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# PARKS

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# PARKS

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*Front cover: The rights of native subsistence fishermen will be protected in Finland's new National Park of the Baltic Archipelago. So will their villages and other traditional life styles and landscapes. Photo: Vesa Mikkonen*

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*Pekka Borg*

# National Park Planning and the Rights of Native Peoples

When planning the use of a national park in an area inhabited by native people with strong traditional ways of life, consideration should be given to the protection of such original ways of life because of their significance to the national historic heritage, and for the preservation of genetic resources and landscapes. In Fennoscandia, particularly, pastoral nomads, fishermen and peasant agriculturists through their traditional means of livelihood have left generally pleasing marks on the landscape. The biotopes so created often have a good diversity of vegetation and wildlife adapted to these sites. Now they are rapidly disappearing, along with original skills needed to carry on traditional ways of living. The rich variety of tools and structures needed cannot be maintained any longer without support. In many cases these native people belong to national ethnic or cultural minorities and need help to be able to maintain their original character.

## Nomadic Laplanders

The nomadic Laplanders living in the northern parts of Fennoscandia have long had certain special rights in some national parks. Activities connected with reindeer husbandry are normally allowed without restrictions. These include grazing, use and maintenance of sites for reindeer separation, fencing, free rights to camp and make fire, and the use of motor vehicles in connection with reindeer husbandry (Fig. 1). Reindeer Lapps and other strictly defined local inhabitants, that is those living permanently within certain limited areas, also have the right to fish and hunt certain species of wildlife for their own livelihood. In Finland they are even allowed to hunt wolves and wolverines in the national parks since these species are considered harmful to the reindeer.

When making master plans for national parks the rights of reindeer husbandry are protected by all means. The reindeer men are consulted when, for example, new hiking trails are planned, since the reindeer are easily disturbed by people at certain seasons. Parenthetically one can ask whether too much freedom of action has been allowed when endangered predators such as the wolf and wolverine cannot be protected even in national parks and when strictly natural lichen areas cannot be kept for science so long as reindeer are allowed to graze indiscriminately.

However, the nomadic way of life of the reindeer-dependent Lapps is diminishing under the pressures brought by technological civilization. It is not enough to permit only modern reindeer husbandry or to preserve the original tools and pictures of them in museums. These traditions should be maintained in some places in living form, and this cannot be realized other than by special permission and economic support. The preferred solution is to retain these skills in established family units within national parks, maintaining the original way of life as of a fixed time, by state subsidy if necessary. There will certainly not be a shortage of people interested in taking part in this kind of life-style restoration and its perpetuation.

## Subsistence fishermen

Almost the whole southwestern archipelago of Finland reveals the influence of the traditional life styles of the local inhabitants.

*Fig. 1. Marking of reindeer calves takes place in midsummer. This corral is inside the Pallas-Ounas National Park in Finnish Lapland. All the traditional rights of reindeer husbandry are allowed in the national park. Photo: Urpo Huhtanen.*

*Fig. 2. Subsistence peasant agriculture has created new biotopes and landscapes in addition to buildings, fences and other old style structures, which are worth maintaining and restoring within the national park. This area is within the planned enlargement of Pyhä-Häkki National Park in central Finland. Photo: Hannu Ormio.*

Cattle and sheep raising has had particularly marked effects on the vegetation. There are fishermen still living in small villages or single houses, although the inhabitants are growing old and moving away from the hard living conditions. Younger people do not wish to stay, due to the poor prices paid for fish and the lack of schools, shops and adequate public communication and transport systems. The situation is much the same in other parts of the Baltic archipelago.

When making the master plan for this particular proposed national park, to be called the National Park of the Baltic Archipelago, Finland, fairly large groups of islands have been selected throughout the archipelago. These represent all the elements of the natural scene based on an analysis of the flora, fauna and geological formations. Archaeological and historical sites have been selected as well as a few abandoned fishermen's houses and villages with their surroundings. It is proposed that these areas (at present largely in private ownership) collectively will form the national park proper, where natural ecosystems will be maintained and man-influenced ecosystems treated in traditional ways. Abandoned houses will be offered to newcomers willing to carry on the old styles of life. It is expected that these areas will be bought by the state.

The plans for using the park for education and information include various park-oriented programs on those islands having good harbors. The interpretation programs will comprise tours to different vegetation types and biotopes, to historic and archaeological sites and to inhabited fishing houses and villages to see the old traditional ways of life.

The larger part of this island area will consist of privately owned fishing villages and houses. This is intended to be a buffer zone where new exploitation of the land (summerhouse building) will be controlled to a certain degree and counterbalanced by state support (e.g. better prices for fish, public communications, transportation and schools).

### Subsistence peasant agriculturists

In general, those people belonging to this group in Fennoscandia have abandoned their original way of life long ago or they maintain only parts of it. No doubt this kind of activity can easily attract people still having skills for this kind of living. In a highly developed country it may be difficult for this to succeed without economic support from the beginning. Also it may be impossible to eliminate some modern facilities, e.g. housing, from it. The national park seems to be suitable for this kind of life, which would provide interesting objectives for visitor education and information functions.

At the Linnansaari National Park in Finland, a master plan is being made to recreate and preserve a living subsistence peasant farm. The plans are based on land use as it was practiced at the end of the 1800's as determined through the help of old maps, archives and interviews with local people. The park will include a living museum of the traditional way of life and will maintain the skills, tools and structures needed (Fig. 2). Moreover, the museum could maintain the gene pool of relict domestic animals and cultivated native plants from that time.

Some early forms of livelihood created habitats peculiar to traditional land use. These are now disappearing rapidly. They include pastures resulting from forest grazing, grove meadows created by mowing and forest grazing together, and a succession of biotopes formed after the plant cover was burned to clear land for agriculture. Also the more distant natural meadows used for hay cutting belong to the habitats to be preserved and supported.

In most cases the opportunity to carry out traditional ways of life can be protected in the national park, in special zones set aside for this purpose—we call them "protected anthropological areas." In highly developed countries this is often difficult to realize without economic support to the people in these living museums. In countries with vast undeveloped areas, the land needed for the subsistence and protection of indigenous peoples and their cultures should be allowed to remain for this purpose, and the people permitted to exist in their traditional patterns without interference from other parts of society.

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# Tourism and Conservation: Conflict, Coexistence, or Symbiosis?

This paper deals with the idea that three different relationships can exist between those promoting tourism and those advocating conservation of nature. These relationships are particularly important when tourism is partly or totally based on values derived from nature and its resources.

1. Tourism and nature conservation can be in *conflict*, particularly when the presence of tourism and what it implies is detrimental to nature and its resources. The result is that conservationists see such a relationship with at least some degree of unhappiness—not to put it more strongly—and, naturally, they often fight back with all kinds of interdictions or other restrictions.

2. There can be *coexistence* when the two camps—the tourist industry and those promoting the cause of conservation of nature—establish relatively little contact. This can be because neither tourism nor conservation is well developed in an area, or because of administrative barriers, or, very widely, because of the ignorance of each concerning the other's field. However, this situation of coexistence rarely remains static, particularly as an increase of tourism is apt to induce substantial changes, so that this stage is followed either by a mutually satisfactory relationship (symbiosis) or by conflict (if things go the wrong way).

3. Finally, there is the state of '*symbiosis*' in which tourism and conservationists are organized in such a way that both their disciplines derive benefits from the relationship. From the conservationist's point of view, this means that, while natural assets are conserved as far as possible in their original condition or evolve towards an even more satisfactory condition, an increasing number of people derive wider benefits from nature and natural resources—whether in a physical, aesthetic, cultural, scientific, or educational sense. Of course there are economic advantages too. Such mutual support between tourism and conservation can and should contribute to the realization that conservation of nature can, indeed, be a useful tool for achieving a better quality of life.

All three types of interaction and their variations exist, as numerous examples throughout the world clearly show. Unfortunately for the majority of cases at present, the relationship between tourism and conservation is usually one of coexistence moving towards conflict—mainly because of an increase in tourism and the shrinking of natural areas. Could it be that, provided the objectives and ways of operating are well understood on both sides, such relations would eventually lead to a symbiotic relationship? Obviously the attainment of such a goal should be attempted.

In recent years there has been, virtually, an explosion of tourism concerned with wildlife, wildlife areas, scenic beauty based on natural resources, and so on. It is not the purpose here to analyze the various reasons behind such growth. They include more leisure time, increased interest of a larger and larger proportion of the widely-increasing human population who are now 'conditioned' to enjoy these values, and various economic factors such as better salaries, improvement of communications, cheaper ground-travel, and expanded and improved accommodation facilities. The fact is that such increased tourism is taking place throughout the world and is unavoidably affecting the resources upon which it is based. To a considerable extent it has taken by surprise the organizations dealing with the administration and management of natural areas, so that they are ill-prepared to withstand its impact.

The net result has been a widespread degradation or reduction in the assets of nature and, with it, of tourism. Many of the places visited by tourists support fragile ecosystems that cannot endure heavy disturbance (e.g. Jubenville, 1974; Usher *et al.*, 1974). After 'saturation point' is reached, or when a critical threshold is passed, rapid degradation seems inevitable. Examples can be found where different types of wildlife disappear because of increasing human presence, noise, or other influence; where roads are built to reach specific areas and in doing so destroy their intrinsic scenic value or cause ecological disturbance; or, all too often, where debris and rubbish are dropped by people who are not conditioned to behave as befits the circumstances. More subtle and, therefore, often ignored, are the effects of increased tourism on various human populations living near the natural areas that are being visited. The sudden arrival of different cultures can be extremely detrimental to the local human resource, often changing cultural and economic patterns in unfortunate ways. This has been largely documented for many places, *inter alia* by Parker (1972), Baines (1975), and Crittendon (1975). Moreover, tourism often changes basic land-use patterns and conflicts with traditional attitudes towards natural resources (e.g. Swift, 1972).

Clearly, steps need to be taken to avoid a catastrophic situation. Adequate administrative arrangements will have to be established, but all interested parties must be made aware of the inherent dangers that a policy of 'laisser-faire' can lead to. Those who handle tourism must be adequately educated to recognize the dangers and, equally, conservationists throughout the world should be made to understand that tourism, rather than being stopped, must be better planned and controlled.

## The challenge of conservation

Conservation was defined during the IUCN General Assembly at New Delhi in 1969 as management of the resources of the environment—air, water, soil, minerals, and living species includ-

*Fig. 1—Visitors to Isla Plaza in the Galápagos Archipelago looking at seals and birds. The photograph was taken when visitors were still permitted to move around critical areas without any restrictions. For the past few years visitors have had to be accompanied by a guide and stay on certain trails as a result of the negative impact on the animals. Photo: Dr. Myron D. Sutton.*

ing man—so as to achieve the highest sustainable quality of human life. (In this context, management includes surveys, research, legislation, administration, preservation, and utilization, and implies suitable education and training.)

This is a long step from the former restrictive approach centered on preservation, which has too often been confused with privilege for the rich and educated. Understandably, this has been resented by the poor and hungry. Conservationists have often had to wage a lonely fight against changes affecting wild areas, and in doing so have been identified as 'conservative' or 'opposing progress'. Thankfully this old concept of conservation is fading out rather rapidly—and none too soon. Preservation remains, of course, an essential tool for conservation programmes, and its application, in combination with other conservation measures, can successfully lead to progress and development in particular as wildlife and wild areas can be made to 'produce'.

## Must tourism be detrimental to conservation?

The answer to this question is, more often than not, negative—provided appropriate steps are taken. The classic case is, of course, that of degradation of a limited resource by a large number of tourists, leading to many kinds of deterioration—such as physical damage, poor waste-disposal, vandalism, and so on (Jubenville, 1974; Usher *et al.*, 1974). Instances are too well known to require further comment. Other factors, however, which usually pass unrecognized, seem to be much more important—including the construction of buildings and roads and other facilities for tourist visitation in natural areas.

The policy of building hotels, restaurants, road systems, and/or even viewing-points, in a natural area, which may be immediately favourable to the development of tourism, has recently been heavily criticized at various meetings. The decision to interfere with the physical setting of a natural area is extremely complicated and should not be undertaken lightly. As a general rule, it is felt that most natural areas maintain their greatest values if they are left untouched. If this is not possible, in and around most natural areas that are managed as such, particularly in national parks, careful zoning should be instituted and rigidly maintained (Fig. 1).

This usually means that a few areas are accessible to the general public, while the majority remain as undisturbed as possible, although, if circumstances permit, access may be allowed on foot. But some areas must remain completely protected and become 'strict reserves'. The location and construction of hotels and roads need very careful planning, and should involve consultations with ecologists and the people who manage the parks. The latter people should obviously have a clear understanding of the present and future requirements of tourists.

Past experience, particularly in those countries where tourism based on Nature has increased dramatically, clearly shows that most former projections of tourist impacts were inaccurate; all too often there had been no assessment, because the value of keeping natural areas as much as possible in their natural state was not recognized. Now the situation has changed, and in some parks of the USA, for example, buildings that had been erected for tourist accommodation are being torn down, motor traffic is being restricted, and the impact of tourism is being reduced or otherwise controlled. The intention is not so much to limit the flow of visitors as to redistribute them in space and time.

As a general rule, it is found most advisable to have hotels and recreation centres situated outside the natural area, and to provide some kind of an information and interpretation centre at the

entrance. However, there are exceptions in some places; for instance, in some of the large game-parks in East Africa, it has been found necessary to have the hotel just within the park, so that the park authorities can better control the management of the hotel and its guests. The other undesirable extreme is where the hotel is built close to the main attraction of the park.

More important, perhaps, is the decision as to who should manage the park. Because of the upsurge of tourism and the glamour it holds, there has been a tendency, particularly in some developing countries, to entrust the management of natural areas with a potential for tourism to the authorities who deal with tourism. This can be fatal, because the people who are thus left in charge are rarely qualified to understand delicate ecological relationships, or to administer parks and nature reserves in such a manner that they can fulfill the purposes for which they were created. National parks, for instance, have been created principally to preserve unique and exceptional features, whereas other areas, not connected with national parks, have often been established for the primary purpose of promoting tourism. IUCN has recently had the opportunity to intervene in a number of cases to get this simple message across—namely, that national parks and equivalent reserves should not be entrusted solely to those promoting tourism.

*Fig. 2—Cloud-forest in Volcan Poas National Park close to San José, Costa Rica. The cloud-forest is a very fragile ecosystem, and visits by the ever-increasing number of tourists (close to 100,000 in 1974) are being restricted by carefully managed and supervised schemes along trails. Photo: Dr. Gerardo Budowski.*

## The symbiotic relationship

Obviously, tourism and conservation can benefit mutually from each other. Tourism helps by lending support to those conservation programmes which will 'develop' educational, scientific, and recreational, resources, with the objective that they in turn will attract more, and different kinds of, tourists. There are as yet only a few cases where this has actually been achieved, but the potential is very great.

A good case is the various tours organized in the Galápagos Islands. Here the tourists are accompanied by highly qualified guides, so that they may enjoy and profit from their trip, yet are prevented from causing more than a minimum of disturbance to the very interesting yet highly vulnerable local fauna and flora (Fig. 1). Both the tourists and the tourist companies are contributing financially towards the Ecuadorian Government–Charles Darwin Foundation conservation programme. The Foundation has established its laboratories on one of the islands, and has undertaken scientific research on the fauna, flora, and geology of the archipelago. This is more than a simple question of providing money: the tours people give financial and moral support that is directed towards the right type of action and, in part, towards making tourism as compatible as possible with conservation aims.

Many more places could mutually benefit from such a relationship. Perhaps the project which IUCN is at present involved in, called 'The Green Book' (of Outstanding and Endangered Landscapes), will help in this respect. The Green Book will take the form of a loose-leaf book identifying and describing outstanding and endangered landscapes which are not, or are only partially, protected.

In many countries, tourism can be aimed at attracting university teachers and specialists in, for instance, birds, plant ecology, or systematic botany. In Costa Rica it has been estimated that such a trend is bringing the country about one million dollars annually, which is considerable considering that the human population is less than two million and the annual budget is small (Fig. 2).

## Promising lines of action

There can be no doubt that the next few years will witness an acceleration of the dwindling of resources that are susceptible to be managed for tourism; consequently at the present stage it is most important to try to foresee future needs. Planning the management of natural resources for national and international tourism must receive high priority, particularly in developing countries where there are heavy population pressures on resources as well as critical trade deficits. Of course, what is needed is the lifting of nature conservation to a much higher level of significance in the planning and development,process of many countries.

This would be a radical change from the past, when economic and social factors gave food production and industrialization a top rating and there was little concern for natural resources. But times are changing, and the amazing growth of tourism as a money earner has brought about considerable adjustments already, and seems destined to bring about far more in the future.

## Tourism can successfully invest in conservation

The most promising ways in which tourism can invest in conservation appear to be the following—not necessarily listed in order of importance, as they are applicable in varying degrees in

different countries or regions:

(*a*) As a general guideline the tourist industry should support conservation organizations financially as an investment to further its own interests, though sometimes it may be necessary to attach conditions to such financial aid. It is quite clear that financial contributions will be particularly productive if they are made to those organizations, whether they be governmental or private, that fully comprehend the mutually beneficial relationship between conservation and tourism.

(*b*) There is a dire need to create parks, reserves, and other protected areas, to meet the growing requirements of the tourist industry. This demands a large amount of research and planning, for example to locate and create a system of national parks and equivalent reserves for each country. However, at this stage, little coordination seems to have been achieved with the tourist industry, even if it is possibly the principal 'consumer'.

(*c*) Much greater cooperation is needed between the tourist authorities and the national parks and wildlife authorities regarding the planning of sites and the construction of hotels and related facilities—particularly access roads.

(*d*) Tourist authorities should actively contribute to the efforts made by conservation groups in the preparation of guidelines for tourist groups in natural areas, the adoption of a code of ethics, and other forms of bringing the right message across to the 'consumers'.

(*e*) Support should be provided to make tours and other tourist facilities connected with natural areas available to schools, university students, and similar groups, at specially reduced rates.

(*f*) The tourist industry should assist in the establishment and maintenance of interpretation and information centres connected with national parks and other natural areas. Again, it is the initial effort and the training of the necessary personnel which are needed most urgently at present.

(*g*) Tourist authorities might assist in preparing and editing publications that explain the natural resources and their attributes to the general public. These should help tourists to understand the ecological functioning of natural parks, the reasons why zoning and long-term planning are essential, and why some areas must be closed to the public.

(*h*) Tourism can play a role in supporting education and training activities that deal with the tourism-conservation relationship. For example, courses might be offered for the guides who take tourists to particular areas, and also for wardens and park personnel connected with tourist activities. Many schools for park administrators are desperately in need of such support.

## Conclusion and summary

A new and promising field has appeared as a result of the increased tourist industry based on natural resources, though too often such expansion has been achieved without due planning and has taken many people by surprise. Conservationists and their organizations have often reacted adversely to this 'invasion', but this need not be so. There are many reasons and examples which prove that a change of attitude, leading to a symbiotic relationship between tourism and conservation in the wide sense, can offer a very large variety of advantages and benefits—physical, cultural, ethical, and economic—to a country.

A tourist industry can expect a brilliant future, based on natural assets of the environment, provided due consideration is given to the ecological principles which must guide resource-use. The alliance of those responsible for tourism with ecologists and conservationists is a natural one, that should contribute greatly to development—the right kind of development involving the right kind of change—leading to a better quality of life for all concerned.

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*Bernardo Zentilli*

# Determining National Park Boundaries

More than a hundred years have passed since the United States established Yellowstone National Park in 1872, the world's first national park. The idea of preserving natural areas as national parks has since spread to most of the world's countries.

National parks have been established in various ways, but currently the tendency is to accept their creation only through special laws that will guarantee their protection in perpetuity.

Although differences exist from one country to another in both the method and the reasons for the establishment of national parks, most countries have adopted the definition put forth by the International Union for Conservation of Nature and Natural Resources (IUCN) at its 1969 meeting in New Delhi.* The New Delhi language is as follows:

> A national park is a relatively large area: (1) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty; and (2) where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment; and (3) where visitors are allowed to enter, under special conditions, for inspirational, educative, cultural and recreative purposes.

Notwithstanding the above definition, each individual national park will of course have its own special characteristics which will require a close study by those persons responsible for planning, administration and management in order to enforce rules that will ensure fulfillment of the purposes for which the park was established and to preserve the values it contains.

One of the most important and most difficult initial actions will be the definition of the area to be included within the park.

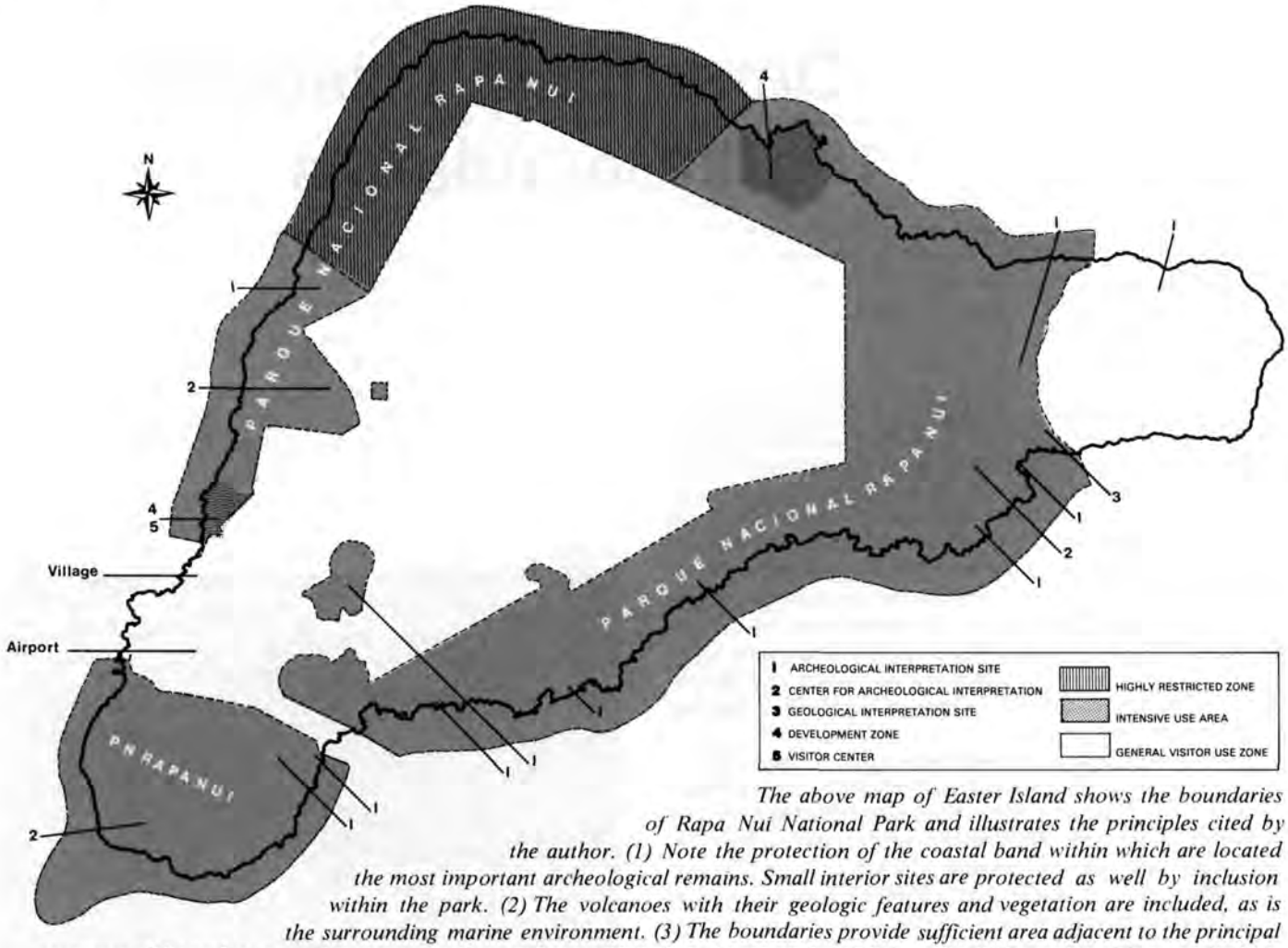
*Animals and their needs must be considered carefully when park boundaries are determined. For example, where herd animals migrate to follow the grass, their seasonal routes should be considered for inclusion within the protected area. Photo: V. C. Gilbert*

## Determining a national park's boundaries

Park administrators normally face the problem of boundary definition from one of two different conditions: (a) an undefined area considered to have the outstanding attributes to justify its establishment as a national park, and a recommendation must be made as to the best boundaries for the area; or (b) a revision of the boundaries of an existing national park is necessary. The methodology followed in both situations is similar, starting from the statement of objectives (see *Introduction to Masterplanning*, R.M. Linn, PARKS Vol. 1, No. 1). This statement will be the basis for the first general conclusions as to park size, taking into account natural and cultural resources to be protected, access and visitation, and other purposes. Without a carefully considered statement of objectives, reflecting identification and inventory of biological, physical, and cultural resources, it is most unlikely that adequate park boundaries could be determined. Let us look at the statement of objectives for Chile's Rapa Nui National Park, for example. The management plan for this park, which is located on Easter Island, sets forth six broad objectives to guide the work of planning, development and operation. They are as follows:

1. To protect and enhance its archeological values, along with physiognomical features in their vicinity;
2. To protect and develop its natural, land, and marine values;
3. To encourage and facilitate research into cultural and

**Certain countries have favored other definitions, such as for example the one adopted by the Organization for African Unity (OAU) at its meeting in Algiers in 1968.*




*The above map of Easter Island shows the boundaries of Rapa Nui National Park and illustrates the principles cited by the author. (1) Note the protection of the coastal band within which are located the most important archeological remains. Small interior sites are protected as well by inclusion within the park. (2) The volcanoes with their geologic features and vegetation are included, as is the surrounding marine environment. (3) The boundaries provide sufficient area adjacent to the principal resources of the park to provide a proper setting, and protection from future undesirable impacts. (4) Space for visitor use facilities is included near the village of Hanga Roa and Rana Kau volcano. These sites are sufficiently removed from archeologically significant features. (5) The volcanoes in the plan are included as protected areas to forestall development and serious alteration of scenic integrity.*

natural aspects and those related to managing and interpreting the park's resources;

4. To contribute to enlightening the public about the park's historical, cultural and natural features, within the environment of the park itself;

5. To develop and broaden recreational opportunities in relation to historical interpretation, the land environment and the sea environment, and tourism as well—but all in keeping with the other objectives;

6. To further the island's and the country's economic development by means of activities in the field of tourism in keeping with the other objectives of the park.

All of these objectives would have a bearing on the boundaries eventually chosen. Clearly, the archeological resources must be included. So must their natural setting and the adjoining sea. So must all areas needed for interpretation and access by visitors.

These objectives, then, serve as an overall guide for fixing boundaries.

## Basic principles

Certain basic principles can be set out as guideposts for the work:

1. *The boundaries should encompass the values or resources that justify establishment of the park.*

This principle emphasizes the necessity of having a thorough resource inventory and analysis prior to the preparation of the management plan and establishment of park boundaries. (See *The Resource Information Base for Planning*, Pierre DesMeules, PARKS, Vol. 1, No. 3.)

2. *All natural areas that exert a major influence upon protection of the park's resources should be considered for inclusion within the boundaries.*

There is considerable variation in the amount of scientific knowledge available for specific countries and particular areas. This, of course, will have a degree of influence on making the best decisions regarding boundaries. For example, in many countries there will be insufficient research to have established wildlife migration patterns, habitat requirement or even inventories of species that would assist the planner. In these instances, it is sometimes necessary to make decisions based on the best information available and initiate needed research and studies as quickly as possible.

Scientists are presently attempting to decide the optimum size and shape of natural reserves based on ecological principles. Although the park planners will usually be faced with many factors other than those which are strictly "ideal" for genetic and species protection, there are interesting theories regarding this important aspect, and park planners should be aware of them.

3. *The boundaries should encompass buffer zones to preclude*

*future use of areas which could pose a threat to the park's integrity.*

Careful thought and analysis must be given to what future use of land surrounding a park could or will be made. At times this information may be available through regional planning offices or development plans from other agencies. In other instances, where large portions of presently undisturbed lands are involved, it may be desirable to recommend an alternative use that would be most compatible with the park. For example, a properly managed forest reserve surrounding a national park may serve as a buffer area, while agricultural development might not be compatible.

This points out the need, whenever possible, to establish the park boundary within the context of a larger regional plan. Establishing the National Park can provide a stimulus to other agencies and organizations whose planning will ultimately affect the park, to reach agreement on compatible land use outside the park boundaries.

4. *The boundaries should enclose sufficient area to facilitate infrastructure for administration, visitor use facilities, protection, maintenance, and circulation, even though these areas may in themselves be devoid of interest from the standpoint of conservation.*

If significant development is anticipated within the park boundaries consideration must be given to allowing sufficient space isolated from critical natural or cultural areas to accommodate this planned infrastructure.

The environmental impact of proposed development within the park must be analyzed from the standpoint of what additional land is necessary for initiating development impact.

5. *The boundaries should include any areas which are of themselves the setting for the park's most noteworthy features and which, if left out, might undergo changes or development which would spoil the park's aesthetic values.*

These considerations will include a number of factors such as views to and from the park, potential water pollution from upstream areas, air pollution, noise, and other degrading influences against which there must be protection.

## Special problems

In actual practice, efforts to include all the needed land will encounter problems of various kinds. Such problems may stem from such factors as the presence of development projects that already have been built or are being planned for surrounding land, the impossibility of acquiring certain tracts of land, the existence of conflicting land boundaries, and so on. If so, establishing the park's boundaries may entail foregoing, at least in part, some of the basic principles we have outlined. The technical staff in charge of the work must try to achieve the best balance possible between the needs of the areas for which improvement is sought and the outside pressures that tend to reduce the amount of available land.

It is important that the areas included within the park boundary be justified within the plan, and the reasons for inclusion clearly pointed out. This may also necessitate describing what alternative uses of the land proposed for inclusion within the park boundaries might be; for example, forestry production, grazing or agricultural use might also be possible land uses for which there may be pressure and the planner must carefully point out why protection is the highest and best use.

The present use and capacity of areas to be included within the park also need to be carefully evaluated and the social and economic impacts of this change analyzed.

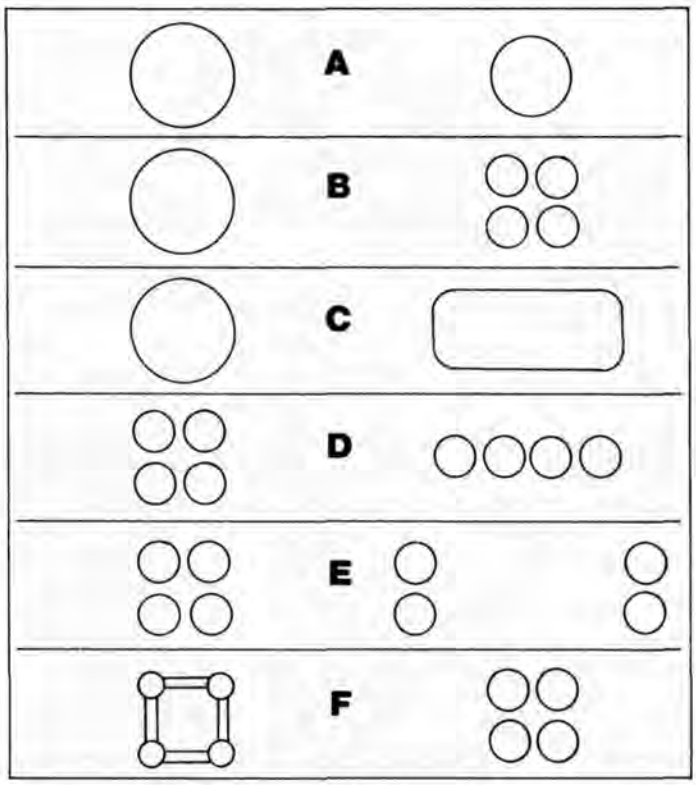
It is not sufficient for park planners to simply say that a certain portion of land, for example, an area that is used for agriculture, should be taken for inclusion within the park. Alternatives should be offered. Furthermore, decision makers must be aware of the social and political impact of such alternatives.

## Choosing the physical boundaries

In choosing the physical boundaries certain general recommendations are fitting, although the likelihood of being able to apply them will vary in each case. The following recommendations are given as examples:

- The use of important readily identifiable geographic features such as rivers, mountain peaks and ridges.
- The use of highways, roads or other works such as canals, oil pipelines, railway lines, etc., as well as state, provincial or national boundaries, and other similar features.
- The use of coastlines, estuaries, islands, etc.

These features contribute to making the boundaries permanent, easy to identify, and not dependent upon any special devices for their demarcation such as fences, markers or other burdensome installations. The selection of such features, however, will depend upon how well other park requirements are met in the area




*There is considerable interest in the relationship of size and shape of game reserves to the animals they protect. This could be important in boundary determinations. Geometric relationships based on biogeographical principles (after J. M. Diamond, 1975; E. O. Wilson and E. O. Willis, 1975) are illustrated by this diagram. Shapes and relationships in the left hand column are always more desirable than those in the right hand column. (A) A large reserve is better than a small one. (B) One large reserve is better than four small ones of equal total area. (C) A circular reserve is better than any other shape. (D) Mutually adjacent areas are better than areas linearly arranged. (E) Close replicate reserves are better than distant ones. (F) Smaller but connected reserves are better than separate but equal areas reserves.*

itself and also upon the objectives for which the park is intended.

A river may not prove satisfactory for boundary purposes if its basin is of material importance to the park itself or if the outer watershed is subject to development in ways that could be incompatible, or affect the course of the river, or alter the landscape.

Likewise, use of a canal or road may prove unsatisfactory if the area contains fauna that must be free to migrate or move on to areas beyond the park. In certain cases boundaries of this kind constitute ecological barriers that exercise a negative effect upon the park itself. Similar disruptions can occur if in setting up boundaries along beaches or coastlines the existing ecological relationship between the land portion and the water portion—a relationship that may be quite essential for the ecosystem's preservation—is not taken into account.

The survey maps that will be required,and which will be helpful for future technical managerial operations or in connection with any legal actions, have to be prepared after boundaries have been set up, or perhaps simultaneously. In many countries the laws require written verbal descriptions of the boundaries to be established. In that event special care must be taken to give accurately the names of topographic features and to select the most prominent ones so as to avoid any possible errors or ambiguities that may lead to lawsuits.

In graphic representations of boundaries the survey maps used in any earlier studies should be employed as basic material. Existing laws may require that new topographic maps be drawn up. Often there is a tendency to make an extremely precise topographical survey covering an entire area that has been declared a national park. However, this undertaking, which is quite an expensive one, is not required at the outset in every instance, and in most cases a traverse showing the boundaries is sufficient.

Detailed maps showing the areas within the park can be drawn up later on, in keeping with whatever need may actually arise.

## Procedure for setting up boundaries

At the time when studies for establishing a park are first undertaken or whenever a plan for managing an already existing one is formulated, the question of the park's boundaries arises.

We already have pointed out certain general criteria that are applicable in establishing a national park's boundaries. The following steps are the most important ones in establishing boundaries in the sequence in which they appear:

1. The gathering of background material on the land in question, including the collection of prior studies of its geology, climate, flora, fauna, cultural features, etc., and the gathering of basic map materials.

2. A study of the particular purposes for which the park is intended, taking into account its features and resources.

3. An analysis of the proposed general area in relation to the areas that surround it. During this stage it will be profitable to look into any development programs for the area that are currently being studied or are already being implemented, and also to give thought to the basic work engaged in by the area's inhabitants and to opinions about the park which they may have expressed either directly or through organizations to which they belong.

4. The analysis of apparent overall boundaries the park may have, in line with management objectives.

5. Establishing in detail the park's boundaries, both on-site and in maps. Any written descriptions of the boundaries that may be required must be prepared.

6. Reproduction of the national park's boundary maps.

Each country has its own laws regarding private land ownership, and as to ownership of property by its states or by the nation itself. Inasmuch as a national park's boundaries will be valid only if they have been established in accordance with existing laws, it is advisable to include a legal advisor on the team to which the work of analyzing and establishing the boundaries is entrusted.

Lastly, let us emphasize that the ultimate aim in setting boundaries is to have a national park that will fulfill completely the purposes of the park is intended, for the full benefit of the nation and its people.

*Bernardo Zentilli is Environment Programme Officer at FAO in Rome. Earlier he was head of FAO's Project on Wild Land Management for Latin America, and before that Chief of the Office of Environmental Preservation in the Chilean Agency for National Forests, with responsibility for national parks and wildlife.*

*Jan Čeřovský*

# Education in East European Parks and Reserves

One of the basic ideas promoted in nature conservation activities in Eastern Europe, particularly in Poland and the USSR, is the principle of rational use as well as protection—two balanced components of one integrated approach.

To implement direct rational use of protected natural areas without damage requires good planning, and good judgment. We have found that the most sensible uses are scientific research and education, though it is evident that very often both of them cannot be imposed on the same territory.

In the USSR, most of the large nature reserves, called "zapovedniks" (with the status of giant open-air ecological research institutes; the Russian term is not translated but used internationally) are strictly closed to the general public. Many are frequently used for training of university students and specialists, some of them are open for special visitors, principally in the form of conducted walks along marked trails.

National parks in Bulgaria, Czechoslovakia and Poland usually fulfill the combined purposes by serving the varying needs of science and research, education and training, recreation and tourism. Areas in which recreation and tourism are permitted clearly could not support research in undisturbed natural ecosystems, but they can be easily connected with education.

In Czechoslovakia, small territories maintained as nature reserves (and a few other categories) have been carefully selected for educational purposes. A key provision is that access by visitors must not cause deterioration of the sites.

## Form number one: nature trails

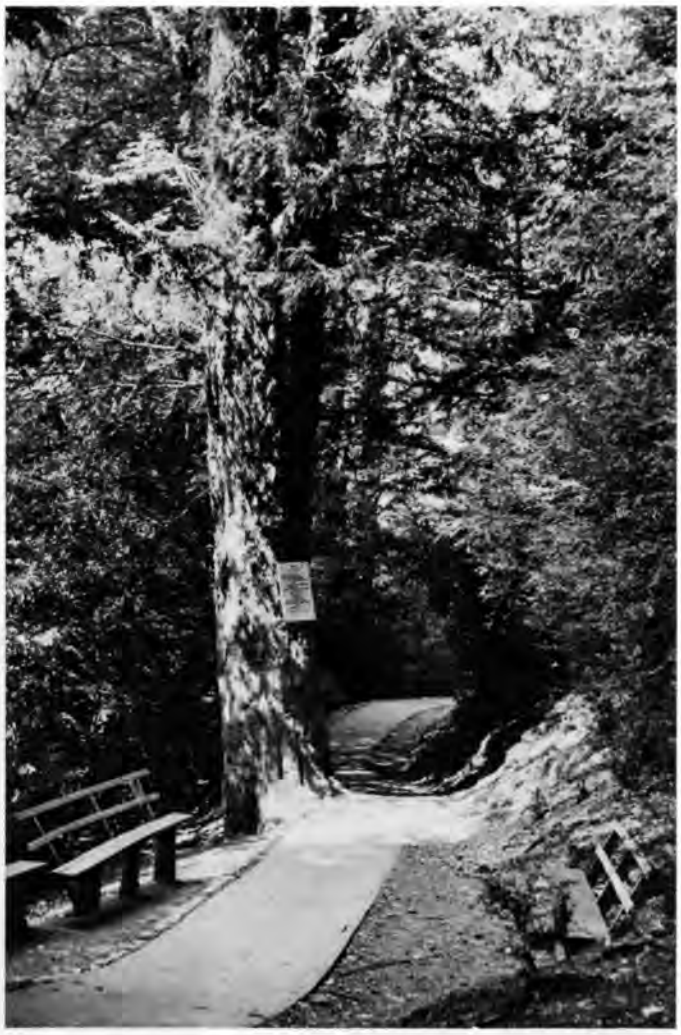
Nature trails are being recognized as the "form number one", i.e., the most attractive, interesting and effective in educational results, first in importance in the cultural-educational use of protected natural areas.

In Europe, nature trails first appeared in Germany after World War I. Today there is a rich system of nature trails in the German Democratic Republic with more than 100 marked paths. The subject has been studied thoroughly and developed to a high degree of pedagogical effectiveness.

There are nature trails in the GDR which take tourists through a large protected area almost equivalent to a national park, such as Sächsische Schweiz (Saxonian Switzerland). There are nature trails in smaller reserves, in city parks and urban areas in general. They deal not only with natural features, but also with cultural features of the respective landscapes, and strongly promote environmental education.

In Czechoslovakia, at the beginning of 1976, there were 33 nature trails, 12 in advanced stages of preparation and 20 to 30 others planned. In the same year a workshop was held in the Slovakian protected landscape area, Mala Fatra, on the subject of nature trails, and a travelling exhibit on the same subject was inaugurated.

Poland now has four nature trails in national parks, three in Kampinos near Warsaw and one in Babiagora; Hungary also has four trails. Specialists in environmental education in the USSR regard nature trails as excellent educational features for national parks already established in Estonia (Lahemaa, 1971) and other Baltic Soviet Republics.



*The Russian zapovednik, Khostinskaya Roshcha, near the famous Sotchi spa on the Black Sea. This nature trail crosses a part of the reserve that is open for tourists.*

## Nature trails lead to educational centre

In the socialist countries of East Europe, we consider a perfect nature trail to be an educational unit, an innovative teaching aid, within a natural area used as a learning environment. A nature trail should not be only a catalogue of plants, animals, rocks, minerals, fossils, etc., but rather a selected case study, as from an ecological text book. Facts and problems explained must be clearly shown, at first hand in the field, before any conclusions can be made. There must be some basic pedagogical system, some logical structure in the contents of a trail; the stops on the path must not be chosen accidentally. From a purely conservation point of view, well done nature trails are conservation measures which can divert the flow of visitors from vulnerable places.

In many national parks, nature trails start from a visitor centre. But our development has been different: educational activities started with nature trails, then came the necessity of basic facilities such as posters, explanatory panels, small open-air exhibits, steps and bridges, watch towers, etc.

When educational activities develop to a certain extent, visitor centres become a necessity. Some Soviet zapovedniks, Polish national parks, as well as Tatra National Park in Czechoslovakia have their own museums with exhibit halls. In the Polish Kampinos National Park, there are four stands or kiosks with year-around information services. The GDR Nature Conservancy runs a special "Central Conservation School" in a prominent protected territory at Muritzsee, the biggest lake of the country.

Many more plans are being launched for it has become evident that educational activities in protected natural areas need permanent well-equipped and well-staffed centres.

## From interpretation towards education

Among special educational programs run by some large protected areas of East Europe, children's and youth camps deserve prominent mention. Several conservation workshops for young people were held in some Soviet zapovedniks during the last decade, one of them at an international level (Voronyesh Zapovednik, 1969). The Polish Student Committee on Environmental Studies, in cooperation with the Polish National Park Service, in the 1970's organized a series of study camps in Poland's national parks with thousands of participants involved. Results of their team work, in which lawyers, journalists, psychologists, engineers and others in addition to ecologists took part, were forwarded to the National Park Service to be used for the elaboration of practical conservation measures.

The Krkonoše (Giant Mountains) National Park in Czechoslo-

*Left: Krkonoše (Giant Mountains) National Park, Czechoslovakia: boys and girls from the summer Young Conservationists School with their leader in the field.*

*Lower left: On the Teufelssee (Devil's Lake) nature trail in Berlin, German Democratic Republic.*

*Below: Explanatory board marks a stop on motor trail around the protected landscape area, Malá Fatra, in the Czechoslovak Carpathians. Both the natural and cultural heritage are being protected. Note the castle ruins. Photos by Jan Čeřovský*

vakia each summer invites boys and girls 12 to 15 years of age to attend a camp called the "Young Conservationists School." In many Czechoslovak "Landscape Protected Areas" all summer camps for youngsters must offer within their total programme a special part devoted to conservation and environmental education.

Environmental education has become not only a popular slogan of the last few years, but the actual framework of all educational activities in national parks and other protected areas in East Europe. These study areas are regarded as an integral part of the national and even the world natural and cultural heritage, and are being used intensively as learning environments, not only for interpretation of nature, but also for real education with the goal of a new environmental ethic for everyday life.

*Dr. Jan Čeřovský is scientific officer of the Czechoslovak State Nature Conservancy, Prague. He is a member of the UNESCO/UNEP Environmental Education working party, and of the IUCN Commission on Education (which he served as Executive Officer, at Morges, Switzerland, 1969-1972).*

# Malaysia Designates Pasoh Forest Reserve for MAB

Pasoh Forest Reserve, in Peninsular Malaysia, is a site chosen by the Malaysian Government for designation as a "biosphere reserve" devoted to ecological preservation and research as part of the world-wide network being developed as part of Unesco's Man and the Biosphere programme. Within the past decade it has become a small isolated island of lowland rain forest in a "sea" dominated by agricultural monocultures. Therefore, in spite of its small size, its value is great as a "baseline" site for gaining understanding of natural ecosystem structure and functioning. All former areas of comparable forest in the vicinity have been converted to plantations of oil palm, rubber, or sugar cane, or have been otherwise modified.

Current ecological baseline surveys being undertaken by biologists of the University of Malaya as part of a UNESCO/UNEP project, "Survey and establishment of biosphere reserves in Southeast Asia," are building on work initiated during the International Biological Program. Studies involving comparison of structure and functioning of such modified ecosystems as oil palm plantations and rubber plantations with natural forest are to be undertaken in the near future. Such ecological studies are essential to provide a basis for national planning which assures long-term sustained productivity to meet human needs. *UNESCO/MAB Secretariat, Paris*

*University of Malaya biologist Ong Siew Ling, carrying out a botanical inventory in the lowland rain forest of Pasoh Forest Reserve. Large tree is a* Shorea leprosula, *one of many representatives of the family Dipterocarpaceae found in this "biosphere reserve." Photo: B. Rollet*

*Allan M. Fox*

# Nature Reserves

[*Editor's note:* Nature Reserves are so important that it seems unnecessary to present arguments in their favor to the readers of PARKS. This discussion, however, summarizes the matter so lucidly—in addition to presenting various data on Nature Reserves in New South Wales—we felt it should be included here. The article was first printed in Vol. 1, No. 5 of *Parks and Wildlife*, issued by the National Parks and Wildlife Service, N.S.W., Australia. For an earlier report on Nature Reserves and their importance with reference to UNESCO's MAB Program, see PARKS, Vol. 1, No. 2.]

Have you ever tried to forecast what the next twenty-five years will bring, what the world will be like in the year 2000? Twenty-five years, the age of a young adult. The impossibility of the task may be gleaned by thinking of the vast changes of the past twenty years and how, in 1950, many of these were not dreamed of—walks on the moon, jumbo jets, super tankers, the pesticide controversy, intense public interest in pollution, Z.P.G. (zero population growth), pine and woodchip forestry and so on. Who would be game enough to forecast the next twenty-five years?

It becomes more and more imperative, then, that we establish banks of genetic diversity and areas where natural processes are allowed to play out their cycles and/or to evolve continuously, before the remaining resource is swamped by accelerating human-oriented growth rates. These growth rates involve both passive consumption (e.g. recreation) and active consumption (e.g. mineral exploitation) of resources.

This idea of maintaining life's evolutionary options (in New South Wales) was first presented in the late thirties. It was considered then that the area surrounding the summit of Kosciusko, the Morton Primitive Area, and the Macquarie Marshes would be sufficient to cover the most significant natural areas in New South Wales. Problems of wildlife management were foreseen, so Mr. A. K. Weir was given a brief to study the management of Banff National Park (Canada) while returning from London in 1939 with the Minister for Health. Kosciusko National Park and the Morton Primitive Area (now National Park) were established in 1944 and 1938 respectively, while the dedication of the Macquarie Marshes Nature Reserve was resisted until 1971.

The birth of the Natural Reserve idea, however, took place with the 1948 passage of the Fauna Protection Act (N.S.W.) with provisions to allow for the establishment of Faunal Reserves for the "preservation, care, propagation and study of fauna." From the beginning, the inseparable linkage of "fauna" with its habitat has been accepted as a basic premise for both the selection and management of areas. The Fauna Protection Panel, set up under the Act, gave this part of the wildlife program highest priority in the face of extensive and powerful opposition. This ecosystem concept became fully bound into the law in September, 1965, when the Chief Secretary, Hon. E.A. Willis, approved of the Panel's recommendation that the term Faunal Reserve be dropped and be replaced by Nature Reserve, "Nature" here being interpreted to mean the full biophysical system. The Fauna Protection Act remained the legal base for the Nature Reserve System until the passage of the N.S.W. National Parks and Wildlife Act, 1974, which incorporated the old Act.

Under this Act, the purpose of a Nature Reserve remains unaltered but is now extended to cover natural phenomena as well as wildlife.

Now the hundredth Nature Reserve has been proclaimed in the Government Gazette of 7th March, 1975, the Cecil Hoskins Nature Reserve. The total area encompassed by the reserves in June 1975, was 308,110 ha. While 100 nature reserves in New South Wales may seem a high number it is not a position from which we should feel complacent. It is the quality of the habitats, diversity and distribution preserved that is important.

## Purpose

To put it simply, nature reserves are a form of land tenure established for the primary purpose of maintaining the diversity of species, process and phenomena.

For man, nature reserves provide:

1. A means whereby interesting, useful, potentially useful and endangered species may be maintained.
2. A series of "bench mark" areas, against which managed and contrived systems may be measured.
3. A source of natural systems for the study of their dynamics and of man's interaction with them.
4. A source of natural systems and phenomena for educational purposes.

However, the highest purpose of all for nature reserves is that of maintaining genetic diversity and the integrity of natural process, so as to ensure that the options of the evolutionary process are kept as open as possible. It would be absurd for the process which produced man and is modifying man to be impaired by careless destruction of the gene pool.

Ideally, a range of viable samples of all ecosystems and their sub-systems, including the ecotones, should be acquired, but because only fragments are left now of some systems, some of the samples reserved will be less than adequate but better than none.

Too often one hears the criticism that a certain reserve is no good because it is too small. In such an instance the critic is usually thinking of a few larger species which the small area of habitat can no longer support. What he is forgetting is the vast constellation of species which still do exist in the area, the microbes, and small vertebrates which belonged to the original

"complete" ecosystem. Such a reduced system will probably be unstable initially but will eventually settle back to a dynamic equilibrium.

All human usage of nature reserves must be related to the capacity of the reserved systems, species, or phenomena to maintain the form of usage without long-term impairment of the natural resource of the reserve. Ideally multiple samples of habitat would be valuable. Recreation in the "games" sense, "sports" sense, or of a mechanized kind, finds no place in a nature reserve. "Re-creation" of a kind aimed at enjoying the natural systems phenomena is a bonus use, allowed only so long as the reserve is unimpaired.

The activities most appropriate to nature reserves are those of research and education, both being limited to methods which will not modify the systems in the long term.

## Management

Linked closely with usage is management, and both require that the primary purposes of the reserve be clearly stated. These purposes will, singly or in concert, depend upon the reserve's resources and would include:

- Education
- Research (species, process, phenomena)
- Bench mark areas for scientific reference
- Endangered species
- Wildlife propagation and establishment, which may involve manipulation of the environment.
- Special purposes

Generally, the more complete the ecosystems constituting a reserve, the more self-regulating will be the reserve and the less need will there be for manipulative management. Thus, where a choice exists, the largest samples available should be acquired for the nature reserve system. However, size alone should not be the sole criterion for selecting areas. Some very small areas are extremely important, e.g., the sea-bird nesting islands and some remnant coastal sand-dune successions located where they are of greatest educational value. It is also acknowledged that management of the smaller areas, particularly if they constitute "islands" in a "sea of development", will be very difficult. Even if a few smaller areas are eventually swamped, their "borrowed time" as a nature reserve will allow for a period of discovering the secrets of the systems. Even the act of breakdown may well provide a vital research and educational resource, demonstrating processes inimical to man's interests.

## What of the future?

The accelerating rate of resource use and growth of technology gives resource value to previously unwanted areas and threatens to consume the remaining wild lands. Concurrently, increasing affluence, mobility and above all free time are causing an explosion in the use of that other great reserve of wild lands, the national parks, for recreation.

The wilderness we have now is all that we or any men will ever have.

So there is an urgent need to extend the nature reserve system to include as broad a coverage of ecosystems as possible, each with its own bank of selected genetic factors, and to protect the existing system from nonconforming uses.

*We depend on earth for everything we use, for our very survival. Awareness and concern for our use of the environment will only be engendered by fostering direct contact with it. By studying natural processes we can learn the principles by which we must manage our natural resources. The use of national parks and nature reserves in developing this growth of conservation attitudes is being encouraged among teachers by a series of teacher schools being held by the National Parks and Wildlife Service education section. Photo: Wendy Goldstein*

The Specht Report in a survey of Australian and Papua New Guinea plant communities aimed to list this basic resource. Significant inadequacies in the reservation of samples of these botanical communities were brought to light in the Report.

There are now moves afoot in the international sphere to list those nature reserves which might be considered of world significance as Biosphere Reserves. This is in response to the growing international fear that global habitat breakdown will cause a landsliding decline in the number of species in the biosphere. Whether or not these predictions happen rapidly or slowly is of little moment. The cost of keeping life's evolutionary options open in terms of reserved landscape and of management is so slight by comparison with the expenditure and development for all other land-uses that there should be no hesitation in implementing a full scale program of research, investigation and reservation.

*Allan M. Fox is Chief, Education/Extension, National Parks and Wildlife Service, New South Wales, Australia.*

# PARK PRACTICE

## Architectural Photogrammetry

Architectural Photogrammetry is fast becoming a widely used tool for preservationists. Combining the principles of photography and geometry, photogrammetry is a method by which scaled drawings can be obtained from photographs, shortcutting laborious hand measuring techniques. Simply stated, the process makes use of photographs taken from known locations to create an optical model that can be scaled or measured in all directions. It is particularly useful for studying large and complex structures or groups of buildings, as in historic districts, where hand measuring would be prohibitively expensive.

### Stereophotogrammetry

There are several kinds of photogrammetry varying in technique, accuracy, and expense. The most accurate and widely used is Stereophotogrammetry. Two or more overlapping photographs are taken at successive camera positions or stations, normally with the camera axes parallel. The locations of the camera stations are carefully measured in relation to the building, specifications of the camera are noted, and some points and dimensions are established on the building or in the space before it. These data are known as survey control.

Stereophotogrammetry may be either terrestrial or aerial. Terrestrial photogrammetry is used for showing individual buildings or groups of buildings in elevation. It is the best way to record small dimensions since the camera-to-subject distances are short.

Aerial photogrammetry is used for mapping and making plans for districts. Survey control in this case includes some targeting or knowledge of elevations, distances, and direction of points on the ground and the course, altitude, and speed of the plane as well as the time between successive exposures.

The products of both processes are photographic stereopairs which, when placed in a plotting machine, present the illusion of a three-dimensional optical model. The same principle can be seen in a child's Viewmaster. Using the survey control, this model can be accurately measured and points can be plotted on paper at any desired scale. A draftsman then joins these points to produce a measured drawing in standard orthographic projection.

The number of stereopairs needed to document a structure depends on the nature of the building and its environment. Elevation drawings are best made from stereopairs taken perpendicular to the building, while oblique views are best for determining measurement of features in more than one plane such as cornices, roofs, and spires. Repetitious views taken from several distances and angles may, therefore, be required. Trees, adjacent structures, and other obsta-

cles that obscure the view may also increase the number of stereopairs needed.

### Rectified Photography

The second and simplest technique of photogrammetry is known as rectified photography. It produces a straight-on view free from the usual photographic distortions. Because distortion is corrected, accurate measurements can be made directly from the photograph. The accuracy of rectified photography is limited to a single plane, and it is best used to document flat exterior or room elevations. It cannot, for example, accurately record the receding slope of a gable roof.

Rectified photographs are achieved in two ways. An ordinary photograph may be projected in an instrument called a rectifier, which corrects for any tilt, rotation, or obliquity of the camera to the subject. Or the position of the camera taking the photograph can be carefully manipulated so that the image plane of the camera is exactly parallel to the facade at its center point. A report, "Rectified Photography and Photo Drawings for Historic Preservation," is available from the Technical Preservation Services Division, USNPS.

### Analytical Photogrammetry

Analytical photogrammetry, also called reverse perspective analysis, is the most expensive and time consuming, but because it uses ordinary contemporary or historical photographs, it is extremely useful for making drawings of damaged or demolished structures. It combines the use of one or more photographs for which the camera position can be determined with geometric calculation of the major dimensions of the structure. Accuracy depends on the quantity and quality of photographs available. This technique has been particularly valuable for the restoration of war-damaged buildings in Europe.

### Advantages of Photogrammetry

Photogrammetry has some distinct advantages over traditional documentary methods. Stereopairs and survey controls form a complete, inexpensive, easy-to-store record of a building. The preparation of drawings can be delayed until some later time, thus deferring one of the major costs of documentation. When drawings are prepared, however, the plotting and drafting require sophisticated machinery and photo interpretation technicians trained to recognize and delineate architectural features. The costs are usually more for photogrammetric drawings of a small building than for regular measured drawings.

Other advantages are that the work on the site can be completed in a short period of time, an important consideration with threatened structures. The accuracy of photogrammetry can detect irregularities and deformities in a building better than hand measurement. Photogrammetry also permits a record to be made of buildings that are too large, complex, or dangerous to be recorded by hand.

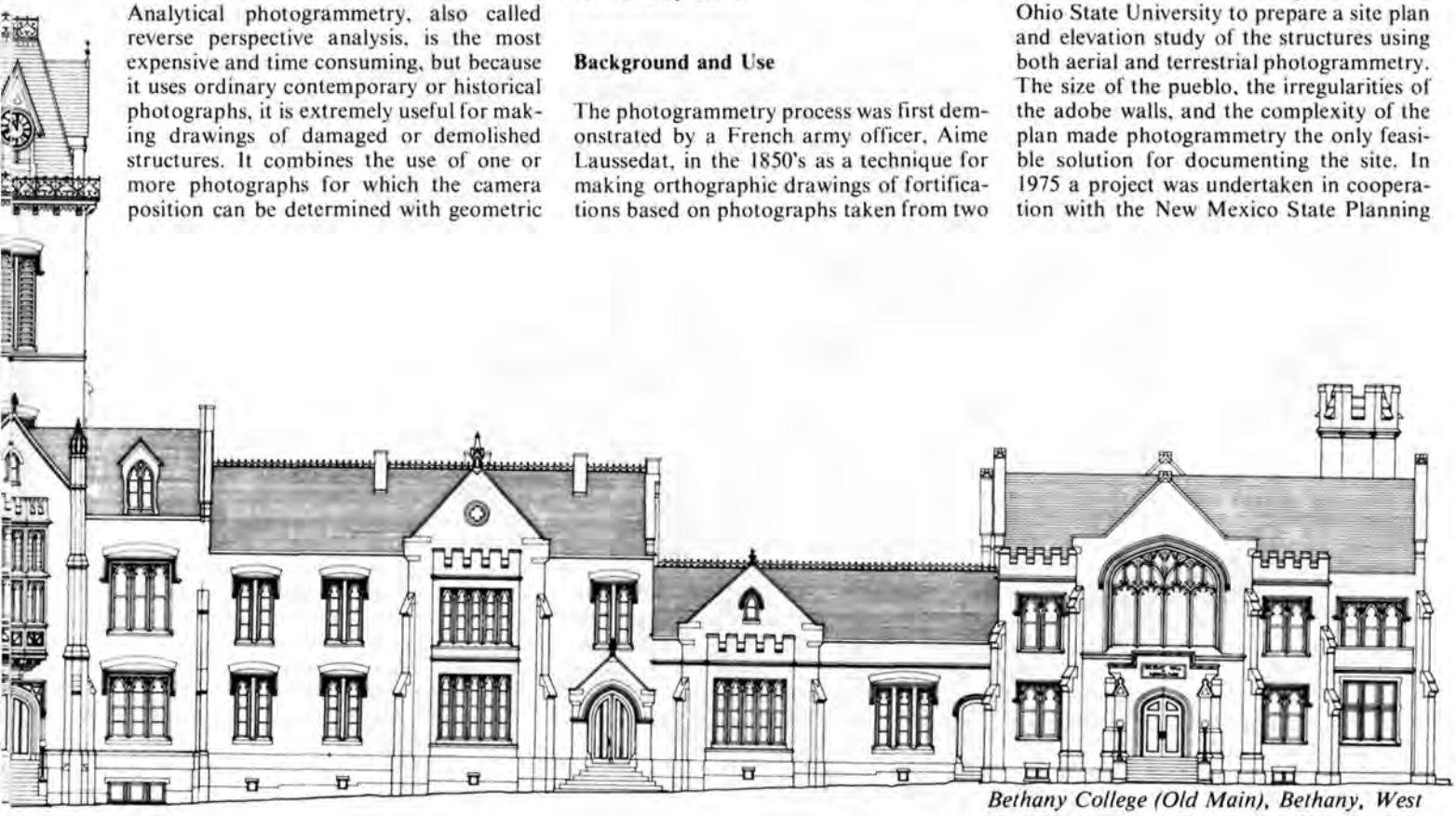
### Background and Use

The photogrammetry process was first demonstrated by a French army officer, Aime Laussedat, in the 1850's as a technique for making orthographic drawings of fortifications based on photographs taken from two different points. The limitations of early cameras and lenses hindered further development, and it was not until the late 1860's that Albrecht Meydenbauer, a German architect, was able to make accurate measured drawings of a church in Freiburg, Germany. In 1885 Meydenbauer organized the first systematic photogrammetric architectural survey, the *Messbildanstalt* in Berlin.

Edward Dolezal, an Austrian professor, developed stereophotogrammetry, the most commonly used technique for documenting historic structures, about 1900. Advances in technology have made increasingly precise and sophisticated cameras and plotting machines available in this century, but the basic techniques still derive from the work of Dolezal.

The destruction that accompanied World War II was the impetus for comprehensive documentation projects in many European countries. By 1956 the Belgians had recorded most of their architectural landmarks and the French Institut Geographique National had begun recording the Egyptian monuments in the Aswan Dam flood pool.

The Historic American Buildings Survey (HABS) has been experimenting with photogrammetry since 1957. Three recent projects illustrate its usefulness and versatility. To assist in the restoration of Acoma Pueblo in New Mexico, HABS contracted in 1974 with Professor Perry Borchers of Ohio State University to prepare a site plan and elevation study of the structures using both aerial and terrestrial photogrammetry. The size of the pueblo, the irregularities of the adobe walls, and the complexity of the plan made photogrammetry the only feasible solution for documenting the site. In 1975 a project was undertaken in cooperation with the New Mexico State Planning



*Bethany College (Old Main), Bethany, West Virginia (southeast elevation). Drawing by Timothy Allanbrook, 1976, for HABS.*

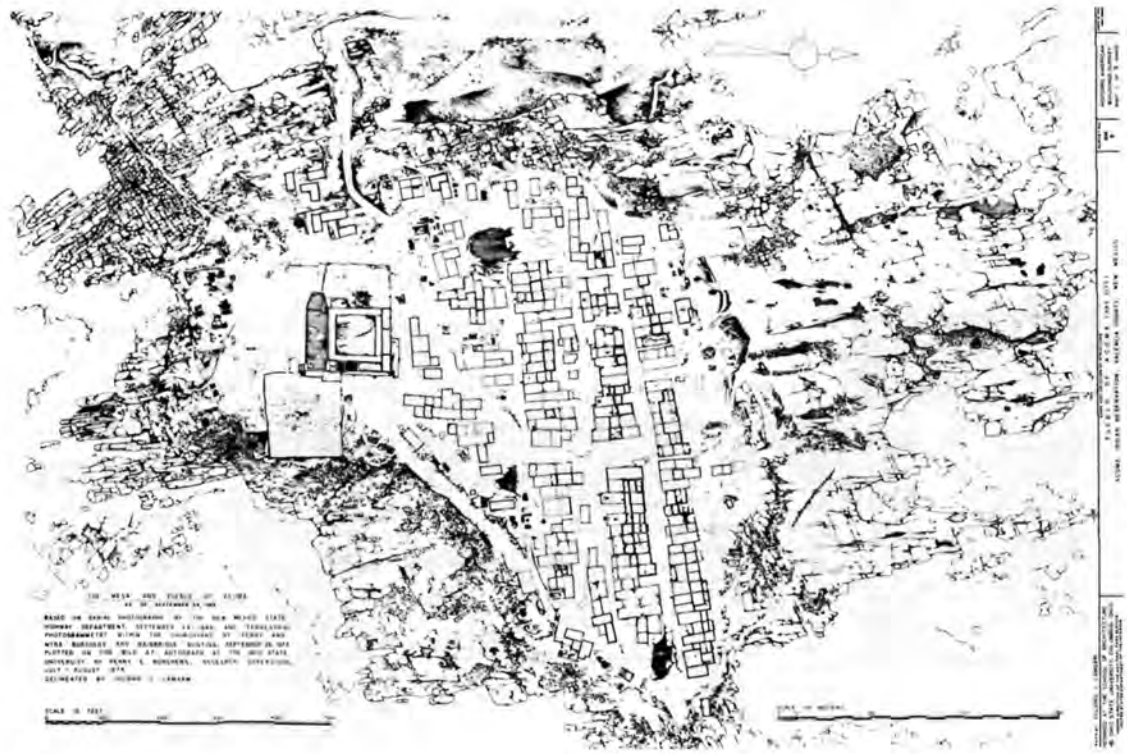
*These two drawings (top and bottom of this page) of the Pueblo of Acoma in New Mexico, U.S.A., illustrate how both aerial and terrestrial photogrammetry can be used to document large and complex sites. Irregular structures such as a pueblo have few straight lines or repetitious structural elements. To measure such structures by hand would be prohibitively expensive and time consuming. The aerial stereopairs were taken nine years before the drawings were made. The major cost of plotting and delineating the drawings was deferred until the drawings were actually needed. These drawings, part of the first complete documentation of the pueblo, will be used in planning the preservation and restoration of the site.*

Office to document the traditional plans and architecture of Spanish-American towns along the Pecos River. The necessary aerial and terrestrial stereopairs were made and plotted before the HABS team arrived on site to do the drafting. In 1976 a project cosponsored by Bethany College in West Virginia produced "as-is" drawings of Old Main prior to restoration work. Because of the size of the building, a combination of photogrammetry and hand measurements was used. The HABS team hand measured and drew the plans and drafted the elevations based on photogrammetric plottings also by Professor Borchers.

These examples illustrate some of the ways in which HABS is using photogrammetry. The speed, accuracy, and adaptability of photogrammetry will undoubtedly lead to wider acceptance and use of this technique in documentation and restoration work throughout the country.

Information on the use of photogrammetry internationally is available from the International Committee on Architectural Photogrammetry, 2 Avenue Pasteur, F-94160 Saint Mandé, France. The American Society of Photogrammetry, 105 North Virginia Avenue, Falls Church, VA 22046, publishes a monthly journal, *Photogrammetric Engineering and Remote Sensing*, and sells other publications on photogrammetry.

*John Burns, the author of this article, is an architect with the Historic American Buildings Survey. The article was adapted from an information release published by the Office of Archeology and Historic Preservation, USNPS.*



## Snow Caves and Shelters

In national parks where heavy snows occur, substantial increases have been noted in winter activities. More and more people are finding that the rewards of visiting parks in winter are substantial: crowds of people are not present to scare away the wildlife; snow adds a new dimension of beauty to the surroundings and brings new opportunities in recreation. Furthermore, even bad weather—if it is not too severe—can be tolerated if you *go prepared.*

Those two words are emphasized in the information on winter travel given out at Rocky Mountain National Park (USA), and that is also the message we try to portray in a special snow cave exhibit in the visitor center at the park. *Go prepared!*

The idea for the snow cave exhibit resulted from a need to stress safety precautions to the crosscountry skiers and winter campers, and the hazards of traveling in the mountains in winter. All the essentials of a winter trip were shown in the exhibit. Skis, poles, and snowshoes stood in the artificial snow outside the cave. Inside were the essentials: snow shovel, stove, cooking kit, food, insulating pad, sleeping bag, warm clothing, extra socks and gloves, sunburn cream, sunglasses, and first aid kit.

Key features in snow cave construction were also shown, such as a vent or chimney for the stove, a ski pole through the ceiling to keep the ventilation hole open, an entrance below the living level to keep the warmth in, and sleeping shelves carved into the side. The stove, in its niche, rested on the blade of the snow shovel.

Rather than clutter up the exhibit with signs and labels, a few pertinent questions were listed on a panel beside the "cave," and an illustrated information sheet on snow shelters was available at the nearby information desk.

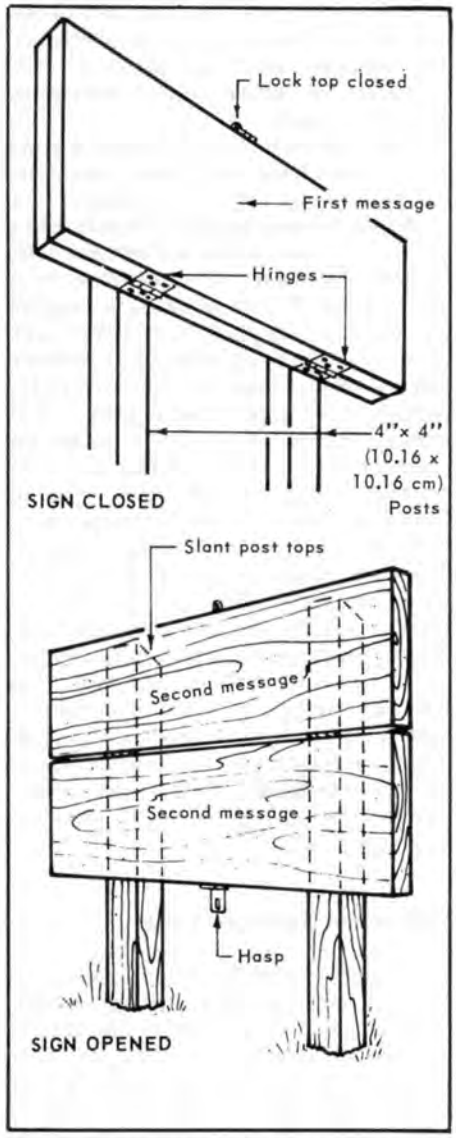
Materials used in construction were woven chicken wire to form the ceiling and walls of the "cave." Polyester fiberfill batting (for quilting) was used to simulate snow and was stitched loosely to the wire frame.

Winter overnight use in Rocky Mountain National Park has been increasing steadily. Many parties use tents, but caves and other types of snow shelters are used also. For several winters past, a seminar was given in late February or March, actually putting into practice the use of snow caves, trenches, and such (see photo).

Between January 1 and April 30, 1976, more than 550 permits for overnight backcountry use were issued to groups having an average of 2 to 3 people per party. With that many people involved, some accidents can be expected. But those who go prepared are not likely to get into trouble. It is the day skier or hiker who unexpectedly has to spend the night in the cold without preparation who is most in need of a snow shelter. If he knows there is warmth (a consistent temperature of -3.8° to -1.1°C) beneath the snow, protection from the wind, which also contributes to warmth, and how to use the usually abundant snow as shelter material, he will survive unharmed. The Park was fortunate that there were no fatalities during the winter due to lost or trapped skiers.
—*Marjorie Dunmire, Rocky Mountain Nature Association*

## Two-headed sign

Where sign messages must change frequently, as on a trail or road that is opened or closed periodically, this simple convertible signboard should provide a ready answer. It consists of two display boards of equal size, fastened together with hinges. To change the sign message one simply removes the lock on top and lets the face panel down to uncover the second sign message. This idea comes from Ranger Jacob Hamilton, USNPS.



# Safe Exterior Stairs

How many falls on stairs in national parks have been caused by poor design we will never know. We must be sure that any stairs built today or in the future are as safe as we can build them. There should be no compromise where safety of visitors and employees is concerned.

This discussion concerns exterior stairs only. Interior stairs are generally built (in the U.S.A., at least) to comply with one of several building codes that are concerned with public safety. Exterior stairs usually do not have a code to follow, but we do know how to design these stairs for greater safety. The following guidelines based on U.S. National Park Service criteria are presented with this in mind.

Stairs should not be used where a ramp can be substituted. Still, many conditions will warrant stairs as well as a ramp.

Before discussing criteria, let us look at a definition. In the words of Professor John Hancock Callendar of Pratt Institute, stairs are: "A stepped footway having a gradient not less than 5:16 pitch, or 31-1/4 percent, or an angle of 17 degrees and 21 minutes; and not greater than 9:8 pitch or 112-1/2 percent, or an angle of 48 degrees and 22 minutes. Below these limits, footways become ramps; above them stepladders."

Interior and exterior stairs may be further divided at 30 degrees slope angle: below 30° is exterior; above 30° is interior. The more gentle slopes are used for exterior stairs because walking pace is leisurely, space is usually available, and more dangerous conditions can exist with adverse weather such as rain, ice, and snow. The steepness, width, and detail of a stairway depend on where it is, who is to use it, traffic conditions, and the construction and maintenance budget. Each stairway would therefore be unique as all of these requirements vary.

### Vertical and Horizontal Limits

The change in levels should never exceed 6 feet (1.83 m) without providing landings. (Figures 1 & 2) These landings should be at intervals of about 4 feet (1.22 m). They should be as wide as the stair and long enough for a man to take two or three normal steps, approximately 6 feet (but no less than 4 feet). Tread width will determine the horizontal run which is tied to the riser height. There should never be less than three treads or steps; one or two are a hazard. Treads must be plainly visible to help prevent stumbling.

### Tread and Riser Relationship

There isn't much agreement among professionals as to the proper tread/riser relationship. Generally, exterior treads are wider and risers are shorter. One formula has evolved from the length of an average person's stride: two risers plus one tread equals 26 inches (66 cm). Five and one-half inches (14 cm) is a good riser dimension to begin with. A 5½ inch riser would permit a tread 15 inches (38 cm) wide. In no case should the riser be less than 4 inches (10 cm) or more than 6½ inches (16.5 cm): the tread must never be less than 13 inches (33 cm). All treads and risers in a series must have uniform dimensions and be perpendicular to the direction of travel.

### Tread and Riser Design

Tread nosing should be rounded or chafered, one inch rounding (about 25 mm) being the most acceptable. (Fig. 2) Treads must not overhang more than 1½ inches (38 mm). Nosing must be slip-proof, and should be of contrasting color to treads and risers to make visibility and identification easier. Treads should be slip-resistant. Risers must never be open except for a ½-inch (13 mm) shadow line or drainage slot at the tread. The top and bottom tread of each flight must set back at least 12 inches or 30 cm (several times that is best) from traffic per-

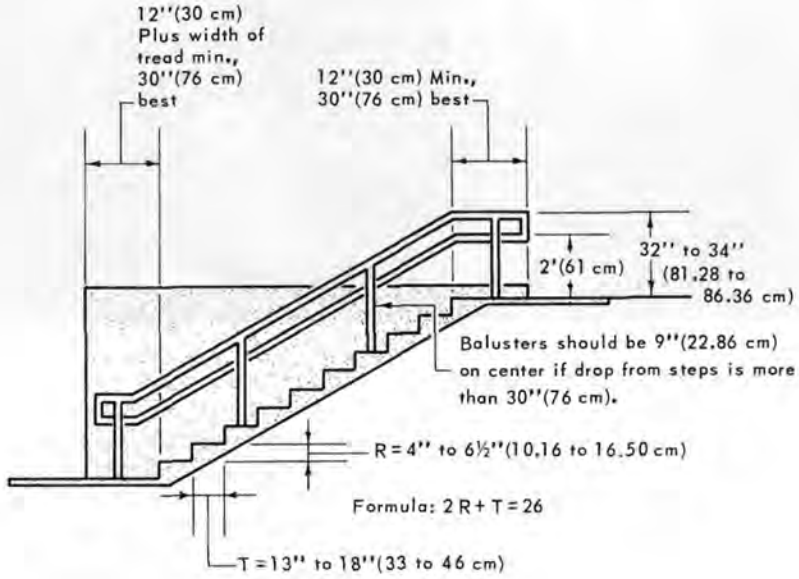
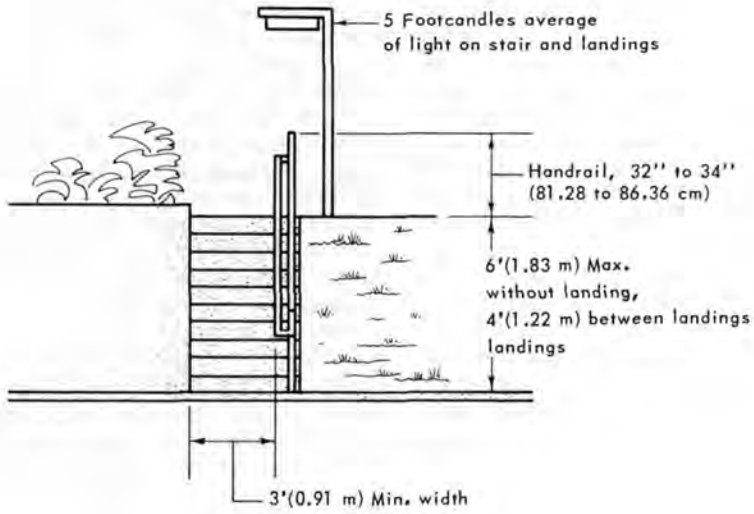



Fig. 1 SIDE VIEW




FRONT VIEW

pendicular to the stairway. (Fig. 1) Tread finish should be different from walks for a warning. Tread finish should be carried about 4 feet (1.22 m) beyond the stairway at the top and the bottom to warn traffic in the same direction of the stair.

### Stair width

The minimum clear width should be 3 feet (91 cm). Width should be increased to handle traffic where steps have heavy use.

### Handrails

Handrails should be 1¼ to 1½ inches (3-4 cm) in diameter and should be mounted at least two inches (5 cm) clear of any wall (Fig. 3) with ends returned to walls. They must be located at least 32 inches (81 cm) above the leading edge of the treads (they may be as high as 34 inches—86 cm). (Fig. 1) Handrails must extend 12 inches (30 cm) beyond the top riser and 12 inches plus the width of one tread beyond the bottom riser. These extensions must be parallel to the floor and must not project into the walkway spaces. Handrails must be continuous on one side of a stair, including landings. Continuous on both sides is preferred, and essential, of course, if stairs are open on both sides. The gripping surface of the handrails must be continuous and unbroken. Anytime children are expected to use the stair, a second handrail at 24 inches high (61 cm) should be provided. When steps are very wide, as across the front of a building, for instance, handrails should be provided 20 to 30 feet (6 to 9 m) apart. Handrails must be able to support 250 pounds (113.4 kg) in any direction.

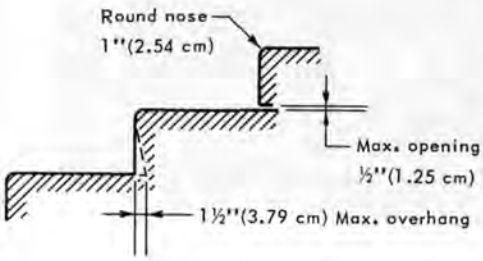



Fig. 2 DETAIL OF STEPS

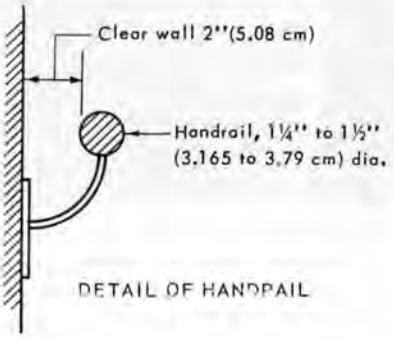



Fig. 3

### Lighting

Regularly used stairs should have a minimum average of five footcandles of light distributed to create shadow to show beginning and end of the stair, and the edge of each tread. The light source should be above the stair and set to one side. (Fig. 1) This position will provide a more accurate definition of each tread. Flush mounted indirect fixtures in side walls and risers usually prove to be more costly to install and maintain and do not light stairways as well as the overhead type.

### General Notes

Stairs must be designed to prevent accumulation of leaves, litter, water, ice, snow, and other matter that could affect safe use. The safest stair can become a death trap if debris collects on a step or ice or snow isn't removed. Every stair should be regularly cleaned and maintained.

Attention to these details should assure the construction and maintenance of a safe stair.

## Guardrails

Guardrails are another means of protecting the visitor that must follow some basic safety criteria. By one definition, guardrails, or guards, are " a vertical protective barrier erected along exposed edges of stairways, balconies, etc." A handrail is " a bar, pipe, or similar member designed to furnish people with a handhold. (A handrail, if of suitable design, may also serve as *part* of a guard.)"

Guardrail locations are subject to controversy. At what minimum grade difference or elevation change are guardrails required? Logic dictates a guardrail anytime a hazard exists, such as any abrupt change in grade. That would be impractical as most curbs would then have guardrails. More appropriate would be to provide a guardrail if there is to be a difference in grade of 30 inches (76 cm). Any condition less than that should require careful consideration of traffic, location and people using the area.

If a guardrail is to be installed, the following details should be considered for safety: Rail height must be a minimum of 42 inches or 1.06 m. If the guard faces a grade change or dropoff more than 25 feet (7.6 m), the rail should be increased to 48 inches (1.22 m) for the benefit of persons having a fear of high places.

Guardrails must be able to support high loads. This is figured at a minimum of 250 pounds or 113.4 kg in any direction, 50 pounds (22.68kg) per lineal foot (applied horizontally 42 inches or 1.06 m above grade) whichever condition would produce the maximum stress.

The area between the guardrail and floor must be filled in by one of the following:

- Intermediate longitudinal rails spaced so that the clear distance between them does not exceed ten inches (25 cm). This would include space between the bottom rail and grade or floor.
- Posts (or balusters) spaced with a maximum clear distance of six inches (15 cm) between them.
- Any panel of timber, plywood, solid wire mesh, expanded metal, or any ornamental grille that would provide equivalent protection against falling as the rails or posts mentioned above.
- Masonry wall may be used for any portion.
- Any combination of the foregoing that would provide equivalent safety.

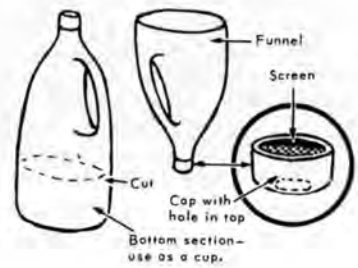
Any opening in the guardrail must be designed to prevent loose clothing or jewelry from becoming caught or wedged in such openings. A continuous six inch (15 cm) high curb under the guardrail will help prevent small objects from rolling or falling through.

*Larry N. Kilborn, author of this article, is an architect with the Denver Service Center, USNPS.*

## Simple money-saving ideas

**Save paint**


**Make a funnel from a discarded plastic jug**



# Proteus, a mini mobile unit for conservation education

As part of a special program to promote conservation education in areas where schools and other facilities are few or far between, the World Wildlife Fund has initiated the design, and financed the development of a new "mini" mobile education unit. The unit is well-adapted for use in national parks, and the first one, in fact, is destined for field use in Senegal, West Africa.

Escalating vehicle and oil prices have placed the relatively well-known, robust four-wheel drive "filmmobile" outside the budget available in many countries. WWF therefore adopted the Renault 'Fourgon' van as its basic vehicle in an attempt to prepare a versatile and economical mobile unit with a price tag below US $6000. Although the photographs showing the conversion apply to this particular van, there is no doubt that with a little imagination and ingenuity, almost any van, truck, or estate car could be adapted for the same purposes.

The Proteus unit has been designed to perform four major functions:

(1) It operates as a public address system, the roof mounted speaker being fed by a 15 watt amplifier contained in the slide/tape unit. In the first vehicle it is necessary to use the mobile generator to power the PA system, but the second unit will have a public address system which operates directly from the car electrical system. Used in this mode, operators of the unit may talk directly to groups of people, broadcast prerecorded cassettes, or canvass audiences for film shows.

(2) A 6×4 foot (1.83 m×1.22 m) roof mounted screen is quite large enough to show pictures adequate for audiences of several hundred people. Power from the compact Honda 300 EM generator is sufficient for either the ELF 16mm (magnetic or optical sound) projection equipment, or to operate Pandamatic slide/tape equipment. The Pandamatic unit has both recording and playback facilities, thus allowing the preparation of 'tailor-made' programs for local audiences in the field. The Kodak Carousel SAV 2000 projector with a long focus lens provides bright pictures even under conditions which are not ideal for projection. Both projectors are housed in rigidised aluminum cases which are rust proof and are strapped during transit into frames rivetted onto the floor of the van.

(3) The unit serves as a mobile exhibition center. Two large display frames are carried in the high dome at the rear of the vehicle and can be assembled using the same tubular aluminum poles which support the screen. Each frame is grooved to receive a display panel, which is reversible. The black formica surface is usually selected for displaying posters, wall-charts, photographs, etc., while the white side may double as a


rigid screen in conditions which are too windy to erect the canvas one. An extra partition in the roof stowage area is provided for large charts or prepared display material.

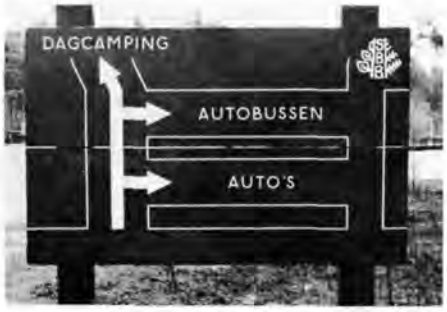
(4) An experimental rear projection screen has been hinged to the "false" roof inside and swings down after releasing two drawer bolts. By mounting the Pandamatic unit and Carousel Projector on the large aluminum storage case in the space formed by folding the passenger seat forward, an image can be reflected from a special mirror to the rear screen. The position of this screen is designed to allow for a bright picture in average daylight conditions.

Every effort has been made to provide for these four functions as simply as possible. To avoid rusting in humid conditions, construction has used aluminum or galvanised parts throughout. Clearly the final test of such a prototype unit is its reliability in the field, and above all its effectiveness in bringing the importance of conserving natural resources to a wider audience.

Will these adaptations enable it to perform this task? Six months of operation throughout Senegal will doubtless provide the answer!

More information may be obtained from the Conservation Education Department, World Wildlife Fund, 1110 Morges, Switzerland. —*Mark N. Boulton.*

# Minimum words, Maximum effect


*Lying astride the delta of the Rhine river and within a few hundred kilometers of 6 other nations, The Netherlands has always had to cope with complex language problems. As one result, the Dutch have pioneered the use of signs having a minimum of words and maximum effectiveness. Here are several examples, including an excellent trail-side interpretive sign which presents basic facts on the Scots pine. The bottom piece of the metal frame is held in place with blind rivets. All are from the Staatsbosbeheer (State Forest Service), sent by Ir. W.G. van der Kloet.*

# PUBLICATIONS

**Counting Animals.** 1975. M. Norton-Griffiths. Publication No. 1, Edited by J. J. R. Grimsdell and H. T. Russell, Serengeti Ecological Monitoring Program, African Wildlife Leadership Foundation, P.O. Box 48177, Nairobi, Kenya, 105 pages (typescript), 50 Kenya Shillings, U.S. $6.00.

This is a very interesting and useful publication. Perhaps the title might have been "Counting African Animals from the Air," since nearly all of the text is devoted to aerial surveys. Ten pages are devoted to ground counts from vehicles, and a final two pages dispose of other methods used for animal censuses. A publication announcement indicates that this handbook is the first of a series on techniques in African wildlife ecology designed for Wildlife Department and National Parks personnel and for wildlife management students. It was produced by photo-offset from typed masters, but the reproduction, arrangement, and writing are all very good, making for easy reading. Both binding and proofreading need to be improved in future issues of the series.

In general, this handbook gives clear and largely nontechnical instructions for nearly all of the steps involved in designing and carrying out an aerial survey based on the strip-sampling procedure. Simple and explicit instructions are given for defining the survey area, drawing a random sample of units, executing the actual survey, and calculating confidence limits for the estimates. It should be very useful to anyone conducting aerial surveys of reasonably numerous large animals in fairly open country. Under other circumstances, some more technical guidance may be needed. For example, transect methods based on measurements of distances from observer to animal are not adequately explored in the handbook. Nonetheless, it should be valuable to anyone conducting aerial surveys because there are so many useful details on setting up the aircraft, training crews, recording, photography, and so on. Too many surveys are presently conducted in which such things as height (altitude) control, accurate delineation of strip width, and counting large groups of animals are neglected. Dr. Norton-Griffiths has quite obviously had a lot of experience in dealing with these factors, so his recommendations are worth study in connection with any kind of aerial survey.

A few comments on specific points may be of interest. Although one of the three main objectives for counting animals (p. 1) has to do with distribution and movements, systematic sampling (evenly spaced transects) is not mentioned in the handbook. Although it brings in various problems, a systematic sample would seem to be worth considering when pattern and movements are of primary concern.

Some statistical concepts are not easy to present in simple terms. One that the author has trouble with is the idea of confidence limits. His claim that confidence limits can be interpreted as meaning "that there is a 95% certainty that the true number of animals lies in the stated range" (p. 11 and p. 14) may confuse a reader who stops to think about it. Once the survey has been finished, the calculated confidence limits either include the true number of animals or they do not—with 100% certainty! Our faith in confidence limits has to rest either on a statement made before the survey is run or on a law of averages—if things are done correctly, 95 out of 100 such statements will include the true number of animals. The same kind of problem comes up in a definition of the statistician's use of "accuracy" (p. 41, "An accurate estimate is one that is near the true total"). Again it is the averaging process that is relevant—averaging a very large number of surveys based on an accurate (unbiased) method will give a value very close to the true number.

A statement that I like very much appears on page 27: "No one in his right mind would ever attempt to count anything in a strip wider than about 1/4 mile." However, a strip of 1.5 km is suggested for searching for large herds of buffalo (p. 30), so that it becomes apparent that experience and good judgement have to prevail. If only large herds are of concern, and the country is very open, one might indeed use a wider strip.

In discussing stratification (p. 36), the author recommends allocating sampling ef-

*On some great plains many animal species live in vast herds and migrate seasonally. Aerial survey is the only reasonably accurate method of estimating their numbers. Photo: V. C. Gilbert*

fort to strata in proportion to animal density, on the basis of a statement that "the variance within a stratum will be directly proportional to the density of the animals in the stratum." The rule for optimum allocation is to allocate in proportion to the product of the stratum standard deviation and the proportion of the total area falling in the stratum. Following the quotation above, one would thus allocate on the basis of the square root of density. In my experience, however, it is more likely that the standard deviation will be proportional to density, so I think the advice given is good even though the logic used may be questioned (in the low density stratum, I would allocate in proportion to square root of density, as the animals there tend to be roughly randomly distributed so that the variance is proportional to density).

A few instances where inadequate proofreading may puzzle the reader may be worth mentioning. In Figure 18 (preceding p. 72), in the lower left-hand corner, "t=2×2" should be t=2.2. On page 81 (top), the denominator of the expression for "d" ought to be the square root of the expression given. Also, on page 82 there seems to be something missing in the first paragraph. Here, readers would be well-advised to look up the topic of one-way analysis of variance in a statistics text. A further problem is that counts of animals are usually not normally distributed, and some help from a statistician probably would be useful.

Something might be said about the *order* in which randomly selected transects are flown. In many cases it may be sufficient to simply work across the area, taking the transects in the order of occurrence on the map. Inevitably, under random selection, a few transects will fall very close together, and one may then wonder if some animals may not be driven onto (or off) the next transect when one is searched. More importantly, when migratory herds are being counted (pp. 83-84) order may be critical. One useful scheme is to draw a new random set of transects for each unit of flying time (e.g., for each day). This will obviously increase deadtime (flying from transect to transect), but may nonetheless be a useful precaution. Schemes of this sort are useful for a variety of purposes, such as comparing observers, aircraft, and so on, and can be found in survey sampling texts under the heading of "replicate subsampling" or "interpenetrating sampling."

I would like to stress the "dubious legality" label attached to stratifying after the survey has been conducted (p. 85). It seems to me to be a way to get quite unsatisfactory results out of an otherwise well-run survey. There are more legitimate ways to approximate the same result. One is to lay out the census area in a number of strips of the same size such that a few randomly located transects can be run in each strip. Another is to resort to systematic sampling. In either case, some help from a statistician is desirable, or one needs to spend some time with a text on survey sampling.

Two final comments:

1. I am doubtful about using "total counts" (pp. 87-92) for wild animals in anything other than quite restricted areas and unless the animals are largely indifferent to aircraft.

2. The user of strip transects had better be sure that he can see virtually all of the animals on the strip. This usually calls for a narrow strip and thus works well only if there are high densities of animals. —*L. L. Eberhardt, Battelle-Pacific Northwest Laboratories, USA*

*This publication may be ordered by mail from the Nairobi Office of the African Wildlife Leadership Foundation. From outside Kenya requests should be accompanied by postal money orders in US dollars. From inside Kenya payment should be by cheque or postal money order originally drawn to the African Wildlife Leadership Foundation. Endorsed cheques or postal orders are not acceptable.* —Ed.

**Manual for Museums.** 1976. Ralph H. Lewis, National Park Service, U.S. Department of the Interior, Washington, D.C. 53 illusts., 412 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. $4.70 (paper). Stock number 024-005-00643-5.

The Director of the U.S. National Park Service, Gary Everhardt, writes as follows in the foreword to this excellent book:

"Among the most important contributions the National Park Service has made since its founding in 1916 has been the development of extraordinary museum technology and administration—national in scope and international in influence. This manual, a distillation of what many persons have learned about the day-to-day operations of museums, is meant to provide curatorial standards and serve as a reference for museum workers everywhere.

"This book was written by Ralph H. Lewis, an outstanding museum administrator and curator with many years of experience in the National Park Service. It is an outgrowth of an earlier (1941) volume entitled *Field Manual for Museums* by Ned J. Burns, a work that went out of print during World War II and is, even to this day, in demand by curators and museum managers.

"In this present manual, Mr. Lewis carries on a tradition of excellence in museum practice that can be traced back to the mid-1930's when Carl P. Russell set the basic pattern for museum work in the national parks. In those early years most park museums could not afford or were too small to engage a full time professional museum staff. Dr. Russell set up centralized laboratories staffed by curators and preparators and provided the parks with exhibition and preservation expertise from this pool. The ordinary maintenance and operation of the museums were left to the superintendents who managed the parks, and to the archeologists, historians and naturalists who interpreted them."

Technically this manual covers the subject completely and in detail sufficient to give the novice curator—including the superintendent, interpreter, naturalist and historian involved in museum work—a strong feeling of security. Its four parts divide the rather overwhelming range of subject matter, with 17 chapters on various functions. Chapter 4, for example, is devoted to "Caring for a Collection." Here the details of preparing specimens for preservation, placing them in safe environments, periodic inspection and provision of preservation treatments are presented in 49 pages with 138 bibliographic references! Bibliographic wealth characterizes the book throughout. Chapter 5, "Using Museum Collections," contains seven pages of reference works with 137 citations.

It probably would be foolish to say that the book contains *everything* any curator would need to know to do his job, but I would guess that such a statement would be close enough to the truth to go unchallenged, at least by park people.

The book is full of good sense in addition to detailed technical guidance. When some technique, such as applying protective coatings on stone, for example, cannot be supported by deep and successful experience, the author clearly so states.

As a publication of the U.S. National Park Service, one would expect *Manual for Museums* to cover problems peculiar to the United States. This it does, but most of the work can apply to museums and historic structures anywhere.

Typography is excellent (10 point Times Roman), with useful appendixes and a good index. The paperbound edition is trimmed to 152×234 mm. The publisher, incidentally, charges 25 percent additional as the postage charge, surface mail, on orders from outside the USA. —*R. I. Standish*

*Giant prehistoric figures dominate the coast of Easter Island and are a featured part of the archeological resources of Chile's Rapa Nui National Park. Photo: Kyran Thelen*

*Back cover: Czech youngsters, members of a conservation work camp, help to establish a new nature trail in the Krkonoše (Giant Mountains) National Park.*