mayfly Nymph	14	0	0	0	13
 Caddisfly Larva	3	0	0	1	1
 Blood Worm	0	0	10	5	0
 Sludge Worm	0	59	32	0	0
 Water Louse	1	0	21	20	0
 Shrimp	2	0	0	1	1
 Rat-tailed Maggot	0	38	4	0	0

Activity - Answer questions



# Exercise Answers b

- Bloodworms, sludge worms, rat tailed maggots in low levels of oxygen (high pollution).
- Stonefly nymph, caddis fly larvae, fresh water shrimp and mayfly nymph in high levels of oxygen (low pollution).
- Raw sewage contains a lot of organic waste
- Raw sewage contains a lot of gut bacteria and other micro-organisms
- High numbers of bacteria use up oxygen to respire the energy in the waste
- As oxygen levels lower the number of species able to tolerate low oxygen levels decreases.

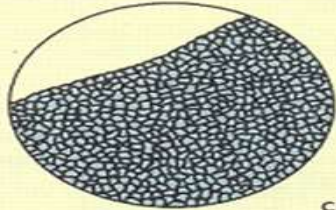
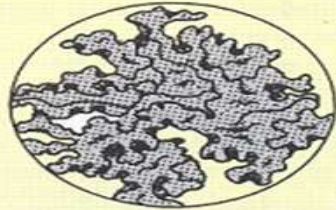
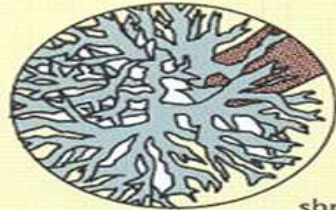
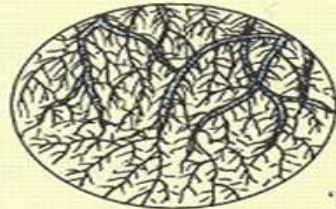
# Exercise Answers ©

- From sample site 1 to 5;
- *Oxygen* levels decrease initially, then begin to increase again
- *Turbidity* increase initially, then begins to decrease
- *Bacteria* numbers increase, then begin to decrease again.

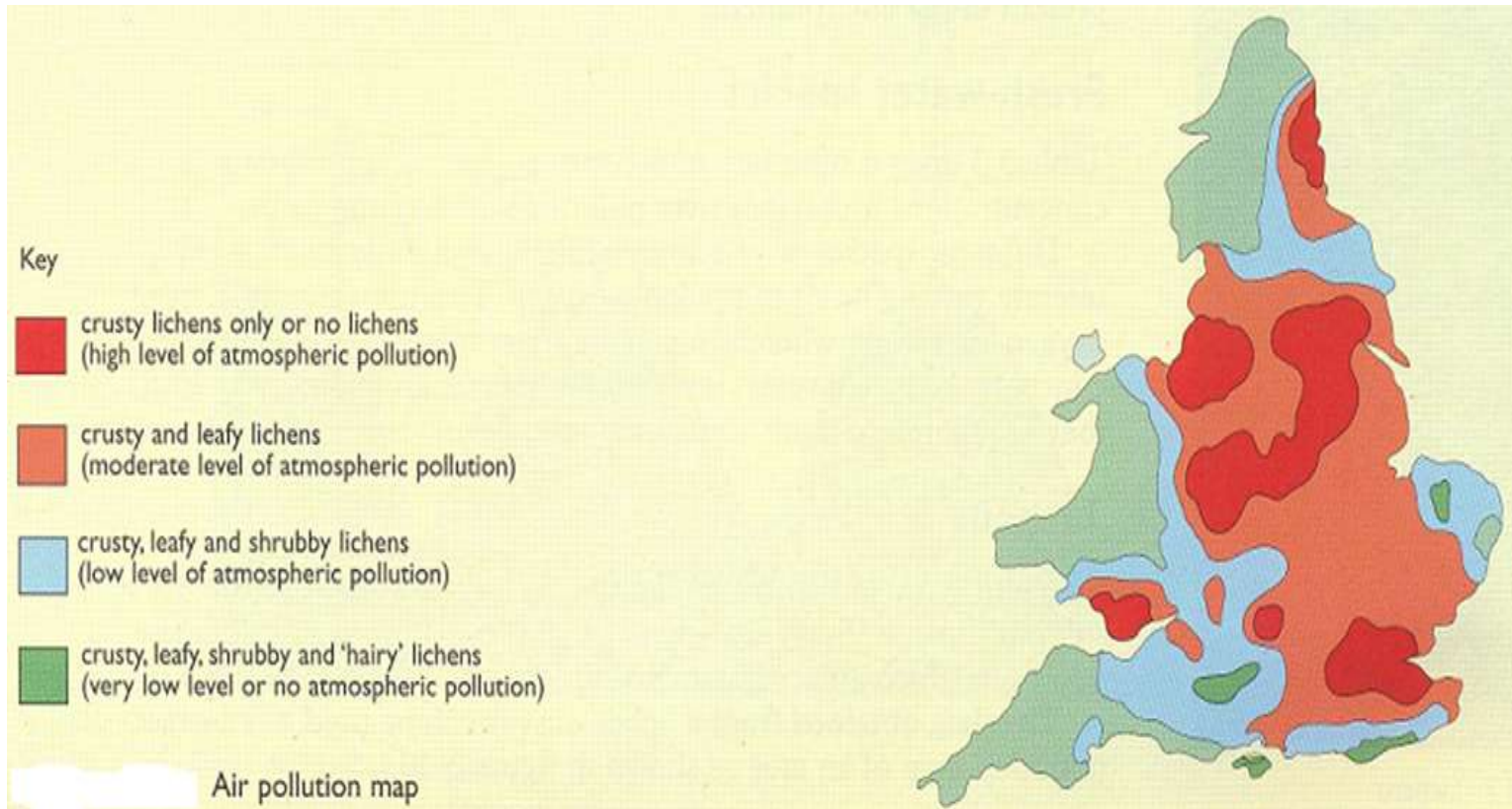
# Pollution Indicators Lichen

- *Lichen* are simple plants composed of algae and fungi that act as indicator species for different concentrations of *sulphur dioxide* (pollutant gas from combustion of fossil fuels) in the air.

# Pollution Indicators - Lichen

indicator species present	appearance of lichen	SO <sub>2</sub> concentration (and level of pollution) of atmosphere
crusty lichens only	 crusty	high
crusty and leafy	 leafy	medium
crusty, leafy and some shrubby	 shrubby	low
crusty, leafy, shrubby and 'hairy'	 'hairy'	very low/zero

# Geographical locations Lichen



# Exercise Answers

1. An *indicator organism* is one whose presence (or absence) tell us about environmental conditions.
2. Pollutant gases are coming from heavy industry, vehicle exhaust fumes, domestic fires and power stations.
3. Hairy lichens are found mainly in rural areas. Areas where the population is lower, there is less industry and traffic contributing to the pollutant gases in the air.

# Success Criteria: I can

- State that sewage is a source of organic material
- Describe the levels of oxygen lowering, bacteria rising and organism numbers falling in a water supply when sewage is emptied in.
- Explain the changes
- State that indicator organisms tell us about environmental conditions
- Identify organisms that indicate low and high levels of pollution.