

**Functions and values of
undisturbed water bodies**

3

Introduction	103
Objectives, materials, organisational points	104
Activity 1: Who am I?	105
Activity 2: Varied life on a river	105
Activity 3: The eco-network – every species plays a role	106
Activity 4: The optimal stream animal – adaptation to life in water	106
Activity 5: The river researcher – expedition on a river	110
Danube tales	117

Biodiversity in riverine landscapes

3.1.

3.1. Biodiversity in riverine landscapes

Natural riverine landscapes are places of diversity. We need them.

Undisturbed riverine landscapes are among the most diverse and species-rich habitats in the world. Diversity is a characteristic of landscapes and species, but also of the inanimate natural world and of human culture. The term biological diversity (in short, biodiversity) covers all these fields.

Biodiversity is a trendy topic today. The reason: the diversity of our environment, even of the whole world, is disappearing dramatically. Many species of flora and fauna are threatened or are already extinct. The habitats in our environment are becoming more monotonous. Even our diet has changed. A large spectrum of useful plants and domesticated animals have been replaced by high productivity species. For example, although there are hundreds of varieties of apples, only a few can now be found in the shops.

There are ever fewer varied riverine landscapes or water bodies rich in species. The reasons for this are: the waters are being polluted, the rivers are used too intensively, dammed and channelled, and floodplain forests are cut off with dams.

There are convincing arguments in favour of maintaining the diversity of our riverine habitats, whether they are from a selfish human perspective, such as the conservation of raw materials for ourselves, or unselfish, in that we grant every life form the right to life.

The preservation of a diverse environment is a great challenge. Everyone can make an important contribution to it.

Objectives:

The children learn

- ✓ to enjoy getting to know some species of our riverine landscapes.
- ✓ to recognise different habitats on rivers.
- ✓ to understand the importance of diversity.
- ✓ to recognise the adaptation of life forms to a water habitat.
- ✓ that animals are losing their habitat through human changes to riverine landscapes.

Materials:

Activity 1: Happy Families cards “Diversity at the Danube”, safety pins

Activity 2: worksheets “Animal species on a river” and “Species and their habitats on a river close to its natural state”, scissors, glue

Activity 3: a large roll of string

Activity 4: paper, paint, brushes

Activity 5: 3–4 nets, brushes, beakers, 2–3 bowls, magnifying glasses, binoculars, a camera, identification books (aquatic animals, animal traces) and the worksheets “The great search”, “The naturalist’s record” and “The river researcher’s record”. Follow-up work: a large sheet of paper, glue, paint and pencils.

Organisational points:

Duration: 3–4 teaching units, half a day outdoors

Location: classroom, a river or stream close to its natural state - preferably a waterway with various kinds of bank-side vegetation, steep and shallow banks, and shallow, clean water

Activity 1: Game

Who am I?

Each child gets a Happy Families card pinned on their backs. In groups of two, the students have to find out which animal or plant they are. The respective partner can be asked questions, but only ones that can be answered with “yes”, “no”, or “don’t know”. The children take it in turns to ask each other.

Alternatively, a card can also be drawn. The species is acted out in mime. The whole class attempts to guess which animal or plant it is.



Activity 2: Group work / discussion

Varied life on a river

Where and how do the fauna and flora introduced in the first activity actually live?

The children arrange the animals from the first worksheet in the second worksheet according to their habitat. For this, the animal pictures from the first worksheet are cut out and stuck on the right place in the riverine-landscape diagram in the second worksheet.



Find more at “Additional information for teachers”:

Biodiversity – a comprehensive term for diversity

Species diversity in figures

Biodiversity in riverine landscapes

Wetlands and particularly riverine landscapes are distinguished by a high degree of biodiversity. Wetlands cover only 1% of the earth but are home to 40% of the worldwide known species. In Europe, 12,000 flora and fauna are counted as regular inhabitants of riverine landscapes.

The diversity of different habitats is home to many species. A gravel bank just a few metres from the river offers quite different living conditions than the river itself. A shallow bank is colonised by different species than a steep bank is. Quiet inlets demand different adaptation from aquatic life forms than fast currents do. Flora and fauna have specially adapted to the different conditions.

Riverine landscapes that are close to their natural state are subject to continuous change. Banks are torn away and deposited elsewhere. Steep banks develop where the river wears away the soil, and shallow

banks where sediment is deposited again. As a result, young, uncolonised landscapes that are available for fresh colonisation repeatedly emerge. River courses that are close to their natural state continually change their course. As a result a new riverbed develops; the old bed forms an oxbow lake and slowly becomes land again.



photo: Euronatur/Schneider-Jacoby

Natural riverine landscapes: offer a wide range of different habitats.

Background information



Activity 3: Game

The eco-network – every species plays a role

The children form a circle. One child starts by choosing a well-known plant of the region, for example, reeds. The “reed child” holds the end of a large roll of string. The other children consider how other species in the riverine habitat are connected with this plant. For a fish, for example, the reeds offer cover. The “reed child” holds onto the end of the string and throws the roll to the “fish child”, who holds onto a piece of the string and then passes the roll of the string to the next species. Possible link points are a predatory fish, a mussel larva (parasite on the fish) and a water plant (which profits from the purification work of the mussel).

The network is built up until all the children are linked with the string. The children can help each other considering what species are connected with reeds.

The network that has arisen symbolises a riverine habitat in which many species live with and from each other considering what species are connected with reeds.

Then, in the next round of the game, as a result of human intervention, the habitat is thrown off balance. For example, the tree that provides shadow on the bank is cleared. When the tree falls, the child representing the tree gives a sharp tug on the string. All the children who feel the tug are affected by the interference with the habitat and also tug strongly on the string. The tug is passed on from species to species until the whole network is strained. In this example, the clearing of a tree affects the whole network: if a single species is lost it can change the whole habitat.



Activity 4: Creative design

The optimal stream animal – adaptation to life in water

Life in flowing waters calls for special adaptations of the river life forms.

The children form groups of four. Each group invents a river animal that is optimally suited to the habitat. The animal must be able to deal with water currents, breathe under water, move, feed itself and protect itself against enemies. >>>

Adaptation to life in water

Life in flowing water calls for special adaptations. With webbed toes, animals move faster on muddy ground and in water. Food is either actively hunted or passively filtered out of the water current. The tail, legs, fins, palps and even recoil mechanisms are used for movement. Oxygen is obtained either from the water through gills or taken from the surface in air cushions or a snorkel.

Some strategies are applied by people in a similar form for shipping, in diving or aircraft building.

Air to breathe is taken under water as compressed air. Our paddles function like the tail of a beaver. The model of the shark’s skin has been converted for the external skin of aeroplanes. Rough surface structures reduce friction, thus saving power. Sewage works are the technical counterpart of the self-purification power of water bodies.

Background information

The students paint their imaginary animal and give it a name. Each animal is then presented to the class. The children’s creative solutions are compared with the adaptations of living river species.



Adaptation to the current

The current in running waters offers the animal and plant world both advantages and disadvantages. The carrying power of the water brings the life forms nutrients and oxygen. However, there is a danger of drifting away. Plants must be able to withstand the constant water pressure.

Adaptation	Species
Avoiding the water current by living in the cavities at the bottom	Dragonfly larvae, freshwater shrimp, insect larvae
Flat, streamlined body to reduce water pressure	Mayfly larvae, flatworms, some fish
Reducing current resistance through flexible and split leaves	Branched bur-reed, pond-water crowfoot
Compensatory migration: adult fish and insects migrate up-river in order to compensate for the downwards drift of larvae and juveniles	Mayfly, river fish
Holding tight with suckers and sticky tendrils, and holding on with legs and bristles	Black-fly larvae, net-winged midge larvae
Using the current to filter out food	Black-fly larvae, midge-fly larvae
Active swimming	Fish

Oxygen provision under water

In clean water bodies, oxygen is sufficiently dissolved in water. However, not all life forms can use the dissolved oxygen. They have to go up to the surface for air.

Adaptation to oxygen provision under water	Species
Gill-breathing: absorbing dissolved oxygen	Fish, tadpoles, insect larvae, crustaceans
Skin breathing: absorbing oxygen dissolved in the water	Water flea, nematodes
Storing air supply under wing cases	Water beetles
Storing air supply in hairy coat	Water spider, water bug
Snorkel	Water bug, hover-fly larvae
Diving bell	Water spider
Web of air to transport oxygen to the root zone	Bulrushes, reeds

Movement

Movement in water is very different from movement on land. The movement apparatus of many animals is adapted for swimming, crawling, floating and running on the water surface. Different life forms use different organs for similar forms of movement.

Adaptation to movement in water	Species
Active moving with fins, tail, legs, tentacles and palps	Fish, frogs, otters, water boatmen, crustaceans
Swimming with the whole body	Snakes, turbellaria, leeches
Hanging from the water surface	Mosquito larvae
Recoil	Dragonfly larvae
Creeping	Snails
Running on the water surface	Water strider

Feeding

The aquatic world offers similar possibilities for feeding as there are on land. Grazers such as snails scrape the algae and bacterial growth off stones. Water fleas and water lice break down fallen leaves. Dragonfly larvae, fish and otters are predators. Some animals, such as leeches and mosquitoes, specialise in blood-sucking.

A special adaptation to life in water is feeding through filtering the water. A water current is actively filtered, and algae and the finest particles are absorbed as food. Examples of filter-feeders are mussels and caddis-fly larvae.

Endangering and protection of biological diversity

In the 20th century our riverine landscapes were greatly changed, in order to open up new developments for people. Rivers were dammed to produce energy. Settlement areas and farmland were protected against floods by damming floodplain forests. Major rivers were straightened and regulated for navigation. Some 200 dams more than 15 m high interrupt the river network in the Danube basin. More than 80% of the original flooding area was dammed by embankments on the Danube and its major tributaries.

The direct benefit to people of these changes is matched by a range of negative effects the changes have had on the natural world. The habitat diversity on the Danube and its tributaries has fallen sharply. Many fauna and flora have lost their habitat. Important functions of riverine landscapes close to their natural state, such as recharging of groundwater, self-purification and floodwater protection, have been reduced.

The threat to biodiversity can be found in the “IUCN Red Lists”. These are directories of species and habitats that are endangered or threatened with extinction. Many of the Danube’s species of fish are now classified as endangered. Some, such as the Baltic sturgeon and the fringe-barbel sturgeon, have probably become extinct. Equally in danger are many amphibians, birds and insects of our riverine landscapes.

These are some of the reasons why species of the riverine landscape have been endangered:

- Rivers have been embanked.
- Impassable dams have been built for hydro-power plants.
- There has been radical draining and damming of the floodplain forests.
- Water bodies have been polluted with unpurified waste water and toxic agents.

- There has been direct persecution of species, primarily predators and birds of prey.

The maintenance of biodiversity in our riverine landscapes is a major challenge. The last sections of river that are close to their natural state should be protected as sites of diversity. Sections that have been spoilt should be turned into attractive habitats again through more natural design.

The implementation of this challenges every individual, school, municipality and region.

There are numerous possibilities for taking action:

- A school yard that is in touch with nature is a source of diversity. A piece of natural meadow can be sown. Perhaps there is even space for a school pond.
- Nest boxes can be built and help various bird species.
- Saving energy, too, helps preserve biological diversity.
- Operating without pesticides, insecticides, aggressive cleaning materials and fertilisers helps to preserve the water bodies.



Modified river: damming and river regulation reduce habitats.

Background information



Activity 5: Activity in the open air

The river researcher – expedition on a river

Part 1: The great search – game

Each child is given the task of finding an object with a particular characteristic. Let them choose one characteristic from the “Watch list”.

The children have five minutes to scatter across their immediate surroundings, but should be careful not to damage any life form! Then the children discuss what they have found.

Part 2: Exploring the river – experiment

Together, a 50-m-long river section with the widest possible diversity is marked out. Then the children form two expert groups to study the water more closely:

- the naturalists
- the water-quality experts.

The groups carry out their research independently. The research findings are entered on a joint research record.

The children have approximately one hour for their research. Each group presents their most exciting finding to the other children. The research records are collected for follow-up work at school.

The tasks of the naturalists

The children are equipped with nets, brushes, beakers, magnifying glasses, two or three bowls, an identification book, the naturalists’ record and a clipboard and pencils.

For 15 minutes the children carefully collect animals or traces of animals at various sites on the river. The captured animals are placed in water-filled bowls and as far as possible identified.

- Larger stones and driftwood are carefully picked up and the animals hanging on them are transferred into the collecting bowl using a brush.
- Animals on the water surface are caught with the net, by slowly drawing figures of eight with it on the surface.
- Animals living on the bottom are moved by hand and allowed to drift in the water current into a nearby net.
- Animals living in underwater vegetation and the tangle of tree roots are loosened by hand and driven into the net by the current.
- Mammals and birds are shy and hard to observe. They often leave clear traces such as footprints, remnants of feeding and droppings (excrement).

Each species is entered in the record, and a note is made of where the animal was found.

The tasks of the water-quality experts

The expert group equip themselves with the research record, a sketch pad and two clipboards and pencils.

Together the marked off river section is paced out and a map of the stretch of river is drawn. The children note important habitat structures such as dead wood, steep banks, sandbanks, shallow banks (so-called slip-off banks) and any large blocks of rock. The plant world of the banks and the stream is also sketched in.

The children take particular note of the modifications in the river course, as well as

Tip: The investigation of a river course is time-consuming. Use the offer of a nearby environmental centre or a protected area. The methods are also suited to researching a pond or wetland area close to their natural state. Working groups can be assisted by accompanying experts.

waste-water inflows, fortification of the banks, and waste dumps. These changes are also entered in the map.

Part 3: Photo-snap! – game

Each child finds a favourite place on the river. Then the children get into pairs. One child is a photographer and the other the “camera”. The photographer now leads the “camera” – the child keeps her eyes shut – (carefully!) to their favourite place. The photographer pretends to fire the camera shutter. The camera child opens her eyes for a few seconds and observes the section chosen, then she is led back to the starting point. Afterwards photographer and “camera” child change roles. This game calls for trust and should be played in a quiet atmosphere.

Finally all the places are photographed with a real camera.

Part 4: The river exhibition – preparation of the results of the expedition – creative design

The children design a class poster together. Each group of researchers from the open-air day contributes their findings. The map of the water-quality experts is enlarged and painted colourfully on the poster. The naturalists pick their favourite animal. This is drawn, painted and cut out. The animals are stuck on the poster in the corresponding habitat. A list of the species found in each habitat can be drawn up.

The photos of the students’ favourite places can also be used in the design of the poster.

Possible problems on the river caused by human intervention can be presented on the margin of the poster. Waste dumping, waste-water inflows and embankments are drawn in.

Tip: Water organisms are sensitive and should not suffer during the investigation. The animals should therefore:

- be carefully collected off stones using the brush
- only be kept for a short time in the investigation bowls for identification purposes
- not be exposed to strong sunlight
- be carefully returned to the water at the point where they were found.

Tip: For further depth, a letter to the municipality or the protected area administration can be written during language teaching. With the letter the class provides information about the special characteristics of the river. If adverse effects on the water have been found during the investigation, the municipality can be called on to remedy them. The children can lend their voices to the animals of the area and speak up for the protection of the river.

"The great search"

possible characteristics and objects to look for:

soft	red	natural	straight
sharp	green	artificial	floating
round	brown	damp	coiled
smooth	blue	old	a fruit
light	hairy	tasty	a seed
heavy	spiny	beautiful	a feather

"The great search"

possible characteristics and objects to look for:

soft	red	natural	straight
sharp	green	artificial	floating
round	brown	damp	coiled
smooth	blue	old	a fruit
light	hairy	tasty	a seed
heavy	spiny	beautiful	a feather

"The great search"

possible characteristics and objects to look for:

soft	red	natural	straight
sharp	green	artificial	floating
round	brown	damp	coiled
smooth	blue	old	a fruit
light	hairy	tasty	a seed
heavy	spiny	beautiful	a feather

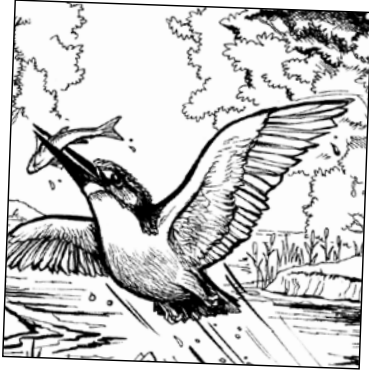
"The great search"

possible characteristics and objects to look for:

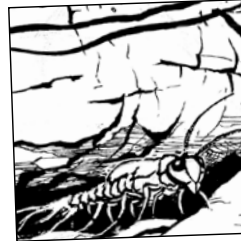
soft	red	natural	straight
sharp	green	artificial	floating
round	brown	damp	coiled
smooth	blue	old	a fruit
light	hairy	tasty	a seed
heavy	spiny	beautiful	a feather

"Animal species on a river (1)"

Rivers that are close to their natural state offer many different habitats, including large stones in the water, a reed bed on the bank and large trees. These habitats are colonised by various species. The living habits and the habitats of some species are described below. Read the text through carefully. Cut out the pictures and stick them in the right place in the riverine landscape in the second worksheet.

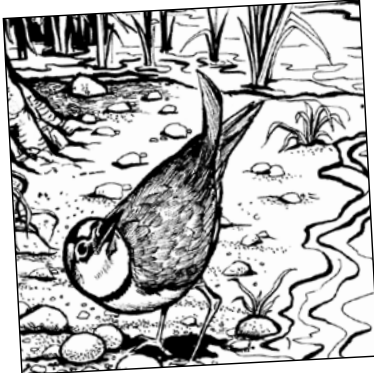


The **kingfisher** is a splendid inhabitant of rivers and floodplain forests. The young are raised in breeding holes in steep embankments. The kingfisher lies in wait for its prey (fish, water insects) on perching vantage points over the water. It catches its prey in a steep dive into the clean water.

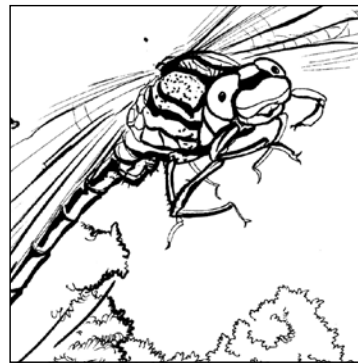


In their larval stage, **mayflies** live in the water. They avoid the light and hide under large stones. Their food consists mainly of the smallest vegetable material. The adults hatch out on land but spend the whole of their very brief life near the water.

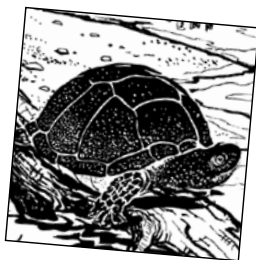
Little ringed plovers live in sparsely vegetated gravel and sand banks on water bodies. Their eggs are so well camouflaged that they can



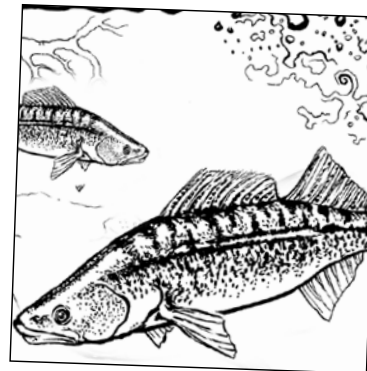
hardly be distinguished from the shingle. The little ringed plover seeks its food – insects, worms and larvae – on flat banks.



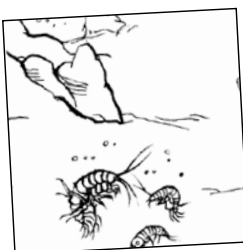
Banded demoiselles or damselflies (a kind of dragonfly) prefer extensive bank-side reed beds. There they occupy a territory and defend it against other members of their species. The eggs are laid on water plants.



European pond turtles are good divers and swimmers. They catch snails, water insects and larvae. They lay their clutch of eggs on dry, sunny river embankments. European pond turtles love sunbathing on tree trunks in the water.



The **zander (pike-perch)** is a common predatory fish in slow-flowing rivers and in lakes. The spawn is laid in deep water in a pit in the gravel or between water plants and often guarded by the parents. The zander prefers the dark, warm water of the Danube basin. In addition the zander is an important and tasty edible fish.



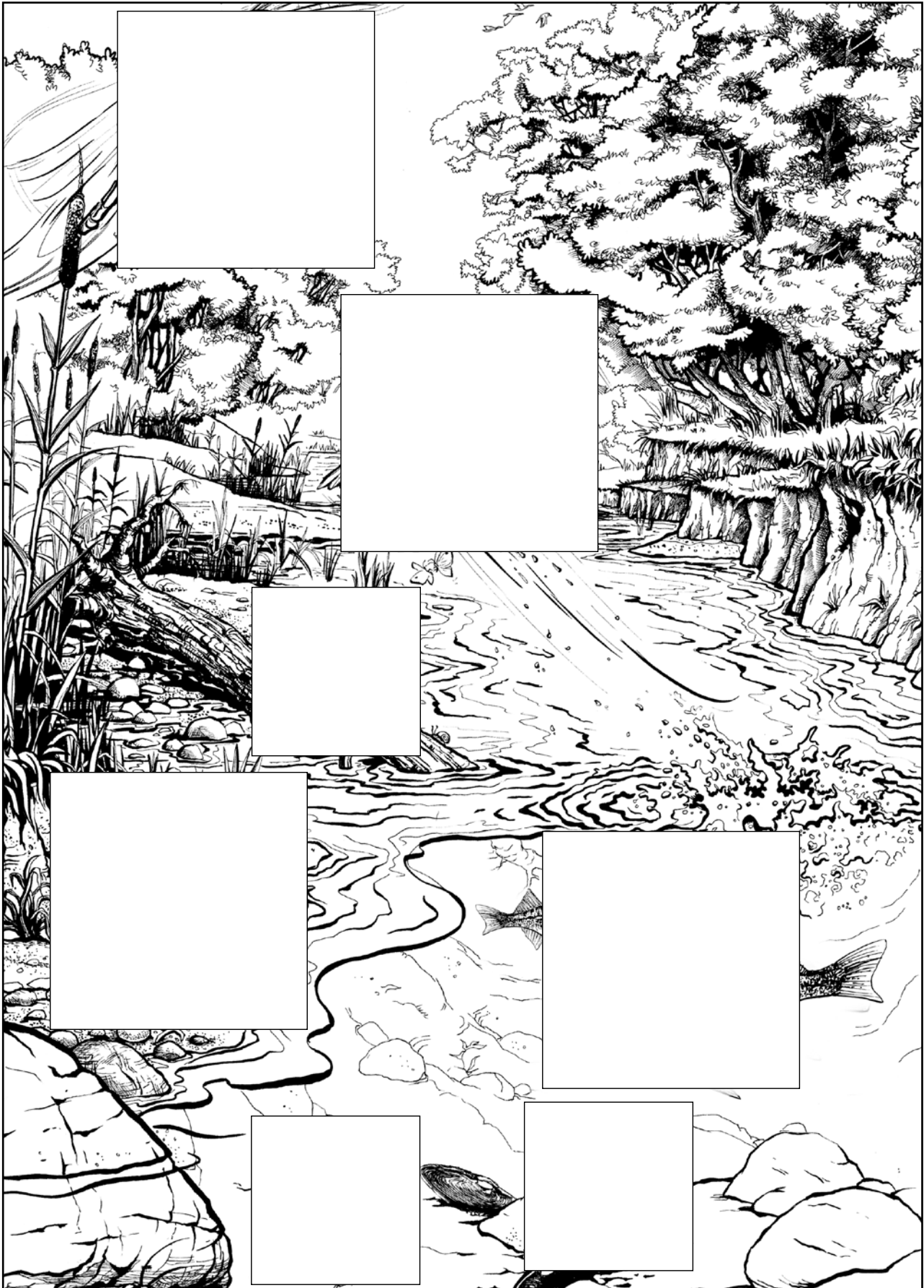
Freshwater shrimps live hidden at the bottom of water bodies, in washed up fallen leaves and dense vegetation. They grow up to 3 cm long and feed mainly on living and dead plants.



Freshwater mussels live half buried on the bottom of water bodies. They pump vast quantities of water through their gills and filter the smallest life forms out of the water as food.

Species and their habitats on a river close to its natural state (II)

In the previous worksheet you learned about some animal species. Here you can see a picture of a riverine landscape close to its natural state. Can you classify the animals according to their respective habitats? Stick your animal portraits in the right place in the picture.



The naturalist's record

An important task in any research project is keeping an accurate record of everything that is observed.

Record Record

First, note down the names of the river, the site and all the members of the research team.

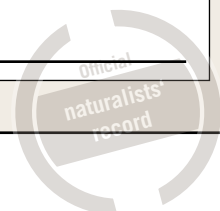
Name of river and site:

Names of the research team members:

Now enter in the following table the animals you have found in your investigation of the water body.

What species were found?

Where does the animal live?



The river-researcher's record

An important task in any research project is documenting the findings accurately, for example, with a map.

Record Record

First, note down the name of the river, the site and all the members of the research team.

Name of the river and site:

Names of the research team members:

A diverse river is rich in habitats. For example, there are a sandbank, a steep bank, large boulders and a tree that has fallen into the water (dead wood). These are important for various animals.

Many rivers are changed by human activity. For example, by building a wastewater pipe, modifying the banks, and leaving behind rubbish.

Walk along the river and draw a map of the river and the banks on the back of this paper:

1. Draw the curves of the river and point out the various habitats on the map.
2. Draw on the map the traces people have left behind.



Danube tales

The Danube: boundary or link? Danube bridge – bridge of freedom?

In April 1999 nearly all the Serbian Danube bridges apart from the Pančevo Bridge in Belgrade were destroyed by Nato air attacks. In the capital of the autonomous province of Vojvodina, Novi Sad (German: Neusatz; Hungarian: Újvidék; Slovakian: Nowy Sad), there were three bridges over the Danube. The city was split in two: rubble was left lying in the river and the water main that ran under the Freedom Bridge was cut off.

For years, life in the city was hindered and all shipping on the Danube was interrupted. At the end of 2001, the European Union had the rub-

ble cleared and limited shipping was possible again. In the meantime, two of the three Danube bridges have been re-opened. The new pontoon bridge, which was installed in place of the so-called Freedom Bridge, was only opened three times a week, on payment of a toll.

In July 2000 the EU Commission decided to make € 26 million available for the reconstruction of the Freedom Bridge in Novi Sad, which is 80% of the rebuilding cost. From October 2005 the bridge has connected the two banks of the Danube as it did in the past.

“Tasty Danube” Part 2: Recipes from the natural world

Although in the past it was common to consume edible plants from the neighbourhood, in European countries it happens less often today, as people obtain their food from other sources. However, recently some people are becoming interested again in consuming domestic wild herbs, so for example elder-flower juice and recipes with wild herbs are enjoying a growing popularity.

Ground elder, bishop’s weed, gout weed

Aegopodium podagraria This plant has long, straw-thick rhizomes growing underground that are slightly fatter at the nodes. These help it to spread rapidly and it can become a troublesome weed. The leaves are single, bifurcated or trifurcated. The leaf sections are partly feathery on one side and non-feathery on the other – they are asymmetrical. The flowers are arranged in white umbels. Ground elder needs nutrients and water, and is primarily found in shady, damp bushes in wet soil, in floodplain forests and river courses. Previously it was considered a folk remedy against gout *podagra*. Crushed leaves help against insect bites.

The young, light-green leaves, harvested before flowering, can be treated as a spinach-like vegetable – see nettles. Young flowers can also be used as a salad. Older flowers have a flavour similar to parsley and can be used as seasoning.



Ground-elder soufflé:

Ingredients:

approx 750 g young, light-green ground-elder leaves • 1 large onion • 100 g ham • 2 eggs • 1 tbsp flour • ½ l whipping cream or milk • white pepper • nutmeg • 50 g butter • 100 g Emmental cheese • ½ tsp seasoning sauce.

Preparation: wash the leaves well and remove coarse stalks. Briefly blanch in hot water. Strain and dry well. Afterwards chop the leaves finely.

Preheat the oven to 220 °C. Dice the onion and fry in the butter with diced ham. Stir this mixture into the ground-elder leaves. Stir in egg yolk, flour and whipped cream and season. Beat the white of the egg with salt until it is stiff and gently fold it in. Pour everything into a greased soufflé dish, cover with slices of cheese and knobs of butter. Bake for 40 minutes at 180 °C (30 min covered with baking foil, 10 min without).

Nettle *Urtica dioica* The nettle is a widespread plant that loves fresh, nitrate-rich soil and is frequently found in the nutrient-rich floodplain forest. Because of its unpleasant bristles, which sting, and its ability to spread rapidly (among other things through runners) many people don't recognise its value, although there are numerous

ways in which it can be used. The folk medicine plant was previously an important fibre plant. As slurry it can be used as a biological pesticide and one can make tasty dishes like soups or spinach meals from young nettle leaves.



Nettle spinach:

Ingredients:

young nettle-leaf tips • onion • salt • pepper • nutmeg • olive oil or butter.

Preparation: dice the onion finely and fry in oil or butter until glassy. Wash the young nettle sprouts

(the tips) well and briefly boil them in salt water, remove, cut and cook gently with the onion. Flavour with salt, pepper and nutmeg. A suitable side dish is boiled potatoes.

Common elder *Sambucus nigra* The common elder likes fresh, nutrient-rich (above all nitrate-rich) locations and is therefore frequently encountered in the floodplain forests. The elder has brittle branches that break easily during flooding, but it sprouts again from the stock.

People have used elder in many ways from time immemorial. Its sprays of white flowers serve as a fever tea, can be used to produce elder-flower juice or they are baked in pancake mix; the black fruit can be turned into compote, juice or wine.

Elder-flower juice:

This juice could be prepared in a school class that has cookery facilities.

Ingredients:

approx. 20 freshly picked elder flowers that are rich in pollen • 1 litre water • 1 kg sugar • 1 sliced lemon • 1 to 2 tbsp citric acid.

Preparation: put all the ingredients into a large pot and mix. The flowers should be well covered with the liquid. Cover and leave to draw in a cold place for about three days. Stir once a day. Sieve well (through a very fine sieve or cotton cloth) and pour into clean bottles. Dilute with water according to taste to make a refreshing drink.

Suggestion: If there is the opportunity in the vicinity of the school the children can gather ground elder, nettles or elder flowers and prepare one of the dishes together. In this way the children can taste how good these natural ingredients can be. If you do this discuss in detail what is to be picked and tell the children only to pick these plants. Preferably check again before the leaves or flowers are cooked to ensure that what has been collected is clean and that no stray plants have got in.



Introduction	121
Objectives, materials, organisational points	122
Activity 1: The river travel agency – waters as recreation areas	123
Activity 2: A river picnic in the class	124
Activity 3: The groundwater experiment	125
Activity 4: The self-purification power of undisturbed flowing water	127
Activity 5: The organic water-treatment plant in the classroom	127
Activity 6: The river newspaper – on the value of undisturbed riverine landscapes	128
Danube tales	130

The value of intact water worlds

3.2.

3.2. The value of intact water worlds

Riverine landscapes in the service of humanity

Riverine landscapes are the lifelines of our environment. For humanity, they represent a unique treasure:

- Riverine landscapes provide us with food and raw materials.
- The forces of water can be used for power production.
- Rivers connect different countries and cities. From time immemorial they have been important transport routes.
- Natural riverine landscapes are attractive recreational areas.
- Extensive riverine landscapes reduce the danger of flooding.
- Natural rivers recharge groundwater.
- Natural riverine landscapes have a great capacity for self-purification.

Important functions are lost as a result of human intervention. Pollution endangers productivity and the capacity for recovery. Damming up flood plain forests can heighten the danger of floods and impede the recharging of ground water. Dams reduce the capacity for self-purification. This is why a careful approach to our riverine landscapes is important.

Objectives:

The children learn ...

- ✓ to connect recreation with natural riverine landscape.
- ✓ to recognise riverine landscapes as the origin of many products.
- ✓ to understand the role of natural rivers to recharge ground water.
- ✓ to experience the self-purification power of undisturbed rivers.
- ✓ to operate a mini organic water-treatment plant in the classroom.
- ✓ that undisturbed river environments fulfil multiple functions and that a careful approach is important.

Materials:

Activity 1: drawing paper, paints and a large sheet of paper

Activity 2: ingredients for a snack with products from riverine landscapes (suggestion: bread, cress, bear's garlic spread or fish spread, elderberry juice, rose-hip or peppermint tea and honey, blackberries, raspberries and hazel nuts, fresh or as a spread)

Activity 3: a large plastic bottle, funnel, gravel, sand and earth, a big glass pot, a large glass

Activity 4: the big river game: no material necessary

Activity 5: the organic water-treatment plant in the classroom: one 10-l bucket, sand, gravel, garden soil, water plants (for example rushes, the common water plantain, sedges) a transparent plastic tube, sticky tape and silicon adhesive

Activity 6: "The Danube Watch" – worksheet

Organisational points:

Duration: 4–5 teaching units

Location: classroom

Activity 1: Creative design

The river travel agency – waters as recreation areas

The whole class is a river travel agency. Exclusive trips to the most beautiful and adventurous waterways near the school are on offer. The children find a name for the company together. The holidaymakers are offered recreation and exciting activities on the most beautiful stretches of water. The children consider what features they can use to advertise the travel destinations and in the process formulate advertising slogans. For example “Swimming Fun in a Natural Paradise” or “On the Track of Rare Species”.

However, the travel agency faces the problem that the beauty spots must not suffer as a result of the rush of visitors. Otherwise, in the long term holidaymakers will not come any more. How can the holidaymakers travel to the area in an environmentally friendly way? What action can be taken to prevent rare species from being disturbed? The children consider how they deal with the countryside carefully. A class poster is designed to advertise the river travel agency. The children paint pictures of the travel destination and the activities on offer. The name, advertising slogans and names of the travel destinations should not be forgotten.



Tip: The subject can be designed in an interdisciplinary way together with art lessons.

Natural water bodies have great recreational value and high tourism potential

Water and environments near water are extremely attractive to people. Rivers offer recreational opportunities to swim, ramble, fish and take part in other water sports.

Natural landscapes provide a source of income as tourist destinations. The Donau Auen National Park in Austria, for example, attracts over a million visitors per



photo: Alice Thinschmidt

Swimming in the river: in safe places it is pure fun.

year. In 2006, with 95.000 ship passengers, ship tourism in the Danube delta in Romania and the Ukraine reached

a new high point.

In view of the popularity, the pressure on the attractive natural landscapes has been growing. The results often are waste heaps, transport pressure and destruction of vegetation. Shy species of animals are driven out of their habitats. Above all, busy shipping traffic can disturb the breeding grounds of rare birds and the spawning of fish.

Many protected areas in the Danube basin offer the right mixture of recreational activities and nature conservation.

You can help to preserve the recreational areas along the Danube basin by:

- using marked routes, rest and swimming areas.
- travelling by public transport or bicycle.
- avoiding polluting activities such as driving a motorboat.
- disposing your waste in appropriate places.
- avoiding leisure-time activities in breeding grounds (islands, sandbanks, steep banks, shallow-water areas) during birds' breeding periods.

Background information



Activity 2: Group work / discussion

A river picnic in the class

The children prepare a snack together. Products from riverine landscapes are used for this. Bread is prepared with cress, bear's garlic spread or fish spread. In addition there is fruit from riverine landscapes, such as blackberries or raspberries (either fresh or as jam). The food can be decorated with edible flowers from daisies and red clover. To drink, according to the time of year, there is also elderberry juice or peppermint and rose-hip tea with honey. After eating the picnic the children draw up a list of useful plants and natural products from the riverine landscape.

Some common useful plants from riverine landscapes are:

- wild plants: bear's garlic, watercress, stinging nettles, ground elder, woodruff
- wild fruit: rose-hips, elderberries, blackberries, raspberries, cornelian cherry, hazel nuts
- medicinal plants: willow, water mint, lady's mantle, yarrow, ribwort plantain, meadowsweet
- fencing plants: osier, rushes, common cattail.

Further products include:

- fish
- wood
- rushes
- honey.

Tip: The best time of year for this activity is spring. Those who are interested can collect a wide range of plants themselves. The most important plants, berries and ingredients are also available in the shops.

Riverine landscapes are green factories

In riverine landscapes the conditions for a rich animal and plant world to flourish are particularly good. Water is the life-giving factor. The flowing waters ensure a good provision of nutrients. Riverine landscapes belong to the habitats with the highest productivity.

Humans' main economic interests in riverine landscapes are primarily fishing, forestry and agriculture, but also hunting. The average economic value of the flood-plain forests in the Danube basin was estimated at € 65 per hectare in 1996.

The continual natural replenishment of water and nutrients in the basin means that sustainably high harvests can be achieved. Irrigation and fertilisers are unnecessary.

The changes in our riverine landscapes made by people who are trying to improve their living conditions can

have also a negative effect on the productive power of this habitat.

Thus, for example, flood-plain forests lose their ability to grow because of the fall in the level of groundwater.

Many fish species have become rare as a result of changes in the water; some have even become extinct. These include the former "bread-fish species", the sturgeon, which played an important role in feeding the population.

Fish yields as a whole have fallen. In the lower course of the Danube the catches have even halved.

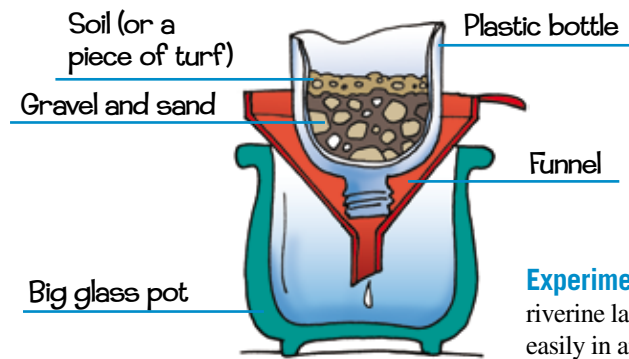
Attempts to farm river landscapes intensively often go wrong. Drainage and intensive arable farming in the Danube delta, for example, led to steppe formation and salinisation of the soil. Yields fell although a lot of money was spent.

Background information

Activity 3: Experiment

The groundwater experiment

A plastic bottle without a bottom is filled with one layer after another of gravel and sand. Finally comes a layer of earth or a piece of turf. The bottle is then set up with a funnel and a large receptacle.



Experiment: recharging groundwater in riverine landscapes can be demonstrated easily in an experiment.

Water in a large glass is coloured with ink. This water is now slowly poured into the bottle. The children can see how the water seeps through the soil and gathers in the receptacle. The children note the time when the water is poured in and when no more water drips into the receptacle.

The water, polluted with ink, slowly seeps through the layers of earth. In the process the ink is absorbed by particles of earth. The water is thus cleansed.

In riverine landscapes the recharging of groundwater and the purification of water happens in a similar way. Pollution and damming of the banks can interfere with this important function, however.

Recharge of groundwater in riverine landscapes

Groundwater is very important in providing people with drinking water and water for other purposes.

Groundwater is the water that exists in subterranean hollows. It can be permeable gravel, grit or sand sediments over an impermeable layer that stops the water sinking further. Caves and crevices in solid rock, for example in karst regions such as in Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, also conduct groundwater. Groundwater, like surface water, is constantly moving and follows gravity. Soil water, in

contrast, is bound to soil particles and is less mobile.

Groundwater is formed when rain and surface water is filtered through layers of earth into the ground. Riverine landscapes play an important role in the recharging of groundwater. Surface water seeps through the substrata of the banks and is cleansed by the sediments and processes in the root area. The waters and soil of the floodplain forests are also saturated during floods. This water, too, contributes to the recharging of the river. >>>

Background information

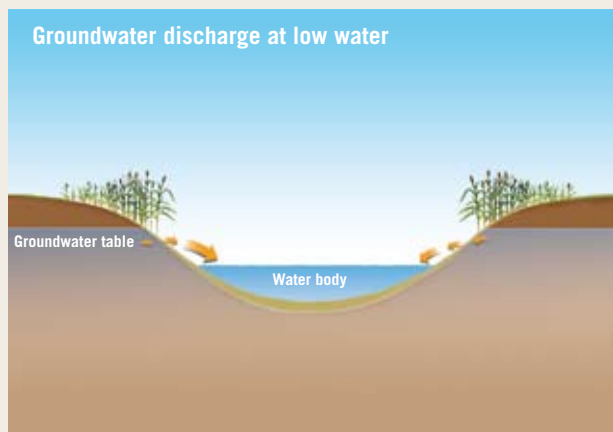
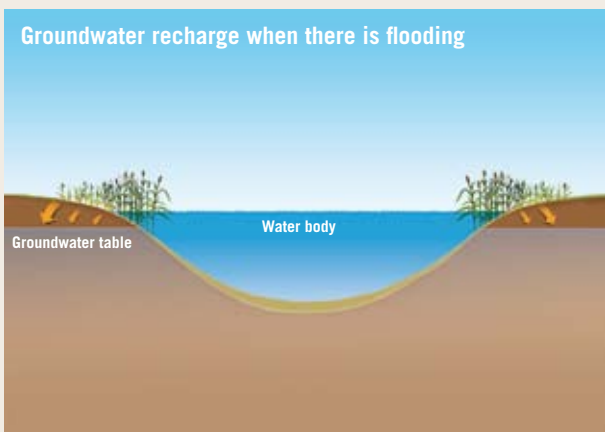
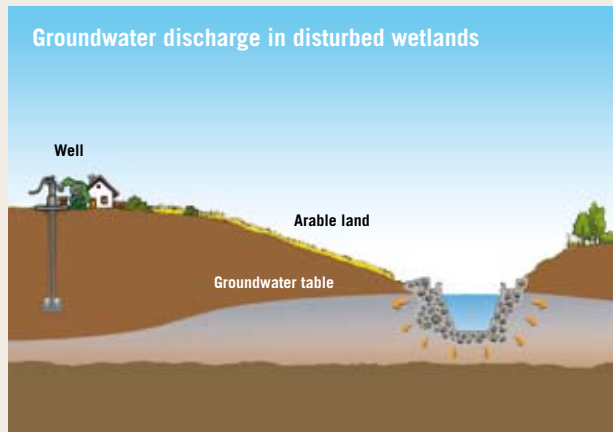
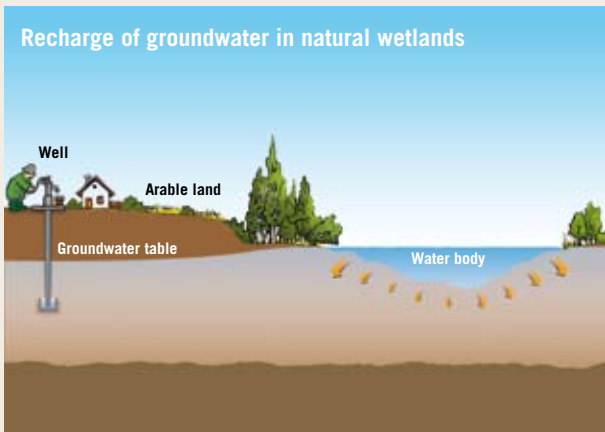
The merging of running water and groundwater is not a one-way process, however. In dry periods, groundwater bodies feed back into the water and thus provide an equalising outflow.

The type of agriculture and condition of the running waters have a substantial effect on the quantity and quality of the groundwater:

- When areas are built over no water can drain into the soil.
- Arable farming and even limited vegetation encourage flow-off on the surface of the land and reduce infiltration.

- The regulation of rivers and in particular the damming of reservoirs can reduce the amount that river water recharges.
- Dredging running water results in a fall in the water table.
- Pollution can directly or indirectly get into the groundwater and thereby endanger drinking water.

Undisturbed riverine landscapes are important for our primary foodstuff – water.



Background information

Activity 4: Game

The self-purification power of undisturbed flowing water



Water bodies have the ability to break down pollution (to a certain degree) themselves. According to the level of pollution, various groups of animals are involved in clearing up the pollution.

The children represent water organisms in a water body. They can represent four different types of animal, which respectively stand for the quality of the water:

- tubifex (sludge worm) – lives in heavily polluted water (slow, serpentine movement)
- freshwater snail – lives in polluted water (slow, creeping)
- freshwater shrimp – lives in good-quality water (rapid rowing with the arms)
- mayfly – lives near clean water that could be drunk (flying away).

The game is based on the classic game of chance (scissors, stone, paper). A drainage pipe pollutes the water with organic waste. All the children begin the game as the sludge worm, which moves slowly and wiggles through the water. If two children meet, the first round of the game of chance is played. The lucky one changes role and becomes an animal of the next level of water quality. By continuing this game, the water quality becomes ever better. The game can only be played between the same species, the losers go down one stage. The game continues until all children have become mayflies. The water then is of good quality again.

In undisturbed water bodies the process is similar; various organisms break down the pollution.

Find more at “Additional information for teachers”:

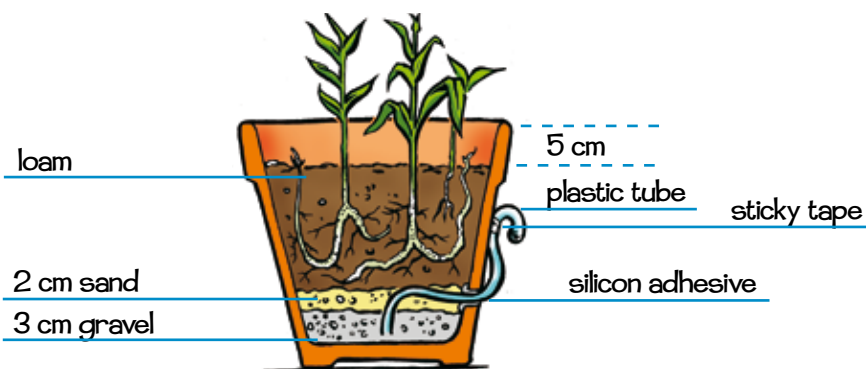
Self-purification in flowing waters

Activity 5: Experiment

The organic water-treatment plant in the classroom



Together, the class builds a functioning mini organic water-treatment plant.



A terracotta pot or 10-l bucket is filled with a layer of gravel, sand and garden soil. A transparent tube is attached to the bottom of the bucket and led out through a sealed opening. The pot is planted with wetland plants such as rushes, the common water plantain and sedges. Now the bucket must be watered for six months. In the first two weeks

Tip: The mini organic water-treatment plant is built in one teaching unit. However, the model can only go into operation when the plants are well grown after six months.



the water level in the bucket should be high, then for three months approximately half the height of the bucket. Then water the bucket less for a month in order to promote root growth.

After six months, the organic water-treatment plant can go into service. Washing-up liquid, coloured water and water containing fertiliser can be poured into it. If the plant works, clean water will flow slowly out of the tube. It should be colourless and odourless. The nutrient content of the water that is poured in and the clean water can be tested and compared using test strips.

Activity 6: Group work / discussion

The river newspaper – on the value of undisturbed riverine landscapes

The children independently complete a newspaper article for the river newspaper on the worksheet. Some functions have already been dealt with in their own activities, others can be discussed briefly for explanation.

Undisturbed riverine landscapes represent a unique treasure for the human race. They provide us with clean water and products such as wood and fish. They are attractive recreational areas and traffic routes. They also fulfil invisible functions, however, for example in the recharging of groundwater or as flood-protection areas.

Self-purification in flowing waters

Clean water is an important precondition for riverine landscapes that are worth experiencing and for our health. Fish, amphibians, water plants, algae and people all need good water.

The quality of our water is threatened by waste water from households and industry, and by fertiliser and pesticide deposits from agriculture. Sewage works make an important contribution to keeping water bodies clean.

Within their pollution threshold, running water that is close to its natural state cleanses itself as well.

If there is pollution, the waste materials are assimilated into the nutrient cycle of the water bodies. The pollution causes an increase in the supply of biomass. This biomass is taken up by animals and micro-organisms. Oxygen is used up in the process and the oxygen concentration falls. The animals and micro-organisms change the biomass into inorganic nutrients, which are absorbed by the vegetation in the waters. Plant growth increases; this again produces biomass, but also again produces sufficient oxygen. Here the cycle finishes, the waste has been assimilated into the nutrient cycle.

Factors supporting the self-purification of water bodies:

- a river course that is close to its natural state and with a rich structure
- rushing, turbulent water
- species diversity
- floodplain forests
- no exceeding of pollution thresholds.

In simple organic water-treatment plants, the purification of waste water is the same as the self-purification processes.

Wetlands play a special role. They are capable of retaining 99% of nitrogen deposits and up to 98% of phosphorus deposits.

Organic water-treatment plants are modelled on wetlands. The nutrients are converted in the root area. The plant roots ensure there is sufficient aeration of the soil.

Background information

Natural riverine landscapes are valuable!! Why?

The famous Professor Waterlady has written an article about the importance of rivers for humans. Unfortunately the text got a bit mixed up at the printers. Can you help? Fill in your name and complete the text using the words shown at the bottom.

The Danube Watch

UNDISTURBED RIVERS CAN DO A LOT MORE THAN JUST RUN DOWN HILL!



Riverine landscapes are the lifelines of our environment.

Research shows that rivers fulfil a wealth of functions.

An article by Prof. Waterlady and _____.

Undisturbed rivers have gravel banks or sandbanks, clean water and so in summer invite us to _____. Water-sports people use the river for _____.

Many big rivers like the Danube and its major tributaries connect different countries and towns. _____ therefore use them as a transport route. Some rivers have such clean water that you can _____ it. Most of the drinking water we use, however, comes through wells from the _____.

Clean river water seeps into the banks and recharges the groundwater. When water pours into the floodplain forest during floods, sand, gravel and fine suspended material is deposited in the floodplain forest. These are good soils for rich plant growth. The _____ and foresters benefit from this. Rivers that are close to their natural state are home to many animals and plants. Tasty _____ can be caught with rods and nets. Some people enjoy just _____ the animals. The water mass of a river is very powerful. Previously, mills were often powered by it. Today, _____ is produced with this power. Rivers can also be dangerous, however. After long periods of rainfall there is the threat of floods. In undisturbed riverine landscapes, floodplain forests and floodplain areas that have not been built up represent an important _____.

go swimming
protect

rowing
farmers

fish
groundwater

shipping companies
electricity

watching
flood protection

Danube tales

Reeds: the exploitation of a renewable raw material

Reeds (*Phragmites australis*) are an indicator of groundwater. Reed beds, which often look dry and as if you can walk on them, show that most of the year one can expect the soil to be covered in water (reeds “like to stand with their feet in the water”).

Reeds have been used by people a long time ago. They have qualities that make them an ideal raw material for particular purposes. They grow rapidly, their stalks are strong, water-resistant and only rot very slowly, which explains their traditional use for roofing and rush mats. Reeds’ ability to “conduct” air, and thereby oxygen, into water-covered soil makes an essential contribution to the self-purification of water bodies. People use this, for example, in organic water-treatment plants.

In the last 150 years, rushes and reed beds have been greatly reduced, primarily through drainage and river engineering projects, and represent an endangered habitat.

Two important areas of reed beds in the Danube River Basin are Lake Neusiedl and the Danube delta.

Lake Neusiedl (Austria/Hungary)

With a total area of 32,100 hectares, half of it, 17,800 hectares, consists of a belt of reeds. Over large areas, the reeds dominate, having optimum growing conditions in the shallow, warm lake. The reed belt is particularly important to numerous bird species as a resting and

sleeping place and as a breeding area. Apart from this, it stores nutrients and minerals and thereby makes an important contribution to the purification of the lake water.

Since 1992 part of the reed belt is in the Lake Neusiedl-Seewinkel/Fertő Hanság National Park and has largely been taken out of use.

Outside the nationalpark areas, some 10% of the reed beds are harvested in winter, when one-year-old reed (which is of the highest quality) is cut. It which is mainly exported to north Germany and the Netherlands for thatched roofing material.

Currently there are scientific projects that are intended to lead to a management plan for ecologically friendly reed cultivation on Lake Neusiedl. Thus there are plans for using old reeds, too, for the first time. A biomass heating plant will be started up in the area as a pilot project. Through periodic rejuvenation of sections of the reed bed the vitality of the reed belt can be maintained.

The Danube delta (Romania/Ukraine)

The Danube delta is now the border between Romania and the Ukraine. In 1990, the countries set up a biosphere reserve in order to give space to the natural world and to people by promoting the sustainable cultivation of the Danube delta.

The Danube delta is a jigsaw of habitats; alongside the reed jungle there are also numerous other habitats, such as shallow lakes, zones that



photos: Milan Vagrin



Reeds: a versatile basic material

photo: Milan Vogrin

are becoming dry land, floodplain forests, sand dunes and mud banks on the edge of the delta.

The fine sediments of the Danube have caused the Danube delta to develop and grow for 10,000 years (at the moment it covers some 650,000 ha). The Danube delta is home to the world's largest closed reed stocks (180,000 ha).

In the 18th century the Lippovenians settled in the Danube delta (which today has 25,000 to 30,000 people) and lived there for hundreds of years sustainably using the raw materials of the delta (above all, fish and reed).

From 1970, the then Danube Delta Institute (Romania) planned to start making the delta

useable for industrial agriculture. For over 20 years a large staff of scientists planned to convert extensive parts of the delta into enormous production plants for fish, reed, cereal, wood and building material.

After 1989, the year of the Romanian uprisings, the institute devoted itself to nature conservation and sustainable development.

The heart of the delta was finally declared a biosphere reserve in 1990, and was included in the Ramsar list of wetlands of international importance in 1991, and in 1993 on the UNESCO list of "World Natural Heritage Sites".

Introduction	133
Objectives, materials, organisational points	134
Activity 1: A mini national park	135
Activity 2: A protected area nearby	137
Activity 3: The protected area club	137
Activity 4: Riverine landscapes know no borders	137
Activity 5: The protected area puzzle	139
Activity 6: Owls and crows	139
Danube tales	142

Protected areas in the Danube basin

3.3.

3.3. Protected areas in the Danube basin

Protected areas safeguard unique riverine landscapes for endangered species and humans.

There are still some stretches on the Danube and its tributaries that are unspoilt and close to their natural state. Examples are the mouth of the Isar in Germany, the Danube floodplain forests east of Vienna, the Kopački rit in Croatia and Serbia, and the impressive Danube delta. Rare species live in these areas, such as the white-tailed eagle, the black stork and the beaver. Fish find rich feeding grounds and spawning places. In view of increasing water containment measures and the use made of most stretches of river, these landscapes represent a unique natural treasure.

Through the designation of protected areas, landscapes that are close to nature are to be safeguarded for the future. The objective of protected areas is to maintain species and habitat diversity and to protect floodplain forests and rivers in a natural way. In protected areas, natural processes and dynamic changes are given priority.

The protection of undisturbed riverine landscapes also benefits humans. Groundwater is aerated and nutrient pollutants are filtered out of the river. The protected areas are places for recreation and offer a source of income as tourist regions.

In the past, nature protection used to be a task for individual countries. Today it is recognised that international cooperation is essential in order to live up to the challenges affecting us across borders.

Objectives:

The children learn ...

- ✓ to get to know the protected areas in their vicinity and in the whole Danube basin.
- ✓ to cooperatively work out the objectives and challenges of protected areas.
- ✓ to appreciate the protected areas in their vicinity.
- ✓ to develop an understanding of the value of protected areas.
- ✓ to recognise riverine landscapes as international, cross-border habitats.
- ✓ about natural jewels of the Danube basin.
- ✓ to get to know protected areas through play.

Materials:

Activity 1: a large roll of string, a pair of scissors, pencils, 1–2 sheets of A5 paper for each child

Activity 2: worksheet, “A protected area nearby!”

Activity 3: a large sheet of paper, pencils, scissors, paints, information about a local protected area (brochures, newspaper articles, pictures)

Activity 4: Danube poster and a copy of a map of the region for each child (including the location of the school, the nearest body of running water and its catchment area), blue and red pencils.

Activity 5: Danube poster, worksheet “Natural paradises under protection”

Activity 6: cloths and string to mark off a playing field

Organisational points:

Duration: 3 teaching units in the school, 2 units outdoors

Location: activities 2, 3 and 4 in the classroom. Activities 1 and 5 in the schoolyard, in the nearest park or in a woodland (with tree stumps, species-rich embankments, old trees and a playing field)

Activity 1: Outdoor activity

A mini national park



The children imagine that they are protected area wardens. In small groups, they look for a place in the countryside that seems particularly worthy of protection to them. This place, a few square metres across, is declared a protected area by the children and marked off with the string. This miniature world contains many special features, such as wild animals and impressive landscapes. The challenge for the protected area wardens is to protect these special features. However, many ant-sized visitors come into the protected area just to relax. For these, paths have to be laid out and information boards put up. In order to ensure that the area does not suffer from too many people crowding in, the children must consider carefully where to admit visitors and where not.

Finally, the class visits the various protected areas together. Each group presents their protected area and points out the special features to the visitors. The wardens also inform the visitors how to behave properly so that the protected area is not harmed.

Find more at “Additional information for teachers”:

Examples of protected areas in the Danube basin

Nature protection areas: objectives and categories

The awareness that parts of the natural world need to be protected began in the 19th century. At that time, people had aesthetic considerations. In particular, charming rocks, waterfalls and trees were protected against change and destruction.

Protected areas fulfil diverse functions:

- conserving endangered and sensitive plants and animals
- protecting large habitat that are close to their natural state
- safeguarding the basics of life, for example in protected areas for drinking water
- conserving diverse cultural landscapes
- providing leisure and tourism areas

- conserving areas for economically important species
- being areas for scientific research.

There are various types of protected area that correspond to these different objectives. Wilderness areas protect pristine natural landscapes. National parks are intended not only to safeguard endangered species and habitats, but also to offer recreation and opportunities for scientific research. Ramsar areas serve to protect internationally important wetlands.

By now, protected areas have become a means of regional development. They offer quality of life as well as possibilities for sustainable tourism and conditions for sustainable use of their resources.

For a long time individual countries took responsibility for nature protection. Each country developed its

>>>

Background information

own conservation strategy. The result was an immense diversity of protective regulations. The World Conservation Union (or IUCN, International Union for the Conservation of Nature) has therefore created a standardised system of six protective categories with different objectives, so that the protected areas in different countries can be compared. The best known category is the national park (category II of the IUCN system).

National parks

The aim of national parks is the protection of natural and near-natural habitats and a designation of a core zone which is not influenced by people. Any use of these areas must be in accordance with the aims of the protection. But recreation and education are also part of the functions of national parks. People should be sensitised to nature.

On the rivers in the Danube basin, there are already 21 national parks, for example the Donauauen (Danube Floodplain Forest) National Park in Austria or the Danube-Drava National Park in Hungary.

Some international protection initiatives are now promoting cross-border cooperation.

Ramsar sites

In 1971 the “Convention on Wetlands of International Importance Especially as Waterfowl Habitat” was signed by many countries of the world. Named after the place where it was signed, the agreement is known in brief as the **Ramsar Convention**. The impetus for it came from the need to protect migratory birds. These species need a network of breeding, resting and wintering quarters. Thus, the protection of migratory birds can only be successful through international cooperation.

The objective of this convention is the protection and sustainable use of internationally important wetlands. To this end, the member states designate their most important wetlands as Ramsar sites. On the rivers in the Danube basin there are now more than 20 large riverine landscapes that have been designated as Ramsar areas. Among them is the trilateral area of the Danube–Morava–Thaya floodplain forest (Czech Republic, Slovakia, Austria) and the Danube delta (Romania, Ukraine).

Biosphere reserves

In 1970, UNESCO (United Nations Educational, Scientific and Cultural Organisation) started an international scientific programme called “Man and the Biosphere”. The biosphere reserves were identified as model regions for scientific research and for the demonstration of approaches to nature conservation and sustainable development. The project is primarily concerned with the conservation and development of cultural landscapes created by human activity. The designated regions are to develop in an economically, culturally and ecologically sustainable way.

In the Danube basin, five large biosphere reserves on watercourses have been identified – for example in the Danube delta.

World heritage

In 1972, on the initiative of UNESCO, the “International Convention on the Protection of the Cultural and Natural Heritage of the World” was signed in Paris. The objective is to conserve cultural and natural assets of “exceptional and universal value” for us and for our descendants, and the international community is considered to be responsible for the protection of areas of outstanding value.

The areas range from historical buildings, such as Monastery of Horezu in Romania, to historical city quarters, such as in Budapest, to whole cultural landscapes, such as the Danube delta.

Natura 2000

Natura 2000 is a nature conservation initiative of the European Union. Its objective is to conserve endangered and characteristic habitats and species through a network of protected areas. The endangered habitats and species in these areas are protected and actively supported. There are various possibilities for countries to achieve these aims, such as strict protection and sustainable use.

The development of the Natura 2000 network is still in process and does not (yet) cover all the regions of the Danube basin.

Background information

Activity 2: Group work / discussion

A protected area nearby

The children take the worksheet “A protected area nearby” home. They collect information on a protected area near where they live. They can ask parents and friends about it or use the internet.

The children bring their descriptions of the protected area, brochures, pictures and newspaper articles to class. The materials can be used for the next task.

Activity 3: Creative design

The protected area club

The class finds a club to support a protected area or a natural feature nearby that all the children know.

Together, information about the area or natural feature is collected. What is it called? What special species are there? Who lives and works there? What is permitted there and what is prohibited? What is the objective of the area?

Together, the children design a class poster about the area. Species peculiar to the area are drawn on the poster or cut out of brochures. The same is done for the most beautiful landscapes, woods, meadows and streams in the area. Naturally, the name of the area and the motto of the conservation club should be included.

Activity 4: Group work / discussion

Riverine landscapes know no borders

The children look at the map of their region. The location of the school is marked with a pencil. The children colour in the river flowing in the vicinity of the school in blue. Together they think about where the water in the river comes from. The children can imagine a rain shower. All the raindrops that fall to earth within the catchment area run through streams and tributaries into the river near their school. The children follow the river and its tributaries back to their sources and highlight these in blue pencil. The area of this emerging network of arteries is then broadly outlined with a red pencil. >>>



Tip: The perfect finale is an excursion to the protected area. Contact the management authorities to explore whether the poster could be displayed or to get active yourselves in protecting the area.



Tip: The intensive work with maps is primarily intended for older children.

It becomes clear that the water has already travelled a long way before reaching the area by the children's school. It has passed settlements, various landscapes, lakes and possibly power stations. The water (its potential for use as well as the threats) is shared with all the people in the catchment area. This is why cooperation beyond municipal and national borders is important. The river water still has a long way to go when it leaves the place where the school is. The children study the Danube poster and mark the location of their school with a drawing pin. Together, they check which towns and countries the water will pass through on its way into the sea. On its way from the source to the sea, the Danube flows through 10 different countries. There are 19 countries that have part of their territory in the catchment area. The Danube is thus "the most international river" in the world.

Tip: The annual Danube Day on June 29 offers everyone, and above all schools, the chance to be actively involved.

www.danubeday.org

Cooperation for the protection of riverine landscapes

Riverine landscapes know no administrative borders. Water bodies and habitats extend beyond our political borders. This is unfortunately also true of problems such as increased flooding and water pollution.

This fact became very clear in 2000, for example, when a collection dam burst at a mining plant in Baia Mare (Romania). Large quantities of environmental pollutants were washed into the Sasar stream and through the rivers Lopus and Szmos into the Tisza and the Danube. Four weeks after the accident, the polluted water reached the Danube delta and poured into the Black Sea.

Changes in the river course can also affect upstream sections, however. The building of dams, for example, prevents the migratory movements of fish, and fish stocks in the upper course of the rivers can be decimated. Hydraulic engineering, spatial planning and nature conservation should be undertaken after taking into account the whole catchment area, and be carried out cooperatively across national borders.

The **Danube River Protection Convention** is the basis for effective cooperation between the states of the

Danube basin. It was signed in 1994 and is aimed at guaranteeing the protection and sustainable use of all the water bodies in the Danube catchment area.

The convention is implemented by the **International Commission for the Protection of the Danube River (ICPDR)**. The declared aim of the ICPDR is the protection and sustainable use of the Danube and its tributaries. This includes the creation of a coordinated water management system for the whole Danube area, the reduction of water pollution, protection from floods and the conservation and restoration of natural flow dynamics, and also the improvement of people's quality of life and promoting biodiversity. Within the ICPDR, experts from all the countries of the Danube Basin jointly develop strategies and guidelines to solve the main problems of the Danube and its tributaries in a sustainable way across the borders.

As the considerate treatment of the water of the Danube basin concerns all inhabitants, everybody is encouraged to be actively involved in the decision-making processes.

Background information

Activity 5: Group work / discussion

The protected area puzzle

The children read descriptions of three nature conservation areas in the Danube basin, without being given their names. The text contains hints about which areas are concerned. The children look for the area on the Danube poster and write the name of the area on the worksheet.



Activity 6: Game

Owls and crows

The children play an instructive game of catch. The class divides into two groups, the owls and the crows. Owls are often considered to be wise and crows to be insidious birds. The two groups stand in a playing field facing each other on the centre line (the field can be marked out with ropes or cloths). The game leader now makes a statement about the protected area, for example, “In protected areas, animals and plants are protected”. If the statement is true, the crows run to their end of the playing field, where they are safe. The owls attempt to catch them first. If the statement is false, the crows attempt to catch the owls. The children who have been caught change groups. Before making a new statement the previous one is briefly explained.

Possible statements in the owls and crows game are:

- In protected areas you can simply throw rubbish away.
- The Kopački Rit is between the Danube and the Drava.
- Beavers live on fish.
- Storks nest in trees.
- Protected areas are also recreation areas for people.
- Pelicans live in the Đerdap National Park (Serbia).



Tip: The children can find some of the “paradises” in the Danube basin at “Additional information for teachers”.

Tip: The statements should relate to the protected areas and species that the children know. The game offers the chance to revise material that has already been learned.

"A protected area nearby!"

Protected areas are places of particular importance for nature and for humans. They are designated in order to conserve their special characteristics. There are thousands of protected areas in Europe and there is sure to be one near where you live. Describe a protected area near you. Ideally, choose an area you have already been to.

Try to find answers to the following questions. You can ask friends and parents for help if you need it, or look for answers in magazines, newspapers or on the internet.



What is the protected area called? _____

Where is it located? _____

How big is the protected area? _____

What is protected in this area? _____

Who looks after the protected area? _____

Are there special species of plants and animals living in this area?

What can you do in the protected area during your leisure time?

Bring this description and the information you have found on the area to class.

"Natural paradises under protection!"

There are several natural paradises on the Danube that have been placed under protection. Three areas are described on this page. Can you guess what areas they are?

If you are unsure, take a look at your Danube poster.



photo: Mario Romulić

In the mid-course of the Danube a river whose name also begins with D flows into the Danube. In the area of the mouth between the two rivers there is one of the most remarkable wetland areas. It is the second largest natural riverine landscape along the Danube. Over 140 species of birds breed in the wetlands, floodplain forests, puddles and ponds. Among them is the heraldic beast of the area, the white-tailed eagle. The area is a nature reserve. A wide range of recreational activities attracts thousands of people to the area every year. It lies on the border between three countries. The protected area is called:

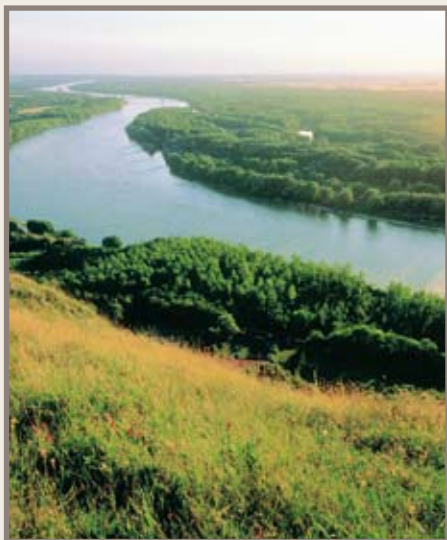


photo: Austria Tourism / Popp G.

Two federal capitals are located on the Danube only 60 km apart. The largest area of near-natural floodplain forest on the Danube lies exactly between these two cities. People have established a national park there. Today, it is among the most popular destinations for excursions. Part of the national park is even inside the city boundaries. The special feature of the national park is the broad belt of floodplain forest and water bodies alongside the river. Beavers, kingfishers and many fish and amphibians still live there. On the eastern edge of the national park, the Morava (or March), another remarkable river, joins the Danube. What is the national park described above called?



photo: Anton Vrauer

Another transnational protected area on the Danube is distinguished above all by one thing: reeds – as far as the eye can see. In this area, the Danube branches into many river arms and channels and feeds reed beds and lakes. The people here still live in close connection with the river. The fisheries and reeds provide important sources of income. The area is a real paradise, primarily for water birds. More than 300 species can be observed here, including pelicans and terns. What is the area called?

Danube tales

Green Belt Europe: the transformation of the iron curtain into a line of cross-border protected areas

For over 40 years, from the end of the Second World War until the 1990s, the iron curtain (the name given after 1945 to the technical cordon of the Eastern Bloc against the west) divided Europe in two, from the Barents Sea in the north to the Black Sea in the south. Thus there was a sophisticated fence between the two parts of the continent, the eastern side of which adjoined a more-or-less forbidden zone in which nature was able to survive unharmed and where there was a remarkable re-strengthening of ecosystems. To leave these habitats to unrestricted exploitation and possible destruction after the fall of the iron curtain would be a great loss. The “Green Belt Europe” initiative is therefore striving, together with local authorities, ministries, municipalities

and nature conservation organisations and scientists, to develop a belt of protected areas that is to become an “ecological spine of European nature protection” or “a string of pearls of cross-border protected areas”, and thus also function to link peoples symbolising the growing together of Europe.

Some examples of protected areas that are in the Green Belt in the Danube catchment area are: Thayatal/Podyjí National Park, Danube-Morava Floodplain Forest Ramsar Area, Neusiedlersee-Seewinkel/Fertő-Hanság National Park, Duna Dráva National Park, Kopački rit Nature Park and Gornje Podunavlje Nature Reserve.

Read more at: www.iucn.org

Weaving plants

Weaving or wickerwork is an age-old cultural technique that was already of great importance to humans during the Neolithic period. The first vessels were woven in order to gather and preserve essential foods. The only precondition for weaving is knowledge of the suitable plant material and manual dexterity. Other tools are not needed for most weaving techniques. Today, knowledge of the manifold possibilities for using various plant species is gradually being lost, as we no longer depend on it, and the traditions are only preserved in a few countries in Europe.

The plants or parts of plants that were used for weaving were primarily dependent on what was available naturally in the respective regions, but it is noticeable that many plants from the bank-side areas of water bodies were used as weaving material. The reason for this was largely the flexibility of plants to adapt to currents and flooding. The fact that there used to be many more marshes, flooded meadows and other wetlands in Europe than there are now lends weight to the likelihood that these techniques used to be practised much more widely than they are now.

Weaving is also used by wildlife, for example by the golden oriole, which weaves its hammock-like nests in the crowns of trees, or the dormouse, which weaves an artistic, ball-shaped nest in branches.



photo: Alice Thinschmidt

Weaving techniques: knowledge almost lost.

A selection of plants from wetland and bank-side areas that are and were used for weaving can be found at “Additional information for teachers”.

Suggestion 1: Ask the children to consider what characteristics plants must have in order to be suitable for weaving. Perhaps each child can bring some examples to school, where a woven work of art can be created with the other children.

Suggestion 2: If there is enough space in the school garden, encourage children to build a willow house, a tent or a wicker fence.

There are building instructions for a willow house at “Additional information for teachers”.

Suggestion 3: If there are still people who know the old basketry techniques locally then consider organising an excursion or a school trip to visit them to learn simple techniques.

