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Final Report

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Previous reports in this series :

1. *International Co-ordinating Council of the Programme on Man and the Biosphere. First session. Paris, 9-19 November, 1971.*

2. *Expert panel on the rôle of systems analysis and modelling approaches in the Man and the Biosphere Programme (MAB). Paris, 18-20 April, 1972.*

3. *Expert panel on Project 1 : Ecological effects of increasing human activities on tropical and subtropical forest ecosystems. Paris, 16-18 May, 1972.*

4. *Expert panel on Project 12 : Interactions between environmental transformations and genetic and demographic changes. Paris, 23-25 May, 1972.*

5. *Expert panel on Project 5 : Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones. London, 19-22 September, 1972.*

6. *Expert panel on Project 3 : Impact of human activities and land use practices on grazing lands : savanna, grassland (fror temperate to arid areas), tundra. Montpellier, 2-7 October, 1972.*

7. *Expert panel on educational activities under the Man and Biosphere Programme (MAB). Paris, 5-8 December, 1972.*

8. *Expert panel on Project 6 : Impact of human activities on mountain ecosystems. Salzburg, 29 January-4 February, 1973.*

9. *Expert panel on Project 13 : Perception of environmental quality. Paris, 26-29 March, 1973.*

10. *International Co-ordinating Council of the Programme on Man and the Biosphere. Second session. Paris, 10-19 April, 1973.*

11. *Expert panel on Project 7 : Ecology and rational use of island ecosystems. Paris, 26-28 June, 1973.*

12. *Expert panel on Project 8 : Conservation of natural areas and of the genetic material they contain. Morges, 25-27 September, 1973.*

13. *Expert panel on Project 11 : Ecological aspects of energy utilization in urban and industrial systems. Bad Nauheim, 16-19 October, 1973.*

14. *Working group on Project 6 : Impact of human activities on mountain and tundra ecosystems. Lillehammer, 20-23 November 1973.*

15. *Consultative group on Project 9 : Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystems. Part on Fertilizers. Rome, 7-9 January, 1974.*

16. *Working group on Project 1 : Ecological effects of increasing human activities on tropical and subtropical forest ecosystems. Pic de Janeiro, 11-15 February, 1974.*

17. *Task force on the contribution of the Social Sciences to the MAB Programme. Paris, 28 February-2 March 1974.*

18. *Regional meeting on integrated ecological research and training needs in the Sahelian region. Niamey, 9-15 March, 1974.*

19. *Expert panel on Project 2 : Ecological effects of different land uses and management practices on temperate and mediterranean forest landscapes. Paris, 16-19 April, 1974.*

20. *Task force on pollution monitoring and research in the framework of the MAB programme. Moscow, 23-26 April, 1974.*

21. *Working group on Project 5 : Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones. Paris, 13-17 May, 1974.*

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S Y N O P S I S

This report describes the objectives of the proposed international network of biosphere reserves under MAB Project No. 8. It defines criteria for the selection of these reserves and recommends guidelines to assist in their establishment and management.

The objectives of the international network of biosphere reserves are :

1. To conserve for present and future human use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends.

2. To provide areas for ecological and environmental research including, particularly, baseline studies, both within and adjacent to these reserves, such research to be consistent with objective (1) above.

3. To provide facilities for education and training.

It is intended that biosphere reserves should comprise not only completely natural ecosystems but also semi-natural ecosystems, including those maintained by long-established land-use practices. Among the proposed reserves there should also be areas that have outstanding potential for restoration to near natural conditions.

The concept of biosphere reserves involves a broad philosophy of conservation which recognizes that successful stewardship will depend on adequate control of the use of land and water in surrounding areas. It may be viewed as an approach to maintaining the integrity of biological support systems for man and nature throughout the whole biosphere. As such it involves conservation, restoration and the acquisition of knowledge for improving man's stewardship of the domesticated and wild countryside.

The programme to establish biosphere reserves is not meant as a substitute for programmes to establish national parks and equivalent reserves. Biosphere reserves may often coincide partly with or incorporate national parks or equivalent reserves but they may include areas which do not conform to the IUCN definition of national parks. They may also include buffer zone areas where manipulative research may take place. The most significant and distinct characteristic of biosphere reserves, however, will be their links by international understanding on purposes, standards and exchange of information and personnel.

UNESCO, IUCN, FAO and UNEP should therefore encourage nations (through MAB National Committees and by other means) to set up reserves that meet the criteria and requirements outlined in this report. Initially the network of biosphere reserves may be based upon existing series of protected areas,

and it is hoped that countries will designate appropriate areas to participate in the international programme.

The procedure for selection of biosphere reserves will differ depending on the nature and purpose of a reserve. There are three main categories : 1) natural areas representative of biomes, their main subdivisions and transition zones ; 2) unique areas or areas with particular natural features of exceptional interest ; and 3) man-modified landscapes. Criteria for each of these categories are outlined to provide objective guidelines towards agreed standards for the network as a whole.

Close attention must be given to the planning of biosphere reserves. All reserves should have "core" areas and "buffer zones". Use would be confined, in most cases, to the buffer areas, with each type of use planned and controlled according to the nature and "carrying capacity" of the area. The requirements for conservation, for research and monitoring, and for education and training are specified. The compatibility of these purposes with use by the general public for recreational and other purposes is discussed. It is concluded that all uses must be controlled so as to be compatible with, or beneficial to, the primary objective of conservation.

The report emphasizes that the establishment of biosphere reserves in the biomes of the world is of world concern on behalf of this and future generations. It must be viewed not only as part of the overall use and development of the natural resources of a country, but as a part of the planned and conservative development of the resources of the biosphere. Accordingly, the biosphere reserves of the world require the close and active collaboration of all the international organizations concerned with the environment and the conservation of environmental quality, foremost among them Unesco, FAO, UNEP, IUCN and ICSU. The interactions and collaboration with existing or proposed international activities, such as the Convention concerning the protection of the world cultural and natural heritage, will need close attention to avoid possible overlapping or confusion.

Since biosphere reserves are to include representative and unique areas of the world's biomes and their subdivisions, it is essential that their establishment be based on a knowledge of the nature and extent of the important biotic communities of the biosphere. This involves international and national support for development of mutually acceptable classifications of the world's biomes and for the required surveys and inventories of biotic communities to determine their nature and extent.

The IUCN system for classification of natural regions will be studied and improved by experts on various natural regions, and this system will be used along with more detailed national classification schemes for selecting representative ecosystems for conservation. It is emphasized that many nations will require international assistance in carrying out surveys and inventories in order to determine suitable sites for the location of biosphere reserves. Great emphasis is placed on conservation of natural areas in the developing world, particularly in tropical forests, grasslands, coastal systems and islands.

It is recognized that the success of the programme will depend upon public information, education and training of local personnel within all countries concerned. Full use should be made of the educational resources of existing sites, especially the national parks and reserves, and model programmes should be developed within these sites in co-operation with local educational systems.

In addition to various suggestions and recommendations included in the main body of the report, a number of recommendations concerning implementation of the biosphere reserve programme are made for consideration by the International Co-ordinating Council of MAB and by National Committees.

1. INTRODUCTION

At its first session in November 1971, the International Co-ordinating Council for the Man and the Biosphere (MAB) Programme defined the various projects proposed under the programme. In stating the problem for Project 8 the Council recognized that the establishment of reserves, protected and managed in various ways, is of importance to mankind through the role they can play in meeting scientific, economic, educational, cultural and recreational needs. Such areas were regarded as essential for research in ecosystems of various kinds and of fundamental importance to the MAB Programme since they represent baselines or standards against which change can be measured and the performance of other ecosystems judged. They also represent a means of maintaining the gene pools of species of plants, animals and micro-organisms.

The Council recognized that efforts to establish an adequate network of protected areas, while successful in some countries, had so far met with disappointing results on the global scale. In order to achieve a co-ordinated world-wide network of protected areas the Council proposed, in co-operation with the intergovernmental and non-governmental organizations concerned, to assist governments to select, to set aside and to manage the areas needed for such an international network. It was suggested that international concern for the long-term conservation of such areas might be achieved through their designation as "Biosphere Reserves", together with promotion of appropriate standards for their conservation.

In September 1973, the Expert Panel on Project 8, in elaborating the scientific content of the project, urged immediate action toward conservation of natural areas (see MAB Report Series No. 12). The panel outlined general criteria and guidelines for conservation of natural areas and their genetic diversity, and it recommended that a special group be convened to prepare criteria and guidelines for the selection and establishment of biosphere reserve, embodying ecological and genetic principles of nature conservation. This document is the report of the task force convened for this purpose.

The terms of reference of this task force were as follows :

To establish guidelines to assist governments to select, to set aside and to manage the areas needed to provide a co-ordinated world-wide network of protected areas, or biosphere reserves.

In particular the group was asked to :

- Develop the objectives, definitions and criteria for selection of biosphere reserves

- Prepare a plan for further definition and classification of natural regions as a basis for identifying representative ecosystems

- Develop a plan for assisting countries to determine priorities for protection of representative and otherwise significant ecosystems, with the objective of establishing some biosphere reserves as early as 1975.

The task force met at Unesco, Paris 20-24 May 1974. Dr. C.K. Varshney (India) was elected as its chairman, and the composition of the task force is given in Annex 1 of this report. The meeting of the task force was organized by Unesco with the co-operation and support of the United Nations Environment Programme (UNEP) and in collaboration with the International Union for Conservation of Nature and Natural Resources (IUCN) and the Food and Agriculture Organization of the United Nations (FAO).

2. THE NATURE OF BIOSPHERE RESERVES

2.1 The concept

The concept of biosphere reserves involves a broad philosophy of conservation. The great changes in the world in the last decades have made it clear that a new dimension in conservation action is required, to provide both for the perpetuation of the Earth's living resources in all their variety, and for the proper study and understanding of the changes affecting them - for the future use and enjoyment of mankind. The international network of biosphere reserves is intended to provide this new dimension by the maintenance of ecological processes on an appropriate scale. The concept of biosphere reserves may be viewed as an approach to maintaining the integrity of biological support systems for man and nature throughout the whole biosphere. As such it involves conservation, restoration and the acquisition of knowledge for improving man's stewardship of both the domesticated and wild contryside.

2.2 Objectives

The task force recognized as the primary objectives of biosphere reserves

1) to conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends.

2) to provide areas for ecological and environmental research including, particularly, baseline studies, both within and adjacent to such reserves, such research to be consistent with objective (1) above.

3) to provide facilities for education and training.

The word 'natural', as used above, requires further amplification. It is intended to include not only natural ecosystems, but also semi-natural systems, including those maintained under long established land use.

It is emphasized that conservation is a major objective. In order to fulfil this role biosphere reserves should constitute a world-wide network of permanently protected areas chosen as representatives of biomes, their major subdivision and transition zones. Such areas will have considerable importance as sites for ecological research and it is intended that this should also be regarded as a major objective of the network. In particular, these areas will act as benchmarks, or standards, against which long-term observations may be carried out to evaluate natural and man-made changes and trends in the environment. In certain circumstances the objectives of conservation and manipulative or experimental research may be incompatible, and if the research would conflict with the conservation objective it should not be allowed. The provision of opportunities and facilities for education and training is an important function of biosphere reserves and is unlikely to conflict with these other objectives.

These broad objectives indicate the essential purposes for which biosphere reserves are intended. The precise nature of individual reserves will vary according to the ecological conditions of different biomes and the degree to which they are modified by man. The expert panel on MAB 8 has suggested some general principles concerning the types of area envisaged as biosphere reserves (see MAB Report Series No. 12, pages 21, 22 , 23).

Thus the panel suggested that the network of biosphere reserves should include not only representative examples of biomes and their main subdivisions, but also specific unique areas which are considered to have special importance

for conservation. Unique areas are those which have some specific characteristics or combination of characteristics which distinguish them from other parts of the biome to which they belong. It is essential to distinguish between these two types of reserves because they call for different selection procedures.

> *While there is justification for including both types, it is recommended that the main emphasis should be placed on representative examples of biomes and their main subdivisions.*

A second recommendation of the expert panel was that examples of landscapes modified by man should be included in the network. A distinction was made between essentially stable landscapes resulting from long-established patterns of land use, and severely modified or degraded landscapes. The panel recommended that samples of varied and harmonious landscapes resulting from long-established land use patterns should be maintained in a form of use which would preserve their character and the genetic diversity which they contain. The land use systems of the Alps (described in MAB Report No. 8, Annex 9) were given as an example. In the case of degraded areas which are capable of being restored to more natural conditions, the panel suggested that "examples of different kinds of human modification, of even of degradation of natural biomes should be included as examples of semi-natural communities and as reserves for species which they contain. Such areas can be used to demonstrate the processes of natural recovery, but a small part of each should be kept in its modified or degraded state as a standard against which recovery may be judged and demonstrated". It follows from these recommendations that several categories of biosphere reserves should be envisaged : natural areas which could be "representative" or "unique" and man-modified areas of the kinds described in the preceding paragraph. Further differentiation between, and even within reserved areas will arise from the various purposes for which they are designated. Some of these purposes may be incompatible, as, for example, the complete protection of natural areas and the intensive study of ecosystems

processes. For this reason biosphere reserves may consist of distinct zones which can be used for different purposes.

> *The concept of a protected core and a peripheral buffer zone, or zones, available for a variety of purposes, will be fundamental to most biosphere reserves. In this way the conflict between different types of utilization can largely be resolved.*

2.3 Relationship of biosphere reserves to national parks and similar protected areas

The international network of biosphere reserves is intended to enhance and strengthen national efforts to establish national parks and other reserves. Many of the requirements of the programme are fulfilled by those national parks and other protected areas which meet the specifications of the United Nations List of National Parks and Equivalent Reserves (IUCN 1973). MAB National Committees are therefore encouraged to make every effort to supplement existing measures to establish national parks and reserves and to extend these networks in order that they may become truly representative of all the important ecosystems in their countries.

Two elements are of great importance :

1) The integrity of the essential characteristics of many ecosystems cannot be safeguarded unless the protected areas are large and varied ; and

2) successful stewardship will also depend on adequate control of the use of land and water in surrounding areas.

Biosphere reserves therefore could in some cases coincide partly with or incorporate national parks or equivalent reserves, but they could also include areas which do not conform to the approved definition of national

parks (IUCN 1973). They may also include buffer zone areas where manipulative research may take place.

The most significant and distinct characteristic of biosphere reserves, however, will be that the network is linked by the existence of international understanding on purposes, standards and exchange of information and personnel.

Unesco, IUCN, FAO and UNEP should therefore encourage nations (through MAB National Committees and other means) to set up reserves that meet the criteria outlined in this report. Initially the network of biosphere reserves may be based upon existing series of protected areas, and it is hoped that countries will designate appropriate areas to participate in the international programme.

2.4 Characteristics of biosphere reserves

The following statements summarize the main characteristics of biosphere reserves :

1) Biosphere reserves will be protected areas of land and coastal environments. Together they will constitute a world-wide network linked by international understanding on purposes, standards and exchange of scientific information.

2) The network of biosphere reserves will include significant examples of biomes throughout the world.

3) Each biosphere reserve will include one or more of the following categories (see Section 2.3 above) :

   (i) Representative examples of natural biomes.

   (ii) Unique communities or areas with unusual natural features of exceptional interest. It is recognized that representative

areas may also contain unique features e.g. one population of a globally rare species ; their representativeness and uniqueness may both be characteristics of an area.

(iii) Examples of harmonious landscapes resulting from traditional patterns of land use.

(iv) Examples of modified or degraded ecosystems capable of being restored to more natural conditions.

4) Each biosphere reserve should be large enough to be an effective conservation unit, and to accommodate different uses without conflict.

5) Biosphere reserves should provide opportunities for ecological research, education and training. They will have particular value as benchmarks or standards for measurement of long-term changes in the biosphere as a whole. Their existence may be vital to other projects in the MAB programme.

6) A biosphere reserve must have adequate long-term legal protection.

7) In some cases biosphere reserves will coincide with, or incorporate, existing or proposed protected areas, such as national parks, sanctuaries or nature reserves.

3. PROCEDURE FOR SELECTION OF BIOSPHERE RESERVES

The selection of biosphere reserves will depend upon specified criteria for each of the following categories of area. It is likely that individual reserves will often include both national and man-modified areas and this can be done within the core and buffer zone concept referred to previously.

3.1 Selection of natural areas representative of biomes, their main subdivisions and transition zones

It is implicit in the concept of a global network that biosphere reserves should represent different biomes of the world, hence selection of appropriate sites will depend on a classification of biomes and their subdivisions. The selection of representative areas must therefore involve two distinct stages.

The first stage is to define the biomes and their main subdivisions which will be represented in the network. The development of a classification system required for conservation purposes is considered in the section dealing with the implementation (Section 5).

The second stage of the selection procedure is the examination of individual areas in order to decide which are appropriate examples of each desired ecological type. This involves the application of criteria for selection.

1) Essential Criteria

For the purpose of selecting representative natural areas it is suggested that the following four criteria must be regarded as mandatory :

(i) Representativeness

(ii) Diversity

(iii) Naturalness

(iv) Effectiveness as a conservation unit.

(i) Representativeness

This is the primary criterion for selection. A reserve should represent as far as possible the characteristic features of the particular biome, so that information relating to the nature and dynamics of the reserve area can be extrapolated to similar areas throughout a biogeographical region.

The level of representativeness will vary between different biomes. It is recognized that only rarely will it be possible to characterize a biome by means of a single reserve owing to the many ecological gradients which, by their interaction, produce geographical variants within a single biome. This type of variability will determine the number of biosphere reserves necessary to provide adequate representation of any one biome, and should be considered during the first phase of the selection procedure.

There may also be critical areas within the biome such as the centres of distribution of particular floristic elements or rare, endangered or threatened species. Such areas will have special significance for the conservation of genetic diversity and should be considered within the context of unique areas.

(ii) Diversity

It is desirable that a representative biosphere reserve should contain the maximum representation of ecosystems, communities and organisms characteristic of the biome. Since total representation cannot be achieved within a single area, it is necessary to define the level of diversity which has priority. This should be at the ecosystem level, so that "diversity" is primarily concerned with the degree to which the range of habitats characteristic of the biome is present in any one area. For example, a reserve representing the Taiga might include coniferous forest, bog, riparian and lake ecosystems, while a coastal reserve might include terrestrial, freshwater, estuarine, and marine ecosystems.

The criterion of diversity can also be applied at lower levels to communities and organisms but this should take second place to ecosystem diversity. Other things being equal, an area with greatest diversity of characteristic communities and organisms will have preference over areas with less diversity of this type.

(iii) Naturalness

This is a measure of the degree of man-induced modification. Obviously the selection of representative samples of biomes in their natural state necessitates a high priority being placed on naturalness, the least modified areas being the most appropriate. In this context modification should be interpreted broadly to include a range of conditions from total destruction of natural habitats, down to the presence of introduced or alien species.

(iv) Effectiveness of an area as a conservation unit

A biosphere reserve must be an effective conservation unit. This criterion involves a number of factors such as size, shape, and location

with respect to natural protective barriers, etc.. Optimum size depends largely on the type of system and the requirements of the species involved. The ideal area is one which is sufficiently large to be self-regulating, through the inclusion of all the interacting components. The relation of size of area to species diversity should be taken into consideration in planning biosphere reserves and in determining their boundaries. See, for example, the discussion by Diamond (1973) on the consequences of species - area relations for bird populations in certain tropical forests.

In terrestrial systems, watersheds will generally provide appropriate boundaries, complete catchments being preferable to parts of catchments. By this means the integrity and continuity of land and associated aquatic systems will be maintained, together with the associated interacting land - water processes. In the case of coastal areas also, management of the catchment is essential to the integrity of a reserve.

Although existing land use constraints may, in some circumstances, prevent the achievement of this ideal, nevertheless a complete catchment should be included in each biosphere reserve, so far as this is attainable.

Another criterion is the nature of the surrounding area. This has been referred to as "buffer-zone compatibility", which is the degree to which the land use of surrounding areas is compatible with the objectives of the reserve.

Methods of achieving an effective conservation unit (such as the provision of a buffer-zone), and the problems associated with the conservation of wide-ranging species (e.g. caribou), are considered in Section 4 of the Report.

2) Secondary Criteria

Other criteria will be of some value in selecting appropriate areas

as examples of natural biomes, but these should apply only where the primary criteria are met. An important criterion for selection of biosphere reserves is the degree of knowledge of the history of an area. Information on former use, past descriptions of the area, inventories of ecosystems, floral and faunal surveys and completed research projects will all contribute to this important but non-essential criterion. The presence of rare or endangered species would give additional value to a site. The relative value of an era for education and research should also be considered.

3.2 Selection of unique areas

Unique areas are those which have some specific characteristic or combination of characteristics which distinguish them from other parts of the biome to which they belong. The designation of unique areas as biosphere reserves cannot be based on an objective procedure since, by definition, each area is selected because of its characteristics being considered sufficiently important to warrant preservation.

As a guide to the level of importance which might justify selection of an area on the grounds of uniqueness, it is suggested that the features concerned should be sufficiently outstanding on a world scale for their international importance to be beyond dispute.

Unique areas could, for example, be the centres of distribution of rare or endangered species, or areas where there is a confluence of different floristic provinces, such as the Carpathian Mountains of central Europe. Selection of such areas would be justified on the grounds of conservation of the genetic material which they contain. Alternatively, an area could be justified on the grounds of its potential for research, such as a newly-formed volcanic island which affords unique opportunities for the study of processes of dispersal, colonization and the dynamics of ecosystem development. The designation of such an area as a biosphere reserve would provide the long-term protection necessary for studies of this kind.

3.3 Selection of man-modified areas

1) Varied and harmonious landscapes

Samples of varied and harmonious landscapes which are the result of long-established and stable pattern of land use should be maintained in a form of use which preserves their character and the genetic diversity which they contain. Dasmann (1973a) suggests that it is necessary to protect landscapes created by past agricultural or pastoral activities and to maintain these activities as continuing ways of life. In addition to their anthropological and social interest, they may have visual and aesthetic importance based on the quality of the landscape. They may also have high scientific importance as reservoirs of genetic materials associated with land use practices which are disappearing from lands managed through use of modern agricultural technologies.

The most important scientific criteria for selection of such areas will be the degree of diversity and stability in the landscapes concerned. In view of the considerable financial support which may be required to maintain traditional land use practices, tourism, which could provide some means of financial support, could be regarded as a criterion for the selection of such areas.

The degree of diversity is an essential criterion. It is the variety of components within the landscape (e.g. forests, meadows and high altitude pastures in a montane landscape) which gives these areas their particular significance for conservation. The degree to which the various habitats are inherently stable under the traditional forms of land use is another factor which should be considered.

2) Selection of modified or degraded landscapes

Since the biosphere reserve network should include a range of modified ecosystems, special consideration should be given to the establishment of reserves in areas where natural conditions no longer exist and the original communities have been modified. The objective of such biosphere reserves will be to restore the areas to as near the original conditions as possible. Specific objectives will be :

(i) to permit recovery from past human impacts such as those resulting from mining, grazing, agriculture and deforestation ;

(ii) to generate new knowledge for rehabilitating and managing areas which have been subject to deleterious land use practices.

Criteria for selection of areas for these purposes, will differ from those used for selecting other categories of biosphere reserve. It will be necessary to identify the range of modified ecosystems which exist and to select examples of types which are capable of rehabilitation. The location of such reserves will therefore be determined from surveys and inventories of the extent and condition of the biomes and ecosystems.

The optimum size of such reserves will depend on the type of ecosystem concerned. In areas such as the Sahel, reserves should ideally include transects from desert to sub-humid savanna with traditional uses and movements of people restricted to certain zones within the transects. Mountain reserves should ideally include a complete catchment or at least a complete mountain-slope system. Wherever possible the reserves should be large enough to encompass the normal movements of resident animal populations. Since research is an important use of such reserves, it should be regarded as a major factor in determining the location of such areas.

The means of maintaining protected areas for these purposes are elaborated further in Section 4, but it is appropriate to emphasize at this point that such areas can be included in the peripheral (buffer) zone of biosphere reserves in which the core is a completely protected natural area.

4. PLANNING, MANAGEMENT AND USE OF BIOSPHERE RESERVES

4.1 General principles - planning and the core/buffer concept

Biosphere reserves should have an important role in helping to achieve the broad aim of the MAB Programme, which is to develop the basis for improving the global relationship between man and the environment. Their effectiveness will to a large degree depend upon how well they serve the needs of different countries. Each biosphere reserve will have its own significant characteristics and values, and each will have specific purposes and uses. The key to effective management is careful planning and each reserve should have a master plan. This plan must establish the aims and policies of the reserve. It should outline the requirements for establishing and managing the area and serve as a basis for providing the necessary resources (manpower and funds). The plan should be always related to the conditions in the surrounding areas and cognizant of the relevant environmental, social and economic issues in those areas. Ideally such a reserve and the surrounding areas which have a major influence upon it should be subject to one agency responsible for planning and executing the conservation and use programmes. Where this is not possible, planning for management of biosphere reserves should be done under the guidance of a council or co-ordinating body which represents the different agencies or landowners for areas which will critically affect the reserve.

1) Buffer zones

Zoning is often a key to implementing the plan, and it is agreed that each biosphere reserve should have either a buffer zone or a "buffer mechanism", such as administrative agreements with those who control the surrounding area, which would help to protect the "core" area of the reserve. Thus, buffer zones could be administrative units subject to change as needs arise.

2) Function and nature of a buffer zone

A buffer zone should be created to protect the core area from man-induced alterations to the geochemistry or to the micro-climatic conditions of the area, and to shield the core from the direct impact of man's activities. For example, extensive land clearing around a small core would probably alter the environment of the core and would be prohibited in the buffer zone.

A buffer zone should provide space for wide-ranging movements of wildlife such as seasonal drifts and migrations between critical areas of a reserve, or for changes in the size of home ranges of animals. The buffer zone would provide additional space for rare or endangered species when the core is too small to accommodate an adequate population size. In highly dynamic systems such as exist in coastal and glacial areas, buffer zones would have to be located to accommodate the shifting of core areas when there is biotic or geomorphological change.

An essential feature of a buffer zone, and one which may well serve as justification of a reserve to land management agencies, is the provision of areas for educational programmes, tourism and other purposes designed to foster appreciation of the biome. Similarly areas within the buffer zone would facilitate manipulative research as well as comparisons of disturbed situations within the buffer zone and of undisturbed adjacent areas in the core.

3) Nature of the buffer

The buffer zone would usually be part of the same biome as the core, but in situations such as exist in a catchment area, a peat bog, or an island, it could well be of a different biome and include transition areas. In dynamic systems such as coastal areas with barrier beaches, the buffer will have to be provided by administrative action and will be subject to change.

The control of dredging outside a core area on a coast or river system, the control of run-off waters from agricultural areas, and the prohibition of clear-cutting of forests adjacent to a core area are examples of buffers provided by administrative action. Considerations for such buffers should be included in national or international land management schemes.

4) Size and management

The sizes of buffer zones and the management programmes for these areas would vary and depend on circumstances. They might be large in the case of forest reserves, drainage areas, or sea coasts, or small in the case of islands in an ocean or an alpine area. In all cases, sound ecological principles should guide the development of a buffer zone. Such principles perhaps would have implications for the planning of local human settlements but as a minimum requirement no new settlement should be allowed in the buffer zone.

Implicit here are regional, national and international land management schemes that take into account the functions of buffer zones and of the reserves as a whole.

Diagrams to illustrate some possible examples of the relations between core areas and buffer zones in biosphere reserves are presented in Annex 2.

4.2 Priorities of various uses and their particular requirements

1) Conservation

Taking into consideration the UNEP objectives to promote the identification and conservation of unique natural sites and especially of representative samples of natural ecosystems and to develop, manage and conserve ecosystems, it is agreed that conservation of biotic communities

should be given the highest priority, thus this will be the primary purpose and use of biosphere reserves. The expert panel on Project 8 stressed that without deliberate protection few natural communities will have a chance of survival and that the reduction of species diversity, proceeding with increasing rapidity, may become irreversible in a mere generation or two.

Dasmann (1972) emphasized that major segments of the world's biota may be lost through failure to establish even a minimum degree of protection. In 1972, of 120 biotic provinces, he listed 41 provinces with no reserves, and 42 with few reserves. Therefore the MAB Programme should give high priority to biotic regions in which there are no or few reserves. Particular attention should be given to tropical forests and grasslands, island ecosystems, tropical coasts and coral reefs.

2) Research and monitoring

(i) Research

MAB being essentially a programme of problem-oriented research, must be concerned with exploring and exploiting opportunities for research which the protection of natural areas clearly affords. Such opportunities are of two kinds : research in the protected areas themselves, examining the changes which occur in natural systems over long periods of time without human intervention, and research in adjacent areas where man-made modifications to the environment, including various types of land use, can be compared with the conditions within the protected area.

Research in the reserve proper should be at three levels : an understanding of the dynamics of the particular ecosystem ; comparisons between ecosystems ; and comparisons in time. All three are essential for long-term baselines studies revealing the interactions between changes in the physical and biotic components of ecosystems. They will provide essential scientific

background for any type of research into environmental or other biological problems to be conducted in the reserves. They will also make a substantial contribution to the understanding of the theoretical and practical aspects of conservation and natural resources management. Finally, such studies will facilitate meaningful comparisons between natural and man-made conditions in research conducted outside the reserves within other MAB Projects.

This approach is in accord with the aim of UNEP to support ecological investigations on ecosystems in relation to the impact on human activities.

Basic to these studies will be an initial comprehensive baseline survey of the conditions and the communities in the reserve, including floristic and faunistic surveys. Such surveys will presumably be repeated at intervals. Photographic records, including ground photographs and remote sensing records, will be of great value.

Such reserves will provide opportunities for various kinds of research which will form part of the proposed baseline studies. Some examples of types of research or measurement are :

(a) Continuous or frequent :

- climatic variables
- hydrological variables
- pollutant levels (including nuclear radiation)

(b) Periodical :

- soil characteristics, including nutrient status
- detailed study of plant and animal community composition and structure on selected sample sites to detect changes in species composition, age distribution, etc.

(c) Occasional :

- studies of ecological and genetic processes designed to provide explanations for observed changes (e.g. predator-prey relationships, age structure and succession ; population size and gene frequencies in populations differing in breeding system, and gene flow).

Special emphasis should be placed on studies designed to assist in determining the conservation management policy for the reserve such as studies aimed at understanding the natural dynamics of populations of animals or of plant communities and the important environmental influences controlling these dynamics.

Extensive opportunities should exist for conducting experimental or manipulative research programmes, with the core area functioning as the control and the buffer providing sites for manipulation, such as experiments which involve manipulations of small catchments to determine effects of logging, grazing, fire, etc., on water quality and yield, with a precalibrated, comparable control catchment in the core. Studying the effects of human activities on animal behaviour and population dynamics may serve as another example of core-buffer comparative research. However, any manipulation in the buffer should be consistent with the management plan for the buffer, e.g. an agricultural experiment in a buffer which is planned only for recreational use would be inappropriate.

A research programme associated with a biosphere reserve established in a disturbed and degraded area will have a different emphasis. The task force recommends that such a reserve should only be established where there is a plausible chance for the area to be restored to a near-natural community. The chief components of the research programme should be : (1) An initial inventory of biota and communities, and repeated surveys at more frequent intervals because of more rapid rates of change ; (2) research aimed at providing recommendations on methods for restoration management ; and (3) monitoring.

A research programme should be an objective of any biosphere reserve and will provide a means of distinguishing the biosphere reserves from the numerous existing programmes aimed exclusively at nature conservation. It is recognized, however, that the first priority should be to identify and protect significant areas. The capability for research programmes may have to be developed over a period of time as personnel and funds become available.

In developing and conducting biosphere research programmes, substantial attention should be devoted in the international sphere to identifying and encouraging compatible and comparable research methodologies and techniques. Some general suggestions for documentation of research and survey undertaken in biosphere reserves are given in Annex 3.

(ii) Monitoring

Some of the biosphere reserves in undisturbed, representative natural ecosystems should serve as baseline areas for research and monitoring activities to be undertaken in the Global Environmental Monitoring Systems (GEMS) of UNEP, to help provide an early warning system for significant environmental problems. The Unesco-UNEP Task Force on Pollution Monitoring and Research in the framework of MAB, stressed the need for such baseline areas in the study of pollutants on terrestrial and associated aquatic ecosystems (See MAB Report Series No. 20). Detailed guidelines and criteria for the baseline studies and monitoring activities are needed and these will be developed later in 1974 under a Unesco project supported by UNEP.

The Commission on Monitoring of the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) recommended in its report on Global Environmental Monitoring (1971) that two types of reference areas should be established : baseline low-exposure areas, and regional medium-exposure areas. it also recommended that the baseline areas should be located in very remote regions, if possible, in all of the major biome types.

" The baseline monitoring areas within each biome type should be well removed from local areas which have already been significantly altered by man's activities and land usages. Although very little land surface on the globe has not been affected in some degree by man, substantial areas, particularly those deliberately reserved as wilderness areas, show minimal direct impact from man, and these should receive first priority in siting. Since the monitoring programme is to operate indefinitely, these sites and their surroundings should be dedicated to monitoring in perpetuity. As a general rule, land-based reference stations should be located in natural areas which are approximately 100 kilomètres removed from any significant human settlements and large-scale agricultural activities. The observing station itself should be designed for minimum impact on the natural biota and environment, or need not necessarily be located within the baseline area."

SCOPE Report 3 (Munn 1973) contained recommendations with regard to an action plan for monitoring programmes in vegetation and forests. Unesco-MAB should have an important role in implementing some of the monitoring activities which should logically take place in biosphere reserves. An example would be the collection and analysis of plant species, such as lichens, mosses, edible nuts, berries and grasses, which might be useful indicators of global pollution trends.

(iii) Education and training

(a) Environmental study areas

Biosphere reserves should be used as resources for scientific training and for developing environmental awareness. The expert panels on Educational Activities under MAB (See MAB Report Series No. 7) and on Project 8 have both recommended that stations and sites associated

with MAB research should become permanent places for demonstration and popularization of environmental subjects. The expert panel on Project 8 (MAB Report Series No. 12) suggested the development of environmental study areas in reserves. These study areas would be especially for the use of educational groups. The facilities and programme materials related to the sites would be developed in co-operation with local educational institutions with the object of developing model programmes which could be modified for use elsewhere. Use would be controlled to specific sites according to the "carrying capacity" of the site to minimize any damage to the integrity of the reserve.

(b) Training at university level

With regard to training at university graduate and post-graduate levels, it should be possible to develop programmes of study related to the particular research activities and objectives of the reserve. This opportunity should become even more attractive to educational institutions when the network of biosphere reserves becomes a reality and there is regular communication of research and monitoring results.

(c) Specialized programmes

In addition to on-site educational and training activities such as those mentioned above, other means of training scientists and technicians should be encouraged. These include specialized programmes, training courses, fellowships and exchanges of personnel. Good examples of specialized training colleges are those at Mweka, Tanzania, and Garoua, Cameroon, which train students in management of national parks and reserves and which receive technical assistance from UNDP/FAO. Similar programmes should be established in other regions, particularly in Latin America and Asia. Activities such as the International Seminar on Administration of National Parks and Equivalent Reserves (a co-operative programme offered by the University of Michigan, the National Park Service, United States Department of the Interior,

Parks Canada, Department of Indian and Northern Affairs and the Mexican Commission of Natural and Cultural Areas (CONOPAN)), should be encouraged. A similar programme on European National Parks and Equivalent Reserves is planned to begin probably in 1976. These programmes should incorporate biosphere reserve themes and objectives and Unesco and other funding sources should be invited to provide fellowships.

(d) Unesco training courses

The first MAB regional training course on tropical ecology, held in Venezuela in 1973, was successful, and the interest shown by the developing countries for this type of training has led to the planning of other courses - in Latin America, in South East Asia, and in East Africa. The general objective of these courses is to train specialists for an integrative approach to the study and rational use of the resources of tropical ecosystems. As such, they should include information on conservation and the establishment of biosphere reserve. As biosphere reserves are established and the research and monitoring functions are implemented, the need for training will become even more critical ; thus courses of a more specialized nature should be organized.

4.3 Public use of biosphere reserves

In many circumstances an area large enough for effective ecosystem conservation cannot be acquired unless certain public uses are allowed. In other cases where human uses may have very adverse effects, strict control will be necessary in order to achieve the conservation objective. Thus the requirements for control of public use of reserves must vary according to the conditions in the countries and the nature of the resources to be conserved. The following statement from MAB Report Series No. 12 relates to this issue :

"One aim of conservation is to safeguard as many existing species as possible. However, there are natural and economic limits to conservation, and completeness of coverage is less realistic and relevant than the biological soundness of systems of conservation, whatever biota they are designed to protect. If extinction of a protected species occurs at some time in the future, it should be due to natural evolutionary causes, and not to an inadequate reserve.

Finally, human impact on reserved areas, unless widespread and severe, should not interfere so seriously with the population structure of the great majority of species in a reserved area as to have genetic consequences. The essence is to keep the impact in reasonable bounds. Infringement of ecological and genetic integrity must be balanced against long-term security of tenure : conservation is, and is likely to remain, uncertainly poised at the will of any generation, community or government. Moderate access for our dominant human species may result in exchanging a bearable loss in biological integrity for a gain in size, diversity and security of reserved areas."

The issue therefore should be whether or not particular uses can be kept in reasonable bounds, or can be directed towards helping to achieve the conservation objectives. The conflict between public use and conservation can often be resolved by planning and zoning of the reserve according to the "carrying capacities" of the different zones. There is no question, however, that the numbers of people using an area will have to be limited to the area's carrying capacity. The IUCN Publications New Series No. 26 (Forster 1973) includes useful guidance on zoning and visitor deployment and on developing a planning programme within a park or reserve.

A final point which was emphasized in MAB Report Series No. 12 is that buffer zones can help to protect natural areas, but if they are to survive in the long term it will be because people become committed to conserving the total environment. The knowledge and the attitudes that lead to this commitment can be engendered by planned programmes which carry MAB concepts and objectives into the schools.

5. IMPLEMENTATION OF THE PROGRAMME

5.1 Co-operation in establishment and maintenance of reserves

The planning and establishment of biosphere reserves will require expert staff and, in some instances, considerable financial resources for buildings, communication and other facilities. In some countries, including some with a great wealth of natural communities of paramount interest to the world and to the countries themselves, there are as yet few protected areas of the "biosphere reserve" type. In some of these, also, the necessary expert staff is as yet not available or the demands of immediate economic development absorb the trained personnel.

Three measures are essential in such circumstances : provision of consultants, training of local personnel, and financial assistance for the establishment of the necessary facilities.

1) Consultants. The immediate need is for a small corps of consultants to help fill the gap which the early - and in some instances urgent - establishment of biosphere reserves will create. The consultants should be selected on the basis of their experience in the particular biomes.

2) Training. Training may be required at several levels. For the professional staff, training at established institutions should be linked with on-site training with the assistance of consultants proposed in (1) above. For the training of sub-professional staff, regional short-duration training courses should be considered, preceded by on-site training and experience.

3) Facilities. The basic facilities will include access roads and other means of communication to and within the reserve,

prominently including the buffer zone. Buildings will be required for administration, research, supervision, and housing of staff. Some reserves will depend on revenue from the tourist trade. In such cases assistance with provision of tourist facilities in the vicinity of the reserve may be a condition of its establishment and continuing viability.

The maintenance of some biosphere reserves may also require financial assistance, especially in the initial period. This may have to include assistance to people who need to be re-established in new homes and occupations and who may require assistance in re-training and re-establishment. More generally, however, assistance in meeting at least part of the cost of staff and management may have to be given for a period of time.

The task force calls attention to the International Co-ordinating Council recommendation that countries should take advantage of funds-in-trust arrangements with Unesco, whereby Member States can make funds available for specific activities in developing countries. This could be an important means of providing the technical assistance required by countries in the planning and development of biosphere reserve programmes.

The establishment of biosphere reserves in the biomes of the world is of world concern on behalf of this and future generations. It must be viewed not only as part of the development of the natural resources of a country, but as part of the planned and conservative development of the resources of the biosphere. Accordingly, biosphere reserves require the close and active collaboration of all the countries and the international organizations concerned with the conservation of environmental quality. Foremost among these organizations are Unesco, FAO, UNEP, IUCN and ICSU. The interactions and collaborations with existing or proposed international activities, such as the Convention concerning the protection of the world cultural and natural heritage, will need close attention to avoid possible overlapping or confusion.

5.2 Classifications : surveys and inventories

Since the reserves contemplated for MAB purposes are to include representative and unique areas of the world's biomes and their subdivisions, it is essential that their establishment be based on a knowledge of the nature and extent of the important biotic communities of the biosphere. This involves international and national support for the identification and description of the nature and extent of biotic communities. General maps of the world's biomes are already available, and these have been further subdivided into biotic provinces in a preliminary classification scheme provided by IUCN.

For international use, and particularly to identify gaps in the existing network of protected areas, Unesco with financial support from UNEP will assist IUCN so that this global classification can be studied and improved by experts on biogeography who are familar with the regional distribution patterns of plant and animal species. The classification system will then be made available to MAB National Committees in 1975. The International Classification and Mapping of Vegetation (Unesco, 1973) should also be useful as a basis for identifying representative ecosystems.

For national purposes, full use should be made of those more detailed classification schemes and of existing vegetation maps and other maps showing the distribution of natural areas that already exist. These along with the global classification will help to enable participating countries to assess the status of conservation of representative ecosystems within their natural regions and determine their priorities for conservation. Where possible technical assistance should be provided by Unesco and other international organizations to countries in identifying areas for conservation, and in the selection, planning, and management of biosphere reserves. Questionnaires, such as that used to survey wetland areas in India, may prove useful for identifying areas that are suitable for inclusion in the reserve system. Aerial and satellite imagery will also be useful in identifying areas suitable for preservation.

Many nations, however, will require international assistance in carrying out national surveys and inventories in order to determine suitable sites for the location of biosphere reserves. Funds should be programmed by Unesco with UNEP support to provide such assistance.

As emphasized in Section 4 of the report, high priority should be given to regions which have few or no nature reserves, with particular attention to forests, grasslands, coastal systems and islands in the tropics. Special consideration should be given to identifying and conserving fragile and endangered species of plants and animals. These deserve urgent attention where these systems are threatened with destructive forms of land use.

In assessing the status of conservation of representative ecosystems the FAO World Forest Inventory Programme and the Tropical Forest Cover Monitoring Programme would be useful. The objective of the latter is to map broad forest cover and land use classes in the tropics and to use this information as a basis for monitoring in the future. These surveys could also provide information on areas which could be selected for biosphere reserves. The reserves could then become important baseline stations for detailed studies and monitoring within the Tropical Forest Cover Monitoring Programme.

5.3 Information, education and training

The long-range success of the MAB programme will depend upon public information, education and training. Therefore, Unesco should develop a plan for the use of communications media to inform the public about the programme and its objectives. Full use should be made of the educational resources of protected sites, not only in biosphere reserves but also in the national parks and similar reserves, and model programmes with MAB themes should be developed within these sites in co-operation with local education systems. An example of the kind of interpretative material that should be produced would be a series of maps and exhibits on the biotic provinces of the world and on the areas that

are now protected in accordance with accepted international standards. Such information material should be developed by Unesco and IUCN.

Training needs for implementing the international network of biosphere reserves must be identified as soon as possible, and the international agencies concerned should increase their efforts to provide assistance to countries which request it.

The questionnaire on educational and training needs, now being prepared by the MAB Secretariat for distribution to National Committees, should also specifically solicit information on their training needs in respect to participation in the biosphere reserve programme. Possible sources of training assistance and financial support should also be identified as soon as possible.

5.4 Inter-country co-operation

Inter-country co-operation will be necessary in many instances in the selection, establishment and management of biosphere reserves. This co-operation could be between countries in the same region which share common interests and problems or between countries in different regions which wish to exchange technology, information and personnel in the field of conservation and research. An example of the latter is the agreement between the Union of Soviet Socialist Republics and the United States on environmental protection, which includes

preservation of natural areas, and related research as a major objective.*

Mechanisms for assistance and collaboration between countries should be developed as has been emphasized by the International Co-ordinating Council of MAB. Regional organizations such as the Council of Europe (see as an example Statement by the Representative of the Council of Europe, Annex 4), the Organization of African Unity, and the Organization of American States, for example, can often provide such mechanisms in arranging co-operation in the implementation of biosphere reserve programmes.

5.5 Inter-agency planning and co-operation

Close collaboration between the international governmental and non-governmental organizations concerned is an essential condition for the rapid and efficient implementation of the biosphere reserve programme. Recommendations for the establishment of an inter-agency group for planning and implementation of a network of biosphere reserves will be found under Section 6.

5.6 Legal framework

In order to establish biosphere reserves, it will be necessary for individual countries participating in the programme to ensure that they have a suitable legal framework within which the necessary controls on land use can be implemented.

* Subsequent to this task force meeting the U.S. and the U.S.S.R agreed at a summit conference in Moscow to support the implementation of the MAB Programme. The following is an extract from the summit communique issued in Moscow, July 3, 1974:

> "Desiring to expand cooperation in the field of environmental protection, which is being successfully carried out under the U.S.-U.S.S.R. agreement signed on May 23, 1972, and to contribute to the implementation of the "man and the biosphere" international programme conducted on the initiative of the United Nations Educational, Scientific and Cultural Organization (Unesco), both sides agreed to designate in the territories of their respective countries certain natural areas as biosphere reserves for protecting valuable plant and animal genetic strains and ecosystems, and for conducting scientific research needed for more effective actions concerned with global environmental protection. Appropriate work for the implementation of this undertaking will be conducted in conformity with the goals of the Unesco programme and under the auspices of the previously established U.S.-U.S.S.R. joint committee on co-operation in the field of environmental protection."

Since biosphere reserves will form a global network linked by international understanding, it would be desirable in the long term for these areas to have a degree of international recognition. The task force suggests that consideration of the way in which this might be achieved be assigned to the proposed inter-agency group.

6. RECOMMENDATIONS

The task force made the following recommendations for consideration by the International Co-ordinating Council :

1. *That a formal agreement be reached between Unesco, FAO and IUCN to secure collaborative planning and execution of a world-wide network of biosphere reserves and that an inter-agency group be established to develop a long-range plan which would be presented to the International Co-ordinating Council at the earliest possible time.*

2. *That on the basis of the long-range plan, funds to assist countries in development of reserves and in training of personnel should be programmed by the organizations concerned.*

3. *That the advice, co-operation and assistance of UNEP should be sought in the implementation of the programme.*

4. *That the IUCN coastal and marine surveys, regional surveys and inventory systems, the FAO World Forest Inventory Programme and the Tropical Forest Cover Monitoring Programme should be used in the assessment of representative ecosystems for the development of a world-network of biosphere reserves. The International Co-ordinating Council should carefully consider the possible continuation of activities undertaken within the International Biological Programme which have a direct bearing on the recognition and documentation of sites of high biological interest, including the Check Sheet Survey and the recommendations for further development deriving from it.*

5. *That MAB Project 8 and the need for the establishment of biosphere reserves should be emphasized in scheduled regional meetings of other MAB projects. A roving mission to countries to encourage the establishment of biosphere reserves should be considered.*

6. *That emphasis on biosphere reserves should be included in existing training courses of MAB, and that specialized courses in biosphere reserve planning, development, management, and research should be considered as the programme is implemented.*

7. That National Committees be invited :

- to initiate or expedite their surveys and inventories to identify areas for conservation and, at the earliest possible time, designate areas to be established as biosphere reserves. This would include the development of suitable legal frameworks if they do not already exist, for the necessary protection of the reserves.

- in the course of selecting sites for biosphere reserves to take full advantage of information gathered during the IBP/CT Check Sheet Survey for the recognition of sites of high conservation importance and their establishment as reserves ; in particular IBP/CT Reserves should be considered for their suitability as core areas for biosphere reserves.

- to develop co-operative bilateral agreements where necessary for the establishment and protection of biosphere reserves ; these could include arrangements for exchange of personnel in research, management, and training programmes.

- to include in education programmes activities to enable people to understand the need for conservation and research programmes at a national, regional and global level. These activities should be developed as a part of the biosphere reserve programme and in co-operation with local educational institutions wherever possible.

- to obtain information on their countries training needs and resources requirements in respect to participation in the biosphere reserve programme.

ANNEX 1

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ANNEX 2

EXAMPLES OF ZONING SYSTEMS FOR BIOSPHERE RESERVES

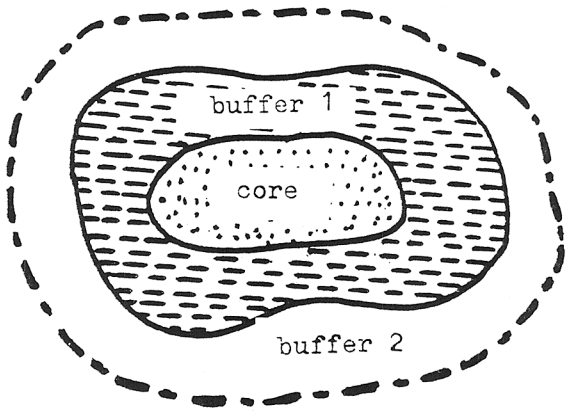
The following examples illustrate the "core" and "buffer" zone concepts. The diagrams are simplified but they suggest a few of the complex situations in different biomes.

1. Basic "core" and "buffer" zones and possible uses of these zones.

   core - no development permitted ; uses are strictly controlled.

   buffer 1 - used for research and educational purposes ; use and movement by the public are limited to authorized sections and tracks.

   buffer 2 - may be used for various purposes, including public recreation, but uses are controlled according to the carrying capacity of the area.

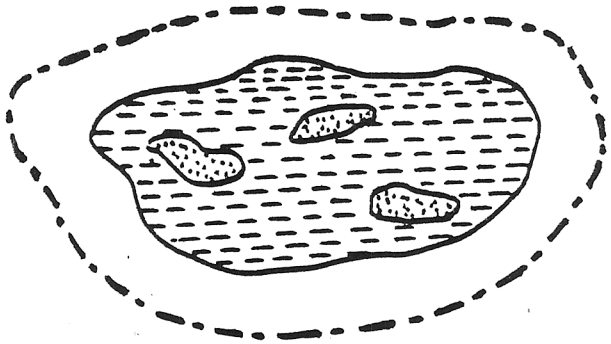


2. Degraded area managed for restoration.

   core - these are remnant natural areas, strictly protected and used for research.

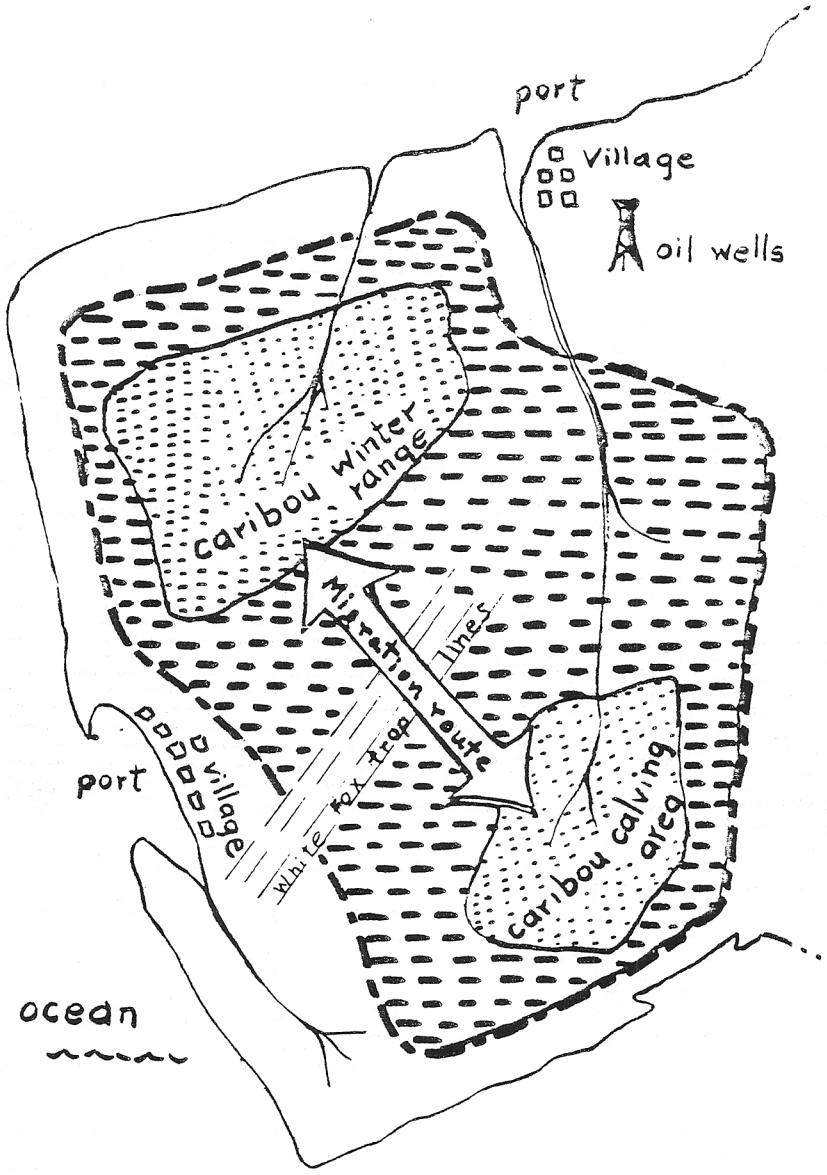
   buffer 1 - area managed for restoration and used for research.

   buffer 2 - area managed for restoration but allowing various public uses such as education and recreation.



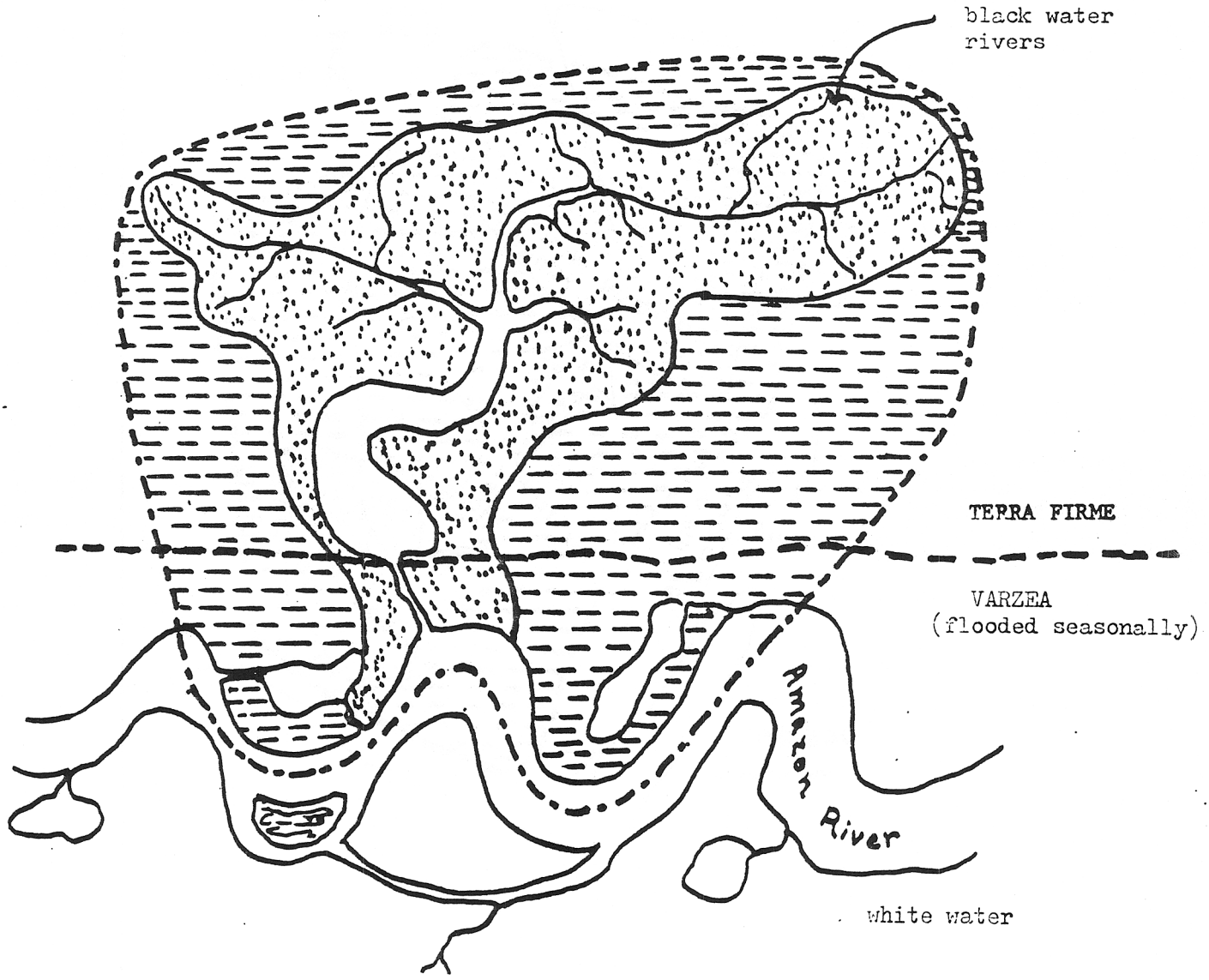
3. Arctic Tundra Reserve

This example has one buffer zone, in which tourist uses and trapping are controlled by land use regulations. The core areas are strictly controlled under special legislation.



4. Rain forest reserve in the Central Amazon Basin

The example below includes a drainage system in a region where high rain forest dominates. In the "Terra Firme" area soils are poor in mineral salts and the area is impoverished floristically and faunistically. In the alluvial land formation (Varzea), soil is rich in nutrients and flora and fauna are optimally developed. (The hylaea amazonica which covers the greatest portion of the Amazon region, is not as ecologically homogeneous as has been thought. Therefore, a number of large reserves would be needed to conserve the great diversity of the "hylaea".)

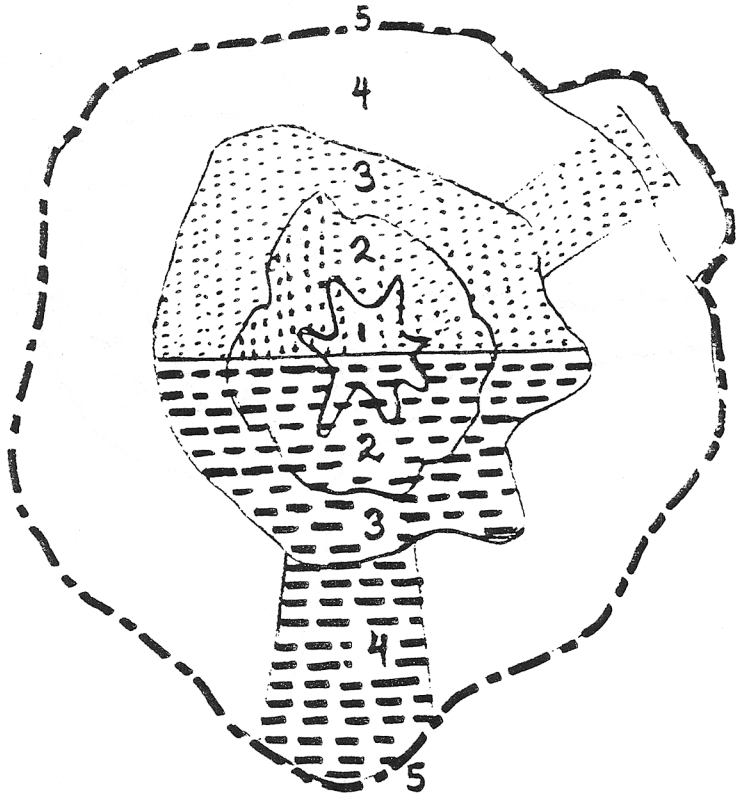


5. Tropical Mountain Reserve

The example below illustrates a tropical mountain in Africa. Part of the mountain (buffer 1) is used by tourists and these uses will continue but will be regulated.

The core area protects examples of some of the fragile communities in the alpine and ericaceous zones. It also extends down through the montane forest belt providing a large transect which could be used for research in all the vegetation zones.

The montane forest belt is an existing forest reserve, with both plantation and natural forests ; thus it serves as a buffer zone.



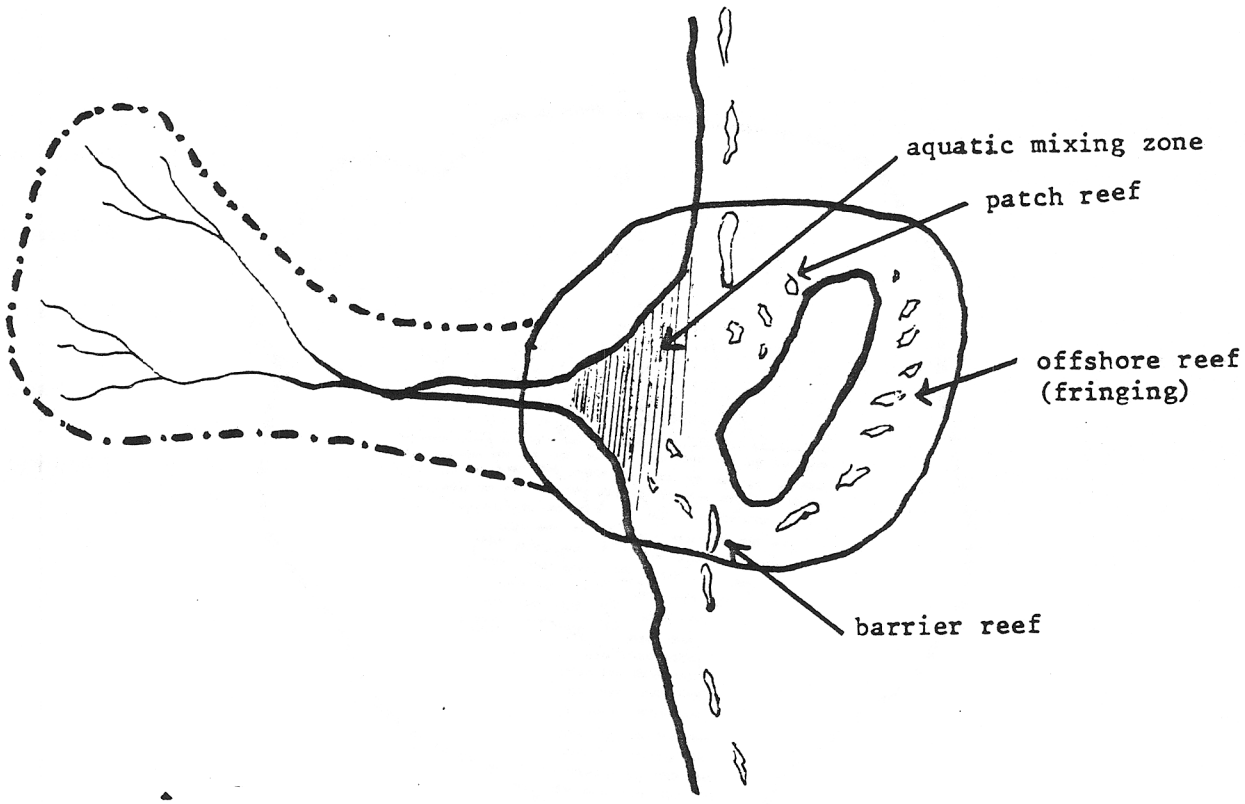
1. Nival belt
2. Alpine belt
3. Ericaceous belt
4. Montane forest belt
5. Savanna area

6. Coastal and marine ecosystems

These areas are dynamic systems which present special problems in conservation. "Core" areas may move and "buffers" will often need to be extensive.

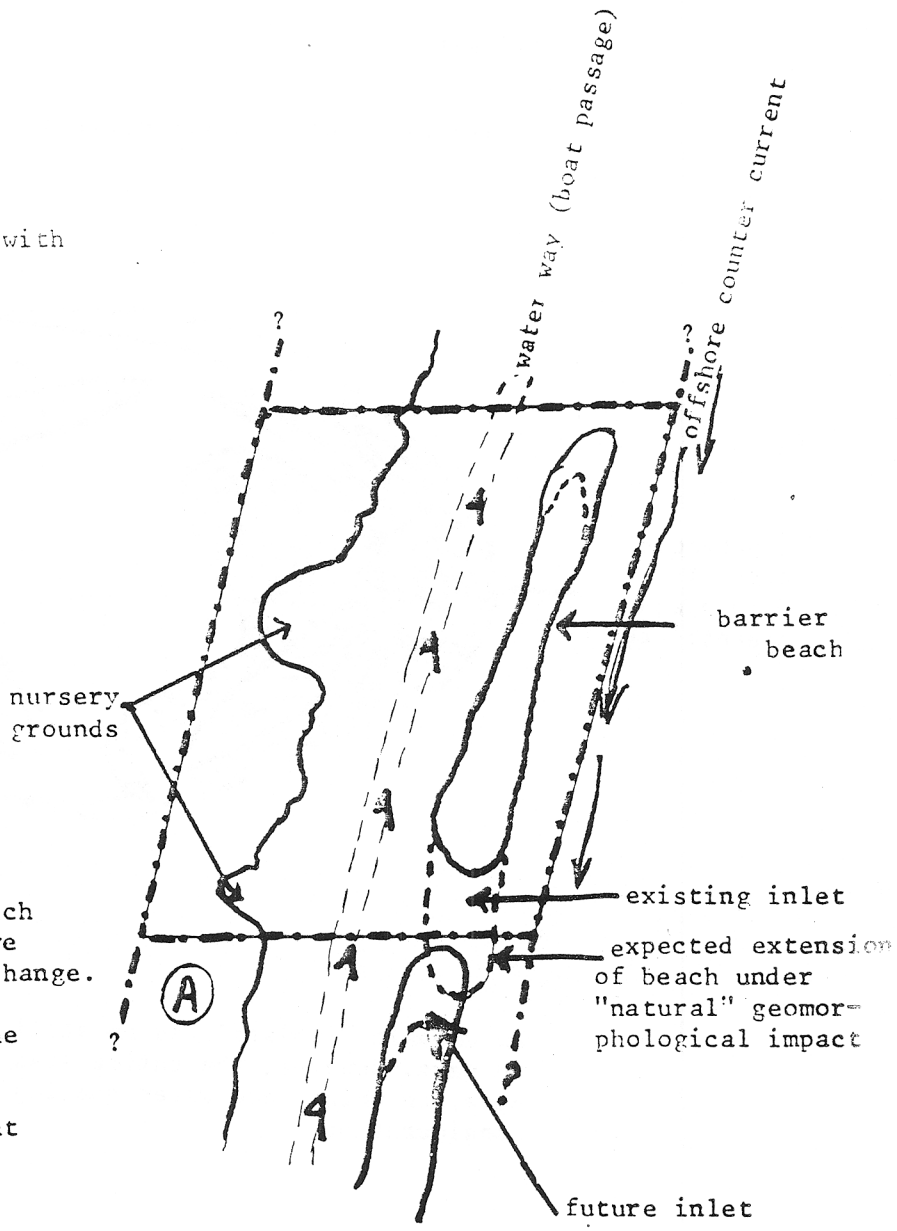
Example a .

A river system, estuary, and reef complex, encompassing an entire river system and many habitat and ecosystem types.



Example b .

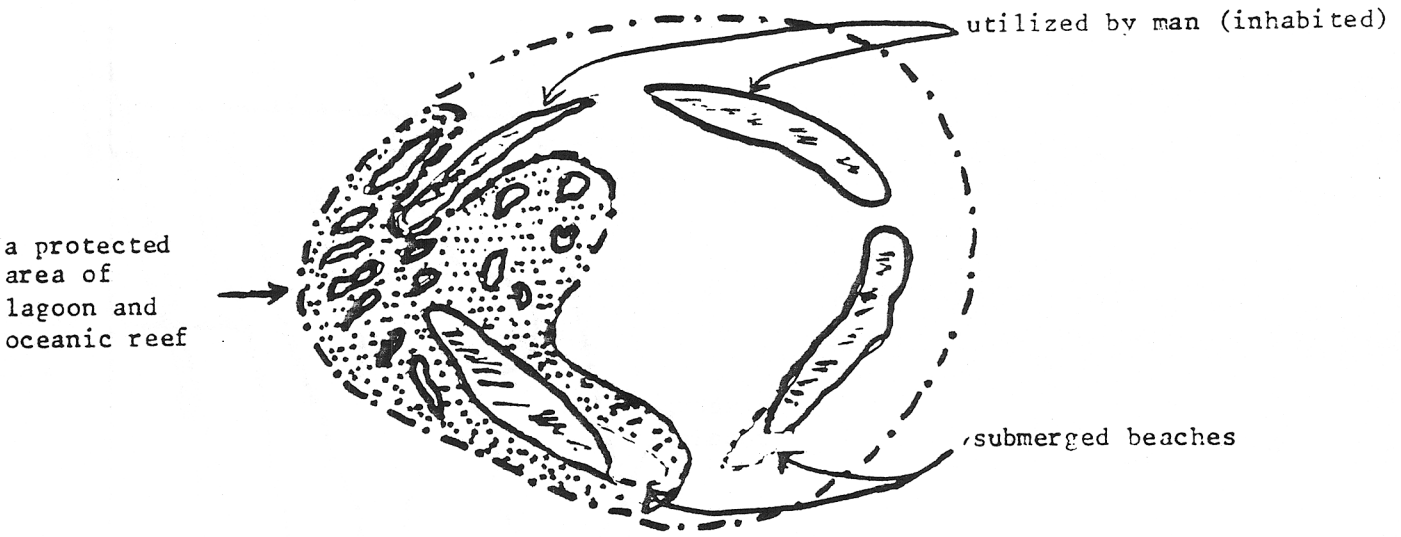
Continental lagoon with barrier beach.



This is a dynamic system in which the entire "core" area will move according to geomorphological change. The buffer zone must move with regard to land use in A as the barrier beach migrates south. Later water quality along the entire waterway may also present special problems.

Example c .

A tropical atoll, partly utilized by man.



An oceanic "isolate", as an atoll, may be strictly protected only in part. However, the entire area must be considered a "buffer" zone, in which case water quality control is the most important consideration.

ANNEX 3

DOCUMENTATION OF BIOSPHERE RESERVES

The task force outlined some general suggestions for documentation of biosphere reserves, but the group recognized that this would require further study and elaboration. This will be done later in 1974 as a part of a project to develop detailed criteria and guidelines for baseline research and monitoring in biosphere reserves so that, as information on specific reserves accumulates, it will be comparable from time to time and from reserve to reserve.

The following suggestions on documentation take into account that activities of each biosphere reserve will be determined to some degree by its particular role in long-term synoptic monitoring of the world network. Thus to a certain extent the variables, frequencies, character of observations, methods of systems analysis and modelling, and documentation will be determined by international agreements on global environmental monitoring.

It was recognized, however, that biosphere reserves would require documentation as a continuous record of their biological and administrative status. This should be undertaken, as resources permit, for each biosphere reserve to ensure that such a record is maintained. The aim should be to provide a well organised repository for relevant information so that maximum benefit is derived from all available material.

The specific objectives of documentation include the following :

1) to provide the historical and scientific background for the development of a management plan which will ensure that the scientific and educational potential of the site is maintained or further developed.

2) to provide a framework for monitoring and interpreting dynamic changes within the reserve and the consequent effects, on current policies within the management plan.

3) to provide information on past and current research projects including the location of experimental plots, how they may affect work in the same area and how they may be accurately relocated.

There are four main aspects to basic site documentation :

1) Survey and mapping of broad habitat types, in terms of topographical features, soils, vegetation and microclimate

Both traditional and modern methods of descriptive ecology should be used to give a documentary and photographic record of the principal biological and physiographic systems in the reserve. The methods used should enable close comparisons to be made to detect changes over suitable periods between surveys.

2) Inventory of species in all major groups in relation to habitat types recognized in 1)

Reliable species records should be maintained for all major groups. More precise information, including population counts, where possible, should be collected for species of particular interest so that a continuous record of their population size and distribution in the reserve is available. Such species may be the subject of intensive population studies.

In connection with the basic survey of the area, reference collections should be made of plants and (at least vertebrate) animals. After adequate naming, one set of these collections should be kept for reference in the reserve, or at a suitable institution with adequate curatorial facilities if these are not available in the reserve ; another should be incorporated in the national herbarium/museum of the country concerned, and further sets should be made available as far as possible to those other institutes where taxonomic research on this biota is being pursued. Ideally a reference library should be developed which would incorporate publications and other materials giving information about the reserve, together with photographs, analyses and other records.

3) Review, collection and indexing of historical and scientific literature

All available literature relating to the reserve or its surroundings should be committed and indexed, and where possible acquired as part of the documentation system. In particular, historical evidence of past influences and land use patterns should be sought for those reserves with secondary or sub-climax biological communities. A request should be made to all users of the reserve that copies of published and unpublished reports and scientific papers should be sent to the documentation centre.

4) Recording of all significant events

A record should be kept of all events affecting the biological status of the reserve, its management policy or administration. The system should include retrospective and current records of management activities, research

and education projects, undesired human pressures from outside and within and significant natural events.

The task force recognizes that the capability to carry out activities such as those suggested above may have to be developed over a period of time in many reserves. However, it should be developed, as soon as feasible, for research and documentation can provide the data base for sound conservation management, and use of the reserves.

ANNEX 4

STATEMENT BY THE REPRESENTATIVE OF THE COUNCIL OF EUROPE, Mr. R. TOMASELLI

The Secretariat of the Council of Europe believes that a close co-operation with Unesco would be most useful for the establishment of a biosphere reserve network in Europe. The programme of the Council of Europe originated from the Conference of Ministers for the Environment, held in Vienna 28-30 March 1973. This conference recommended that :

- a survey should be conducted of the most endangered zones ;
- a research should be carried out to better understand the cause-effect relationships in respect of degraded lands ; and
- other kinds of research should be encouraged in these zones.

The Italian Delegation presented a project concerning the establishment of a network of representative ecosystems in the Mediterranean region. The Sub-Committee for the Conservation of Wildlife and Natural Habitats (Chairman, Dr. Gay) of the European Committee for Nature Conservation and the Conservation of Natural Resources, took, on the occasion of this meeting in March 1974, the decision to establish a network of reserves in Europe and approved the creation of an Ad Hoc Working Group "European Network", with Mr. Tomaselli as President. This Group will meet during the second half of 1974 for the first time.

The Italian Delegation informed the Sub-Committee that activities in this respect have already been started ; for instance, that a reserve has been formed on the island of Monte Cristo, as well as other reserves which are either already established or whose establishment is under way, and that these reserves could be included in the European Network.

The Sub-Committee thought that it would be helpful if analogous measures could be taken by other European countries, in order to preserve typical natural areas.

The Norwegian Delegate announced that in his country, as well as in other Nordic countries, two types of projects have already commenced :

1) protection of typical Nordic landscapes still in a natural state ;

2) protection of humid zones as part of a network for migrating birds.

At present, IUCN, in collaboration with the Council of Europe, is conducting a survey of National Parks and protected zones in Western Europe. This report will be completed by the end of 1974. The results of these efforts will help the Council of Europe to define a concise and systematic programme in this field. Dr. Gay, in his function as delegate of the European Committee, stated, on the occasion of a meeting organized by IUCN, that the report produced by IUCN should indicate to what extent different natural habitats are already protected in Europe and should deal with the effectiveness of protective measures. Furthermore, he pointed out that this survey will deal only with natural reserves (Category A) and National Parks (Category B), as defined under the Resolution (73)30 of the Committee of Ministers. (Categories "A" and "B" have to be interpreted following the terminology adopted by the Council of Europe for protected areas).

Keeping this in mind, the Ad Hoc Group "European Network" will examine the results of these activities, evaluate the various possibilities for establishing a network of protected zones in the Mediterranean basin, and develop guidelines for the setting up of a network of protected areas in Europe.

This clearly shows that close co-operation between Unesco and the Council of Europe should be envisaged, especially with respect to MAB Project 8 and related activities of the Council of Europe.

ANNEX 5

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