

# NATURE IN FOCUS

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## NATURE IN FOCUS

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Cover - an aerial infra-red photograph of farmland and woodland. Such photographs are used for crop monitoring, detecting diseased vegetation, for distinguishing between different vegetation types and to obtain information on soils and surface geology — the infrared being specially sensitive to the moisture content of the soils. The blue represents green in true colour; the green represents red in true colour and the red is the infra-red.



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# EDITORIAL

The soil is as essential to life as the air we breathe and the water we drink. We have always depended upon it for our food and it also affects our ground and underground water resources. Now its value has become priceless with the tremendous rise in world population, yet we are in grave danger of losing in a matter of years what has taken so many centuries to evolve.

The most efficient use of land for our purposes occurs when there is a balanced relationship between the soil, vegetation and climate. Without a covering of vegetation, severe soil erosion may be caused by rain and wind, particularly in sloping areas, thereby rendering the land useless for any kind of agricultural activity. Although topography cannot be easily altered, lack of vegetation and hence soil erosion, can. The two major causes of the latter are inefficient agricultural and forestry methods and overgrazing, principally in Mediterranean areas. But not only is it necessary to improve agricultural techniques to meet the ever-increasing demand for food; the productive soil which already exists must also be protected. At the same time, however, particular care must be taken not to pollute the land through the improper use of chemicals, pesticides, etc., in certain agricultural activities, or with wastes, particularly those that are radio-active.

Together with the rise in population, there have been rapid advances in technology so that land is also needed

for new industrial developments as well as for recreation. It is therefore essential that the production potential of any land be given serious study and consideration before allocation for these purposes so that insofar as it is possible, the most unproductive land may be allocated to industry.

A further problem in Europe today is that the returns from the land do not adequately compensate for the work put into it. As a result, many farmers are going to work in industry, thereby vacating valuable productive soil, for which strict measures of protection must be put into effect at once.

In summary, there is an obvious and urgent need to develop the most efficient methods of using the existing productive land resources of the world and to protect them as far as possible from industrial expansion, pollution and erosion.

If adequate measures for a rational use of soil are not taken immediately, we run the risk of seeing the agricultural potential of the soil diminish before our eyes and the hunger problem becoming more and more serious. Let us not forget that prevention is better than cure, and let our actions be guided by economic reasoning.

# SOIL CONSERVATION IN EUROPE

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During the past decade, debates, publications, repeated warnings from scientists and resolutions by major international bodies have focussed attention on the deterioration of the environment as a result of the damage inflicted by man on the world around him. The most serious aspects of this damage are the erosion, exhaustion and biological impoverishment of the soil.

Can anyone be unaware of the vital importance of the soil for mankind? The human race cannot keep alive without food, which in its turn is directly dependent on the fertility of the soil. The problem of Mother Earth has always caused concern but at the moment there are at least two urgent reasons why it should be given increased attention. First of all, the earth is going to have to supply food for more and more people: the population of the world grows apace. Secondly, people are striving after a fuller life and exploiting to this end the means that scientific and technical progress have put at their disposal. A rise in food and living standards necessitates, however, a large-scale expansion of the entire economy. Production and trade will have to be accelerated to meet increasing needs and greater demands will therefore be made on all natural resources, including the soil.

But soil resources are limited, and there have been countless examples of mismanagement in the past. Only two generations ago, a President of the United States launched the slogan: «Conservation» of natural resources. Today this anxiety is spreading — as witness the many international plans for action in this field.

Europe cannot and must not remain passive in this important campaign,

particularly where her soil is concerned. Although some people might be inclined to dismiss soil conservation as a matter of secondary importance in traditionally agricultural countries, on closer examination this would obviously be a great mistake. Three major aspects of the problem militate against such an attitude.

The first is the continuation before our very eyes of spectacular geomorphological processes: the action of the sea and the erosive effects of mountain torrents. We are occasionally reminded of them through dramatic incidents such as landslides or avalanches.

The second is the gradual process of natural erosion. Any traveller who flies over the Mediterranean Alps and their foothills cannot help being struck by the chiselled appearance and defacement of the countryside. Although climate is an important contributory



factor, it must not be forgotten that man's mistakes have dangerously accentuated the scale of erosion.

The third is the erosion, biological degradation and exhaustion of tilled land which may be less striking but is no less dangerous and certainly more widespread. From time immemorial European agriculture has had its soil conservation problems. In large parts of the Continent where the climate is fairly mild, the deterioration of the soil has been slowed down or counteracted somewhat by periods of recovery as a result of the sporadic application of judicious laws and the impact of historical events.



British Museum

Nonetheless present attempts to achieve larger profits and higher productivity in an immediate future are leading to the use of farming methods and techniques which, if applied indiscriminately and without adequate tests beforehand, would help erosion resume its insidious course and give rise to biological disturbances and pollution.

What can be done in the circumstances? First of all, an inventory must be drawn up of the various types of soil, the damage inflicted on them and the dangers threatening them. Methods of combatting these problems should then be thought out and careful plans laid for their implementation. This task, whose magnitude must not be played down, requires, however, an effort from all of us. Scientific research, relevant information for technicians, education of those who extract the products required by man from the soil and official support for a policy entailing the rational use of resources to ensure their long-term conservation are essential to this end.

# SOIL BIOLOGY

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## BACKGROUND

From ancient times until the late eighteenth century the earth was thought to be endowed with a «vegetative principle». With the advent of agricultural chemistry this philosophical view gave way to more practical ideas based on scientific experiment. But before long the chemical theories proved inadequate to explain certain phenomena such as the absorption of nitrogen by plants. There was widespread and sometimes violent controversy before it came to be generally agreed that the supply of nourishment to plants depended on the action of soil-inhabiting bacteria. Thus, at the end of the nineteenth century, the science of soil biology came into being.

The soil is now considered as an animate being capable of experiencing life and death, sickness and recovery. Its vitality depends on the multitude of living communities, both microscopic and visible, which it supports.

Good soil is soil which is alive and whose breathing can be measured. We are concerned here only with micro-organisms, since their influence is decisive, even though visible organisms such as worms and insects do, of course, perform useful functions.

## MICRO-ORGANISMS IN THE SOIL

One gramme of earth contains about a thousand million micro-organisms, and an acre more than a ton. There are therefore more bacteria, fungi, moulds, microscopic algae and protozoa in a handful of soil than there are human beings on this planet.

It is quite wrong to suppose that micro-organisms are necessarily associated with disease: pathogenic microbes are far less numerous than the useful micro-organisms, without which life on earth would soon cease. The example of antibiotics suffices to mend the reputation of the microbial population, tarnished, incidentally, by the misdeeds of a minority of microbes which generally live outside the soil. Mankind makes widespread use of the ability of certain micro-organisms to produce antibiotics which, applied in small quantities, hinder the growth of other species. These potent therapeutic weapons are obtained mainly from micro-organisms that inhabit the soil. One outstanding example is streptomycin. For this reason alone the soil deserves protection; but, as we shall see, its microflora have other uses besides.

## ACTION OF SOIL-INHABITING MICRO-ORGANISMS

One could list at great length all the actions of micro-organisms, but that would make tedious reading. I propose instead to illustrate them rapidly by means of a few examples.

## Micro-organisms and soil structure

The elementary particles of the soil (sand and clay) combine to form aggregates, which are its structural backbone. Good structure is essential to fertility. The soil of dunes, for instance, has no structure and is therefore liable to erosion.

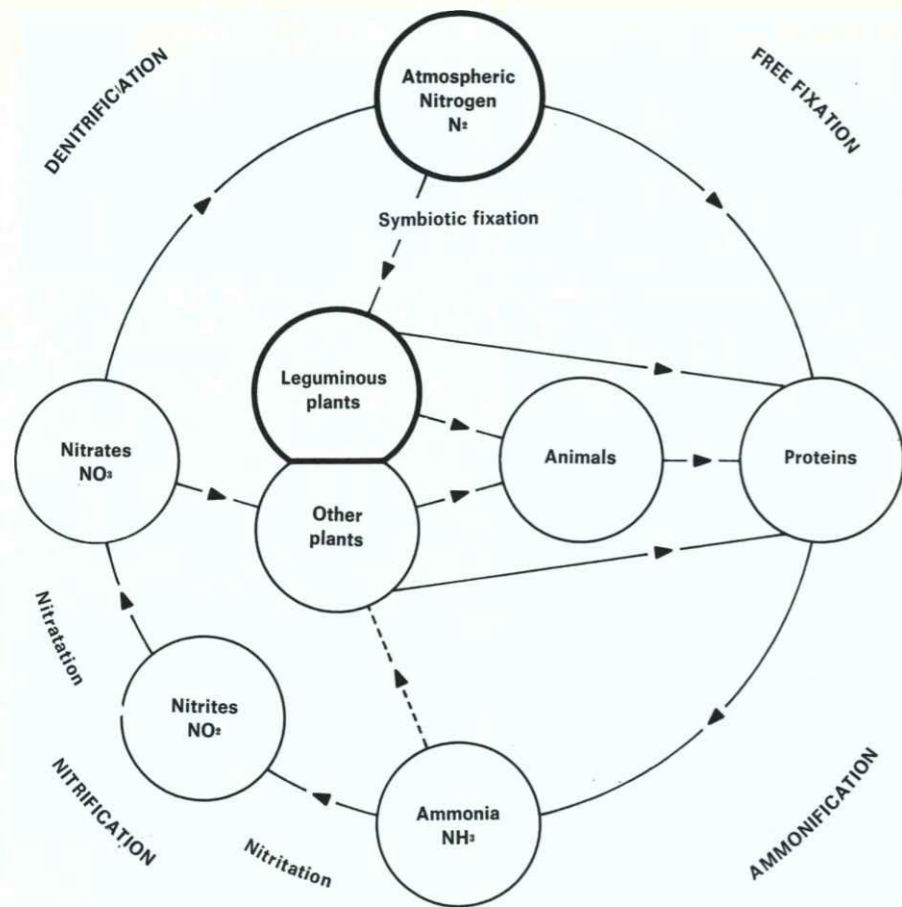
The micro-organisms help in the formation of aggregates: bacteria emit

sticky secretions which cement the soil particles together and the filamentous fungi bind them with microscopic threads. This is a simple action, but the following example is more complicated and highlights some of the biochemical reactions of which micro-organisms are capable.

## The nitrogen cycle

In the biosphere, nitrogen goes through different states. It passes through a cycle, beginning and ending as atmospheric nitrogen. The diagram will make it easier to understand the phenomenon. It shows the sequence of transformations through which nitrogen goes in the natural environment. Nitrogen is found in the soil in organic form (proteins) and in mineral form (ammonium salts, nitrites and nitrates). In the air, it is normally present in the form of free nitrogen. Free nitrogen is absorbed by the soil in two ways. The first involves the action of certain micro-organisms capable of assimilating nitrogen directly. The *Azotobacter* and some *Clostridia* are responsible for this process, known as free fixation.

The second process, involving larger amounts of nitrogen, is the result of an association between leguminous plants and bacteria known as *Rhizobia*. This association is called symbiosis. Thus the leguminous plants, of which there are over ten thousand species in the world (including clover, lucern, peas and beans), are unique in that they can assimilate atmospheric nitrogen with the aid of bacteria, whereas other plants depend for their supply of nitrogen on the presence of nitrates or ammonium salts in the soil. Both of these compounds are micro-biological in origin and are the result



▲ The nitrogen cycle showing the successive transformations of this element in nature. Extract from «La lutte biologique contre la faim» by C. BONNIER and J. BRAKEL, ed. Presses agronomiques de Gembloux, Belgium, 1969.

of the mineralisation of the proteins from dead vegetable, animal and microbial matter. As the diagram shows, this transformation takes place in stages: ammonium salts first, followed by nitrites and then nitrates. The work is shared by successive microbial groups. The first group is responsible for ammonification, the second for the production of nitrites and the third for the conversion of nitrites into nitrates.

The cycle is completed by the action of the denitrifying bacteria which restore free nitrogen to the air by breaking down some of the nitrates.

One can now understand more clearly the difficulties of nineteenth-century scientists who were ignorant of the existence of the biological «reagent» and attempted to explain the absorption of nitrogen by plants on chemical principles alone.

### Other cycles

The action of micro-organisms is not concerned solely with nitrogen. There are other cycles (carbon, phosphorus, iron, sulphur, magnesium, etc.), all closely interrelated. In fact it is difficult to think of any phenomenon in the soil in which micro-organisms are not involved.

### Symbiotic fixation

We have seen that leguminous plants are unique in that they absorb atmospheric nitrogen. It is an essential phenomenon without which all life would slowly disappear from the surface of the earth. It deserves further consideration.

Nitrogen fixation takes place in radical excrescences, known as nodules, which appear as a result of the penetration of bacteria of the *Rhizobium* type.

An interesting feature is that, once bacteria have colonised a particular leguminous species, they cannot achieve perfect symbiosis with any other species. Hence some soils may lack the *Rhizobium* suitable to the particular leguminous plant it is desired to cultivate. Bacteria bred and selected in the laboratory must then be introduced artificially. This technique is called inoculation. It has been used successfully in all parts of the world. Curiously enough, its use is particularly widespread in the richer countries, although one would expect it to be primarily of interest to developing countries for a number of reasons; ease of application, economic advantages, increased protein production, etc.



Inoculation of Lupin (*Lupinus luteus*). On the left: inoculated plots. On the right: plots which have not received *Rhizobium*. In the foreground the variety of Lupin is Neven, in the middle ground the variety used is Express.



Chaire de Microbiologie, Gembloux

### THE EFFECT OF THE ENVIRONMENT ON MICROBIAL ACTIVITY

The actions of micro-organisms are affected by the environment. The biological equilibrium of the soil is determined by such factors as temperature, humidity, desiccation, aeration and mineral content, which will not be discussed any further here.

However, the residues of human activity can also upset an established equilibrium and in some cases they pollute the soil. We shall examine three cases in turn: cellulose-based substances, plastics and pesticides.

Trippers tend to leave papers and wrappers behind them wherever they go and one scarcely dare imagine what the landscape would become without the existence of one class of micro-organism: the *cellulolytics*. By a complex and fairly slow process, these organisms manage to clean up the countryside.

The process is worth mentioning as a perfect example of how work can be organised. A principal micro-organism breaks down the cellulose into various components which include toxic products; these would put a stop to the process if a second microbial group did not eliminate them. Meanwhile, a third group of organisms backs up the others by excreting stimulant substances. This action, together with that of the climate, helps to limit the damage.

The same is not true in the case of plastics, whose use is becoming more and more widespread. Campers are heavy consumers of plastics, judging by what they leave behind. Farmers often discard large fertiliser sacks on their land. Sportsmen now use plastic cartridges instead of cardboard ones. One could give many other examples besides.

Faced with these compounds wholly foreign to our biosphere, the soil micro-organisms are powerless, despite the presence of a wide variety of enzymes. Will nature finally be smothered by a blanket of this undesirable matter? The only hope lies in the utilisation of biodegradable materials. Meanwhile, with good will from every citizen, it should be possible to avoid resorting to punitive measures.

The use of pesticides (including herbicides, insecticides and fungicides) has become more and more widespread. The danger is that by accumulating in the soil they will become a source of contamination for plants, ground water and rivers. The micro-organisms will not be spared. Some are more sensitive than others, and

their destruction could inhibit certain activities essential to the life of the soil. Fortunately, the earth has the faculty of spontaneous decontamination, in particular under the action of micro-organisms which convert certain products into harmless compounds.

The way ahead is clear: only biodegradable substances must be used and the others must be prohibited.

As we said, the soil can experience life and death, sickness and recovery. We should add that our own health is bound up with that of the soil.

Micro-organisms contribute to the production of antibiotics, the structure of the soil, the nitrogen and other cycles, symbiotic fixation and biodegradation. All of these actions are essential to human life.

The soil deserved a charter. The future of our species demands that it be applied, even at the expense of certain economic interests.

# SOIL EROSION by water and wind IN EUROPE

By soil erosion we mean the movement of soil by water or wind. In Europe, erosion by water is more important. Flowing water displaces the soil from higher to lower positions on the landscape, partly by sheet-erosion (the removal of a rather uniform layer of soil from the surface of the land by the rain) and partly by gully-erosion (the removal of stones, gravel and finer material by running water with the formation of channels unable to be smoothed out completely by ordinary cultivation). Soil erosion destroys plant habitats by dispersing the soil around the roots, which is then removed and deposited in more level positions. Thereby existing soils are covered.

## FACTORS AFFECTING SOIL EROSION BY WATER

### 1. The degree of slope

The steeper the slope, the greater the part played by gravity. The degree of slope can be reduced by terracing such as is usually done in viticulture.

### 2. The rainfall

Rainwater is the transporting medium for the soil. The amount of average annual rainfall is not as decisive as its distribution. If much rain falls in a short time (mm/min) the soil cannot take up the water quickly enough; it flows over the surface and carries along with it soil material. The destruction of soil is especially considerable if rain falls in a period when arable land has little or no plant cover, for example from autumn to spring. Soil can be loosened by use of lime and organic matter and management so that the pores are made larger and water can infiltrate more quickly.

### 3. The plants

A dense cover of plants protects the soil from erosion because the rain does not fall directly on to the soil and the plants fix and immobilise the soil with their roots. The plant cover reduces the run-off by allowing the water to infiltrate slowly into the soil. A forest provides the best protection because the trees intercept the rain and allow it to fall slowly on the soil. The tree-roots also penetrate deeply into the soil and hold it fast. Grassland is also a good cover for the soil and protects it extensively against erosion. Most endangered is arable land during a period in which few or no plants are present (autumn to spring). Whereas a cover of grain crops effectively reduces erosion, root crops (mainly maize) cover too little of the field, so that soil erosion can occur on slopes.

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### 4. Type of soil

Permanently aggregated soils with large pores take up the rain quickly. Too few large pores, i.e. if the soil is too dense, means that the water cannot be absorbed easily and tends to flow along the surface. Soil not aggregated into crumbs is dispersed and carried off by the rain, particularly if it does not contain enough clay and organic matter.

The run-off of water is also enhanced if the rain falls on well-dried soil. In this case the rain is initially repelled by the air adsorbed onto the soil particles and since it cannot penetrate the soil quickly enough, it runs off the surface. Only when the water has displaced the air and the soil has become somewhat moist, can it take up the water easily. If there is a permeable top layer underlaid with an impermeable sub-soil which effectively stops infiltration of the water, the top layer becomes very wet and pulp-like and tends to flow away, especially in a sloping area.

### 5. Soil management

Furrows directed down a slope collect the rain and let it flow off quickly, during which process soil material is also carried along. Sloping fields should therefore always be cultivated horizontally, i.e. perpendicular to the direction of the slope. Thus large furrows (caused by ploughing) or smaller furrows (caused by sowing and harrowing) lying across the slope simultaneously prevent run-off and erosion.

## SOIL EROSION IN DIFFERENT PARTS OF EUROPE

The cause and the extent of soil erosion by water are different in Western, Central, Southern, Northern and Eastern Europe.

### Western and Central Europe

Precipitation is well-distributed here, there being little very heavy rain. Maximum rainfall is during July and August when the arable land is covered with plants. The cultivated slopes are mostly terraced (Fig. 1) and nearly everywhere cultivation takes place across the slope. This is why soil erosion by water is relatively small compared to Southern Europe. Only soils containing a little clay and a large amount of silt (e.g. loess soils) undergo greater erosion (Fig. 2). On the whole, cultivation, liming and fertilisation keep the soil loose, so that rain can easily penetrate it.

Figure 1. Terraced slopes near Schleiden/Eifel (Federal Republic of Germany). Soil: rendzina with stony loam texture derived from W. Devonian limestone.

Figure 2. Erosion on young loess soil on about a 3% slope near Bergisch-Neukirch, district Cologne (Federal Republic of Germany). The soil is poor in organic matter and rich in silt; thereby the water easily disperses the soil particles. The seeder has drawn furrows in the slope direction, therefore the run-off is more intensive.

### Southern Europe

In Southern Europe intense soil erosion by water can often be seen (Fig. 3). When the areas of Southern Europe were still wooded, no soil erosion occurred. Since then large sections of the forest have been cut down and pasturing on these areas by goats



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Prof. Dr. Dr. Mückenhausen



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Prof. Dr. Dr. Mückenhausen

and sheep has not allowed trees to grow again. Here the rain falls in a period when there is little plant cover, i.e. in autumn and spring. In autumn the rain falls on dried-out soil and immediately runs off. Larger areas (such as in Italy) consist of material rich in silt and clay and show severe erosion. In earlier times the lack of arable land made it necessary to cultivate steeper slopes as well, and such open fields were also far more susceptible to erosion. This led to severe erosion in large areas of Southern Europe.

Figure 3. Intensive gully erosion in Pleistocene grey fine sandy clay near Volterra in Toscana/Italy.

Figure 4. The pastures are fenced in by stone ramparts, about 10 km west of Aberdeen/Scotland. The dense grass growth protects the soil against erosion.

### Northern Europe

Here the sloping sites are less cultivated, being covered with forest and

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Prof. Dr. Dr. Mückenhausen

grassland (Fig. 4). The cultivated soils occur mostly on slight slopes and are derived mainly from gravelly-sandy glacial material which easily takes up the water. The cultivated clay soils lie in the plain, the sloping clay soils being chiefly pastured or wooded. Altogether soil erosion by water in Northern Europe is not serious.

### Eastern Europe

In this part of Europe it is necessary to differentiate. The northern part consists of permeable glacial material, the natural soil cover being forest. The flat areas are cultivated but soil erosion is only nominal. By contrast, soil erosion by water on the large arable lands (*Chernozem, Kastanozem*) of South-East Europe is severe, even on slight slopes. From the large and small valleys (*Balki*) flowing water cuts gullies (*Owragi*) sideways into the loess-landscape (Fig. 5). The loess is easily eroded because it is very rich in silt. The frost penetrates deeply into the soil, then in spring when the thaw comes and the snow melts, the soil thaws superficially and the water cannot penetrate the sub-soil because of the frost. The soil then becomes very wet and flows down the gentle slopes. Only the plains are unaffected by this. When the areas of South-East Europe were covered in a dense steppe-vegetation there was of course very little soil erosion. Only when these areas began to be cultivated did soil erosion properly begin. In loess soils the water deepens and elongates the gullies permanently. The use of fascine or something similar at the source of the gullies can stop this erosion.

### SOIL EROSION BY WIND

This kind of soil erosion is limited to fairly small areas in Europe. The conditions for it are as follows:

1. The wind must touch the soil di-

rectly. If the soil is protected by plants, then the wind cannot pick up and move the soil particles.

2. The soil must consist of loose particles which the wind can pick up and transport. The transportation of particles depends on the wind speed and size of particles. This dependence of wind speed (m/sec) and particle size (mm/ $\phi$ ) is shown below:

	Wind speed m/sec	Particle size mm/ $\phi$
up to	0.5	0.05
»	1.5	0.10
»	4.0	0.25
»	6.5	0.50
»	15.0	1.00

Soils which are very rich in particles below 0.05 mm/ $\phi$  are not so much affected by wind erosion. Such soils also have particles below 0.002 mm/ $\phi$  which have sorptive properties. This means that the soil particles aggregate to form crumbs which cannot be blown away because of their size. In Europe, predominantly sandy soils without or temporarily without vegetation are susceptible to wind erosion, such as the Marchfeld near Vienna, the sandy areas of Hungary and Lower Saxonia and the Baltic. The transport of fine soil particles below 0.05 mm/ $\phi$  as, for example the loess formation in Asia, is not important in Europe. The wind may also have other effects. Soil over which the wind is blowing directly is quickly dried. This is the case in the extensive arable lands of the Southern European part of the Union of Soviet Socialist Republics (USSR).

If the grains of sand carried by wind strike the leaves of plants, these too may be damaged. Intensive wind also damages the plants by pressure and violent movement. Strips of trees and bushes which are vertical to the main wind direction brake the wind, keeping

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W. F. Schmidt

it away from the soil and thereby protecting the plants and animals on the pasture and settlements between them.

Figure 5. About 50 m deep gullies (*Owragi*) on a flat slope on the bank of the river Don, north Golubinka/Ukraine.

Modern civilisation, with its compulsion to expand and through technological progress, is causing our natural environment to deteriorate steadily. The appropriate authorities in many countries are anxious to analyse this danger and catalogue their natural resources, in particular those which are already in urgent need of protection. This is not a new problem and numerous projects of this kind have been undertaken in the past, including attempts to combat erosion in hilly regions; but a good many of these have gradually been abandoned for financial reasons. This is why, in the last few years, ecological studies have forged ahead in many European countries.

Knowledge of the natural environment, its management and its conservation, requires study of the various elements which comprise it, and soil, the mainstay of life, is one of the fundamental components.

A large number of problems arise on consideration of the rational use of land. It seems obvious that their solution presupposes the fullest possible understanding of the characteristics of soil. Thus precise and detailed information not only about the structural characteristics of each soil type, but also about the physical and chemical properties is needed.

In addition, all data on the environment should be related to geographical distribution. A map is the easiest way of giving a clear idea of the surface distribution of a tremendous variety of things, and this also includes soil. That is the reason for soil cartography: it is the best means of establishing a complete list of soils and showing their distribution across the country.

Soil science, or pedology, studies the soil as a living environment which evolves in time and space in relation to its original substance, to contours, climate, vegetation and man, all factors in soil development. Thus soil science attempts to demonstrate and

# SOIL CARTOGRAPHY AND ENVIRONMENTAL PLANNING

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describe the various processes, successive or simultaneous, involved in bringing soil to the stage of evolution at which we see it. It also studies more practical aspects of soil — as the source of food for plants, the regulator of the hydrological cycle and of the quality of water, the mainstay of buildings and the urban infra-structure.

Pedology is a synthetic science, coordinating the work of many different disciplines, and yet has its own methods and system. It is also a fundamental science when contemplating the technical problems of exploiting and conserving soil.

It is a relatively new science which has achieved recognition as an independent branch and has made great progress in the last few decades, both with regard to theory and to diagnosis and mapping.

So it is immediately obvious that a soil map is a necessary accompaniment to any research in this science. Soils may be studied from different angles:

- the stage in their evolution,
- their intrinsic properties,
- their current utilisation,
- the treatment needed for better utilisation or for their conservation.

Soil is an extremely complex thing. Its nature and behaviour result from the action of a certain number of physical and chemical factors upon it. Some of these can easily be modified by man and must therefore be ignored when defining and mapping soils. Other factors must be taken into account if they have a virtually permanent effect on the soil. As far as possible we try to confine ourselves to permanent features. For example there are the factors influencing the susceptibility of the soil to erosion: these are texture and structure, which are responsible for the stability of soil, the gradient, form and length of slopes

and, less directly, the speed at which water filters through and the permeability of the lower strata.

Similar soils can be given a name or a symbol defining their origin, composition and properties. It is then possible to represent them by a simple conventional sign. Alternatively, they can be given numbers to represent their elementary features — the origin and nature of the substance, the depth of any substrata, texture, water formations and evolution. In the latter case representation is more complicated. We shall see that the technical problems may be varied according to the aim in view. The second procedure is usually used for large-scale detailed documents for immediate use and the first is reserved for general documents on a medium or small scale.

In general terms, the main purposes of soil cartography are as follows:

- to list and classify the soil units,
- to solve the problems of land management, regional planning and soil conservation.

Thus one of the fundamental aims of soil cartography is to establish an exhaustive list of the soils of a given area, thereby contributing to the formulation of a precise «balance-sheet» of natural resources.

Among the many applications of soil cartography, in the realm of rational regional planning, several major ones are immediately obvious: siting and working out development projects, classifying soils according to their potential uses, preparing technical projects, protecting and improving land abandoned by farmers, etc.

The aims can vary greatly depending on whether one is thinking in terms of a plot of land, a farm, an administrative district or a region. In the case of the first two, the general aim is simply improved land management: a better knowledge of the land, the adaptation of crops to different soils

and the choice of the least damaging cultivation techniques. At regional level aims are naturally wider and the map can provide the answers to all sorts of questions about exploiting soil, work projects and planning and conservation programmes. Such maps, which are the first stage in these types of studies, have so far generally been to help make the most of the soil and in the context of planning programmes, are undoubtedly one of the main techniques employed.

Traditionally the majority of the soil is used for agriculture but modern civilisation is making increasingly high demands on land for industry, housing or recreation. It is clearly in the public interest that only the least fertile land should be taken away from agriculture. In order to seek a solution to this problem the responsible authorities have set up various regional planning programmes. These programmes provide for a certain number of multi-disciplinary studies which would draw on soil science, ecology, land management, economics, industry and town-planning for their material.

This means that demarcation of the principal soil units is one of their primary basic features.

The problems encountered here may vary considerably according to the type of ecological environment and social and economic conditions. In intensively cultivated plains an acute awareness is needed of the deleterious influence of bad agricultural practices, single-crop farming which provokes imbalances, pollution and erosion, which may be inconspicuous but is nevertheless present. Different types of soil vary in their sensitivity to such damage. Here it is important to identify the causes of deterioration and study their distribution. Industrial and urban structures are also gener-

Département de tourisme de l'Aisne



ally undergoing major extensions in these regions. At this stage the problem is how to share out the land between towns, industry, agriculture and open spaces. Medium-scale maps help to establish logical foundations for this choice.

«Marginal regions», where unprofitable land has been abandoned, constitute another urgent problem. Whatever the reasons for abandoning the land, the consequences are always the same: it reverts to wasteland, vegetation of little value even for recreation sprouts up at random, erosion advances, the solid discharge from rivers increases and elementary rural

**This aerial photograph shows clearly the consequences of precipitation on soil partly exposed as a result of cultivation. The thalweg, covered by mud that has flowed down the hill, is shown in relief by the dark lines due to harrowing and the white strips which represent the impoverished topsoil.**



infrastructures such as roads deteriorate. This creates difficulties of access to these areas for the purposes of conservation work and means the loss of a heritage which would be more than welcome in a few decades to come. Hence, before starting any action, it is advisable to classify marginal regions according to the ease or difficulty of reclaiming them.

Since these areas will remain agricultural for some time yet, it is important to ascertain their physical potential — for example by an improved assessment of their suitability as health resorts, a study of soil in mountainous regions, etc. Such studies help to single out regions where agricul-

ture would scarcely bring in a reasonable income for the population and thus to decide on the action to be taken.

In mountainous regions and in those where the climate fosters various erosive processes, we need to study in

**The soil supports various types of vegetation — permanent vegetation and annual vegetation — which must be adapted according to the edaphic conditions of each region.**



Conseil de l'Europe

teristic regions, and also recreation and leisure areas chosen for their scientific or aesthetic value, we need a thorough knowledge of the environment and in particular of the soil.

All this means, of course, that the maps used in regional-planning programmes vary a great deal in scale. The aim is to try to meet different demands by drawing up documents with scales corresponding to the amount of detail required.

The smaller scales, 1:1 000 000 to 1:250 000, are used for very general documents indicating the distribution of the major soil units. Many countries have produced this type of map. How-

Great progress has been made in soil cartography in recent years, chiefly thanks to the improvement of soil description techniques, a noticeable harmonisation of concepts among soil scientists and the development of new methods for observing the environment.

For direct use in planning, soil science maps generally need to be made more thematic, bearing in mind the fact that any rational regional planning must be based on a classification of land according to its value. Obviously a pedological map proper should never be «biased» since one cannot foresee what conclusions will be reached after comparing maps of the natural environment with those covering the agricultural, urban and human aspects. It is, however, possible to see to what extent soil maps, as the basis of our ecological knowledge, constitute a major element in the preservation and conservation of nature.

In view of all these pressures, it recently became clear that harmonisation at national level was essential. Institutions have been set up which are at present working very effectively in many European countries. Now we are faced with the problem of co-ordination in the context of international organisations which is currently being solved by the establishment of specialised working parties. The resulting work should produce maps showing the distribution of the main types of soil in Europe, and more generally the major ecological units, so that we can establish a balance-sheet of our natural resources and clearly define which sites need protection.

Environmental studies should be directed towards this very broad objective.

particular the sensitivity of the different types of soil to this erosion; basically this should be done in relation to the relief and to the characteristics of the soil.

Furthermore, for siting and organising nature reserves in different charac-

ter, regional planning demands more precise surveys, so-called medium-scale — 1:100 000 to 1:25 000. These usually take the form of «morphogenetic» maps which give data on both the formation of the soil and the nature of its components. It was for these systematic surveys that national soil cartography institutes were originally set up.

Finally, land use in the strictest sense and the application of conservation principles or special techniques have given rise to the need for more detailed, large-scale local maps - 1:10 000 to 1:5 000. They usually indicate the main factors which in one way or another limit the use of the soil.

# EUROPE'S FLORA threatened

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John Markham

Military orchid (*Orchis militaris*).

## INTRODUCTION

20 000 species of the wild flowers of the world are in danger of extinction. This is the opinion of Dr. Ronald Melville, the author of the first part of the «Red Data Book» for plants which appeared in 1970. Published by the International Union for the Conservation of Nature in loose-leaf form it contained accounts of the present and past distribution of 68 species, assessed the reasons for decline, their potential economic value, and what can be done to save them.

The first list contained only one European species, the beautiful Lady's-slipper Orchid, *Cypripedium calceolus*, threatened by collectors and gardeners to such an extent that it is now virtually extinct in several countries. In Britain where 24 localities were once known, there is now only one. How many more species in how many countries have reached this position? In most cases we do not know, but reading the limited literature which is available it is surprising and alarming to discover that the same species are declining all over Europe.

Broadly speaking, there are three categories of threatened species. First are the European endemics, which are often rare and local plants whose protection is a special European responsibility; then there are more widespread species (such as *Cypripedium calceolus*) whose rapid decline on a world scale gives rise to real concern. In addition the botanists of any single country are rightly concerned about many species now rare within their borders, even if these are still abundant elsewhere in the world; such species constitute a large and important third category.

Though collecting is one factor causing the decline there is no doubt that loss of habitat has been the main cause, particularly drainage followed by ploughing: it is the plants of wet places, marshes, bogs, ponds and lake margins which have suffered the biggest loss, species like Greater Spearwort, *Ranunculus lingua*, Pennyroyal, *Mentha pulegium* and Marsh Pea, *Lathyrus palustris*.

## THE NEED FOR NEW KNOWLEDGE

The first task is to find out which species are involved and where they occur.

S. M. Walters has begun on the rare endemics: he is building up a card index through the international advisory structure developed for the

publication of *Flora Europaea*: from the data he supplies the Biological Records Centre is preparing lists for each European country. A list based on the first two published volumes of *Flora Europaea* contains 600 species which suggests that the final total may be about 1 500 species or about one tenth of the total flora.

The lead for declining species was taken by Belgian botanists A. Lawalr e and L. Delvosalle who published in 1969 a list of rare plants which had disappeared or were under threat in their country (*Plantes rares, disparues ou menac es de disparition en Belgique*). This has stimulated the production of a similar work for the British Isles which should be published in 1972. It will be the local equivalent of a Red Data Book and will be an invaluable tool for conservation in Britain.

The initiative of the Societ a Botanica Italiana which set up in 1970 an organisation to produce a list of all vascular plant species needing protection in Italy, is to be particularly welcomed, as much of the problem of conserving the European flora is concentrated in the lands bordering the Mediterranean where floristic richness is greatest. This Italian group is exchanging information with S. M. Walters so that both indexes can be improved. It is only when we have similar studies for each country that we can begin to assess which species are in need of special care, and which country is best fitted to conserve the European population.

## ACTION WHICH CAN BE TAKEN

The first vital step in conserving the flora of Europe is to give wide publicity to the problem so that plant protection gains a much higher priority in people's minds and actions — particularly the people of north and west Europe. Not only have we been the first to destroy most of the natural vegetation of our lands for agriculture, housing and industry but, and perhaps as a reaction against these developments, this is also where the enjoyment of natural history as an amateur pursuit is at its strongest. With increased affluence and cheaper travel naturalists are being attracted to the south and particularly the Mediterranean in ever growing numbers. The development they, and millions of other tourists, bring is irreparably damaging the botanical riches they go to see. Moreover, many amateur naturalists apply less rigorous control

of their collecting instincts when visiting another country. They may know the rarities of their own country and resist the temptation to collect there, but collect without restraint when abroad, but the cause of conservation will be lost if we each collect the other's rarities.

What is needed is a Code of Conduct for the whole of Europe. This might be modelled on the recent Code published by the Botanical Society of the British Isles. With the support of the World Wildlife Fund, 130 000 copies have been circulated to individual naturalists and schools throughout the country. The main clauses deal with collecting plants and visiting them. Uprooting wild plants except arable weeds is discouraged and it is suggested that only common species be collected and not even these in nature reserves and similar areas. The taking of photographs is commended but the photographer is reminded of the damage he can cause and that photographs themselves can give clues to the localities of rare species. Other visitors are reminded that if they make an obvious path to a rare species this may encourage unwelcome attention and that trampling around a plant may damage seedlings and prevent regeneration.

Whilst the protection of plants in their native localities is the ideal conservation objective, this may not always be possible and whatever happens we must try to ensure the survival of the species, in cultivation if necessary. In Britain the Botanical Society of the British Isles has begun discussions with the larger botanic gardens to find out how many of them will take responsibility for maintaining stocks of material of known origin. This would account for the perennials, but for annual or biennial species storage of seed may be more appropriate. During the past four years the Royal Botanic Gardens at Kew have developed a seed bank with extensive low-temperature storage facilities. It has been agreed that Kew will maintain stocks of rare British species. The Biological Records Centre will set up an index of sources and it is hoped that in time professional botanists needing living material will seek it first from botanic gardens.

This material can have another important conservation function. If the native site of a rare species is threatened temporarily the species can be reintroduced after the danger has passed, from stocks originally taken from the site.

There seems no reason why the botanic gardens of Europe should not

all contribute to conservation in this way, particularly where the rare endemics of the south are concerned. Here again the richer and better endowed institutions of the north and west must play the largest part.

Legislation to protect individual species and the habitats in which they occur is very variable throughout the different countries of Europe, and any move to co-ordinate the codes of law and to publicise their provisions would be extremely useful. It is to be hoped that this and other important work can be undertaken through the International Union for the Conservation of Nature, which is in process of setting up a working group on the preservation of the European flora, following a conference in Czechoslovakia in 1970.



Nature Conservancy

Marsh pea (*Lathyrus palustris*).





*Ameles objecta, cyrillus*



*Omocestus viridulus*



*Bombus terrestris*



*Lucanus cervus*



*Nymphalis io*



*Calopteryx virgo*



*Notodonta Ziczac*



*Mimas tiliae*

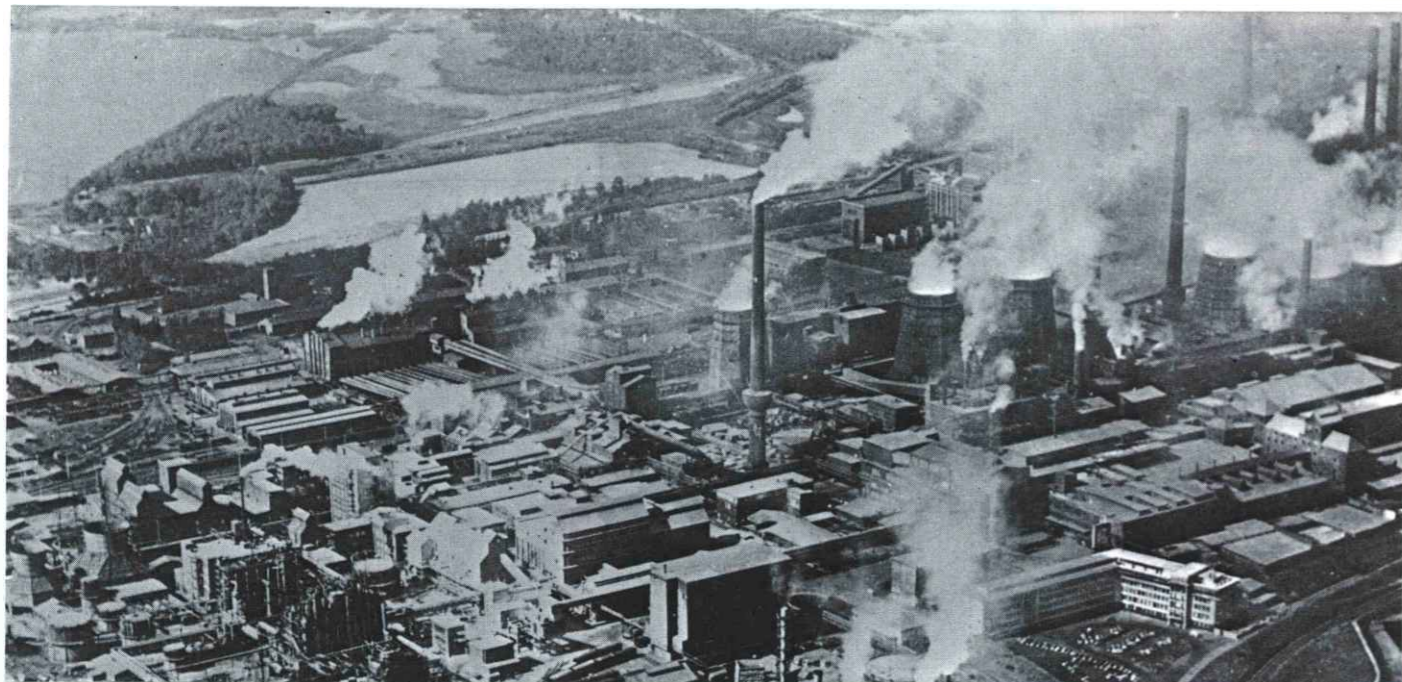


*Dasychira pudibunda*



*Acanthosoma haemorrhoidale*

**Insects not only dominate the animal kingdom through their diversity and numbers: they are also determining factors in most natural phenomena. They can obviously cause great damage to man, as in the transmission of diseases and the ravaging of crops, but it must not be forgotten that in many cases our livelihood depends upon them, for example, the pollination of flowers by bees and the destruction of pests by other insects inoffensive to man. Moreover a source of constant delight and study is provided by their myriad shapes, hues and antics. Pollution, the misuse of pesticides and other environmental changes have however proved detrimental to many innocent and often beautiful species, while others with more harmful effects have built up a natural resistance.**



COI

The Right Honourable  
**PETER WALKER, MBE, MP**  
 Secretary of State for the Environment,  
 United Kingdom

## THE BRITISH APPROACH TO THE ENVIRONMENT

Management of the environment is not a new concept. We have all long been aware of its necessity in order to maintain a reasonable standard of living. However the recent and rapid advances in technology and industry together with the population explosion are now having such far-reaching influences on the environment that Government action has become urgent and necessary.

Hence in November 1970 Britain became the first country in the world to create a Department of the Environment with resources specifically to solve the problems of protecting and improving the quality of the environment. This, incidentally, conforms with one of the main recommendations of the Declaration from the Council of Europe's Conference on the Management of the Environment in Europe, in Strasbourg, February 1970.

Prior to November 1970, three other Government Departments had direct interests in the environment in Britain: the Ministry of Transport, the Ministry of Housing and Local Government and the Ministry of Public Building and Works. Conflicting interests and the absence of a unified approach to general environmental problems were the

inevitable results of such a regime. Furthermore, the system of Local Government had not changed since its creation in 1888, when the population was only 28 000 000, there were no cars on the roads and only the Savoy Theatre, London was supplied with electricity. This system is now being totally reformed in accordance with present day requirements, and the three Ministries have been amalgamated to form the new Department of the Environment. Rationalisation resulted in six research laboratories becoming attached to the Department under the auspices of a new Director General for Research. The co-ordination of their various research activities will add further support to the combined efforts of the Department.

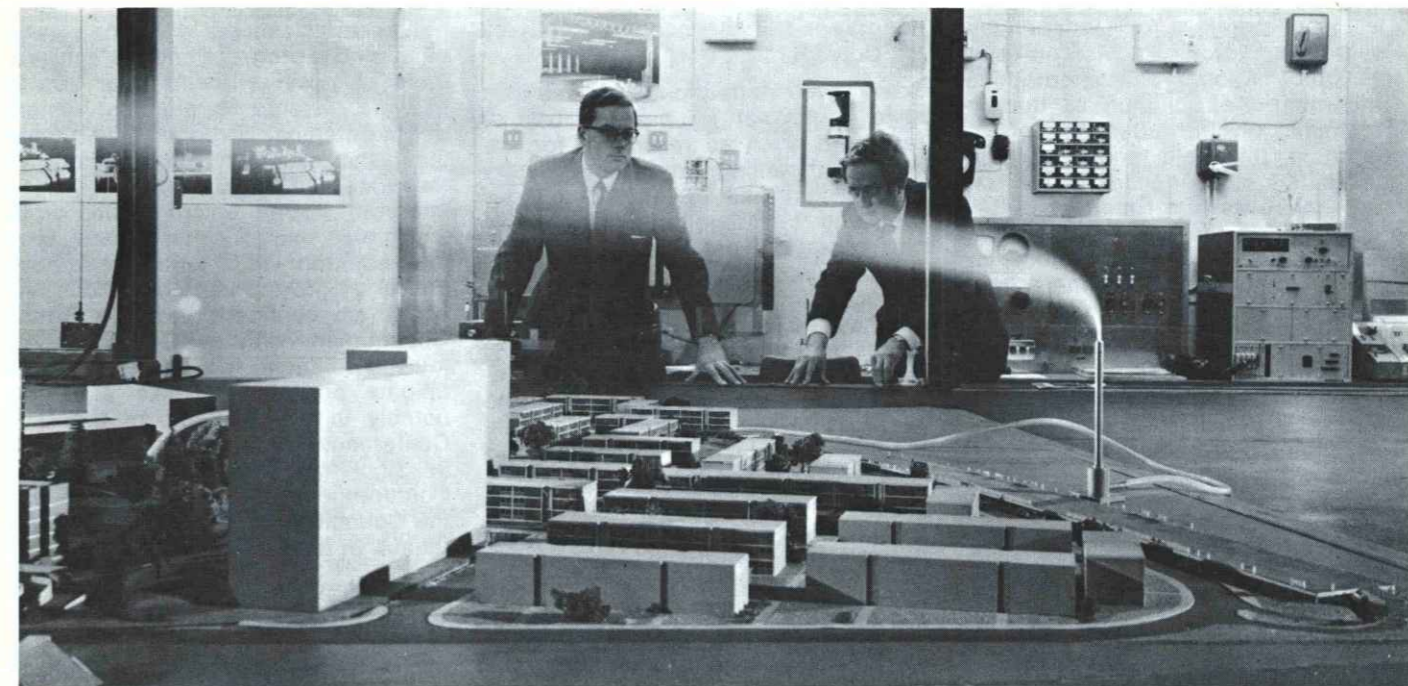
Eight Ministers have been appointed within the Department, each of whom is aware of the total strategy of the Department and all of whom continually co-operate to assess the most efficacious means of fulfilling its objectives. Behind them is the teamwork of their officials.

The advantages of this co-ordinated administration are many. Previous situations where a desirable housing development proposed by one Ministry has been delayed by another

failing to provide the necessary transport facilities no longer exist. The decision to allow heavier lorries, which was previously viewed only within the narrow confines of the Ministry of Transport, can now be considered with respect to every aspect of the environment likely to be affected. Similarly, the new Department has far greater scope and flexibility in regional planning activities.

Nevertheless, the creation of an appropriate administrative machinery is merely one side of the equation. It is equally important to establish definite policy objectives towards which this machinery can aim. The main objective is obviously to improve the quality of life and to minimise the hostile and noxious elements of the environment. Our problem is to develop the best method of approach and to establish priorities.

Britain has a very high population density exceeded only by those of Hong Kong and the Netherlands. Her activities are largely industrial and technical. We must therefore manage, develop and utilise as best we can the limited resources we possess. It is often suggested that safeguarding the environment necessitates a halt in technical advances. However, I feel



COI

◀▲  
 The problems of pollution have been given priority treatment.

that if past and present technology have created environmental problems, it will surely provide a means for their solution in the future. Britain is also a strictly urban society. Eighty per cent of the population are living in towns. In Great Britain as a whole a little over 8% of all land was in urban occupation in 1970 and this is expected to have risen to just over 11% by the year 2000.

The past has also left an appalling legacy of derelict land and buildings, outworn communities, slums etc., all of which emphasise and perpetuate the disparity in prosperity between different parts of the country. Furthermore, as real incomes rise, so will people's expectations, which will be reflected in demands for higher standards and such increasingly rare commodities as space. In the past, pleasant surroundings have often been available only for the privileged few and usually at the expense of others. We must aim to provide for everyone equally. The first priority of the new Department, therefore, is to improve the bad environmental conditions from which a rather large proportion of our population at present suffers. Not only is this socially and morally the correct policy for us to adopt: it

is also perhaps the most rewarding investment we can make.

The first major decision taken in this direction was the reform of housing finance so that greater resources could be devoted to slum clearance together with a programme for the improvement of older properties. The deleterious effects of bad housing, both socially and economically, are well-known and widespread: overcrowding can affect a child's attitudes for life. Moreover, the aesthetic aspects can also have a lasting effect. Hence future planning and building will give full scope to architects and town planners in the hope of providing a new age of taste and elegance for the many whose surroundings have also been poor for most of their lives.

The problems of pollution have also been given priority treatment. A firm foundation for this has been provided by the valuable and entirely voluntary co-operation of industry with the Alkali and Clean Air Inspectorate. The adoption of the «best practicable means» of controlling pollution has already led to a substantial improvement in the cleanliness of air and the purity of river water. The «peasouper» fogs of London are now a thing of the past. But that does not mean that

our troubles are over. Public expenditure is now weighted to allow further research into methods of improving the quality of air and water. However, since the public cannot be expected to bear the whole cost, when an individual industry pollutes the environment, the principle «the polluter must pay» applies without question.

The British climate and location of industry means that most of our water supply has to be re-cycled. The cost of maintaining high standards of purity is rising significantly each year with the massive investments into new sewerage plants, particularly those in the worst affected areas of northern England. The administration of rivers and sewerage treatment is particularly important and the Government have now decided on a major reorganisation which will bring the whole hydrological cycle within the control of the ten new Water Regional Units.

Among our other achievements in this area is a large programme for improving and restoring derelict land, new regulations prohibiting the emission of dust and grit from furnaces and reducing noise, smoke and fumes produced by motor vehicles. We have brought new industrial processes under the control of the Alkali and Clean

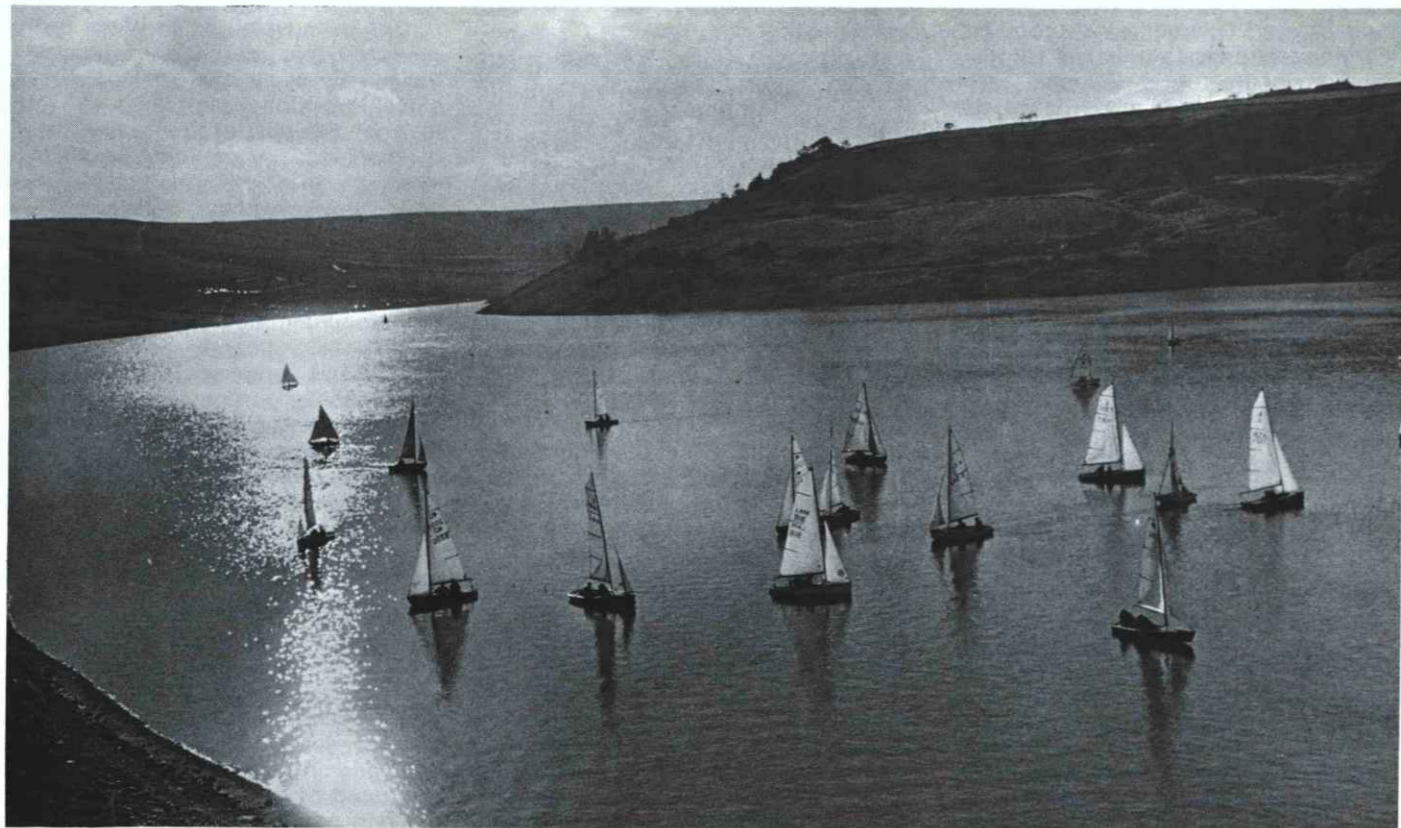
Air Inspectorate. An independent Royal Commission to advise on «matters both national and international concerning the pollution of the environment, on the adequacy of research in this field and the future possibilities of danger to the environment» made its first report in 1971. It presented a generally encouraging assessment of the state of our environment and put forward many helpful suggestions for the future.

If our first priority is to improve the environment then our second must be to conserve what is pleasant and valuable and exists at present. The Department has numerous prospects for the conservation of historic towns, villages and buildings since it can now co-ordinate building preservation, roads and traffic management. Similarly the threat of industrial development in recreational areas can be met with wise and careful planning which is essential for our small island with its ever-growing population. But our approach as a whole must be less towards preservation in a narrow sense and more towards the proper planning and management of rural resources. This is one of the tasks to be tackled in our current regional planning studies and structural plans and, at European level, in the framework of European Architectural Her-

itage Year 1975, launched recently by the Council of Europe.

Some of our recreational requirements have been met by multiple use of resources such as reservoirs for angling and sailing, and the Forestry Commission has a long record of providing facilities for camping and nature trails. The Countryside Commission also encourages the provision of recreational activities. It must be emphasised here that none of this represents an erosion of rural peace: we are not envisaging «planned recreation» everywhere and we hope to ensure that the countryside will still provide opportunities for peace and solitude as well as for group activities. The Government is playing an active part in international discussions concerning the environment. We all recognise that pollution of the air and sea does not respect international boundaries, and that international agreements can be very necessary. We also recognise the importance of dialogue within the European community concerning problems common to us all and which are shared by other developed nations in the world. We therefore subscribe to most of the international organisations concerned with such problems but here we must stress the need to guard against needless duplication of work between com-

peting organisations, which only serves to hinder progress and the achievement of positive results. Our aim is to work towards an efficient system of international arrangements combining the maximum consultation for the achievement of agreements on important issues. Environmental problems are indeed international and their solution will require co-operative efforts by governments at various levels. I am confident that the British Government, with its Department of the Environment, will continue to participate actively in these activities, notably in the follow-up of the U N Conference that has just been held in Stockholm and in the Ministerial Conference on the Environment which the Council of Europe is preparing for Vienna in March next year.



Yachts sailing on the recently opened Scammonden Dam, near Huddersfield, England.

COI

# YELLOWSTONE PARK ITS FIRST CENTURY

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The national park concept is officially one hundred years old. It was March 1, 1872, that President Ulysses S. Grant of the United States of America signed the act which reserved more than two million acres of the Montana Territory as Yellowstone, the world's first national park.

Beginning on March 1, 1972, a variety of nationwide observances will mark the creation and development of the United States National Park System. Through these National Parks Centennial activities, the United States will celebrate 100 years of parks and

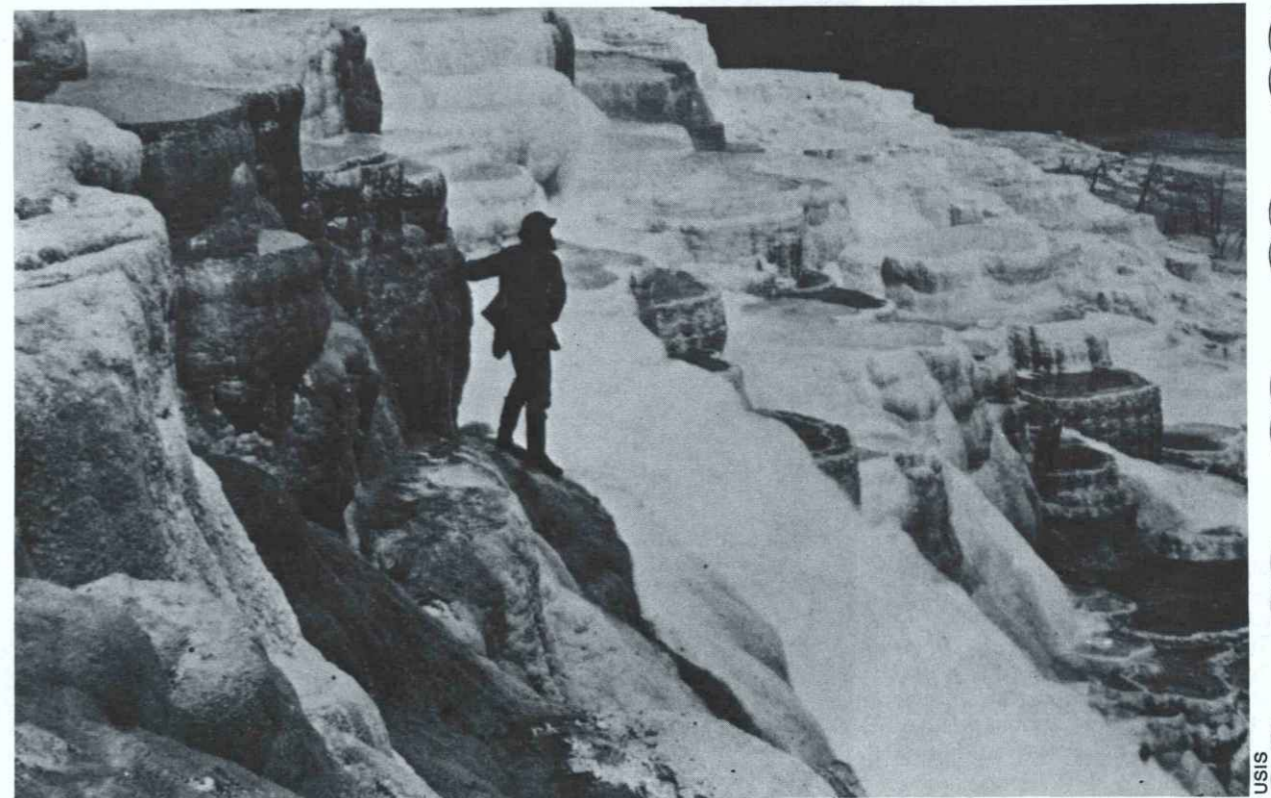
seek ways to extend to the second century of national parks the singular contribution this institution has made to man's strength and development. The practice of setting apart areas of land for protection in their natural states is, of course, not a new one. Other nations as well as the United States had acted prior to the establishment of Yellowstone to reserve areas for this purpose. Yellowstone was unique because it marked the genesis of a new public lands policy which — shaped by the democratic ideal — reserved outstanding areas

to be administered by the nation for the benefit of all its people.

Eighteen years passed before the United States established other national parks. In the meantime, Canada, in 1887, created Banff National Park at the site of a mineral hot springs, and the Mexican Government began in 1898 the protection of an outstanding forest area.

Australia established a Royal National Park in 1879, while New Zealand set aside her first, Tongariro, in 1894.

In Europe, Great Britain organised in 1895 a National Trust to make land pur-



A photograph of Yellowstone taken in 1871.

USIS

chases, and, a few years thereafter, the Netherlands, Sweden and Switzerland also initiated national park programmes.

In Indonesia, an important series of nature reserves was created in 1919. Japan established a dozen national parks between 1934 and 1936. While Argentina led out in 1903, other South American nations took up the concept in the 1930's, when Chile, and Ecuador termed reserves «national parks».

In South Africa, protection of the Sabi Game Reserve began in 1892, and it became the famous Kruger National Park. After 1925 large national parks were established in Rwanda and Katinga, and nature reserves in Madagascar. The two decades following 1933 saw established the great parks of eastern and central Africa.

A further flowering of the park idea was the creation of parks crossing national boundaries. Of interest is the fact that 1932 dated the designation of both the Waterton-Glacier International Peace Park on the United States — Canada border in the Rocky Mountains, and the first international European park on the Dunajec, a boundary river between Poland and Czechoslovakia. (See *Nature in Focus* No. 11 page 2).

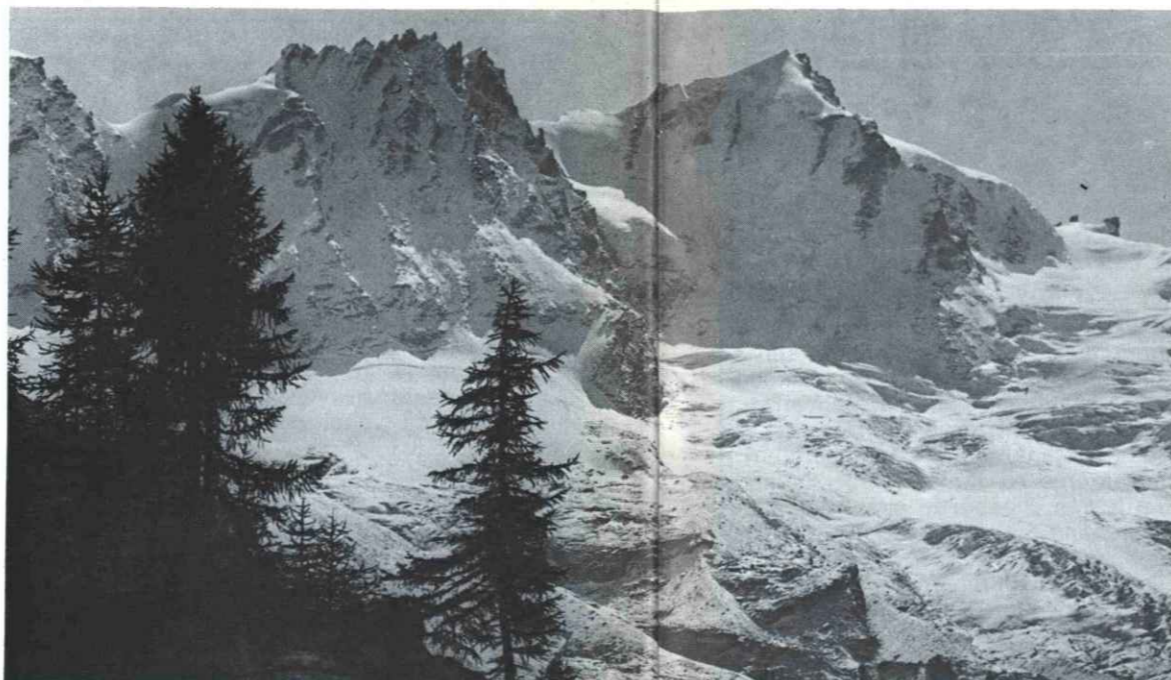
The foregoing examples highlight actions of the more than 100 nations which have established national parks or equivalent reserves in the past hundred years.

The history of the national park movement in the United States is divided into three distinct periods. The first, extending for nearly half the century, was an era of somewhat haphazard growth during which parks were carved from government-owned lands in the West. Vandalising of Indian ruins and other valuable objects led to passage by the Congress in 1906 of the Antiquities Act which gave the President of the United States authority to proclaim as «national monuments» public lands whose historical and scientific values were deemed worthy of preservation. Congress later designated some of these monuments as national parks.

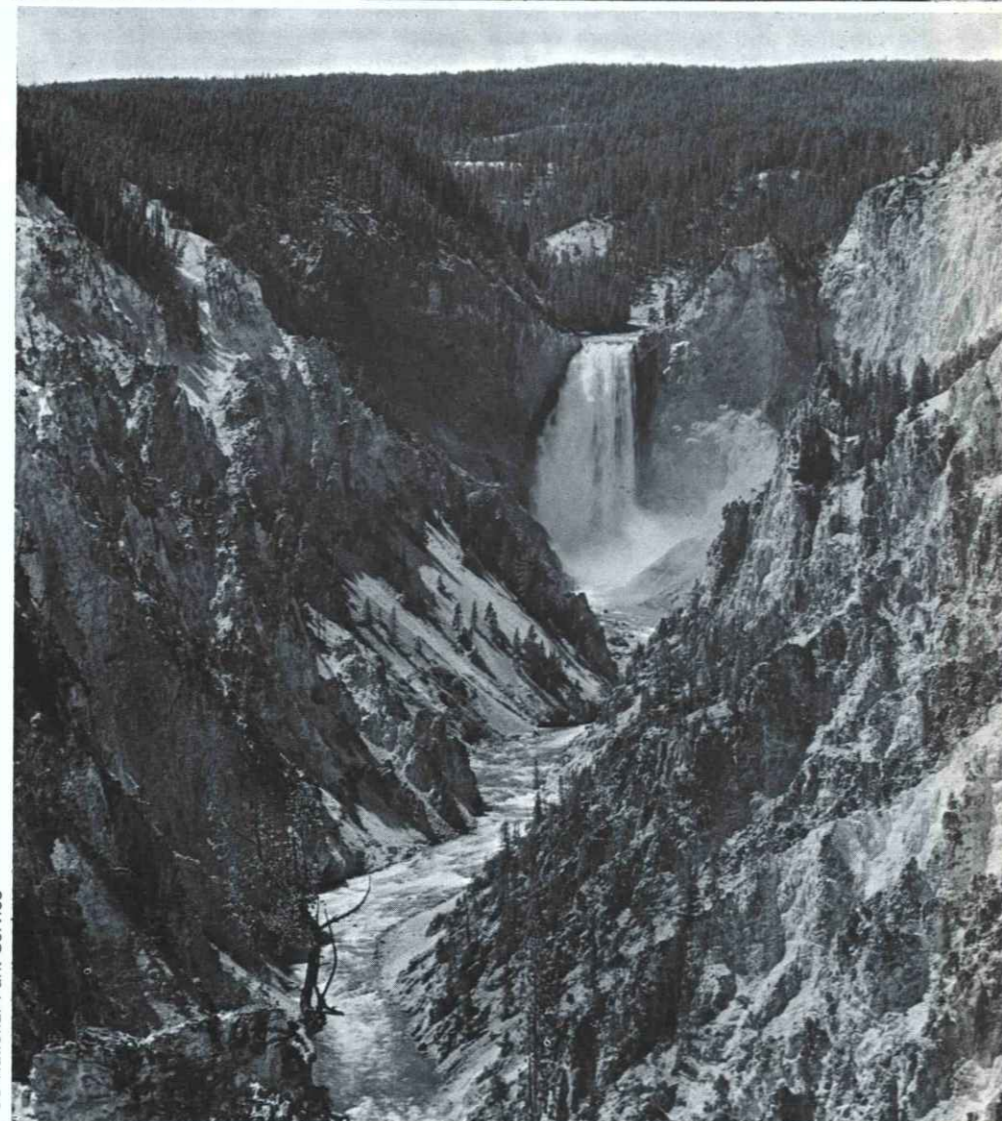
Examples of the early preserves are a forest of the earth's largest trees (Sequoia National Park), a segment of the chasm of the Colorado River (Grand Canyon National Park), a glacier-clad dormant volcano (Mt. Rainier National Park), and thousands of trees-turned-to-stone (Petrified Forest National Park).

The second period of the United States Park history began in 1916, with the establishment of the National Park Service as a bureau of the United

► **Formerly a royal hunting reserve (1856), the Gran Paradiso Park was established by decree in 1922 and by law in 1947. Sited in the north of Italy, it is typically alpine, with gigantic glaciers and coniferous forests.**



Parco Nazionale Gran Paradiso



US National Park Service

▲ **The irreplaceable splendour of Grand Canyon, Yellowstone.**



F. Rausev/LSPN

▲ **Of all west-European national parks, the Swiss National Park is certainly one of the oldest. Created in 1914, it is situated in the famous Engadine Dolomites, at the extreme east of the country.**

States Department of the Interior. During this period the attitude of the nation changed from an acceptance of the creation of scenic parks in the West to a firm commitment to a national system embracing areas of historical as well as natural significance. At the opening of this period there were 16 parks and 21 monuments. Between 1925 and 1940, Congress enacted a series of major land-use measures which expanded the scope of the National Park System to include national historic properties, national parkways, and national seashores. The number of areas in the System was almost doubled in 1933 when President Franklin D. Roosevelt transferred to it from other government departments 18 historical areas and 15 national monuments. The demands of World War II and the Korean War imposed upon the National Park System a period of restricted funding which resulted in stagnation and deterioration of physical facilities.

In 1956, the Government initiated a 10-year major rehabilitation programme known as «Mission 66». And by the end of that decade a movement was firmly underway to expand significantly the public ownership of outdoor recreation lands. The National Park Service has played a major role in this expansion, which is continuing. For the Service it has meant not only more acreage, but also widened philosophical horizons and new programmes. Seashores, lakeshores, reservoirs, and areas intended for swimming and picnicking have been added under a new administrative category — the «recreation area».

To meet the needs of a modern — largely urban — society, cultural programmes have been initiated. New historical areas have been brought into the system, and the National Park Service has been assigned leadership responsibility for preservation of historic sites throughout the nation. This period has been marked, also, by increasing contributions to the developing world conservation movement.

The park Visitor Center, as a public educational facility, has been made a feature of national parks in Italy, Switzerland, Costa Rica, Columbia, Argentina, Venezuela and elsewhere, traceable in several instances to the inspiration and data received by officials attending the International Seminar in Administration of National Parks and Equivalent Reserves sponsored by the United States and Canada. The urgent establishment of faunal reserves, together with the application of strict controls on visitor use, have sprung from official visits made to United States national wild-life refuges and national parks. Deserts, seashores and glaciated areas once ignored, are being rapidly incorporated into park systems, largely because of their success in the United States. Now as the world gains experience, a reverse flow of ideas is benefiting the United States.

A dividend of United States park policy has been the economic benefits derived from tourism. The promise of foreign exchange earnings and the improvement of local economies are important inducements for current acceleration of park establishment and increase in park funding throughout the world. At the same time, it is clear that the principal motivation behind parks — the desire to preserve and appropriately use a national heritage — has become, since the Yellowstone incident, an international philosophy guiding national park administration in nearly all countries.

# ...NEWS...NEWS...NEWS...NEWS...NEWS... FROM STRASBOURG

## ECY - STOCKHOLM - VIENNA

The widely-reported United Nations Conference on the Human Environment, held at Stockholm in June, represented another positive and encouraging step towards solving the world's environmental problems. Amongst the many important long-term decisions reached, most notable was the establishment of new structures within the UN organisation, primarily to promote international cooperation and to advise, inform, encourage and above all co-ordinate the environmental activities of specialised agencies and regional UN organisms. The Council of Europe will naturally be part of this great collective effort, having already proved itself in the environmental field over the last 11 years, as witness the success of European Conservation Year in 1970, the first large-scale conservation exercise of its kind.

Several of the Stockholm recommendations stressed the need to develop efficient information systems, particularly in and for developing countries, and for more research into pedology, pollution, legislation etc. The Council of Europe through its European Information Centre for Nature Conservation, may contribute valuable assistance here, together with its experience in the exploitation and management of natural resources, and also its previous accomplishments in the legislative field. The Council's project for a «European Convention for the Conservation of Fresh Water against Pollution» will also help realise the recommendation that co-ordinated programmes for air and water surveillance be established. The importance of each organisation acting within the sphere of its own experience figures prominently on the agenda of the Ministerial Conference on the Environment to be organised by the Council of Europe from 28-30 March 1973 in Vienna.

Since it is now obvious that world co-operation presupposes regional co-operation, the Council of Europe will intensify its environmental programmes to contribute still further to the global effort to safeguard the natural resources of the biosphere.

## THE ENVIRONMENT DEBATE

A proposal for the appointment of a European High Commissioner for the Environment, who would be entitled to make any proposals to governments concerning the protection of the environment, is to be submitted to the Ministerial Conference on the European Environment in Vienna (28-30 March 1973).

This was one of the points of recommendations unanimously adopted by the Consultative Assembly during its debate on the environment on 21-22 January 1972. The Assembly also found a general lack of co-ordination between European and international organisations in the environmental field where such action could only be effective if governmental action itself were co-ordinated. Since the success of the campaign to improve the environment depends largely on concerted international action, the appropriate international bodies should therefore be given more power in the supervision of national action for the harmonisation of regulations, norms and emission levels. A recommendation (no. 659) was also made to the Committee of Ministers, inviting all the governments of member States to adopt as soon as possible the principles of a national environment policy. The ten principles include:

- the responsibility of the polluter;
- the establishment of the departments for the control and protection of the environment;
- integration of such departments with those responsible for regional planning;
- penalisation of acts detrimental to the environment, and that the responsible local authorities be assured the necessary resources.

Governments should also be invited to ensure that European farmers be able to avoid the use of products detrimental to the environment.

The Committee of Ministers was further recommended to contribute to the UN Conference on the Environment (Stockholm 5-16 June 1972) by defining

the most urgent problems in Europe, as well as to prepare conventions and agreements on pollution control and a policy for the promotion of planning of natural areas and landscapes. Mr. Genscher, Minister of the Interior of the Federal Republic of Germany, who addressed the Assembly, stated that it was cheaper to avoid pollution beforehand than to try and rectify the situation after it had happened. He denied that experimentally-neutral products were more expensive than polluting ones and stressed that far-sighted policies were necessary if long-term arrangements for the achievement of production without pollution were to be made.

The Assembly agreed that in the future, top priority would be given to environmental questions and special attention paid to the co-ordination of all European action, the intensification of co-operation between international organisations and the promotion of the establishment of information systems in national parliaments. The Standing Conference of European Ministers of Education and the Council for Cultural Co-operation were asked to encourage environmental education at all levels.

A separate recommendation (no. 660) on the impairment of the environment and its effects on human health again called for closer co-operation with other organisations, such as WHO and OCED, for an extension of the mandate of the European Information Centre for Nature Conservation and for European legislation accompanied by strict control measures.

To reduce air pollution from motor vehicle exhaust gases, the Assembly appealed to all Council of Europe member States to ensure that environmental experts are engaged in national and international work in the field of motor vehicle transmission control. Members of the Assembly were invited to introduce in their respective national parliaments draft legislation similar to the United States Federal Standards.

A resolution on the repercussions of supersonic civil flights on the human and natural environment was finally

adopted after being referred back for further study. The terms of the resolution stated that before taking the decision of operating civil supersonic aircraft, competent authorities should await the results of scientific research into the effects on human health, animal life and climate. Supersonic flights should, in any case, not be permitted on a large scale and be banned over populated areas.

## THE ENVIRONMENT AND THE EUROPEAN MINISTERS OF JUSTICE

Mr. Pleven, Minister of Justice of France, presented at the 7th Conference of European Ministers of Justice, which took place at Basle from 15 to 18 May 1972, a report on the contribution of criminal law to government efforts to safeguard the environment.

After having briefly outlined the problem of the risk of the destruction of nature by man himself, Mr. Pleven insisted on the necessity of an action to safeguard the environment against the dangers presented by the various kinds of pollution and to protect man against these threats to his physical, biological and mental health.

The campaign to control pollution is spreading on several levels: technical — maximum pollution levels, establishment of methods for detecting pollutants and controlling the degree of pollution in products and the natural environment — but also legislative and statutory of both a deterrent and repressive kind.

This twofold legislative aim raises inevitably the question of the contribution of criminal law to general environment conservation policy.

To assess the criminal law contribution to the protection of the human environment at its true worth, it is vital that States should exchange information, for pollution recognises no frontiers. Special socio-legal research should be undertaken to define the potential role of the various penal law measures in effective conservation of the environment. The Council of Europe should lend its support to this venture, with a view to harmonising legislation, harmonisation which must constitute a major objective for all member States.

A resolution in that sense was elaborated at the end for the Conference.

## THE THIRD PARLIAMENTARY AND SCIENTIFIC CONFERENCE

Some 150 parliamentarians, industrialists, scientists, science managers and administrators met in Lausanne from 11 to 14 April, under the auspices of the Council of Europe Assembly to discuss the place of scientific research and technological application in society and the function of parliaments in forming science and technology policy. The dialogue was fruitful and wide-ranging and many detailed proposals were made, but in general the Conference's attention was focused on three main areas:

- the need to direct scientific and technological effort to objectives which society itself would lay down in a human perspective. The Club of Rome's study on «The Limits to Growth» was at the centre of discussions. It was clearly brought out that some way would have to be found of enabling decision-makers, whether parliamentarians or members of governments, to be fully aware of all the repercussions of their decisions, and of giving parliaments the means to exercise their functions properly in the technological age.
- The need to encourage co-operation in Europe on fundamental scientific research, in the social sciences as well as the «pure» sciences. The experience of some of the existing organisations was analysed, and the lessons drawn from the comparative failure of some, and the success of others like CERN. In general, participants emphasised the need to encourage ground-level contracts among working scientists.
- The need to have a coherent technological policy for Europe. This would imply establishing some sort of European machinery to frame and operate such a policy, which would include in particular the co-ordination of public purchasing policies. For this to be possible national governments would have to use much more sophisticated methods of evaluating technological effort.

The proceedings and conclusions of the Conference will be debated by the Assembly in October, when the Committee on Science and Technology will present concrete proposals for follow-up action.

Satellite view of Europe.



## A FUTURE FOR OUR PAST

The Council of Europe is to proclaim 1975 «European Architectural Heritage Year». The purpose of the year is «to protect and enhance buildings and areas of architectural or historic interest, to conserve the character of old towns and villages and to assure for ancient buildings a living role in contemporary society».

This move may be considered as the second part of the Council of Europe's campaign to improve the quality of the environment. In 1970 the Council launched «European Conservation Year» which provoked an enormous public interest in the defence of nature and resulted in a Europe-wide movement towards more rational management of land, water and other natural resources.

Now, after several years of expert studies, the organisation is determined to fight the growing threat to our architectural heritage and to provide for it a new lease of life in the modern world.

Since this operation will also require the support of public opinion throughout Europe, national committees will soon be established in each of the seventeen member countries of the Council and it is hoped that this will also occur in other European countries. The organisation wishes the campaign to be open to every European State, whether or not it be a member of the Council.



Council of Europe

## EUROPE ASSESSES ITS WATER RESOURCES

Better methods of evaluating fresh water resources to ensure more rational management of supplies were discussed by the Strasbourg Water Symposium, organised by the Council of Europe and the Louis Pasteur University of Strasbourg from 29 February to 3 March 1972. This is the first time that the Council of Europe has co-operated closely, in a scientific study of this kind concerning the environment, with institutions of higher education. More than one hundred governmental experts and scientists from fifteen West and East European countries, as well as Iran, Canada and Venezuela, took part. Several conclusions were reached:

- a permanent exchange of information on data sources, research methods and international rivers and ground water resources should be organised at European level;
- a systematic survey of the various cartographical aspects of hydrological phenomena would also be most useful;
- international co-operation in exploiting recordings achieved on the technical level should also be developed on the scientific level;
- lastly, the Symposium emphasised the great importance of national water surveillance networks.

These conclusions of a scientific and technical nature were designed to improve research and action to safeguard one of mankind's most indispensable resources, namely, water.



Council of Europe

## THE EUROPEAN DIPLOMA FOR THE ABRUZZI NATIONAL PARK

«The struggle to conserve and enhance the value of our natural heritage will never cease» — these were the words of Mr. Lujo Toncic-Sorinj, Secretary General of the Council of Europe, when he presented the European Diploma for Nature Conservation to the Italian Minister of Agriculture and Forestry on 21 May last. «Indeed it will become increasingly arduous», he continued, «and the Council of Europe wishes to be in the vanguard. In presenting the Diploma to the Abruzzi Park in recognition of its European, scientific and cultural value, I ask you to redouble your efforts to preserve for future generations this fine mountain and forest landscape, this wild-life sanctuary on which the presence of the Apennine bear confers a special distinction».



## EUROPE'S LOCAL AUTHORITIES

The Europe Conference of Local Authorities will meet in plenary session at Strasbourg at the end of September, the main theme being «The participation of the citizens, of the local authorities and of the regions in the regional planning of Europe». The chairman of the Committee for Regional Planning and Development will present the Conference's opinion on «The organisation of a European network of trunk road communications as a part of European regional planning». This report recommends, among other things, the creation of a high speed inter-city link (aerotrain) between Brussels, Luxembourg, Stras-

bourg, Basle, Geneva, where European institutions have their headquarters, as such transport has few undesirable effects on the environment. The enlargement of the Communities will form the basis of wide-ranging discussions on the report to be presented by the president of the Association of Mayors of France on «The role of the local authorities within the framework of the Council of Europe in the near future». In addition, committee work on the role of local authorities in environmental planning and protection, especially concerning city traffic, air and water pollution, is to be undertaken.

## THE EUROPEAN SOIL CHARTER

At its meeting in May 1972, the Committee of Ministers of the Council of Europe adopted the European Soil Charter.

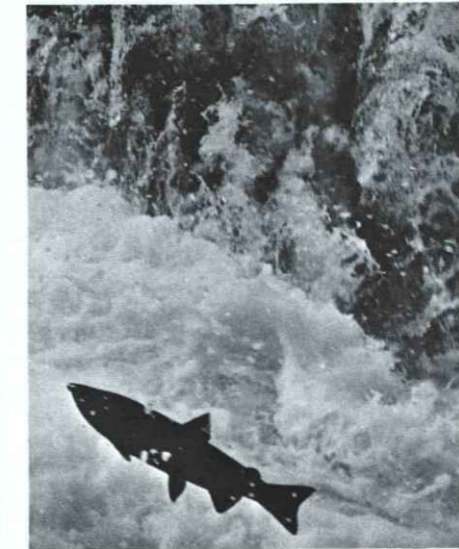
Twelve principles are laid down in the Charter. First of all, the various uses of the soil are set out, then measures for its conservation; and finally, the national and regional authorities are asked to take certain steps in conjunction with their regional planning schemes.



# SHORT NOTES

## Denmark agrees to help save the Atlantic Salmon

In February 1972 the United States announced that agreement had been reached with Denmark to curtail the salmon fishing off western Greenland. Ever since the development of this fishery in 1956-57, there has been a growing concern for the future of the Atlantic salmon. Fears that it would lead to the extinction of the species initiated a number of fishing research programmes culminating in a proposal for a ten-year ban on drift netting in known salmon feeding grounds, by the International Commission for the Northwest Atlantic Fisheries at Warsaw in June 1969. Denmark, the Federal Republic of Germany, and Sweden did not agree to this proposal. Denmark felt there was insufficient



USIS

evidence at the time to justify such a ban but agreed to restrain salmon catches and apply certain restrictions on gear and fishing seasons. Now, under the present agreement, the high seas salmon fishery by Danish flag vessels will be gradually phased out by 1976, after which it will cease altogether. The agreement also gives either government the right to request future meetings to review the status of the salmon stocks.

Although there are still fears that this action will be insufficient to save this highly prized natural resource, the fish once called «Salar the Leaper»

by the Romans, it is hoped that the decision taken by the Danish Government will set an example to other salmon-fishing countries and lead to the ultimate elimination of high-seas salmon-fishery.

## Seabirds in Danger

It is not generally realised by most Europeans that a large group of birds, the auks (*Alcidae*) living on the high seas and on isolated rock islands are in grave danger.

Dr. Bill Bourne of Aberdeen University and Baron Antoine Reille of the French League for Bird Protection state that populations of guillemots (*Uria aalge*), razorbills (*Alca torda*), and puffins (*Fratercula arctica*) are declining so drastically as to give justifiable cause for alarm.

At the end of the last century, colonies formerly estimated to number over several hundreds of thousands of these birds, such as at Ailsa Craig (Scotland), Grassholm (Wales) and the Scilly Isles (England), were already beginning to diminish.

In 1969 a national census of breeding seabirds undertaken by the (British) Seabird Group, revealed a startling decrease in colonies off Clo Mor, the Shiant Islands and especially St. Kilda of north-west Scotland and in many other areas. Before 1960, there were around three million breeding pairs of puffins on St. Kilda. Since then, and particularly in the last two or three years, the numbers have declined so rapidly that the island now supports only one-tenth of the original population. The French colonies of auks are said to be almost extinct: the most important breeding colony on Sept Isles has evolved as follows:

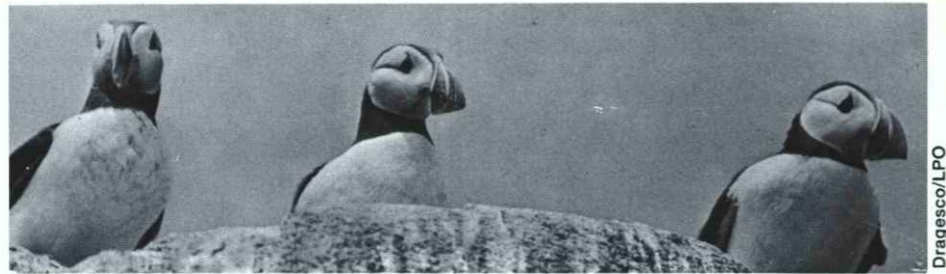
	1950	1966	1969 <sup>1</sup>	1972
puffins	7 000	3 000 <sup>2</sup>	500	440
guillemots	950	250	100	90
razorbills	350	440	150	150

<sup>1</sup> the year of the Torrey Canyon disaster;  
<sup>2</sup> this figure represented 95% of the French puffin population.

The reasons for this decline are not certain, although it is believed that oil pollution, poisoning by toxic chemi-

cals and perhaps disease or changes in conditions at sea are involved. Moreover, many seabirds are trapped and drowned in the nets of salmon fishing boats on the high seas — half a million Brünnich's guillemots died in this way last year.

**Puffins — high-sea birds, victims of the changing environment?**



Dragesco/LPO

## Conservation Programme for World Wildlife

The World Wildlife Fund has published its Conservation Programme for 1972-73. The 104 projects were selected with the scientific advice of the IUCN who originated many of them.

The WWF and IUCN will combine their efforts to promote environmental education: projects include the preparation of method books for teaching at primary and secondary school levels as well as popular publications and international exhibitions.

Among the species covered by the WWF projects are polar bears, vicuña, turtles, eagles and tigers. The main project involving the tiger is the establishment of a sanctuary in the Chitawan Park in Nepal. As a further part of the effort to control or avert the intense pressure on wild cat populations in general, as a result of the fur trade, financial support is being given to field studies of jaguars, leopards, ocelots and cheetahs.

The WWF have also announced the establishment of a special Fund for Biotype Acquisition, for the setting aside of land in its natural state for conservation «for scientific, cultural, educational, aesthetic and economic purposes». Among the numerous biotype projects are: the conservation of various wetlands throughout Europe; the protection of the cloud forests of Guatemala and Panama; virgin forests in Nepal, Indonesia, Peru and Brazil, islands in the Galapagos and Seychelles and Lake Nakuru in Kenya — one of the most dramatic examples of a threatened biotype. Farm chemicals and pressure for settlement threaten not only the singularly spectacular gathering of over a million Lesser Flamingoes, pelicans and storks, but also the destruction of the whole ecosystem of the National Park itself.

## The European Working Conference on Environmental Conservation Education

The first European Conference on Environmental Education was held on 15-18 December 1971 at Rüschlikon, near Zürich, Switzerland, and attended by specialists on environmental education — scientists, administrators, teachers and other educators. Besides clarifying general concepts, surveying the present situation and pointing out the needs, the conference formulated specific recommendations for projects and programmes in environmental education related to primary and secondary levels, teacher training, higher education and out-of-school education.

It was jointly organised by the International Union for the Conservation of Nature and Natural Resources (IUCN) and the World Wildlife Fund (WWF) with the support of numerous other organisations. Under the Chairmanship of Dr. L. K. Shaposhnikov (USSR), the participants considered that the Conference had provided an invaluable opportunity to exchange information on the methodology and implementation of environmental education in the different European countries. The Conference proposed practical programmes in environmental education adapted to meet the needs of education systems in a wide variety of situations.



Prof. A. Carr / WWF

Among the recommendations put forward, the following are of special interest: with respect to out-of-school environmental education for children and youth, it was recommended that the governments should make it possible for individuals to give service to the community in the form of work in the environment field as an alternative to military service.

It was further proposed that European governments contribute to an international trust fund for youth activities in environmental conservation at a European level, to be administered by the Council of Europe and the Council on Mutual Economic Assistance.

With respect to teacher training, which was given special attention, it was recommended that efforts be made to develop in the teacher a critical awareness of environmental problems to enable him to provoke responsible attitudes concerning environmental matters in his pupils; and that environmental conservation be recognised as an essential part of teacher training. Special training courses of youth leaders, «animateurs» and other informal educators in environmental conservation should also be organised as a matter of urgency.

**Tracking radio being wired to shell of mature green turtle.**

## NATURE IN FOCUS LOOKS AT BOOKS



### PROTECTION OF THE NATURAL ENVIRONMENT

The Division for the Protection of the Natural Environment of the Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forêts et l'Équipement Ruraux — CERAFER, of the French Ministry of Agriculture, presents in album form the activities of 15 countries concerning the protection of the natural environment. Precise information is given about national parks, natural reserves and the management of protected zones.

Each country is considered within its own geographical, economic and political framework. The reports themselves are supplemented by a large number of illustrations, maps and diagrams which allow a visual realisation of most of the work from each country.

An addendum gives a list of the principal protected sites in the form of natural parks in Europe.

The 15 countries concerned in these reports are: Belgium, Bulgaria, Denmark, the United States, Finland, Great Britain, Italy, Japan, the Netherlands, Federal Republic of Germany, Rumania, Sweden, Switzerland, USSR and Yugoslavia.

**La Protection de la Nature  
Ministère de l'Agriculture  
Département de Protection  
de la Nature, CERAFER  
[Text in French]**

### SOCIALISATION OF THE NATURAL ENVIRONMENT

In a study of the economic and political aspects of man's natural environment, the author accuses a society fascinated by materialism, liberalism and urbanisation of being the main contributory factor in the destruction of our environment. He advocates that any attempts to stop this damage will require a total reform of society by a «socialisation of the natural environment» — which would involve the creation of an authority in favour of nature and not on nature. Similarly, there would have to be a new policy on industrial expansion, environ-

mental planning and international relations, in order to avoid an increase in poverty which would eventually and inevitably lead to revolution.

**Socialisation de la Nature  
Philippe Saint Marc - Editions Stock, 1971  
[Text in French]**

### WHALES, DOLPHINS AND PORPOISES

As a rare bi-product of a lifetime of sea voyages, Dutch Captain Mörzer Bruyns has produced a «Field guide of whales and dolphins». A fascinating book and unique in nature, it summarises the author's observations made during some forty years at sea. The excellent drawings in this work will be, for many readers, their first encounter with this mysterious group of animals which, through overhunting and the pollution of the environment, may soon become yet another threatened aspect of our environment.

Through knowledge, more understanding may be created and this Guide should certainly stimulate this interest.

**Field guide of Whales and Dolphins  
Captain W.F.J. Mörzer Bruyns  
Uitgeverij tor/ n.v. uitgeverij v.h. c.a. mees  
Ziesenslade 1411  
Amsterdam (Netherlands)  
[Text in English]**

### MANUAL ON GERMAN WATER LAW

The Manual on German Water Law, formerly edited by Professor Wüsthoff and continued by Professor W. Kumpf, has appeared in 6 volumes between 1958 and 1971 and gives a virtually complete survey of the legal provisions applicable in the Federal Republic of Germany concerning the use and protection of its waters. All aspects of the use of fresh waters and the sea-shore and protection against pollution are covered, including, for instance, traffic on waterways, construction laws, taxation, as well as measures against various forms of pollution.

The manual comprises the Federal acts in force, among which the act on the use of waters (Wasserhaushaltsgesetz) and the act on Federal waterways (Bundeswasserstrassengesetz) may be mentioned; both acts are accompanied by commentaries.

Moreover, this Manual contains the pertinent acts of the Länder, which, according to the Constitution, are competent to pass legislation in this field. A certain number of legal provisions no longer in force which may still be important for established rights of users, are also reproduced. It contains furthermore certain international agreements. It is completed by a se-

lection of important court decisions in the field of water law.

The publication in loose-leaf form allows for constant updating.

**Handbuch des deutschen Wasserrechts:  
Wüsthoff-Kumpf  
6 volumes, loose-leaf edition 1958-1971  
Erich Schmidt Verlag, Berlin  
[Text in German]**

### SPLENDOURS OF THE SEA

Although sea shells are naturally photogenic, the impeccable photography and the thought put into the design and layout of this book, have made it a work of art. The numerous illustrations, including both black and white photographs and hand-tipped colour plates, reveal the fascinating world of the sea shells with their tremendous variety of shapes, colours, structures and textures. A short description of the physical characteristics and habitats of each species supplements every picture. A longer introductory text deals with points of more general interest, such as the role of shells in history, shell lore in different cultures and the influence of shell form on art. Thus the subject is considered in depth but at the same time in terms sufficient for the general reader, who cannot fail to be intrigued by these wonders of the sea.

**THE SHELL: Five Hundred Million Years of Inspired Design. Hugh and Marguerite Stix, and R. Tucker Abbott. Photographs by H. Landshoff.  
Published by Harry N. Abrams, Inc., New York.  
[Text in English]**

### WATER POLLUTION — A WORLD PROBLEM

Legal, scientific and political aspects of water pollution were discussed at a Conference held in July 1970 at the University College of Wales.

The report of the Conference includes the papers which were delivered on a wide range of subjects, including, pollution by nuclear and thermal waste, oil, chemicals, pesticides and sewage.

In addition, the discussion on these papers has been included in this report and provides a great deal of valuable information. Probably due to the exclusively Anglo-Saxon participation in the Conference undue emphasis has been placed on pollution problems in the North Atlantic areas. In fact, other regions are hardly touched upon at all. With this reservation in mind the publication presents valuable reading to experts and laymen alike.

**Water Pollution as a World Problem  
David Davies Memorial Institute  
of International Studies Europa Publications,  
London 1971 [Text in English]**

# ZUSAMMENFASSUNGEN

## BODENERHALTUNG IN EUROPA S 2

Frédéric Fournier  
Generalinspekteur des wissenschaftlichen  
und technischen Forschungsbüros Obersee,  
Versailles, Frankreich

Als eine der lebensnotwendigen Aufgaben des Menschen auf dem Gebiet der Umwelterhaltung gilt die Abwendung von Bodenerosion, von Erschöpfung und biologischer Verarmung des Bodens. Die drastischen Auswirkungen der Naturerosion lassen erkennen, dass das Problem der Bodenerhaltung von den traditionellen Agrarländern nicht ausser acht gelassen werden darf. Die unbedenkliche Anwendung entwickelter landwirtschaftlicher und industrieller Produktionsmethoden zum Zweck der Ertrags- und Gewinnsteigerung wird nur noch stärker zu Erosion, Verschmutzung und biologischem Ungleichgewicht beitragen. Unterrichtung der Öffentlichkeit über die Bodenarten, ihre laufende Schädigung und die noch ausstehenden Gefahren tut not. Erst dann können Möglichkeiten zur Lösung dieser Probleme erwogen werden.

## BODENBIOLOGIE — S 3

Jacques Brakel  
Leiter des Forschungszentrums  
für Hülsenfruchtpflanzen (IRISA)  
Staatliche Landwirtschafts-Hochschule,  
Gembloix (Belgien)

Unser Erdboden ist belebt. Die Tätigkeit von Mikro-Organismen — viele von ihnen lebenswichtig für den Menschen — ist mannigfaltig: sie verarbeiten Sand und Ton zu Grundsubstanzen des Bodens; ihre Tätigkeit ist entscheidend für den Stickstoff-Kreislauf. Freier atmosphärischer Stickstoff wird im Boden von AZOTOBACTER oder CLOSTRIDIA gebunden; dies ebenfalls durch Symbiose von RHIZOBIA und Hülsenfruchtpflanzen. RHIZOBIA setzen totes Proteinmaterial in Ammoniumsalze um, die von einer zweiten Bakteriengruppe in Nitrite und von einer dritten Gruppe in Nitrate verwandelt werden. Andere Bakterien vervollständigen diesen Kreislauf durch Umsetzen von Nitraten in atmosphärischen Stickstoff. Alle Pflanzen ausser Hülsenfruchtpflanzen benötigen diese Nitrate und Ammoniumsalze für ihren Stickstoffhaushalt. RHIZOBIA sind wichtig für Symbiosebindung in Wurzelknollen: Böden ohne Rhizobia können mit Laborkulturen dieser Bakterien angereichert werden. Die Tätigkeit von Mikro-Organismen wird vom Menschen und seiner Einwirkung auf die Umwelt beeinflusst. Abfallpapier beispielsweise, von Ausflüglern zurückgelassen, würde zu Halden anwachsen, würde es nicht von CELLULOLYTIA abgebaut (wie von zwei weiteren Bakteriengruppen), und durch klimatische Einwirkung vernichtet. Allerdings können die Mikro-Organismen im Erdboden keine Plastikstoffe vertilgen. Schädliche Auswirkung auf Mikro-Organismen hat die zunehmende Verwendung von Insektenvernichtungsmitteln; künftig sollten deshalb nur «bio-degradables» zur Verwendung kommen.

## BODENEROSION DURCH WASSER UND WIND — S 6

Prof. Dr. Dr. Eduard Mückenhausen  
Professor für Bodenforschung,  
Universität Bonn

Bodenerosion ist die Fortbewegung von Erdreich durch Wasser und Wind. Von Einfluss sind Bodenneigung, Niederschläge, Pflanzenwuchs, Bodenbeschaffenheit und Bodenbewirtschaftung.  
**WASSEREROSION**  
In West- und Mitteleuropa, wo Niederschläge über das Jahr gleichmässig und selten als Wolkenbrücke fallen und wo die Bestellung quer zur Hangneigung erfolgt, bleibt die Wassererosion gering. In Südeuropa dagegen kann sie bedeutend sein — besonders wo Frühjahrs- und Herbstregen auf zu stark abgraste, ausgetrocknete Böden fallen und diese unverzüglich abschwemmen. Die Art

der Kulturen auf stark geneigten Hängen ist ebenfalls von Einfluss: in Nordeuropa, wo weniger bekanntes Land mit Wald und Graswuchs bedeckt ist, greift Erosion kaum um sich. In den Flachlandkulturen Osteuropas ist sie unbedeutend. Demgegenüber ist die Erosion in den Steppenkulturen (Schlammböden) Südosteuropas beträchtlich.  
**WINDEROSION**  
Voraussetzung hierfür ist, dass der Wind lockere Bodenpartikel direkt erfassen kann. Das Ausmass der Winderosion hängt ab von der Pflanzendecke und der Grösse dieser Bodenpartikel. Winderosion ist geringfügig in Europa und auf relativ kleine Gebiete beschränkt, wie z.B. Marschfeld bei Wien.

## BODEN-KARTENKUNDE UND UNWELTPLANUNG — S 9

Marcel Jamagne  
Abteilung für Bodenstudien und Bodenkartographie von Frankreich, Nationales Institut für landwirtschaftliche Forschung,  
Versailles, Frankreich

Rationelle Landnutzung erfordert wirkliche Kenntnis der Eigenschaften des Bodens, seiner strukturellen, physikalischen und chemischen Besonderheiten und seiner geographischen Lage. Die Bodenkarte gibt hierüber den besten Aufschluss und spielt deshalb in der Bodenkunde eine wichtige Rolle. Diese Wissenschaft befasst sich mit der Untersuchung von Böden im Hinblick auf deren qualitative Eigenarten sowie Nutzung und Bewirtschaftung. Die Probleme der Landvergabe, Regionalplanung und Umwelterhaltung hängen ab von sozialen und wirtschaftlichen Bedingungen einerseits, und der Grösse der zur Verfügung stehenden Flächen, landwirtschaftlichen und industriellen Erfordernissen andererseits. Bodenkarten zeigen die verschiedenen Bodenqualitäten auf und lassen mögliche künftige Bodenveränderungen (Erosion) erkennen, und können als Grundlage für Entscheidungen in den vorgenannten Fragen dienen. Bodenkarten variieren im Massstab je nach dem erforderlichen Zweck. Kleinere Massstäbe werden verwandt für Globalübersichten, mittlere Massstäbe in der Regionalplanung und grosse Massstäbe zur Entscheidung über Landnutzung und Naturschutzmassnahmen. Ein Klassifizierungssystem für die Bodenqualitäten weist ähnliche Variationen auf. Für die Umwelterhaltung spielt die Bodenkartenkunde deshalb eine wichtige Rolle. Nach anfänglicher Entwicklung nur im nationalen Bereich scheint sie jetzt auch über die Grenzen hinweg Beachtung zu finden. Sicher wäre es von Vorteil, wenn von einer internationalen Arbeitsgruppe — zumindest für Europa — eine Bodenkarte für unsere Bodenschätze erarbeitet und auch die Regionen festgelegt würden, die des Naturschutzes bedürfen.

## EUROPAS BLUMEN IN GEFAHR S 12

Franklyn Perring  
Biological Records Centre, Monks Wood  
Experimental Station,  
Huntingdon, Grossbritannien  
S. Max Walters  
Botany School, Cambridge, Grossbritannien

Etwa 20 000 Arten wildwachsender Blumen in Europa sind in Gefahr auszusterben. Dabei handelt es sich um drei Pflanzengruppen:  
— die typisch europäischen Arten,  
— die weiter verbreiteten Arten, und  
— solche Arten, die in einzelnen Ländern selten vorkommen.  
Der Hauptgrund für diese Entwicklung ist der Verlust geeigneter Umweltbedingungen. Einzelne Länder haben die betroffenen Pflanzenarten und ihre Standorte bereits erfasst; zur Erhaltung dieser Pflanzen in Europa ist eine umfassende Unterrichtung der Öffentlichkeit erforderlich. Da Pflanzen nicht immer in ihrer natürlichen Umgebung geschützt werden können, ist mitunter ihre Aufzucht in botanischen Gärten nötig. Damit wird es mög-

lich, bestimmte Arten wieder in die freie Natur zurückzuführen, sobald die Gefährdung behoben ist. Eine Angleichung der gesetzlichen Schutzvorschriften in den einzelnen europäischen Ländern ist hierfür jedoch unumgänglich.

## UMWELTSCHUTZ IN GROSSBRITANNIEN — S 16

Peter Walker  
Stellvertretender Staatssekretär im Ministerium  
für Umweltschutz, Grossbritannien

Im November 1970 hat Grossbritannien als erstes Land der Welt ein Ministerium für Umweltschutz eingerichtet. Acht Minister sind in dieser Dienststelle tätig, der sechs Forschungslabore angehören. Aufgabe dieses Ministeriums ist es, im Hinblick auf eine Verbesserung der Lebensbedingungen die Entwicklung schädlicher Umwelteinflüsse zu bekämpfen. Zu 80 % lebt Grossbritanniens Bevölkerung in Städten. Eine der ersten Massnahmen des neuen Ministeriums war deshalb eine Neuordnung der Wohnungsbaufinanzierung mit dem Ziel, grössere Geldmittel für die Beseitigung von Slums bereitzustellen zu können. Die Zusammenarbeit zwischen Industriebetrieben und dem «Alkali and Clean Air Inspectorate» hat es möglich gemacht, auch Probleme der Umweltverschmutzung aufzugreifen. Als erstes Ergebnis zeigt sich eine beachtliche Verbesserung der Qualität von Luft und Trinkwasser. Die Erhöhung der öffentlichen Ausgaben wird diese Resultate weiter verbessern. Ein Programm wurde festgelegt zur Verbesserung der Böden in aufgegebenen Gebieten, Bestimmungen erlassen gegen das Abblasen von Hochofenstaub sowie zur Einschränkung von Lärm, Rauch und Dampf aus Kraftfahrzeugen. Darüber hinaus ist es nötig, das Vorrücken der Industrie in Erholungsgebieten einzuschränken, um die Schönheit von Naturgebieten zu erhalten. Die Regierung Grossbritanniens ist bereit, bei internationalen Verhandlungen über diese Probleme eine führende Rolle zu übernehmen.

## EIN JAHRHUNDERT NATIONALPARKS — S 19

Edwin Winge  
Informationsbüro des US - Innenministeriums,  
National Park Service, Washington

Der Gedanke des Nationalparks ist hundert Jahre alt. Der erste Nationalpark der Welt, Yellowstone in den USA, wurde am 1. März 1872 geschaffen. Mehr als 100 Staaten haben seither Nationalparks oder ähnliche Naturschutzgebiete eingerichtet. Ursprünglich wurden die Nationalparks im Westen der USA auf Regierungsgelände vorgesehen. Nach der Gründung einer Nationalparkverwaltung (National Park Service) im Jahre 1916 ging man dazu über, in die Naturparks auch Gebiete von historischer Bedeutung einzubeziehen. Der Kongress hat zwischen 1925 und 1940 eine Reihe von Massnahmen getroffen mit dem Ziel, die Parkanlagen zu erweitern und historische Bauwerke und Meeresküsten einzuschliessen und Wanderwege anzulegen. Diese Entwicklung geht weiter; inzwischen haben auch andere Länder, wie z.B. Japan, ein Nationalparksystem mit ähnlicher Verwaltung entwickelt wie die USA.

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