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EDITORIAL

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An international meeting of experts specialising in problems associated with the impoverishment in plant species of numerous natural environments in Europe took place at Arc-et-Senans, France, in November 1973, under the patronage of the Secretary General of the Council of Europe.

It was thanks to the Claude-Nichols Ledoux Foundation and its Centre for Reflection on the Future and to the initiative of the French Ministry for the Protection of Nature and the Environment, now the Ministry for the Quality of Life, that these biologists from the different European countries were able to meet. Why such concern today ? Why should scientists and managers alike now be giving priority to the study of this impoverishment, to research into its past and present causes and, above all, to providing remedies ?

Without attempting to reply to all these questions, we may at least offer several explanations. This is one of the functions of "Naturopa".

The disappearance of a flower or an animal from some small area in Iceland, France or Greece is not merely as is often thought, a trivial event of interest only to a few, sometimes too few, specialists aware of the existence of such species in these areas ; it is the sign of more radical changes and — as demonstrated for the whole of Europe by the Arc-et-Senans Symposium — of the start of a general process of deterioration indicating that serious upheavals are taking place in man's physical environment, or to be more precise, environments, for they are essentially varied. These natural environments represent the balance achieved over thousands of years between the physical and the living world, a balance which specialists are today attempting to penetrate by analysing what they term the "ecosystems".

Europe's natural environments are characterized by a great diversity in their biological and aesthetic features. From one end of the continent to the other the contrasts are striking. Mostly homes of ancient civilisations (the countries of Europe) often display diversity of another kind, superimposed on the multiplicity of natural landscapes : that wrought by man on the environment as a result of his manifold activities. Hence the origin of that infinite variety of features, exemplified by the so-called "terroirs" in France which impart, or rather used to impart, a remarkable element of originality. Human influence has varied considerably from one region or environment to another, but can be considered to have existed practically everywhere.

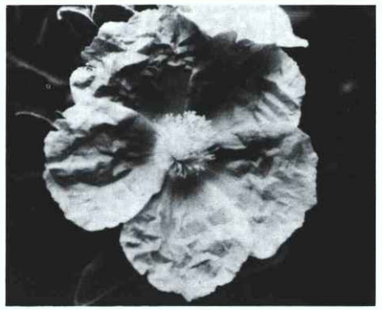
Europe also presents an astonishing mosaic of scenic vegetation — the plant world's response to the influence of ecological conditions. The "far north", Lapland for example, is characterized by a tundra landscape : a frequently frozen soil produces stunted birches and willows; vast stretches remain permanently frozen ; the plains consist of expanses of peatland and screes, both bedecked in summer with colourful carpets of flowers found further south only on the highest mountains : saxifrage, dryas, creeping azalia and different varieties of cottongrass. Further south, approximately on the same latitude as the Arctic Circle in Scandinavia, is the timber line with forests composed mainly of birch trees and conifers, quite small at first. The ground is carpeted with bilberries, club-moss, ordinary mosses and lichens. The great boreal forest, or taiga, forms a wide belt extending from Norway across Siberia. Still in its natural state, often very dense and practically impenetrable in places, it is a magnificent forest of immense biological and economic value.

To the west of Norway and south of Sweden begin the forests of Central Europe : the Norway pine and spruce are gradually replaced by deciduous trees : beeches and oaks which, in their strictly natural state, populate the forests in equilibrium with their environment throughout the lowlands of Western Europe.

The mountain ranges bring an element of contrast to these regions : species peculiar to the mountains of Europe give a distinctive character to numerous ranges : the firs in the colder Alpine regions and the northern Pyrenees, the larch in the drier regions of the Alps and the silver pine at high altitudes. Above the tree line are the grasslands, infinitely rich in flora, or moorlands, frequently covered with rhododendrons. The vegetation at the summits consists of low-growing species with large, very colourful flowers — the alpine plants with which we are all familiar : the gentian, campion, crocus, snowbell, edelweiss and anemone. Each mountain range in Europe has its own characteristic species which are found nowhere else. Hence the splendid multiplicity of colours and shapes which reflects the genetic originality of endemic mountain flora. The great mountain barrier formed by the Pyrenees, the French Massif Central, the Alps and the Carpathians, which separates Northern from Southern Europe more or less isolates the Mediterranean world. It is a totally different kind of world : the dry summers and mild climate create very special ecological conditions ; the natural Mediterranean forest consists mainly

of evergreens, such as the holm oak and cork oak, and the dozens of small trees associated with them. This natural Mediterranean forest has been seriously degraded : many forests of pines, a poorer species, have been planted, often after fires ; numerous garigues with thyme and rock roses mark stages of impoverishment culminating in the rocky wastelands which abound all round the Mediterranean. All vegetation in Europe is at present under intense pressure from the expansion of what is often termed the "technosphere", that artificial world of concrete and metal which is a characteristic feature of our modern civilisation. But in a number of regions certain influences are undoubtedly more serious than others, and the simultaneous disappearance of numerous plants provides us with proof of the magnitude and seriousness of such phenomena. Thus throughout the whole of Central Europe the flora found in the wetlands (lakes, ponds, streams, bogs) is in decline : certain species have disappeared from entire regions or else their geographical boundaries have receded, in some cases by several hundred kilometres. An urgent rescue operation must be mounted to safeguard the remaining marshes and peat-bogs, for the disappearance of wild water-plants is also the sign of a change in the composition of the water, and, in many cases, of pollution or eutrophication, ie an abnormal overall increase in organic matter. Other plants which are in extraordinarily rapid decline are the adonises and nigellas, found on cultivated land ; in some cases even the cornflower and poppy have disappeared from a number of regions as a result of the use of weed-killers and of pesticides in general (the indirect effects of these on both fauna and flora are undeniable).

A further category of European plant, which includes certain very rare and geographically very restricted species, has for some years been in considerable danger of extinction : these are the coastal species found in the dunes, trampled underfoot and uprooted (alpine sea-holly, sand lily) and also the species found in salt-marshes, frequently selected as industrial sites. The shores of the Mediterranean, long subjected to disastrous coastal urbanisation and now today the Atlantic coast as far north as Brittany and Normandy, are in danger of losing all their attraction by becoming veritable walls of concrete. At the present time, certain forest ecosystems may well be at risk if they are compressed to such an extent that they are unable to withstand pressure from the artificially planted conifers.



Cistus albidus *(Cystaceae), one of the prettiest of the genus found in the Mediterranean maquis and matorral shrub communities.*

The disappearance from a number of regions of epiphytic lichens and probably mosses as well, is evidence of the increase in air pollution. The Council of Europe, like more specialised bodies such as national departments for environment protection and the International Union for the Conservation of Nature and Natural Resources, has encouraged joint action on urgent problems affecting European flora and vegetation ; it did so in the case of the "bocages", man-made hedgerow landscapes of great diversity and biological interest — veritable sanctuaries bearing witness to an ancient form of nature in many regions, but seriously impaired as a result of land consolidation — and again in the case of the Mediterranean "maquis" at present under increasing pressure.

The Council's aim in promoting joint European action is the ultimate establishment of a coherent protection policy throughout the entire continent in order to preserve the natural wealth which constitutes our common heritage, a heritage that is very often an irreplaceable source of reserves for the future.

The protection of these European plant and animal species is also vital to preserving an adequate degree of genetic diversity for man. That is why it is not enough to compile inventories of species in decline or threatened with extinction, as symposia of experts like those held at Arc-et-Senans have done : it is essential at this stage to concentrate on establishing a proper ecological policy at European level. An ecological policy involves not only the protection of rare or threatened species or the creation of essential nature reserves or national parks but also the execution of a co-ordinated plan of action to secure for the inhabitants of Europe the perpetuation of the manifold biological and natural environments around them which represent a unique feature of their irreplaceable heritage and the heritage of the civilised world.

THE MEDITERRANEAN FLORA MUST BE SAVED

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As Man has grown out of his primitive state of being a constituent element of nature's ecosystems in order to use them to his own ends, he has brought about the progressive destruction of his environment. The damage has taken diverse forms varying with circumstances and modes of life. Fire and overgrazing are the main forms of destruction, leading to the denuding and erosion of the soil with which we are familiar today.

In addition to these already ancient forms of destruction and impoverishment, man has devised other equally dangerous forms such as deforestation, the cultivation of steep slopes, the use of chemical fertiliser and pesticides, unplanned urban expansion, etc.

While all these forms of exploitation of the environment by man imply a great threat to his own survival, the Mediterranean area is undoubtedly one of the world's regions in which the consequences of haphazard development can be the most catastrophic. The Mediterranean climate has particular characteristics which mean that damage can be irreversible. Forest growth in this area is delicately balanced, and once this balance is broken it cannot be regained. It is sometimes said that the Mediterranean area is fundamentally hostile to sylviculture. Thus the destruction of natural forests and other types of vegetation leave the way open to soil erosion, which, with the help of irregular but heavy rainfall, leads to the impoverishment and sterilisation of the environment and, finally, to desert conditions.

Faced with these prospects, which are already becoming unfortunate realities, we must give some thought to the difficulties of reafforestation, and to the general recuperation of the natural environment.

Agriculture in the broadest sense, together with demographic concentration and the resultant urban expansion, have gradually become the most powerful forces in the destruction of natural flora and vegetation, and to these factors may be added the more recent development, exponential in its growth, of tourism.

Subsistence agriculture, in which pasturage and cultivation of grain have been pushed to an extreme, the uninterrupted growth of cities, which have absorbed acre after acre of primitive vegetal growth, the proliferation of leisure sites and tourism particularly in mountain regions and along the coast, with more attention paid to preserving capital than preserving nature, have been the key agents of the destruction of many rare or even endemic plants, belonging to vegetal groups of great scarcity and interest for which the perturbation of the natural environment means the risk of extinction.

These dangers are all the more serious in the case of the Mediterranean region in that its local climatic conditions have fathered particular plants and vegetal species which are to be found nowhere else in the world. The wealth of endemic species in the Mediterranean area is astonishing. One may form an idea of their extent by considering the European sector by itself and limiting data to the species given in the first three volumes of the *Flora Europaea.* Suffice it to say that out of a total of 2,086 endemic species in Europe, 1,639, or almost 80 %, are Mediterranean : in other words, four out of five endemic species in Europe are therefore Mediterranean plants !

In Spain, France, Italy, Greece and the other countries bordering the Mediterranean, the total number of endemic species runs into hundreds and even thousands (representing, in fact, almost a third of the endemic species of the European part of the region). In Spain, for example, *Teucrium* has 20 endemic species and *Sideritis* 15 of the 28 European species ! Mention could also be made of the wealth of endemic species in Portugal, like the *Narcissus, Armeria, Cistus, Silene* and others. Among its 116 endemic species figure the wonderful *Linaria algar-*

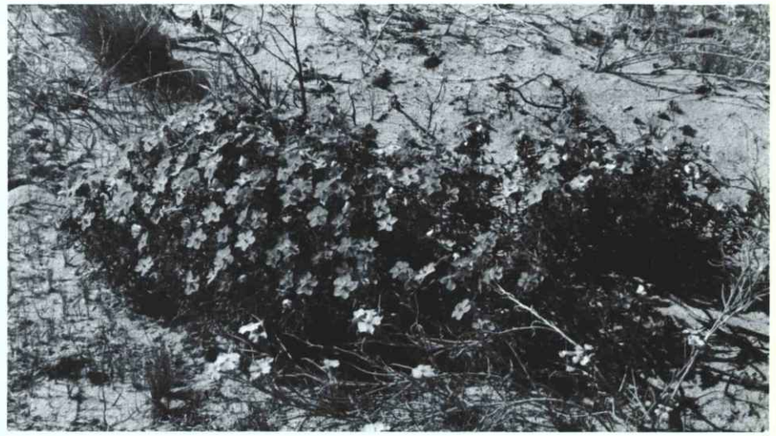
viana, L. coutinhoi, L. ficalhoana, L. lamarckii and *L. ricardoi,* of which most belong to the vegetal groups typical of sandy areas on the coast. This diversity of flora is of great interest for many reasons, be they scientific, aesthetic or other, the whole constituting an additional testimony to the value of the Mediterranean area. What a tragedy it is, then, that destructive forces have caused the extinction of many rare plants and are posing a threat to still others, almost always because of ignorance or immediate economic interests, at the expense of the aesthetic and spiritual value, and the scientific and even economic potential, of local flora !

How many endemic species have already disappeared as a result of erratic development of Man's relationship with his environment, and how many others are now in their turn on the way to extinction ? Spain and the other Mediterranean countries, so rich in endemic plants, have already lost some of these valuable species. The areas containing others have been successively consumed, in particular along the immense coastline where urban expansion and tourism exercise a heavy pressure, daily increasing the danger of extinction.

Portuguese flora has been subject to the same destructive processes. Among others, the endemic species *Onosis cossoniana* and *Hedysarum flexuosum* have disappeared from the Troia peninsula, at the mouth of the Sado River where the growth of tourim has put an end to the harvesting of these plants for many years past. Elsewhere the attractive autumn daffodil *(Narcissus serotinus)* has disappeared from the Algarve region which was for a long time the only known area where this species grew in Portugal.

In the south, for example, on the Monchique mountain range, the *Quercus canariensis* which exists in this area only, is threatened with extinction because of the timber industry. The other feature of this ancient climatic mountain forest is the *Senecio grandiflorus,* a fine local Lusitanian endemic species which is also now very rare and has taken refuge in spots where the destructive influence of man has penetrated only slightly or not at all.

Many other species, endemic or otherwise, are also rare and at least for the present are in a very perilous situation with their survival much in doubt. Among these, the majestic *Echium boissieri* which grows in chalky soil is in the process of becoming extinct around Elvas because of heavy ploughing by tractors. The *Astragalus algarbiensis, Narcissus calcicola* and *Narcissus fernandesii, Limodorum abortivum* and *L. trabutianum, Cheilanthes vellea, Loeflingia tavaresiana, Euphorbia monchiquensis, Tuberaria major, Silene rothmaleri* and *Cistus palhinhae* and many others are in need of effective protection if they are not to face extinction.



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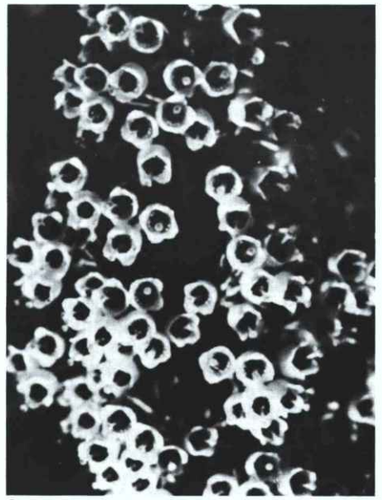
1 Anagallis monelli *var.* trojana - *Lusitanian endemic of the dunes of the Troia peninsula.*
2 Limodorum arbortivum - *one of the numerous Portuguese species needing effective protection to prevent its complete disappearance.*
3 Quercus canariensis - *found in Portugal in the Serra de Monchique only, a species threatened with extinction due to exploitation of its wood.*
4 Lepidophorum repandum - *particular to Portugal, found in sunny coastal regions. Fairly common but very localised on the European scale.*
5 Armeria pungens *(Plumbaginaceae) - one of the most beautiful species to be found in the coastal communities of Portugal.*
6 Pancratium illyricum (Amaryllidaceae) - *particular to the Western Mediterranean.*
7 Morisia hypogea - *a curious member of the cress family particular to the Western Mediterranean (particularly Corsica and Sardinia, thus very restricted in Europe). Synonym :* Morisia monanthos.



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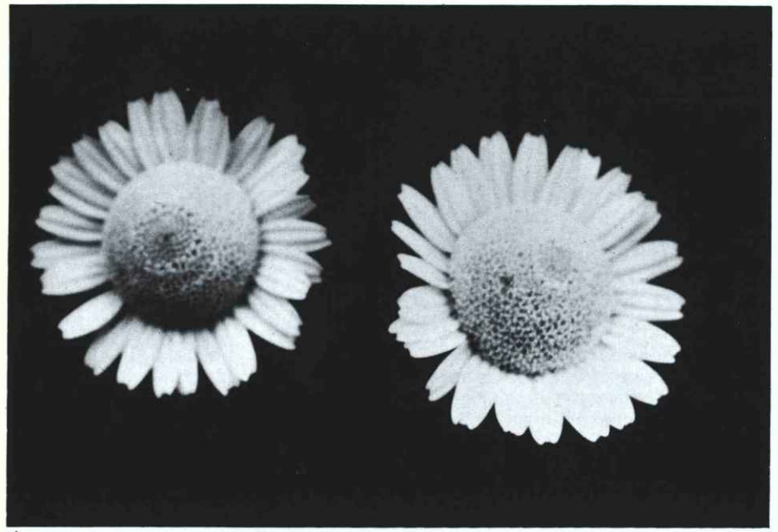

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Many more examples could well be given of the destruction of Mediterranean flora as well as of rare species threatened by total extinction.

Clearly man's self-preservation requires the preservation of the natural environment which is an immense source of energy, and which alone is able to restore his health and happiness. The intricate balances of nature, all vegetation and plant-life, must find in man their most stubborn and far-sighted defender.

No great perspicacity or profundity is required to understand that the destruction of flora and vegetation must be prevented at any price. Purely from the landscape angle, for example, one has only to think of the wealth of hidden corners in the Mediterranean area, richly endowed with blankets of natural vegetation brilliant with all the shades of green, under the shadowof trees of millenial antiquity, resplendent in the sunlight and dotted with a host of brightly coloured flowers, of both typical and rare species. Here erosion is unknown, the spirit is calmed, the body relaxes and the eyes are filled with wonder...

How can the destruction of this natural environment, of this revivifying paradise be tolerated — that human destruction whose danger increases daily with the steady advance of urbanisation ?

The enormous potential reserves constituted by Mediterranean flora are of both scientific an economic interest. Through research on certain plants science has been able to cast light on many questions, including problems of genetics, phylogenics and taxonomy.

Plants containing oils and essences have given rise to various industries and the variety of aromatic plants, Labiates in particular, suggests that there are still great possibilities for future development.

Agriculture has always been destructive of nature, drawing most of its present resources (plant growth) from the natural environment. Many universally-known fodder plants are derived, thanks to scientific research, from certain species of Mediterranean plant such as *Trifolium, Ornithopus, Lupinus, Medicago, Dactylis and Festuca.*

There is moreover a valuable reserve of vegetal genes in the Mediterranean area which must be defended at whatever price from " genetic pollution ". Nor should one forget the exceptional part played by the so-called medicinal plants which have historically been important for the human race and whose origin is Mediterranean. Arguments such as these will convince even the sceptics of the

urgent need to protect the Mediterranean flora.
It is clear that in many places the impoverishment of the natural environment has gone far beyond expected limits and that the balances of nature have been irreparably disturbed, which entails great dangers, some unforseeable, for the future of the human race.
Man's duty is to protect without further procrastinations what remains of Mediterranean flora and vegetation, but more importantly he must think much further ahead and examine the results of his activity before destroying that which nature has taken thousands of years to build. It is only through policies which are modest and far-seeing enough not to sacrifice tomorrow's well-being to today's wealth that he will be able to survive.
To ensure adequate protection, it is clear that parks and natural reserves must be established in each Mediterranean country. But this is not enough. More complete information must be obtained on all rare and endemic species in need of protection, legislation must be passed to ensure that they are so protected, and their natural habitat must be defended.
There is urgent need of a campaign for educating and informing all levels of society, a campaign that should be general, permanent, unambiguous and attractively presented so that everybody may get to know the beauty of plant life and its scientific and economic value.
Despite the contemporary victory of materialism over the spiritual, one must learn to love plants in their natural state despite their often modest appearance. And one cannot love what one does not know...
Let protection therefore be the order of the day. Protection of the marvellous, rare and useful Mediterranean plants ; and protection in general of the natural environment, of that natural environment over which man has mastery through his intelligence, if only he will divest himself of his cold insensitivity and exaggerated technical approach and give free rein to his soul. For let there be no mistake : it is only through the humanising of man in this way that the future of man can be assured.

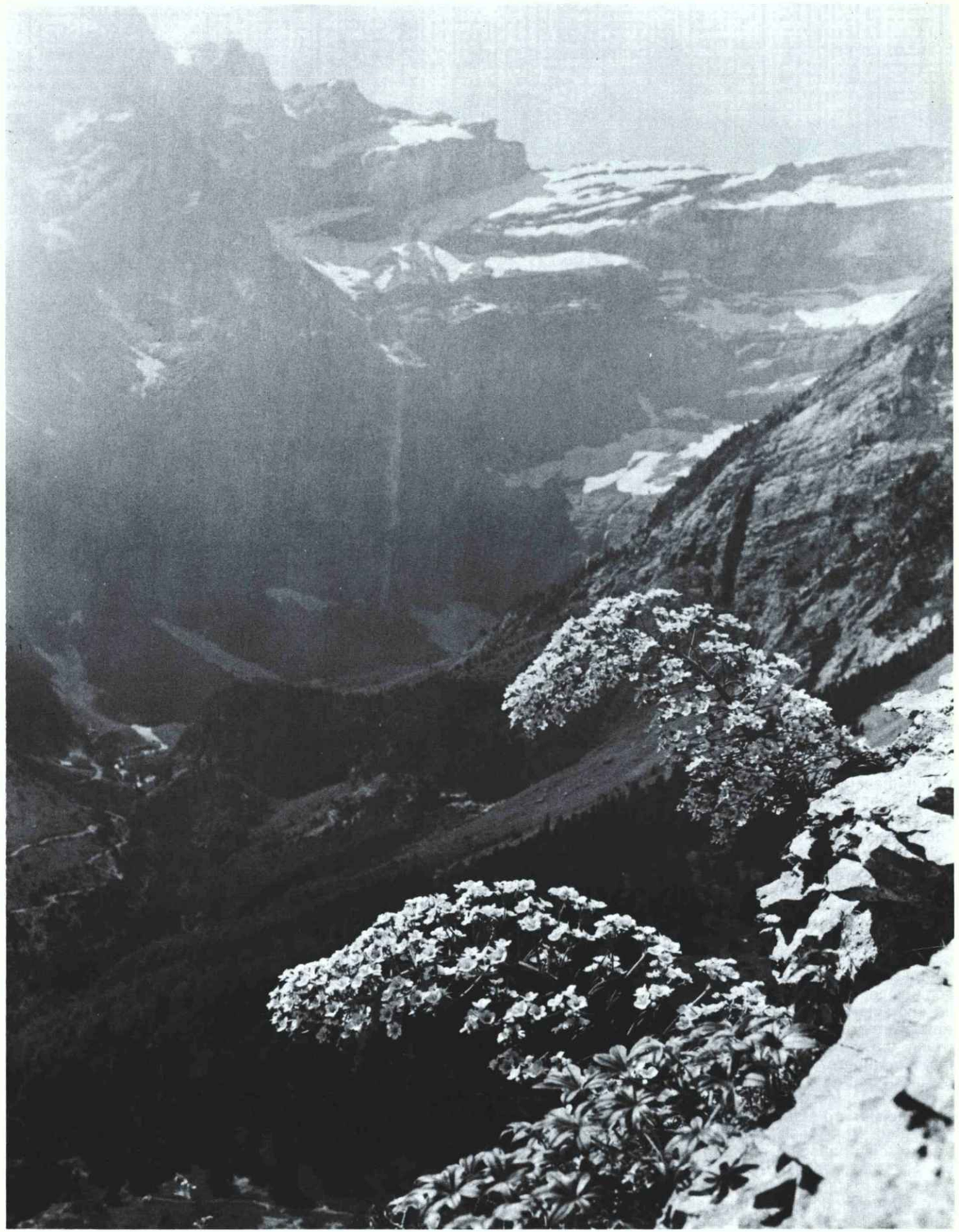
PLANT SPECIES CONSERVATION IN THE ALPS

POSSIBILITIES AND PROBLEMS

Harald RIEDL, Naturhistorisches Museum Vienna, Austria

When we consider the preservation of the alpine flora of Europe we have to distinguish between two major types of threats directed against its survival : in the first case, an integral part of the landscape, with all its flora and fauna, is endangered mainly by human action such as felling of trees for ski-runs or flooding of valleys for power plants. In the second case, particular species are endangered either because they are extremely rare or because man is collecting them in too great a measure for their ornamental value or for some special reason such as use as an ingredient for preparing an alcoholic liquor as is the case with the yellow gentian *(Gentiana lutea)*.
Where human activity destroys the natural environment on a large scale it is useless to speak of particular endangered species. In this case the alpine flora as a whole is threatened and the destruction of vast areas may be disastrous to their original population of plants and animals too. For as long as man continues to sacrifice his fellow creatures in order to expand his economic interests for even the smallest profit — short periods as is the case in some of the winter sport resorts in western Austria or on the long term by building highways through the most picturesque parts of the Alps to promote tourism — we have to envisage the imminent possibility that the typical alpine plants and animals will gradually vanish forever from the face of the earth. It is only through a profound understanding of the innate value of nature's richness and the birth-right of its older inhabitants that the human mind itself may be persuaded to adopt a humbler attitude and an utterly different esteem of our original surroundings as they were before man entered the stage of evolution on earth. Without this understanding there is little hope that nature as well as man can be saved from an untimely end. Man will even have to learn to abstain from some of the facilities an unlimited use of the energy resources of earth seen to grant him in order to avoid a greater catastrophe in the future.
Let us be optimistic for the moment and believe that man will learn his lesson in time : there still remains the question of those species that are endangered because they are getting rare either by natural causes or because of a severe persecution by man. In almost every European country there are lists of plants that must on no account be picked, or at least uprooted. In most instances these species would not be so rare were it not for their aesthetic appeal to man. Protection by law will certainly save a great number of spectacular plants from extinction. This is especially true for some of the alpine species such as lion's foot *(Leontopodium alpinum)* the picking of which is supposed to bring honour to the collector who is considered particularly daring for gathering the flowers under supposed personal danger of death. There are some exceptions to the rule such as *Cortusa matthioli* (primrose family) or *Bulbocodium vernum* (lily family) which are both rare and spectacular. Many plants will however pass unobserved by man, but nevertheless remain threatened due to the very restricted number of areas where they still occur in nature. In order to learn some general rules about these species that will help us to design measures for their preservation and which are usually derived from facts about the history of the alpine flora as a whole, we first have to study their distribution.
Let us begin with the so-called endemic species. Endemics are species with a very limited distribution confined to one particular region that may be a country, a province or only one mountain, valley etc. Among the places especially famous for a relatively high number of endemics is Monte Baldo, renowned for a hundred years or more. This is a mountain not far from Lake Garda in northern Italy. The specific name " baldensis " will be found in several different genera,

though not all plants called by that name are really confined to Monte Baldo. It is situated in a region in which the southern Alps slope down towards the wide plain of the river Po on the very border of that majestic "backbone" of Europe formed by the long chain of the Alps as a whole. In the ice-age, even the southernmost peaks were covered by glaciers which helped to model the landscape beneath them. The basins of the famous lakes in upper Italy all have been moulded by the action of such glaciers. In sheltered places, however, some vegetation of a more thermophilic character was able to survive during warmer periods before or between the various glaciations. When the ice withdrew and northern plant species climbed up the slopes of the mountains to remain there in a relatively undisturbed state, they were thus separated from their usually larger area of distribution in northern Europe. But these relics from a warmer period were further driven back by plants better endowed for competition. These "new comers" either came as a result of migration following the fluctuations of climate or were recent products of hybridization between the ancient stock itself and the species that had withdrawn to the higher altitudes. In the act of hybridization, their chromosome number was multiplied as a result of the inability of the parental chromosomes to pair and segregate in an appropriate manner. Thus the paternal and maternal chromosomes of closely related species were added to each other. The progeny, called "allopolyploidic" was far better adapted to the prevailing conditions, while the parents, especially those ancient thermophilic species mentioned above, remained as exiles in the few niches in which they grew in during the ice ages. Many of the endemics of Monte Baldo and other places along the southern and eastern border of the Alps (for instance Koralpe in Carinthia) belong to this old "diploidic" stock and are rare relics of older times.
Not only along the border of the Alps, but also as islands just in their centre, we find unusually dry conditions similar to those prevalent in steppe regions. These "dry islands", about which J. Braun-Blanquet has written a remarkable book, also show a great number of rare relics. As an example we mention the Rhone Valley between Sion and Sierre in the Swiss province Wallis, where we find a species of Ephedra, a small nearly leafless shrub belonging to the gymnosperms *(Ephedra helvetica)* and a rare representative of the Borage family, *Onosma helveticum,* among others. The same species of Ephedra and a closely related Onosma species reappear near Trento in northern Italy. A close relative of the meadow saffron flowering in spring *(Bulbocodium vernum)* is confined to the lower end of a steep, rocky mountain slope sheltered from the wind and other adverse climatic influences in Carinthia.
As another example of habitats where rare and therefore endangered plant species are likely to be found, such localities may be mentioned which are peculiar due to uncommon rock types. On serpentinic rocks, for instance, special ecotypes have evolved that are



Cotton-grass.

Alpine eryngo (Eryngium alpinum ombelliferus)

thermophilic and drought resistant to a high degree. Some of them, like *Dianthus capillifrons,* a carnation, *Potentilla serpentini,* a cinquefoil and several small ferns are commonly regarded as separate species. If we want to save these plants from extinction, we first must have an inventory of places where they are found. These places have to be turned into fully protected nature reserves under a permanent scientific control that helps to guarantee the present state of conditions as occasionally quite natural changes occur that would lead to the ultimate extinction of a species. It is a widespread but wrong opinion that natural habitats will not change without human influence.

Sometimes the most interesting and rarest plant species are found under conditions that only form a very unstable, transitory stage in the development of vegetations towards its local climax. Even the climax as the state representing a more permanent equilibrium between rather fixed outer conditions and the vegetational cover as the temporary goal of the development of vegetation in a certain region may change with changes of climate. As far as possible man should try to prevent any change of conditions in a nature reserve. He cannot, however, prevent an alteration of the local climate. The last aid man can give to plants threatened by extinction from climatic changes is to cultivate them in a suitable environment or create seed-banks in which the genetic material at least is preserved. We must not forget that speciation always starts from the old, diploidic stock, while the more advanced and more adaptable polyploids have less power to produce new combinations of characters. If the diploids vanish, the group as a whole is condemned to disappear should a severe climatic deterioration surpassing the range of adaptability of the polyploids lead to their extinction. But even if the latter survive no future evolution will start with them as parentage of unforeseen new races. Only the diploids may produce new allopolyploids by hybridization alone. It is not a mere whim of botanists to be especially keen on the preservation of rare relic species. They are providing the background for a future as rich in genetic possibilities as it was in the past. This is one of the most important tasks especially in alpine countries, where such ancient relics have been preserved up until now so that they might secure a resurrection like that of phoenix from the ashes even if a natural or a man-made catastrophe has bared vast areas of their former life.

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Saxifraga longifolia - *Pyrenean saxifrage.*

THREATENED AND PROTECTED PLANTS IN THE NETHERLANDS

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Leiden, Netherlands

At the beginning of this century the number of vascular plant species occurring in the Netherlands was estimated at 1400, of which 44 % were considered rare (Mennema, 1974b). However during the last seventy-five years, not only have over seventy species actually become extinct, but the percentage of rare species has also risen to 56 %. In fact, only 20 % of the Netherlands flora can now be regarded as very common. The increase in rarity has been more dramatically shown by Westhoff et al. (1970) who found that the product of the number of rare species multiplied by the number of localities in which they are found for the year 1970 to be as little as 30 % of the product calculated for 1900. These and the following data are all based on a systematic mapping of the Netherlands flora, begun by Goethart and Jongmans (1902). A complete coverage of the Netherlands was finished in 1950, when a second investigation was started to enable comparative studies to be made. This second investigation is still in process and although it is not yet completed (Mennema and Van Urk, 1973), much valuable information has already been obtained for certain species as will be illustrated below.

Unfortunately only a small number of the maps established in the 1900-1950 survey have been published (Goethart and Jongmans, 1902-1908 ; Sloff, 1935-1950) where as other European countries who began mapping their flora at much later dates have already published fully comprehensive results eg Scandinavia (Hulkén, 1950), Great Britain (Perring and Walters, 1962) and Belgium and Luxembourg (Van Rompaey and Delvosalle, 1972). However, all the data from investigation records over the last seventy five years are available at the institute for the Investigation of the Netherlands vegetation (IVON) which has thus been able to analyse many of the changes in the occurrence of different flora over this period. Full results will be published in the Atlas of the Netherlands Flora (Mennema, 1975b). An example of this analysis is the comparison of data for about 170 different species collected before and up to 1950 and after 1950. It was found that since 1950 3 % of the species studied had increased, that 37 % had neither increased nor decreased and that 60 % were definitely on the decline (Mennema, 1973). In some cases the increase was only apparent eg the number of localities where *Phyllitis scolopendrium* and *Carex buxbaumii* occur have increased due to greater knowledge and a more intensive investigation of their habitats. A true increase has been ascertained for only two species, viz *Angelica archangelica* and *Crambe maritima*. Quené-Boterenbrood and Mennema (1973) investigated the decline of 30 plant species in terms of a comparison between their presence in twenty km² quadrats at the time of the survey and their presence in these same quadrats before 1950. For some species the decline has been very marked — for example, *Anacamptis pyramidalis*, *Centaurea calcitrapa, Cochlearia officinalis, Gagea villosa, Himanthoglossum hircinum, Oenanthe peucedanifolia, Salvinia natans, Teucrium scordium* and *Thesium humifusum* have disappeared completely from 80-100 % of the quadrats where they occurred before 1950. It is very difficult to express the decline of a species in actual numbers of specimens. In the Netherlands complete records are available only for *Pinguicula vulgaris* (Schimmel, 1968). About 1900 there were many thousands of specimens occurring in 170 quadrats each of 20 km² ; in 1975 the number of specimens is between 150 and 200 in only 11 quadrats of 20 km².

This year an annual registration of specimens of some of the very rare species will be started using a similar method to that of Perring in Great Britain.

The records of IVON make it rather easy to enumerate the endangered plant species in the Netherlands.

Preparation of maps for the Atlas of the Netherlands Flora makes it necessary to survey all the literature published in the Netherlands on each species. And this literature often provides a lot of information as to the reason(s) for the decline of a particular species. Of the species found to be on the decline from the comparative map analysis as mentioned above, information concerning the decline has been found for about 72 % (Mennema, 1973). Three main reasons have been distinguished :

Following a comparison of data for about 170 different species, collected before and after 1950 in the Netherlands, it was found that since 1950, 3 % had increased, 33 % had neither increased nor decreased and that 60 % were definitely on the decline. In certain cases the increase was only apparent. Thus the number of localities where Phillitis scolopendrium *(above) occurs has increased due to greater knowledge and a more intensive investigation of its habitat.*

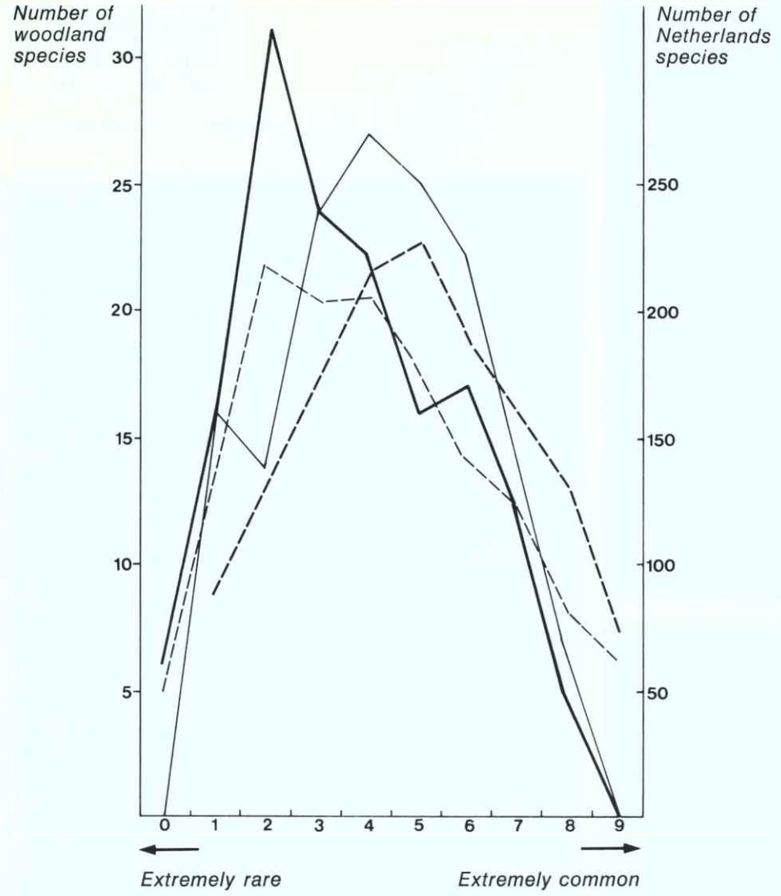
a) by natural causes, eg shifting of the area *(Campanula rhomboidalis, Cornus suecica, Himanthoglossum hircinum, Oenanthe peucedanifolia, Salvinia natans, Thesium humifusum, Wahlenbergia hederacea)*, rabbit-glutton *(Anacamptis pyramidalis)*, periods of dryness *(Scrophularia vernalis)*, the flood of 1953 *(Verbena officinalis)* ;
b) by direct human influence, eg gathering plants *(Aceras anthropophorum, Fritillaria meleagris, Leucojum aestivum,* the tubers of *Bunium bulbocastanum)*, inefficient management *(Scrophularia vernalis)*, increasing recreation pressure *(Calystegia soldanella, Euphorbia paralias)*, collecting plants for pharmaceutical use *(Arnica montana)* ;
c) by indirect human influence, eg urban and industrial development *(Fritilaria meleagris, Gentiana cruciata, Leucojum aestivum)*, renovation of old walls *(Asplenium ruta-muraria, Phyllitis scolopendrium, Perietaria judaica)*, reclamation of nature areas *(Anacamptis pyramidalis, Campanula glomerata, Carex pulicaris, Equisetum telmateia, Eriophorum gracile* and *E. latifolium, Hammarbya paludosa, Juncus capitatus, J. mutabilis* and *J. tenageia, Littorella uniflora,* all the species of *Lycopodium* in the Netherlands, *Narthecium ossifragum, Pinguicula vulgaris, Spiranthes aestivalis, Viola stagnina)*, re-allotment *(Carex dioca* and *C. pulicaris, Eriophorum latifolium, Littorella uniflora, Pinguicula vulgaris)*, technical and cultural measures to ameliorate the grass-land and the use of herbicides *(Aceras anthropophorum, Arnica montana, Fritillaria meleagris, Gagea villosa, Galeopsis ladanum, G. segetum* and *G. speciosa, Legousia hybrida* and *L. speculum-veneris, Melampyrum arvense, Narcissus pseudonarcissus, Orobanche minor, Polygala serpyllifolia* and *P. vulgaris)*, changes in corn trade relations *(Centaurea calcitrapa)*, air-pollution (all the species of

Himanthoglossum hircinum - *a species definitely on the decline in the Netherlands, due to natural causes such as shifting of the area.*

Lycopodium in the Netherlands), water-pollution *(Azolla caroliniana)*, drainage *(Anacamptis pyramidalis, Carex dioica* and *C. pulicaris, Eriophorum latifolium, Isoetes lacustris* and *I. setacea, Juncus capitatus, J. mutabilis* and *J. tenageia, Viola stagnina)*, changes in the original water-management *(Teucrium scordium)*, closing of the former Zuiderzee *(Apium graveolens, Artemisia maritima, Cakile maritima, Cochlearia anglica* and *C. officinalis)*, closing of the estuaries in the southwestern part of the Netherlands *(Cochlearia anglica* and *C. officinalis, Scirpus triqueter).*

It is remarkable that the decline due to indirect human influence is 12 times greater than that due to direct human influence (Mennema, 1973). This is why measures to protect threatened plant species in the Netherlands merely through the prohibition of gathering plants (1973) are very insufficient as they are for most European countries (Mennema, 1975a). That is why at the first Conference in Arc-et-Senans (France) in 1973 we tried to go further than just a European prohibition of gathering plants.

We think it is essential that every European country should investigate and register all its own rare and endangered plant species. Once this has been achieved it will be possible to draw up a list of European endangered plant species. These species could be subdivided in phytosociological/ecological groups such as rock-plants, weeds, ruderal plants, aquatic plants, salt plants, plants of seashore and sea-dunes, etc., etc. If the problems are in general the same for all the European countries (and we believe they are !), then some of these groups will contain a great number of endangered plant species. And the group of forest-plants will undoubtedly not be among those the greatest number. It is for this reason that it seems incomprehensible to me that the second Arc-et-Senans Conference in 1974 discussed the problems and the perspectives of the woodland flora. For as far as the Netherlands is concerned (and this also seems to be the case for most other European countries) the regression of the woodland flora during the last 75 years is less significant than the regression of the entire Netherlands flora (Mennema, 1974a). The real regression of the Netherlands flora is to be found in the wetland flora, the arable weeds and the poor land flora. To solve this problem measures must be found to stop or avoid the impoverishment of the habitats of these flora. But how ?



The regression of the woodland flora in the Netherlands during the last 70 years in relation to the regression of the entire Netherlands flora.

——— : *woodland species in 1900*

——— : *woodland species in 1970*

– – – – – – : *all Netherlands species in 1900*

– – – – – : *all Netherlands species in 1970*

It is obvious that considerable collaboration is needed from many different specialists. For the problems of endangered flora are intricately linked with the problems of air-pollution, water-pollution, reclamation, re-allotment, the necessity of the amelioration of the grassland, the use of herbicides, and of drainage, etc., etc. They are thus the responsability not only of biological experts nature conservationists and nature lovers, but also of technical, political, economical, sociological, commercial experts, etc., etc. It is only through a mutual effort that a solution will be found.

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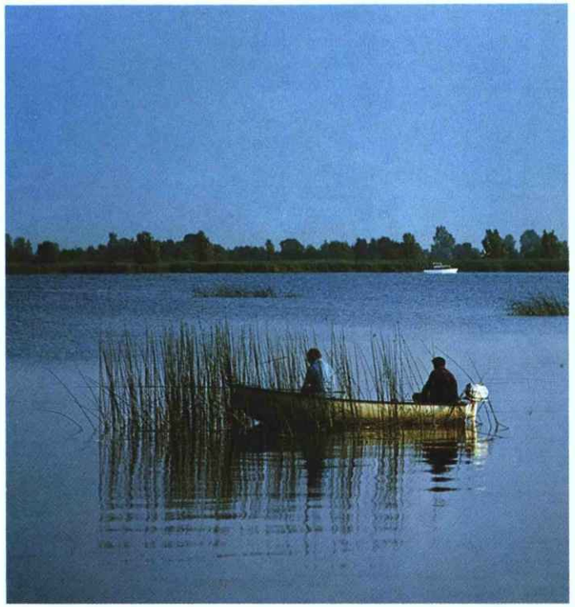
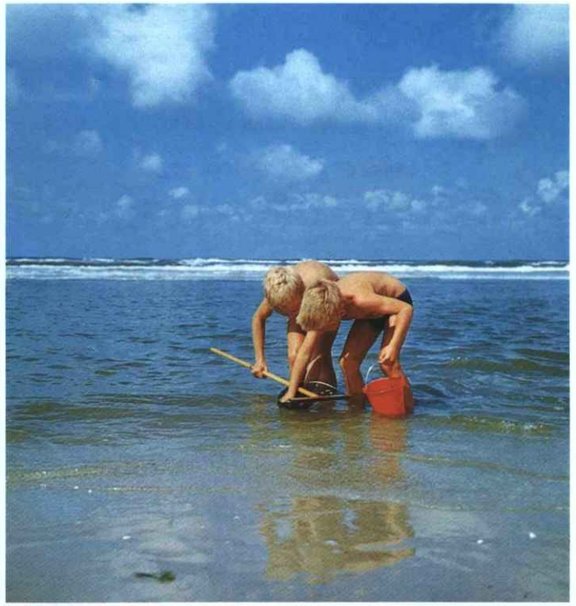
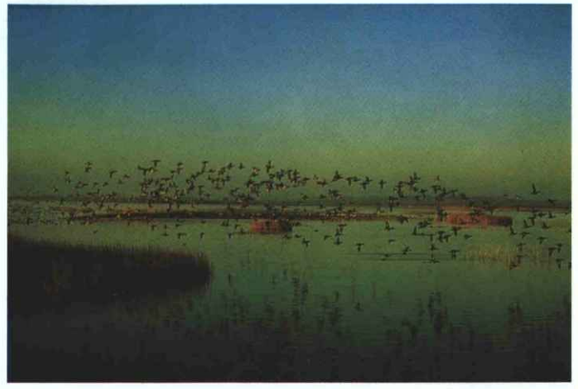
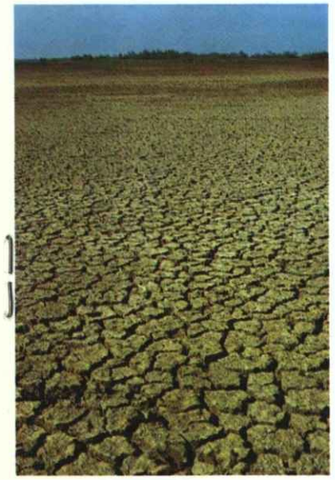
WETLANDS

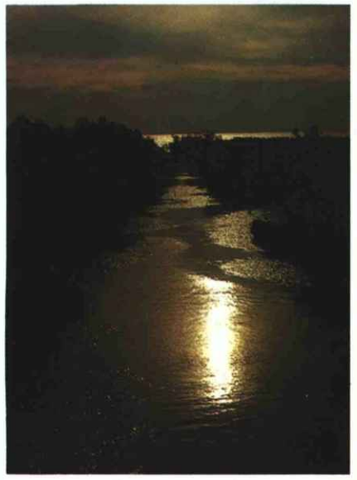
COUNCIL OF EUROPE INFORMATION CAMPAIGN 1976-77











The Council of Europe's Information Centre for Nature Conservation will dedicate a special publicity campaign to the conservation and management of wetlands in 1976/1977. Following in the footsteps of its soil and freshwater campaigns, the Centre intends to draw attention from all over Europe to one of the most diverse and productive — yet also one of the most threatened — aspects of our environment : the wetlands.
It is hoped that through close cooperation with such international specialist organisations as the International Waterfowl Research Bureau, maximum publicity will be achieved in such a way that not only will the public and authorities concerned be informed of the need to conserve wetlands but that practical propositions will also be offered to them as a means of meeting this need.

THE HEILIGENHAFEN CONFERENCE ON THE INTERNATIONAL CONSERVATION OF WETLANDS AND WATERFOWL

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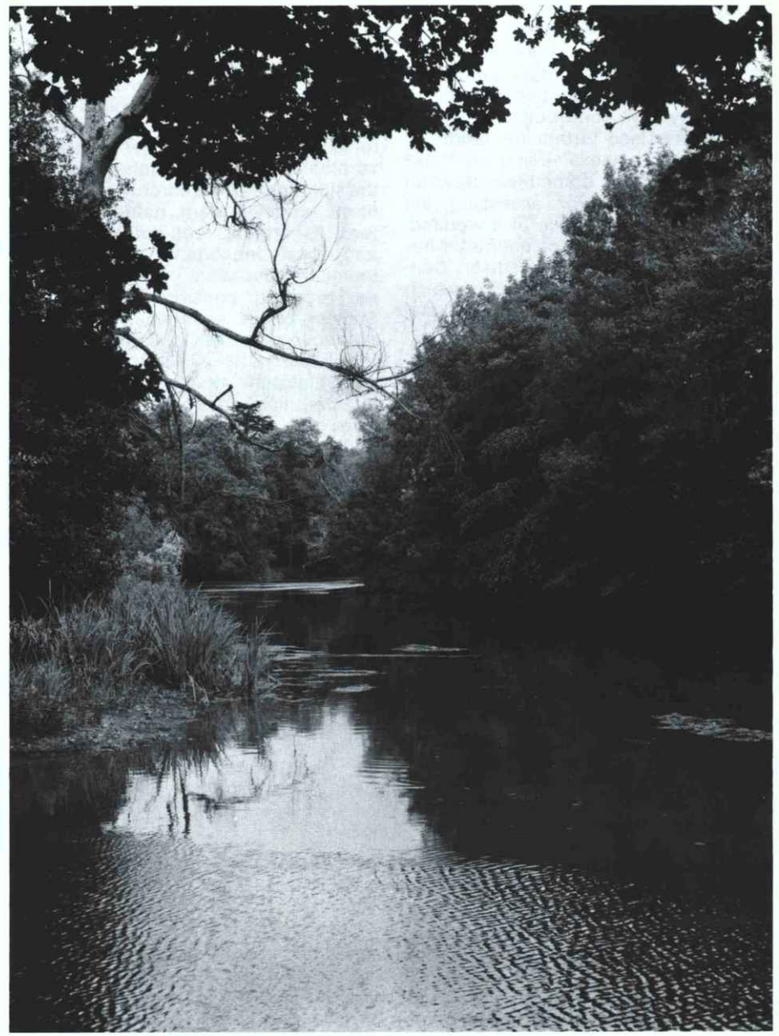
The Ramsar Convention

It was highly appropriate that, in this Opening Speech on behalf of the host country, Mr. Joseph Ertl, Federal Minister of Food, Agriculture and Forestry, should announce that the Federal Republic of Germany had just signed the Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The Text for this important Convention had been decided upon at the preceding Conference at Ramsar in Iran. It is therefore generally known as the "Ramsar Convention", though it was actually opened for signature in Paris, at the UNESCO Headquarters in July 1972.
The Federal Republic was the eighth country to sign, its predecessors being Iran, Finland, United Kingdom, USSR, Switzerland, Norway and Australia. During the course of the Conference the Swedish delegate was able to announce that his country had become the ninth Signatory. However, for the Convention to come into force, seven countries must have become Contracting Parties, by ratification through their legislature or by signature without reservation as to such ratification. At the present there are five Parties, Iran, Finland, Australia, Norway and Sweden. One of the functions of this Conference was to add impetus towards the implementation of the Convention over as wide an area of the Earth's surface as possible.
No less than 39 nations (as compared with 23 at Ramsar) sent delegates or observers to Heiligenhafen, a holiday centre on the Schleswig-Holstein coast, from 2nd to 6th December 1974. There were also representatives of FAO, UNESCO, the United Nations Environment Programme and the Council of Europe, along with six international Non-Governmental Organisations.
It was particularly encouraging to see representatives from many Asian and African countries, Bangladesh, Iran, Iraq, Japan, Jordan, Kenya, Mali, Mauritania, Niger, Pakistan, Senegal, South Africa, Thailand and Zambia. These countries are among those containing some of the last great wetlands, often in near-pristine condition ; their counterparts in Europe have so often been degraded thoughtlessly and relatively fruitlessly.
The Ramsar Convention requires the conservation of wetlands both specifically and by general measures. A Contracting Party designates suitable wetlands within its borders and undertakes to maintain them in proper condition. Thus, the United Kingdom has designated 13 such areas in its first list, Iran 18, Sweden 20. But, of course, the number of areas is not the whole story, their size is very relevant. Thus the Iranian contribution includes two areas of more than 400,000 ha. and three around 100,000. Then, besides formulating and implementing their planning to conserve the designated wetlands, the Contracting Party is required to ensure the general wise use of all wetlands within their territory. This Convention is the first ever to impose limitations on a country's freedom of action in dealing with land use within the national boundaries. Not unnaturally its structure is therefore not rigidly sanction-based, indeed is somewhat permissive. It seeks to function by exhortation and example, by competition and comparison, by accountability in the eyes of the international community. Conferences such as that at Heiligenhafen are specifically called for in the Articles, to serve as the forum where the nations can report, be judged and questioned on the progress they have made in the conservations of wetlands and waterfowl. The aim is not to pillory any country but to bring to bear the weight of informed international opinion so that the authorities concerned may be persuaded to restructure their plans, taking into account interests they may not have known existed.

The National Reports

The circulated National Reports of the nine Convention Signatories were considered first, then the written Reports of 24 other countries represented at the Conference and of four others which were unable to send delegates or observers. Verbal reports or short statements were made on behalf of six further countries present. Clearly there is not the space here to review in any detail this mass of information and at the Conference itself there could only be short exchanges on major points. As an example of the news, good and bad, we may instance the Report of the United Kingdom. The Conference was glad to learn that the developmental threats to two major wetlands in S. E. England, Foulness and the Medway, had been averted through changes in planning decisions. However, the Icelandic delegate questioned the proposal to remove all protection from Greylag and Pink-footed Geese in parts of Scotland — on the grounds of agricultural damage — while the Norwegian delegate deplored the shooting of many thousand Oystercatchers in S. Wales because they ate cockles. In both cases the British delegation was able to give replies that indicated that better counsels might yet prevail because of pressure from conservationists.
The Report of the host country revealed numerous threats to the remaining wetlands in the Federal Republic and the Conference agreed to four specific Recommendations aimed at modifying the destructive tendencies about which it was informed. While the delegate from Iceland could report improvements in wetland conservation, the fate of the great central oasis of Thjorsarver, subject of a special Recommendation at Ramsar, remained in doubt. So did that of the North Bull Island in Ireland. In Italy, hitherto rather backward in conservation, great steps forward had been made but an urgent Recommendation concerning legislation was requested. The Netherlands were congratulated on the action to safeguard the Dollard on the Waddensea coast. The Report from Senegal gave rise to a Recommendation jointly addressed to that country, Mali and Mauritania. Indeed the Conference emphasised the desirability of regional arrangements and co-operation, bearing in mind the "flyways" of the migratory waterfowl. In general the Conference felt that there was a net loss of wetlands throughout the world, at a rate that was extremely alarming in many countries. It recommended the urgent implementation of the Ramsar Convention and of every other possible step to ensure that at least the major wetlands of the world are conserved for future generations — of birds as well as of Man.



The richness of wetlands

One of the most difficult messages to get across to administrators, politicians and planners is that wetlands are not wastelands, but are highly productive areas, integral parts of the whole environment, to be destroyed at our ultimate peril. The technical sessions (comprising 31 papers) therefore opened with presentations deriving from the work of the International Biological Programme which over the past decade had greatly advanced our knowledge and evoked co-operation in research across all boundaries of national and ideological differences. The biological richness of both freshwater and estuarine wetlands was described in detail. The extraordinary wastefulness of Man as a predator on fish and other sea-food was emphasised. Thus he only consumes about half the material he gathers. Even worse, since his fishing boats are driven by fossil fuels, he actually uses nearly twice as much energy collecting the flesh than he gains from eating it. The direct conversion of petroleum products into protein might be a more efficient use of our fuel stocks !

Waterfowl populations

However, the detailed assessment of biological productivity is a lengthy, painstaking process and a wetland may well be destroyed by technological intrusion before its value on an international scale has been established. The use of waterfowl as indicators to demonstrate the richness of a wetland habitat has therefore been developed by the International Waterfowl Research Bureau (which with the German Federal Institute of Vegetation Research, Nature Conservation and Landscape Management - BAVNL - organised the Conference and provided the Secretariat). The distributions of ducks, swans, coots and waders in Europe, Asia and North Africa, based on counts made at many thousands of wetland sites, were laid before the Conference. Similar surveys for West and East Africa were necessarily somewhat less detailed. A great deal of this information was gathered by

highly competent amateurs and the Conference recognised the enormous contribution such people can make, calling for their encouragement by the early publication of the results to which they have contributed. Other papers emphasised further indicators of a wetland's richness. Using all these data, a specialist committee drew up a set of criteria for assessing the international importance of a wetland. This will be valuable for countries becoming Parties to the Ramsar Convention and having to decide which wetlands to include in their national List for especial protection.

Waterfowl migration

Next, the vital necessity for international co-operation in the study of waterfowl migrations was discussed. The Soviet Union's crucial role as the main producer of waterfowl migrating West and South from her northern territories was already known. More surprising, perhaps, was the extent to which birds from Eastern Siberia enter the United States. The agreements for circumpolar research projects between these two countries, and the Soviet Union's desire to co-operate with all countries in Eurasia and Africa were therefore most welcome. The Conference endorsed a system of world-wide colour marking codes for swan and goose studies that in itself was a significant step forward in international liaison.

Wetland management

Wetlands are continuously evolving and are susceptible to change so their scientific management is of the utmost importance. Often we need to halt their evolution at a particular moment or seek to turn the clock back. Always we must be countering the abuses to which wetlands are subject. Sometimes the technology which so easily destroys these fragile ecosystems can be used to create new wetlands. A complete day was spent discussing the techniques available for ensuring that the best possible use was made of those wetlands that had been saved. Examples were drawn from the United States and Canada, from Africa, and from countries round the Baltic. The restoration of degraded wetlands such as Lake Hornborga in Sweden aroused lively interest, while pollution control in the River Thames had resulted in a near-incredible re-colonisation by fish and by thousands of ducks and waders. The successful restoration of a river which was all but dead should give hope to conservationists the world over.

Co-operation and education in wetland use

The possibilities for the multi-use of wetlands by the many interests involved was repeatedly emphasised. Indeed, there was an absolute necessity for collaboration at all levels from Governments to individuals, including the full range of research workers, farmers, administrators, naturalists, hunters, fishermen, reed-cutters, tourists and local inhabitants. The general theme of education, in the widest sense, received considerable attention. The lay public sees wetlands as monotonous expanses of flatness, fit only for "reclamation". Publications, films and television all play valuable roles in spreading an enlightened interest through a wide audience. But nothing makes such an immediate and lasting impact as personal involvement. Waterfowl are the most easily appreciated aspect of the wetland scene, but are wary and easily disturbed ; crowds of people intrude on the sense of lonely wilderness. Yet it is possible to reconcile the irreconcilable. The Conference was intrigued to hear how the public can be willingly restricted to a small part of the wetland and conducted to concealed, well-equipped observation posts along screened corridors. In this way large numbers of people can come to appreciate, without disturbance or intrusion, the quiet beauty of the marshes and the wonder of the massed flights of waterfowl.

The rationalisation of hunting

One class of user of the wetlands over whom there has been much controversy is the hunter. Nowadays he is accepted as functioning as a predator within the natural system, provided that the harvest of waterfowl which he takes, and the associated disturbance, are rationalised and controlled. Indeed, it was made clear that the modern hunters are themselves conservationists and provide many of the data on population structure and breeding success which are essential for a proper biological basis to the exploitation of a renewable natural resource. Again the experience of colleagues in the United States and Canada was expounded, but it became clear that important progress was also being made in the Old World, both in research and in establishing reasonable conservation measures. Nevertheless, flexibility in hunting seasons in relation to hard weather and to other sudden changes in the balance of kill and production were still required. It was also appreciated that in many countries the hunting seasons were excessively long. The Soviet delegation suggested that the aim should be 60 days of actual shooting in the course of a season.

At the end of the technical session it was announced that the Government of the Federal Republic of Germany had offered to produce a draft for a Convention concerned with the conservation of all migratory animals, and to host a Conference to examine the problem. This would probably be in 1976 and the whole exercise would be carried out in close association with the appropriate international bodies. In view of the rising interest in wetland conservation in Africa, it was decided that the successor to the present Conference should be in that Continent. There was great enthusiasm when the delegate from Zambia proposed, subject to the final agreement of his Government, that its site should be Lusaka.

Note on Personalia present

President Dr. W. Erz (BAVNL) ; Vice Presidents Dr. I. Maximov (USSR) and Prof. A. A. Haapanen (Finland) ; Rapporteur - General Prof. G. V. T. Matthews (IWRB) ; Chairmen, Credentials Committee Prof. S. Qasem (Jordan), Drafting Committee Sir Peter Scott (UK), Criteria Committee Sir Hugh Elliott (IUCN).

ENVIRONMENTAL CONSERVATION PROBLEMS IN MALTA

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Lying in the centre of the Mediterranean in latitude 36°, longitude 14°, the Maltese Islands have a total area of approximately 320 square kilometres. The main island, Malta, comprises 250 sq. km.; Gozo, 7 km. to the North West, 64 sq. km. The small island of Comino, roughly midway between the larger two, is only 2,5 sq. km., while Filfla, a small uninhabited rock, lies 8 km. off the South West coast of Malta.

Taken in very general terms, the main ecological features of the group as a whole are characterized by the prevalently rocky, undulating terrain, and the relative shallowness of the local soil strata. Soil formation itself, under Maltese climatic and geological conditions, is essentially a very slow process, and soil types are limited by the calcareous nature of all the parent rock. Three main types of soil can be distinguished — the Terrarossa soils, formed from Coralline limestone, the Xerorenzina, from Globigerina limestone, and Carbonate raw soil, from fragmented Upper Globigerina and clay. There are distinct differences in fertility between the various kinds, and mixtures (arising out of both natural and artificial causes) are frequently encountered. Wind conditions and the irregularity of rainfall have also contributed to the fact that considerable areas in exposed situations present a barren appearance all the year round. This is accentuated during the hot summer months. The average annual rainfall is just over 500 mm., this figure being subject to considerable variation from year to year, and to irregular distribution within any particular year, usually occurring in heavy showers of relatively short duration. Within this overall framework, however, a complex of different habitats can be found on land, and the islands are comparatively rich in angiosperm species, which are estimated at 1300, within 470 genera. This figure includes cultivated plants, and the ratio of less than 3 species per genus suggests that a large proportion of these evolved outside Malta. It is also probable that several species have been gradually introduced over the years. The variation in habitats is evidenced by the fact that approximately 10 % of angiosperm species are hydrophytic, living in valleys and ponds where water, accumulated by winter rainfall, does not dry out completely during summer. One fifth of the angiosperm species are common on the numerous walls and bastions with which the Islands (mainly Malta and Gozo) abound. Conifers are relatively few, and only about 12 species of Pteridophytes have been recorded so far. Comprehensive lists of the flora have been made as far back as the last century, and a new systematic list has recently been compiled. Lower plants have been less extensively studied. Practically all species have one thing in common — the ability to tolerate highly calcareous soils.

The natural and semi-natural vegetation is necessarily restricted by the value of arable land, and exists, for the most part, only in rocky or semi-rocky waste useless for agricultural purposes, or in valleys and other isolated pockets where, similarly, the land cannot be turned to productive use. This has exercised some effect on the indigenous (and imported) animal population. Malta's wild fauna is relatively limited, especially in tree-inhabiting species. Apart from insects, terrestrial invertebrates comprise some isopods, various arachnids, some pulmonate gastropods, and a variety of nematodes. Two genera of earthworms (*Allolobophora* and *Eisenia*) are present in isolated damp pockets in valleys. Vertebrates comprise one species of frog (*Discoglossus pictus*), a few species of lizards, snakes, geckos and slow-worms, and a number of birds, most of which are migratory. There are very few wild mammals

The coastal situation is somewhat different. The sea around Malta is, for the most part, clear and unpolluted, and several of marine species, representing all the major phyla are present around and near the coast. The dominant plant species are *Posidonia* and *Cystoseira*; the fauna are much more varied. The coastline is predominantly rocky, except for some sandy beaches scattered at various points, and the fauna and flora of the littoral zone show no significant variations from region to region.

Nature conservation in Malta is rendered difficult, in the strict sense of the term, by various problems perhaps not normally encountered in other countries. In these problems, not only the particular environmental conditions, but also, to a large degree, the size-factor plays a major part. Above all, the natural environment itself is viewed within the general context of the human environment as an integral whole, and nature conservation itself is now being tackled, not purely as a separate concern, but as part of a balanced national environmental framework.

From the general point of view, recent developments aimed at protecting wildlife as a whole have included drastic amendments to Malta's Pest Control legislation. Originally aimed at protecting the farmer from "dubious" brands, and minimizing operator and consumer hazards, the Pesticide Regulations were revised in 1971 to include environmental hazards among the main criteria employed in categorizing Pesticides. As a result, practically all the persistent organo-chlorine insecticides are now on the restricted list, and no longer available for general sale and use. This was done, even though the comparative persistence of these chemicals in local soils is low, as the shallowness (of the soil) coupled with the hot summer temperatures, hastens degradation. Some problems were encountered in a few cases where no safer, equally-effective alternative was available, but with the advent of new less-persistent pesticides, the only remaining organo-chlorine compound, Aldrin, is gradually being phased out of use.

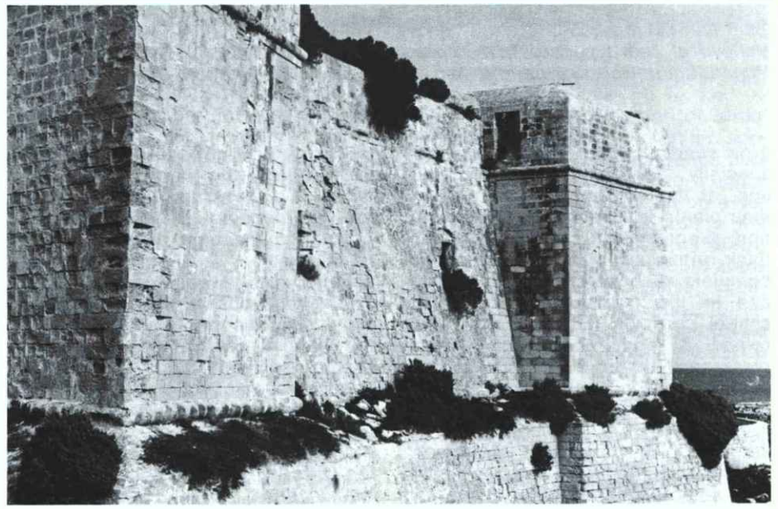
Birds represent the only class of animals which have received ad hoc legislative attention. Regulations for the protection of birds have been in force for several years. Briefly, these comprise (a) a list of "protected" birds, the shooting or trapping of which is prohibited, and (b) a list of public gardens and similar areas where no shooting or trapping of any kind of bird is allowed. Practical enforcement of such regulations have not been easy, in view of the facts that (a) bird-shooting and trapping has been a popular sport in Malta since time immemorial and (b) some of the "prohibited" areas are easily accessible from many points. This situation is probably not uncommon elsewhere. The majority of hunters are, however, discriminatory, and shoot mainly at migratory game. The position is currently under view.

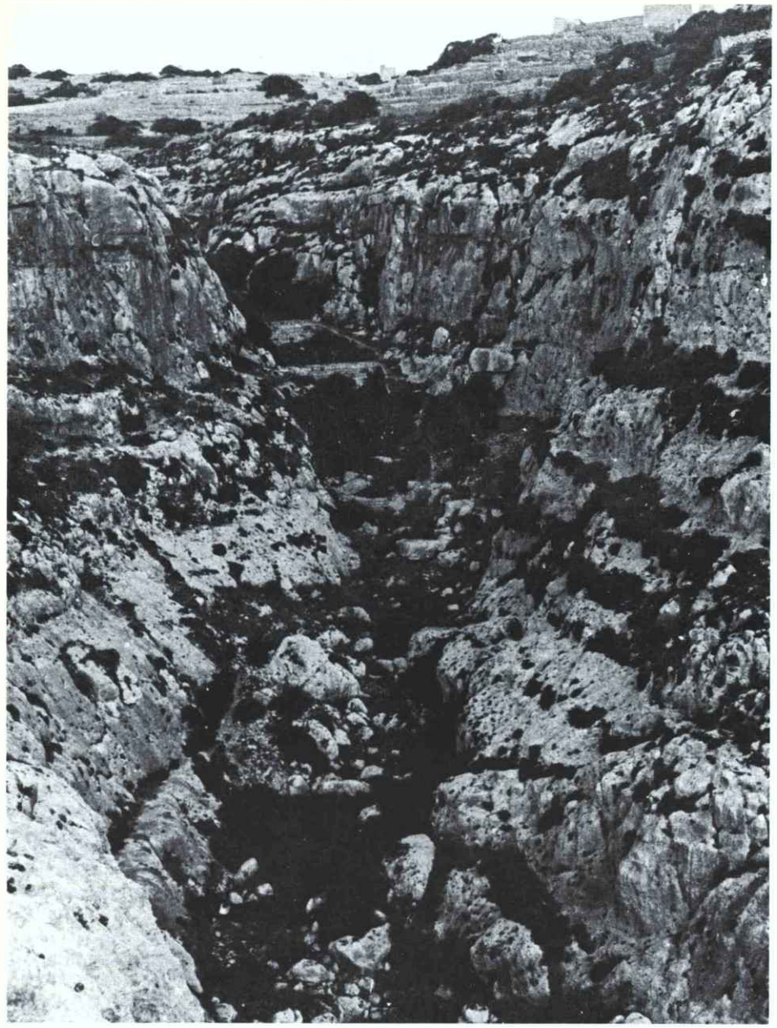
Conservation of plant species has so far not demanded any specific administrative measures. Chemical Weed Control in Malta is only practised on a small scale, and is confined to areas under cultivation. Owing to the small size of fields, machinery used for spraying is of the Knapsack type, and, even in windy conditions, the total amount of spray-drift is not significant. Coupled with these, one should also consider the overall plant distribution in the Maltese Islands. About 20 % of the recorded angiosperm species can be described as relatively sparse. This sparsity, however, in the main, arises out of a low population density of these plants in common habitats, rather than the restriction of the species to specialised habitats. Except in a few isolated instances, there appears, at least at the moment, to be no risk of any species disappearing.

Conservation of natural terrestrial ecosystems again presents a mixed problem. It has already been mentioned that the only "natural" land in Malta is that which, for some reason or other, is unsuitable for agricultural purposes. Though several types of habitat are present, these, with the exception of rocky waste land, are scattered all over the islands in what one might call "penny packets". Most of them are still virtually untouched, but their "official" recognition as nature reserves presents difficulties because of their very small size and scattered distribution. Furthermore, many of these are privately-owned. From the more general aspect, the national situation has always demanded that any land should be put to its most productive use, and soil conservation legislation, whereby any soil dug up from building sites has to be removed and transported to barren land (for reclamation purposes), has been in force for several years. Land reclamation, coupled with an intensive afforestation programme, has been accelerated in recent years, and semi-natural areas are both increasing, and supporting a variety of life-forms following the initial planting.

The greatest problem — the scarcity of greenery and natural life — is currently being tackled by an emphasis on improvement and expansion, rather than conservation alone. In this context, nature conservation and education are being closely linked. Schoolchildren are being encouraged to

Old fortifications, walls and bastions often support a large amount of vegetation. One of the commonest plants is the wild caper, Capparis sativa.





Valleys of this type are fairly common, some considerably wider than this. Vegetation on the sides and at the bottom differ to a variable extent.

grow seedlings themselves (from seed specially provided and distributed) and, at the appropriate time present their plants for use in public afforestation programmes. One major drawback in the past has been the almost complete absence of biological sciences in the primary and secondary school curricula. This has now been remedied, and, apart from formal classroom tuition, a Field Study Centre has been in operation for the last two years. This is proving an indispensible help in the creation of a sense of environmental awareness that was previously noticeable for its complete absence. Field courses and tours in the scattered natural habitats available are also regularly organized, and one main problem in this respect, considering the disparity in population numbers between the various species, is the drawing of a definite line between collection and on-the-spot observation, in order to avoid (as has happened elsewhere) the almost complete removal of a scarce species through (illogically enough) overcollection during educational outdoor classes having the general aim of study and conservation. From the purely scientific viewpoint, the majority of habitats in the Maltese Islands have received taxonomic, rather than ecological, attention, and there is still an ample field for study in this sphere. Here, however, in general, it would be difficult to justify restriction of access to any land in Malta on the sole grounds of the scientific value of its biotic content, not only because such value is, in many cases, doubtful, but also because of other difficulties in connection with such restrictions. There are one or two exceptions here, and the problems involved in these isolated instances appear to be that any public restriction of access, unless accompanied by appropriate measures not always possible to execute, could very well achieve the reverse effect by drawing unnecessary (and harmful) attention to the localities in question. The coastline, and the waters immediately adjoining it, present a somewhat different picture, though the general problems involved are similar. Sandy shores are relatively devoid of marine life, while those with a rocky or mixed substrate present very much the same general picture in all localities. Spear-fishing is extensively practised, but only throughout the summer months. The increasing tourist trade is of considerable national importance, and the conservation effect can be best achieved in most instances by striking the necessary balance between retaining as much as possible of the natural characteristics of a locality, and providing appropriate recreational amenities in such a way as to enhance, rather than detract from, the former. The absence of heavy Industries in Malta ensures that the immediate coastal waters are free from pollutants, and consideration is currently being given to the possibility of designating appropriate coastal areas as natural marine reserves. Such designation will obviously have to fall winthin a general plannin programme for the whole coastal zone, and will, amongst other things, necessarily have to take into account other potential uses of any locality selected, and above all, the problems concerned with its management.

ECOLOGY IN A NEW BRITISH CITY

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Milton Keynes was designated a new city in 1967 to accommodate about 250,000 people from London and the natural growth of Buckinghamshire, in preference to the expansion of existing towns and villages. It is situated in 22,000 acres of North Buckinghamshire, lying about halfway between Oxford and Cambridge and London and Birmingham. The Master Plan which was published in 1970, sets our six goals :

1. Opportunity and freedom of choice.
2. Balance and variety.
3. Easy movement and access.
4. Creation of an attractive City.
5. Public awareness and participation.
6. Efficient and imaginative use of resources.

The Corporation appointed an ecologist to its staff towards the end of 1972, about 12-18 months after the start of implementation of the Master Plan.

The topography is one of gently undulating land lying between 209 ft O. D. and 367 ft O. D. The natural drainage of the area is divided equally between two river valleys which flow south to north into the River Ouse (which forms the northern boundary of the city). The geology is simple, comprising a variable thickness of calcareous boulder clay in the north to a neutral boulder clay in the central and southern parts of the city. First and second river terrace gravels and alluvium occupy the river valleys, with Oxford Clay exposed over large areas of the valley flanks. Blisworth limestone and Cornbrash outcrop extensively in the north and northwest.

The average rainfall is about 648 mm. with mean annual evaporation of 432-437 (380 mm. occurring during the summer months).

Ecological activities in Milton Keynes divide are into three parts :

1. Wildlife conservation.
2. Ecological engineering and design — i. e. the use of ecological principles as a technology to achieve planning and design aspirations.
3. Environmental Education and interpretation.

Wildlife conservation can be further sub-divided into :

a) the preservation of established wildlife and wildlife habitats e. g. woodlands, clay pits, clay spoil heaps, road verges, etc. ;
b) the creation of new habitats, for example grassland, wetland, woodland, lakes, road verges, golf courses, landscapes, etc.

A diagrammatic representation of the ideal situation is given in fig. 1. Although there was no ecological input into the Master Plan, a number of reports were prepared by academic institutions and voluntary organisations. The most comprehensive and useful study was one carried out between 1968 and 1971 by the Corporation's forestry officer who recorded details of every hedgerow and hedgerow tree (including copses) in the City. This included the predominant species of the hedge and details of tree species, including the estimated life expectancy, the state of the crown, etc., the data being stored on 1:2500 maps and a set of schedules. In 1972 a visual and subjective survey was made to ascertain the number of sites of wildlife value in the city which revealed many sites of interest that had not previously been recorded. Some of these areas have been or will be deleteriously affected by development but because plans were or are in such an advanced state, it has not been possible to change or modify them. Because of the size of the development programme it is inevitable that some sites will be lost either by direct development or indirectly by isolation or location, for example it will not be possible to retain the wildlife value of a small meadow and a clay spoil heap close to the City Centre. It is therefore necessary to evaluate the viability of the site in relation to the development programme and "trade off" of the losses against opportunities to create new habitats.

Ecological monitoring of these sites (including woodland, grassland, clay pits, clay spoil heaps, road verges, railway embankments, canals, etc.) is now in progress to :

a) provide information for more detailed ecological evaluation and to provide data on which to base arguments and order priorities ;
b) gather information for the historical record ;
c) monitor the effect of management, development, urbanisation, recreation and other public pressures ;
d) produce information on which to base management programmes for those areas which are to be retained ;
e) obtain information about the structure of the various ecosystems so that better advice and information can be given to planners, landscape designers and managers about the treatment of established ecosystems and the creation of new habitats, for example the rate and type of colonisation of Oxford Clay or calcareous boulder clay, the effect of a particular management regime, etc.

This work involves the collection of quantitative biological data, information about the physical nature of the site and the soil and water chemistry. In some cases time has only permitted the collection of qualitative data. Rare or unusual plant species occurring on sites which cannot be retained or which will not be viable when the city is completed, are being transplanted to a safe area or kept in the nursery until suitable, safe habitats can be found or created within the City. The seed of wildflowers from these and other sites is collected by voluntary labour for eventual sowing on suitable sites. A collection of living flowering plants and ferns is being made for the creation of the herbaceous equivalent of an arboretum. A herbarium of flowering plants, ferns and bryophytes has also been established.

Animals are more difficult to deal with, but a scheme to map on ½ km. × ½ km. grid, the distribution of birds, mammals, butterflies, and other species (including flowering plants) has been established. In order to monitor changes the scheme will run on a seven year cycle, i. e. recording will only occur during 1973-74, 1980-81, 1987-88, etc. The results should show the distribution and relative abundance of species so that suitable habitats can be created in appropriate situations for animals (and plants) to move to.

The opportunity to create new habitats, (on the large scale) to compensate for losses caused by development is not generally possible in the expansion of existing towns and villages. It should be possible by good planning,

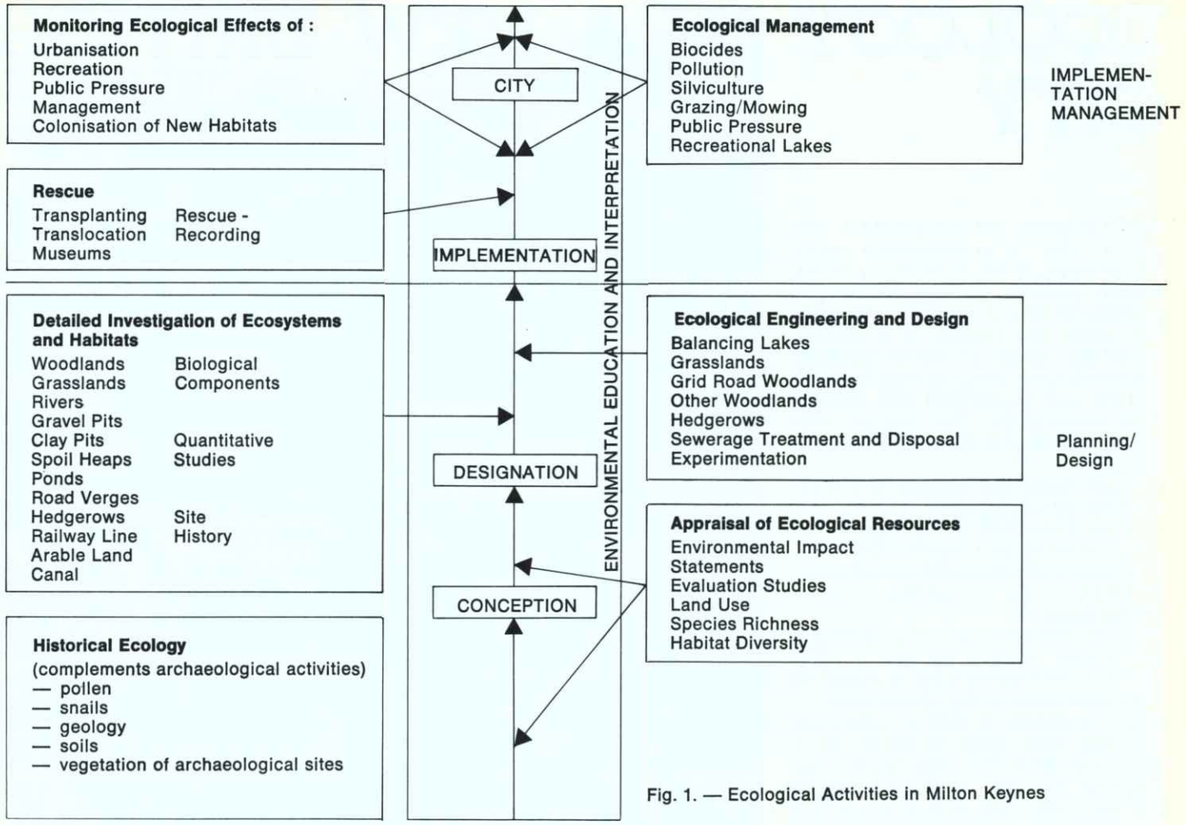


Fig. 1. — Ecological Activities in Milton Keynes

design and management to replace a wide range of habitats and plant and animal species or even increase the wildlife of the area.

The road system of Milton Keynes is an irregular grid of curving horizontal and vertical roads with intersections at roughly 1 km. intervals. There will be about 146 km. of road, with verges on each side of 15 m. - 35.9 m. (i. e. a total verge width at any point will be 30 m. - 71.8 m.). Apart from a 4.5 m. wide service reservation adjoining the road, which will be maintained as short grassland, the verges will be planted with trees to form belts of woodland running through the city, forming a total of about 7.6 sq. km. of woodland.

Consideration is being given to the creation of a zonal management system across the verge comprising 6 zones. Zone 1, short grassland ; zone 2, medium grassland (i. e. 400 mm.) ; zone 3, tall grassland ; zone 4, shrubs ; and zone 6, forest trees and shrubs ; and zone 6 forest trees and plants of zones 4 and 5. The number and width of the zones will be determined by site conditions and design criteria. These new roads will complement existing road verges, the canal and the railway as "wildlife corridors", forming a network linking together discrete sites and from which wildlife can colonise new habitats.

Golf courses provide opportunities to create new hedgerows, blocks of woodland, scrub and rough grassland for wildlife. Blocks of woodland are also being planted within the 3000 acres of open space and linear park. These blocks will complement other habitats such as the balancing lakes (see later), grassland areas, the rivers and drainage ditches, etc.

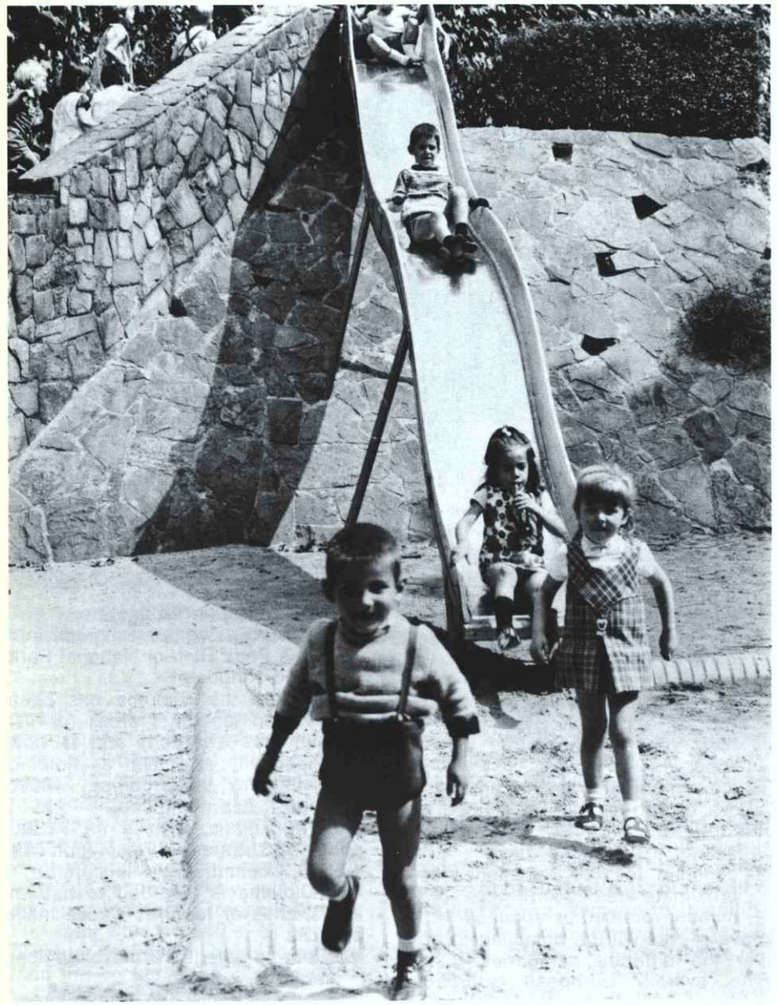
Part of the ecological work is to monitor the rate of colonisation of these new habitats by plants and animals. Ecological engineering design and management are concerned with the achievement of planning and design aspirations which may or may not have a wildlife value. The grid road planting landscape policy outlined above is an example of the creation of woodland ecosystems for visual amenity and wildlife purposes. In the following example, ecological knowledge is being applied to achieve recreational aspirations, with certain exceptions any wildlife conservation value is secondary.

In order that the presence of Milton Keynes shall not make flooding in the Ouse Valley any worse than it was in 1947, a number of impoundment reservoirs (known as balancing lakes) are necessary. It was decided to make some of these lakes permanently wet for land and water based recreational/ amenity purposes (i. e. the flood capacity is on top of a permanent body of water). The lakes will be off stream, have a general depth of 1.8 m. (with localised deep water channels) and receive a direct discharge of run-off from the city's streets and roads. The lakes, which vary in size from about 40 acres to 200 acres, will be zoned for different water and land based activities. One has been scheduled for wildlife and passive recreation, whilst the others will be used for yachting, angling, canoeing, paddle-boats, etc. with commercial development around the margins, e. g. hotel, club-houses, public houses, etc.

The ecological effort has been to attempt, (on a " costbenefit " basis) to assess the ecological implications and consequences of the design and recreational aspirations, to identify the natural and man-made problems which may arise, and to list the design/management options to prevent or ameliorate the problems and to make recommendations accordingly. An ecological monitoring programme is currently being devised.

Some of the balancing lakes will be wet/dry (filling up with water only in times of storm and being dry the remainder of the time). After completion of engineering works a standard seed-mix is sown and the resulting grassland managed by sheep grazing. Monitoring is being carried out to investigate the changes in the composition of the sward resulting from the oscillating water levels.

Environmental education and interpretation are important to stimulate children and adults to understand and appreciate their surroundings and therefore to care for them better. A high quality environment, an excellent landscape scheme, or an area of wildlife value can be severely damaged if the public as a whole do not understand and appreciate the design/management aspirations. In order to involve children in caring more for their environment the Development Corporation is encouraging and assisting with the establishment of insect gardens and tree nurseries in schools — the children actually plant and look after the trees and shrubs. A Conservation Corps has recently been started for people over 12 years old whilst a Junior Conservation Corps for pre-school children to 12 years is currently being devised with the purpose of being an umbrella body to co-ordinate individual groups of children based on schools (as an extra-curricular activity) youth clubs, Community Centres, Scouts, Guides, etc., — each with its own image and with its own priorities within the common purpose, aims and objectives, of the main body.



Environmental education and interpretation are important to stimulate children and adults to understand and appreciate their surroundings and therefore to care for them better.

...NEWS...NEWS...NEWS...NEWS...NEWS...

FROM STRASBOURG

Ad hoc Group — Plant Species

Numerous plant and animal species have disappeared from particular areas of Europe, some even from the entire continent. Several species are threatened with extinction.
The ecological dangers inherent in this situation are still unknown.
In order to halt this trend, lists must be compiled of those species which are threatened and require special protection. Lists of this type covering the whole of Europe, such as the IUCN Red Book, are of the utmost importance not only for the protection of our biological heritage but also for the satisfactory functioning of our vital systems and the harmonisation of the various states frequently divergent legislation in the matter.

Having recognised the need for urgent action, the Council of Europe published a booklet on threatened European mammals in 1969. This survey is to be updated in 1975. A similar survey on threatened European birds was carried out in 1973 along the same lines, and a number of resolutions and recommendations on the subject addressed to Council of Europe member states have been adopted by the Committee of Ministers.

Now a group of eminent specialists designated by the European Committee for the Conservation of Nature and Natural Resources is engaged in compiling a European list of endemic plants in danger of extinction.

As a result of Recommendation N° 4 of the first European Ministerial Conference on the Environment (Vienna 1973) two international symposia were held at the Arc-et-Senans International Centre for Reflection on the Future to consider problems relating to European plant species in danger of extinction. Since the purpose of compiling lists of endemic plants is to enable practical and political measures to be taken to protect them, and in view of the intergovernmental character of the Council of Europ's work, the experts who participated in the Arc-et-Senans symposia and the governmental experts on the European Committee consider that the Council of Europe should carry out this project in close and active collaboration with Flora Europaea and IUCN.
At the first meeting of the ad hoc group, held in Strasbourg on 10 and 11 December 1974, 5 categories of European flora were defined :

a) endemic plants found only in small areas in Europe ;
b) other endemic plants in marked decline in Europe ;
c) non-endemic plants found only in small areas in Europe ;
d) non-endemic plants in marked decline in Europe ;
e) plants, others than those in categories a) to d), which are in danger of extinction by reason of their very small number in Europe.

The exact situation each plant in the above categories will be defined by the following data :

— extinct,
— confined to 1 or 2 localities approximate area 25 km²,
— number reduced by about 50 %.

Several lists will be compiled to cover the different categories.
The overall, European approach adopted in the initial stage will subsequantly be replaced by a regional approach.
In order to speed up progress, national data relating to the 5 categories mentioned will be requested from Flora Europaea which has been assembling such information for 20 years and has already published 4 volumes on European flora, the 5th and final volume being due to appear shortly.
This project is restricted to Council of Europe member states but will take in the whole of Europe if possible. At the next meeting on 9 and 10 September 1975 the national lists based on the 5 categories will be studied and the provisional European list drawn up.

Tenth Anniversary of the European Diploma

The European Diploma was created by the Council of Europe in order to promote effective conservation and management in protected areas considered to be of exceptional European interest. On 29 March 1965 the Diploma was awarded for the first time, by a decision of the Committee of Ministers of the Council of Europe, at the proposal of the European Committee for the Conservation of nature and natural resources, to :

— the nature reserves of :
the Camargue (France) ;
the Hautes Fagnes (Belgium) and to the Peak District National Park United Kingdom).

Since then the Diploma has been awarded to ten other areas (cf. list of diplomas awarded) and is now internationally esteemed as helping to safeguard those areas whose prestige it has enhanced.
The regulations, revised on 19 January 1973, appear in Resolution (73) 4 of the Committee of Ministers.
The Diploma is awarded to natural areas, sites or features whose main purpose is :

— either to safeguard the biological heritage,
— or to preserve the character of the landscape,
— or to combine the social, recreational and biological functions of the area concerned.

Governments applying for the award must send the Secretariat full supporting documents, which are then examined by the "European Diploma" Working Party. Before submitting its conclusions to the European Committee, the Working Party takes steps for an on-the-spot appraisal to be carried out whenever it has been clearly established that the area is of European interest. The European Committee then makes a recommendation to the Committee of Ministers, which is empowered to award the European Diploma. Every year the authorities responsible for managing the area awarded the Diploma present a report on the situation in the area, site or natural feature.

The protected landscape of Siebengebirge (FRG), an example of an area combining social, recreational and biological functions.

The Diploma is awarded for a five-year period at the end of which it may be renewed. At this point an expert is appointed to carry out a new on-the-spot appraisal. So far, all the diplomas have been renewed.
The award of the Diploma does not involve any financial contribution ; its value is not merely symbolic. It can provide those responsible for the area with a means of bringing pressure to bear in order to strengthen the conservation of the protected area and avoid its deteriorating (through building, unsuitable development, etc.). Several examples bear this out :

1. The *Wollmatinger Ried* Nature Reserve : in 1973 the hunting of all species of aquatic birds was prohibited in the whole region as the European Committee had made the renewal of the period of validity of the diploma conditional on this.
2. The Salzburg authorities refused to allow the building of acces and through roads in the *Krimmler Ache* Valley of the Krimml waterfalls site (Austria), since this might have resulted in the Diploma being withdrawn.
3. In June 1974 the Council of Europe was informed that there was a danger of a high-speed railway line being built in the north of the *Siebengebirge Nature Reserve* (FRG). An independent expert was sent to make an on-the-spot study of the impact that the project would have in and around the reserve.

Recommendations have been made, stressing the need to work out a countryside planning programme and reduce the effects of building the line (noise, damage to the landscape) to a level where they would not seriously be of harm to the reserve.
Five applications have recently been received :

— the Gran Paradiso National Park (Italy) ;
— the Vanoise National Park (France) ;
— the Pyrenees National Park (France) ;
— the Weltenburger Enge Nature Reserves (FRG) ;
— the Manyas-Kus Cennati National Park (Turkey).

List of Diplomas awarded

29 March 1966 : Hautes Fagnes (Belgium).
29 March 1966 : Camargue Nature Reserve (France).
29 March 1966 : Peak District National Park (United Kingdom).
27 October 1967 : Krimml Waterfalls (Austria).
27 October 1967 : Lüneburg Heath (FRG).
27 October 1967 : Muddus National Park (Sweden).
27 October 1967 : Sarek and Padjelanta National Parks (Sweden).
27 October 1967 : Swiss National Park.
27 November 1967 : Abruzzi National Park (Italy).
29 November 1968 : Wollmatinger Ried Nature Reserve (FRG).
2 July 1970 : Boschplaat Nature Reserve (Netherlands).
22 September 1971 : Siebengebirge (FRG).
26 October 1973 : Germano-luxembourgeois National Park.

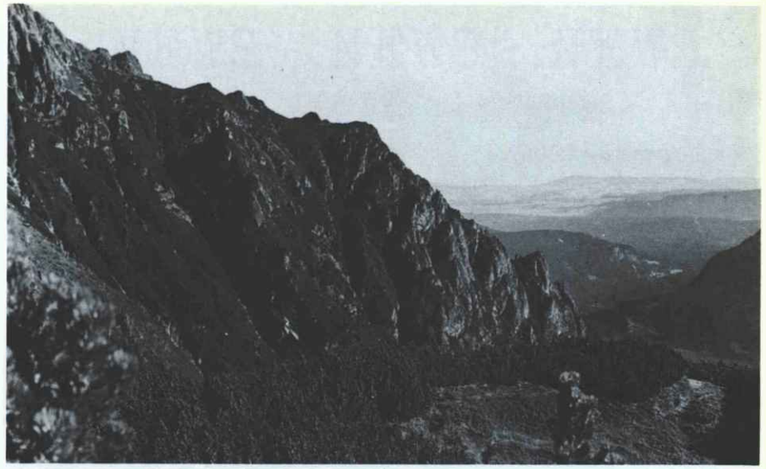
NOTES

Nature protection and national parks in Poland

In 1904, sixteen years after the creation of the first natural park at Yellowstone in the USA, Polish scientists living in the Cracow area proposed that a national park be set up in the Tatras mountains. The project, one of the first of its kind in Europe, was put into effect only fifteen years later in 1919, when a National Council for Nature Protection was set up in Poland. In 1921 the Council founded the future Bialowieza National Park. Between 1921 and 1939 four more national parks were founded : Greater Poland, Pieniny, Babia Gora and Tatras. The latter was not created until 1939 on the eve of the Second World War. A considerable impetus was given to all action of this kind in Poland when a Nature Protection Act was passed in 1934. The Act was considerably in advance of its time, but had a fundamental shortcoming ; the fact that it was not accompanied by any regulations on enforcement made it difficult to achieve anything practical. Only after the Second World War, as a result of the Nature Protection Act of 7 April 1949, was action taken to institute a co-ordinated system of natural parks. Poland now has 13 national parks with a total area of 103,000 hectares, 75,000 of which are forest and woodland where all the species growing in Poland are represented.

There are six national parks in mountain areas - Tatras, Pieniny, Babia Gora, Karkonosze, Holy Cross and Bieszczady. To these may be added the Ojcow Park, in the Cracow region. In central Poland there are the Greater Poland, Kampinos and Roztocze parks, and in the east the magnificent natural park of Bialowieza. The Wolin and Slowiny natural parks are situated in the north, near the Baltic coast.

The national parks were created in Poland by a directive of the Council of Ministers, issued in response to proposals by the Minister for Forestry and the Timber Industry, and fulfil a dual purpose which is both scientific and social. So far, more than 400 works on national parks have been published in Poland. In the parks are 13 permanent research stations, attached to various institutes and more especially the Polish Academy of Sciences. Also in the national parks are ten nature museums whose aim is to bring home the importance of nature protection in the life of a modern nation to a wide public. During 1973 alone the museum was visited by more than 300,000 people, mainly pupils from primary and secondary schools.



A view of the Tatras National Park.

The creation of nature museums and the growing number of visitors to national parks have given rise to a problem that is hard to solve ; the visitors may be ardent nature enthusiasts, but they also contribute unwittingly to the deterioration of the natural environment. This problem must be solved as soon as possible, for every year the number of tourists visiting the natural parks is rising with incredible rapidity, owing to publicity promoting parks and the spread of the motor-car in the country which makes it easier for lovers of greenery and fresh air to travel about. An attempt is being made to remedy this problem by limiting the parts of the parks that may be freely visited and marking out tracks which the tourists have to keep to.

In addition to the national parks there are 610 nature reserves in Poland, covering an area of over 58,000 hectares and varying in character according to region and purpose. There are 300 forest reserves, 86 floral reserves, 10 aquatic reserves, 52 for animal life, 30 for plant life and 64 for the countryside.

Nature protection in Poland comes under the direction of the Ministry for Forestry and the Timber Industry, where there is a post of General Nature Warden. The Minister and the Conservator are advised by a National Nature Protection Council with 30 members appointed by the Council of Ministers ; and a regional nature warden has been appointed in each province. The wardens and the National Nature Protection Council work in close collaboration with the various institutes and scientific centres of the Polish Academy of Sciences and higher education establishments. In addition, a Nature Protection League in operation in Poland since 1928 now has over 900,000 members, most of whom are young people. This charitable organisation has formed a nature protection team whose main aim is to inspect the state of parks and reserves. All these activities are provided for in the Act of 7 April 1949. However, there is more and more talk in Poland of amending the Act with a view to adapting it better to the needs of modern times, now that development is so much more rapid than in nature itself.

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