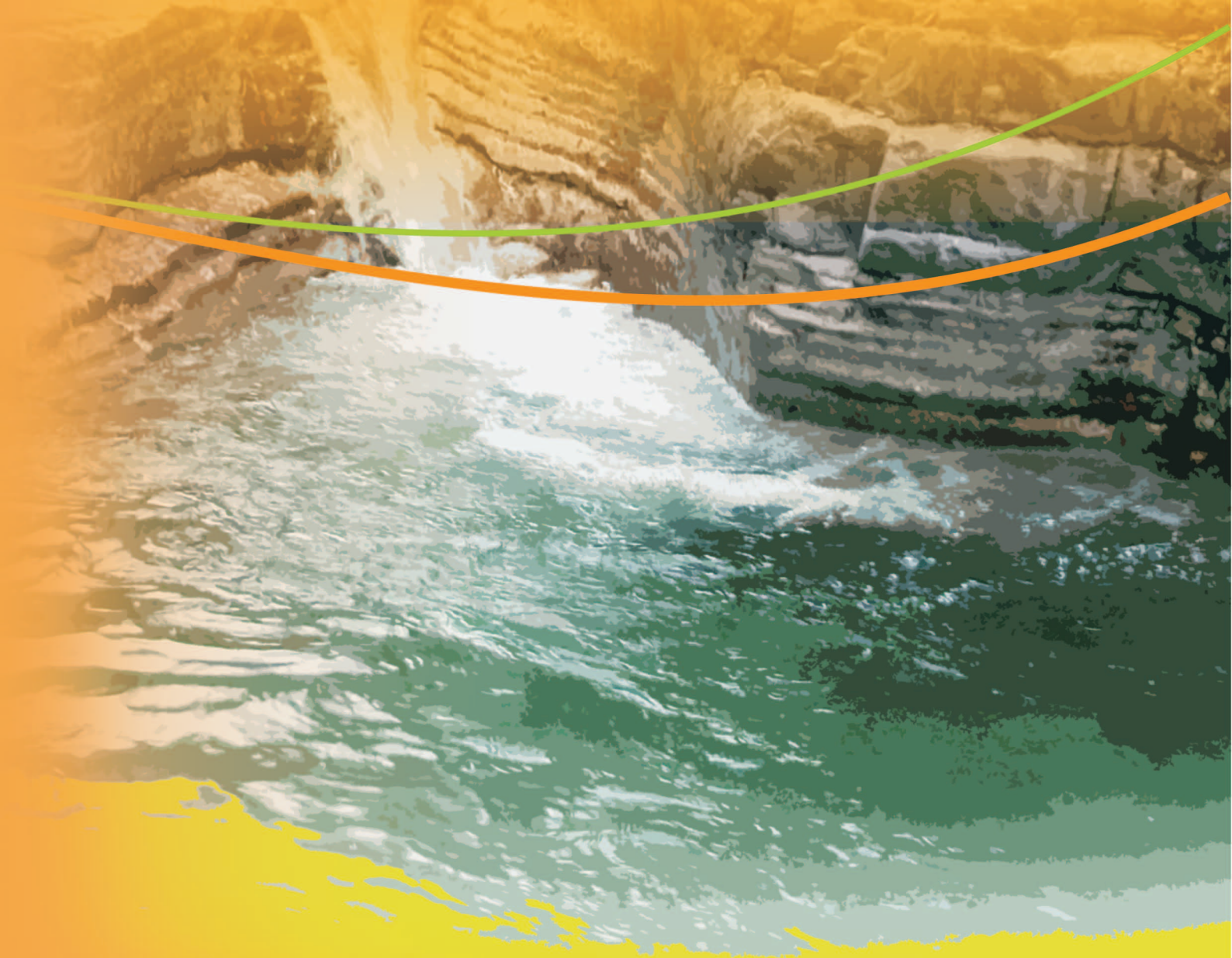

ACTIVITIES TEXTBOOK

FRESHWATER ECOSYSTEMS OF EUROPE

An Educational Approach

Education and Culture
Socrates

Produced by the EC funded project
CONFRESH 226682-CP-1-2005-1-GR-COMENIUS-C21
www.nhmc.uoc.gr/confresh

FRESHWATER ECOSYSTEMS OF EUROPE

An Educational Approach

Activities Textbook

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FRESHWATER ECOSYSTEMS OF EUROPE

Activities Textbook

Chapter

1

CHAPTER I

WATER

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Task 1. Identifying water and its processes

Use the words in the box below to:

a. name the three states of water

b. On each arrow, name the process that enables water to change from one state to another

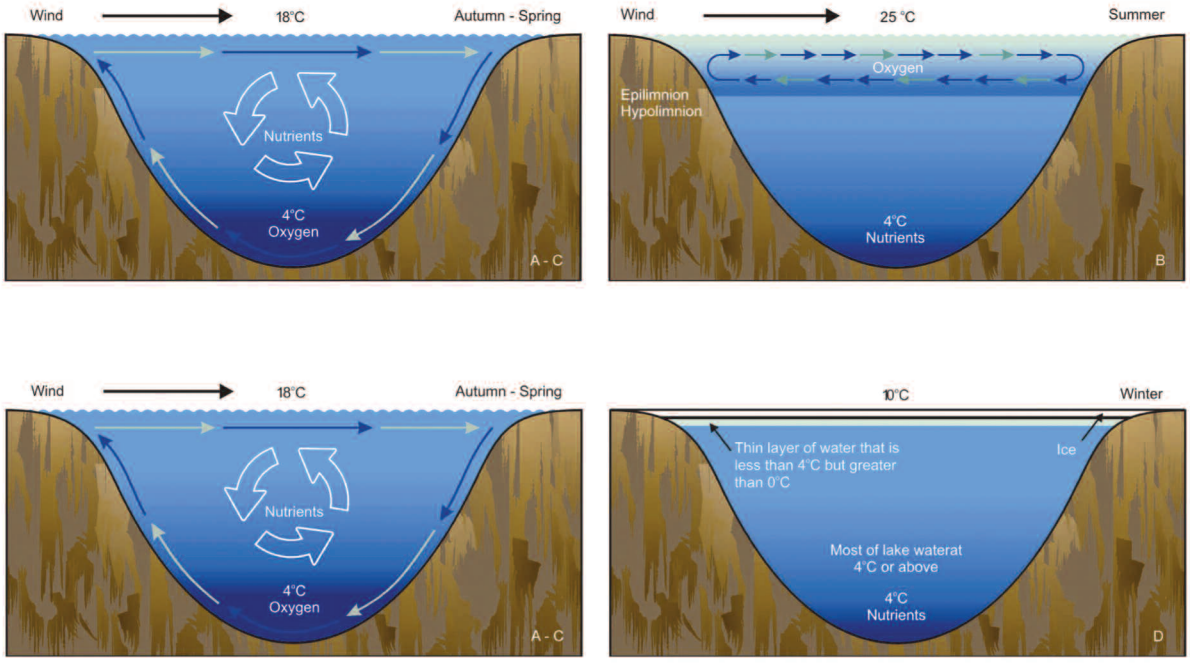
gas (steam, water vapor), condensation, liquid, evaporation, freezing, melting, solid (ice)



1)..... ..... / ..... 2)..... ..... / ..... 3)..... .....

Task 2. Investigate the relationship between water temperature and its density

Look at the diagrams below showing the temperature pattern in a lake over the four seasons of the year. Then answer the questions.



a. Record the temperature of water at the bottom of the lake for each season and explain why it doesn't change.

.....

.....

b. How do you think the constant water temperature at the bottom of the lake influences the organisms living there?

.....

.....

Task 3. Water as a universal solvent

The table below shows the amount of salt which can be dissolved in 100g of water at different temperatures.

Salt solvency in water of different temperatures.

Water temperature	**0°C**	**20°C**	**40°C**	**60°C**	**80°C**
Amount of dissolved salt in 100g of water	**35,7g**	**36,0g**	**36,6g**	**37,3g**	**38,4g**

a. Plot the information in the table above in a graph

b. From your graph complete the following sentences:

1. In 100g water at 40 c we can dissolve .....g of salt
2. The higher the temperature the .....
3. Would it possible to dissolve 40g of salt in 100g of water of the temperature 20 °C?

Explain your answer

.....

.....

.....

Task 4. Water as a universal solvent

The table below records the amount of oxygen that can be dissolved in 100g of water at different temperature (under normal atmospheric pressure[1] at the sea level).

[1] standard atmospheric pressure is 101 325 Pa = 1013.25 hPa

Solvency of oxygen in water of different temperature

Temperature of water	**0°C**	**10°C**	**20°C**	**30°C**	**40°C**	**50°C**
The amount of dissolved oxygen in 1000cm^3 of water	**47cm^3**	**37cm^3**	**30cm^3**	**26cm^3**	**22cm^3**	**20cm^3**

a. Plot the information from the table on to the graph

b. From your graph explain how oxygen levels change with temperature.

……...

……...

Task 5. Investigate other gases dissolved in water

In the table below shows the amount of different gases which can dissolve in 1 dm^3 of pure water at different temperature, under normal atmoshperic pressure (1dm^3=1000cm^3, this amount is called 1 liter).

Analyze given data and carry out the instruction.

The temperature of water saturated by gas		**0°C**	**10°C**	**20°C**	**30°C**	**40°C**
An amount of dissolved	**Nitrogen**	**23cm^3**	**18 cm^3**	**15 cm^3**	**13 cm^3**	**12 cm^3**

gas in 1000cm^3 of water	**Oxygen dioxide**	**1676cm^3**	**1163cm^3**	**848cm^3**	**652cm^3**	**518cm^3**

From this table what can you say about waters ability of dissolve gases at different temperatures?

The solvency of gases ……..…., when.....water temperature.

Experiment 1. Investigate how carbon dioxide levels change with temperature

Apparatus: two bowls, two glasses, sparkling mineral water, some of warm and cold water.

Method: Pour hot water into one of the bowls, and cold water into the other. Into each bowl put a glass filled half of mineral water. Draw the apparatus set up in the box below. Write down your observations and explain what you think is happening.

Observation: ……..…..

……..……

……..……

Conclusion: ……..……..…..

……..……

Experiment 2. Investigate water's surface tension

Apparatus: a bowl, a glass or jar , some coins and some water

Method: put the glass into a bowl and fill it to the brim of water. Next add a coin, carefully slipping into the water. Add as many coins as you can without the water over flowing. Look at the surface of the water

Observation: ……

……...
……...

How many coins you were able to add to the full glass of water?
Explain what happened when you added the coins. How did the surface of the water change

……...

Conclusion:

……
……
……
……
……

Experiment 3. Further investigation of water's surface tension

Apparatus: A handkerchief or piece of cotton cloth, a rubber band, a glass and water **Method:** soak a handkerchief in water then wring it out. Pour water into the glass. Stretch the wet cloth tightly over the top of the glass and fasten in place with a strong rubber band.
Turn the glass up-side down. Record what you see.

Observation:……...……
……
……
……

Conclusion: water filled the space between the fibres of the cloth or handkerchief. So the combination of threads and surface tension of the water filling the spaces formed a barrier, preventing the rest of the water from flowing out of the glass.

Task 6. Water surface tension helps live the aquatic organisms.

Investigate how small animals use water's surface tension. Look carefully at the photo and write down why this insect (*Gerris lacustris*) is walking on the water surface.

.....

.....

.....

.....

.

Experiment 4. Investigate water movement in plants

I. Apparatus: a jar, blue ink, white flower.

Method: Put some water into a jar, add some ink and put in the white flower. Put this in a warm place. Make a drawing to show the experiment set up

Observation.....

.....

II. Apparatus: a jar, blue ink, a stalk of celery.

Method: Put some water into a jar, add some ink and put in the stalk of celery (you might want to use a piece of celery that has begun to whither, as it is in need of a quick drink). Put this in a warm place. Make a drawing to show the experiment set up.

Observation……..

……...

Conclusion: Inside the plant stem there are tiny tubes connecting the roots to the leaves and flowers. These tubes carry water to all parts of the plant. The sun causes the plant to lose water, and so more moves up the stem from the roots. Here the cut stem still draws in a water, and carries the ink stained water to the flower. This water movement is a combination of two processes. The first is capillarity, the tendency for water to rise in very thin tubes. The second is transpiration, which is responsibly for water rising several meters up plants and trees.

Experiment 5. Making an indicator for pH testing - ph records the acidity or alkalinity of a solution.

Apparatus: a piece of red cabbage, a knife, hot water, a big jar, three small jars, vinegar, bicarbonate of soda, and a teaspoon

Method:

Cut red cabbage into small pieces, put them the big jar and cover with boiling water. Wait for 15 minutes. Set out the three small jars and add some water to each. Set the first jar aside. To the second jar add two teaspoons of vinegar. To the third jar add two teaspoons of bicarbonate of soda. Then add five teaspoons

of red cabbage liquid to each jar (scientists would call this liquid an infusion) record what you see happening.

Observation:

1. Jar 1 – plain water

   ……..

   ……

2. Jar 2 – with vinegar

   ……..

   ……

3. Jar 3 - with bicarbonate of soda

   ……

   ……..

Draw the result of the experiment.

Conclusion: The infusion of red cabbage juice is an indicator because it changes its colour to red when it comes into contact with acid (vinegar) and into blue when it comes into contact with alkali (bicarbonate of soda).

Pure water is not acid or alkali, so the indicator hasn't changes its color. The water acts as a control for the experiment showing that it is the acid or alkali that causes the change.

Experiment 6. Testing water pH from a lake or a pond

Apparatus: samples of water taken from different water sources and indicator for pH testing (red cabbage infusion, as above). A jar for each water sample.

Method: place each water sample into a jar, label it noting where it came from. Add your pH indicator solution and record what you see.

Make a table to record your observations.

Conclusion: What can you say about the pH of the water sources you tested.

……..

……..

……..

Task 7. Investigating water balance in humans.

Look at the information from the table below:

Water taken in and lost from the human body			
Amount of taken in water (water input; in ml)		**Amount of water lost (water output; in ml)**	
Drinks	**1500**	**Urine , faeces**	**1600**
Food	**700**	**Sweat**	**500**
Water resulting from metabolic processes, such as respiration	**300**	**Water vapor given off from respiration, breathing out**	**400**

1. What is the percentage of water a human takes in eating food?

……..

……..

……..

……..

2 What is the percentage of water a human loses as sweat?

……..

……..

……..

……..

2. Why do we need to take in extra water on sunny, hot days?

1. ……
2. ……
3. ……
4. ……

Observation: ……

Conclusion: ……

……

……

Task 8. The water cycle

Add labels to complete the diagram of the water cycle. Use the information in the box below to remind you of the processes involved in the cycle.

rain/precipitation; groundwater (flowing under the ground); surface runoff; evaporation/transpiration from plants; evaporation from the land; forming clouds/condensation; infiltration/absorbing into the soil

Πείραμα 7. Ερευνώντας την απώλεια νερού κατά τη διάρκεια της αναπνοής

Παρατηρείστε προσεκτικά τη διπλανή εικόνα. Χρησιμοποιήστε την για να σχεδιάστε ένα πείραμα στο οποίο να αποδεικνύεται ότι χάνουμε νερό όταν αναπνέουμε. Γράψτε με τη σειρά: τα υλικά, την εκτέλεση, την παρατήρηση και το συμπέρασμα.

Το πείραμα

Υλικά: _____

Εκτέλεση: _____

_____

_____

Παρατήρηση: _____

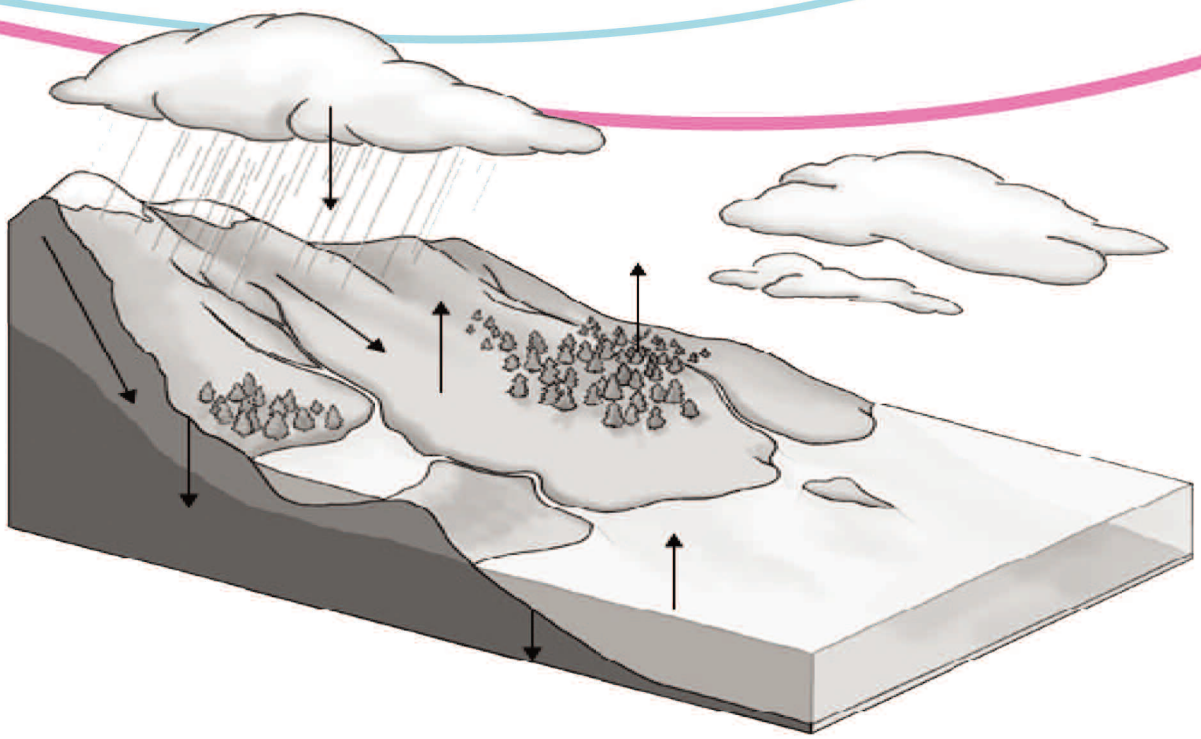
_____

_____

Συμπέρασμα: _____

_____

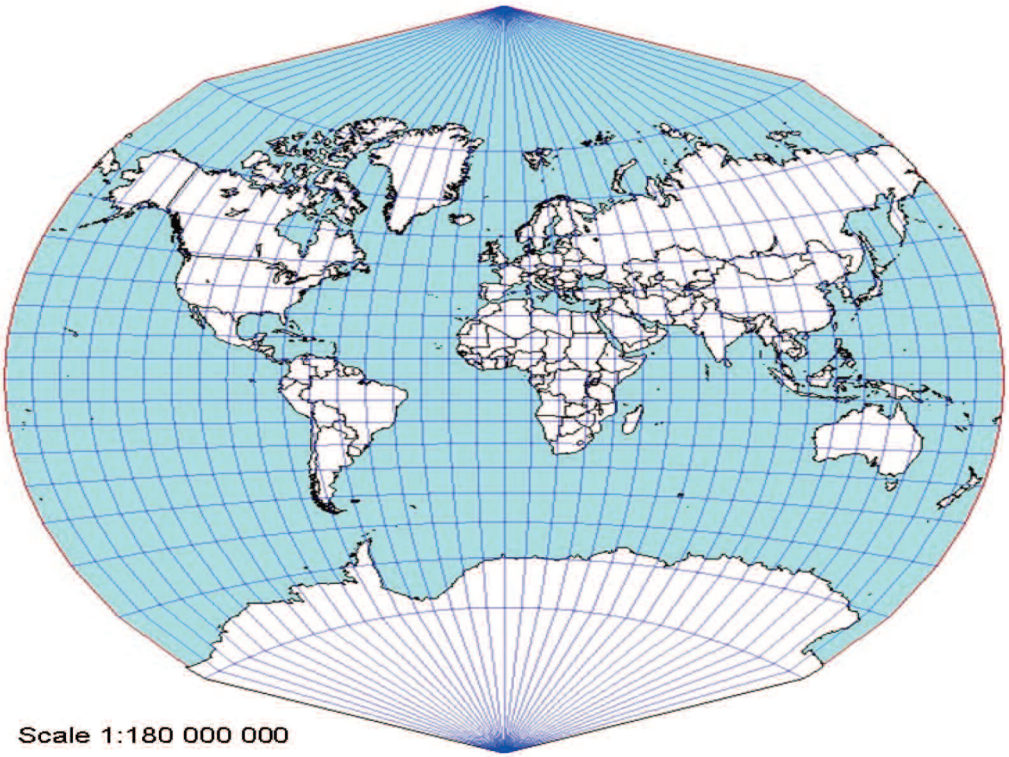
_____



Task 9. Continents and oceans of the world

a. On this map write down the names of the continents and oceans

b.



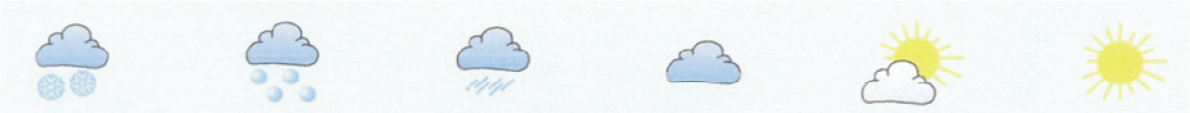
Scale 1:180 000 000

What is the scale of this map? How many kilometers correspond one

centimeter on a map?.....
.....

Task 10. Keeping a weather chart

Make a chart, with at least 14 rows, set up as shown below. Record the weather at the same time each day. Try to record: the temperature, the direction of a wind, clouds, rain (precipitation).



Date	Temperature (°C)	Wind direction	Type of precipitation and clouds	Other climatic conditions

The table might be copied and used as your work sheet to fill up by your observations.

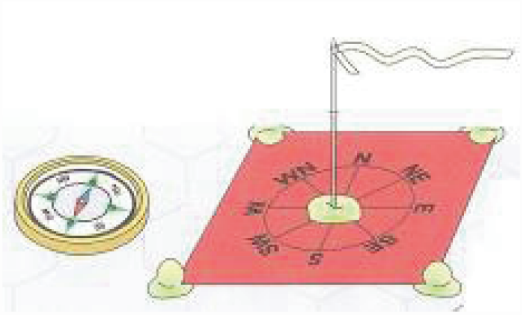
Apparatus: you will need a thermometer, a wind measure (look at task 19) and to consult a diagram with climatic symbols such as the one below. In the last

table column you should record some other climatic conditions, eg. storm, thunders, mist, fog, rainbows.

Task 11. Making a home-made wind gauge

Apparatus: some stiff cardboard or a piece of plastic, strong tape, a stick, a piece of woolen thread, waterproof felt-tipped pen, a compass.

You can see from the picture how all these pieces of apparatus are used to make the wind gauge.



Explain, what the abbrevations given on a wind measure mean:

N - …… E - …….

S - …… W - ……

NE - …….. SE - ……

SW - ……. WN - ……..

Remember! the woolen thread shows where the wind is going, so it comes from the opposite direction.

Task 12. Making a home made rain measure

Apparatus: a long narrow jar, waterproof pen, tape and a strong stick.

Method: mark 1cm divisions on the side of the jar with the water proof pen. Push the strong stick into the ground and tape the jar to it. Alternatively tape the jar securely to a window sill.

Record the amount of rain water you collect each day in a table showing the date and the amount of rain collected.

Compare your results with the results from the meteorologist stations, which are published in TV or radio.

…….

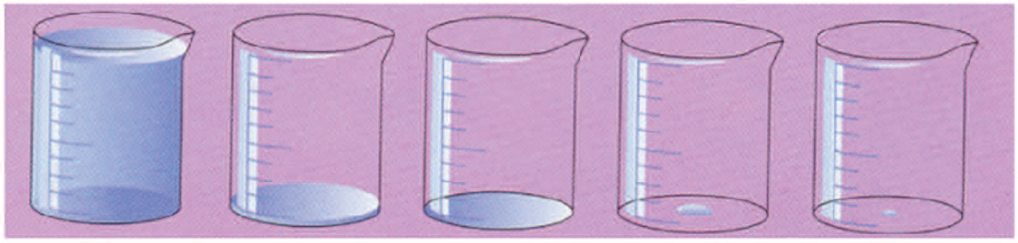
…….

If you carry out these observations for a whole year plot the rain collected on a graph. ……

……

Task 13. Comparison of freshwater and ocean/salty water quantity on the Earth

The diagram below shows the distribution of the different water types on earth



97,26%	2,1%	0,62%	0,019%	0,001%
Oceans	Icecaps Glaciers	Groundwater	Lakes Rivers	Atmosphere

a. Write down all the type of fresh water. How much is there?

……..

……..

b. What percentage of fresh water available?

……

……

c. How much more salty water is there than fresh water?.

……

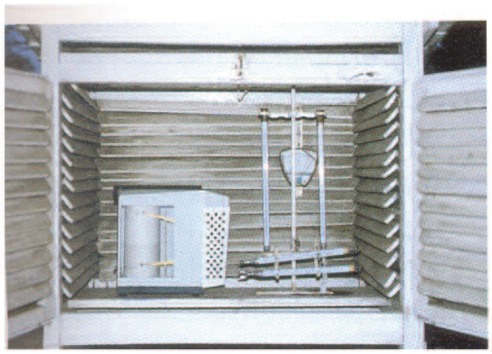
……

Task 14. Meteorological station

a. Name the equipment, which is used to monitor weather conditions and to record specified environmental parameters. Set the relevant units.

1. air temperature - …… - unit……
2. rain/precipitation - …… - unit……
3. humidity - …… - unit……
4. barometric pressure - ……- unit……
5. wind direction and speed - ……- unit……

b. Write down the name of equipment types, placed in the meteorological station.



FRESHWATER ECOSYSTEMS OF EUROPE

Activities Textbook

Chapter

3

CHAPTER 3

LAKES RIVERS AND ESTUARIES

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ACTIVITY 1

1. Habitat assessment

Biologists can assess the stream ecosystem quality in a number of ways: visually by documenting the surrounding physical habitat, chemically by testing the water for specific pollutants, biologically by noticing types of plant and animal species present. The evaluation of habitat (the location, with its own specific set of environmental conditions, where an organism occurs naturally) is fundamental for the assessment of the ecological integrity of the ecosystem.

For instance, habitat is a place that includes everything that an animal needs to live and grow. It includes food resources, the physical characteristics of the environment, as well as places and materials to build nests, raise young and keep safe from the predators. The habitat quality evaluation can be accomplished by characterizing selected physical and chemical parameters (e.g. water temperature and pH) in conjunction with a systematic assessment of the physical and biological structure. Through this approach, key features can be rated or scored to provide a useful assessment of habitat quality. For streams, an encompassing approach to assess the structure of the habitat includes an evaluation of the variety and quality of the substrate, channel morphology, bank structure and riparian vegetation.

2. Materials and equipment

1. Habitat Assessment Field Data Sheet.
2. Appropriate clothes and footwear.
3. Clipboard.
4. Pencils and permanent markers.
5. 35 mm camera (may be digital).
6. Video camera (optional).
7. Arrow-shaped and scale labels for photographing and documenting sampling area and details.
8. Flow or velocity meter (optional).
9. *In situ* water quality meters (optional).
10. Compass or Global Positioning System (GPS) Unit (optional).
11. Fields guide for plants and animals.
12. One-meter long stick and water proof measuring tape for help measure depth and width.
13. Thermometer.

3. Procedure

1. Select a 100 m reach (or other reach designation) to be assessed.

2. Obtain a close look at the habitat features to make an adequate assessment. If the physical and water quality characterization and habitat assessment are done before the biological sampling, care must be taken to avoid disturbing the sampling habitat.

3. Complete the Habitat Assessment Field Data Sheet, in a team to come to a consensus on determination of quality. Those parameters to be evaluated on a scale greater than a sampling reach require traversing the stream corridor to the extent deemed necessary to assess the habitat feature.

4. Safety precautions

1. It is never wise to work alone around water. Always work in teams.
2. Children should always be accompanied by watchful adults.
3. Avoid sampling during storms or high water. In addition to the potential danger, it is unlikely that meaningful samples can be collected under such conditions.
4. Avoid sampling at sites with high or steep stream banks. Select sampling sites where no one is likely to slip and fall when trying to approach the stream.
5. During and after sample collection, keep hands away from eye and mouth areas. Always wash hands with soap and clean water after sampling. Never eat after sampling until hands have been washed.
6. If the stream is likely to be polluted, avoid contact with the water by wearing rubber gloves and boots.
7. If there is any concern that the stream may be severely polluted, it would be wise to consult with local health authorities or natural resources agencies for specific warnings or guidance.
8. If no one has a mobile phone, or there is no signal in the area, know the location of a nearby phone in case of emergency.
9. Always bring a first-aid kit containing antiseptic, bandages, etc.

5. Guidelines to fill-up the protocol

Site identification

The location of the site is described in the narrative to help identify access to the site for repeat visits. The water body latitude and longitude are specific data for the site.

Weather conditions

This information is important to interpret the effects of storm events on the evaluation effort.

Site location/Map

A photograph may be helpful in identifying site location and documenting habitat conditions. A hand-drawn map is useful to illustrate major landmarks or features of the channel morphology or orientation, vegetative zones, buildings, etc. that might be used to aid in data interpretation.

Site characterization

In regions where the perennial nature of streams is important, or where the tidal influence of streams will alter the structure and function of communities, this parameter should be noted. Otherwise, communities inhabiting coldwater streams are markedly different from those in warm water streams. Note the origination of the stream under study, if it is known.

Catchment features

Collecting this information usually requires some effort initially. However, subsequent visits will most likely not require an in-depth research of this information.

Predominant surrounding land use type

Document the prevalent land-use type in the catchment of the site (noting any other land uses in the area which, although not predominant, may potentially affect water quality). Land use maps should be consulted to accurately document his information.

Local catchment non-point source pollution

This item refers to problems and potential problems in the catchment. Non point source pollution is defined as diffuse agricultural and urban runoff. Other compromising factors in the catchment that may affect water quality include feedlots, constructed wetlands, septic systems, dams and impoundments, mine seepage, etc.

Local catchment erosion

The existing or potential detachment of soil within the catchment (the portion of the catchment that directly affects the stream reach or station under study) and its movement into the stream is noted. Erosion can be rated through visual observation of catchment and stream characteristics.

Velocity

The intensity of the flow can be evaluated according with the appearance of the surface water (flow types)

Free fall – clearly separates from back-wall of vertical feature

Chute - low curving fall in contact with substrate

Waves – white water tumbling waves

Rippled – no waves, but general flow direction is downstream with disturbed rippled surface

No perceptible flow – no net downstream flow

No flow – dry river bed

Canopy cover

Note the general proportion of open to shaded area (presence of riparian vegetation) which best describes the amount of cover at the sampling reach or station.

High water mark (m)

Estimate the vertical distance from the bank full margin of the stream bank to the peak overflow level, as indicated by debris hanging in riparian or floodplain vegetation, and deposition of silt or soil. In instances where bank overflow is rare, a high water mark may not be evident.

Proportion of reach represented by stream morphological types

The proportion represented by riffles, runs, and pools should be noted to describe the morphological heterogeneity of the reach.

Canalization

Indicate whether or not the area around the sampling reach or station is canalized (e.g., straightening of stream, bridge abutments and road crossings, diversions, etc.).

Dam present

Indicate the presence or absence of a dam upstream in the catchment or downstream of the sampling reach or station. If a dam is present, include specific information relating to alteration of flow.

Aquatic vegetation

General type and relative dominance of aquatic plants. Only an estimation of the extent of aquatic vegetation is made. Besides being an ecological assemblage that responds to perturbation, aquatic vegetation provides refugee and food for aquatic fauna. List the species of aquatic vegetation, if known.

Evidence of animals

Indicate the presence or absence of the animals. Using the field guides, identify as much species as you can.

HABITAT ASSESSMENT PROTOCOL

School name: **Level and class**:

Name(s) of student(s):

Date:

Site name: (create a unique name that describes the location of your site)

1. Identification of your site:

Name of the nearest town or village: _____

Describe the access to the site:

_____

Describe the weather now (tick a box):

Clear/sunny	Overcast	Showers	Rain (steady)	Rain (heavy)
☐	☐	☐	☐	☐

Coordinates:

Latitude	☐ N	Longitude	☐ E
	☐ S		☐ W

Source of location data (check one):

☐ GPS ☐ Other_____

If other, describe:

Name of the aquatic ecosystem: (Name commonly used on maps)

Water type:

☐ Salt ☐ Brackish ☐ Fresh

Type of aquatic ecosystem (tick a box):

☐ River	☐ Creek/stream	☐ Lake/reservoir	☐ Pond/wetland
☐ Spring	☐ Irrigation channel	☐ Estuary	

Position in the basin:

☐ Upper ☐ Middle ☐ Lower

Estimated altitude _____ (metres)

2. General features of your site

Face downstream when describing the left and right banks.

View of the site

Sketch a bird's eye view (a view looking down from above) of your lake, estuary or stream site, showing curves in the stream, adjacent land on both sides, etc.

Mark areas of vegetation, eroded banks, fences, roads, drains, etc. For example, try to draw about 100 metres of stream length.

Remember, it is only a rough sketch. Label the sketch. Mark and number any photo sites and draw an arrow to show the direction from which each photograph was taken. Show the direction of stream flow and the scale of your sketch.

Description of channel, banks and water

✓ Average width of wetted part of stream _____ (metres)

✓ Average width of channel, e.g. to base of roots of woody plants _____ (metres)

✓ Average depth of riffles at the site _____ (metres)

✓ Dominant size of bed material (%)

boulder	cobble	gravel	sand	silt

✓ Evidence of erosion (head cuts, undercutting banks, incised bed)

_____

✓ Describe the appearance of water – clear, oily sheen, foamy, frothy, milky, muddy, coloured brown, green, reddish or other

_____

✓ Describe Smell of water - none, sewage, fish, chlorine, rotten eggs, other

_____

✓ Flow type:

Free fall ☐
Chute ☐
Waves ☐
Rippled ☐
No perceptible flow ☐
No flow (dry) ☐

✓ Water temperature ºC _____

Aquatic plants (tick the best description):

✓ Presence of logs greater than 10cm in diameter in the water

None ☐ Occasional ☐ Plentiful ☐

✓ Large aquatic plants

Present ☐ absent ☐ Attached ☐ Free floating ☐

✓ Algae in the water

	None	Occasional	Plentiful	Colour (green or brown)
Algae growing on submerged stones, twigs, etc				
String-like algae (filamentous)				
Detached "clumps" or "mats" of floating algae				

Evidence of animals

(foot prints, songs, shells, marks, skin casts, excrement, etc.**)**

- Birds (describe/name)

_____

- Mammals(describe/name)

_____

- Reptiles (describe/name)

_____

- Amphibian (describe/name)

_____

- Insects (describe/name)

_____

3. General conditions around the site that might be affecting the water body

These conditions may include, degraded vegetation on bank, banks collapsed, eroded, stock erosion paths, mud in or entering stream, litter, rubbish in or next to stream, actively discharging pipes, other pipes, drains entering, dams, weirs across stream.

_____

_____

_____

_____

Land uses near the site

The way the land is used and managed can have a severe effect on the health of the waterway. Look at the surrounding land uses for a distance of up to 400 metres away from the site.

	Agriculture (%)	Construction (%)	Recreation (%)	Bush, forests, nature reserves (%)	Other land uses (%=
Land use area as a percentage of total					

Add a comment if a land use or management practice appears to cause problems.

Presence of effluents

Record observations if pipes or drainage are present.

✓ Location of pipe/drain

☐ In-stream ☐ In bank ☐ Near stream

✓ Discharge from the pipe

	None	Trickle	Heavy	Intermittent	Steady
Rate of flow					

	Clear	Foamy	Turbid	Oily sheen	Coloured (name)
Appearance					

	None	Sewage	Fishy	Chemical	Chlorine
Odour					

✓ Condition of the stream bank below the pipe or drain

No problem evident		Sewage litter, e.g. toilet paper		Rubbish, e.g. cans, paper		Eroded		Lots of algae	

Add notes or additional comments on the condition of the stream below the discharge.

4. Ideas for rehabilitation actions

While describing the site, you may think of some actions that could be taken to improve the habitat in and around your stream. Write them down here for reference.

ACTIVITY 2

1. Macroinvertebrates sampling on rivers

Freshwater macroinvertebrates, or more simply "benthos", are animals without backbones that are larger than ½ millimetres (the size of a pencil dot). These animals live on rocks, logs, sediment, debris and aquatic plants during some period of their life.

The macroinvertebrates are a link in the aquatic food chain. In most streams, the energy stored by plants is available to animal life either in leaves that fall in the water or in algae that grow on the stream bottom. Both algae and leaves are eaten by macroinvertebrates. Macroinvertebrates are a source of energy for larger animals such as other macroinvertebrates, fish, which in turn, are a source of energy for birds, raccoons, water snakes and even fishermen. Some macroinvertebrates cannot survive in polluted water but others can survive or even thrive in polluted water. In a healthy stream, the stream-bottom community will include a variety of pollution-sensitive macroinvertebrates whereas in an unhealthy stream, there may be only a few types of tolerant macroinvertebrates present.

Useful stream-bottom macroinvertebrate data are easy to collect without expensive equipment. The data obtained by macroinvertebrate sampling can serve to indicate the need for additional data collection, possibly including water analysis and fish sampling. Collecting stream-bottom macroinvertebrates is not dangerous; however, accidents can happen when groups of people are involved in any outdoor activity. The use of common sense is always the best safety precaution, and the following specific safety suggestions are recommended.

2. Sampling material and equipment

The following materials and equipment are recommended for collecting macroinvertebrate samples from streams with rocky or gravel stream beds.

- A Kick seine (a fine 25x30 cm net with a 0,5 mm mesh and 50 cm supporting poles on each side) (Fig. 1) or hand net kick (a frame of 25x25 cm supporting a net with a 0,5 mm mesh) (Fig. 2)

- White sheet (a large white plastic bag will do) to place under the kick seine when locating collected specimens (not necessary if the kick seine net is white).
- Containers for holding and sorting macroinvertebrates if you plan to identify the collected specimens in the field (white enamel or plastic shallow pans and ice cube trays work well).
- Plastic buckets if you plan to transport the collected specimens to your "lab" for identification (it will be easier if the buckets have lids).
- Hand-held magnifying glasses (or magnifier boxes) to aid in specimen identification.
- Tweezers or forceps for handling specimens (optional).
- Small brushes for brushing macroinvertebrates from rocks during sample collection (optional).
- Wading boots or other tall waterproof boots and rubber gloves to wear during sample collection.
- Thermometer for recording stream-water temperature.
- Sample Record and Assessment Form, pencils, and clipboard
- The identification cards

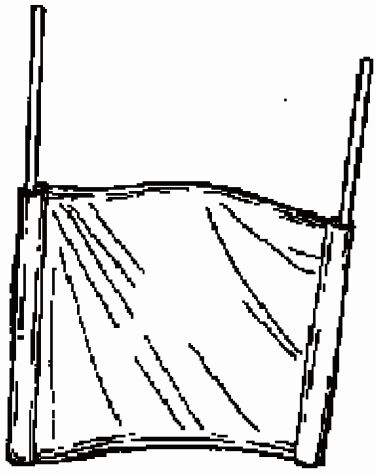


Fig. 1. Kick seine.

Fig. 2. Hand net sampler.

3. Construction of a kick seine net

A simple kick seine can be constructed from the following materials:

- 25 x 30 cm nylon screening or netting (0,5mm mesh)
- 2 broom handles or wooden dowels (50 cm long) for handles
- Heavy tacks and hammer or heavy staples and staple gun

Construction:

1. Make a hem along the 25 cm sides of the netting by folding over and sewing the edges, leaving a 25 x 30 cm section of net. (If the netting is too difficult to sew, a hem can be constructed using a strip of canvas or cloth.)
2. Spread the netting out flat and place the handles along the unhemed 25 cm edges.
3. Roll of netting around each handle, leaving a 25 x 25 cm section of net between the handles. Then nail or staple the net to the handles.

An alternate approach is to fold over and sew the 25 cm edges of the net to form sleeves for the handles. In any case, the final size of the net should be 25 x 25 cm.

4. Safety precautions

1. It is never wise to work alone around water. Always work in teams.
2. Children should always be accompanied by watchful adults.
3. Avoid sampling during storms or high water. In addition to the potential danger, it is unlikely that meaningful samples can be collected under such conditions.

4. Avoid sampling at sites with high or steep stream banks. Select sampling sites where no one is likely to slip and fall when trying to approach the stream.
5. During and after sample collection, keep hands away from eye and mouth areas. Always wash hands with soap and clean water after sampling. Never eat after sampling until hands have been washed.
6. If the stream is likely to be polluted, avoid contact with the water by wearing rubber gloves and boots.
7. If there is any concern that the stream may be severely polluted, it would be wise to consult with local health authorities or natural resources agencies for specific warnings or guidance.
8. If no one has a mobile phone, or there is no signal in the area, know the location of a nearby phone in case of emergency.
9. Always bring a first-aid kit containing antiseptic, bandages, etc.

5. Sampling strategies

Riffles are the most commonly sampled habitats for the survey of wade able streams. Riffles are shallow areas with medium to fast current where the substrate is a mixture of gravel, cobble and boulders. These areas are the preferred habitat to sample because they:

- Contain the greatest diversity of macroinvertebrates.
- Contain pollution sensitive and pollution tolerant species.
- Have fairly consistent habitat throughout the riffle.
- Are shallow and easy to access.
- Are easy to recognize.

Other habitats can be sampled: runs; pools; habitats with detritus deposition or live plants.

6. Sample collection procedures

If you choose the kick-seine method, have one person hold the net upright facing the flow at the downstream edge of the sampling area. The net should be stretched out to its full with the bottom edge lying firmly against the stream bed. No water should wash under or over the net.

To avoid losing macroinvertebrates that should be part of the sample, do not stand in or disturb the sampling area before the kick seine is in place. To avoid capturing macroinvertebrates that should not be part of the sample, do not stand in or disturb the stream bed above the sample area.

Macroinvertebrates in $1m^2$ sample area must be washed into the kick seine. While one person holds the net, a second person first brushes all the cobbles in the sampling area to dislodge the attached macroinvertebrates. As each cobble is brushed, it can be placed outside the sampling area. When all the cobbles are brushed, use the feet to stir up the entire sampling area to dislodge any burrowing macroinvertebrates.

If a hand net is used, face the frame to river flow and disturb the upstream substrate with the feed in order to dislodge the organisms from the sediment.

7. Removing the sample from nets

Carry the net to the stream bank and spread it out flat. Carefully examine the net and the collected debris for macroinvertebrates. Look carefully as many specimens will be small and hard to see. As you remove them from the net using tweezers or fingers, sort them into different types and place each type in a separate container filled with stream water.

If your plan is to transport the sample back to your laboratory before sorting and identification, you can place the contents of the kick seine (including the debris) into a bucket that is partly filled with stream water. If you put a lid on the bucket (recommended), you should leave some air space above the water in the bucket to allow mixing of oxygen.

8. Identification

Once macroinvertebrates are collected and sorted, they can be identified in the field using the identification cards.

If you are identifying the macroinvertebrates in the laboratory and you have access to a computer, you can also use the Macroinvertebrate Identification Keys on line (http://people.virginia.edu/~sos-iwla/Stream-Study/Key/Key1.HTML; http://www.dec.state.ny.us/website/dow/stream/index.htm).

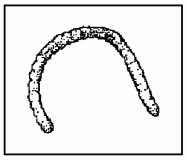
For a simple assessment of the ecological quality of your freshwater habitat (see also chapter 4), please fill-up the following **Health Card.**

HEALTH CARD

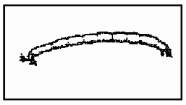
Have you found only these aquatic macroinvertebrate animals?

Then the ecological status of your freshwater ecosystem is

bad....



Freshwater worm

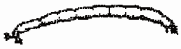


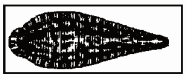
Midge blood larva

Except the previous animals, have you found also these organisms that are included in frames?

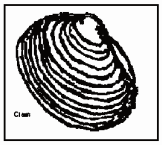
Then the ecological status of your freshwater ecosystem is

moderate..

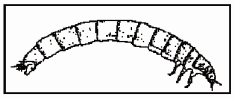




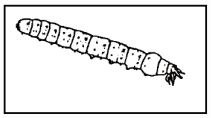
Leech



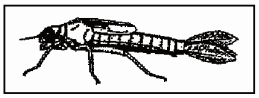
Freshwater mussel



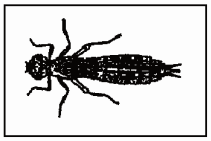
Beetle larva



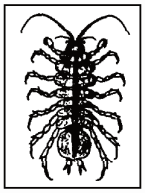
Fly larva



Damselfly nymph



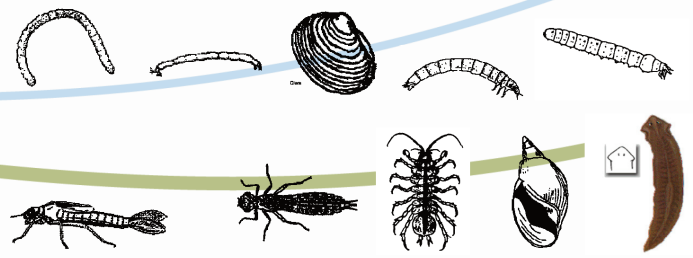
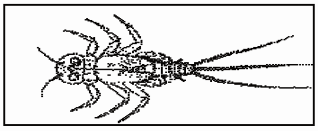
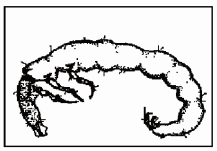
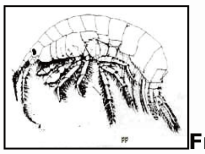
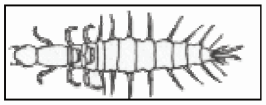
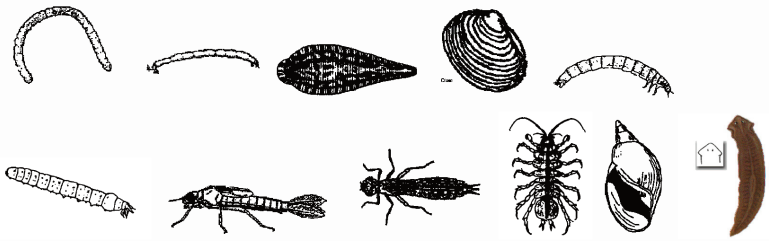
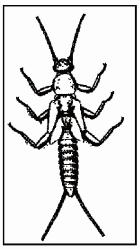
Dragonfly nymph



Freshwater slater

Freshwater snail

Flatworm

Except the previous animals, have you found also these new organisms that are also included in frames? Then the ecological status of your freshwater ecosystem is **good!**	  **Mayfly nymph**  **Caddisfly larva**  **Freshwater sandhopper**  **Alderfly larva**
Except the previous animals, have you also found this very important organism in frame? Then the ecological status of your freshwater ecosystem is **high!**	  **Stonefly nymph**

FRESHWATER ECOSYSTEMS OF EUROPE

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Chapter

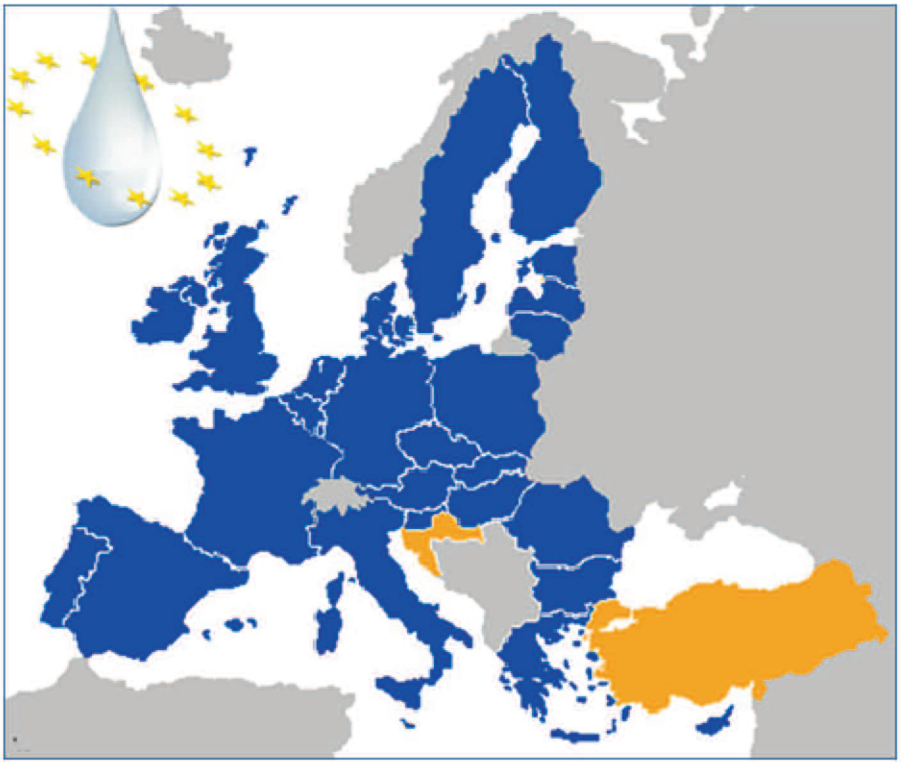
4

CHAPTER 4

ASSESSING THE ECOLOGICAL STATUS OF FRESHWATERS

Barbara Bis
Prof. of Biology, Dpt of Limnology and Invertebrate Ecology, Institute of Ecology and Environmental Protection, University of Łódź, Poland

1. In the map of European Union states (the EU states are highlighted by blue background) find your country and write the name. Please, find and write down the information how long your country belongs to the EU (a year of accession), and how many states presently has been established the organization of the EU.



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2. Write the title of the most important/influential EU Environmental Policy legislation/directive connected with the new water protection and management politics in the EU states

.....
.....

3. Finish the sentence:
One of the main aims of the WFD is to establish a framework for the protection of all European water types:

a.....
b.....

c.....
d.....

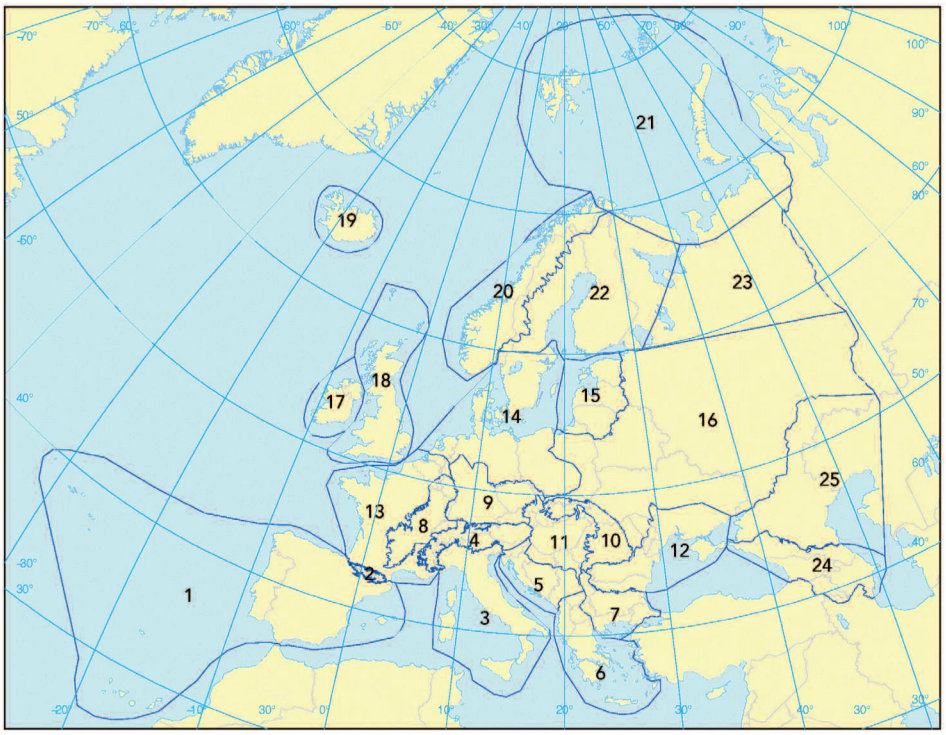
4. Describe the major objectives of the European Water Framework Directive:

a.....
b.....
c.....

5. Categories of surface water bodies under the WFD are following:

a.....
b.....
c.....

6. On the basis of European **ecoregions**, selected under the WFD – please find and write down the name of ecoregions, which are covering location of your country:



Ecoregions for rivers and lakes

1. Ibero-Macaronesian region
2. Pyrenees
3. Italy, Corsica and Malta
4. Alps
5. Dinaric western Balkan
6. Hellenic western Balkan
7. Eastern Balkan
8. Western highlands
9. Central highlands
10. The Carpathiens
11. Hungarian lowlands
12. Pontic province
13. Western plains
14. Central plains
15. Baltic province
16. Eastern plains
17. Ireland and Northern Ireland
18. Great Britain
19. Iceland
20. Borealic uplands
21. Tundra
22. Fenno-scandian shield
23. Taiga
24. The Caucasus
25. Caspic depression

7. Indicate/underline three parameters that are obligatory for rivers typology in EU states under the WFD:
a. catchment size
b. country area
c. geology
d. human population
e. altitude

8. Write down the name of the river system, located in your eco/region – where according to your knowledge - it could be possible to find the best, reference

conditions for all biological elements to live (it should be location with the minor human impact, predominantly protected area). Try to define for the choosen section of the river the latitudinal, longitudinal coordinates, write it down.

……
……
……
……
……

9. Try to describe the river section you have choosen by characteristics of the basic parameters under WFD and define:

- the catchment size of the river;
- the elevation;
- dominated type of soil/geological settings;
- the primary basin system to your river (large river basin or sea/ocean basin).

……
……
……
……
……

10. Find an example of the river systems/basin in your country, which is transboundary river - is flowing through your and other countries. Define the primary basin to this river (sea/ocean basin)

……
……

11. Complete the sentence, writing the number of quality classes, required by the WFD:

Each EU country should define and establish the ……..……quality classes related to the environmental modifications – separately for all biological quality components (BQC) and water body types.

12. Conclude the sentence:

Ecological status of water bodies is determined by following quality elements:

a……
b……
c……

13. Select/underline the four groups of the biological quality elements recommended by the WFD to monitoring river systems:

a. freshwater macroinvertebrates
b. diatoms
c. fishes
d. birds
e. riparian plants

f. aquatic plants
g. aquatic mammals

14. On the basis of the Identification Cards for Freshwater Macroinvertebrates, the selected representatives of benthic fauna, and a short description of their tolerance to dissolved oxygen tolerance - describe/write down a brief water quality assessment (as it is given in the example below):
(1) bad water quality/polluted or
(2) very good water quality/unpolluted.

Mayfly – very sensitive, Good water quality

Caddisfly – sensitive, ...

Mosquito larva – very tolerant, ...

Freshwater Worm – very tolerant, ...

Bloodworm – very tolerant, ...

Stonefly – very sensitive, ...

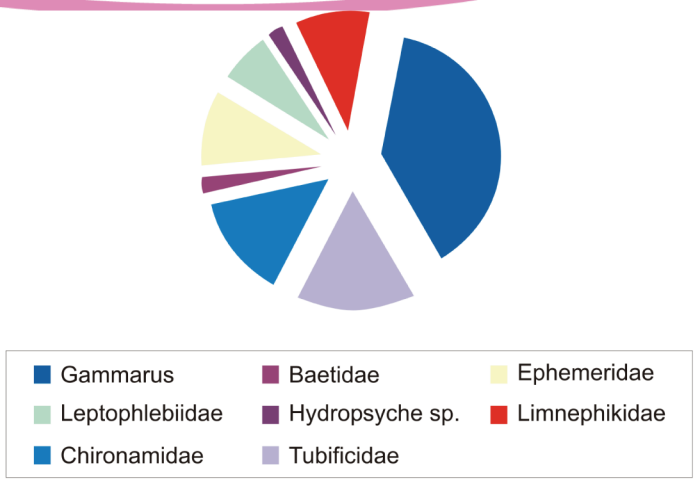
14. After field sampling from the selected river section - in the laboratory working with a group of your colleagues, on the basis of the Identification Cards for Freshwater Macroinvertebrates try to:

a. identify representatives of main taxonomic groups,

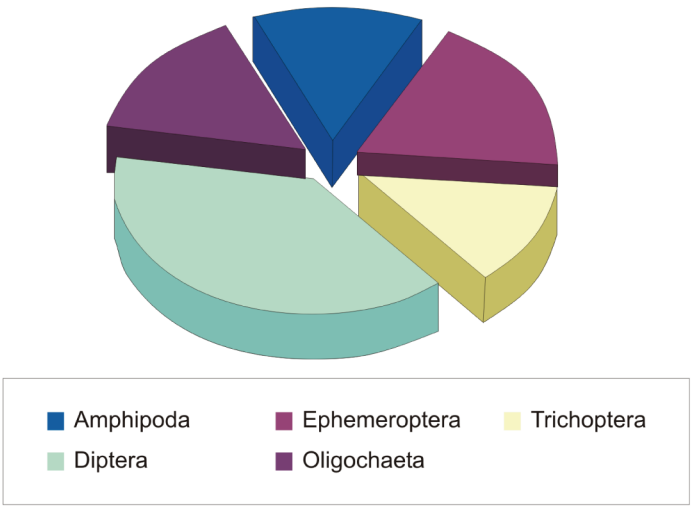
b. prepare taxonomic list with abundance (with two columns: 1. name of taxon; 2. N value = number of organisms, representing a given taxon) - see the figure below,

c. on the basis of taxonomic table - try to prepare the figure[1] presenting an abundance of the main bioindicator groups occurring in the river sample.

Taxon	N
Gammarus	20
Baetidae	3
Ephemeridae	15
Leptophlebiidae	10
Hydropsyche sp.	3
Limnephikidae	15
Chironamidae	56
Tubificidae	23



Taxon	N
Amphipoda	20
Ephemeroptera	28
Trichoptera	18
Diptera	56
Oligochaeta	23



15. As you know, biological diversity is the variety of all living organisms. Why do you think maintaining biodiversity is so important for future the Earth and all humans life?

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.....

FRESHWATER ECOSYSTEMS OF EUROPE

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Chapter

5

CHAPTER 5

DISTURBANCES

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Komodromos Nikos
Biologist M.Sc. Teacher of Secondary Education, Secondary School of Pera Choriou & Nisou, Cyprus

BE A JOURNALIST! DO YOUR OWN SURVEY!

What to do

STEP 1

1. Go outside and survey your surroundings. Walk around. Go to the highest point of your area.
2. Look over the land and the way the ground slopes down from this high point. If it rained, where would water flow? You're looking at one or several catchment or drainage basins. That is the area of land where all water drains to the same body of water.
3. Sketch a picture of this view of your basin
4. Have a camera to document all you do from the start
5. Take the local map to check the landscape you look at with the one that is drawn on the map
6. Use your notebook to write down things you observe and things that don't look right or you want to question later
7. If you aren't sure which things are helpful or problems, just record what you do see for now

Make a list of what you notice such as:

1. In my site, water flows through:

- bare soil
- vegetation (cultivations/forests/shrubs)
- streams
- lakes
- villages
- farms
- industry lots

2. There is possible erosion with bare soil washing into the basin
There are shrubs that keep soil from washing away
3. There are marks of a recent fire
4. There are marks of extended droughts (very dry soil, extended dry channels in streams)
5. There are dams
6. There are bore holes and pipes for irrigation purposes
7. There are walls
8. There are industries that may contaminate water

Research and hypothesize

STEP 2

To the next step, gather information on the web and interview local scientists and local basin experts to determine how the basin you are studying measures up to the characteristics noted by you. Then create hypotheses for such questions:

- How much water is drained through the catchment or drainage basin of my survey?
- How much water does penetrate groundwater and how much remains on the surface?
- What activities in the basin use water?
- What activities create waste water?
- What quantities of fertilizers or pesticides are used in this basin for agriculture?
- Do we already know the quality of water in this basin?
- What do we already do to conserve or protect water?
- What kinds of building and zoning are the board allowing? How does this impact the catchment basin?

Throughout the survey, encourage your friends to take pictures, write articles, and interview environmentalists. Once the entire research is complete, create an illustrated article, scrapbook, web site, or video and make a presentation with your records and your proposals to the board of your area.