

1. Fundamental Thoughts on Earth-Science Conservation

By GEORGE P. BLACK & GERARD P. GONGGRIJP*)

1.1. Introduction

The surface of our Earth has evolved through the prolonged operation of natural processes, some originating within the Earth, others occurring at its surface and still others being of extra-terrestrial origin. Together, over millions of years, the natural operation of these processes has produced an endless variety of geological landscapes, which differ from place to place and change with time.

Since the arrival of Man, however, nature has been manipulated. Initially, Man's impact was small but, as more and more natural resources came to be exploited, and as the scale of his attempts to control the natural operation of geological processes grew, this effect on the environment markedly increased. As a result, in many places on Earth, the local geology, geomorphology and pedology have been – and continue to be – greatly altered through human activities such as intensive agriculture, river regulation, coastal protection, mineral extraction and all types of construction. Such activities often lead to the partial or total destruction of entire geological sections, geomorphological features and soil profiles, and, although mineral extraction and road and railway construction often leads to the creation of exposures showing the internal structure and composition of landforms, this is only small compensation for the eventual destruction of the landform itself. For unless there is some intervention in the interests of Earth-science conservation, most such artificial exposures are likely to have only the shortest of lifespans. Furthermore, since many geological features are, in effect, "fossil" rather than still actively developing, a significant proportion of geological landscapes, once destroyed or damaged, can not be replaced or repaired.

At the end of the nineteenth century, the increasing impact of Man on the landscape led to the rise of nature conservation movements all over the world; in these movements, biologists took the leading role. Earth scientists, many of whom were involved in the exploitation of natural resources, were, in general, not fired with the same enthusiasm for conservation. Moreover, at that time, mineral exploitation was not extensive by present-day standards, was little regulated, and the "restoration" which today damages the scientific interest of so many disused workings was not commonly practised. Nevertheless, individual Earth scientists and members of nature conservation societies gradually became more and more involved in Earth science conservation until, in the second half of the present century, there was a general move towards the adoption of more active policies for Earth-science conservation during a general revival of interest in na-

ture conservation as a whole. At this time, initiatives were taken in several countries to preserve important Earth-science sites for scientific and educational purposes and selection criteria were developed to identify where priority should be given to the needs of Earth-science conservation rather than to other potential land uses, when the future of exposures, sections and features was under consideration. At the same time, inventories of valuable sites were commenced and policies for Earth-science conservation were formulated at a national level. However, although geology pays no attention to frontiers, international contacts among Earth science conservationists remained few, except between some specialists.

1.2. International Co-operation

In 1987, inquiries made among Earth-science conservationists showed that there was a great need for, and a general desire for, an enhanced level of international contact. Based on the results of this inquiry, the first international workshop was organised in 1988 at Leersum in The Netherlands by the second author. At this meeting, the twelve participants from Austria, Denmark, Finland, Great Britain, Ireland, Norway and The Netherlands discussed the following subjects:

- Legislation; conservation policy; the classification, listing and selection of sites; site management and educational usage.
- The establishment of an international working group.
- The production of a newsletter.
- The implementation of international projects.

During the meeting, it became clear that, in the participating countries, Earth-science conservation had been treated more or less as a step-child in comparison to "biological" conservation, although there were legal provisions which make Earth-science conservation possible. There was confidence that this situation would be improved if an active working group were set up to operate on a national and international level.

This first meeting resulted in the establishment of the European Working Group on Earth-Science Conservation with the following aims:

- Exchange of information; by a newsletter and through meetings.
- Mutual support; as had happened in the past on the Bartonian type locality.
- Promotion of Earth-science conservation; on both national and international levels.
- Organisation of annual meetings; with general discussions, special items and an excursion.
- Production of a newsletter; twice a year.
- Implementation of common projects.

A common project identified at the first meeting was the preparation of an informative article on international Earth science-conservation to be illustrated by examples from the different countries. This to appear

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in Autumn 1990 in "Naturopa", a journal on nature conservation published by the European Information Centre for Nature Conservation of the Council of Europe. A wide variety of sites and areas of Earth-science significance from each of the participating countries will be discussed to draw attention to this special branch of nature conservation.

1.3. Second International Meeting on Earth-Science Conservation

The second international meeting on Earth-science conservation was organised by Dr. WALTHER KRIEG, Director of the Vorarlberger Naturschau in Dornbirn and was held at Schloss Hofen in Lochau, near Bregenz, from 6th to 10th May 1989. It was attended by Earth scientists from eight countries – Austria, Denmark, Finland, Great Britain, Ireland, The Netherlands, Norway and, for the first time, from Switzerland. On this occasion, the first day was devoted to the presentation of the papers which appear as the succeeding chapters, and was followed by a day spent in general discussions and the formulation of a strategy for the future. The two days of excursions showed a wide range of conservation problems, particularly those specific to mountainous regions.

During the discussions, it was reported that progress had been made with the preparation of site inventories in several countries. The inventories for Great Britain and The Netherlands had been completed and in the former country had even been partly revised. In Finland and in Switzerland the authorities are to undertake site selection in the near future and in Austria discussions on site selection at a national level will shortly be initiated. In Ireland, an inventory compiled in the '70's requires up-dating and incorporation in national nature conservation policy and this was to be discussed late in 1989. In Norway conservation policy gives priority to inventory preparation and to the protection of representative Quaternary landforms and of (threatened) fossil and mineral localities.

The need to prepare a European site list was considered as was the need to standardise the methodology and criteria of site selection. With the need to involve countries at present unrepresented on the working party in mind, consideration was given to the production of a manual on site selection, selection criteria and site grading (see below).

During the discussion on site management and educational usage, the problems caused by the concealment of landforms by reforestation were briefly discussed. For example, in The Netherlands, reforestation plans which have been drawn up for an area of small landforms (creek ridge systems) threaten to change the landscape and render it impossible to see these fine-scale geomorphological features. Examples from other countries were mentioned and it appears that this is a problem of international occurrence.

Discussion on the benefits to be had from the adoption of sites by geological societies – generally agreed to be an effective means of conservation – led to a consideration of the degree to which each country's geologists were organised. This varies markedly from country to country, from a low level of organisation in Norway to a high level in Great Britain.

It was recognised that the usage of sites, even for quite legitimate purposes, could give rise to management problems and lead to difficulties with site owners, especially in the case of fossil and mineral localities and caves. In Britain much had been done to solve such problems through the adoption of a national "Code of Conduct" for geological fieldwork prepared by Dr. ERIC ROBINSON of the Geologists' Association. It was agreed that he should be asked to co-ordinate the drafting of a European code with the help of the representatives of the other countries.

Full regard was given to the need to promote Earth-science conservation among the general public through providing easily understood leaflets and displays at information centres and museums while, at the same time, attempting to interest national and international policy agencies such as EEC, IUCN and The Council of

Fig. 1.
Members of the European Working Group on Earth-Science Conservation on excursion in Vorarlberg visiting a *roche moutonnée*.
Photo: G.P. GONGGRUP.



Europe and scientific organisations such as IGU, IUGS, ISSS and INQUA.

A new opportunity has recently been given to nature conservation through the possible cessation of farming on marginal agricultural land. In places where this occurs, an enlargement of the areas protected in the interests should be possible and in The Netherlands and in Denmark, for instance, initiatives have already been taken to transfer farmland which is to be abandoned into biological nature reserves. It was felt that this opportunity was also relevant to Earth-science conservation and that geologists also should take part in the discussions and planning for any such changes in land-use.

The Working Group intends to publish a Newsletter twice a year to give news of the latest meeting and of the programme for its successor along with news from individual member countries and reviews of books, legislation and of any other relevant developments.

A sub-committee was formed to look into the preparation of a manual for Earth-science conservation,

which was seen as being both a means of influencing authorities and of encouraging colleagues in other countries in addition to its long term aim of standardising methods. Such a manual should contain information on classification and inventory procedures, the selection, registration and management of sites, the role of conserved sites in education, the organisation of Earth-science conservation and other related topics. A draft is to be produced for discussion and ratification at the 1990 meeting and, when published, it is intended that it should be presented to the Council of Europe and widely circulated to interested organisations.

To follow up the manual, a European site list, comparable with that produced by the Corine project for biological sites, should be produced, having been selected by use of criteria developed from those outlined below by Dr. WILLIAM WIMBLEDON. It is intended to take this matter further at the 1990 meeting to be held in Norway.

2. European Heritage Sites and Type Site Inventories

By WILLIAM A. WIMBLEDON*)

2.1. Introduction

All European countries have features of international interest to the Earth scientist. Landforms and rocks present evidence of past events and environments, and this evidence is not limited by national or regional boundaries. The Earth sciences are truly international in outlook, and the complex story of, for instance, volcanic episodes, of ice-ages and of sealevel changes and many other widespread events can be traced across the continent.

At its meeting in the Netherlands in 1988, the European Working Group on Earth-science conservation discussed the need for the compilation of lists of "type sites". A type site is here defined as follows: any site in the modern or historical type area for a rock or chronostratigraphic unit, or the site/area where rock, geomorphological/landscape or pedological phenomena were first defined or recognised. The label is not here-confined to stratigraphic sites alone.

At its second meeting in Bregenz further consideration was given to this difficult task. The author proposed that the exercise was worth doing because, by the labelling such localities or areas we could

- 1) add support to local or national initiatives to protect sites,
- 2) submit finalised European lists to the EEC, Council of Europe, UNESCO etc. for use in their work in the

wider protection of geological, geomorphological or landscape features,

- 3) gain added status for sites which are although already recognised locally deserve wider recognition, and
- 4) gain publicity for such labelled sites, which should heighten public and government awareness of all Earth-science sites, be they tiny fossil sites or enormous wilderness areas.

How to go about compiling lists of heritage/type sites.

2.2. Categories

Most European states have compiled or started to compile inventories of their earth-science localities. This does not, however, address the problem of priorities in an international setting. For instance it has been suggested that Britain has 100.000 "sites" of earth-science interest. Around 3100 of these are to receive protection under existing national legislation. Some hundreds of these might be considered as contender European type sites, but only a small percentage would be regarded as truly international heritage sites using present strongly anthropogenic criteria, even allowing for Britains unrivalled, rich and varied rock, fossil and landform record.

There are a number of possible ways in which sites may be categorised in attempts at putting together a European type site or type area list, all of which are used to a greater or lesser extent in prioritising site selection in local or national conservation schemes.

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Zoologisch-Botanische Datenbank/Zoological-Botanical Database

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