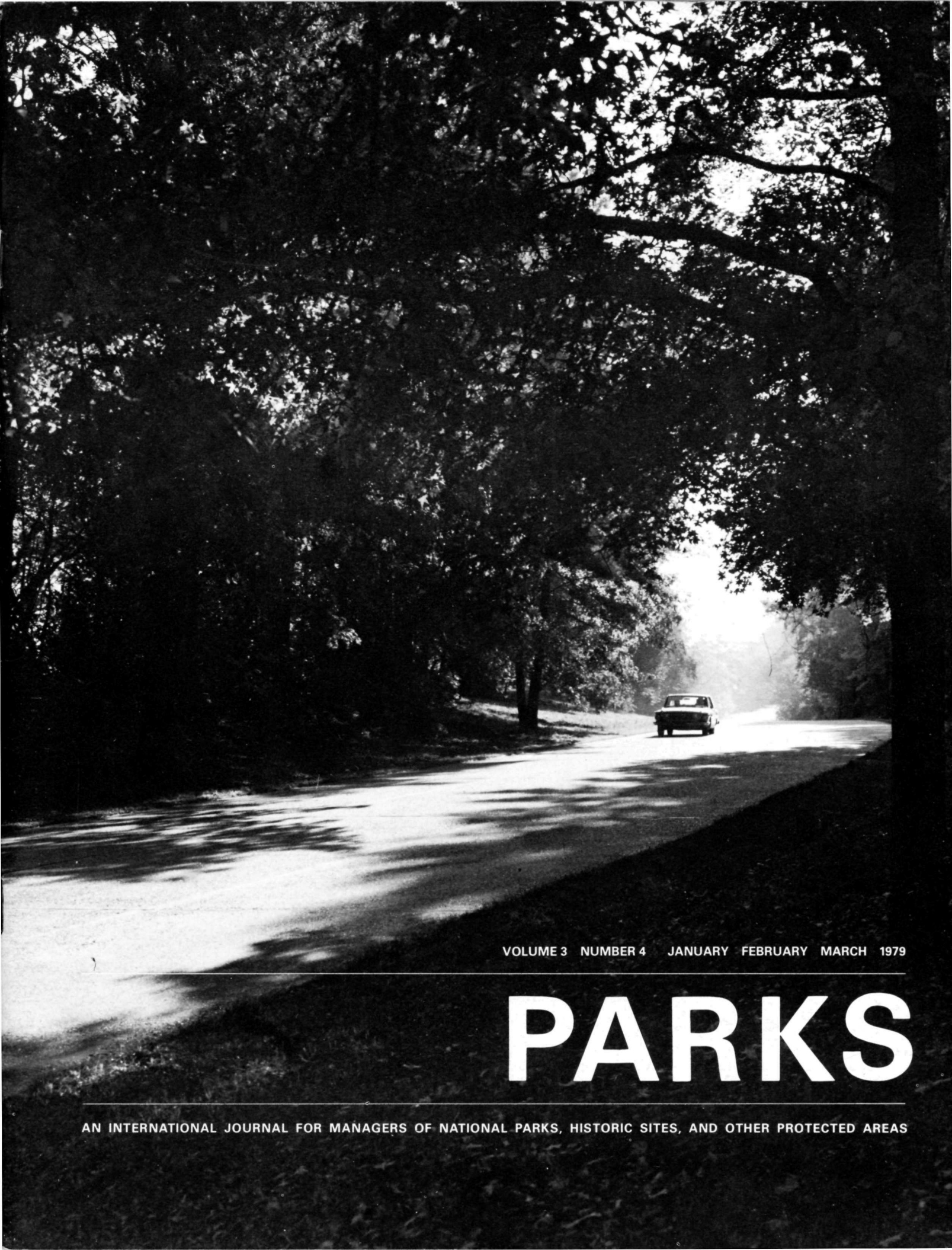

VOLUME 3 NUMBER 4 JANUARY FEBRUARY MARCH 1979

PARKS

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

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Volume 3, Number 4 January, February, March 1979

Front Cover: Roads in parks should be designed for leisurely travel, be esthetically pleasing and lie lightly on the land. This pleasant and safe road is in Colonial National Historical Park in Virginia, a part of the Colonial Parkway which connects Jamestown National Historic Site and the Yorktown Battlefield Visitor Center. Back Cover: The U.S. National Park Service has had great success in excluding private vehicles from certain portions of heavily-visited parks by providing special vehicles for visitor transportation. These now operate in 35 park areas. Resulting benefits are many, including opportunities for experts on park staffs to interpret the park resources to groups riding mini-trains such as this one at Yosemite National Park.

PARKS Magazine is an international publication for the exchange of information on the planning, use and management of the world's national parks and other protected natural and cultural resources.

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Juan V. Oltremari and Edmundo Fahrenkrog

Institutionalization of National Parks in Chile

Chile was one of the first Latin American countries to officially establish a National Park. This came on June 21, 1925, when the "Benjamin Vicuña Mackenna National Park" in the Cautin province was created.

Unfortunately, this first Chilean National Park did not last long because four years later it was annulled. Nevertheless, this precedent has constituted the basis for the subsequent establishment of protected areas. A year later, on July 17, 1926, the "National Park Vicente Pérez Rosales" with an area of 135,000 ha was established in the province of Llanquihue. This park is still in use.

The Conservationist Movement in South America

The antecedents of this conservationist movement are found in the prehispanic civilization of the Incas. They took the first steps in conservation and protection of nature with an agricultural system that included terraces for soil conservation and special measures for the protection of animals.

During that period provisions for the protection of guano birds were important. The reason for their conservation and protection was neither aesthetic nor moral, but rather economic because of the Incas' need to secure adequate production of fertilizer. Wetterberg (1974) points out a Garcilaso de la Vega quotation (1609) describing the means employed to protect such birds:

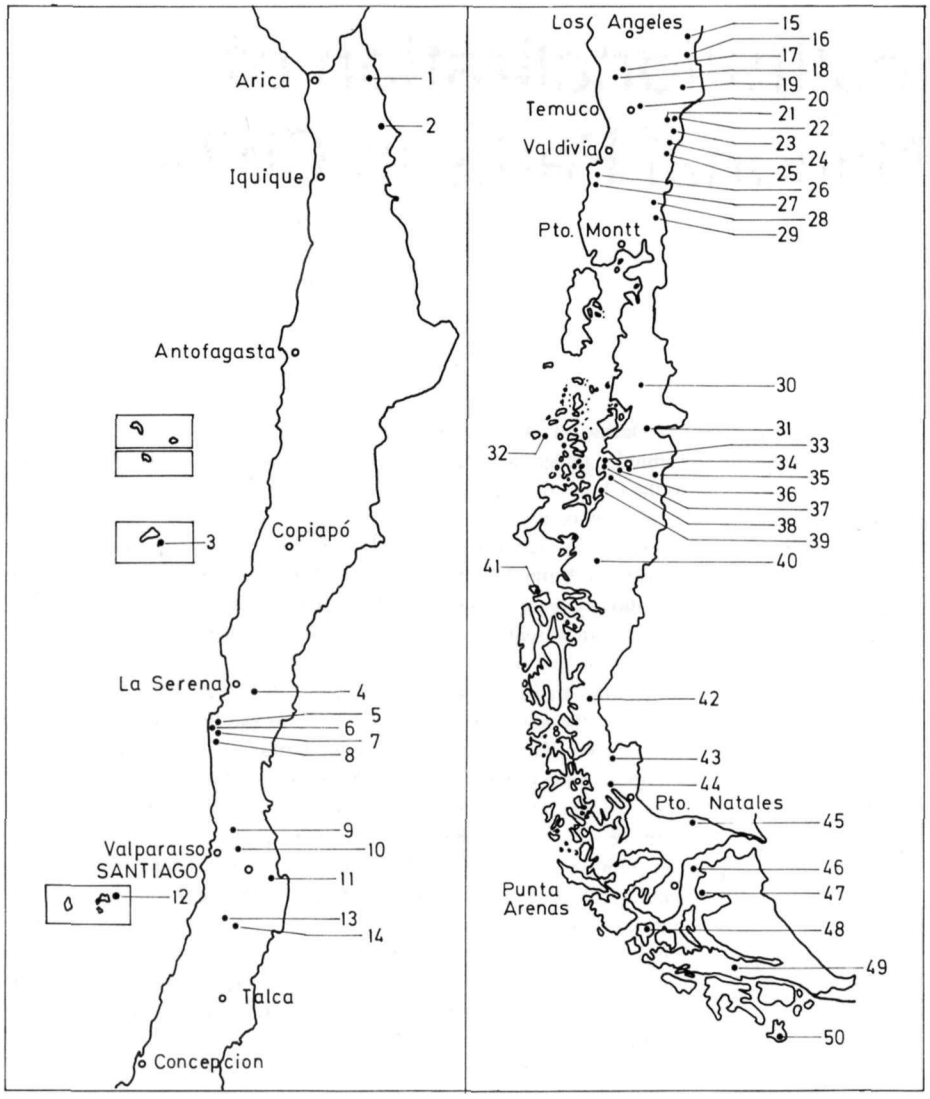
"During the Incas' reign, the birds were protected by strict laws: it was forbidden under the penalty of death to kill any of the birds or to get close to the islands throughout the nesting season."

Wetterberg also mentions that besides the guano birds, meat and wool producing animals were protected. Hunting across the Inca Empire (from Ecuador to Central Chile) was controlled by law, and its violators were punished by death. Hunting was legal after the mating of the animals, and it was rotated from district to district to allow their reproduction and the growing of new wool.

With the arrival of the Conquistadores on the Pacific coast of South America, the nature conservation action of the Incas suddenly ended. Looking for the wealth of the New World, the Spaniards paid little attention to the protection of the native flora and fauna. Although some laws included protectionist measures, these never were carried out.

In the history of nature conservation and protection the South American countries, in contrast to the U.S.A., have had few promoters of the nature protection idea. Wetterberg mentions Andre Rebouças, a Brazilian statesman, who in 1876 pointed out the need of creating national parks, and even suggested two places: the Bananal Island, in the Araguaya river, and the Siete Saltos waterfalls in the Parana river. However, the first Brazilian national park (Itatiáia) was not established until 1937.

Above: Effects of recent volcanic activity can be observed in a number of Chile's national parks. This river, for example, has new waterfalls over a wall of lava. Right: The Araucaria pine (Araucaria araucana), sometimes called the monkey puzzle tree, is an important forest species protected in the national parks of Chile. This photo, taken in the Conguillio National Park, also shows a lake with its beach of dark lava sand.



THE NATIONAL PARKS OF CHILE

NUMBER		AREA
1.	Lauca (*)	400,000 ha
2.	Isluga	40.11 ha
3.	Isla de Pascua (*)	4,589 ha
4.	Pichasca	80 ha
5.	Fray Jorge (*)	6,845 ha
6.	Punta del Viento	3,000 ha
7.	Valle del Encanto	120 ha
8.	Talinay	114 ha
9.	Los Mineros	2.89 ha
10.	La Campana	undetermined
11.	El Morado	undetermined
12.	Juan Fernández (*)	18,300 ha
13.	Las Palmas de Cocalán	undetermined
14.	El Bollenar de las Nieves	undetermined
15.	Laguna del Laja (*)	11,600 ha
16.	Ralco	undetermined
17.	Nahuelbuta (*)	5,432 ha
18.	Contulmo	82 ha
19.	Tolhuaca (*)	3,500 ha
20.	Cerro Ñielol	80.65 ha
21.	Los Paraguas (*)	18,000 ha
22.	Conguillío (*)	40,000 ha
23.	Huerquehue (*)	3,900 ha
24.	Villarrica (*)	13,780 ha
25.	Pirihueico	undetermined
26.	Los Alerzales (*)	1,230 ha
27.	Barra del Río Bueno	619.50 ha
28.	Puyehue (*)	117,000 ha
29.	Vicente Pérez Rosales (*)	135,175 ha
30.	Lago Rosselot	12,390 ha
31.	Lago Las Torres	15,280 ha
32.	Isla Guamblin (*)	10,625 ha
33.	Cinco Hermanas	227.50 ha
34.	Río Simpson	41,160 ha
35.	Dos Lagunas	180.70 ha
36.	Puerto Chacabuco	221 ha
37.	Quitralco	10,900 ha
38.	Los Huemules	12,500 ha
39.	Bahía Erasmo (*)	28,320 ha
40.	Laguna San Rafael (*)	1,350,123 ha
41.	El Guayaneco (*)	30,498 ha
42.	Bernardo O'Higgins (*)	1,761,000 ha
43.	Torres del Paine (*)	161,635 ha
44.	Monte Balmaceda (*)	7,900 ha
45.	Paliaike (*)	3,000 ha
46.	Los Pingüinos (*)	97 ha
47.	Laguna de los Cisnes (*)	25.30 ha
48.	Hernando de Magallanes (*)	800,000 ha
49.	Alberto M. de Agostini (*)	800,000 ha
50.	Cabo de Hornos (*)	63,093 ha

*Included in the United Nations list of national parks and protected areas.

A typical camping site in a Chilean National Park. Facility development has little impact on the land.

The Chilean Situation

At present Chile has 50 national parks, 27 of which have been internationally recognized in the 1975 *UN List of National Parks and Equivalent Reserves* (IUCN); their total surface area surpasses 5,500,000 ha, more than 7.3 per cent of the continental territory (National Forest Corporation, 1978).

The national parks were first backed by the Forest Law of 1925 and later by the 1931 Supreme Decree, popularly known as the Law of Woodlands. This law entrusts the national parks with the responsibility of protecting specific species of trees and maintaining the natural beauties of the landscape. Unfortunately, as time went by, the interest of the lawmaker in the protection and conservation of the natural environment has been declining due, especially, to laws and decrees favoring settlements and colonization, as well as a lack of adequate control to enforce the laws.

In 1967, also by a Supreme Decree, Chile ratified the Final Act of the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere which was signed in Washington in 1940. In this Act, national parks, significant nature features, regional reserves and bird migration are defined, specifying in each case the respective goals and obligations of the contracting countries.

Although the national parks in Chile have been in existence more than 50 years, traditionally their administration has faced a series of problems reflected in the present situation of each of them. The most serious difficulties have been inadequate organization and a lack of specialized technical staff which is a result of the absence of clearly defined policy, an insufficient budget, inadequate legislation not in accord with the advancement of modern ecology, increasing recreation and tourism, and lack of co-ordination among official agencies directly or indirectly in charge of making decisions that affect such areas. Fortunately some of these problems, especially those related to the definition of technical policies and institutional status, are being solved.

Historically, state heritage land has been under the custody of the Agriculture and Livestock Service (Servico Agrícola y Ganadero, SAG) a branch of the Ministry of Agriculture. Regarding management, an important step was the creation of the first Regional Administration of National Parks and Forests Reserves (Administración Regional de Parques Nacionales y Reservas Forestales, APARFO) under SAG, with jurisdiction over about 70 percent of all the country's parks. With the creation of this Regional Administration with sufficient power to make decisions and solve problems within a proper legal mechanism, and having competent personnel and suitable appropriations, the problems of the Chilean National Parks were seriously approached.

Nevertheless, with the establishment in 1972 of the National Forest Corporation (Corporación Nacional Forestal, CONAF) which took charge of the national parks and forest reserves of the country, APARFO was dissolved. This brought, in the beginning, some loss of previous management agility mainly because the new tasks had to be fitted into an institutional scheme in which lumber production had priority over conservation and recreation.

Furthermore, the slow general development of the country at the time forestalled opening the protected areas to science, education and outdoor recreation. This fact helped to avoid the negative impact of a public not prepared to evaluate or, consequently, to use properly areas which then lacked proper management and security.

Because of this negative situation it was decided in 1973 to make a serious analysis of all the actual protected areas of the country. This task has been carried out by CONAF with the help of international organizations such as the Peace Corps and FAO, through their CHI-562 and TF-199 Projects. This co-operation was supplemented by the governments of Argentina and Peru when they opened the Bariloche Park Ranger Training Center and the Pampa Galeras School for game wardens which have served as training bases for Chilean rangers.

Just before the co-operative agreements with international organizations were signed, in 1970, the Faculty of Forestry Engineering of the Austral University of Chile included in its curriculum studies related to the planning of national parks. These topics, which later would also be taught in the College of Forestry Engineering of the University of Chile, included values, planning and techniques of wildland management, principles of ecology, protection of wild animals, and considerations of multiple use of natural resources.

The studies program included in the curriculum for a degree in Forestry has alleviated, at least in part, the scarcity of trained personnel with basic knowledge in management of natural areas and that of candidates interested in such work. The work of the universities also has made possible the initiation of scientific investigations, oriented basically to fulfill the needs of CONAF.

CONAF Work in Conservation

The National Forest Corporation, through its Department of Conservation of the Environment, has the responsibility of protecting, administering and managing the country's wildland areas. A priority task has been the development of new technical and managing policies (CONAF, 1975) taking into account the legal provisions in force, international agreements and treaties, and documents and regulations enacted in countries with larger experience in this field.

The document mentioned above sets forward guidelines for planning, management, development and administration of national parks and related areas (National Park System) as a basis for attaining conservation of the country's natural and cultural heritage and that of the environment in general. In one of its chapters, the objectives are stated as follows:

"*Conservation* of natural and cultural heritage of national or international importance that society wishes to institutionalize to secure its primitive composition, to maintain its original evolutive path, and to insure the following public benefits; *investigation* of the resources included and their interrelations with the idea of obtaining basic data regarding the natural and cultural phenomena and of controlling the impact of man on his environment; *education* through the interpretation of the significance of the heritage included in the areas and through 'environmental education,' using a national park as an outdoor museum; *recreation* for the domestic and foreign visitor who spends his free time in contact with nature."

Under the postulates, a revision of the entire national system is being carried out. Those areas which do not fulfill the basic requirements of a national park will be reclassified as a different kind of protected area within the national system (e.g., a significant nature feature, a scientific reserve, a wildlife refuge or reserve) or a category that represents values of regional or local importance, such as district or municipal parks and recreational areas, among others.

Parallel to all this, priority zones for management and development have been designed, based mainly on urgent needs to protect species of flora and fauna in danger of extinction, and requirements for recreation and tourism.

At the present time the central and southern regions of the country have been given precedence. The central region holds the largest concentration of people; the southern region includes vast areas well known for their scenic wealth, especially the lake region. Nevertheless, the definition of these priorities does not mean that the extremes of the country have been forgotten. Indeed, two national parks, one located in the north and the other in the southernmost end of the country may be mentioned as areas of priority attention.

The basic principle that has to be taken into consideration in the development of these protected areas is that all human activities taking place within their borders must be subordinated to the primary objective of the conservation of the resources. The possibilities of use of the

A recreation area in the Conguillio National Park. Development is minimal and makes use of local materials produced by volcanic activity.

A partial view of the high snow covered peaks in Conguillio National Park. Note the Araucaria pines.

resources are determined by the zoning, and by the management programs stipulated in the *Management Plan* and by the internal regulations for the "use of visitors." In general, the goal is that the areas for development should be located in officially designated sites and that they include only installations necessary for the administration of the area and for the convenience of the public. These facilities can include campgrounds and picnic areas, roadside exhibits and displays, lookouts, biological stations, information booths or visitors' centers, amphitheaters, minimum lodging for tourists, and housing for technical and security personnel. This implies that major installations jeopardizing the natural landscape or other values of the area shall be located outside the limits of the unit, so as to maintain the park as a center of attraction rather than as a place for the development of tourism.

A Glance to the Future

Although the ideas of protecting natural areas are old, history does not record an authentic tradition on conservation or popular support for wildland areas among the South American nations. Unlike the U.S.A., where conservation is and has been a popular movement (Nash, 1967), in Chile wildland areas have been preserved rather through the effort of a few interested persons. The reason seems to be that the majority of the South American countries have not reached a stage of development that induces the common people to appreciate nature as "an escape" from "civilization." There is no doubt that among the human requirements, the first is to satisfy basic needs. Once this is done, and more so when it has been exceeded, history shows that concern for nature conservation and protection of the environment where man lives increases rapidly.

According to these premises, it would appear logical that only in the future will a true appreciation for wildland areas emerge among those countries facing more urgent problems. However, indifferent land use can result in irreversible changes in natural resources. The pollution of the environment, the extinction of species, as well as destruction of cultural values are evidence not only of excessive development in certain countries, but also of a lack of integral planning of resources in less industrialized nations.

This has created the need to cautiously anticipate future demands and wants. This anticipation must be rational and moderate, not in opposition but offering possibilities of economic development. In this sense, acting strategically, Chile still has a long road to travel. Several of the country's parks must be reclassified according to a clear concept of their objectives. At the same time the best use must be decided for those units actually classified as parks but which do not meet the required standards. In these decisions, the international criteria adopted by the United Nations can be of great help.

Furthermore, any attempt of development faces the hard reality of the lack of trained personnel, not only on the planning level but also in the carrying out of proposed management. This situation shows the need of training personnel at the professional level as well as technical and subordinate personnel. At the same time the vital role of the national parks in their educational mission should be reviewed, not only among their actual visitors with lectures and displays, but also at the national level by taking advantage of public channels of communication. Only in this way will the movement to preserve natural areas have the necessary strength to obtain that support required for an adequate management, both from the standpoint of their institutional and economic needs.

To all this the unavoidable task of evaluating the actual programs of development should be added. There is no question that appropriations for the national park programs diminish the possibility of development of other activities. The one who makes decisions regarding distribution of economic resources must also weigh alternatives based on tangible benefits. This last aspect shows the need of suitable standards in order to quantify, at least in part, the value of the national parks, either from the economic standpoint as recreational land use, or from the standpoint of the social benefits of preserving and protecting natural areas for future generations.

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Ian G. Trotman

Western Samoa Launches a National Park Program

In 1974 the government of Western Samoa passed legislation to provide for a National Parks and Reserves System. However, little progress was made until March, 1978, when approximately 7,000 acres (2800 ha) on the southern central portion of the island of Upolu were set aside as the first national park, O Le Pupu-Pu'e. This Samoan name means "The Cliffs-Mountain."

Unfortunately, over the intervening years progress had been limited for reasons which are well known to other developing nations, namely, a lack of expertise and trained staff, and inadequate financing for the purchase of land and park development. There was also the added complexity of land being held under customary ownership, that is, communally owned by a family but with the title held in trust by an elected chief (Matai), a common situation in the South Pacific. Although this has not been a problem in establishing O Le Pupu-Pu'e, since it lies on government-owned lands, the development of national parks on non-government lands needs to be reconciled to the question of customary ownership. For this reason it is hoped that the O Le Pupu-Pu'e National Park will serve as a demonstration area, and thereby foster wider public and political support for the concept of national parks and conservation in general. This will not be an easy task in a largely subsistence society.

A report prepared in 1975 by the International Union for Conservation of Nature and Natural Resources (IUCN) and a United Nations Development Advisory Team (UNDAT) considerably assisted Western Samoa by outlining a basis for a system of national parks and reserves. Reservation of approximately 6 percent of the land area was proposed to provide permanent protection of all major ecosystems and for a range of historic sites for aesthetic, educational, cultural, economic and recreational purposes. Staffing requirements were outlined and the formation of a National Parks Authority was recommended. The latter recommendation has not been implemented as alternatives, such as a National Conservation Trust, are being considered.

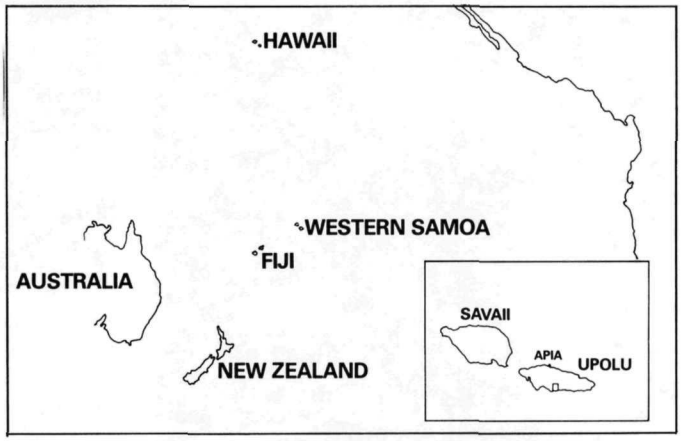
In early 1977 responsibility for administering National Parks and Reserves was transferred to the Department of Agriculture and Forests. A reorganization of the Forestry Division enabled a small but enthusiastic staff to commence activities leading to the establishment of the first park.

The skeletal staff now handling national parks and reserves work is headed by an Acting Superintendent who combines this responsibility with Forest Extension (encouraging public awareness of forest values and the planting of small scale woodlots). He has received valuable training under the regular International Training Course sponsored by the Australian Government. A national parks trainee is presently gaining field experience before going overseas, probably to New Zealand, for training as an information officer. A junior forest assistant, who will also be visiting New Zealand for training, completes the existing professional staff. However, approval recently has been received to double this number. A labor force of three caretakers and a fluctuating number of up to about 15 workers completes the local staff. All are assisted by one U. S. Peace Corps volunteer, a natural resources graduate. A senior park ranger from New Zealand will arrive early in 1979 to spearhead park development.

In this first whole year of operations a small budget of $WS30,000 has been allocated. It is hoped this will increase to$WS200,000 in 1979. Our aim for the next few years is to deliberately progress slowly by developing only one or two of each of several recommended classes of reserves so that they can serve as demonstration areas to arouse interest and support for the concept. These areas will also allow staff to get practical experience of operating in the local situation before trying to expand. Most initial areas would be on land controlled by the Government as legislation does not readily permit such use of customary communally owned land. It is hoped that as a result of these demonstration areas there will be willingness to consider some form of dedication of lands for parks and reserves with the local people participating in management in a somewhat similar manner to the approach being used in Papua New Guinea, as reported in a recent issue of PARKS.

Goals of the Park are to: 1. Conserve a large representative area of the land forms, vegetation and wildlife in a largely unmodified state. 2. Conserve water supplies for current and future use. 3. Communicate to the public the concepts and values of the natural history of the country and their natural heritage, providing an outdoor classroom. 4. Provide tourist attractions containing features of outstanding interest and representation of the natural environment.

One of the largest parks likely to be established in Western Samoa, the O Le Pupu-Pu'e National Park contains a range of ecotypes found on Upolu. The park is buffered on one side by a block of State Forest being used for a reforestation project and on the other side by an experimental demonstration farm. Both are controlled by the Department of Agriculture and Forests.



This map shows the Central Pacific location of Western Samoa, and the O Le Pupu-Pu'e National Park, shown as a rectangle on the southern side of the island of Upolu.

Physiography

The park is bounded on the south by the cliffs of the "iron bound" coastline which were formed by the marine erosion of the relatively recent pahoehoe lava which poured over the existing coral reefs into deep water. Extending inland, the park continues to the highest point on the island, Mt. Fito, a cone situated on the central mountain range. The park is unique in including the only area on the south coast where three of the major volcanic formations from which the island is formed are found close together, with the consequent and varied range of soil types which have formed over them.

Geology

Western Samoa is wholly volcanic in origin. Six different periods of volcanism, ranging from Pliocene to recent, have occurred here.

The youngest volcanics within the park, the Puapua volcanics, began erupting when the sea level had risen to nearly its present position following the last glacial period.

An example of Puapua cinder cone (Mt. Fito) is found in the park and it is well preserved. On the coastal lowlands the Puapua lava are low gradient, ropy pahoehoe flows.

Rocks from the oldest volcanic period, the Fagaloa, are also found in the park, as are Salani volcanics. Variations in the surface structures caused from these volcanics have resulted in some notable waterfalls in the nearby Togitogiga Recreation Reserve.

Although there are 90 different named soils in Western Samoa, they are mostly formed from basalts. Variations in soil types reflect the composition of the parent material.

Vegetation

Near the coast the pahoehoe lava of the Puapua volcanics remains bare and grades back into a littoral belt of scrub, demonstrating the effect of salt wind shearing the coastal vegetation.

Continuing inland, the area is characterized by poor quality lowland forest. This is the only remnant of an extensive tract which spread along the south coast of Upolu before agricultural clearing. It is now restricted to the harsher edaphic sites of the Puapua volcanics.

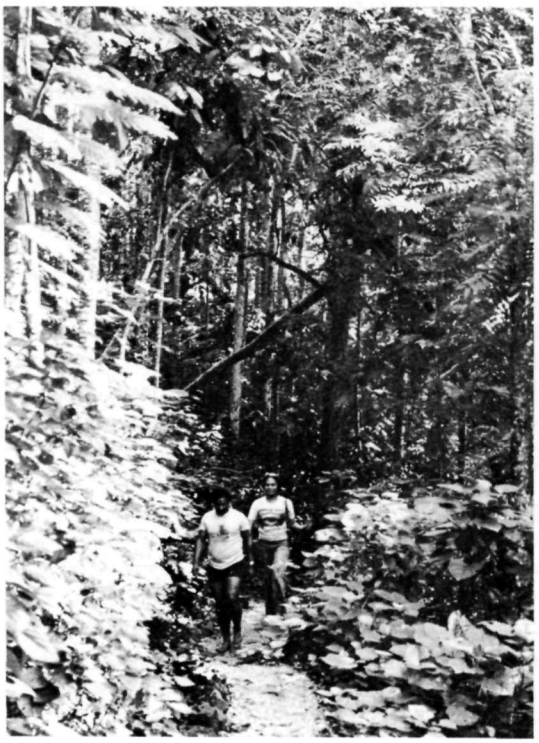
At higher elevations in the park the foothill forest occurs on the rolling to moderately steep terrain, extending approximately from 750 to 1,800 ft. (228m to 548m). These foothill forests have a somewhat higher proportion of tree ferns, and there is greater growth of moss and lichen on tree trunks than is evident in lowland situations.

Many of the species prominent at lower elevations persist and may even be locally common in the higher elevations in the montane and cloud forest. The proportion of ground and tree ferns increases markedly on the upland plateaus and many of the trees are clothed in lichens, mosses and epiphytes. The largest trees in the canopy are often the same as those of the foothills. The montane cloud forest trees have an average height of about 80 feet (24m).

Proposed Development

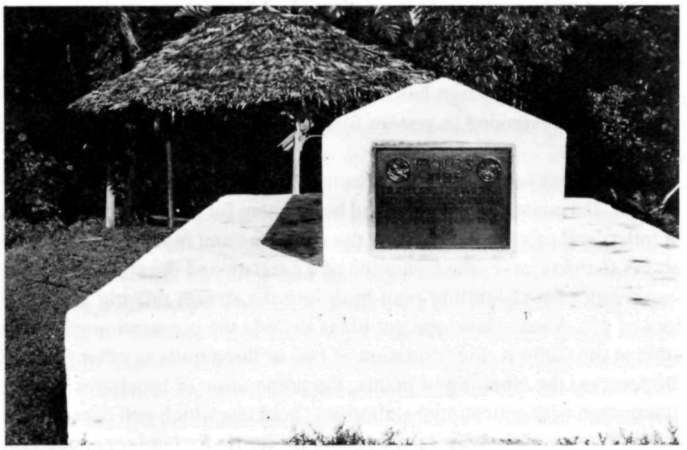
In the North along the central island mountain range the park includes an upland plateau flanked by deeply dissected canyons. This area is the only remaining tract of relatively inaccessible wilderness type high forest on the island of Upolu.

A UN sponsored survey by a team comprising a geologist, botanist and wildlife expert has just been completed, adding to the knowledge of the park. Their report, expected early in 1979, is eagerly awaited. The survey has revised the geological map, as it affects the park, by discovering that the Puapua lava actually erupted from Mt. Fito, following an indirect course to the coast. A long lava tunnel (1800 meters) which contains colonies of bats and swiftlets has been discovered. Forty two species of birds have been observed in the park along with three species of lizards, one previously unrecorded. The vegetation has also been described and related to the landforms. A series of excellent diagrams have been prepared showing the origin of geological features and currently active processes. Once the survey team's report is available, zoning will be considered but this is likely to be very simple,



Above: O Le Pupu-Pu'e National Park's iron bound coast was formed during the Puapua Volcanic period when lava buried the reef and plunged into deep water. Note the bare lava and sheared littoral shrub zone grading into forest. Left: An improved trail leads through lush vegetation to the summit of Mt. Vaea. The Acting Superintendent of National Parks, Tuli Toagaga, and a reporter are pictured.

The entrance to Tusitala Historic and Nature Reserve with Mt. Vaea in the background. Robert Louis Stevenson's tomb is on the left peak of the hill.



The tomb of Robert Louis Stevenson showing a plaque to the memory of his wife Fanny. In the rear a round Samoan fale (house) shelters a picnic table and benches.

possibly involving a small central upland wilderness area, and a more intensive development zone around the main information center and headquarters. The bulk of the area would be left as protected natural environment.

The main visitor center will be located on the coastal road which bisects the park. This will provide information on the park as a whole. A second, small information center will be located on a penisula of bare lava and will contain information specific to that area, for example, on the nature of the lava and the littoral vegetation belt. These centers will encourage public understanding of the values contained within the park and will be very important for educational purposes.

Other developments completed include a nature trail around a portion of coast to the bare lava penisula. Plants will be labelled and there will be stops at points of particular interest. Literature will be used to explain these features. A similar nature trail will eventually be developed to the lava cave. A trail from the coast to Mt. Fito is under construction and will have a descriptive leaflet prepared on the landforms and vegetation through which the trail passes, together with an indication of wildlife likely to be seen. Information centers will contain display boards, a range of brochures and booklets, hopefully models, and eventually slide/tape shows. In the longer term we have visions of fostering cultural activities at the main center including Samoan singing, dancing and handicrafts. It may also be possible to encourage tours of the reforestation project and demonstration farm with the National Park as part of a more varied tourist package. Other ideas await publication of the survey team's report and the secondment of the senior park ranger to spearhead the development. At present our major limitation is likely to be adequate staff. We do not wish to risk damage to some of the major attractions by inadequate supervision, and until this is available such areas are likely to be opened to the public on a restricted basis only.

Western Samoa is fortunate in having a larger land mass than many of the other islands of the South Pacific. It is expected that the O Le Pupu-Pu'e National Park will be an important reserve in accord with the principles ennunciated in UNESCO's "Man and the Biosphere Programme," typifying islands of volcanic origin. The benefits should be of international and regional importance, reflecting a national asset of high social and educational value.

Tusitala Reserve—the burial place of Robert Louis Stevenson

Arising from a gift of land to the people of Western Samoa from descendants of Robert Louis Stevenson and his wife Fanny, the Administration of Western Samoa passed an Ordinance in 1958 setting aside a small area containing Stevenson's tomb as the Robert Louis Stevenson Memorial Reserve, and approximately 120 acres (48 ha) as the Mt. Vaea Scenic Reserve.

Following the establishment of a National Parks and Reserves Section within the Department of Agriculture and Forests, the Government brought these two Reserves into the System under the new name of the Tusitala Historic and Nature Reserve. Tusitala was the name given to Stevenson by Samoans and means the "Teller of Tales." At the same time, additional Government land was added to bring the area up to approximately 320 acres (129.5 ha).

The famous Scottish author, a frail man, travelled to many parts of the world seeking an area where he could live more comfortably with his poor health. After visiting various parts of the Pacific, he and his wife Fanny arrived in Western Samoa in 1889. Charmed by the tranquility of the islands and the friendliness of the people, together with the considerable improvements to his health, they decided to buy land and build a house. Their plot of land was over 300 acres (121.5 ha) on the side of Mt. Vaea, which rises behind Apia, Samoa's capital and chief port. Waterfalls and streams tumbled down the hillside giving rise to the Samoan name Vailima, which means 'five streams'. This name was given to the Stevensons' elaborate home. This building with a number of additions forms the basis for what is now Government House. It was occupied by the Administrator during the period when Samoa was a New Zealand Trust Colony and since Independence it has been the Official Residence of the Head of State.

At first there was only a rough track up to Vailima but the local people laid a broad road and called it the "Road of Loving Hearts" in recognition of their devotion to Stevenson who helped them during a period of political unrest.

Stevenson died in December, 1894, and was buried on the summit of Mt. Vaea.

Eventually a large tomb was built over his grave, on the side of which was carved on a plaque the words of his immortal poem, "Requiem," which he had written 15 years before. It includes these famous lines:

Here he lies where he longed to be;
Home is the sailor, home from the sea,
And the hunter home from the hill.

Mt. Vaea, an outlier of the foothills rising to the central island mountain range, juts almost into the city of Apia. It is largely unmodified, except to the north where a few residences have been built overlooking the city. The mountain is covered by lowland and hill country forest, some of which was badly damaged by hurricanes in past years. Since the eastern faces of the mountain form part of a water

catchment area, exotic trees were planted on the most severely damaged sites to protect the soil. With the increasing pressure of urbanization, some villages have unfortunately cleared parts of the land for food crops. An educational campaign has been undertaken to prevent further clearance and it is intended to restore forest to the reserve as the food crops mature.

Renovations so far undertaken include the upgrading of the track to the summit, the construction of a round house there for picnics, the provision of toilets and rubbish receptacles, the surveying and fencing of the public access to the reserve, the formation of a car park and the clearing up and improving of a swimming pool built into the stream flowing along the foot of Mt. Vaea. Development plans include the preparation of a map table at the summit, the formation of two or three trails to other parts of the reserve, the labelling of plants, the preparation of brochures and, in association with educational authorities, booklets which will describe the natural history of the reserve and encourage its use for outdoor education.

Recently the Head of State announced that a portion of the Vailima grounds would be linked with the Reserve and a forest aboretum for development as a botanical garden.

Currently, more than 150 people visit the area each month.

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Ian G. Trotman has just concluded a tour of duty in Western Samoa as the Chief Forest Officer in the Department of Agriculture and Forests. He was seconded to this position under the New Zealand Bilateral Aid Programme.

John Blower

Nature Conservation in Indonesia

The Indonesian archipelago is the world's largest group of islands, said to number over 3,000, and varying in size from small coral atolls to such large land masses as Borneo, Sumatra and W. Irian (the Indonesian half of New Guinea). Straddling the equator, they extend in a great arc for a distance of some 6000 km between longitudes 92° and 141° east, enclosed to the northward by the South China Sea and Pacific and southward by the Indian Ocean.

To the west, Sumatra, Borneo and Java lie on the Sunda shelf, and — even now only separated by shallow seas — were joined to the Asian mainland within the past 20,000 years. At the eastern end of the archipelago, Irian and the Aru Islands rest on the Sahul shelf, separated by the Arafura Sea from the Australian continent of which they were once a part.

Ecologically these two groups of continental islands reflect affinities with, respectively, mainland S.E. Asia and Australia, and are therefore divided zoogeographically between the Oriental and Australian Regions; Sumatra, Borneo and Java in the former, and Irian and Maluku in the latter. Sulawesi and the Lesser Sundas having remained physically isolated from the two continents are true oceanic islands, and have evolved a specialized flora and fauna with both Indo-Malayan and Australian elements and also an unusually high proportion of endemics. Lying to the east of Wallace's Line, they are placed zoogeographically-together with the Philippines — in the Wallacean Sub-Region of the Oriental Region.

Much of Indonesia is mountainous, with a long chain of ranges, in many places culminating in volcanic cones, running down the west side of Sumatra through Java to the Lesser Sundas. There are also extensive highland areas in Central Kalimantan, Sulawesi, and in West Irian where the Central highlands form a great East-West watershed averaging 4000 m above sea level and reaching over 5000 m at the snow-capped peak of Puncak Jaya (formerly Gunung Cartenz), Indonesia's highest mountain.

There are also extensive lowlands in East Sumatra, in Kalimantan and in parts of West Irian.

Indonesia is one of the most richly forested countries in the world, with a wide range of forest types ranging from coastal mangroves, freshwater swamp forests and lowland rainforest to the savanna woodland and dry monsoon forest of Lesser Sundas; from the *Pinus merkusii* of Sumatra to the *Casuarina junghuniana* so characteristic of the Java volcanoes, and from oaks, chestnuts and *agathis* to *Eucalyptus* and other typical Australian genera which begin to appear in the more easterly islands. According to official statistics some 1.2 million km² or approximately 63 per cent of the country is forest covered, though this includes extensive areas of secondary vegetation devastated by shifting cultivation of areas which have been intensively logged.

The vast extent of the country and wide spectrum of habitats is reflected by the diversity of this fauna, with such characteristically Asiatic elements as tiger, leopard and clouded leopard, elephant, rhinoceros (Javan and Sumatran), tapir, banteng and sambar of the western islands contrasting with the typically Australian fauna of W. Irian with its marsupials and monotremes, including kangaroos, wallabies, phalangers and spiny anteaters. But apart from the separation of predominantly Asiatic and Australian fauna west and east of Wallace's Line, there are many interesting anomalies in distribution of individual species such, for example, as the occurrence of tiger in Sumatra, Java and

Bali (where it is now probably extinct) but not in Kalimantan or any of the other islands; leopard *(Panthera pardus)* in Java but not in Sumatra or Kalimantan; tapir and elephant in Sumatra but not Kalimantan (there are a few elephant in Borneo though they are said to have been introduced), and Malayan sun-bear in both Sumatra and Kalimantan but not elsewhere.

Of special interest and importance are the relatively large number of endemic primates such as, for example, the orangutan—of which the two sub-species, *Pongo pygmaeus pygmaeus* and *P. pygmaeus abelii,* occur in, respectively, Kalimantan and Sumatra — the proboscis monkey *Nasalis larvatus* of Kalimantan (which, along with *Pongo pygmaeus pygmaeus,* also occurs elsewhere in Borneo), the black Celebes macaques — of which at least four separate species have been distinguished — and a number of others, including no less than four primates endemic to the Mentawai islands off the west coast of Sumatra (a gibbon, a leaf-monkey, a snub-nosed langur, and pig-tailed macaque.

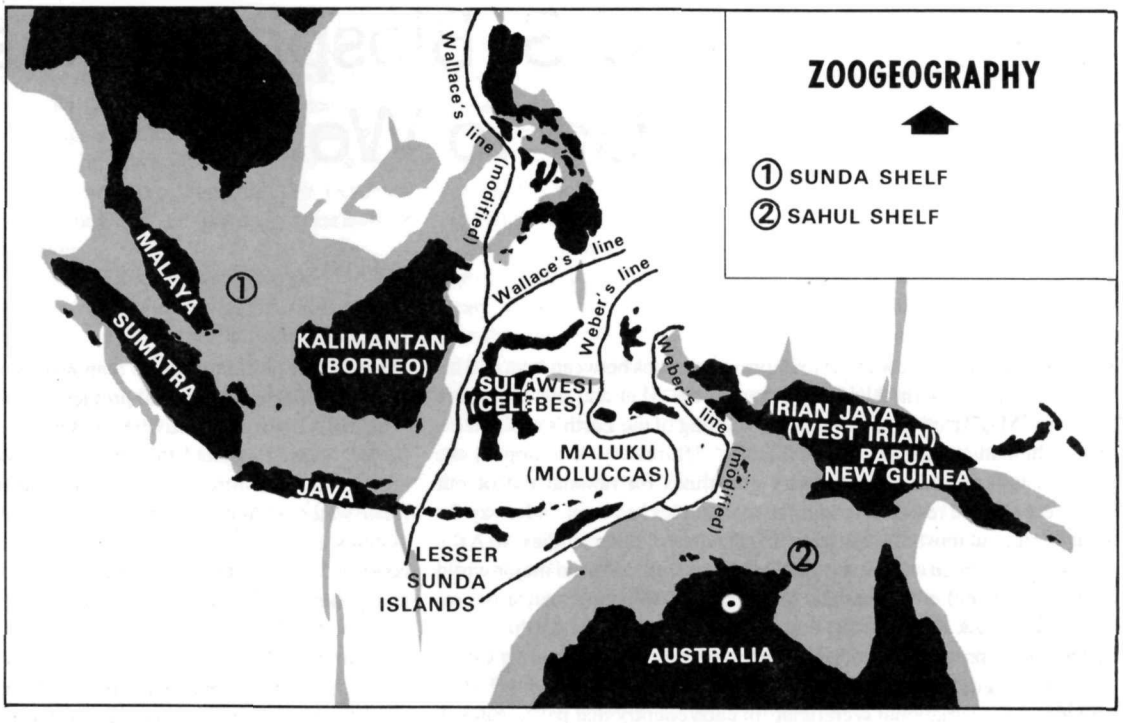
Among more unusual representatives of Indonesia's endemic fauna are the Komodo dragon, *Varanum komodoensis,* the world's largest lizard, confined to the west coast of Flores and three neighboring off-shore islands; the dwarf buffalo or anoa of Sulawesi (2 species) and the babirusa, a very remarkable pig in which the tusks of the male protrude through the top of the upper jaw, curving back towards the eyes. There are innumerable other mammals, birds, reptiles, insects and other creatures endemic to the forests of Indonesia, and, of course, also very many plants.

But despite the remarkable diversity of Indonesia's wildlife, both numbers and range of most species are being steadily depleted through loss of habitat, hunting and other causes and a substantial number are listed in the IUCN Red Data Books as threatened. Prominent among the twenty mammals so listed are orangutan, tiger, leopard, clouded leopard, Asiatic wild dog, elephant, Sumatran and Javan rhinoceros, tapir, banteng and dugong. Of these all are endangered and some, such as the Javan tiger, orangutan, Sumatran elephant and the two rhinoceros, seriously so. There have been no confirmed reports of Bali tiger for several years and they are now almost certainly extinct, while there are believed to be not more than 4-5 Javan tiger left in the Meru Betiri Reserve in East Java. The Sumatran sub-species, of which there are probably still several hundred, offers the only real hope for the future survival of tiger in Indonesia, and then only if reserves can be established with sufficient areas of suitable habitat and effective protection against hunting.

There are still viable populations of orangutan in both northern Sumatra and Kalimantan, but they are dependent on primary forest habitat with a relatively continuous canopy, and are coming under increasing pressure as more and more of the remaining lowland forest is logged. It is unlikely that elephant now number more than one or two hundred in all of Sumatra, scattered in small groups, isolated in remaining islands of forest and no longer able to complete their long seasonal migrations. Though less dependent on primary forest, they too need sufficiently large areas where they can wander freely and are safe from hunting and other forms of harrassment. Of special interest and importance are the two species of rhinoceros, the two-horned Sumatran, *Dicerorhinus sumatrensis,* and the one-horned Javan, *Rhinoceros sondaicus.* Both are now very rare and each is dependent for its survival on a single reserve; the former on the 8000 km² Gunung Leuser Reserve in North Sumatra, where there are believed to be about a hundred (there are also a few small relict populations elsewhere in S.E. Asia), while the Javan, of which there are probably not more than fifty, is confined to the relatively small (300 km²) Ujung Kulon peninsula in West Java, now proposed as part of a future national park.

From these few examples it will be seen that while Indonesia has one of the richest and most varied faunas in the world, many of the larger and more spectacular species are so reduced in number that without effective protection they could follow the Bali and Java tigers into extinction within a few years. Other species and the ecosystems of which they form a part, ranging from birds of paradise to dugongs and from coral reefs to lowland rainforest, are increasingly threatened and call for urgent conservation measures before it is too late.

Conservation is the responsibility of the Directorate of Nature Conservation, which is a part of the Directorate-General of Forestry. There are at present some 160 Reserves totalling about 3.8 million hectares, equivalent to just under 2 percent of the land area. They range in size from as little as one hectare to 8,000 km² in the case of Gunung Leuser in North Sumatra (actually a complex of several adjoining Reserves). There are as yet no national parks in Indonesia, though eight have now been proposed, including Gn. Leuser, Ujung Kulon,



Indonesia includes portions of two major zoogeographical regions, the Oriental and Australian, and groups of its islands reflect affinities to the mainland of Southeast Asia or to Australia. Between these groups lie Sulawesi and the Lesser Sundas which are true oceanic islands with their own endemic species. The seas covering the Sunda and Sahul shelves are shallow, generally not more than 200 meters deep.

Baluran, Bromo Tengger, Komodo and Lore Kalamanta (Central Sulawesi). All these areas are potentially fine parks which could play a valuable role both in conservation of Indonesia's natural heritage and also in development of the economically important tourist industry. Their legal establishment must, however, await introduction of the new legislation now in course of preparation since the existing law makes no provision for national parks.

The present conservation areas consist of Nature Reserves which are fully protected by law and Game Reserves wherein wildlife is protected but the habitat can be "managed." Nature Reserves comprise less than half the total, which means that fully protected areas amount to less than one per cent of the land area. Unfortunately "management" in several large and important Reserves has taken the form of timber exploitation, with the result that forest ecosystems have suffered serious damage and habitat for orangutan and other species dependent on closed canopy primary forest has been much reduced.

Apart from the inevitable conflict of interests between conservation and commercial timber exploitation, other major problems include encroachment by shifting cultivators, poaching, and the extensive export trade in wildlife, especially birds from W. Irian and Maluku. The Directorate of Nature Conservation is severely handicapped by lack of trained and experienced staff at all levels and also by the present inadequate legislation. But the situation is gradually improving and conservation is being given high priority under the Third Five-Year Development Plan, with a considerably increased budget allocation (approx. US $2 million for 1978/79) and a projected three-fold increase in the total area of Reserves to 10 million hectares. Particularly encouraging is the recent policy decision that nature conservation shall be the first priority in forestry planning for the immediate future, and that the objective will be conservation of total ecosystems rather than of individual species in isolation, as has tended to be the case in the past.

Technical assistance in conservation planning is being provided by a small-scale FAO project which, since it started in 1974, has been chiefly engaged in field surveys, together with Directorate of Nature Conservation personnel, and in preparation of management plans. Substantial support is also being provided by the World Wildlife Fund which now has a US $1 million program including research, surveys, provision of equipment and other assistance. Greatest promise for the future, however, lies in the central Nature Conservation Training School shortly to be established near Bogor under the Netherlands Government aid program. This will provide much needed training for supervisory field staff (Warden and Assistant Warden level) and others, and it is hoped it may eventually also be able to accept students from other neighboring countries.

Especially encouraging is the increasing concern of University students and other educated Indonesians for such problems as pollution and the dangers of over-exploitation of natural resources. The growing appreciation of the recreational value of natural areas is demonstrated too by the thousands of city dwellers who at weekends and holidays flock to Cibodas, Pangandaran and other well-known Reserves in Java. While there are still many problems for conservation in Indonesia, these changes in public attitude, and particularly the high priority now being given by Government itself to environmental matters, offer real hope for the future.

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Napier Shelton

U.S. Biosphere Reserves Go To Work

In 1970 an ambitious new effort to improve relations between man and his environment was born. UNESCO created the Man and the Biosphere Program (MAB) to increase our understanding of the Earth's ecosystems and of human impact on their dynamics. Ultimately, it is hoped, the program will provide the necessary guidelines for rational use of our biosphere. Varied research relating to these topics has been underway for a long time, but most of it has been independent of other studies. MAB's primary goals are to coordinate and focus new studies on the major world environments and environmental problems and to communicate the results of the work to those who undertake to "manage the earth."

The MAB program is guided by the International Coordinating Council (ICC), a group composed of scientists from 30 nations. UNESCO provides the international secretariat. In each country that participates in the program (currently more than 80), a national committee organizes activities directed at national problems, within guidelines from the ICC.

All MAB program activities presently are conducted within one of 14 project areas. Projects 1 through 7 focus on particular kinds of environments — tropical forests, temperature forests, grazing lands, arid zones, fresh water, mountains, and islands. Projects 9 through 14 focus on systems and processes — pesticides/fertilizer, engineering works, urban ecosystems, demographic change, perception of environmental quality, and pollution. The chairmen of these Projects in a country form the national MAB committee.

Central to the entire MAB program is Project 8 — Biosphere Reserves. An international network of biosphere reserves is being set up to preserve representative samples of the earth's ecosystems, with the

genetic materials they contain, and to provide testing grounds where the tolerance of these ecosystems to human manipulation can be studied. This article describes the United States' attempt to establish and use such reserves.

At the international level, the MAB task force on criteria and guidelines for the choice and establishment of biosphere reserves designated three main categories of reserves: (1) natural areas representative of biomes, their main subdivisions, and transition zones; (2) unique areas or areas with particular natural features of exceptional interest; and (3) man-modified landscapes (UNESCO 1974). Each reserve, the task force decided, should have a "core" area that is preserved in a natural state, and a "buffer zone" in which manipulative research could be conducted. It is this combination of both preservation and experimentation that makes biosphere reserves unique.

While evaluating areas for inclusion in the biosphere reserve network, the U.S. MAB Committee on Project 8 quickly realized, however, that very few existing sites in the U.S. fit the core and buffer zone model. There were many areas such as national parks, which were dedicated exclusively to preservation of sample ecosystems, and many other areas, such as experimental forests, that were devoted to manipulative research. The Committee therefore "developed the concept of multiple reserves whereby experimentally oriented tracts are matched with large preserves similar in biologic and environmental features. Together they provide a single conceptual biosphere reserve for a biotic province." (Franklin 1977).

Examples of composite biosphere reserves are, in Oregon, the H.J. Andrews Experimental Forest and Three Sisters Wilderness, both administered by the U.S. Forest Service; in the central Rocky Mountains, Fraser Experimental Forest (Forest Service) and Rocky Mountain National Park (National Park Service); and in the Southern Appalachians, Coweeta Experimental Forest (Forest Service) and Great Smoky Mountains National Park (National Park Service). Some reserves, such as the Central Plains Experiment Station in Colorado, run by the U.S. Agricultural Research Service, have not yet been matched.

As of November 1978, 29 biosphere reserves had been established in the United States. All were existing preserves or experimental areas, and, as the criteria require, all had long-term legal protection. Administered by five U.S. federal government agencies (Forest Service, National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Agricultural Research Service), these reserves are in biotic provinces ranging from Alaskan tundra to Puerto Rican rain forest.

As the first selections were being made, a *MAB Information Synthesis* (Risser, in press) was underway. This report characterizes each reserve by selected environmental and biological parameters, so that quantifiable comparisons between reserves can be made. The *Synthesis* identifies various gaps in the distribution of reserves, showing, for example, vegetation types and climatic regimes that are poorly represented or missing from our biosphere reserves.

In 1978 the U.S. MAB-8 Committee received nominations for four new reserves that would fill some of the gaps. Konsa Prairie Research Natural Area in Kansas, co-administered by Kansas State University and The Nature Conservancy, has both protected and manipulated areas of tallgrass prairie. The University of Michigan Biological Station protects and studies 4,048 ha of formerly logged northern hardwoods and pine forest. The Virginia Coast Reserve, owned by The Nature Conservancy, totals 13,511 ha of coastal barrier islands and marshes. Niwot Ridge, a Forest Service "wilderness area" in the Rocky Mountains of Colorado, consists of 1500 ha ranging in vegetation from ponderosa pine forests to alpine meadows. This intensively studied area was proposed as part of a three-part reserve, the existing two being the Fraser Experimental Forest and Rocky Mountain National Park.

Once biosphere reserves are established, the next step is to decide how best to integrate MAB activities with those already underway on the chosen sites. In the U.S., regional workshops in the Southeast, Southwest, Northwest, Rocky Mountains, and California have made significant headway in attacking the problems. Each workshop drew together the managers of the biosphere reserves in the region. In addition, the workshops were attended by scientists who had done research related to those reserves, local government officials, representatives of Federal and State land agencies, and MAB-9 representatives. Recommendations for a U.S.-MAB policy and action plan and for local activities were developed.

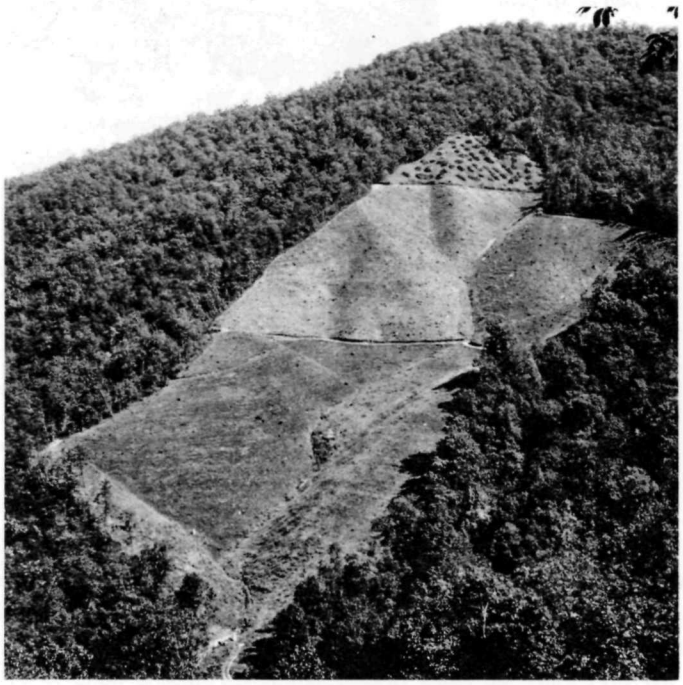
A group of Mexican and U.S. scientists inspect a termite mound in a grazing area in La Michilia. The group was on a tour of the future biosphere reserve. Dr. Gonzalo Halffter, Director of the Mexican Institute of Ecology and head of MAB-8 in Mexico, is the gentleman in the dark sweater (left) leaning over the mound. Photo: V.C. Gilbert.

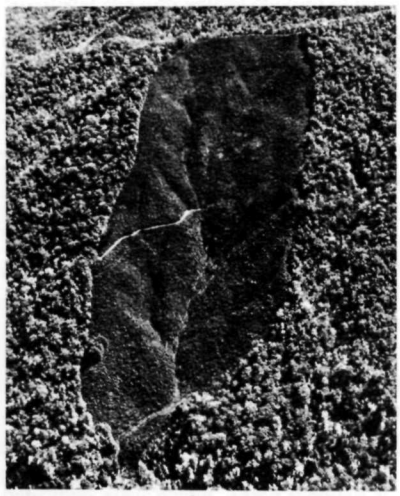
One response to workshop recommendations was the preparation by the U.S. Geological Survey of computer listings of spacecraft images and aircraft photos for each biosphere reserve in the U.S. These will have many uses. For instance, examination of photographs taken over a 5-year period at the Desert Range Experimentation Station in Utah has revealed a darkening trend, which when interpreted, will help in identifying desertification indices. Such indices can warn of deteriorating conditions or measure the impact of management.

Two North American biosphere reserve groups—one in the East and one in the West—offer particularly good examples of the potential of the important MAB concept which stresses cooperation among biosphere reserves and among scientists and countries concerned with similar problems.

The Appalachian Mountain Cluster, consisting of Great Smoky Mountains National Park, Coweeta Experimental Forest, and Oak ridge National Laboratories, deals with moist deciduous forest of the Eastern Forest Province. Great Smoky Mountains National Park encompasses 213,057 ha of rugged mountain forests in eastern Tennessee. Sixty percent has been logged or farmed in the past, 40 percent is virgin forest. Although research has been conducted in the Park since the 1930's, a carefully planned, coordinated research program, influenced by the Park's status as a biosphere reserve, has been underway for only a few years. Emphasis has been placed on filling critical gaps in basic information through establishment of permanent vegetation plots, remapping of park vegetation (last done in the 1930's), inventory of rare and endangered species, and monitoring of populations of exotic species and their effects. Climatic measurements, which have been collected for many years, are being continued. In recent years precipitation pH has been closely monitored because of the growing global concern about "acid rain." These inventories and monitoring efforts will form a good base for describing the Great Smoky Mountains ecosystems as they are now and as they react to internal and external influences in the future.

Great Smoky Mountains National Park is a preserve where human influence on the environment is kept to a minimum. Not far to the south, in similar forested terrain, the Forest Service's Coweeta Hydrological Laboratory measures the effects of various forestry practices on the habitat. The 35-year accumulation of hydrologic and climatological





Mature oak/hickory-covered watersheds at Coweeta Experimental Forest in the southern Appalachian mountains serve as a baseline for evaluating the effects of species conversions such as to white pine (center) and to grass (left) on the quantity, quality and timing of stream flow, and on nutrient cycling processes. Photos courtesy of the U.S. Forest Service.

records, together with data on past watershed manipulations, form a basis for present research on nutrient cycling and ecosystem stability. Data from the undisturbed national park to the north provide useful comparisons with findings at the experimental Forest Service laboratory.

Cooperation among Coweeta, Great Smoky Mountains, and Oak Ridge National Laboratories, administered by the U.S. Department of Energy in east Tennessee, is being encouraged. Oak Ridge offers extensive computer and information storage facilities, as well as forest ecosystem studies that can be compared with those on the other two areas. Computer terminals will be placed at Great Smokies and have been placed at Coweeta to take advantage of this resource. Oak Ridge is not an official biosphere reserve, however.

Thus, cooperation among three areas, run by three different U.S. Government agencies, is helping to point the way toward wise forestry and recreational practices in Eastern American hardwood forests.

In the west, a pair of biosphere reserves illustrates the possibilities of cooperation across international boundaries—a prime MAB objective. The Beaver Creek Watershed, an experimental area within Coconino National Forest in Arizona, and La Michilia in Durango, Mexico, both lie in dry pine-oak forests in mountainous areas.

Beaver Creek has an 18-year history of research on the ecological effects of various logging practices. Scientists here are developing ecosystem simulation models for use in estimating commodity production and effects of alternative forest management practices on many facets of the ecosystem.

La Michilia consists of protected wild areas on the highest ground and ranches and communal farms on other areas. Thus far, research here has emphasized environmental and biological inventories, but more sophisticated projects, such as the use of insect biomass as an ecological index, now have been undertaken.

Cooperation between the two biosphere reserves will allow knowledge gained at each to be applied and tested at the other. For example, La Michilia will serve as a testing ground for the models developed at Beaver Creek, and will benefit from their applications to grazing and forestry. Insect biomass indices developed at La Michilia will be tested at Beaver Creek. Both reserves will be used as training grounds for investigators from Mexico, the United States, and other countries. Over the coming years, this cooperation is expected to add greatly to our knowledge about management of dry forestland from eastern Washington through Central America.

If biosphere reserves are to serve as benchmark areas and testing grounds for various management practices, their environmental, biological, and anthropological parameters must be monitored to detect change. In October 1978, scientists from 11 nations met in the United States to develop guidelines for international long-term monitoring programs in biosphere reserves. For most types of data, three levels of monitoring were worked out, to fit the levels of funding, knowledge, and equipment available. After thorough review by MAB-UNESCO and MAB national committees, these guidelines will be published.

Although most monitoring in biosphere reserves will be tailored to local or national needs, the reserves are also intended, where feasible, to serve international needs. Land use, climate, air pollution, carbon dioxide, and pesticide levels are among the variables being monitored worldwide by international agencies such as the Food and Agriculture Organization, the World Meteorological Organization, and the World Health Organization. Biosphere reserves should prove useful as data collection sites in such programs.

At this early stage, the American public is generally unaware of the MAB program. To begin the enlightenment process, bronze identification plaques have been made for each U.S. biosphere reserve. Brochures explaining the U.S. MAB program have been printed, and brochure inserts describing the particular role of each reserve in this program are planned.

To improve communication among scientists working on MAB projects, a bulletin has been developed. The final goal is to get the results of research into the hands of land managers and decisionmakers. Toward that end, the publications subcommittee of the U.S. MAB National Committee is investigating ways to publish and distribute technical notes, less technical versions of such reports, and handbooks.

The benefits to our lands and waters of this information flow should begin within the year. Perhaps soon the Man and the Biosphere Program will have real impact throughout the world. Biosphere reserves, the core of this program, will stand as symbols of hope for the health of our planet.

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PARK VIEWPOINTS

Honesty in Interpreting the Cultural Past *Marcella Sherfy*

By 1965, the U.S. National Park Service had earned a solid reputation for good interpretive programs in historical and natural parks. It prided itself on brief, informative presentations and exhibits that sparked visitors' curiosity and made *understanding* park values an enjoyable experience. The Service, in fact, had come to consider *interpretation,* both the label and the unique activity of limited communication, one of its most important contributions to good park practice.

But by 1965 also, many Park Service historical interpreters had abandoned thematic or chronologically outlined walks and talks that characterized earlier historical interpretation and were experimenting instead with historical demonstrations and "living history" dramatizations. The interpreters were part of a generation increasingly reluctant to glorify their country's military and political past. They addressed the first American audience reared exclusively on fast-paced television entertainment. And they shared with visitors that decade's special political, environmental, and social unrest, which bred a longing for apparently simpler, more ordinary, hopeful times and lives.

The innovations that historical interpreters made in the 1960's reflected the particular climate of that decade and represented the Service's long-standing commitment to relevant,helpful interpretation. Historical demonstrations and dramatizations became very popular. Americans enjoyed the resulting blend of information, entertainment, and nostalgia.

But in its increasing dependence upon living history and demonstration, historical interpretation has come to violate the boundaries of interpretation's special function and the canons of historical study and presentation. It has become a form of communication used more to attract interest and applause than to translate park values into understandable terms. Its use as a vehicle for communicating contemporary social and political beliefs abuses historical people and the sense of the past. Its sweeping claims to broad portrayal of the past blur visitor perception and appreciation of historic resources. Historical interpretation, in short, needs to be honest in its treatment of the past and in its statement of purpose.

The two statements that follow address both elements of our responsibility as historical interpreters.

An Ethic Beyond Accuracy

No historical interpreter admits any virtue in factual error. But that is only the beginning of historical interpretive ethics. We must be historically *honest* as well as accurate.

Historical honesty involves a particular patience, tolerance, and perspective. It requires a desire to understand and present the events of the past in the past's own terms. It is the delicate task of both trying to put ourselves into the perceptions of another generation and still recognizing that we cannot fully do so. It suggests that we treat historic people as we would wish to be treated by future interpreters.

To be historically honest, we:

— have no right to assume that people of the past felt as we do about similar experiences or ideas.

Pictured here are examples of "living history" presentations at Colonial National Historical Park. The park employee in battle dress tells visitors something about the equipment and life of a militiaman during the Revolution. The bewigged gentlemen introduce visitors to the "Americanization" of an important Colonial family in the restored 1711 Nelson mansion at Yorktown. NPS photos by Richard Frear

—cannot imbue previous generations with our own political principles or values.
— cannot misleadingly "select" the facts that we present to make a particular point.
—must not think or tell others that we are portraying the past when in fact we are simply demonstrating some few physical activities or objects of a previous generation.

Few experiences are more frustrating than to stand silent, unable to offer any explanations or qualifications when someone pokes fun at us, takes our words out of context, bends our opinions to serve their arguments, or characterizes us with unimportant details of our life. The people of the past are in that position. Since we will be where they are someday, we have every reason to be as thoughtful and honest about our predecessors as we want posterity to be with us.

That kind of honesty requires a different sort of research than that needed to determine the exact color of a military uniform. But it is far more important. What we are doing, after all, is *interpreting*. That means that we must *listen* to the people of the past in all records and sources we can find and then *repeat* (not twist or cull or exaggerate) their words and thoughts.

Past Time

Interpretive programs are now characterized by the words "recreate" and "reenact." Living history talks and interpretive brochures frequently begin with the words "step into the past with us." And when asked what it is we want to accomplish in a historical area, we often respond "to make history live."

Perhaps we use those phrases only because we were taught in school to employ clever, dynamic introductions. Or, perhaps we have used them so long in interpretation that we believe that they express what we do. Regardless, those phrases are misleading and in a real sense dishonest.

Rather what we do at any historical park is preserve and interpret remnants—pieces—of the past that have survived to the present. Those remnants include buildings, fences, furniture, and—as presented usually in written form—the bare outlines of human thought and activity. Those remnants are surrounded by the rest of our parks or the rest of our words and actions. We design that surrounding environment or activity to resemble what we think the historic setting was . But in no sense have we brought back or "recreated" the past. Except by miracle, we will not do so. Yes, we can reproduce some physical elements of the past. But even on the most simple items such as clothing, we cannot even after much debate and research — be certain that we are wholly accurate. The physical world itself changes subtly though irrevocably: weather patterns shift; chemical fertilizers and insecticides take a toll; breeding changes the animal population. We simply never know everything about a physical historic environment.

It is extremely important to recognize that no formula exists from which to recreate the thoughts, values, and emotions of people who lived in the past. Even having studied the literature of a previous generation, worn its clothes, and slept on its beds, we cannot free ourselves of our own perspectives and values. Inevitably, we use our perspectives and values to evaluate and interpret previous generations. We cannot, however we might wish it, be another person or know his time as he knew it or value what he valued for his reasons.

Our claims to presenting a total recreation of the past are misleading and destructive. Our certainty that we can "know" earlier generations denies essential human complexity. More important, that claim distorts our visitors' understanding of history and its value to us in the present. Too often we promise visitors a total "past". Then we really give them bits and pieces of it instead, allowing them to assume that they have learned all there really is to know about an event, a lifestyle, or a person. The deception leads to romanticizing, false stereotyping, and easier manipulation of the past for use in propaganda. Visitors will, I think, understand more of the past, consider it more wisely, and want to know more when we tell them the limits of our knowledge and portrayal.

Past time, in short, has gone by forever. That is the first principle we should convey to visitors at historical parks. The magic of history and its ability to provoke thought and learning depend on our recognition of how intricate and unfamiliar earlier human life may be. Hence, we must make the remnants of the past in our historical parks prompt visitor curiousity about the past, rather than be a reassuring, but false presentation of "the way it was."

Marcella Sherfy is a historian who developed the foregoing Viewpoint while serving with the Division of Cultural Resources Management at U.S. National Park Service headquarters in Washington, D.C. She is now a historian with the Heritage Conservation and Recreation Service, a new organization within the Department of the Interior which recently absorbed archeological and historic preservation functions previously carried out by the National Park Service.

PARK TECHNIQUES

National Park Roads in the USA: Purposes and Design Standards

James W. Stewart

The National Park System is distinguished by two basic factors: the quality of its natural, historical, and recreational resources, and the protection of these resources unimpaired for the present and future benefit and enjoyment of the people.

In recent years these national parklands increasingly have become places of temporary escape from urban life and for the refreshment and renewal of values we like to call the "national park experience." Mobility of vacation travelers has brought some of the most remote wilderness areas within easy reach. As the result of these factors the parks must now cope with a volume of visitors that seemed inconceivable a decade ago. There were 61 million park visits in 1965 and 103 million in 1966, but by 1977 the total visitation had reached approximately 263 million people! Much of this increase, however, is accounted for by new additions to the Park System in or near heavily populated areas.

This extraordinary level of park visitation represents both a threat to park values and an opportunity to interpret their values as a significant part of this Nation's natural and cultural inheritance. Since the abiding purpose of our large national parks is to bring man and his environment into closer harmony, it is this, the *quality* of the park experience — and not the statistics of travel— which must be our primary concern. Appreciation and enjoyment of a visit to a national park depend to a remarkable extent on it being a leisurely experience, whether by automobile or on foot, or by some other means, and the distinctive character of the park road plays a major role in setting this essential, unhurried pace.

In our view, the design and location of park roads must be in harmony with the philosophy that *how* a person views the park can be as significant as *what* he sees, thereby helping insure that national parks remain places to which people go for a special kind of experience, rather than merely places where famous scenic and cultural wonders may be seen. This

Scenic roads should fit into the landscape with a minimum of disturbance to the land and to its flora and fauna. This example is on the Blue Ridge Parkway in North Carolina.

obviously imposes limits on the use of present road systems and construction of new ones.

The purpose of park roads, their design standard, location, and impact on parklands has been an issue since about 1918 when the problem of the automobile in parks became a reality. At first, this accommodation consisted primarily of improving the quality and width of the existing roads designed for horsedrawn wagons. In the early 1930's the aim of roadbuilding was convenience, freedom from dust, avoiding steep grades, and to do as little damage as possible to the landscape. Looking at the history of how access was developed in the national parks, it is apparent that up to the mid-1960's administrators thought mostly in terms of meeting or keeping ahead of the demand for places to drive and park so visitors could have "a park experience."

Policy directions developed in the early years of park growth do not always match present day realities. For example, Secretary of the Interior Lane's directive of May 13, 1918, stated that "Every opportunity should be afforded the public, wherever possible, to enjoy the national parks in the manner that best satisfies the individual taste. Automobiles and motorcycles will be permitted in all of the national parks; in fact, the parks will be kept accessible by any means practicable." In an interpretation of this policy, Director Mather stated:

> "It is not the plan to have the parks gridironed by roads, but in each it is desired to make a good sensible road system so that visitors may have a good chance to enjoy them. At the same time, large sections of each park will be kept in a natural wilderness state without piercing feeder roads and will be accessible by trails by the horseback rider and hiker."

Now, 60 years later with annual innundations of visitors, mostly in automobiles, we have quite different problems to solve. New roads and more parking spaces, by themselves, obviously aren't the answer, for there is no end in sight if present trends continue. Futhermore, in most park locations it is impossible to construct roads — of whatever standard — without causing damaging, enduring scars, obstructing the natural movement of wildlife, and degrading the very resources we are obliged to preserve.

For some years it has been our policy that when faced with a choice between creating a severe road scar in order to bring visitors to a destination point, or requiring visitors to walk a considerable distance, new road construction is to be considered *the last resort* in working out solutions to park access.

Where the road systems are well established, as in older parks, solutions to circulation problems must start with that given situation: Speed limits can be reduced; two-way roads can be converted into total or partial one-way systems; existing administrative or service roads may provide for leisurely one-way nature roads or other uses; automobiles may be limited to certain portions of a park, and bus, minitrain, or other transportation furnished.

We have had great success in such limitation with introduction of the visitor transportation system (VTS) program. The first minitrain system was inaugurated in 1971 at Yosemite National Park, and now the program has been expanded to 16 other park areas. During 1977, more than 8 million park visitors made use of the 17 systems. In addition, visitor transportation is provided in 18 other Park Service areas by park concessionaires.

In our approach to new access solutions, it must be assumed that those who visit the national parks do so for the purpose of enjoying a unique experience, and therefore are willing to accept necessary restrictions, including those regulating numbers of people and their means of travel. If the park experience is to keep its distinctive quality, the numbers of people and their methods of access and circulation will necessarily have to be more closely controlled.

However, we must keep in mind that as the economic realities of energy use change the American lifestyle, the use patterns in national parks will also change. Accommodation of the automobile may cease to be a "problem" in the proportions it has been in the past. Other issues also must be addressed. A very hard look must be taken at the purpose of park roads and the aesthetic standards to which they were built in relation to relentless pressure to "upgrade" these park roads to meet safety standards prescribed for Federal-aid highways. Highway safety is mandated and is of utmost concern. How and to what extent safety measures must be applied to the park road situation continues to be an issue.

In order to effectively deal with changes in visitor use and needs, the Service will question the continued validity of the existing road system, whether the system needs to be curtailed, expanded, or supplemented by other circulatory modes. The use of public transit or limitations on use must be considered as an alternative to road improvements where the capacity of roads and parking are chronically exceeded. The following policy criteria should be applied in considering the construction, expansion or upgrading of a road as a means of access, with findings as follows:

— access to the area is necessary;

— the road is the best alternative;

— the resulting effects on the park environment — including wildlife mobility and habitat, rare and endangered plant and animal life, archeological and historic resources, drainage, stream flow, erosion, cuts and fills — will be kept to the minimum feasible;

— the road is intimately and harmoniously related to the landscape through which it passes; and that

— it takes maximum advantage, consistent with the foregoing criteria, of interpretive and scenic values.

In summary, a road should not be considered until the most thorough and thoughtful determination has been made of the most meaningful way in which people can experience the park, and no road should be constructed that is not in harmony with the primary resource protection mission.

James W. Stewart is Chief of the Appropriate Technology Division, National Park Service, Washington, D.C., 20240 USA

Design Standards

The following text is taken from the 1968 U.S. National Park Service booklet entitled "Park Road Standards."

Five types of park roads exist: major, minor, special-purpose, interpretive (motor nature), and administrative. And then there are national parkways.

Park roads, of these varying types, are built over terrain and under climatic conditions which approach the infinite in variety: On high mountain ridges in rugged terrain — along seashores and lakeshores — from the permafrost of Alaska to the deserts of the Southwest and the Everglades of Florida—over lava fields and through rain forests. Each road problem must be influenced by the specific local conditions of climate and topography, as well as ecological and interpretive factors.

This requires maximum flexibility in working out design features, which does not permit the establishment of arbitrary standards. Instead, the following guidelines are provided, within which necessary flexibility can be reached.

Design: An esthetically pleasing road is one which lies lightly upon the land utilizing natural support wherever possible. Moreover, heavy cuts and fills must be avoided. In effect, the road is molded to the terrain through which and upon which it is passing. Monotony is avoided, and maximum advantage taken of park values, by eliminating long tangents, by changes in elevation, by developing viewpoints and overlooks as well as providing close-range views of local scenes. The road should, in fact, strive to maintain a continuing sense of intimacy with the countryside through which it is passing.

In forested terrain, clearing limits should be carefully controlled and selective cutting should be used to produce variation and indentation in the tree line. Retaining walls can reduce the height and extent of cut-and-fill slopes. In heavy mountainous terrain and under certain other conditions, serious consideration should be given to the use of trestles or bridges, tunnels, and half-viaduct sections to reduce scarring and permit movement of wildlife.

Ditches and Slopes: The immediate roadside setting must exemplify the highest design quality in terms of blending ditches and shoulders and related tree and other vegetative cover. The objective should be a natural and attractive setting. To minimize maintenance problems, cut-and-fill slopes should be rounded, warped at the ends for transition, and properly seeded, fertilized, and mulched for early recovery and to control erosion.

Roadway Structures: The design of all structures—bridges, tunnel portals, grade-separation structures, and retaining walls—should be aesthetically pleasing as well as functional and easily maintained.

Engineering: Working within the guidelines established by scientific, interpretive, and aesthetic considerations, the engineer is responsible for providing expert engineering advice in road planning, and for constructing a road which is safe, has adequate foundation and drainage, and will require a minimum of maintenance. Engineering also includes thorough soil analysis by borings and other necessary geological determinations to assure roadbed stability.

Vertical Alignment: On parkways, major and minor park roads, and administrative two-way roads, grades of 7 percent are normally a desirable maximum, but grades of 8, 9 or even 10 percent should be considered for relatively short distances to avoid excessive

Traffic congestion and other problems resulting from too many private cars have forced a number of parks to exclude automobiles from certain areas. Mini-trains or other group transport vehicles replace them. The first Mini-train system was inaugurated in 1971 at Yosemite National Park. Now 34 other U.S. park areas also have similar systems.

Horizontal and vertical alignment of park roads should respect the terrain. This road is the Natchez Trace Parkway in the states of Alabama, Tennessee and Mississippi.

cuts and fills or to reach desirable points of interest. On one-way roads where vertical sight distance is not a problem, these requirements can be further relaxed and a more undulating gradeline used to reduce cuts and fills to a minimum and to provide for leisurely driving.

Design Speed: The maximum degree of curvature permitted on a road is generally expressed in terms of "design speed" which represents the maximum speed at which a curve can be safely driven. Thus a road with 25-mile-per-hour (40 km/h) design speed has no curves which cannot be safely negotiated at 25 miles per hour.

Except in special cases approved by the Director, major and minor roads in natural and historical areas should have a design speed not to exceed 25 miles per hour, parkways and major roads in recreation areas, 45 miles per hour (72 km/h), and special-purpose or interpretive roads, 15 miles per hour (24 km/h).

Rigidity in laying out horizontal alinement to a uniform design speed should be avoided, by reducing the design speed to fit the terrain, with the proviso that proper signs should mark the drastic reductions in design speed for the safety of the driver.

Roadway Widths: Roadway width constitutes the width of the final completed roadway extending from edge of shoulder to edge of shoulder. A road having 22 feet (6.70 m) of pavement and 3-foot (about 1 m) shoulders would have a roadway width of 28 feet (8.53 m).

Selection of the proper roadway width is made on the basis of numerous factors including existing and anticipated traffic volumes, safety, type of terrain, engineering requirements, design speed — and the purpose for which the road is being built. Pavement widths that are too narrow can defeat their own function.

The extreme outer edge of the pavement, the weakest point, carries the wheel load and tends to break down and create a raveled edge which requires constant patching and maintenance.

The width of shoulders is equally important. Shoulders which are too narrow do not provide good support for the edge of the pavement nor adequate space for pull-off in case of emergency.

Except as may be approved by the Director, roadway widths in natural areas shall be as follows:

1. Major two-way park roads should have a pavement not to exceed 22 feet (6.70 m) plus shoulders not to exceed 3 feet (about 1 m).

2. Minor two-way park roads should have a pavement width not to exceed 20 feet (6.10 m) with shoulders not to exceed 3 feet.

3. Major, minor, and special-purpose one-way park roads should have a pavement width not to exceed 12 feet (3.66 m) with shoulders not to exceed 2 feet (62 cm).

4. Interpretive (motor nature) roads should have an overall width not in excess of 14 feet (4.27 m).

5. Administrative roads should be of the minimum width necessary to serve the purpose of the road. In no event may they exceed the guidelines for minor park roads.

6. Where guardrails or guideposts are required for reasons of safety, two additional feet (62 cm) of shoulder will be permitted.

The foregoing standards will not permit certain oversize vehicles to use such roads safely, and such vehicles should be prohibited by regulation.

Recreation Areas: As a rule, two-way parkways and two-way major roads in recreation areas serve functions broader than roads in natural areas, such as driving for pleasure and providing access for recreational vehicles and boats. Accordingly, where necessary to accommodate such use, roadway widths for two-way roads in recreation areas may be 24 feet (7.32 m) of pavement and shoulders not to exceed 4 feet (1.22 m). Roadway widths in excess of the foregoing should be approved by the Director. In those recreation areas where the road is part of a through highway, no higher standard should be approved within the area than exists for the roadway outside the area.

Other type roads (minor two-way roads, interpretive and administrative roads) in recreation areas should be of widths specified for similar roads in natural areas.

Parking: Parking areas, either within the system or at terminal points, are an integral part of the circulation system. The placement of parking areas where they intrude, by sight or sound, on significant features must be avoided. Moreover, the size of parking areas should be limited to the greatest extent possible for effective operation. Where large parking areas are necessary they should be broken up with plantings and screenings, if possible.

Signs: Roadside signing, whether regulatory, informational, or interpretive, is an integral part of the visitor experience, as well as road design. Care should be exercised to insure that the quality and design of all signing enhances the visitor experience.

Road Surfaces and Materials: Wherever appropriate, the color of materials used in road construction will be chosen to harmonize with the general character of the landscape. Chips used for periodic sealing and repair should be selected from appropriate rock material sources. The above is equally applicable to parking areas.

Trail Surfaces and Materials: A particular effort shall be made to avoid the construction of black top trails in sensitive areas such as Indian ruins and natural features, and the above guidelines for road materials will apply to trails. Elevated boardwalks, such as the Anhinga Trail (in Everglades National Park), are often effective solutions, and methods of stabilizing soils should be investigated.

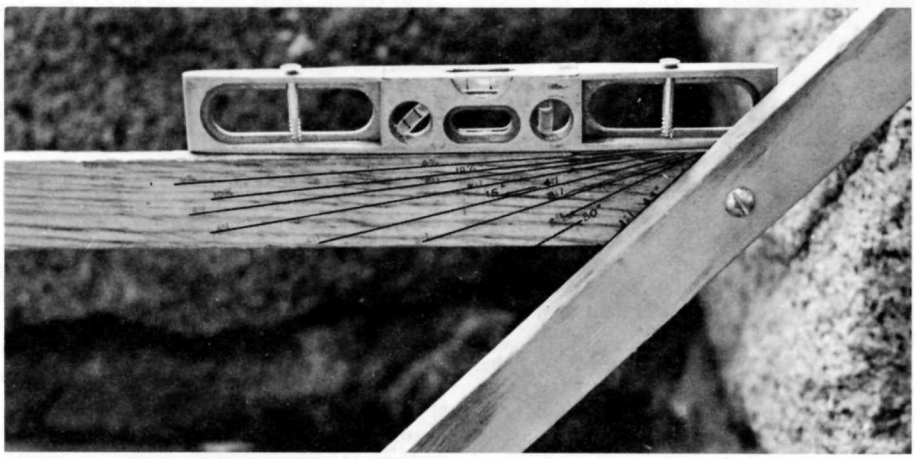
Borrow Pits: Only when economic factors make it greatly impractical will borrow pits be created in the parks, or present pits further utilized, unless located in washes or other places where natural factors will eradicate the scar.

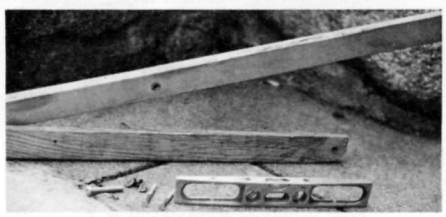
One-way Roads: In general, the philosophy should be followed that the primary park purposes of preservation, enjoyment, and interpretation are collectively served better by one-way roads than by two-way roads (major and minor park roads and parkways). Accordingly, one-way roads should be constructed in preference to two-way roads wherever practicable, when in keeping with the purpose of the road and these guidelines.

Interpretive (Motor Nature) Roads: An often overlooked opportunity to disperse the traffic load and to increase visitor enjoyment is to convert existing roadbeds — such as abandoned roads and railroads, fire roads, and administrative roads — into interpretive roads or motor nature trails. Their use for this purpose is encouraged. These low-speed, often one-way roads, with ample parking, viewing, and trail opportunities, encourage visitors to explore the scenery and features at a leisurely pace.

Alternate Methods of Transportation: The Service must avail itself of an up-to-date, continuing analysis of all potentially useful modes of transportation. Feasible alternatives to road transportation should receive experimentation in parks or recreation areas in which serious circulation problems now exist or in which access has not yet been provided.

There are many areas where no roads should be built because their marks on the landscape would be unacceptable. Unfortunately, too many parks have been cut and scarred by roads that were located without much thought having been given to the visual aspect or other disturbances. At this park, Fort Bowie National Historic Site in Arizona, visitors must walk into the ruins area.





A Gauge You Can Make to Check Slopes and Angles

Roads, trails, parking lots, campgrounds, ramps and the like often involve the use of slopes or other construction where angular measurement is required.

In lieu of expensive instruments, the following design for a simple gauge that can be operated by one person will be found suitable for most rough field work. With it you can check slopes and grades under construction, lay out the angular lines for parking lots or campground spaces and do similar jobs.

The gauge requires only a small carpenter's level, two laths or similar small pieces of milled lumber, a protractor, and several bolts and nuts.

Some years ago Lawrence F. Knowles made the instrument shown here while working as a landscape architect at Yosemite National Park. On the side of one lath he plotted lines to show angles of slopes, grade percentages, and other angles most often used in road construction. These included grades such as 6 and 10 percent, slopes such as 8:1, 6:1, 4:1, 3:1, 2:1, and 15°, 30° and 45° angles. A small carpenter's level was attached on top of this lath.

The second lath was pivoted with a through bolt to the first lath so that when moved its top edge lay parallel to the plotted lines.

The instrument in parts and assembled, and employed in various common uses, is shown in the accompanying photographs.

This award-winning idea was originally presented in *Grist,* Volume 14, No. 1, a Park Practice Program publication of the U.S. National Park Service and the National Recreation and Park Association.

Knots You Should Know: Loops and Nooses

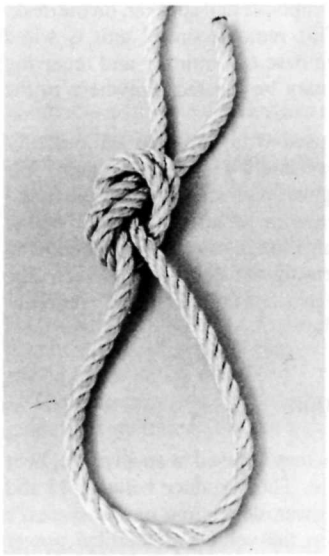
Loops: Closed loops in the end of the line or rope have countless uses. The bowline and its variations, which are among the most useful, were discussed at some length in PARKS (Vol. 2, No. 2, p. 23) but there are others park personnel should know, including the following examples.

Perhaps the simplest, which is easy to make but not easily undone after a load has been put on it, is the *common loop-knot*. This is simply an overhand knot made with the end of the rope doubled.

Another useful loop is the *figure-of-eight loop-knot* which is made by tying a simple figure-of-eight knot with the end of the rope doubled. Like the common loop knot, this is easy to tie and very secure but it is difficult to untie after a strain has been put on it.

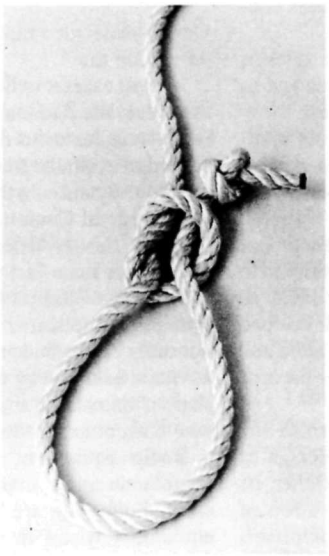
A third variation is a *slippery hitch and thumb knot* or overhand knot. This is easy to make and undo but not as strong as the previous two.

Yet another loop, which is strong and serviceable and easy to undo even after having been subjected to considerable strain is the *running knot and check knot*. This is, as the photo shows, a simple slippery hitch with the end of the running part knotted around the standing part.



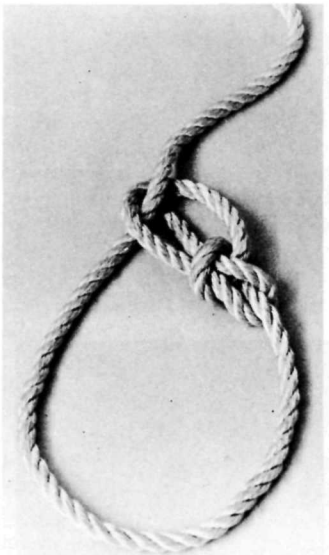
Common loop-knot

Figure-of-eight loop-knot



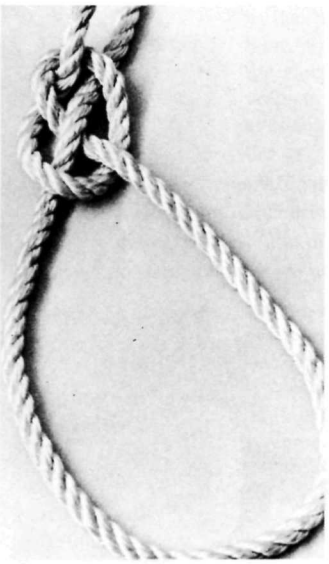
Slippery hitch & thumb knot

Running knot & check knot



Running bowline

Running noose



Crossed running knot

Topsail sheet bend

Nooses: A noose is made when a closed loop is tied around the standing part of the rope. This forms an adjustable loop that can be tightened securely around an object that is to be lifted or handled, and cast off easily when the job is done.

One of the best is the *running bowline*.

One of the simplest nooses is called the *running noose*. To make it tie an overhand knot in the end of the rope and then knot this around the standing part to form the running part.

Another useful running knot is the *crossed running knot*. This is somewhat difficult to describe but its form can be easily made out from an examination of the photo.

Finally there is the *topsail sheet bend*, or midshipman's hitch, which is formed by making a large half hitch and two more above it around the standing point.

With a little practice anyone can learn to tie these simple loops and nooses for which there are many occasional uses in park work.

—R.I. Standish

Photos: Clare C. Ralston, USNPS

Radio for Field Communications

Henry L. Jones and Ray Murry

A well engineered, properly installed and maintained radio system can be a valuable asset to the communication program of any well-run organization. In fact, it is almost impossible to operate any active field organization without a radio system where very large areas and surface transportation difficulties are present, and particularly where land-line telephones are not available. Radios are invaluable for search, rescue, fire, or other emergency uses, and of course for the day-to-day administration of an organization and management of the area concerned.

Radio equipment is expensive but systems can be designed to meet specific needs and to provide benefits that far exceed the cost.

Over the years a system for voice communications by radio has been developed to support management of the 1,348-square-miles (3,493 km^2) Sequoia and Kings Canyon National Parks in the high Sierra Nevada mountains of California. It is a system that can be modified to meet changing needs. It can be updated as technology advances. The system as developed also provides a model that can be modified and adapted for parks and reserves in other parts of the world.

This article is not intended to furnish the detailed technical data necessary to design or purchase a communication system. Rather, its intent is to familiarize the reader with a few of the more common components that comprise a system. Much of the equipment discussed here is used at Sequoia/Kings Canyon and is typical of the field radio systems in the U.S. National Park System.

There are many manufacturers of quality radio equipment throughout the world. The type of equipment needed will be determined by requirements for the physical area, availability of equipment, and procurement requirements, including available funds.

How to Get Started

Once you decide a radio system is needed, what do you do first?

In most cases it will be necessary at the outset to contact the national authority which assigns radio frequencies to determine the regulations related to available frequency bands and licensing requirements. In the U.S.A., this authority is the Federal Communications Commission.

When this is determined, contact with a designer or manufacturer of radio systems and equipment would probably be the next move. For less complicated systems a manufacturer normally can provide this service. Based on his advice a field survey would be the next logical step to determine the type of system which would accomplish the desired results.

Radio equipment is supplied by various manufacturers in many different models and sizes. Following are brief descriptions of the equipment found in a typical system which could include a base station, mobile radios, portable radios and repeater units.

Base Station

The base station is the core of a successful system. They are available in various output wattages, the most common being between 15 and 90 watts of power. The wattage selected will depend on distance and terrain to be covered. A base station radio usually is a self contained unit mounted on a desk or table convenient to the operator, or one that can be operated remotely with only the control unit, including microphone and speaker, on the desk. (Figure 1) This remote control unit is wired directly to the base transmitting and receiving units which may be located elsewhere in the building.

Antennas used with our base stations produce between 0 and 9 decibles (dB) gain. The dB gain designation on an antenna is the measure of increase in effective radiated power (ERP) the antenna is capable of producing without increasing the transmitter power. The gain antenna also aids proportionately in reception of signals.

Mobile Station

Mobile radios may be used in an airplane, boat or land vehicle. They produce between 15 and 90 watts of power, depending on the system's needs, and use the vehicle's electrical power source. Many models have good transmitting range in the higher wattages of output. Combi-

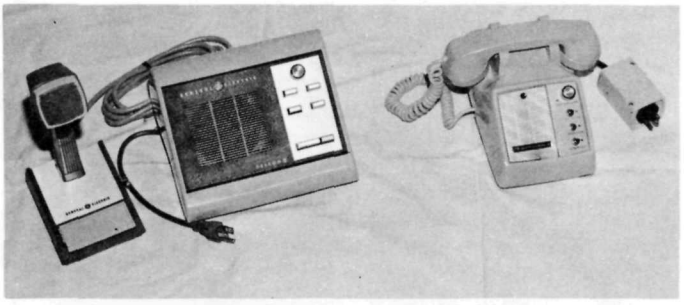


Fig. 1 Right: Telephone and external microphone remote controls for a base radio station. Fig. 2 Below: Control head, microphone and speaker for trunk-mounted mobile radio unit, and the mobile radio receiver and transmitter mounted in the trunk or luggage compartment of a vehicle.

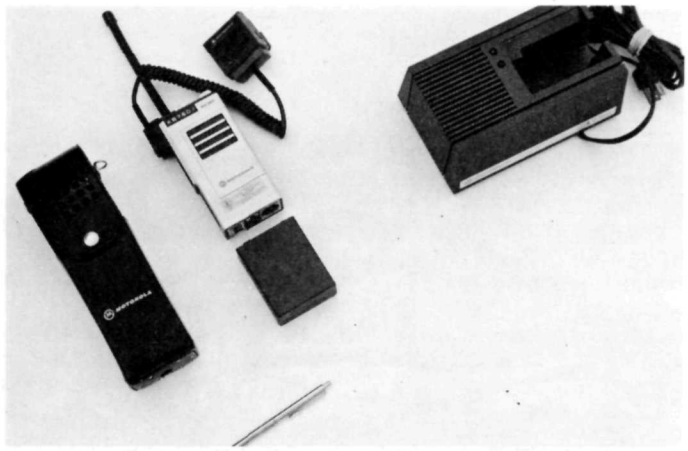


Fig. 3: Using a 5-watt portable radio. Right: A 6-watt portable with battery charger (on right). The carrying case (left) and hand microphone shown attached to the radio are optional equipment.

nations are available which allow the radio to be mounted in a convenient location such as under the seat or in the trunk of a vehicle where it is out of the way (Figure 2). The set is connected to the control head which is located with the microphone and speaker where the user has easy access, as in the driver's compartment. Other mobile radio types are self-contained in a single unit for mounting in the driver's compartment. These generally have to be smaller with a lower power output.

The antennas used on our vehicles are 3 dB gain, roof-mounted. This effectively doubles the radiated power over a 0 dB antenna. The roof of a vehicle acts as a ground plane, thus providing proper antenna performance.

Portable or Hand-held Radios

Portable radios, sometimes called "handie-talkies" or "walkie-talkies" are hand held units which can be carried on the belt or in a backpack. They are battery powered and have a built-in antenna (Figure 3). The goal of all portable units is to provide the best performance with the most power output and yet be light in weight. This often is inconsistent because as power output requirements go up battery size and consequently total unit weight increases.

The most common portables have between 2 to 6 watts of transmitting power. Approximately, these units weigh between 18 ounces (510 grams) and 42 ounces (1190 grams) and measure 3 inches (7.6 cm) wide by 1½ inches (3.8 cm) deep with a height of about 4½ inches (11.4 cm) to 6½ inches (16.5 cm) depending on the type of separate belt-carried battery attachment used. Some larger units have the batteries contained within them.

Portables are powered with widely-available batteries which can be rechargable (nickle cadmium), or non-rechargeable such as mercury and alkaline types.

The battery selection is normally determined by the type of operation required. Rechargeable batteries are the most economical if a recharging electrical source is available in the proper voltage. If alternating current (a.c.) only is available, a transformer and rectifier to supply the proper direct current (d.c.) voltage is required. Where recharging facilities are not available the throw-away type of battery is used.

When a portable is to be used in a vehicle, its performance can be enhanced considerably by using a special console. This allows the unit to operate in the vehicle as a mobile set, or when removed, as a hand-carried portable. In this type of installation the portable unit slides into a fitted space making connections automatically to operate from vehicular electrical power and with the external antenna and a speaker mounted permanently on the vehicle. When in the console the portable unit's battery is being charged from the vehicle's power source.

A wide variety of accessories are available for use with these portables: belt carrying cases, antennas, earphones, headsets, speaker microphones, etc.

Modern technology has reduced the size and weight of the portable radios now available and for this reason they are popular and make a good addition to any radio system. Naturally, the performance is less than a base station or mobile radio because they generally have less power output.

Sunshine Power System

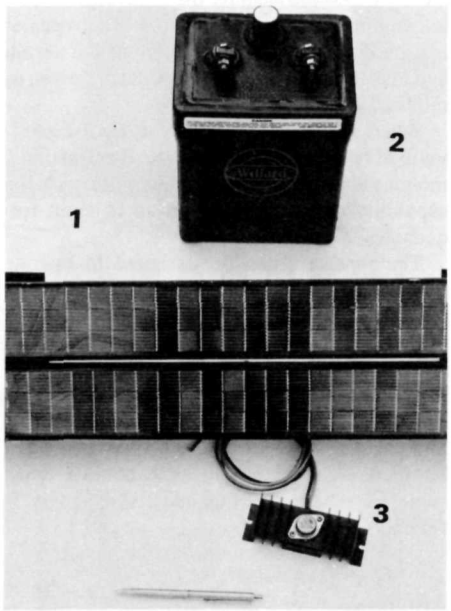
A photovoltaic system is simply a solar powered battery charger. The battery stores the current produced by an array of photovoltaic cells and provides energy to the load on demand. A blocking diode prevents battery discharge back through the array after dark.

There are virtually no boundaries to the use of photovoltaic systems. They operate effectively and are nearly maintenance free in any environment: deserts, mountains, oceans, and congested urban areas and under all climatic conditions.

When properly installed a solar system turns light (even cloudy day light) into direct current electric power and stores it in batteries.

The result is an independent power station located exactly where the user wants it and designed for the task at hand. Complete solid state technology provides a total system which has no moving parts, uses no fuel, and is long-lived. It is virtually maintenance free, fail-safe and inexpensive when measured against the initial and continuing costs of other power sources such as motor generators, thermo-electric generators and even long line or underground commercial power.

A typical solar generating system, pictured above here, is composed of: 1. Solar Array (combinations of solar cell modules to meet power needs). 2. Storage Batteries. Many factors are taken into account: the array and battery



reserves are sized to meet site and load parameters. The number of batteries is governed by the load and the number of days the system must operate with below-average solar radiation. 3. Voltage Regulator. To prevent an overcharge condition a solid-state shunt regulator is used. This also maximizes battery life.

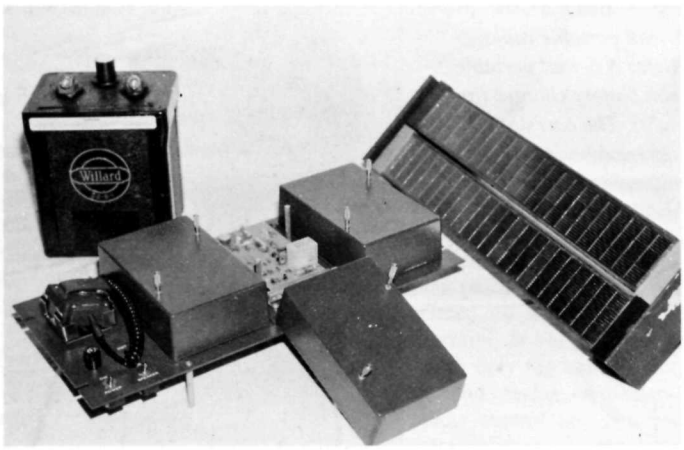


Fig. 5 Left: A repeater installation in the backcountry of Sequoia and Kings Canyon National Parks, and (above) the repeater unit with solar cell and storage battery.

Backpack Sets

The electronics in backpack units are generally the same as in hand-held portables with additional power and signal output available. Backpack units usually have larger and more powerful batteries to provide greater output capacity and they can operate much longer without recharging or replacement. They can still be carried around but are much heavier and larger than hand-held portables, weighing about 12 pounds (5.5 kg). (Figure 4).

The "packsets" have been used to great advantage in aircraft. They are easily removed, have greater power, external antennas, an external microphone, and may be plugged into the aircraft's electrical system.

With external antennas, they can serve in emergencies as low power base stations and mobiles.

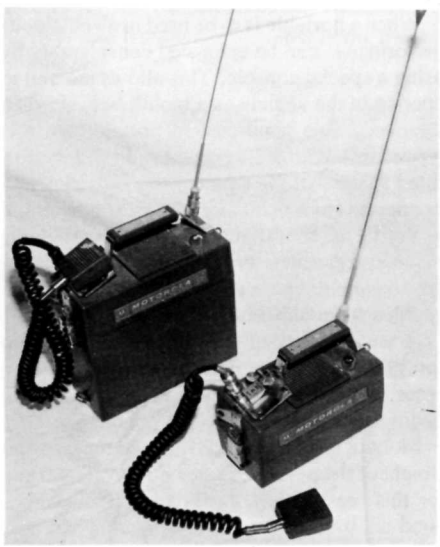


Fig. 4: Pack sets with different battery packs.

Repeaters

If the area you manage is small and has fairly flat terrain, radio communication from one location to another is relatively simple and usually the signals are clear. However, if you are trying to send voice radio signals over mountains or high hills and other obstructions, transmitting and receiving efficiency may be drastically reduced, or even impossible.

In this case you need a repeater station (or maybe several), which is a unit that receives a message and retransmits the signal to another location on a different frequency. The repeater is usually located on a high point of the terrain and may transmit with 5 to 90 watts of power, as required (Figure 5).

When a repeater is used, you need a minimum of two frequency channels. Base stations, mobiles and portables can be supplied with the capability of transmitting on up to eight frequencies.

The repeaters can be designed to operate from commercial power, or replaceable batteries, or batteries that are kept charged by a solar array of photovoltaic cells which convert sunshine to electrical energy. These solar collectors are quite effective, especially in locations that are difficult to reach for servicing. Unfortunately, they are rather costly at present but there are some remote or difficult to reach locations where no other electrical supply is feasible.

Antennas

Antennas come in various shapes, sizes and materials to meet varying requirements. Some of the common types are called collinear, yagi, dipole, corner reflector, log periodic and coaxial. Every antenna has specifications such as gain, radiation pattern in horizontal and vertical planes, impedance, wind loading, lightning protection and many more. Each factor is extremely important. The best radio made will perform no better than the companion antenna installation so expert advice should be sought in selecting the type of antenna to use in particular situations.

Procurement

There are many manufacturers of quality radio equipment. A system should be designed to meet particular needs by a competent technician before the recommended components are purchased. Major components from various manufacturers are generally compatible, but technical experience, plus some experimentation, are required to make the system operate dependably and efficiently.

Cost of equipment will vary. As an example, in the U.S.A. the portables may cost between $500 and $1,500. The mobiles often cost $600 to $2,000 and base stations can cost from $1,000 to $3,000. The cost variance is also affected by the type of equipment, number of frequency channels, the wattage, size and accessories desired.

Maintenance, Preventative Checks and Replacement Parts

Cost and accessibility of service plus the size and complexity of your system probably will determine whether you have the equipment repaired by a dealer, contractor or your own inhouse technicians.

One of the best ways to hold repair costs down is periodically to send all equipment through a preventive maintenance checkup. Once each six months on a rotation schedule the equipment used in Sequoia and Kings Canyon National Parks is serviced. Each piece of equipment is checked and restored to factory

specifications. These preventive checkups reduce major breakdowns and keep the system operating, doing the job for which it was designed.

History cards should be kept on all equipment to record trouble and work performed. This gives the technician not only a record of part failures and costs, but a record of when preventive maintenance is due.

Effectiveness of a Radio System

About 95 percent of the 863,160 acres (349,316 hectares) in Sequoia and Kings Canyon National Parks is now accessible by radio because of the complex system of repeaters used. On occasion, when a rescue operation is going on in a remote area and radio communications are poor, simple messages can be relayed by personnel in aircraft using a mobile or portable radio unit. In case of greater needs, an airborn repeater can be sent up in an aircraft.

Any system will be only as good as the engineering that went into its design and installation, the quality of the components, the preventive maintenance, and care and use of the equipment.

One way to assure proper use is to have periodic training sessions with the employees who use the equipment. Train them so they know how the equipment works, how they can get the greatest efficiency from the system and the proper care and use of the radios. This will do much to assure long life for the equipment. However, attempts by unqualified users to repair these electronic units can be disastrous. Only qualified technicians should make repairs.

Environmental conditions in the area where the radio system is to operate also have an effect on its performance. Wind, ice, lightning, moisture and extreme temperatures are serious conditions that need to be taken into consideration when the system is designed. Salt spray from the ocean can play havoc with a highly sophisticated system if the proper components aren't properly selected, installed, and protected.

Summary

Radio Communication is fast, flexible and efficient but the equipment required is generally expensive. Competent technical assistance is needed to plan and install a system, and proper maintenance is essential. Generally, however, in any remote area or active field operation a well-designed system provides benefits that far exceed its costs.

Henry L. Jones is Management Assistant at Sequoia and Kings Canyon National Parks in California. Ray Murry, a veteran electronics technician, supervises the technical coordination of radio communication systems in the Western Region of the U.S. National Park System.

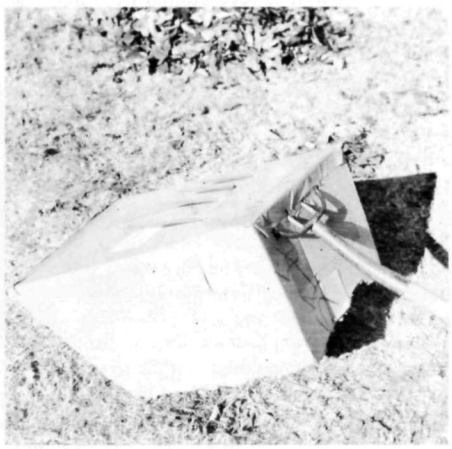
No Cost Leaf Scoop

Moving leaves from raked up heaps to a large container or truck can be easy with a simple scoop. The one shown here, designed by Johnnie Hays while working at Platt National Park (now Chickasaw National Recreation Area), was made from a standard four-tine pitchfork and a cardboard box.

To make the scoop remove the top and one end of the box, and insert the pitchfork tines through the lower back of the box and out the bottom. The box will be held rigidly on the fork.

In normal use one box should last several days. A more durable scoop on the same pattern could be made with light-weight metal.

This idea also originally appeared in *Grist,* Vol. 14, No. 1



Gentle Persuasion

If this sign said "Don't litter" chances are it would be ignored by some people. Visitors, like most people, tend to resent blunt commands. This sign on the Duke of Atholl's estate in Scotland is an example of the opposite extreme. Here the message is in a bit of good-humored verse. Results are said to be very good. *Photo: Gordon Fredine*

BOOKS & NOTICES

The Environmental Impact of Outdoor Recreation, 1977, Geoffrey Wall and Cynthia Wright. Department of Geography, University of Waterloo, Waterloo, Ontario N2L 3GI, CANADA. 79 pages, paper. $5.00, surface postage paid.

This booklet focuses on recreation-induced changes in the environments of outdoor areas attractive to people. Essentially it is a review of more than 200 reports and papers by a very wide spectrum of authors, primarily in Canada, USA, and Great Britain, but several other countries also are represented. The text follows a logical pattern of recreational use effects on the geology, soil, vegetation, water quality, wildlife and air in natural, semi-natural and even urban park environments.

The authors have carefully assembled research findings in all the above categories showing both the similarities and differences in conclusions reached by the various observers. This is very helpful in itself, but a most valuable contribution of this work is to show the variety of approaches and techniques followed. Equally important are the conclusions pointing out where additional, and often much additional, research needs to be done in this field.

The booklet concludes with a sincere effort to appraise the implications of findings for the manager. Given the need for further study of causes and effects of recreation-related degredation of environments, a reasonable effort is made to show what applications of research findings can now be made to developing concepts of carrying capacity, planning, and site management, and where additional work must be done if the quality of outdoor recreation is to be protected. *–Gordon Fredine*

Los Parques Nacionales de Venezuela, 1977. Ricardo Gondelles A., José Rafael García and Julián Steyermark. Instituto de la Caza Fotográfica y Ciencias de la Naturaleza (INCAFO), Centro Iberoamericano de Cooperación (CIC). Industrias Cráficas Casamajó, S.A., Barcelona. 224 pages with 156 photographs in color and a map. Price in Madrid: US$29.80 (INCAFO, Castelló 59, Madrid, Spain)

This is the first book of the series "La Naturaleza en Iberoamérica." The three authors, of recognized authority on the subject, had the advice of Venezuelan experts of high calibre. Its luxurious presentation and the exceptional quality of the illustrations, with photographs of natural scenic beauties and flora and fauna, make this book a graphic document of originality which undoubtedly will go a long way toward filling the basic purpose of making known to the public at large the natural beauties of Latin America. At the same time it teaches respect and consideration for the renewable natural resources. In a parallel way, it serves to increase conservationist culture.

Although the index cites only 17 Venezuelan Parks — Henri Pittier (Rancho Grande), Sierra Nevada, Guatopo, El Avila, El Guácharo, Terepaima, Cueva de la Quebrada de El Toro, Yurubí, Yacambú, Macarao, Aguaro-Guariquito, Morrocoy, Mochima, Archipiélago de los Roques, Médanos de Coro, Laguna Tacarigua and Canaima and the natural protected areas of Isla Margarita — in reality the book covers 19 national parks and 7 natural monuments of the Venezuelan parks system.

It contains a very brief bibliographic list which does not include all the bibliography cited in the text. A list of the scientific and vernacular names of the mentioned species is lacking, but in nearly all cases both nomenclatures are included in the text. A well defined balance characterizes the treatment of the importance of each one of the zones or areas described.

In regard to the bibliography, its elaboration has been done with little orthodoxy. Titles that could be important for the readers are omitted: for example, the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, which is noted in the Introduction, is neither listed nor its origin mentioned in the bibliography. There are inconsistencies in the citing of various authors, titles and pages too, and other minor editorial flaws which probably will escape notice by readers not trained to check such details.

Without any intention of reducing the value of the information contained in the text, which undoubtedly is presented with great care and scientific accuracy, it should be noted that there are occasional lapses from the usual very high standard. (We must remember that the public for whom the work is intended, is an audience that in general gives great authority to the printed word and exercises little criticism regarding the information transmitted.) For example, in the caption of the picture of a guácharo (oil bird) on page 86, it is said that the bird is of the size of a hen with red eyes. Now the color of eyes certainly is that of the iris, and this, in the eyes of the guácharo, is the color seen in the photograph on page 99, a magnificent reproduction of a guácharo in full flight. Its eyes are black. When the pupils of the eyes of any vertebrate are opened to the full diameter, as we see in the guácharo on page 86, the color that appears is that of the blood vessels of the "bottom of the eye" which irrigate the retina and are seen through the humor of the eyeball.

Another inaccuracy is observed in the caption on page 37, which states that the three-toed sloth "eats vegetation at hand." In the selection of leaves for food the sloth is very specific and a high percentage of its daily diet comes from one species alone.

It should be noted also that in the case of this first book of the series a small version was not simultaneously published, the reduced price of which could have made it more accessible to a larger public, as was done for the book about the Costa Rican parks. Furthermore, the cost of the book indicated here for Madrid is below the one charged in Caracas, which takes it out of the reach of many people who need it the most. This is unfortunate because, in principle, it is precisely this group to whom the conservation message contained in its pages is aimed.

In spite of all the criticisms that can be made, it must be emphasized that we are dealing with an original and praiseworthy effort of the highest quality. It would be of great value for all libraries serving the natural sciences, from the taxonomic, biogeographic point of view, as well as being a valuable source of general information with a clear and well aimed conservation message.

If one picture is worth a thousand words, the 156 illustrations of this book "speak" eloquent volumes about the prodigal qualities of nature in Venezuela. *–Braulio Orejas-Miranda*

New *Communiqué* Address

The Foundation for Preservation Technology's bi-monthly newsletter, *Communiqué,* no longer associated with the Center for Anthropological Studies, has a new address in Albuquerque, New Mexico. The editor, Barbara Daniels-Swannack, can be addressed by mail at Box 2165, Albuquerque, New Mexico 87103/USA. Her telephone number is: Area Code 505—766 4721.

Ice capped Osorno Volcano (2740 m) on the shore of Lake Todos Los Santos dominates the eastern part of Chile's Vicente Perez Rosales National Park, one of the first in South America. Photo: Gary Wetterberg