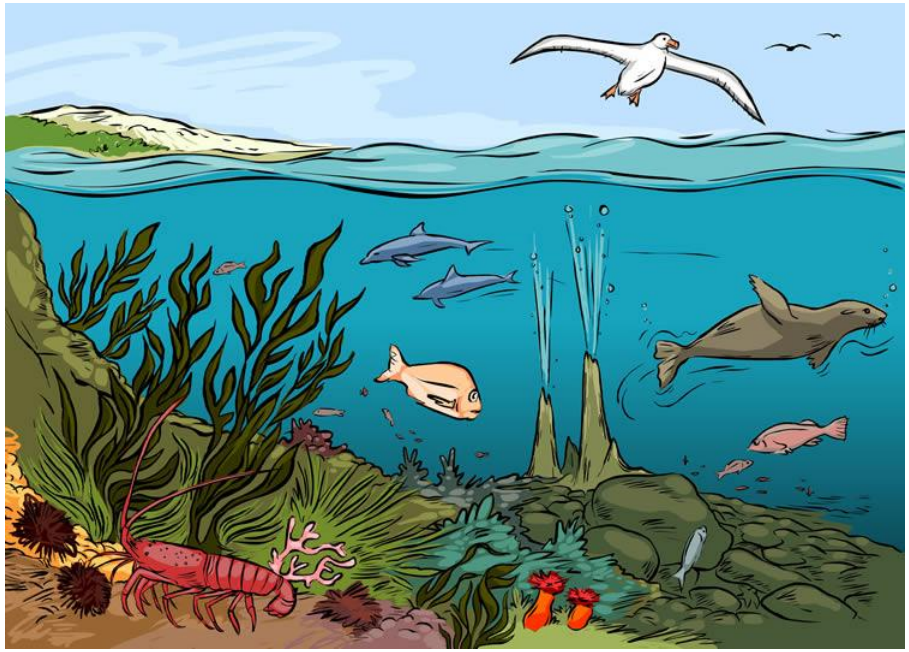
Dynamic Ecosystems



Marine Ecosystem

Desert Ecosystem

Learning Intentions

- Components of ecosystems:communities of living organisms, ecological groupings; ecological niche
  - Define appropriate related terms
  - Examples of different ecosystems
  - Identify the abiotic and biotic factors associated with different ecosystems

- Background reading Heinemann Chapter 19, Pages 363-381
- Questions 1, 4. Page 369
- Questions 5-7. Page 375
- Question 9-12 Page 379
- Questions 14-15. Page 381

What is an Ecosystem?

A community of organisms interacting with one another and with their physical surroundings.

Community – group of organisms living and interacting together.

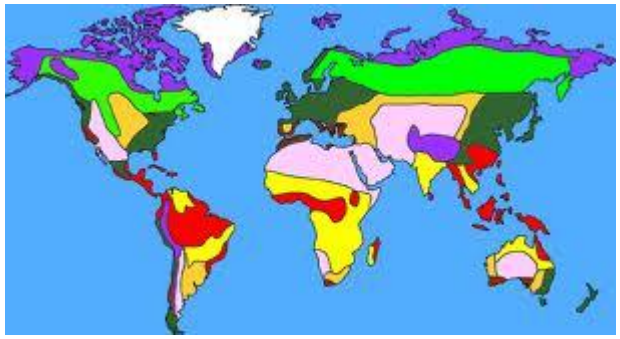
(BIOTIC COMPONENT)

Physical Surroundings – non living part of the environment

(ABIOTIC COMPONENT)

Some related terms

- Biosphere – The part of the Earth that is made up of all living things and the abiotic factors associates with these factors
- Biome – broad scale life zones e.g. Desert, grassland, forest...
- Environment – the external surroundings in which a plant or animal live which tend to influence its development and behaviour.
- Habitat - place where an organism lives e.g. the habitat of koalas are eucalypt forests of eastern Australia



Some related terms

- Microhabitat - a specialised area within a habitat where some organisms live. E.g. around the trunk of a tree fern in a wet forest where mosses and fungi grow because it is shaded and moist.

- Ecological Niche – where it lives and its particular adaptations suited to that habitat. It also includes the role it has in its habitat
  - For example a dolphin could be in potentially another niche than another dolphin in a pod that utilises significantly different food resources and foraging techniques.

Features of an Ecosystem

- Self – sustaining: can be maintained without inputs from other ecosystems.
- Can be small (pond)
- Can be very large (biosphere).
- Made by humans (urban ecosystem)

Naming Ecosystems

Ecosystems can be named in several ways.

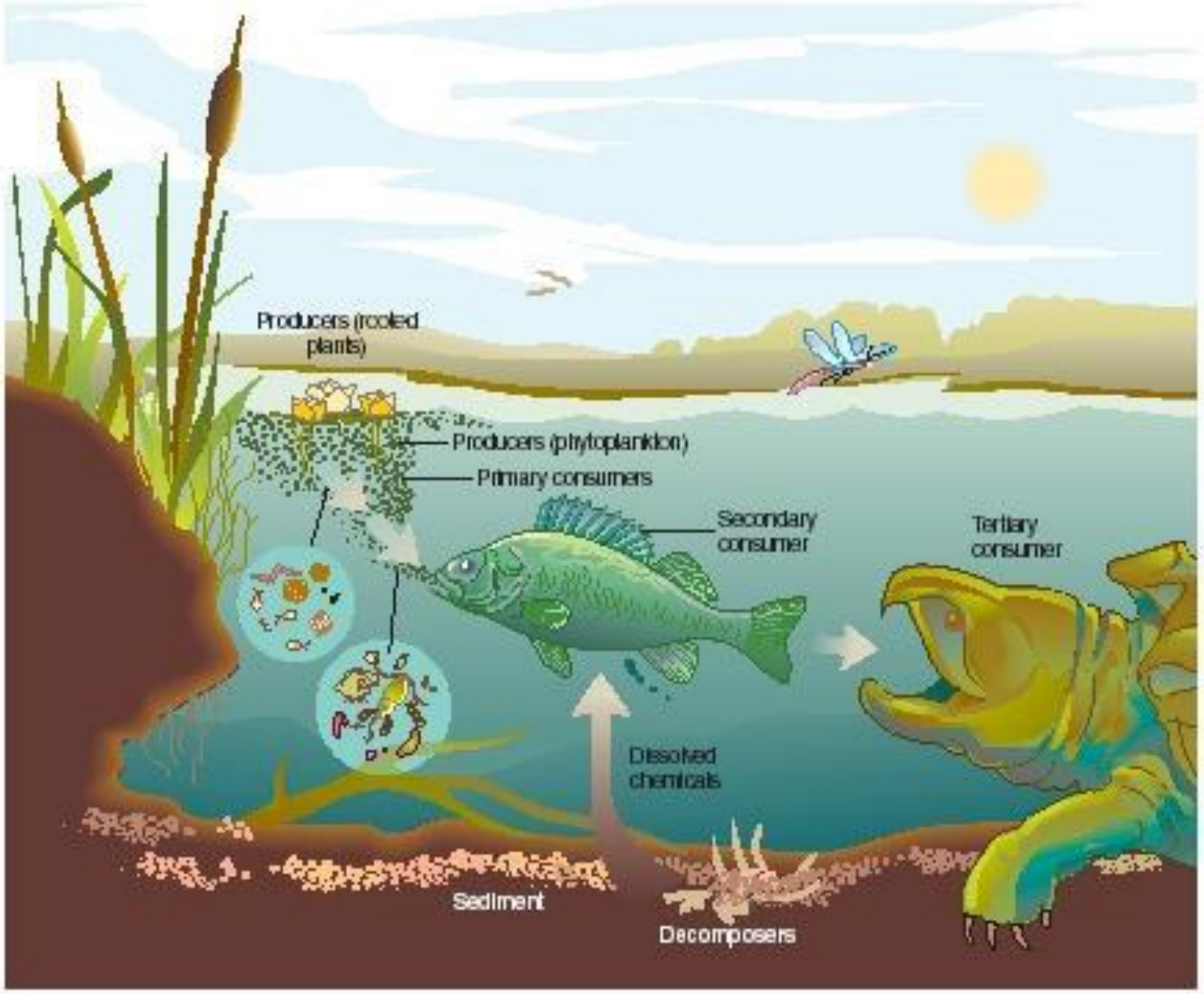
1. Based on the abiotic environment e.g. terrestrial or freshwater ecosystem.
2. Based on the dominant species e.g. Mangrove ecosystem or a saltbush ecosystem.
3. Based on the structure of the plant community e.g. rainforest ecosystem, a grassland ecosystem or a forest ecosystem.

- Look at the following ecosystems and name the biotic and abiotic factors involved.

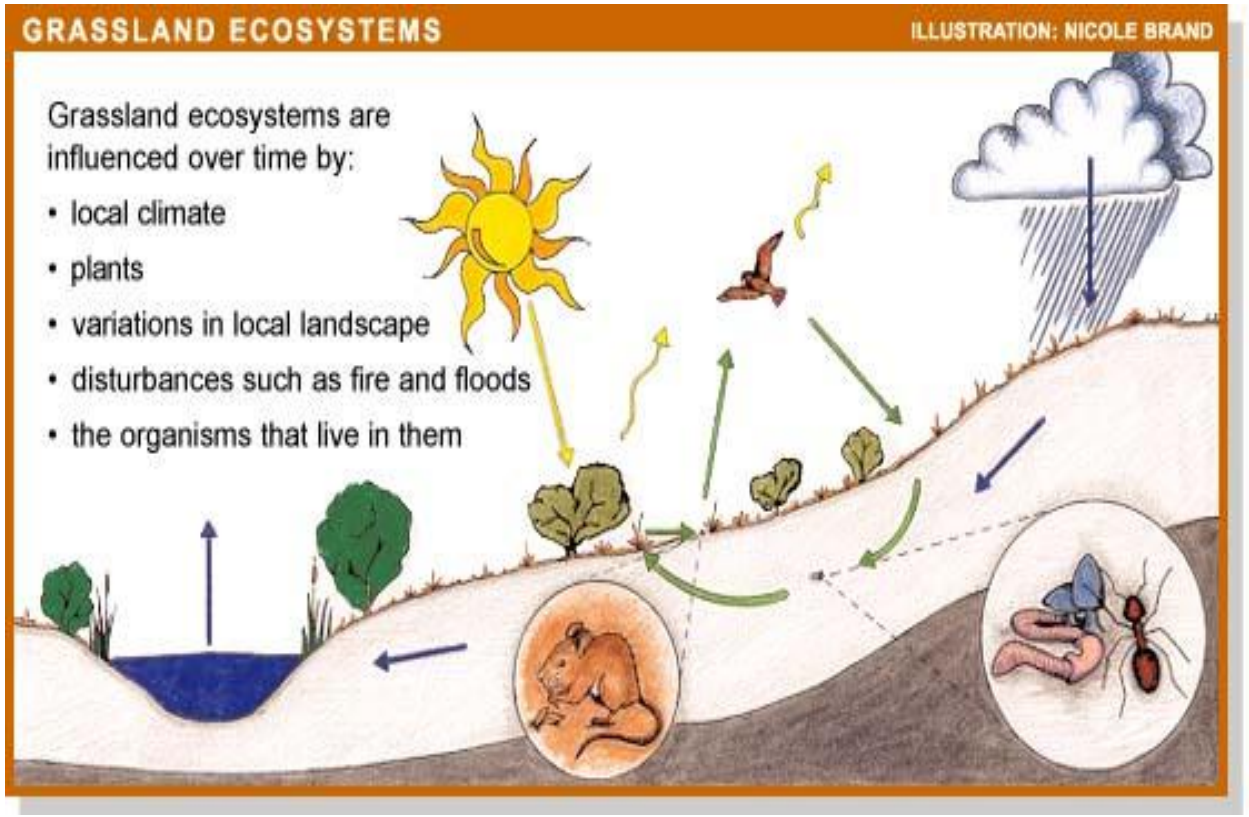
- Describe the type of habitats found in each ecosystem.

- Describe any human interference that may occur and how it could affect the ecosystem.

Example 1. Freshwater Ecosystem



Example 2. Grassland ecosystem



Example 3 Sea Ecosystem

Environmental Factors that affect ecosystems

Environmental factors

The following factors affect where animals and plants will be found.

1. The temperature of the environment.
2. The humidity of the air.
3. The pH of the area.
4. The light intensity of the area
5. Turbidity
6. The flow rate of the water in the area.
7. Dissolved Oxygen in water.
8. The flow rate of wind in the area.

We will measure some of these factors when visiting our ecosystem at the Organ Pipes National park.

TEMPERATURE

Water temperature can be measured using a thermometer or a temperature probe. The temperature of water is a very important factor in water quality. Many of the physical and biological characteristics of a river are affected by temperature.

The following can influence the temperature of streams.

- Depth of water
- The season
- Time of day
- Warm urban run-off from streets, footpaths and carparks.
- industrial cooling processes
- Clearing of vegetation that shades watercourses
- Soil erosion, road building and general construction, which contribute to increased turbidity and therefore water temperature.
- Discharge from reservoirs that lowers natural temperature levels.

TEMPERATURE

Temperature changes can effect the distribution and abundance of organisms:

•Changes in water temperature will alter the amount of dissolved oxygen. (The higher the temperature the less oxygen remains dissolved in the water.)

•Will effect the rate of photosynthesis that occurs by algae and other plants.

•It will increase the metabolic rate of organisms in the water. This increases the oxygen demand of dish, aquatic insects and bacteria.

TEMPERATURE

A short period of high temperatures can make the stream unsuitable for sensitive organisms even though the temperature is suitable during the rest of the year.

For example some species have different temperature requirements at different stages of life.
Fish larvae tolerate a narrower range of temperature than do adult fish.

Back

Humidity

Humidity in air is the amount of water vapour in air.

Mosses are simple plants which do not have the ability to absorb water. They are found in damp places.

Back

pH

This is a measure of how acidic or basic (alkaline) the water (or soil) is on a scale of 0 to 14. It is the measure of hydrogen ion (H^+) concentration. Distilled water has a neutral pH of 7.
Measurement between 0 and 7 indicate the solution is acidic (i.e. more H^+ than OH^- ions.)
Measurement between 7 and 14 indicate the solution is alkaline(i.e. more OH^- than H^+ ions.)

The soil in high rainfall areas tends to be acidic. Plants like rhododendrons and azaleas grow in this type of soil.

We will use a pH probe to measure pH of the stream. The pH of a fresh water stream is usually in the range of 6.5-8.2 though wide variation can occur because of the catchment geology.
Some factors that can affect the pH are:

- Amount of rainfall
- Industrial run-off .including sewage....
- Nutrient pollution e.g. Fertilisers are high in nutrients such as Nitrogen which can promote algal growth. Many Australian plants are sensitive to phosphorus.

Back

Light Intensity

This is the amount of light in the environment.

It is measured with a light meter similar to that used with a camera.

Back

Water turbidity

Turbidity is the cloudiness of water and is the result of suspended materials in it. Suspended material decreases the ability of light to pass through and can therefore limit plant growth and fish and invertebrate food sources.
We have a probe that can measure turbidity of water

High levels of turbidity can:

•Decrease the diversity of aquatic organisms. Where less light penetrates the water, less photosynthesis occurs which reduces the level of oxygen in the water.

•The water becomes warmer because any suspended particles absorb heat from the sun. This also decreases the amount of oxygen dissolved in the water.

Back

Water Flow Rate

This tells us the flow rate of moving water. We can measure this by using a cork and seeing how fast it flows in a stream.

These animals have streamlined bodies to cope with the fast moving streams. They are shown on the next slide.

Back

Dissolved Oxygen in water

Oxygen dissolved in water is vital to the existence of most aquatic organisms. Oxygen is a key component in cellular respiration for both aquatic and terrestrial life. The concentration of dissolved oxygen (DO) in an aquatic environment is an important indicator of the environment's water quality.

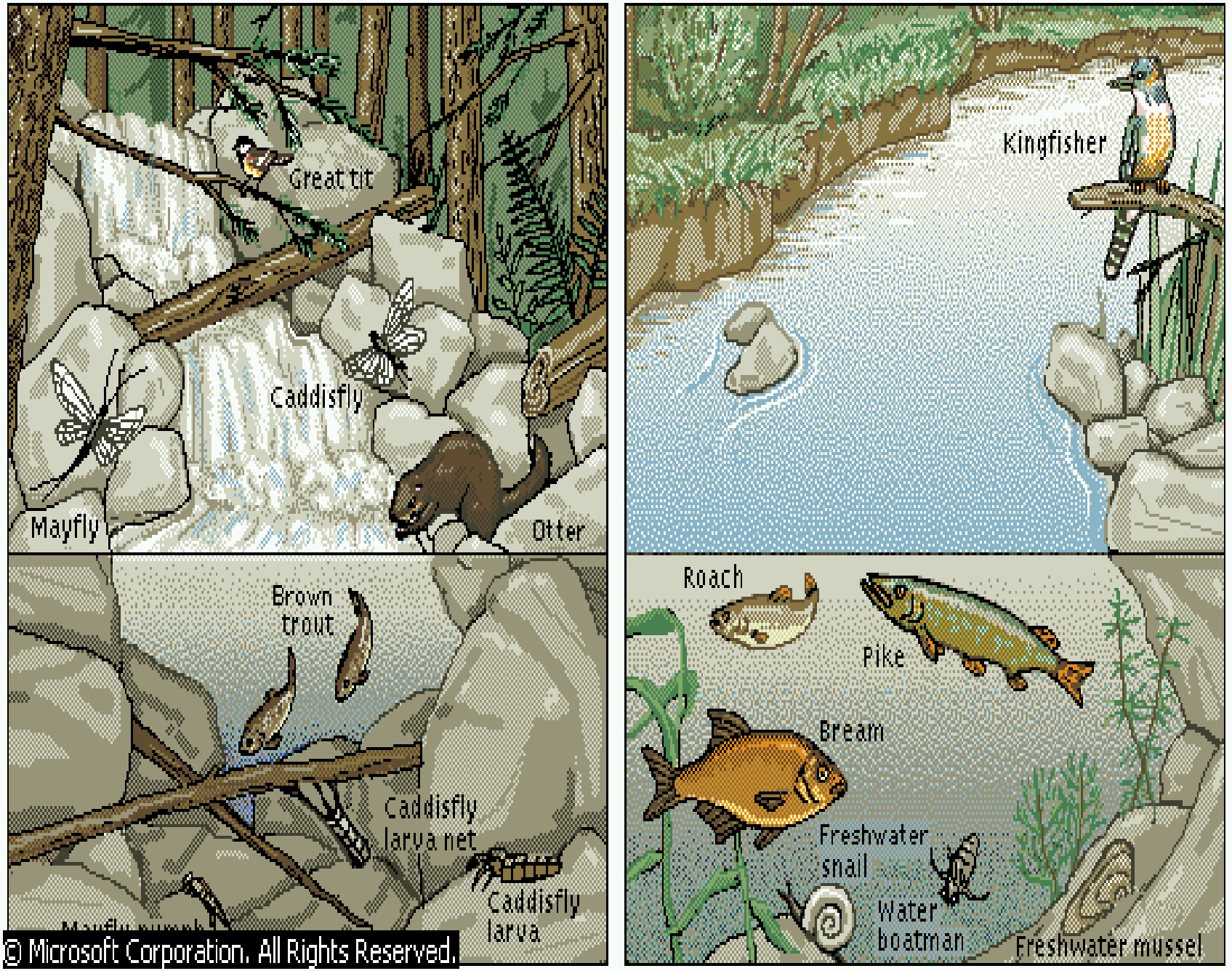
The following animals (next slide) have streamlined bodies to cope with the fast moving streams. Take a note of their names.

Back

Dissolved Oxygen in water

Oxygen dissolved in water is vital to the existence of most aquatic organisms. Oxygen is a key component in cellular respiration for both aquatic and terrestrial life. The concentration of dissolved oxygen (DO) in an aquatic environment is an important indicator of the environment's water quality.

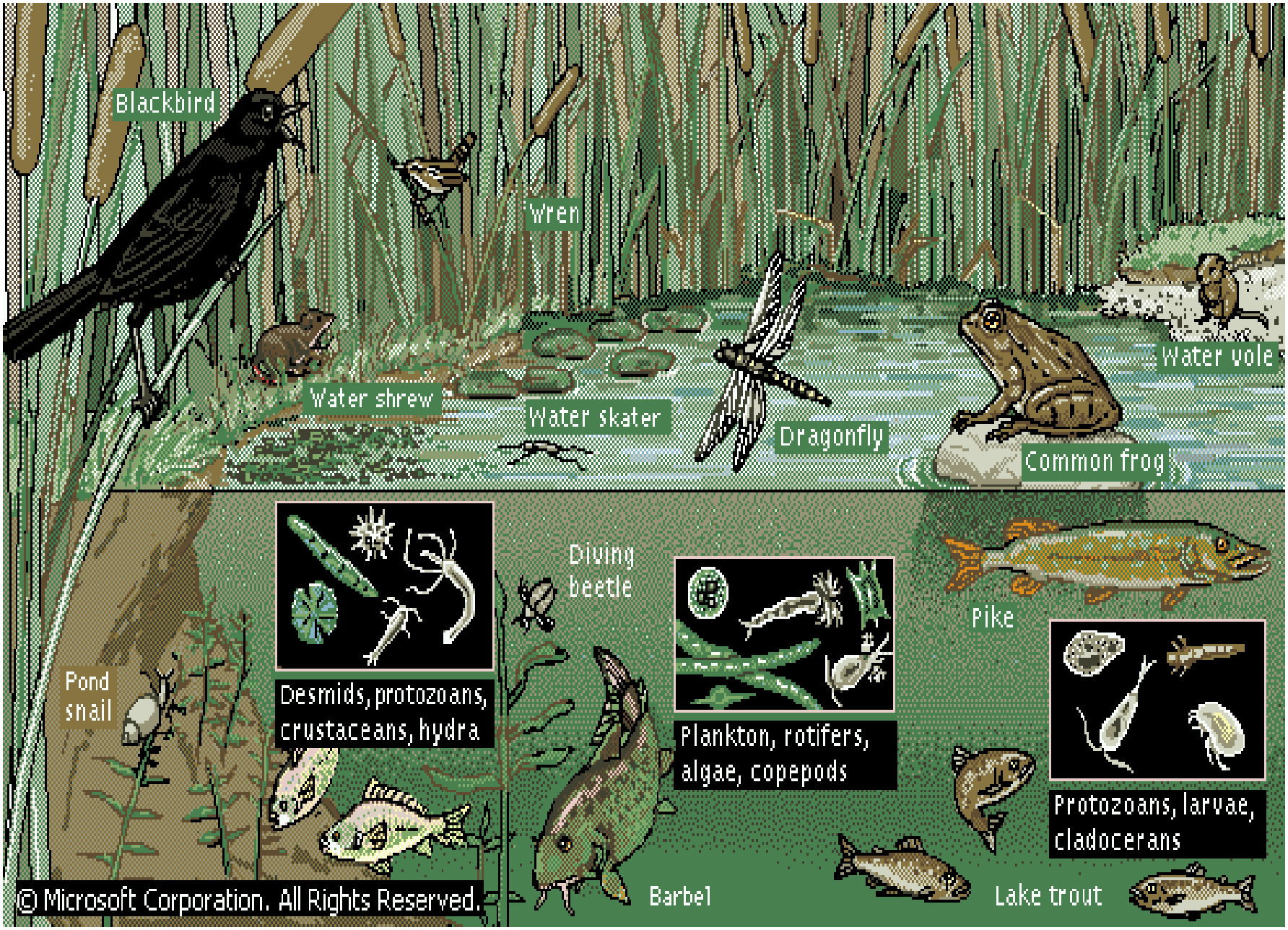
The animals on the next slide have streamlined bodies to cope with the fast moving streams. They also also require Higher concentrations of dissolved oxygen.



Dissolved Oxygen in water

Other organisms can survive in environments with lower concentrations of dissolved oxygen.

The animals shown on the next slide can survive in more still waters.


Blackbird
Wren
Water shrew
Water skater
Dragonfly
Water vole
Common frog
Diving beetle
Pike
Pond snail
Desmids, protozoans, crustaceans, hydra
Plankton, rotifers, algae, copepods
Protozoans, larvae, cladocerans
Barbel
Lake trout
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Dissolved Oxygen in water

The diversity of organisms is greatest at higher DO concentrations. The table below lists the minimum dissolved oxygen concentrations necessary to sustain selected animals.

Organism	Minimum dissolved oxygen (mg/L)
Trout	6.5
Smallmouth bass	6.5
Caddisfly larvae	4.0
Mayfly larvae	4.0
Catfish	2.5
Carp	2.0
Mosquito larvae	1.0

Dissolved Oxygen in water

Oxygen gas is dissolved in water by a variety of processes and factors:

PROCESSES

- Diffusion from atmosphere
- Aeration as water moves across rocks and debris
- Aeration from wind and waves
- Photosynthesis of aquatic plants

FACTORS

- Temperature, Stream flow, air pressure, aquatic plants, decaying organic matter, and human activities.

Percent Saturation of DO in water

EXPECTED LEVELS

The unit mg/L^2 is the quantity of oxygen gas dissolved in one litre of water.
When relating DO measurements to minimum levels required by aquatic organisms, mg/L is used.
When discussing water quality of a stream or river , it can be helpful to use the term *percent saturation*. Percent saturation is the dissolved oxygen reading in mg/L divided by 100 % dissolved oxygen value for water at the same temperature and air pressure.

DO Level	% saturation of DO
Supersaturation	>=101%
Excellent	90-100%
Adequate	80-89%
Acceptable	60-79%
Poor	<60%

Use the handout to convert the average DO collected at the site to the percent saturation of oxygen. This takes into account temperature collected on the day.

Back

Wind flow rate

Wind flow rate :- this tells about how fast the wind is flowing in a particular area. It is measured with a wind speed gauge Some trees become windswept and indeed in windy conditions, some trees will not grow at all.

Back

RESOURCES

You can find more on factors affecting water quality from:

http://www.vic.waterwatch.org.au/