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PARKS

AN INTERNATIONAL JOURNAL FOR MANAGERS OF NATIONAL PARKS, HISTORIC SITES, AND OTHER PROTECTED AREAS



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| JOHN FOSTER | 1 A Park System and Scenic Conservation in Scotland |
| RICHARD A. MEGANCK
and J. MARTIN GOEBEL | 4 Shifting Cultivation: Problems for Parks in Latin America |
| JORGE A. BETANCOURT,
DONALD HANSON
and KEN WILD | 9 Honduras' La Tigra: Public Benefits Through Conservation |
| KENTON R. MILLER | 11 Forests for People: A Message from Djakarta |
| HANNO HENKE | 13 The Lüneburger Heide—Conservation of a Cultural Landscape |
| | PARK TECHNIQUES |
| KLAUS BERKMÜLLER | 17 Visitor Information Center at Nepal's Royal Chitwan National Park |
| TUX TURKEL | 20 Gilsland Farm: a Progress Report on Solar Energy |
| BERNARD FEILDEN | 21 Examples of Appropriate and Inappropriate Technology in Conservation
of Cultural Property |
| | 22 Neat Knot Note |
| | 22 Sign Face Protection |
| | 23 PARK VIEWPOINTS |
| THOMAS LOVEJOY | 23 The Conservation of Evolution |
| | 24 BOOKS & NOTICES |

Front Cover: A red deer 'royal' stag in the foothills of the Cairngorms in Scotland. Back cover: Water in abundance flows from La Tigra to slake the growing thirst of Tegucigalpa and other communities. Photo: Dennis Glick

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John Foster

A Park System and Scenic Conservation in Scotland

Why are there no national parks in Scotland? This question is frequently asked by visitors to Britain. Why indeed, in a country which possesses such a great diversity of scene in its mainland, its 800 islands and the 10,000 kilometres of its coast? Why, too, when it attracted more than 13 million tourists in 1977 and over £500 million into its economy from tourism? To understand why, one needs to look back into history and, in doing so, to remember that the pressures on the Scottish countryside over the years have been much less than those in England where national parks were established under legislation passed in 1949.

Early Beginnings

Background to understanding the situation today begins with the Access to Mountains (Scotland) Bill of 1884. Although it failed, the Bill nevertheless marks the beginning of an interest in public recreation. This was soon to become closely linked with a parallel interest in conservation of countryside of high scenic quality.

The development and recreational pressures on the Scottish countryside were relatively light through the early part of this century and the next significant step forward did not occur until 1945. In that year an official government report recommended the creation of five national parks in Scotland, taking in 484,700 hectares of high quality landscape. Again there was little demand for action and these proposed national

parks were not established. Instead, the areas were designated as "National Park Direction Areas." This did no more than provide a planning oversight of them by central government which would help to retain their character.

In the 20 years or so up to 1967 a variety of bodies contributed to conservation and recreation in Scotland. The Nature Conservancy established National Nature Reserves (there are 51 today) taking in 89,550 ha; the Forestry Commission developed 5 Forest Parks (the first in 1935) covering 104,000 ha; the National Trust for Scotland (a voluntary body) acquired for protection and public access a number of extensive mountain properties; and county planning authorities designated Green Belts around major towns and, in the countryside, Areas of Great Landscape Value for special protection against unsuitable types of development.

Countryside Commission for Scotland Established

The Countryside (Scotland) Act of 1967 established the Countryside Commission for Scotland as an agency of central government. It also enabled local authorities to set up and run country parks, these being quite small areas, generally not less than 10 ha or more than about 400 ha, with relatively intensive countryside recreational use. Today there are ten formally designated country parks in Scotland, with another dozen or so at various stages of development.

The Cairngorm Mountains, a National Scenic Area, seen across the broad valley of the River Spey. Photo: Scottish Tourist Board



On a larger scale, a local authority in the west of Scotland about a decade ago pioneered the development of a form of regional park, extending over an area of about 12,000 ha, within which recreation is the dominant use in parts only. Much of the area is carefully maintained in its established uses and landscape character. A second similar park is proposed south of the capital city of Edinburgh.

The range of designations and powers governing land use in Scotland is formidable, but with so many public authorities, both national and local, and voluntary bodies involved, work is not well co-ordinated and the comprehensive framework necessary for the conservation and management of the countryside in the face of the growing pressures now on it is simply not available. The Countryside Commission for Scotland recognised this early in its existence and, after carefully studying the situation, produced a report for government entitled *A Park System for Scotland*.^{*} This report was published at the end of 1974 as background for public debate and was generally well received.

Comprehensive Recreational Strategy

The Commission's proposals are designed to fit into the two levels of local government which exist in Scotland (region and district). They develop a comprehensive recreational strategy which ranges from high-density recreational areas, usually in or near towns, through a variety of

^{*}Published by the Countryside Commission for Scotland, Battleby, Redgorton, Perth, Scotland. Price 50p plus postage and packing.

At 1344 m Ben Nevis is the highest mountain in Britain and is within a National Scenic Area. The town of Fort William lies in the foreground. Photo: Scottish Tourist Board



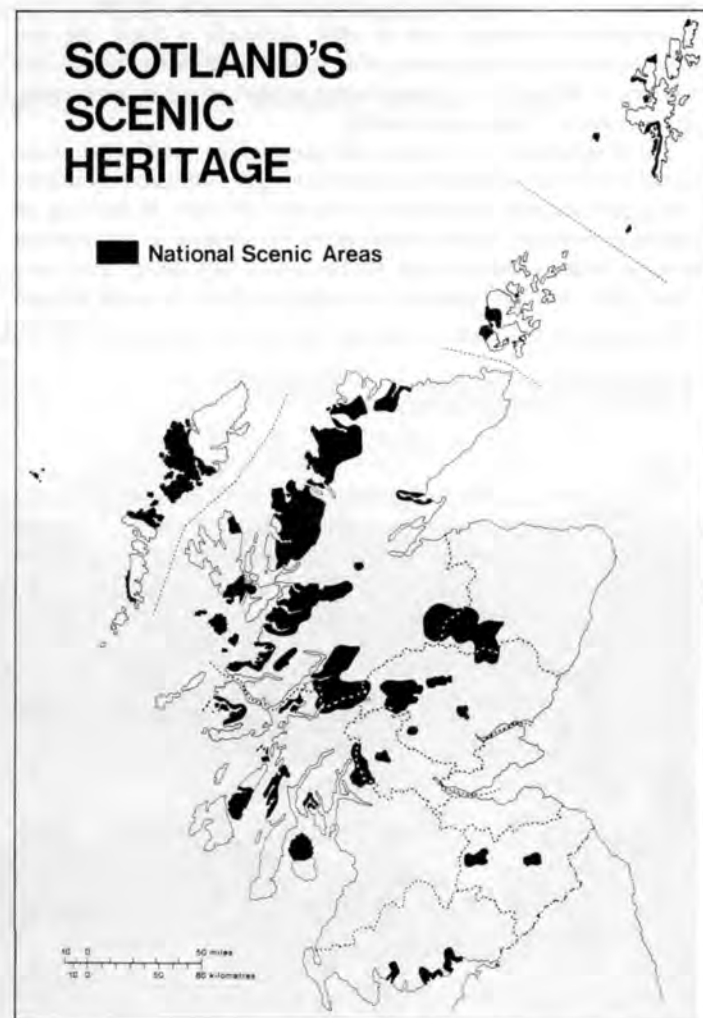
low-density recreational areas, generally remote from urban centres, where recreational use may be secondary to such uses as upland agriculture, forestry or water catchment. A fundamental point has been that the recreational pattern should impose conservation safeguards appropriate to each level or intensity of recreational use. A recreational plan for a region should impose restraints in recreational terms as stringent as those for the conservation of scientific interest or economic land uses such as farming and forestry.

From the idea of a comprehensive recreational strategy the Commission developed the concept of a system of specific areas designated as parks. Outside the parks there would be, as separate entities, a whole range of smaller scale recreational provisions (picnic sites, viewpoints, car parks, etc.), the elements of which would be related to one another and to the overall recreational planning strategy for a region and the designated parks themselves.

The Park System

The park system, as proposed, has four main elements —

- 1) Urban Parks — These are long-standing in most towns and cities, but in the past have seldom been linked positively in strategic terms with countryside provisions. This link is seen as essential in the future.
- 2) Country Parks — The Countryside (Scotland) Act provides the statutory authority for country parks; their nature and range of size have already been described. Designation and management is by district or regional authorities, singly or jointly.





Rangers of the Countryside Commission for Scotland. A ranger service is provided in the popular mountain area of the Cairngorms, situated in the Central Highlands about 50 kilometres south of Inverness.

3) Regional parks — These would be some hundreds of hectares in area, with recreation as the dominant use in parts only. The parts intensively used for recreation would be linked together by footpaths, avoiding areas of sensitive farming and forestry interests. Regional Parks would be designated by the regional authorities in consultation with the Commission and subject to the approval of central government, and would be managed generally by the regional authorities with strong funding support from central government. Legislation is required to provide statutory recognition for regional parks.

4) Special Parks — These would be areas already under substantial recreational pressure and having particular attributes of scenic character which give them a national rather than a regional or local significance. This national significance suggests that the community as a whole should bear the cost of setting up and running them, and would justify the involvement of some national thinking in decisions affecting their management and development. The Commission proposes, therefore, that there should be a separate Park Authority for each Special park, with two-thirds of the members appointed by the existing local authorities and one-third by central government to represent the scenic, recreational, scientific and other important aspects of the park. The Park Authorities would have local planning powers and a very high proportion of the finance for capital works and running costs would be provided by central government, on whom would rest responsibility for designation. All of this requires new legislation.

Battleby House, the headquarters of the Countryside Commission for Scotland, is located near Perth.



The Commission's first approach to the idea of a park system has been broadly conceptual and, apart from three important and obvious mountainous areas suitable as special parks — all identified in the 1945 report — the physical range of the system has not been worked out in geographical terms. This would be something for local authorities and the Commission to do over a period of time.

National Scenic Areas

While the park system is recreation orientated, adequate conservation of scenic resources is seen as an essential part of the concept. Beyond this, the Commission recognized from the outset that there are areas in Scotland of outstanding scenic importance, in national and even international terms, which are not under great recreational pressure at present and which it might therefore not be appropriate to designate as parks within a recreational system. In an extensive study carried out over a period of three years the Commission has identified forty such areas of national scenic significance, covering in total about 1,001,800 ha, or one-eighth of the land and inland water area of Scotland. The results of this study were published in April 1978 in a report entitled *Scotland's Scenic Heritage**.

*Published by the Countryside Commission for Scotland, Battleby, Redgorton, Scotland. price £3.00, plus postage and packing.

This report has been well received by the general public, voluntary bodies and local government interests in Scotland, and protection of the forty areas identified in it as being sought broadly in two ways. First, in terms of the statutory planning system, local authorities are being asked to incorporate policies which will protect the overall character of the areas against inappropriate change, and ensure that primary land use activities will continue to be able to thrive. Consideration is being given to what central government attention to planning control will be needed and for how long. The second means of protecting national scenic areas is through land management and the idea is being developed of promoting legislation which will allow public authorities to make management agreements with private landowners. Under such agreements, or easements as they are called in the USA, land uses could be modified on occasions in the interests of scenic conservation. In return landowners would receive compensation for income lost through the terms of the agreements.

But why are national parks as such not proposed within the park system? Briefly, to have tried to develop the national park idea in the international sense would have meant imposing a substantial element of national ownership of land and a national management agency on the present pattern of many different private and public ownerships and a strong democratically elected local government with its own planning powers. The Commission did not feel such an imposition to be appropriate in a Scottish context. It also recognised that within internationally

accepted national park standards, conservation must always take precedence over recreation and other land uses. This was seen as lacking the flexibility needed to cope with a heritage approach which seeks to conserve traditional qualities and national and regional characteristics in a living, in-use way rather than in a museum sense.

Both the Parks System and the National Scenic Area proposals, as far as is possible within existing legislation, are being worked into the recreational and scenic conservation strategies of local authorities. One or two local authorities are unhappy about aspects of the proposals in relation to their local interests, but discussions are going ahead with these authorities to sort out their problems. The main need now is for the necessary legislation to put into effect those parts of the Commission's proposals not already covered by existing legislation, notably to make provision for regional and special parks and for management agreements to control land uses in favour of the scenic conservation interest.

The government has stated its support in principle for the Commission's proposals and has indicated its intention to proceed to legislation as soon as the economic circumstances will allow this to be done with the reasonable certainty that there will be adequate financial resources available to back up the new powers.

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Richard A. Meganck and J. Martin Goebel

Shifting Cultivation: Problems for Parks in Latin America

The search for lands for farming continues to be an increasing problem in some developing regions of the world. Rapid population growth, lack of arable lands and few adequate programs for meeting the growing demands for food, fiber and work are among the factors contributing to the current conditions. Attempts to ameliorate them are constantly hampered by the local social, political and economic conditions, and are proving to be too slow for the rate at which these problems are growing. This is particularly the case when considering the unique natural areas such as national parks and other protected reserves, many of which are being severely disturbed and occasionally destroyed by practices related principally to the survival of human beings. Many times these areas are the only remaining habitats for wildlife, yet they may be desperately needed for food and money generating activities. How to successfully preserve them is a question of increasing relevance, especially in Latin America where population pressure has been so acute.

The existing forested area of developing nations has been estimated to exceed 1 billion hectares. However, according to a 1978 World Bank report, it is being consumed at such a rate that "it could disappear within 60 years" unless fundamental changes in land use occur. Between 1900 and 1965 nearly half of the forested areas in developing nations were cleared for fuelwood and agricultural purposes, mostly by subsistence farmers. While the average size of a family clearing is less than 2.5 ha,

more than 30 percent of the world's exploitable soils (some 300 million ha) is currently utilized for temporary cultivation. The impact of this practice, coupled with the lack of adequate programs to reclaim abandoned lands, compounds the severity of the problem. In Latin America alone, an estimated 5 to 10 million ha are cleared annually for cultivation, for construction materials and wood for fuel (World Bank, 1978). Eric Eckholm of the Worldwatch Institute summarized the environmental impact of this unchecked deforestation in the Third World.

The accelerating degradation of woodlands throughout Africa, Asia and Latin America . . . lies at the heart of what will likely be the most profound ecological challenge of the late twentieth century . . . the undermining of the productivity of the land itself through soil erosion, increasingly severe flooding, creeping deserts, and declining soil fertility (Eckholm, 1975:8).

Development of Milpa as a Land Use Practice

The system of agriculture practiced by many pre-Columbian peoples is known variously as slash-and-burn, *milpa*, or *canuco*. Traditionally, this system involved the farmer living in densely forested areas, belonging to a small tribe or community, and whose traditions and practices had



Example of small farm typifying milpa practice.

All Photos: Arno H. Brehme, Bioconservacion, Mexico.

evolved over millenia. The boundaries of the land area used for farming were determined from custom, usually falling within close proximity to homes and communities. After initial settlement, cultivation was restricted to secondary forests which were cut and burned during the dry season. According to Watters (1971), this was practical since it required less work than expansion into primary forests. Thus, small patches of forest were cut, burned and planted with a staple crop. After 2 to 4 years, soil fertility tended to decrease in most zones and the farmer would rotate to a different plot, allowing the field to become invaded by natural vegetation, thus undergoing natural forest fallow. Re-establishment of the soil's initial fertility could take as long as 20 to 25 years.

It is generally accepted that in this system the actions of the shifting cultivator probably did not reach the point of upsetting his balance with the environment. Of course, the populations of these 'traditional' shifting agriculturalists remained small because they did not enjoy a high standard of health or material well-being. It should be remembered, however, that their basic needs were met, and they often could continue to reuse the same land over and over again without invading new virgin forest. With less pressure from fewer farmers, *milpa* farming could succeed without the eradication of an entire continent's forests.

The *milpa* system became more widespread as the colonial period progressed and as the natives were driven from their traditional lands. Pushed by the conquerors, they were slowly forced to cultivate hinter-

lands less suited for maintaining their populations. The balance of the traditional *milpa* system was upset and virgin forests were invaded for a variety of resources.

As the years passed, the situation worsened considerably. Huge tracts of land were partitioned and turned over to commercial farming interests. Meadows, hillsides and forests were used mostly for wood products and grazing. Herds of cattle, horses and sheep multiplied rapidly. Coupled with the European colonists' disregard for native land claims, this trend led to serious overgrazing and the conversion of much traditional *milpa* land into permanent pasture (Prescott, 1936).

For most nations in Latin America, reform in the treatment of Indian and peasant cultivators and their holdings has begun only during this century. Some progress has been made, yet the conditions of the people have often remained unchanged. But, because the exploitation of these people continued for more than three centuries, a new type *milpa* cultivation pattern has evolved—that imposed not by tradition but by necessity.

Here, according to Watters (1971), the cultivator is no longer a member of a tightly knit community. If he lives in a village or town it is only a matter of convenience, a situation that can be easily altered. Normally, the man knows no ownership to land, but colonizes private or public forested areas oftentimes within parks or similar reserves. Thus, he takes advantage of three conditions: the fertility accumulated in the soil, the virgin timber stand, and the poorly defined and protected boundaries of these areas.

In general, he proceeds as did his traditional counterpart. First, he fells the trees and burns a patch of forest preparing it for what he often perceives will be a permanently productive plot (Watters, 1971). He may even take measures such as "mixed cropping" in order to spread planting and harvesting efforts over the entire year, reduce the chance of catastrophic losses to pests, disease, or weather, and to insure limited protection of the soil resource by maintaining a continuous cover (Eckholm, 1976). New methods may also include the use of machinery for cultivation and the application of a variety of inorganic fertilizers or pesticides (UNESCO, 1974). Nevertheless, after only a few years, yields decline rapidly because of a decrease in the stability and fertility of the soil and because uncontrollable weed growth becomes too difficult a problem to counter. At this point, he simply will move to an adjacent plot—if one is available—and begin the process anew.

More often, however, this cultivator is finding himself a victim of rampant population growth and of local and national conditions which limit the supply of new lands at his disposal. Becoming literally 'land hungry' he will either cultivate the plot until productivity is completely exhausted, or wait the shortest possible period until a slight increase in fertility of the soil will support a meager crop. If he is able to clear another plot close by, he will likely allow his animals to graze on the abandoned land since weeds for livestock still will grow there for some time.

With the vegetative cover eliminated, and the soil compacted, the final ruin of the land occurs, for often these plots are on hillsides and rains will rapidly carve entire slopes into unusable gullies and wastelands; mud, rocks and silt quickly choke streams and drainages become dry. Gill (1976) states that more than 75 percent of Mexico's forests have been destroyed since the arrival of the Europeans with much of the destruction having been caused in more recent years by these practices.

There is an ever increasing need for Latin American countries to intensify management of natural resources for a variety of social goals. Developing necessary infrastructure and massive projects for sustained food and fiber production in order to stimulate their economies are among them. Yet as a result, new lands for subsistence agriculture are becoming a thing of the past, and the farmer and his family are left with few choices to avoid serious deprivation. According to Watters (1971) and others they are: 1) the family may split up, some or all members of which must migrate to the overpopulated and probably unhealthy conditions of the city, or 2) they may be driven to invade lands which are privately owned



or otherwise set aside by decree as part of the national patrimony such as national parks, wildlife reserves, or similar areas.

The *Milpa* and its Effects on the National Parks of Latin America

Wetterberg (1974) interviewed leaders from the South American countries at the Second World Conference on National Parks held in Grand Teton in 1972. To them, illegal occupation of reserved areas by *colonos* (settlers, squatters) was considered to be one of the most widespread and difficult to resolve problems in South American systems. Supporting this claim, Meganck (1975) and Perry (1972) found this problem to be the major management issue presently being faced by Colombia's division of national parks. And Hamilton (1976), studying the use of Venezuela's rain forests, found that prevention of new *canuco* agriculture is both a "continual threat" and a "major problem" in national parks. Eckholm (1978) substantiates this claim in a recent study by indicating there are "30,000 *campesino* families living within the national parks, forest reserves, wildlife refuges and protected zones" in that country. The problem in Haiti has reached such proportions that an estimated 9 percent is all that remains of the country's original forest cover. In Central America and Mexico, the problem is also extensive. As early as 1946 Mexico's national parks were suffering from an invasion by people without arable land or sources of firewood for cooking and heating purposes (Vogt, 1946).

Some cases in point should illustrate the tangible and intangible losses which have been experienced in national parks due to illegal cultivation. In El Salvador, Daugherty (1973) urged the establishment of a Montecristo Cloud Forest National Park because invasion by peasant agriculturalists and wood cutters had eliminated over 50 percent (12 km²) of the only remaining habitat for numerous animal species.

La Macarena National Park in Colombia, also a rain forest subject to continued encroachment, has one of the world's most varied flora and fauna due to its unique location between the Andes mountains and the Orinoco and Amazon Rivers. Despite the relatively limited number of scientific investigations which have been undertaken in the area, over 450 species of birds, including 20 endemic forms, have been identified (Olivares, 1962). INDERENA, (the natural resource management institute of Colombia) reports jaguar, white-lipped peccary, and the endangered spectacled bear are found in La Macarena. Reptiles include five species of turtles (Meganck, 1975) and the area also has an extremely rich primate fauna. When the park was first established in 1948, more than 1,300,000 ha were included. Subsequent entry by *colonos* for

agriculture, firewood cutting and poaching have reduced this reserve to less than half of its original size. In addition, the "new boundaries" are not ecologically delimited but simply reflect the current extent of the invasion into the park (Struhsaker, 1976; Meganck, 1975).

Presently, in excess of 1200 established *milpas* are situated within the park and realistically there is little hope of relocating these individuals in the near future. Shortages of funds, trained personnel, public support for environmental issues and power to enforce existing statutes are but a few of the major deficiencies Colombia must overcome before this resource is properly managed, insuring protection of the habitat and the fauna it supports. However, these conditions are not unlike those found in other Latin American nations and are intricately tied to broader social and economic conditions occurring there.

Similar problems are also being encountered by the Division for Protection of Nature of the Department of National Parks and Equivalent Reserves in Brazil. Dr. Maria Tereza Jorge-Padua (1976) documents the case of continuing encroachment in Aparados da Serra National Park. Since this area is in an ecological transition zone, it provides habitat for a great number of threatened species including the giant otter, giant armadillo, La Plata otter, pampas deer and the giant anteater. Since its establishment in 1959, the area surrounding the 13,000 ha park has been intensively cultivated. The major management problem facing the Division is how to maintain the integrity of the park while providing for the growing needs for arable land and firewood for local farmers.

Some Possible Alternatives Available

As Perry (1972) states, "Spontaneous settlement" has always been a part of the Latin American scene. To be able to settle on any unoccupied land has become a tradition, almost a right. A man claims a stretch of forest or the edge of a colonized area, and clears it to establish rights of ownership.'

The origins of this "right" can be traced to the colonial epoch. Today, with land reforms which have followed extensive civil unrest in several nations, some rights to ownership have been granted to peasant peoples. These policies are aimed at giving small farmers status and security and have done much to augment their sense of personal pride. Together with the population growth and the construction of roads to formerly isolated areas, park managers meet considerable opposition to the closure of lands for national park purposes.

Possible alternatives to these resource management conditions range from doing nothing, in one extreme, to expelling legal as well as illegal land claimants without compensation, on the other. Quite obviously the

internal circumstances in each nation will determine how issues will be treated. Each nation—each park area—is different. Solutions suitable in one may not be acceptable in another. However, all nations appear to agree that establishment of national parks and reserves is a worthy goal for segments of the national patrimony, so taking actions on extreme alternatives seems hardly the proper way to pursue that goal. Indeed, other alternatives have been proposed. Wetterberg (1974), for example, identified several possible alternatives for problems of illegal colonization. They are: 1) employment in the parks of the *colonos*, 2) relocation of the *colonos*, 3) alteration of park boundaries to exclude areas affected by the *colonos*, and 4), the zoning of land use in the parks, and enforcement of zoning restrictions. Each is briefly discussed below.

Employing the *colonos* would provide a labor force familiar with the local environment. According to Wetterberg, not only could they be gainfully employed, but also could provide valuable information to park visitors. If they continued to live in the traditional way this would provide an interesting new dimension in the park scene. However, advantages of this alternative would need to be weighed against the notions of private ownership rights (i.e. if the people were made to live in the government housing), the problem of policy discontinuity and position insecurity with each new governmental administration, and, of course, the problem of sheer numbers. It would be difficult in the case of La Macarena, for example, to employ that many *colonos*.

Relocation has been successful in some countries including Colombia (Isla de Salamanca, Purace and Tayrona National Parks) and Venezuela (Guatopo National Park). In Costa Rica's Santa Rosa National Park, 28 families were successfully moved out of the park and with the cooperation of ten governmental agencies and the United Nations (Sutton, 1972). Perhaps this is the most attractive alternative in terms of ridding the park of human encroachment. However, in most cases to date, the numbers have been relatively small, keeping the cost low, and the people could be convinced to relocate because equally good or better land was offered. The Venezuelan Guatopo* case was an exception. Here about 3,500 families were reimbursed for their land claims and crops at a cost equivalent to U.S. \$10 million (Rodriguez, 1976). However, not many nations are willing or able to invest those sums in park programs in order to completely clear these areas of occupancy. One major problem with this alternative is the implicit legitimization of land claims which in turn may encourage additional illegal colonization.

Altering park boundaries has already been discussed somewhat in reference to La Macarena National Park in Colombia. Generally, this solution does little to preserve park values. It may eliminate the problem temporarily, and it may be cheaper than relocating or paying for settled land, but usually it is "detrimental to nearly all park objectives" (Wetterberg, 1974). Furthermore, if not accompanied by strict enforcement, new boundaries simply become the victims of further abuse (Meganck, 1975).

Wetterberg's final alternative, zoning the park and enforcing the zoning restrictions, involves designating certain already settled portions for existing uses and restricting the uses occurring inside or outside designated zones. Except for the cost and technicalities of enforcing the restrictions, this alternative seems less expensive socially and monetarily than relocation or employment (Wetterberg, 1974). Here, of course, depending on the degree of ecosystem purity desired, some of the area's values may or may not be compromised. Further, alternatives would need to be considered in light of probable population growth in the zone areas.

Significantly stepping-up vigilance of park areas by increasing the numbers and training of park guards is, of course, another possibility. Some authors even feel that in order to insure that park values or boundaries are not further compromised, the military should be utilized for their defense, thus demonstrating to *colonos* that these areas are to



Example of erosion resulting from loss of vegetation. For practical purposes this land will never recover.

remain free of encroachment — at any cost. Admittedly, while there is surely a need for increased manpower for protection, this solution is extreme. And, although it may be true that "the integrity of the preserves could be enforced only at gunpoint" (Eckholm, 1978), it is not likely that this solution would work very well. Perhaps a quote from a park inspector of La Macarena could serve to illustrate why:

"Many of the people poaching and farming in this park are poorer than we and have been our friends for years. Do you really think that we are going to arrest them? We also have been forced to cut the trees and kill some animals in order to supplement our diet out here in the field and are therefore also technically breaking the law." (Meganck, 1975).

Quite obviously, local officials realize that the peasant agriculturalists are not conspiring to act against the law, but simply trying to feed their families. Likewise national leaders hesitate to take drastic action as they too realize the possible consequences of denying their people a piece of land, particularly in the wake of distributive agrarian reforms and their own lack of effective alternatives.

The Milpa and the Future of Latin America's National Parks

Specific mention has not been made in this paper of every Latin American country. This may lead the reader to believe that the problem of the *milpa* in national parks may not exist everywhere or that perhaps its effects are not as severe in some places as mentioned herein. The fact that all administrators interviewed in Wetterberg's study (1974) mentioned that the problem was present in their countries suggests that only the latter

* Guatopo is a water catchment area for Caracas.

could possibly be true. As is often the case, it is extremely difficult to generalize about a region made up of so many different countries, cultures and levels of national development. Perhaps the *milpa* is not of major importance in a few places; mining, timber harvesting, poaching or administrative and management problems could well be at the forefront instead. What is important, however, is that valuable habitat and unique natural areas of tremendous biological value are being compromised through this practice.

No solution to the problem will completely satisfy everyone. At this point it seems that employing illegal *colonos* or zoning with enforcement are the most compatible solutions given the local significance of land ownership and the funds presently made available for park management. There is little question that altering park boundaries is an inappropriate answer, as it has done little to eliminate the problem permanently. Yet it is very likely that this situation will change in the long run. As national and international development continues, tourism and travel become much more popular, and the value of national parks grows quickly for those seeking respite from the crowded and expanding urban areas. A national preservation system is likely to gain broad support in such conditions. Most important however, the knowledge gained from research and the revenues and recreational benefits generated from local and foreign visitation are likely to be greater than the short lived advantages derived from the *milpa* practices.

To conclude, the *milpa* agriculturalist should not be ignored irrespective of the benefits gained by park protection. Unless his problems of subsistence living are dealt with, it is not likely that the problem of habitat destruction will be solved. While the *milpa* is not the only plight Latin American park managers face, it appears to be most crucial, as the lands being lost are very difficult to restore. It is thus highly important that boundaries be clearly marked and enforced with trained professional personnel. In the final analysis, however, national parks in Latin America will not become protected areas of national significance until the majority of the population agrees to treat them as such.

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Jorge A. Betancourt,
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Honduras' La Tigra: Public Benefits Through Conservation

About 25 kilometers northeast of Tegucigalpa, the capital of Honduras, lies a green "island" in a "sea" of development. This area, known as La Tigra, is soon to be the first national park of Honduras.

La Tigra is an area of 7571 hectares, with slightly over 1000 ha in virgin cloud forest and about 6500 ha in 40-to-50-year-old second growth forest. The rugged mountains, whose highest point reaches 2290 meters, contains 10 peaks over 2000 m. Today, the size, location, topography, vegetation, and history of La Tigra have made it very important to national development, and the conservation movement in Honduras.

La Tigra has had a colorful history. This mountainous area was the scene of one of the biggest gold and silver mining operations in Central America between 1881 and 1954. At one time more than 1000 men from various countries worked in over 90 miles of main tunnels which included some 70 veins and more than 50 miles of crosscuts for the Rosario Mining Company. The mining operation had a great impact on the La Tigra area, both environmentally and socially. Although the mining company built a hydroelectric plant that utilized the cheap and abundant water from the mountains, and constructed schools and a hospital, the mining operation left huge scars because of coinciding lumbering activities which supplied fuel to the mills and support beams for the mine shafts.

Early in the twentieth century, the La Tigra area was also recognized for its tremendous water production potential. Several farsighted people sought to take advantage of the numerous clear streams to augment the water supply of Tegucigalpa. Toward the end of the 1920's, the National Water Company (SANAA—Servicio Autonomo Nacional de Acueductos y Alcantarillados) constructed the first small dam. In 1960, the Water Company developed a comprehensive system for collection with several small check dams and a system of pipelines to Tegucigalpa. Present plans are to upgrade the existing transport system and study the feasibility for

increased water production. The proposed La Tigra National Park area currently supplies approximately 40 percent of the water for Tegucigalpa's 350,000 people, as well as for several surrounding communities.

On the lower slopes of La Tigra one finds a pine-oak forest which has been extensively cut over for agricultural purposes. However, above 1800 m the mountain is covered with a lush hardwood cloud forest. This forest, usually bathed in clouds, captures the moisture which filters down and forms the streams which provide a continual year round supply of drinking water. The cloud forest is usually dark and damp and heavy with water-laden epiphytes, mosses, and tree ferns. Sometimes the sheer weight of plant mass and water is enough to topple giant oak trees. The combined elements of altitude, fog, temperature, wind and an average annual precipitation of 1759 mm produce an abundance of water for the surrounding communities.

Although designation of La Tigra as a national park faces many problems, particularly financial ones, its importance as a protected watershed to supply essential water for several hundred thousand people is a very important consideration. Beginning in July of 1952, 2000 ha were set aside as a reserve for watershed protection. Then in July of 1966, the reserve was expanded to the present 7571 ha to further protect the watershed and maintain the production and quality of water. During 1977, the Directorate of Renewable Natural Resources conducted extensive inventories of the other natural and cultural resources of La Tigra and proposed the area as the first national park of Honduras. Since then, a master plan and also an interpretive and public use plan have been written which include the proposed park in a larger tourist circuit plan and programs for sound agricultural development. A system of nature trails has been planned and wildlife studies have been carried out.

The master plan addresses such problems as the gathering of firewood

La Tigra; a general panorama of the virgin cloud forest. This unique cloud forest ecosystem is responsible for the production of a continual year round supply of drinking water for Tegucigalpa and other communities.
Photo: Ken Wild





Cultivation on southern La Tigra shows the contrast between the intact forest and the rapidly increasing encroachment of migratory agriculture. Development projects such as terracing, multiple cropping, and agroforestry are part of the plan to offer alternatives to farmers while helping to protect the watershed and animal habitats of La Tigra. Through such projects, the park demonstrates that conservation and development can work together for the benefit of all.

Erosion on the southern edge of La Tigra contrasts sharply with the

lush vegetation of the cloud forest. This erosion is the result of slash-and-burn agriculture and deforestation, problems which the park is trying to solve through the introduction of alternative farming techniques and ecodevelopment projects.

Environmental education lesson at one of the holding ponds. A National Water Company employee explains the water system to a group of students as part of an environmental education program carried out in a local town, San Juancito, in 1978. Photos: Ken Wild

and the collecting of ornamental plants within the proposed park boundaries. Colonization or illegal landholdings, coupled with destructive slash-and-burn agriculture, are also problems. Another problem results from the fact that the La Tigra area, because of its altitude and cool climate, is the ideal place to grow certain temperate zone crops such as cabbages, carrots, and onions which are vital to the diet and economy of the local people.

To resolve these problems and conserve the La Tigra watershed, a number of alternatives have been proposed in the master plan.

One is the development of cottage industries, such as growing and selling flowers instead of planting corn on steep slopes. Nurseries to raise and sell ornamental plants will provide jobs and income, and will help to eliminate the destructive gathering of mosses, tree ferns, orchids, and bromeliads. Appropriate farming techniques, which would include terracing, multiple cropping, and agroforestry, can provide alternatives to the deforestation and erosion caused by slash-and-burn agriculture. Also, managed woodlots within a buffer zone should provide sufficient firewood to meet local needs. The people now living illegally within La Tigra can be given jobs such as guides, guards, and maintenance personnel and the public relations problems that result from expropriation and expulsion can thus be avoided.

In 1978, an environmental education program was developed in the sixth grade of a local elementary school. This helped to create an awareness and understanding of the proposed park's goals and objectives, and initiated a concern for conservation within the local populace. Other public relations and environmental programs were carried out in the nearby community to show the benefits of and to gain support for the park.

La Tigra plays an important role in the development of watershed management in Honduras. Except in specific projects, no single government agency at present is in charge of watershed management. The National Water Service Company is in charge of drinking water and sewage control. Although this agency was instrumental in setting up reserves for municipal water supplies, it has no overall watershed protection projects. The National Electric Company (ENEE) is also involved, due to its interest in the development of hydroelectric power, but it does not have an adequate work force to protect all watersheds. The National Forestry Corporation (COHDEFOR) is responsible for all forests in Honduras. It has a small watershed management unit that has

begun terracing projects in cooperation with the farmers, but lacks the support to carry out needed integral watershed protection. Also involved is the Directorate of Renewable Natural Resources (RENARE) which, with its proposed system of parks and equivalent reserves, is trying to conserve some of the more critical and outstanding wild areas and watersheds in the country.



The quetzal, with its lustrous plumage and long tail feathers, is one of America's most beautiful birds. It lives happily in La Tigra's cloud forests. Other wildlife species include whitetail deer, peccaries, rabbits, squirrels, and an occasional ocelot or puma. Photo: Chris Vaughn

In addition to an attempt to be a model of coordinated interinstitutional watershed management, La Tigra National Park will provide other benefits. Recreation is important to an increasingly mobile urban population that is seeking more relief and alternatives from city pressures. Another value of La Tigra is its role in the development of national and international tourism. The proposed park is just one part of a 50 km tourist loop in the metropolitan Tegucigalpa area which is expected to add to the national and local economies.

One of the important functions of the reserve is its educational role. Through interpretation and environmental education programs, the general Honduran public as well as tourists will be able to understand and appreciate their natural and cultural heritage. Finally, and perhaps most important, is the role of La Tigra in the national conservation movement. The park will denote official acceptance in Honduras of the need for conservation of natural resources, and recognition that land use and natural resources need to be planned, used rationally, and developed with

the cooperation of all institutions. La Tigra should be the spark for comprehensive watershed management, sound agricultural development and land use, and environmental education throughout the country.

Without management and protection, the La Tigra area would most likely follow the traditional pattern of development — deforestation, destruction of wildlife habitat, and serious water shortage problems for thousands of people. With proper management, La Tigra National Park can benefit many and prove that conservation and development *can* work together.

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Kenton R. Miller

Forests for People: A Message from Djakarta

Last autumn the leaders of the world's forestry profession — some 2500 colleagues from 104 nations and 14 international organizations — gathered in congress in Djakarta to examine in depth "how forestry might best serve human beings, individually and collectively."

They summarized their key conclusions with suggestions to all members of their profession, and to the world at large, in the form of a *Declaration* containing 26 paragraphs.¹ The Congress made clear its belief that "the world's forests must be maintained, on a sustainable basis, for the use and enjoyment of all people". In synthesis, the Declaration calls attention to the urgent need to tie the many diverse goods and services of the forests of the world to the needs of people, particularly the rural poor. Forests can contribute in direct ways, economically and socially, to food, livestock and energy production and to employment. However, the intensity of management and use of forest lands must be increased. So must productivity, to expand benefits in the face of growing demands from a shrinking forest estate.

Two aspects of the Declaration are of special interest to conservation managers.

First, the Congress explored the social dimension of the management of forest resources. The role of local participation in decisions affecting rural land management, the role of women, the welfare of forest workers, and the impacts of forestry activities on the human environment were stressed. Concern to make forests serve the well-being of the more deprived populations was summarized in four points (paragraph 26):

- a) "forests must make a greater contribution to the economic development of the more underdeveloped parts of the world, without detriment to the needs of future generations;*
- b) international cooperation must be strengthened in the fields of inventorying, management and the conservation of forest resources, especially in the developing countries;
- c) forest productivity must be raised so as to allow the alienation (transfer) of more land to agriculture;

- d) the maximum amount of employment must be afforded in rural areas."

The second aspect of interest is the importance given by the Congress to the role of natural area management. The fact that most conservation work around the world is carried out by forestry institutions and by foresters is generally lost beneath the preponderance of attention and investment given to wood industry and timber extraction (one single product of forest ecosystems). The Declaration carries the message that foresters from industry, private and public enterprises and government services, should search for and establish an appropriate balance in the dedication of forest and wildlands for all of the many products and services which people need from their natural resources.

The signals from Djakarta to conservation managers can be restated as seven guidelines:

1. *Conservation of natural resources is to be considered within the framework of overall rural development.* Agriculture, animal husbandry, wood and wild animal production, protection of watersheds and genetic resources and environmental conservation are to be treated as elements of one context which requires integrated planning and management. The traditional concept of multiple-use forestry is thus to be broadened. And, it is recognized that people are "the motive force of development, not simply the passive object of development." (paragraph 7).

2. *Protected areas are integral to the framework of rural development to insure that particular areas critical to development are managed for objectives directly related to the welfare of people.* The various categories of protected areas, such as national parks, national forests, wildlife sanctuaries, game reserves, nature reserves, cultural landscapes, biosphere reserves and world heritage sites, have been described systematically by their objectives of management.^{2,3} These include:

- a) maintain representative samples of each of Earth's major biological units in their natural state and protect the genetic materials they contain;
- b) facilitate research to explore and understand natural ecosystems and ecological processes;
- c) facilitate monitoring of bench-marks or control areas, provide

*Emphasis added.

information and documentation on natural and altered natural ecosystems, and support the evaluation of environmental impact of alternative development strategies upon natural resources and people;

d) conserve sites, structures and objects of cultural heritage;

e) support and collaborate with experimentation on the conservation and use of flora and fauna for use in pharmaceuticals, medicinal research, food and timber development and watershed management;

f) conserve and enhance the habitat for wild fauna which may be harvested to supplement human diets;

g) provide opportunities for recreation to enhance the appreciation of the natural heritage and for the healthful use of leisure and to support tourism development;

h) conserve and enhance timber resources to meet the needs of local people for firewood and construction demands, and for industrialized purposes for social and economic development.

By managing a series of categories of protected areas to provide for such an array of goods and services within the rural development framework, natural resources can be conserved, renewed and enhanced to serve the needs of people, and the employment base for rural people can be expanded.

3. *Resource conservation areas require professional management if benefits from forest and wildlands are to be received by people on a sustainable basis.* Personnel at all levels must be afforded training opportunities. Training programs and materials must project a balanced view of natural resource management so as to integrate forestry, conservation, agriculture and animal husbandry. National and international organizations should expand their support for training centers and the preparation of teaching materials which incorporate the broad view of rural development.

4. *Wild fauna, a resource capable of providing protein, various products and employment, warrants expanded attention.* This requires the protection of species and habitats having high potential, with research into management techniques, marketing studies and the familiarization of people with the concepts and importance of sustainable wildlife utilization.

5. *Wild and forest land uses are to be intensified in response to growing demands for products and services and to insure appropriate environmental conservation.* Parallel with the search for increased yields of wood per hectare and for improving the efficiency of wood-using industries, the management of wildlands and protected areas are also to seek greater productivity and efficiency in the provision of consumptive and non-consumptive uses. Research, monitoring and educational activities can be greatly intensified and more carefully related to human requirements. Protected areas can be selected and managed not by chance or by whim, but by systematic scientific methods which insure to the maximum extent that genetic resources will be conserved, watersheds protected, and development made sustainable. To meet the objectives of human welfare, many conservation areas will have to be expanded in size, their shape will require modification to embrace maintainable ecosystems and protection will have to be intensified. Other areas can be managed to provide multiple outputs and greater employment.

6. *Policies of governments and international organizations must mandate and support the integration of traditional sectors for rural development.* Current policies are oriented generally towards individual management sectors, including forestry, agriculture, animal husbandry, soil conservation, parks and wildlife, water resources, and scientific

research. Thus, it is difficult to stimulate a unified approach to rural development. The challenge lies in providing singularly clear direction for related sectors such that all elements can become parts of one whole. And the traditional sectors, including conservation, parks and wildlife, can become members of one larger interdisciplinary team working towards a common purpose.

7. *Action is required which will have immediate impact upon the rural poor and also insure long-term benefits to all people.* Among the immediate needs are food from wild fauna and multiple cropping management, energy from wood and wood derivatives, potable water and opportunities for employment on conservation projects. Behind these and other short-term activities lie measures for the management of wild and forest lands to minimize erosion and sedimentation of water works, agriculture and pasture areas, the enhancement of stream flows, the maintenance of genetic resources, and the development of employment alternatives which fit into a systematic regional scheme for planting, cropping and conservation projects.

In this connection, conservation management can benefit from a planning approach which differentiates between tactical-level problems which focus upon the immediate needs of nature protection and the human community, and strategic-level problems which focus upon the overall longer-term goals. The IUCN World Conservation Strategy⁴ suggests lines for strategic-level action similar to paragraphs in the Declaration of the Eighth World Forestry Congress. It calls for integrated natural resource management policies, the protection of species and genetic materials, the development of networks of protected areas of various categories to provide for an array of benefits from forests and wildlands. It seeks sound environmental planning of entire regions and ecosystems, and research on ecological processes and critical questions facing development. Finally, it urges action to develop public consciousness of the need for a balanced and sustainable human environment.

Even with these compelling words from the Forestry Congress, conservation managers are liable to remain skeptical, especially in view of the massive deforestation taking place throughout the tropics. However, perhaps the tide is turning! The ambitious conservation program in Indonesia gave Congress participants the impression that at least the government of the world's sixth most populous nation is putting the right foot forward. The safest bet would appear to be to join the team. Without serving the people, neither the forests nor the protected areas will survive.

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Hanno Henke

The Lüneburger Heide — Conservation of a Cultural Landscape

The Lüneburger Heide Nature Reserve protects a relatively large remnant of pastoral heath landscape that is many centuries old. The Reserve covers 19,740 ha, of which about 4450 ha, or 22.4% of the total area, are heath. Forestry, hunting and agriculture are the other land uses within the Reserve. During medieval times and up to the middle of the 19th century, the heath covered most of the northwest German and Dutch lowlands. In the course of the last hundred years, however, the pastoral use of the heath has been completely abandoned. Consequently, to guarantee survival without significant change it has become necessary to protect this culturally and ecologically important landscape through management measures which replace former agricultural use. Today the Lüneburger Heide is one of three remaining man-caused heath landscapes in Europe. The other two are the Campina Heath in Flanders and the Randøle Heath in Jutland.

Because ownership of the land is predominantly private, it has been necessary to develop a flexible protection and planning organization. This has the active involvement of private groups and the public and results in effective conservation of the typical heath landscape while permitting an economic existence for some 1100 inhabitants.

Within the legal protection framework of the Nature Reserve it was only possible to prevent land use intensification and alteration on the heath to a certain extent. However, through the involvement and financial support of the Verein Naturschutzpark (VNP), a private public benefit organization, conditions for the protection and management of large undivided heath areas have been improved. The scientific knowledge necessary for effective measures to prevent the natural regrowth of birch-oak and beech-oak woodlands plays a major role in the heath's conservation.

In its geographical location between the metropolitan areas of Hamburg, Bremen and Hannover, the Lüneburger Heide Nature Reserve, with over three million visitors per year, plays an important role in recreation and education. This makes imperative further protection of the heath as well as measures for visitor information and distribution of use.

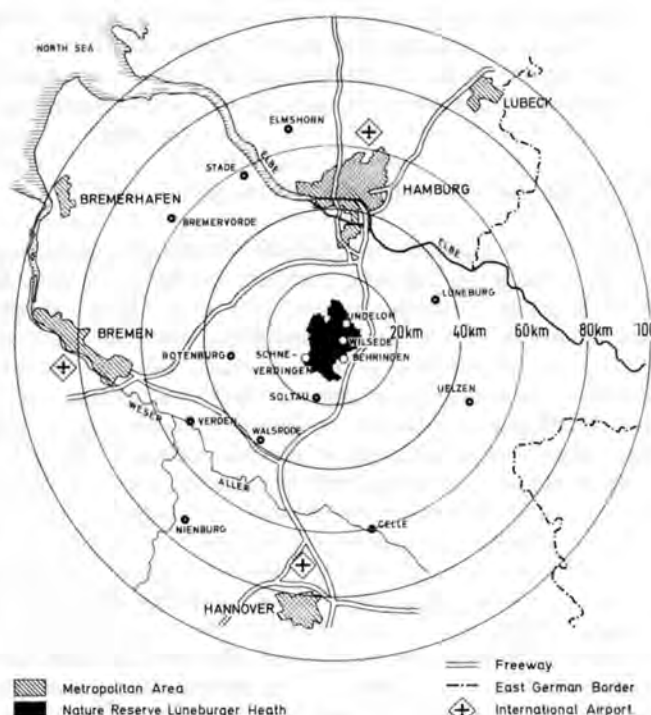
The landscape structure of the Nature Reserve has evolved through agrarian land use and is conserved as a landscape of national importance through the help of all involved parties, primarily at the local level.

Although this is generally contrary to the way national parks are administered, there is, nevertheless, strong support for the Lüneburger Heide to become a national park.

Development and Change of the Heath Landscape

The northwest German heathland evolved as a result of woodland devastation by man in prehistoric to medieval times. Pristine birch-oak and beech-oak woodlands were eliminated by fire, timber cutting and grazing. With clearance, the woodlands were replaced by dwarf shrubs of heather (*Calluna*) and furze (*Genista*). This wide-spread secondary plant

Location of the Nature Reserve Lüneburger Heath in Northern Germany



association over millennia became permanent through one specific extensive land use, sheep grazing.

The beginning of the alteration from primeval woodland to a large heath landscape is believed to have taken place with the transition from nomadism to agrarianism at the end of the Neolithic Period, 4000 to 1700 B. C. It is known from soil profiles and prehistoric findings that the oldest *Calluna*-heaths are about 5000 years old. In the Bronze Age heath areas were already widespread in the northwest German lowlands. Based on the distribution of burial mounds the early heath is believed to have included the area of today's Lüneburger Heide.

The heath areas had their greatest distribution from the Middle Ages to the end of the 18th century. The heath was used in several ways: for sheep grazing, for beekeeping and honey production, as a source of bedding for stables, humus for fertilizing fields, and sod blocks for building roofs and walls.

The delicate balance between man and nature in the heath landscape broke down as one or several elements of the system were eliminated. In the 19th century two main factors led to a profound change in heathland use: the decreasing demand for sheep wool due to imports, and agrarian reforms which led to intensification of agriculture. Indicators for the

One of the herds of sheep which are necessary for the preservation of the heath.

Photo: G. Olschowy



breakdown of the traditional agrarian heath economy were the decrease of sheep (more than 700,000 in 1861 as compared to about 200,000 in 1900) and the increase of woodlands by afforestation and natural seeding. It was only in the second half of the 19th century that the public was introduced to the heath landscape by painters and writers who pointed out that diminishment of this unique landscape was evident everywhere.

Protection, Administration and Planning

The first protection measures were initiated in 1906 when it was no longer easy to find large areas of heath unaffected by afforestation and intensified agriculture. Within a short period, large areas of heath and several farm building complexes were purchased by the Verein Naturschutzpark (VNP). This laid the basis for the later Nature Reserve. In order to extend protection to heath areas not owned by the VNP, an ordinance was passed in 1921 by which the area was declared a Nature Reserve. After the National Nature Conservation Act (Reichsnaturschutzgesetz) became law in 1935 the Lüneburger Heide Nature Reserve was included in the National Nature Conservation Register and became subject to the provisions of this new comprehensive conservation act. According to the 1921 Nature Conservation Ordinance, which is still in force, alteration or elimination of heath without the permission of the Nature Conservation Authority (NCA) is prohibited. This legal provision, however, only applies to the heath areas and not to other lands within the Reserve over which the NCA has no direct control. The NCA has limited authority as the Nature Reserve serves at the same time as a living and working area for more than 1000 people. The property ownership within the Reserve is

Natural succession of birch resulting from insufficient management measures. Photo: G. Olschowy



divided almost equally between the State Forest Administration, the VNP and farmers. Without the cooperation of the property owners the NCA would not be in a position to pursue effective nature conservation because it functions only as a supervisory agency, primarily through legal means. The NCA has no management function. Management measures have to be implemented, as a rule, by the land owners themselves for which only limited governmental financial assistance is available. Under such conditions the conservation of large heath areas in the Nature Reserve probably would not have been possible without the active involvement and financial support of concerned citizens as members of the VNP. As an extension to its legal power, based on the Reserve's Ordinance, the NCA has developed a landscape plan to help in its supervisory function. This plan, prepared in 1969 by the Lower Saxony State Research Center for Nature Conservation and Landscape Management, establishes the objectives and measures for protection, management and development of the whole Nature Reserve.

Research and Management

Besides the preservation of old sheep stalls and farm buildings, prehistoric dwellings and burial mounds, as well as diverse landscape elements such as peat bogs, dunes and wetlands, a primary objective in the Nature Reserve is the conservation of the heath areas through management measures. While the Reserve consists of about 4450 ha of heath, only 2810 ha (14.2%) are accessible to the public because the remaining area is used as NATO maneuver grounds by the British Army.

After cessation of pastoral heathland use as practiced for many centuries, the natural succession of plant life now is again partially prevented with the help of more than 5000 sheep, most of which are owned by the VNP. Nevertheless, during the last 20 to 30 years, an increased growth of birch seedlings has been noted. This poses a great problem to Nature Conservation Authority, to the VNP as the owner and manager of the largest portion of heath areas, and to the scientists as well. The herds of sheep have not been sufficiently effective in restricting the growth of birch by eating the seedlings. It was originally believed that simply by increasing the number of sheep the problem could be solved. However, the birch growth has continued to increase, threatening some parts of the heath and making the use of chemical and mechanical control measures necessary. These measures, however, threaten the existence of individual birch trees, birch groves, and roadside birches which are typical features of the heath landscape. Scientific studies have shown that the growth of birch and other tree species are not the cause but, rather, a symptom of the deterioration or aging process of the heath. In the degeneration phase of heath plant associations, conditions favor the regrowth of natural woodlands, starting with pioneer species such as birch and pine. It must, therefore, be the objective of management to keep the man-caused heath vegetation in its optimal phase as long as



Path guard rails prevent visitors from trampling the heath. Photo: H. Henke

possible, or to restore it to this phase. In the historic multiple use of the heath, optimal conditions were maintained particularly through the periodic removal of heather and humus for stable bedding, fertilizer and building materials. As a first measure in a comprehensive management plan, the Nature Conservation Authority subsequently developed, in agreement with the involved parties, a differentiated procedure for eliminating the birch in degenerating heath areas. The numerous scientific problems concerning the preservation and management of all landscape elements of the Nature Reserve make continuous scientific research and scientific supervision of management measures necessary. The State Research Center for Nature Conservation and Landscape Management, which is basically responsible for all nature reserves in the State of Lower Saxony, is not equipped with sufficient funds or staff to handle this task. Consequently, the construction of a special research station for the Lüneburger Heide Nature Reserve will be started this year. This station will probably be a part of the North German Nature Conservation Academy, under the sponsorship of the three Federal States of Lower Saxony, Hamburg and Bremen, plus the VNP and other institutions.

Visitor Use and Information

The uniqueness of the heath landscape and its proximity to the heavily populated metropolitan areas, has led to heavy use and steadily increasing visitor impact on the Reserve, some of which has been damaging. From mid-August to early October when the heather is blooming more than 200,000 people visit the Reserve on weekends alone. Three million yearly visitors travel to the Lüneburger Heide via private automobile or easily accessible public transportation. Not only has the number of daily visitors increased, but also visitors are staying for a longer time, that is, spending a vacation in the vicinity.

A first step toward better distribution of the visitor impact has been attempted by locating parking facilities at numerous places on the Reserve's fringes. With two exceptions, all roads in the Reserve are closed to public automobile access; but the local inhabitants are exempted from this regulation. Horse-drawn carriages operated by local farmers, initiated and promoted by the VNP, are available for visitor use and are a big attraction for many city-dwellers, especially children. This also provides a source of income for the farmers. In addition, it is possible to ride one's own or a rented horse or bicycle. Inns with stable facilities for visitors on horseback tours are located in and around the Reserve. Since the heath can withstand only a certain degree of trampling, it is necessary to restrict visitors to paths. Despite demarkation of paths with low wooden railings, damage occurs to the heath alongside the paths in areas of high use. Through better visitor information and distribution as well as



Horse-drawn carriage with visitors. Photo: H. Henke

better path routing, the prevention of severe damage is being attempted. Also, horseback riders are now confined to special paths. The hiker can choose from a wide variety of well-marked routes which have the parking areas as their departure point. A special feature, particularly popular during the heather blooming season, is a moonlight hike through the Reserve. A visit to the Lüneburger Heide provides a good opportunity for physical recreation, a nature experience and education, which are in high demand by German urbanites. In the last few years the Reserve's visitor information system has been very much improved by the VNP. In the information centers at Niederhaverbeck and Undeloh, the visitor is informed about the evolution, importance and conservation of the heath landscape. Also, nature trails familiarize the visitor with the Reserve's flora and fauna.

The village of Wilsede is not only the geographical center of the Nature Reserve, but also its cultural center where traditional music and dance are performed year round by groups from all over Europe. An historical museum, which shows the farmer's traditional way of life over centuries, is of high visitor appeal.

Other Land Uses

The Nature Reserve consists of over 50 percent forest areas and 8 percent agricultural areas which are used for economic purposes and in which nature conservation measures can only be applied to a limited degree. The inclusion of these land uses in the Reserve is, however, of im-

A bit of the devastated heathland on military maneuver grounds. Photo: G. Olschowy





*Facade of an historical farm building.
Photo: K. Bitterling*

portance for the preservation of the heath landscape as a whole. This enables the Nature Conservation Authority to better influence the practice of forestry and agriculture within the Reserve. For example, forest edges bordering heath areas and along paths are managed by the State Forest Administration according to ecological criteria.

Earlier, an incompatible feature in the Nature Reserve was noted, the use of part of the heath area for military maneuvers. As a result of tank movements, sections of the heath are devastated and closed to the public. For the past few years the VNP has had a legal suit against the Federal Republic of Germany, demanding the return of the maneuver grounds, which are only on lease to the Federal Government. The return of these grounds would be very important for the Reserve and would demonstrate the constitutional importance of nature conservation.

Potential National Park

The legal requirements for establishing national parks in the Federal Republic of Germany have only existed since the enactment of the Federal Nature Conservation Act in 1976. In the same year the Federal Research Center for Nature Conservation and Landscape Ecology pub-

lished a scientific study concerning the possibilities for setting up national parks in the Federal Republic. In this study the Lüneburger Heide was put forward as a potential national park. The Federal Government can only recommend the setting up of national parks. The establishment of them is a matter reserved by the Federal States, but subject to agreement with the Federal Government. Due to some opposition to having a historical cultural landscape of national importance declared a national park, the State Government of Lower Saxony has reserved judgement on the matter. In the meantime, the parties involved in the Nature Reserve, particularly the VNP, have tried to implement as many measures as possible for the Reserve to meet the international criteria for national parks. If the heath landscape can comply with international standards and if its protection is secured for the future, the Lüneburger Heide Nature Reserve in my judgment deserves to be designated a national park.

Hanno Henke is a research scientist at the Federal Republic of Germany's Bundesforschungsanstalt für Naturschutz und Landschaftsökologie in Bonn. He specializes in landscape planning and landscape ecology. He is a member of the IUCN Commission on National Parks and Protected Areas.

PARK TECHNIQUES

Visitor Information Center at Nepal's Royal Chitwan National Park *Klaus Berk Müller*

A tourist drops his movie camera in headlong flight from a rhino which came trotting towards him. He reaches the teashop at dusk without his camera.

This and similar situations are not altogether rare at the Royal Chitwan National Park in Nepal where the season of October 1977 to May 1978 saw an increase in visitor numbers of more than 100 percent over the same period the year before. With a strong tendency to rise even further, it is clear that information, guidance, and restrictions will have high priority in the years to come, not only to prevent similar mishaps and more serious accidents, but also to harness the park's potential for dispensing environmental information in a broader sense.

In anticipation of this trend the National Parks and Wildlife Conservation Office of Nepal has recently spent NRs 80,000 (equivalent to US \$6,700) on the construction of a visitor information center.



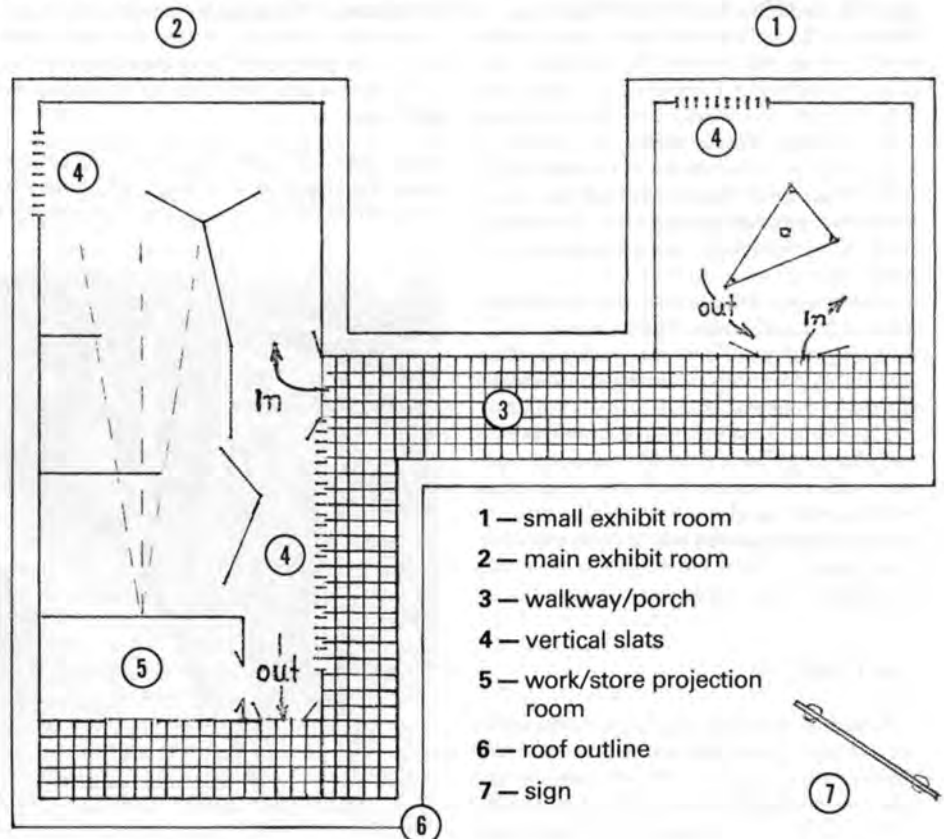
The new Visitor Center features two exhibit rooms connected by a covered walkway. It was built with local materials in the local style. Vertical slats in the walls and skylights make the interior light and airy. All photos: D. L. Golobitsch

Location and Technical Aspects

Together with other administrative buildings, the center is situated near the village of Sauraha on the northern bank of the Rapti river which forms the park boundary in this area. The park is in south central Nepal, partly on the border with India.

The center consists of (1) a small square exhibit room (see the accompanying diagram with numbered features) and (2) the larger, rectangular main exhibit room, both connected with (3) a roofed-in walkway. Local craftsmen built it with local materials. Its tiered roof with clay "Tharu tiles" blends well with the style employed for local houses. Rather than using concrete, which here is a symbol of affluence and progress, we built the walls with brick and gave them a roughcast of cowdung and loam, a mixture which has proven its worth in centuries of use on village huts.

A tropical monsoon climate demands good ventilation, not only for coolness but also to prevent moisture and mold. Vertical wooden slats (4) from floor to the top of the wall allow





In the small exhibit room visitors learn about Nepal's parks and reserves in general, and receive specific orientation on Royal Chitwan facilities, topography, rules and regulations. What to expect while riding an elephant, and what to do if confronted by a potentially dangerous animal are also explained.

air to enter freely at all times. The lack of a closed ceiling exposes the fine workmanship of the roof support structure and helps to keep the buildings cool.

Light is equally important. It comes through the gaps between the slats and through skylights. Whitewash inside further enhances brightness.

Without windows at eye-level virtually all of the walls are potential display space. Almost their whole length is lined with display panels four feet deep. These are screwed onto wooden runners so they can be removed easily in case of future alterations.

The lines shown inside the rooms on the diagrammed floorplan represent additional display boards. They partition the exhibit rooms into niches and compartments. This makes best use of the floor space and increases display area. It accentuates separate exhibits and subjects by shielding them from others and, in addition, channels visitors into a flow pattern which passes all displays in sequence. The main exhibit room accommodates eight individual display boards, most of which are linked with each other. One is attached to the wall by hinges and can be swung flat against the wall to make room for a limited audience for an audio-visual program which can be projected from a combination store/work/projection room. (5)

All display boards can be dismantled, moved, and reassembled within minutes.

In the small exhibit room a triangular structure on wooden legs is arranged around the central roof support post.

Last but not least it should be mentioned that two charming Tharu girls decorated some outside walls with hundreds of white fingerprints merging into intriguing floral designs.

The center is situated next to the ticket office. Most people visit it just before or after they have bought their entry permits.

The Exhibition

All exhibits and displays except photographic enlargements were prepared and assembled at the site using locally available materials and low cost techniques. One can well imagine the difficulties faced in a situation where carpenters

fashion their own saws from sheet metal and where drills are set in motion by a string pulled back and forth. A few minor items such as rubber cement, etc., had to be imported.

The visuals consist largely of maps, photographs, pictures and poster-style texts. A variety of other eye-catching objects however adds a third dimension and helps sustain interest.

Information about the park and its wildlife, about activities and orientation constitute the mainstay of subjects. Particular emphasis was placed on the didactic sequence of the exhibits. Supplementary exhibits sometimes link different sections and show up interactions and interrelationships between them.

People are prone to consume the attractions of the park just like any other form of entertainment with utter ignorance or even disregard of the fact that the very existence of wild places and animals depends on how man treats his environment. Value judgements and strong environmental messages, beyond the narrow context of the park itself, have therefore been incorporated in numerous displays throughout the exhibition.

Eight major topics are presented in the large exhibit room. This is part of the wildlife section, one of the largest in the Center with eleven displays. Note the rhinoceros skull next to the man in the center of this picture. The horn was hacked off by poachers.



Last but not least, we wanted to satisfy people's natural curiosity with information along the lines of the "Guinness Book of Records." Manipulative displays and occasional humorous texts further intensify the general appeal of the exhibition.

The Displays

The caption, "National Parks Protect Wildlife for People," next to photographs of people, beckons the visitor to enter the small exhibit room. There, with the help of maps and aerial photos, the visitor obtains his bearings relative to the surroundings. He discovers that Nepal has four national parks and three wildlife reserves and he is asked how many his country has. Two maps support the text about topography and boundary lines of the park. Turning left, one faces a long display panel. Vivid colors and cartoons ameliorate the dry wording of the park rules. No one ever fails to read the comments about "What to do in case of an encounter with a potentially dangerous animal." This can also be said for the next display which among other things talks about some of the finer points of elephant rides. As you turn around you face a graphic composition of color pictures and brief text which takes the place of the usual essay about why we need national parks.

As one walks towards the entrance to the main exhibit room one learns from a large panel which subjects are dealt with in the main exhibit room. Sizeable enlargements of photos depicting historic hunting scenes form the background to the brief account of the park's history. A supplementary panel highlights interesting details about tiger hunts in the old days.

With the aid of cartoons and graphic charts we read about seasons, temperatures, and rainfall on the wall opposite. A complementary display forms the bridge to the next group of



These displays discuss the cycle of seasons, and environmental degradation resulting from overgrazing and loss of forests.

displays. "The climate and the vegetation largely determine where an animal species can live" — this forms the gist of its message.

The major vegetation types of the park come next. Wood samples of khari and sisso complement the text on the riverine forest. Fourteen different wood samples mounted on a wheel-like carrier invite the visitor to learn about the major timber species and their uses.

The next panel describes the dominant position of sal (*Shorea robusta*) among the park's vegetation types. A smaller board dwells on the importance of fringe habitats for wildlife, comparing them to suburbs and showing the distribution of the major vegetation types throughout the park. The adjoining panel carries a brief description of the grasslands. A piece of spiny bark and comments about a very prominent tree species in the park, the simal tree, rounds off the section on vegetation.

A niche opposite is devoted to a discussion of the vegetation of the Terai — the flat strip of land between the mountains and the India border — and forest destruction in the wake of migration and natural population increase.

Wildlife is introduced with the question "How many species of mammals/birds are found in the park." The answers are revealed underneath two flip-boards. A small but conspicuous display about snakes follows. From there we turn left and detect a preserved baby gharial. This exhibit deals with crocodilians in general and with the endangered gharial and the local breeding project in particular.

"Carnivorous mammals of the park" is the title of the next display. The black silhouettes of carnivorous mammals are aligned along the perimeter of a large wooden disk. Moving a pointer to a particular picture, the name of the animal and, through color coding, its conservation status, are revealed in a special window in the disk. This is followed by statements about the various races of tiger. Some of the lesser known mammals, together with their habitat preference, are described on the next panel. With tongue in cheek "*Homo sapiens turisticus*" was placed under this heading.

Much space is dedicated to the rhinoceros. A 4' x 7' (1.22m x 2.13m) mural of Albrecht Dürer's etching of a rhino made in 1515, as well as a skull and a piece of skin displayed on a stump of wood, attract attention immediately. Few people fail to study the graphs about past and present distribution of the Asian rhino species. There are rhino facts and rhino fiction as well as information about why they have become so rare. Last but not least everybody wants to know the answers to the questions on the flip-boards, particularly the one which asks how far a displaying rhino bull can squirt its urine.

The section "people and the park" talks about resentment of the park by local people, about crop predation, and environmental degradation caused by people. It develops into a plea for nature conservation. An excerpt from the text:

"What is more important, animals or people?"

"With this rhetorical question some visitors argue that park land could provide a livelihood for many now landless farmers. True, and so would the art treasures of Kathmandu if offered to the highest bidder.

"But for what price?"

"The problems caused by a deteriorating environment, depleted resources, and a burgeoning population will not be solved by driving more wildlife into extinction.

"Only population control, together with a more equitable distribution of income and resources, can eventually reduce the abject poverty and misery of millions of people.

"National parks not only enable rare and fragile beauty to survive, but they also maintain the biological diversity, the watersheds, the wetlands, the forests and the soil, to allow the destruction of which would be an unforgivable crime rather than a solution of the problems.

"The cash you leave in Nepal is welcome. More valuable to us in the long run would be your appreciation of places like Chitwan combined with an understanding of how hard it is for us to adequately feed, clothe, and educate our people. Hopefully you will then raise your voice in favour of the painful political decisions necessary to be made now."



Seven displays are devoted to vegetation and the major habitats of the park. This one discusses the Sal Forest (*Shorea robusta*), large and extremely useful trees growing in India and Nepal.

The tiger ecology research project at the park is dealt with in some detail. With the help of pictures, graphs, a map, and a discarded radio collar, the visitor becomes familiar with the aims of the study, with the darting (chemical immobilization) procedure and the latest results of the research.

Finally, the visitor passes a series of flip-boards with questions and answers of a serious and not-so-serious nature. Several interesting trophies and curios, such as a baby gharial with two heads, six legs and one body, slowly lead to the exit.

Along with the construction of the visitor center the carpenters carved by hand some fifty signs of varying sizes. The first longitudinal cuts from a log produce semi-round planks which are considered wastage but serve well as sign-boards. Dead tree limbs from the park furnished the signposts.

A second visitor center is presently under construction at Sagarmatha (Mt. Everest) National Park.

Apart from fulfilling a not insignificant role in their respective environments both centers must be recognized as the first institutionalized efforts to impart relevant knowledge in informal teaching situations. They are, furthermore, proof of the fact that such facilities are neither beyond the limited means of the national parks office nor too difficult to execute even under the prevailing adverse conditions. In time they will become catalysts for informal environmental education outside parks and reserves. Similar projects for Nepali audiences are indeed planned for the new national park office headquarters in Kathmandu and the College of Forestry at Hetauda.

Klaus Berk Müller planned the visitor information center described in the foregoing article while on a two-year assignment to Nepal from the German Volunteer Service. Earlier he served five years in conservation and education work in Thailand.

Gilsland Farm: A Progress Report on Solar Energy

Tux Turkel

The Maine Audubon Society headquarters in Falmouth, Maine, built in 1976, is the largest totally solar-and-wood-heated building in the northeastern United States. As such it has been the focus of a great deal of public attention. In a time of heating-oil shortages and rising costs people want to know how solar heating works, and how well.

Located in a six-state region that is heavily dependent on imported oil, the question of heat was an important factor in 1973 — the year of the oil embargo — when Maine Audubon's board of directors began wrestling with plans for a new home.

Initially, there was a great deal of debate over the type of structure that would best house the society, and how to heat it. After interviewing several designers, Portland architect George Terrien was hired for the job. Terrien enlisted the services of University of Maine Professor Richard Hill. Together, they designed the first building in the country to integrate active solar collectors and a wood-burning furnace into a single storage and distribution system.

Terrien and Hill were working at somewhat of a disadvantage in 1974. At first glance, Maine appears an unlikely place to attempt such an experiment. Snow blankets the ground from late November to mid-March. Winter lows of minus 20 degrees F. (-29°C) are not uncommon. But while the season is cold it is also relatively sunny, and it is the amount of sun, not the temperature, that has the greatest bearing on solar heating potential.

This is not to say that Falmouth, at 43 degrees North latitude, experiences tropical sunshine. Well aware of the solar limitation, the designers planned Gilsland Farm to require as little heat as possible in the first place. This meant siting the building to take advantage of the shelter provided by a belt of conifers, and



Aerial view of Gilsland Farm, looking east. Several siting considerations are visible including the relationship between the 2,000 square-foot (185.8m^2) southern collector face and the tapered north wall. Also on the north side, note the sloping roof and edge of the windbreak.

The skylights, located over the library, represent a compromise between natural lighting and heat loss. Photo: Chris Ayres

heavy insulation — six inches (15.24 cm) of fiberglass insulation in all walls and nine inches (22.86 cm) in the roof. It meant an insulated perimeter, triple-glazed windows, an airtight entry and virtually every energy-conserving technique that was available in 1975.

The second design criterion involved the heating system. It was here that a radical departure from the state-of-the-art was made. Most active solar heating technology of the time took advantage of the greater heat storing capacity of water as a transmission medium. The use of water, however, even with antifreeze solutions for cold climates, remains a tricky and costly proposition for space heating. Collectors and piping must be made to exacting specifications to minimize the potential for leakage. Gilsland Farm employs air-type collectors that were constructed with hand tools at the site at a cost of \$4.50 per square foot. Commercially manufactured collectors can run four times that price. And, because the collector array also serves as the roof of the building's 2,000 square foot (185.8m^2) southern face, installation cost is included.

The collector design is simple. It epitomizes a low-technology answer to a high-technology problem. Two-foot (0.61 m) wide troughs are fitted with galvanized steel insect screening. The screening is fashioned in a wave-like pattern and the entire absorbing surface is painted black. The collector cover is fitted with a translucent, fiberglass reinforced plastic called Kalwall, which, unlike glass, requires little care in handling. The rear of the collector is filled with eight inches (20.32 cm) of insulation. Air rises by convection from the bottom of the collector to the building's peak, allowing temperatures to

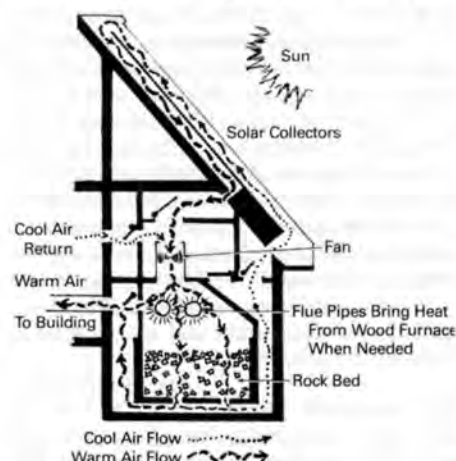
climb as much as 100 degrees F. (56°C .) on the journey. Fans direct the heated air down the back of the collectors and into a massive crushed rock storage bed.

The storage bed represents the third major design consideration. If all the heat from the collectors was allowed to enter the building at one time, the resulting temperature would prove quite oppressive. Therefore, heat collected during the day must be stored for gradual release later. It can then be doled out during the day as needed and used at night.

The storage bed is composed of 105 tons (95.3 metric tons) of crushed quartzite. The one-inch (2.54 cm) rocks are housed in an insulated, underground bin measuring 10 feet wide, 3 feet deep and 70 feet long (approximately $3\text{ m} \times 1\text{ m} \times 21\text{ m}$). Fans and ductwork, similar to that of conventional forced air heating systems, distribute warm air from the storage bed throughout the building.

The solar collection system has satisfied around 75 percent of the building's heating demand over the past three winters of operation. But prolonged storms can result in days of overcast skies. To address this problem, Gilsland Farm relies on wood for back-up heat. Ninety percent of the state of Maine, some 20 million acres ($8 + \text{million ha}$) is forested. Heating with wood is an age old practice here. But Professor Hill's wood furnace is different. It was designed to burn large quantities of wood at very high temperatures, with very high efficiency, and with very little pollution as an end product. This is accomplished by injecting a draft of air to create a cycling process that results in nearly complete combustion.

The hot air produced by the furnace climbs to



**Heat Storage and Supply
By Solar Collector Panels**

over 1,000°F. It passes through a heat exchanger — 150 feet (45.72m) of galvanized culvert pipe suspended horizontally over the rock storage bed. Fans direct the warmed air into the storage bed in much the same manner as is the heat from the solar collectors. Exhaust gases complete the trip through the culvert and exit, with the help of another fan, up the chimney.

The integration of these two systems has greatly simplified the operation and maintenance of the heating plant. Technical packets, explaining in detail how the system works, are available from Maine Audubon by mail.

But Gilsland Farm is more than an experiment in alternate energy. It is a diverse, protected environment within a 15 minute drive of 100,000 residents of greater Portland. In satisfying the need for day-use recreation for urban dwellers, Gilsland Farm offers an unique alternative. Images of Maine conjure up thoughts of the great north woods. These vast lands do exist, but only at the end of several hours of highway driving. With gasoline shortages and rising prices the need for natural areas close to home is obvious.

Gilsland Farm fills this need. In the winter, cross-country skiers line the landscape. Spring and summer find picnickers and hikers taking advantage of the trail system. Autumn is a time for birders to study migratory waterfowl on the river behind a backdrop of red and yellow foliage. But the building itself remains the focal point of most visits. Administratively it becomes difficult at times to conduct day-to-day operations with 25,000 people passing through annually. Interest in energy conservation is beginning to take its place beside natural history and natural resources conservation as a drawing card at Gilsland Farm.

When Gilsland Farm opened its doors in the fall of 1976, the design of the building rested squarely on the leading edge of technology. That is no longer the case. Accelerated research in alternate energy has seen to that. In the past few years solar space heating has moved in a different direction. Today, the emphasis is on passive solar heating, that is, using the sun without fans, motors or pumps. Passive solar buildings rely on direct sunlight for warmth, the same phenomenon that makes an automobile uninhabitable after it has been parked in the sun for a period of time. In Maine, passive solar structures can receive more than 50 percent of their heating demand from the sun at a much lower cost than with an active system. Wood heat and/or other fuels can supplement as needed.

Does the move to passive systems make Gilsland Farm a "dinosaur?" Not at all! After all, the present system works. It heats the 6,000-square-foot building for 24 hours with the energy absorbed during 3 hours of sunlight. It remains in the mainstream of alternative energy, if not technologically, then, at least, educationally. As a pioneer it answered many questions. Yes, solar heating works. Yes, a transition from a fossil fuel dependent to a renewable source society can be facilitated with a minimum of sacrifices. And yes, there are

ways to use energy in an environmentally sound manner.

Tax Turkel is Energy Education Coordinator for the Maine Audubon Society.

For further information: Detailed technical packets explaining the design and performance

of the building are available directly from the Maine Audubon Society for US \$11, including postage and handling. Publications are also available on building solar greenhouses and upgrading the thermal efficiency of older buildings. The address is 118 Route One, Falmouth, Maine 04105, USA — Ed.

Examples of Appropriate and Inappropriate Technology in Conservation of Cultural Property

The following notes have been prepared by Dr. Bernard Feilden, Director of the International Centre for Conservation, Rome (ICCROM), an autonomous scientific intergovernmental organization founded by Unesco in 1959. It has 61 member countries all over the world and 13 associate members (public or private non-profit cultural institutions). Dr. Feilden draws on his long experience, and that of ICCROM, to outline some of the basic considerations involved with respect to appropriate conservation technology. Both positive and negative examples are cited.

Traditional technology has the great advantage that it has been tested by time under all possible climatic hazards. There is a storehouse of knowledge for those who can read the message contained within each object. Advanced technology may ignore this accumulated wisdom only at its own peril, or unfortunately, when techniques are not tried and tested, at the peril of cultural property. For example, Portland cement is a magnificent and indispensable material when used correctly, but because of its strength and impermeability its application can be disastrous to historic buildings. When used in pointing stone or brick it can accelerate frost decay. When used in structures situated in countries with extreme climates its thermal move-

ment is damaging. If used when sulphates or gypsum are present, dangerous chemical actions may be set up. In the Acropolis, where it was incorrectly used decades ago, it has cracked and its reinforcing steel is rusting. Those who used Portland cement in the wrong places were not using an appropriate technology, particularly as its use is almost irreversible, but some people do not know of any other form of cement and unwittingly think that they are doing a good job. Portland cement has been mainly developed for its strength and setting characteristics, whereas the properties desired in a mortar for historic buildings are durability, porosity to reduce frost damage, permeability to avoid condensation within the material and to allow vapour transference, elasticity to absorb deformations, plasticity to avoid hair cracks and allow local overstraining, a pleasant warm colour or the ability to receive colour additives, strong adhesion and adequate strength and reasonable setting characteristics with "hydraulic" properties, i.e. the ability to harden without carbon dioxide, under water if necessary.

A much better material for these types of conservation needs is natural pozzuolana — "Roman cement" — or hydraulic limes. The Italian cement industry has in fact agreed to co-operate with the International Centre for Conservation, Rome, in research to produce a

The stronger and less flexible cement mortar has caused the softer adobe bricks to crumble thus leaving a "honey-comb" of cement mortar joints. Photo: National Park Service



suitable cementation material.

Traditional crafts have a great part to play in the conservation of cultural property. Craftsmen can provide the appropriate technology for conservation problems if they are willing to co-operate with scientists and conservators. Here we have a problem, as a craftsman likes to protect his secrets in order to secure his employment, but in many cases the knowledge contained in these secrets will die with him. But should the traditional craftsman be able to expand his role and embrace an appropriate technology in which his skills are essential he would become a *conservation craftsman*, a breed that is precious wherever cultural property is in need of safeguard.

The technology of each craft has its own history. Therefore a knowledge of the history of his craft and appreciation of the skills used in the creation of cultural property would be a source of pride to the modern craftsman and give him enthusiasm for conservation.

In some industrialized countries there is such a shortage of conservation craftsmen that young men with university education are seeking this role. In some developing countries there is still time to save traditional knowledge from disappearing altogether and employ skilled craftsmen on conservation work, avoiding waste of valuable human resources.

Traditions for each material

Conservators of furniture, silver objects, clocks, bindings, etc., have largely come from a traditional craftsman background. However, in conservation the craftsman's role is not to make it "as good as new". He has the more difficult task of repairing carefully and retaining as much material as possible. Therefore, his skill and understanding of the original process is indispensable. On a large project a conservator should work with a team of craftsmen, judgement and experience being necessary to get the right balance in skills according to the needs of the project. For example, on any large project of mural painting conservation a good mason and plasterer is indispensable. The size of the team may range widely with a probable maximum of eight craftsmen to one conservator. On difficult conservation problems the architect needs the help of consultants, one of whom should be an architectural conservator. As the architect has the support of foremen, he may be able to work with yet more craftsmen. When a difficult problem arises it can only be solved by all parties meeting and discussing it together. In this way the craftsman's skill and knowledge of practical technology is fed into the conservation project.

On worm eaten panel painting, sometimes completely undermined areas are carefully removed and replaced with new seasoned wood chosen to correspond to the lost original in type and grain and therefore react to variations of temperature and relative humidity in a similar manner with the remaining wood. For the consolidation of weakened lime plaster wall paintings in some countries repeated applications of

lime water are used. Here it is hoped that a consolidation of the binding component material of the original (CaOH turning to CaCO_3 with exposure to CO_2 in the air) will act to reinforce the deteriorated original.

The aim of conservation is to slow down the process of decay. The study of causes of decay of cultural property is fundamental to its preservation in order to enable a correct diagnosis to be made. As in medicine, the symptoms must not be mistaken for the disease itself.

A material in its context: the example of mud brick

Careful inspection of the whole object in its environmental context is the preliminary to any intervention. Cultural property has been made of wood, stone, earth, brick, ceramics, glass, textiles, animal products, paper and metals. Knowledge of the history of usage and how the material has performed in different environments is essential before any intervention can be considered. For example, mud brick, one of the most important building materials in the world, may last thousands of years in an arid desert, whilst in the humid tropics it disappears quickly without constant maintenance and attention to the roof over it. In this case traditional techniques do not seem to be sufficient to solve the conservation needs of this material. However, it is interesting to note that advanced scientific technology to date has also failed to provide a suitable solution. With this in mind, two conferences on the subject have been held under the auspices of ICOMOS. These discussions have defined some of the criteria that must be met by any material used to preserve mud brick.*

The new material shall not fundamentally change the character of the structure, either in colour, appearance or nature. The material should either be naturally reversible (by decay) or chemically reversible.

The application must be from the outside.

The effect of the consolidating material must be to produce a deep (i.e. not less than 300 mm) layer of protected material, preferably diminishing in density of protection to avoid the formation of a plan of cleavage at the point where the consolidation runs out. One method of achieving this would be to have a material which could be applied successively in different dilutions.

The material must itself be cheap and relatively permanent. The carrier of the material must also be cheap. It must have very good penetration characteristics under different degrees of consolidation. It should not be repelled by water and it must not permanently deform or damage the unbaked earths.

The carrier must be capable of application simply and by relatively unskilled labour and should not be toxic or have other hazards.

If modern industry can provide such a material it will benefit countless people needing to use mud brick and so help solve their urgent

*With acknowledgement to John Warren, M. Litt., ARIBA, FRTP.

housing problems. Here we have a problem in conservation that also has much wider implications—an example of applied appropriate technology.

The foregoing notes are reprinted from World Cultural Heritage, Information Bulletin No. 12, published by the Division of Cultural Heritage, UNESCO, October 1978

Neat Knot Note



Some knots are easy to make, very useful and reliable in many applications but they will jam into a solid mass of rock-hard fibers when subjected to a heavy load. When this happens it is a major chore to untie them.

Two such knots are the common loop knot (also called a double overhand knot) and the figure-of-eight knot.

To prevent these knots from jamming under a load simply insert a pencil stub or equivalent into the knot when you make it. Where in the knot you insert the pencil is of no matter, but when you put it out the knot will be loose enough to untie with ease. —R.I. Standish

Sign Face Protection

One simple way to protect signs from vandals who specialize in defacing them with paint is to spread the sign face with a thin coat of petroleum jelly.

The clear protective coating can be applied with a window squeegee, paint brush, sponge or roller.

Graffiti sprayed or painted on the sign face can be simply wiped off.

This item originally appeared in GRIST (September-October 1968), a publication in the Park Practice Program of the National Park Service and the National Recreation and Park Association.

PARK VIEWPOINTS

The Conservation of Evolution *Thomas E. Lovejoy*

Much has been written about the species of perennial corn (maize) discovered last year in Mexico. The possibility of using it to breed the perennial characteristic into domestic corn has not been put to the test but no doubt this will be attempted. Perennial corn, if it could be made to produce like the annual varieties, would save energy and reduce soil erosion by eliminating yearly plowing. Indeed, the potential results of advancing the culture of corn, the third most important grain in the world, are impressive.

What has been left out in most of the excitement in the media is that until "discovered" by a particularly expert botanist, this plant would have been considered hardly more than an insignificant weed growing in one of the last remaining and rapidly disappearing highland forests of the Mexican Sierras.

One important point here is that many of the major advances in our history stem from the discovery of surprising new potential from species previously considered insignificant. Among the most fundamental was the discovery that plants deliberately could be cultivated by man, and this of course, laid the basis for the neolithic agricultural revolution and related major advances of civilization, including the discoveries of vaccines and antibiotics. There is every reason to believe, as the discovery of this new species of corn dramatically tells us, that there may be many such surprises down the line; however we are in no position to tell which species will provide them and which will not.

A second important point to make is that while pressures of human population, of hunger, of poverty and of development may well result in destruction of many of the planet's remaining wild ecosystems with their rich and varied genetic material, many important contributions toward meeting those same pressures exist in these as yet undisturbed wild areas, waiting only to be discovered. Indeed, it is important to reflect on how much better off the world may be for that Mexican forest not having been turned into an ordinary cornfield. Potential advances in medicine, agriculture and forestry depend squarely on maintenance of diversity in nature. Maintaining biological diversity is, consequently, a fundamental strategy in providing for future human welfare.

The above touches only on the direct benefits to be derived on a species-by-species basis, and says nothing about the more general benefits to be derived from protecting natural ecosystems and thus natural balances: forest ecosystems that protect and regulate watersheds, for example, or fundamental global cycles of elements such as carbon and nitrogen. These are enormously significant values, ones which we have tended to undervalue because they have been perceived to be free, yet

which we should all the more highly value because they *are* free. When a species becomes endangered it does not only mean potential loss of direct benefits, perhaps yet unrevealed; it also means the ecosystem of which it is part is under stress, and that the ecosystem's ability to perform its more general function is being eroded.

So conservation has to be viewed not only as being concerned with protecting the diversity of biological entities (i.e., plant and animal species), but also as protecting the diversity of biological processes. If protecting the existing diversity of species is fundamental to human welfare, so is protecting evolution—the wellspring of variety.

Providing for the continuity of evolutionary processes is our real concern. Man is actively affecting the direction of evolution all over the planet by fragmenting wildlands and snuffing out evolutionary lines, breaking the chains of biological events in nature. Little if any of this is done with a conscious realization of its effects on evolutionary processes, most of which are incompletely understood. That is why it behooves us to save as many of those products of evolution as are on hand, so that we can direct our influence more wisely and consciously. That is why it can be important to save certain obscure molluscs and earthworms, for example, because special evolutionary phenomena may be occurring in those species and nowhere else in the entire Animal Kingdom. This may be very difficult to explain to the average person whose life or children may nonetheless be affected by it all. But one would hope at least that he might be impressed that the problems of Rh negative mothers are better understood and treated because of genetic principles learned from studying a species of African butterfly.

The conservation of present and future biological diversity can be achieved through a global network of national parks and reserves that are secure in their protection of the genetic material they contain. Unesco's Man and the Biosphere Program is a ready instrument to help in this achievement. The opportunities to establish such a network are in the hands of present leaders of all nations and their ministers and those of the next decade or so. One fervently hopes that indifference will not prevail, and that political leaders will avail themselves of these critical opportunities in human history—that in the history books to be written they will be remembered and honored for having recognized and husbanded the irreplaceable biological bases of human welfare, not scorned for having permitted human existence to be forever stunted.

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BOOKS AND NOTICES

Facets of Wildland Conservation in Middle America, 1978. Anne LaBastille. Wildlands and Watershed Management Unit, Renewable Natural Resources Program, CATIE, Turrialba, Costa Rica. English and Spanish versions, 39 and 41 pp, respectively. Paper. Free upon request.

This useful and informative booklet is an important contribution to the literature documenting the current status of conservation units in Middle America. It is the only English-language publication which provides a regional perspective of the Central American nations' parks and related areas. Furthermore it places into an appropriate context the significant regional role of the Wildlands and Watershed Unit, currently directed by Dr. Craig MacFarland, of the Tropical Agricultural Research and Training Center (CATIE) in Turrialba. The format of the booklet affords the casual reader capsule summaries for countries of particular interest while at the same time it provides the more serious reader with an introductory cross-referenced regional survey.

The introduction provides a general context for conservation units by relating them to human benefits such as water, food, employment and education. In the main body of the booklet Dr. LaBastille describes the principal current conservation projects of Panama, Costa Rica, Nicaragua, El Salvador, Honduras, Guatemala, Belize and southern Mexico. The booklet concludes with a discussion of CATIE's Wildland and Watershed Management Unit's involvement in strengthening regional institutions and promoting international cooperation through meetings, seminars, workshops, research and communications.

Some minor flaws exist in the work but do not detract from its overall usefulness. The printer in San Jose did not detect several errors of the English-language version. This has resulted in the subsequent publication of a list of errata which unfortunately did not receive the same distribution as the booklet. Likewise, a Table of Contents would have been a useful addition to the English-language document. This latter deficiency does not exist in the Spanish-language edition.

With this publication Dr. LaBastille has provided another valuable contribution for the wide audience, including myself, which has

vicariously shared her international experiences and observations through her photographs, lectures, television appearances and articles in *Audubon Magazine*, *National Geographic*, *Biological Conservation*, *Reader's Digest* and many others. — G. B. Wetterberg

The Endless Village, 1978. W. G. Teagle. The Nature Conservation Council, West Midlands Region, Attingham Park, Shrewsbury, U.K. £1, plus postage.

This is an account of the ways in which wild flora and fauna have adapted to an urban environment, in this case the Birmingham area, and provided a rich source of enjoyment to the city dweller. It illustrates the potential value for wildlife conservation of a surprising number of habitats — buildings, abandoned quarries, walls, gardens, parks and open spaces, road edges, railway and canal embankments, derelict lands, streams, and so on.

Since the world is becoming more and more urban, this publication and a few other studies of similar phenomena, could stimulate a much wider awareness of the wildlife in towns and cities and indicate to planners and land managers ways in which such plant and animal communities can be encouraged.

Some of the findings are quite unexpected. For example, who would have thought a pair of black-necked grebes would turn up in the area, or a Chinese muntjac?

Requests for copies should be sent to The Nature Conservancy Council, Interpretive Branch, Attingham Park, Shrewsbury, Salop SY4 4TW, Great Britain. — R. I. Standish

Wildlife Reference Handbooks

The following handbooks are part of a series on techniques in African wildlife ecology designed for wildlife department and national park personnel and for students of wildlife ecology and management. Included are:

Handbook 1, "Counting Animals," by M. Norton-Giffiths (reviewed in PARKS, Vol. 1, No. 4)

Handbook 2 and 3 (combined), "The Dis-

tribution of Animals in Relation to Resources" by David Western and "Studying Predators" by Brian Bertram

Handbook 4, "Ecological Monitoring" by J. J. R. Grimsdell

Handbook 5 (In preparation), "Population Dynamics of Large Mammals" by A. R. E. Sinclair.

These handbooks are available from the Nairobi Office at the following rates:—

—Collected from the office . . . K.shs 50.00
—Mailed in Kenya, surface mail K.shs 55.00
—Mailed to Eastern Africa—U.S. \$7.00 per copy plus U.S. \$4.00 for airmail charges.

—Mailed to Western & Southern Africa—U.S. \$7.00 per copy plus U.S. \$6.00 for airmail charges.

—Mailed to Europe—U.S. \$7.00 per copy plus U.S. \$7.00 for airmail charges.

—Mailed to Australia and U.S.A.—U.S. \$7.00 per copy plus U.S. \$10.00 for airmail charges.

All payments should be in U.S. dollars or Kenyan shillings and if sent by mail, should be made by postal order, cheque or bank draft to the African Wildlife Leadership Foundation, P.O. Box 48177, Nairobi, Kenya.

Referencias Bibliograficas Seleccionadas em Portugues e Espanol Relacionadas com Planeamento de Parques e Areas de Recreacao, 1978. J. J. Griffith, V. L. Garcia, C. E. Dias. Universidad Federal de Vicosa. Biblioteca Central. Vicosa, Minas Gerais Brasil. 16pp. (Available free upon request).

This list of references includes 95 citations relating to park planning and recreation areas. The list is purposely limited to those documents published in the Spanish and Portuguese languages which are most frequently utilized in coursework at Vicosa Federal University. The introduction emphasizes the lack of specialized documentation in those languages. The references are listed by topics including the planning process, sociology of leisure, visual resources, interpretive planning and sample plans. The authors request suggestions of complementary material which could be added to future editions. — G.B.W.



The south wall and roof of the Maine Audubon Society's headquarters building is composed almost entirely of solar collectors which are shallow troughs 2 feet (60 cm) wide. Heat is absorbed by black-painted screens and conveyed as hot air to a crushed rock storage bed. The 2000 square-foot (185.8 m²) array can collect enough energy during 3 hours of sunlight to heat the building for 24 hours. Photo: Maine Audubon Society

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