

Factsheet No.9 in the Environment Agency education pack

Life in R

- Food chains
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STEPPING STONES

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ENVIRONMENT
AGENCY

When a river is healthy with clean, unpolluted water, it will contain a wide variety of plants and animals. The different forms of life found in rivers and lakes depend upon each other.

FOOD CHAINS

They are linked together in a **Food Chain**. All types of water environment, including rivers, lakes and ponds have their own food chain, as well as every wetland, such as marshy areas, flood plains and coastal waters. The food chain begins with sunlight. Microscopic plants, called **algae**, absorb energy from sunlight, releasing oxygen. This process, called **Photosynthesis**, takes place in all plants including those growing in or near water. These plants provide food for tiny animals including snails, shrimps and mayflies. These in turn are eaten by small fish, such as roach, which in turn are eaten by predatory fish such as pike. Other animals are also part of this food chain, including birds, mammals and people.

BIOLOGICAL MONITORING

The animals that live in a river can give us a great deal of information about the quality of its water. This type of **biological monitoring**, in which the Environment Agency records the **invertebrates** (animals without a

backbone) found in rivers, can indicate pollutants not easily detected by chemical sampling of the water. Many animals, such as mayflies, are sensitive to chemical

changes in the water. These animals are collected in nets and each type given a score from 1, for animals that can live in polluted water, to 10 for animals that can only live in clean water. It is then possible to award a total score, or an average score, for each sampling point. In polluted water, there will be high numbers of just a few tolerant species (eg bloodworms) so the average score will be low, but in clean water there will be small numbers of a diverse range of creatures (eg mayflies and caddis flies), so there will be a high average score. Biological monitoring is a very sensitive method of assessing the quality of water environment since it reflects the effects of all pollutants at all times.



FRESHWATER HABITATS

Biological monitoring takes place at hundreds of river sites as well as many lakes. Each stage of a river, wetland or coastal area provides different habitats for fish and other wildlife and plants. In other words, different types of water or stages of a river have different physical conditions that are preferred by different plants and animals. For example, game fish such as trout like cold, clear, fast flowing water that contains plenty of oxygen, such as may occur near the source of a river (where the river begins). Here, there are few plants but a wide range of invertebrates, such as mayflies, which provide food for the fish. However, slow-moving fish, such as bream, prefer still water like that found in lakes and canals. Here, the water may not hold as wide a variety of creatures, but there will be a lot of them (eg bloodworms) to provide food.

HUMAN USES OF RIVERS

There are many pressures on the natural water environment. One of the roles of the Environment Agency is to protect and preserve it from the damaging effects of human activities, yet also to encourage people to make more use of it.

In order to ensure that the environment is safeguarded, the Agency carries out regular sampling and testing of the water. This may be biological sampling, as



explained earlier, or **Chemical Sampling**. This involves testing the water, as least 12 times a year, to see what chemicals are present in the water.

THE EFFECTS OF FARMING

In order to grow more food, farmers may use **fertilisers**, which help the plants grow. These contain nutrients such as nitrogen and phosphates. Today, farmers are encouraged to limit the amount of chemicals they use, because heavy rain may wash them off the land into

ivers. If this does happen, the water may become enriched by the nitrates or phosphate which can cause the numbers of plants present in the water to increase sharply, leading to problems. The enrichment of water with these types of nutrients is called **eutrophication**. In normal amounts, the plants are beneficial, since they produce oxygen and occupy a place in the food chain,



but if they multiply, then die and decay, the bacteria feeding on them use up much of the available oxygen. Large amounts of decaying plants will result in a lack of oxygen in

the water that can cause fish and other creatures to suffocate and die.

Eutrophication can also be caused by **livestock farming**. Farmers have always used animal waste as a natural or **organic** fertiliser, spreading it onto the fields because it is full of **nutrients** that make the soil more fertile. This must be done very carefully because if any were to find its way into water, it would cause serious damage. Bacteria, present both in the waste and in the water, would thrive and multiply as the organic material provides a rich source of food, and the bacteria would quickly use up all the available oxygen in the water.

A natural ecosystem will contain many different chemicals, but if the balance is upset, it can interfere with the food chain. If phosphates get into the river, they will act as a fertiliser for the plants in the water which will grow rapidly and possibly block the water channel, cut out the light or slow the water flow, thus making it unsuitable for various aquatic creatures. During the day, the plants use carbon dioxide to produce oxygen (photosynthesis), producing very high amounts of dissolved oxygen in the water, but they then use this oxygen at night or when the sky is very cloudy. This process, called **respiration**, never stops and so if there are a lot of plants, at night the level of dissolved oxygen in the water may sometimes fall too far and, in extreme circumstances, can cause fish deaths.

WASTE DISPOSAL

There are very strict laws that apply to the disposal of human waste, particularly **sewage**. After treatment by the water companies, it is discharged into streams and rivers. This is very carefully monitored by the Environment Agency to ensure that it does not cause any damage to the environment because, as well as the bacteria it contains, it also contains ammonia - a **toxic**

(poisonous) chemical. In order to prevent pollution from occurring, discharge consents are issued. These give people permission to discharge waste water, but set strict limits on quality and quantity. It is very important that toxic pollutants do not **enter** the water as they may then enter the food web. Tiny amounts are absorbed by plants, but as the plants are **eaten** by small creatures, the amounts of toxins in creatures will increase at each level within the food chain, leading to disease and possibly death of larger animals, such as otters.

FISHERIES MANAGEMENT

Fish are an important indicator of the health of a river because they are dependent on clean water, suitable habitat and adequate flow. A healthy fish population is a sign of a healthy river. Fish are also important to anglers. Most of the work carried out by the fisheries staff of the Environment Agency is funded by income from the sale of rod licences.

To monitor the health of fish populations, a programme of surveys is carried out. Survey techniques include seine netting and electro fishing. Analysis of the information gathered during these surveys is used to classify fisheries, detect changes to fish populations and identify problems at an early stage. If a problem is found fisheries staff work **with** other sections of the Agency to identify the cause of the problem and take action to improve the situation.

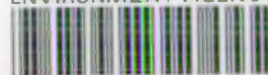
Sustainable improvements to fish populations can only be achieved by ensuring the quality and quantity of water is adequate, and that river habitat is suitable. Restocking is rarely a long term solution to a fisheries problem and only normally done to replace losses caused by a pollution incident. If there are no problems in a river, a fish population will achieve its own, natural balance of numbers and species.

THE ENVIRONMENT AGENCY

The Environment Agency was formed by a merger of the National Rivers Authority with Her Majesty's Inspectorate of Pollution and the Waste Regulation Authorities. This new organisation began operating on 1 April 1996, and has responsibilities for the environmental protection of water, land and air.



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MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 4UD
Tel: 01454 624 400 Fax: 01454 624 409

ENVIRONMENT AGENCY REGIONAL OFFICES

ANGLIAN

Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

SOUTHERN

Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

NORTH EAST

Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

SOUTH WEST

Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

NORTH WEST

Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

THAMES

Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

MIDLANDS

Sapphire East
550 Streetsbrook Road
Solihull B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

WELSH

Rivers House/Plas-yr-Afon
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770 088
Fax: 01222 798 555



NATIONAL LIBRARY &
INFORMATION SERVICE

THAMES REGION

Kings Meadow House, Kings Meadow
Road, Reading RG1 8DQ

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0645 333 111

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

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0800 80 70 60



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