

VOLUME 4, NUMBER 3 OCTOBER, NOVEMBER, DECEMBER 1979

---

# PARKS

---

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

---

# PARKS

---

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

Volume 4, Number 3 October, November, December 1979

- ANNE LaBASTILLE** 1 Facets of Wildland Conservation in Central America
- ANDREW WARREN,** 6 Ichkeul, The Problems of a Wet Park in a Dry Country  
**G. E. HOLLIS, J. B. WOOD,**  
**M. D. HOOPER & R. C. FISHER**
- WALTER L. HARTMANN CRESPO** 11 Belgica Lagoon, First Mexican Educational Park
- NEW ZEALAND WALKWAY** 13 New Zealand's National Walkway Network  
**COMMISSION STAFF**
- 16 PARK TECHNIQUES
- DONALD F. BENSON &** 16 Designing Good, Basic Visitor Centers  
**ROBERT W. BAIRD**
- MERRICK SMITH** 20 Simple Footbridges
- 22 Resource Management
- 22 Climbing Aid
- RALPH SHEETZ** 23 Some DOs and DON'Ts on the Care of Museum Furniture
- 23 Gentle Persuasion
- 23 Good Idea
- 24 BOOKS & NOTICES

*Tall palms edge the beautiful beaches of Cahuita National Park on Costa Rica's eastern shore. This park protects the only significant coral reef formations on the country's Caribbean coastline. Photo: Anne LaBastille*

---

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.

PARKS Magazine is published by the International Union for Conservation of Nature and Natural Resources (IUCN), Dr. David A. Munro, Director General, for a consortium whose members are FAO, UNEP, UNESCO, OAS, Parks Canada, U. S. National Park Service, IUCN and the World Wildlife Fund. It is produced with the cooperation of the Eastern National Park and Monument Association, and with the financial assistance of the Federal Government, States and Territories of Australia, and of New Zealand.

PARKS (USPS 397-270) is issued quarterly in separate editions in English, in French under the title PARCS, and in Spanish under the title PARQUES. Published at Room 3121, 1100 L Street, N.W., Washington, D. C. 20005. Controlled circulation postage is paid at Washington, D. C. Distribution of all editions is by mail. For information please address: The Editor  
PARKS Magazine  
c/o National Park Service  
United States Department of the Interior  
Washington, D. C. 20240/U.S.A.

PARKS printing costs are paid with donated funds. Ideas or viewpoints expressed do not necessarily reflect those of the sponsors, collaborators or advisors.

All material may be reprinted unless it is either protected by copyright or the material has been reprinted in the issue from an identified source publication. In such event no reprints are authorized except upon permission of the copyright holder or the source publication. Reprinted material should bear the author's name and credit to PARKS Magazine should be given. The Editor would appreciate two copies of any material so used.

The English and Spanish editions of PARKS Magazine are printed in the United States. The French edition is prepared and printed in Canada by Parks Canada.

The English edition of PARKS Magazine is available on microfilm from University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan 48106/U.S.A.

Anne LaBastille

# Facets of Wildland Conservation in Central America

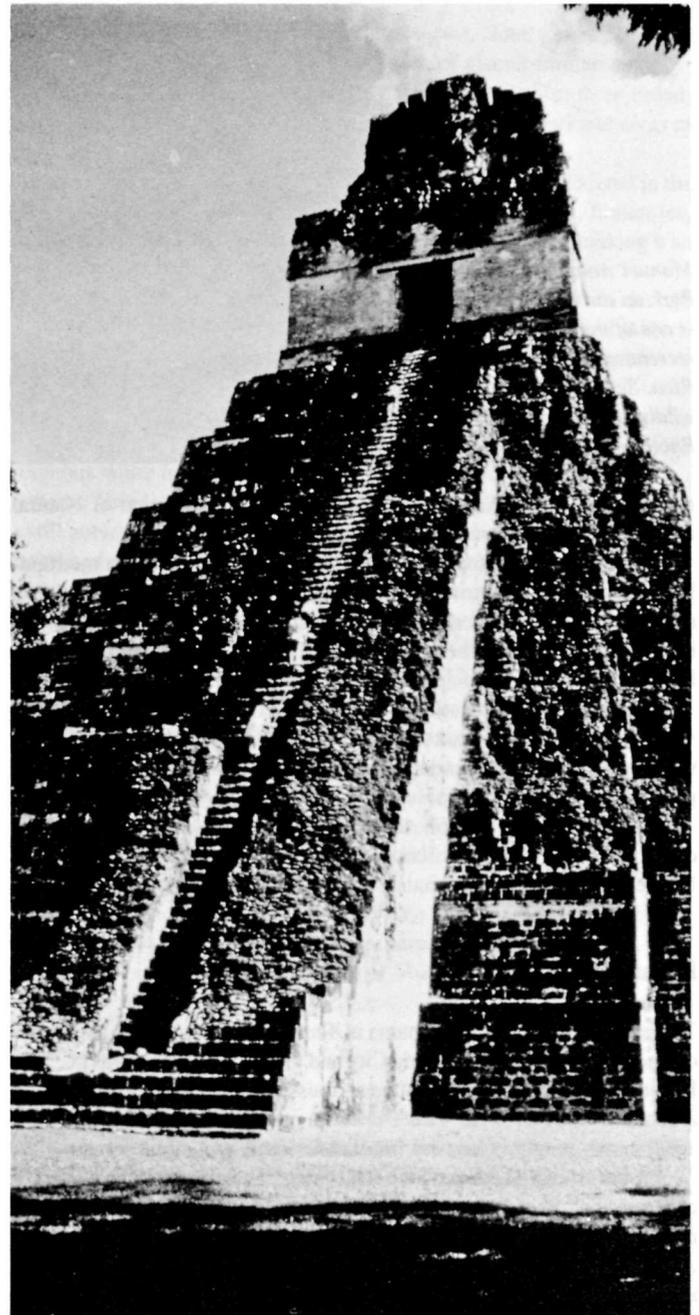
*The countries of Central America are similar to many other developing nations around the world in experiencing an expanding technology, rapidly increasing population, and threatened environments. A great need exists to protect the natural renewable resources, because almost all ecosystems in Central America are subject to an increasing number of environmental problems and threats. In every country one can find instances of degradation. Watersheds and water supplies are suffering from erosion and land slippage due to the uncontrolled cutting of forests, compaction of soils from livestock or heavy machinery, and poor agricultural practices. The introduction of exotic plants and animals is causing competition with native populations and, in some cases, the extinction of certain species. The transfer of infectious diseases and parasites across national borders, and the contamination of ecosystems and poisoning of people from the misuse of chemical pesticides and fertilizers are growing dangers. Another insidious threat is the gradual destruction of scenic sites which have a high intrinsic value for tourism and recreation. Their disappearance can mean a loss of potential economic benefits.*

*The Wildlands and Watershed Project within the Natural Renewable Resources Program at CATIE (Centro Agronómico Tropical de Investigación y Enseñanza, or Tropical Agricultural Research and Training Center), is dedicated to prevent the kind of environmental damage described above. It assists the governments of the Central American Isthmus – Guatemala, El Salvador, Nicaragua, Costa Rica, Honduras, and Panama – in the management of their natural and cultural resources. Wherever possible, the Unit collaborates with and advises the institutions within each country so that as they become strengthened they may manage and utilize their own wildland resources more effectively. The Wildlands Project is engaged in providing support services for conservation activities including national park and reserve planning, surveys, development, and management. It arranges regional conservation meetings; conducts workshops, seminars, and training courses, and furnishes an international liaison and communications network with governments and conservation organizations. The Unit strives to produce long-term benefits for rural populations from the wise use of wildlands and watersheds.*

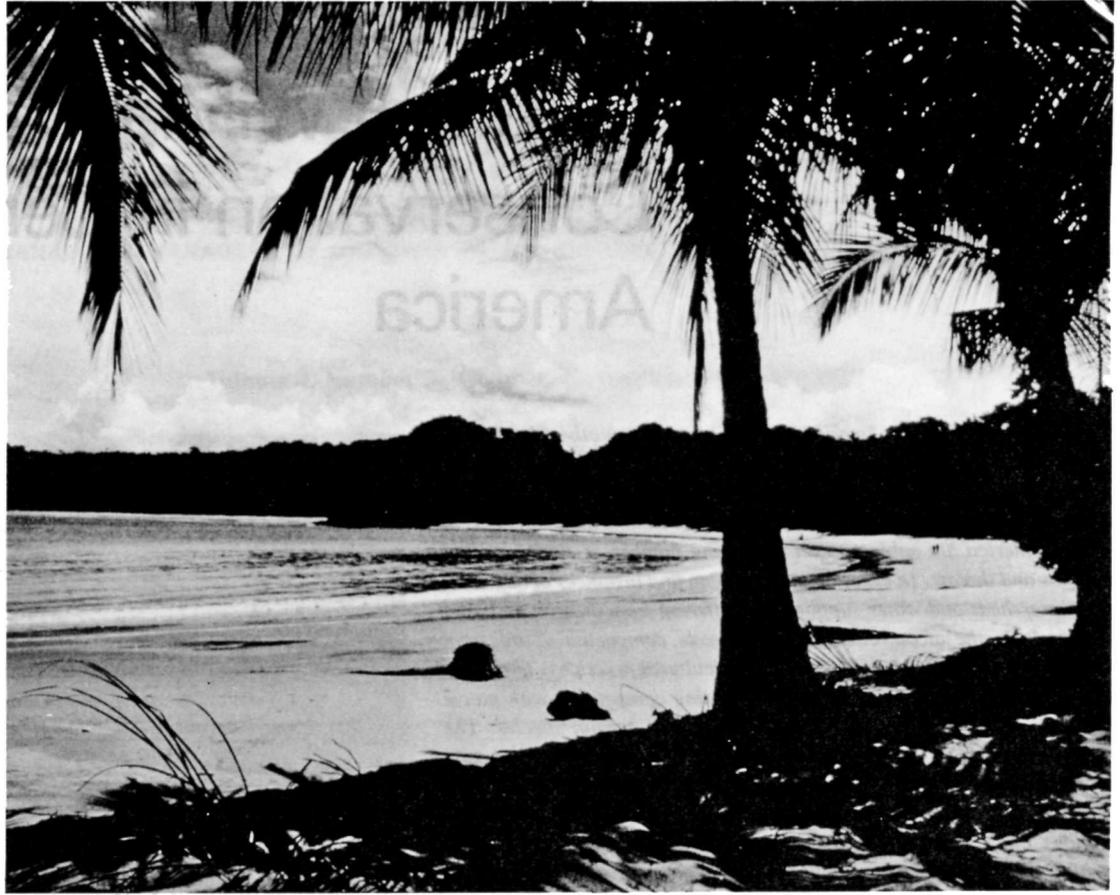
*All of the above projects are financed through a grant from the Rockefeller Brothers Fund (RBF) and financial contributions from the World Wildlife Fund (WWF), the International Union for Conservation of Nature and Natural Resources (IUCN), and CATIE. The Project was established in July 1976 and began the RBF project activities in January 1977. Although Central America is the main focus of Project interest, support is extended to Caribbean and South American nations whenever and wherever feasible.*

## National Parks Support Services

The most vigorous aspect of the Central American national park program has been the establishment of a “pilot” park in every country for demonstration purposes. This idea was agreed upon at the 1974 confer-



*At Tikal National Archeological Park in Guatemala spectacular Mayan ruins rise up out of the surrounding jungle. The park protects a rare combination of natural and cultural values. Photo: Anne LaBastille*



*Manuel Antonio National Park on the Pacific Ocean is one of the most beautiful recreation areas in Costa Rica. Seabirds and wildlife are abundant here. Photo: Anne LaBastille*

ence — the Central American Meeting on the Management of Natural and Cultural Resources — held in San José, Costa Rica.

The main criteria of these pilot parks are easy access from metropolitan areas, and the protection of outstanding natural and/or cultural resources. Since this meeting was held, all six countries have taken the initial steps to create their prototype. This remarkable initiative has formed the beginnings of a Central American system of national parks.

Other types of conservation areas proposed or already started are a few very large “frontier” parks, smaller wildlife reserves, biosphere reserves, marine national parks, multiple use reserves, and archeological parks.

In the following section the current state of park planning and development is briefly described for each Central American country, plus Belize and southern Mexico.

## **Panama**

The pilot national park for Panama is *Altos de Campana* which lies about one hour’s drive west of Panama City and the Canal Zone. It was decreed Panama’s first park in 1966, but no serious effort was made to protect the area at that time. The 4,800 hectare park comprises at least five ecosystems, ranging from dry tropical forest to cool cloud forest.

One unfortunate circumstance is that subsistence farmers have already cut over and cultivated a large part of the park area. RENARE (Panama’s Department of Natural Renewable Resources within its Ministry of Agriculture) has recently begun planning and marking the park boundaries more clearly, and contacting illegal settlers. A park administrator has been assigned and work is underway on basic visitor facilities. CATIE’s Wildlands Project is supporting the park by designing and supplying buildings and interpretive displays, with training sessions, and in consulting services.

The second national park to be decreed (1976) is *Volcano Barú* in the extreme western part of Panama. This lofty mountain (3,478 m) is the country’s highest point. Both oceans can be seen from its rocky summit on a clear morning. The volcano’s ecosystems range from low montane rainforest to very humid montane forest, and including cloud forest and elfin woodland. A goodly population of quetzals, one of Central America’s most beautiful yet endangered birds, exists on the western and northern slopes. Near the peak, a fascinating complex of craters makes this volcano park a mountain climber’s and photographer’s joy.

Although Barú is well-forested above 2,700 m, below this elevation clearing for food crops, flowers, lumber, and cattle has been extensive. The watershed and woodlands of Volcano Barú need active protection. RENARE is presently trying to clarify the ownership status and boundaries within the park. One park administrator and guards have been assigned. CATIE is assisting RENARE in elaborating the master plan for Barú.

*Bocas del Toro*, also located in western Panama, is the natural coastal counterpart park to lofty Volcano Barú. It is a group of islands in the Caribbean Sea with corals, mangroves, white beaches, crystal clear water, and a rich marine life. There is a strong possibility that this area will soon be established as a marine/coastal national park.

In the *Canal Zone*, high interest is currently centered on forming at least two national parks. They would be close to the two major population centers, Panama City and Colón, and to two distinguished research centers, Gorgas Memorial Laboratory and Smithsonian Tropical Research Institute (STRI). The key reason for establishing parks in this area is to protect the existing rainforest and to prevent deforestation, the resulting erosion, and eventual siltation of the Panama Canal. Sedimentation of this world-important commercial waterway would lead to inestimable cost for dredging and maintenance. In addition, a very high tourism potential exists.

*Portobelo National Park*, decreed in 1976, is perhaps the most impor-

tant colonial historical setting in the Americas, along with Mexico and Santo Domingo. It lies within a protected bay and coastal strip of about 10,000 hectares, facing the Caribbean. Historically, Portobelo played a major role from the time of Columbus, through the era of pirates and Spanish treasure fleets, until it was destroyed by the English in 1739.

Very recently, some settlement has occurred inland along the lower valleys. This encroachment gives cause for concern because the Portobelo watershed is a critically situated hydrological regime. It partly provides water for the operation of the interoceanic canal, somewhat controls the quality of this water which is also the domestic source for Panama City, and regulates river flows down to the sea. Excessive siltation and erosion on this side of the watershed could kill marine corals and fill the bays and mangrove swamps.

IPAT (Panamanian Tourist Agency) and RENARE are presently collaborating in managing this area. RENARE has placed a few guards in the park, and IPAT is working on the restoration of the fortresses and other ruins with a loan from BID (Inter-American Development Bank). The Project is giving continuing consultant services to the park.

The *Darién National Park*, consisting of about 450,000 ha, is at once the largest proposed conservation area, the most ambitious plan, and perhaps the most important biological region in all Central America. The Darién is one of the last three great tracts of undisturbed tropical forest in the Isthmus.

Tremendous attention and land use pressures will soon be focused in the Darién upon completion of the Pan American Highway. At present, the only stretch missing between Alaska and Tierra del Fuego is in the Darién Gap. Once finished, as is expected in the 1980's, the region will become dangerously vulnerable to ecological abuses, loss of cultural values now represented by the unspoiled native tribes, infiltration of squatters, and the spread of human and animal diseases.

For these reasons, the proposed Darién National Park has been given top priority. Its goals are multiple. They include saving representative samples of terrestrial, freshwater, and marine ecosystems; protecting the many watersheds; safe-guarding the future scientific, aesthetic, historical, and educational values of this wildland region; preventing the spread of hoof-and-mouth disease from South America north into Central America; eliminating the illegal entry of immigrants from Colombia into Panamá; and preserving the indigenous cultures and life styles of the Choco and Cuna Indians (about 6,000) who inhabit the area.

Given all the above, it seems that a large, tightly-controlled national park with a cultural zoning system is the most feasible way to protect the Darién and its inhabitants. A master plan for the national park has been completed by CATIE's Wildlands Project, following a request from the Ministry of Agriculture in Panama.

## Costa Rica

Costa Rica has become an outstanding example in Central American conservation for its system of national parks and reserves. It is probably the most advanced country in conservation-education, public awareness, number of protected areas, and park management in Central America. All of its major ecosystems are represented by parks or equivalent reserves. Fourteen wildland areas have been protected and are described below and several new areas are under consideration and being established. For further information, the reader is referred to the excellent Costa Rican National Park Service's publications, as well as *Los Parques Nacionales de Costa Rica*, 1978, Mario A. Boza, INCAFO, Madrid, Spain.

*Volcano Poás National Park*. This park was already developed in 1974, and now is a pilot national park. It has received a loan of \$1,800,000 U.S. from the Central American Bank for Economic Integration for construction of facilities. This bank loan sets an extremely important precedent for conservation work in Central America.

*Santa Rosa National Park*. This is another pilot national park and Costa Rica's only historical one. It contains the sole protected example of Pacific dry tropical forest as well. One of its beaches, "Playa Nancite," is world-famous for the massive arrival of over one hundred thousand female turtles, the Pacific Ridley, which have used the sandy shores to lay their eggs since immemorial times.

*Tortuguero National Park*. The beaches of this section of Atlantic coast are important for nesting of green and Carey sea turtles. The coastal swamps and wetlands are also manatee habitat. Palm forests and Caribbean lowland rainforest are found here.

*Corcovado National Park*. This is the Costa Rican Park Service's "ecological showpiece." The unusually high investment of about \$5 million U.S. is resulting in good educational, scientific, and economic pay-offs. Many endangered species such as the jaguar live in this Pacific coastal park, and there are rich archeological remains on Isla del Caño.

*Chirripó National Park*. The highest peak in Costa Rica and southern Central America (3,820 m) offers splendid views, cloud forest, páramos, an interesting flora and fauna, and evidence of glacial formations.

*Manuel Antonio National Park*. A tropical forest edges three broad, white, curving beaches in one of the most beautiful recreational areas of Costa Rica. Wildlife and sea birds are abundant.

*Rincón de la Vieja National Park*. This active volcano is located in the Guanacaste Range (1,898 m) and contains 9 eruptive points, fumaroles, and hot mud pools. Thirty-two rivers originate on its slopes, making it an important watershed for the region.

*Tempisque National Wildlife Reserve*. Costa Rica is proud to declare this as its first wildlife preserve. Tempisque is probably Central America's key waterfowl swamp area and comprises over 11,000 hectares of protected land.

*Cahuita National Park*. The only significant coral formation on the Atlantic coast of Costa Rica is found here. Forests of palms edge gorgeous white beaches, making a most picturesque landscape.

*Barra Honda National Park*. While legally established, Barra Honda is still not implemented or ready for the public. It is a system of caves and caverns of great beauty with important populations of bats. Much of this subterranean world is yet to be explored.

*Cabo Blanco Absolute Nature Reserve*. This is the oldest reserve in Costa Rica. It is situated at the very tip of the Nicoya Peninsula and has a rocky coastline attractive to sea birds and marine life. Cabo Blanco has excellent examples of dry tropical forest species.

*Islas de Guayabo, Negritos, and Pájaros Biological Reserve*. These small isolated islands in the Gulf of Nicoya serve as nesting and roosting sites for colonies of frigate birds, brown boobies, and brown pelicans.

*Monteverde National Biological Reserve*. This prime sample of virgin cloud forest stands high in the central mountains of Costa Rica. It possesses the largest population of quetzals in the entire country.

*Guayabo National Monument*. This is the most important archeological site in Costa Rica, with ancient paved roads, monuments, and aqueducts. It is located on the slopes of Volcano Turrialba.

## Nicaragua

Nicaragua began a land use and capability survey which includes wildlands after the San José natural and cultural resource meeting in 1974. The plan for the Pacific region (first phase) has been completed. The second phase for the northwest and central area is presently underway. Meanwhile, the highest priority is being given to implement the *Volcano Masaya Pilot National Park*. All attention is focused here—one of the fastest developing parks in the Isthmus. The Central Bank of Nicaragua has set aside \$1 million U.S. for park development and land purchases. The Central American Bank for Economic Integration has promised another \$800,000 U.S. so far, if the National Planning Organization gives Masaya top priority. This pilot park with its ready access to

## 4 PARKS

Managua's population, and its high educational values, should soon be ready.

The volcano has an active crater with a view into a burning lava lake. Somewhat below the crater complex lies a blue lagoon, Laguna de Masaya, a unique caldera lake. Ecologically, this pilot park is intriguing because of its various successional stages.

*Saslaya National Park*, 11,800 hectares of rugged mountain terrain in north central Nicaragua, represents the only officially declared National Park in this country. The expanses of primary rainforests encompassed by park boundaries provide suitable habitat for a variety of wildlife species such as jaguar, margay cat, boas, deer, peccary and others. Although the area has tremendous potential for scientific, recreational, and educational uses, it has not yet been developed, owing to its isolated location.

The reefs, sandbanks, and islands of Nicaragua's Caribbean region are as wild and fascinating as any part of coastal Central America. Two spots of exceptional interest are the *Pearl and Miskito Cayes*. Also, two more volcanoes may be developed. One is *Volcano Momotombo*, including its lagoons and the nearby shore of Lake Managua; the other, *Volcano Mombacho*, which has two patches of rare elfin forest and lakes with aquatic bird life.

### El Salvador

The Central American country with the smallest land space, highest population density, and most industrialization is El Salvador. Very few wildlands still exist, and those that do are under extreme pressure and usually are greatly disturbed. Nevertheless, the El Salvador National Park Service is moving ahead on its own. It has chosen its pilot park and at least three other potential areas.

*Montecristo* (called "Trifinio" in Guatemala and Honduras) lies on the border of these three countries. It is found within an extensive region of broken mountains, much of them covered with primary premontane rainforest and cloud forest. This environment provides a perfect habitat for quetzals, and a healthy population of these endangered trogons exists in the 800 hectares of climax cloud forest at Montecristo. Another great attraction is the large number of orchids and bromeliads. Over 200 species of orchids have been recorded, at least one-quarter of them endemic to El Salvador.

Development of an international park was originally discussed at the San José meeting, and further plans are now being made to attempt to establish a tri-national frontier park. In El Salvador, the Montecristo area covers about 2,000 ha., and the Trifinio wildland area in Guatemala and Honduras amounts to several thousand more. Although Montecristo is still not yet legally declared a national park, the watershed is well protected, having been officially declared a forest reserve by the government. Park guards are already on duty.

*Lago Jocotal*, a very shallow, eutrophic, 1,000-hectare body of water, is receiving considerable attention. Large numbers of native and migrating waterbirds use Jocotal. Without doubt, Jocotal is the richest freshwater area in El Salvador. Until recently, it was common to hear of incidents such as the three hunters who shot 400 ducks in three days at Eastertime!

In one bold stroke, the Park Service closed the area to hunting. It has held this ban effectively. However, a new, more insidious, threat has appeared — pesticides, mostly from nearby cotton fields. During the rainy season, large die-offs of birds and fish have taken place. The Park Service is making a strong effort to work against these degrading uses by improving its management of the lake. Jocotal deserves to be part of an international system of wildlife reserves which will ensure our migrating waterfowl safe, uncontaminated resting and wintering grounds.

Another area of recent interest is "*El Imposible*" Forest. It is named for a tortuous mountain pass, and contains a larger diversity of tree species

than any other forest in El Salvador. Over 300 kinds are known. Curiously enough, the area was scarcely visited by naturalists or scientists until 1975, perhaps because it was inaccessible and in private ownership for so long. Currently, however, pressures are mounting to cut the trees and convert the area into coffee plantations.

The Park Service is making flora and fauna studies, and checking out the land tenure and proposed park boundaries. Money was allocated by the government in 1978 for buying El Imposible. Meanwhile several park guards have been stationed here to protect the 4,000-hectare forest against illegal squatters and timber cutting.

### Honduras

One of the three great wild tracts remaining is the *Mosquitia*—a region of legends, teeming wildlife, trackless jungles, and little-known bands of Indians. Quite aptly, it is called "Central America's Little Amazon." Here, rivers are the roads.

In May, 1977, a full-fledged expedition supported by the Honduran Natural Resources Division (DIGERENARE) of the Ministry of Agriculture, and by the Wildlands Project, conducted a preliminary ecological inventory. It spent a month travelling by dugout up the Río Plátano, least disturbed of all watersheds in the Mosquitia.

The Mosquitia has an abundance of archeological ruins. Weird petroglyphs are found carved on giant river boulders, and the fabled "White City" is marked on the maps, still waiting to be discovered. This legendary Indian retreat was declared a National Archeological Park in 1969. The existing legal framework will make implementation of a national park far easier. Actually, a very good case can be made for setting the 200,000 hectare watershed aside as a Biosphere Reserve under UNESCO's MAB Program.

The Wildlands Project is working closely with DIGERENARE and the Anthropological and Historical Institute of Honduras in furthering the inventory and planning of the Mosquitia park.

In complete contrast to the Mosquitia, yet making an ideal juxtaposition, are the *Bay Islands*, said to have some of the finest coral reefs in the Western Hemisphere. They also have sand beaches, cliffs, mangrove swamps, and sand flats distributed between the three major islands of Utila, Roatan, and Guanaja. These tight little island communities are equally fascinating sociologically.

A recent study made for the Central American Bank for Economic Development considers this area as having great tourist potential, and recommends including the reefs around Roatan in a marine national park.

The pilot park chosen by Honduras is *La Tigra*, located less than an hour's drive from Tegucigalpa (15 to 25 km). It is receiving high priority from the National Parks Division of DIGERENARE. La Tigra stands like a cool, green world apart from the bustle, noise, and heat of the capital. The range rises to 2,310 m and is clothed in oaks, liquidambar, and pines, with a type of cloud forest at the summits. Through these forests flash quetzals, peccaries, rabbits, whitetail deer, squirrels, and an occasional puma or ocelot.

This mountain range is critically important as the watershed which gives a constant supply of potable water to the capital and suburbs. Fortunately, much of the land belongs to the National Hydrological Institute of Honduras, thus restricting private ownership. Once roads are improved, La Tigra should become a popular national park on a pleasant half-day circuit for vacationers and tourists from Tegucigalpa.

*Lago Yojoa* (Lake Yojoa) is not a national park, but it qualifies as a Multiple Use Reserve. Ideally, the reserve should be handled by one administration composed of all the various land users, and with firm guidelines for management and protection against future damages. The successful integration and operation of this multiple use reserve can demonstrate to Hondurans and other Central Americans the importance and benefits of natural resource planning and management.

A hiker rests near the summit of Volcán Barú, highest point in Panama and one of the first national parks in that country. Photo: Anne LaBastille



## Guatemala

This gloriously scenic country has a high potential for a diverse system of national parks and reserves. But, population pressures and agricultural-industrial activities are increasing rapidly and destroying many of the existing wildlands and natural resources.

*Volcano Pacaya* was chosen as the pilot national park after the 1974 San José conference. It is among the best examples of an active stratovolcano in Central America. The ragged steep mountain mass lies close enough to Guatemala City to see frequent explosive outbursts of lava and burning gases at night. Pacaya was already decreed a national park in 1963. This was followed by further planning, assignment of personnel, and training activities. However, by an unhappy set of circumstances, including the 1976 earthquake, the project was discontinued.

*Lago Atitlán (Lake Atitlán)* is considered to be one of the most beautiful bodies of water in the world. The 340-meter-deep, aquamarine lake is framed by three majestic volcanoes which reach a maximum height of 3,510 m. This purple-blue backdrop forms a dramatic frame for the clear water and numerous Indian villages along the shoreline.

The lake was decreed a national park—the water surface only—some years ago. Since then, Presidential decrees have been made to protect the rare, flightless, endemic Atitlán grebe, and the reed-cattail beds which serve as the chief habitat for grebes, waterfowl, fish, frogs, and other aquatic life. Technically, the lake's watershed and shoreline are far too densely populated and utilized to qualify as a national park. In addition to the high Indian population, the number of hotels, restaurants, vacation homes, and condominiums has increased considerably. Real estate prices have risen fantastically. The ideal status for Lake Atitlán, therefore, would be a Multiple Use Reserve, the same as Lago Yojoa in Honduras.

*Tikal National Archeological Park* in the Petén jungle is legally established and functioning. It covers about 600 km<sup>2</sup> of undisturbed tropical humid and dry deciduous forest with the Mayan city ruins at its center. Thanks to the protection afforded here, wildlife is plentiful. Considering that one-third of the Petén has already been grossly disturbed or destroyed by ranching, lumbering, and colonizing, this makes Tikal National Park a remarkable experience for visitors.

Management at Tikal is principally through the National Institute of Archeology and History (INAH) and the National Tourism Institute (INGUAT). A \$13 million U.S. loan has been provided by BID for construction of tourist facilities in Flores (about 30 km south of Tikal) on the shores of Lake Petén-Itzá, and for improving access roads to the Park.

## Belize

Belize, in spite of its small size, has significant natural and cultural resources. Population numbers and pressures are still quite low, and the British colonial system left a fairly well-organized forestry management program. In comparison with El Salvador, for example, Belize has a high percentage of wilderness with abundant wildlife. Moreover, strict hunting regulations are in effect.

Two areas are worthy of the greatest protection. One is the *Chiquibul/Maya Mountains* region. Undisturbed broadleaved and pine forests clothe these ranges, including the only existing cloud forest in Belize, and Victoria Peak (1,115 m), Belize's highest point.

It probably has the highest density of spotted cats left anywhere in Central America. Another attraction is the number of Mayan ruins dating from about 800 to 1200 A.D. which are still shrouded in jungle growth. On archeological grounds alone, the Chiquibul/Maya Mountains region deserves protection. Ideally, it should be made a Biosphere Reserve.

The other area of world importance is the barrier line of coral reefs stretching along the entire coastline of Belize from Yucatán, Mexico, to Guatemala. It has often been compared to the Great Barrier Reef of Australia. Not only is it second in size, but the *Belize Barrier Reef* is certainly a close runner-up in the richness and diversity of its marine life. The incredibly clear blue water contains fantastic coral formations and colorful tropical fishes. Not only is Belize a diver's paradise, but international marine scientists consider these reefs to be of world significance.

## Southern Mexico

Although Mexico is not part of the Central American Isthmus, its southern area of Chiapas is ecologically contiguous and similar to Guatemala's Petén and Belize's western limestone section. As already described, the Chiapas/Petén/Maya Mountains tropical lowland forests are some of the very few remaining extensive tracts of wilderness in Middle America.

In southern Mexico, the *Lacandona* region of Chiapas is the last refuge of broadleaved tropical forest. Luckily, 300,000 hectares of Lacandona

have been decreed a Biosphere Reserve (1978). The land is a limestone base with numerous small lakes, rivers, and hills. The unusual aspect of Lacandona is the intensely turquoise color of its streams, perhaps due to some abnormally high concentration of carbonates, and the hazy blue tinge of its mountains when seen from afar. This probably accounts for the name, "Montes Azules" (Blue Mountains), which rise here.

The Lacandona is quite inaccessible save on foot or horseback, and still harbors a tiny population of Lacandon Indians. They are of great interest to ethnologists and conservationists striving to prevent the extinction of "ecosystems people."

\* \* \*

Hopefully, in the not too distant future, the seeds that have been sown will bear their first fruits. The early conservation efforts will be visible not

only by the physical presence of parks and reserves, but also in the psychological state of the public towards environmental matters. Public appreciation and concern towards natural resources and wildlands will result in a better quality of life for all Central Americans.

*Dr. Anne LaBastille is an internationally known ecologist, writer, and consultant on wildlife and natural area conservation. This article was condensed from her booklet by the same title published in 1978 in English and Spanish (38 pages) by the Wildlands and Watershed Management Project, Renewable Natural Resource Program, CATIE, of Turrialba, Costa Rica.*

Andrew Warren, G. E. Hollis, J. B. Wood,  
M. D. Hooper & R. C. Fisher

# Ichkeul, The Problems of a Wet Park in a Dry Country

Because it is dry and sunny and near to Europe, Tunisia has been able to build a large tourist industry in a country with comparatively few other resources. The development of this tourist trade, when added to the demands of irrigated agriculture and industry, and the demand for an increasing standard of living, puts pressure on the country's limited water resources. The largest potential for water supply is in the wet northern hills between which lies one of the most important waterfowl lakes in the Mediterranean region. The soon-to-be declared National Park at Ichkeul (Figure 1) will therefore be born into the middle of a classic conflict between development and nature conservation.

Lake Ichkeul, or Garaet el Ichkeul, has been known as a wildfowl refuge since at least the early part of this century, but only recently has it become appreciated as an internationally important wetland site. Ichkeul

is now the most important refuge in North Africa because most of the others that used to grace the northern coastland have suffered drainage for agriculture in the post-war years. It is estimated that over 200,000 over-wintering ducks sometimes congregate at Ichkeul, and this is almost certainly an underestimate as the enormous size of the lake and its muddy, shallow shoreline make counting very difficult. Undoubtedly, much still remains undiscovered about the area. For example we found 4 percent of the world population of white-headed duck (*Oxyura leucocephala*), for the first time, on one cursory visit in May 1977.

International pressure to protect Ichkeul, as well as pressure from the local voluntary organizations, has been building up in the last few years, and the Tunisian *Direction de Forêts* has responded by planning a national park at Ichkeul. Within the proposed park there are few real

Fig. 1. The location of Ichkeul.

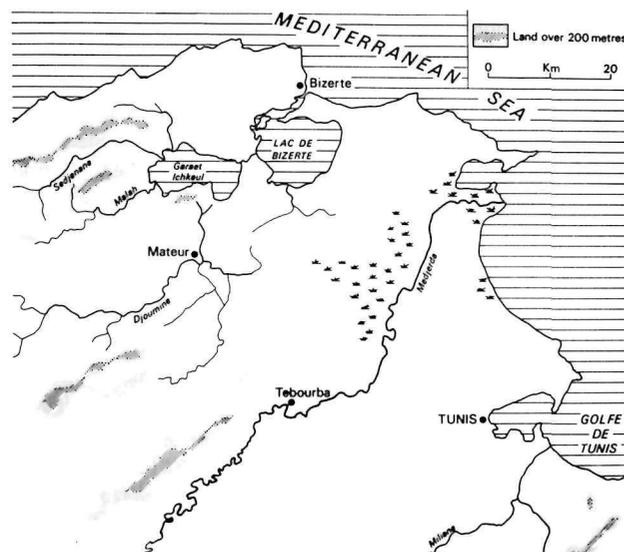
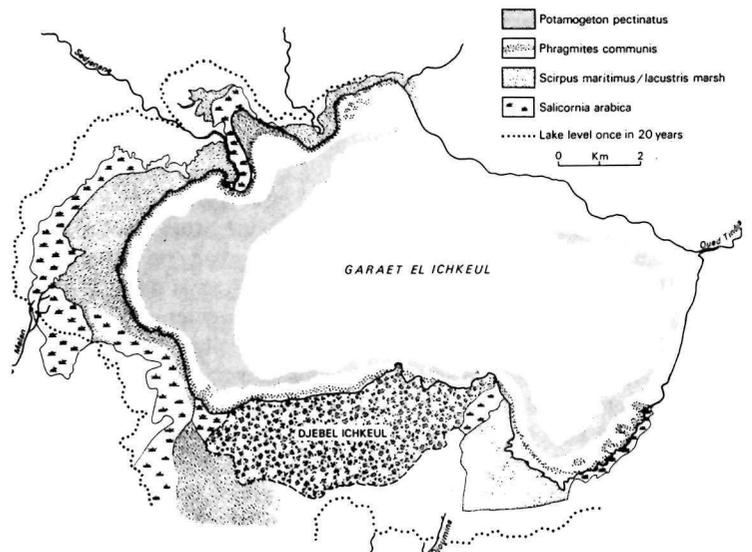


Fig. 2. The Environs of the proposed Park at Ichkeul.



problems: the *Direction* already owns all but a tiny parcel of the land and can reach agreements about fishing, grazing and hunting. The real problems are outside the park and arise from the demand for water.

The *Direction des Forêts* asked the Conservation Group at University College London to formulate a Management Plan for the Park and this has now been completed. In it we attempted to reconcile the demand for water with a continued wildlife interest.

Three rivers and several smaller streams feed the Lake (Figure 2). Most of these dry up in summer and because it lies at sea level and is connected by a narrow channel to the Mediterranean, sea water enters the lake to balance the excess of evaporation over freshwater input. The main "forcer" of this system, rainfall, has at least three distinct types of variation. First, and most obviously, it is very seasonal: about 70 percent of the rain falls between October and February. Second, the heaviest mean annual rainfalls (probably over 1000 mm) occur in the northern mountains, notably in the catchment of the Oued Sedjenane feeding into the northwestern corner of the lake. Third, and of enormous, if as yet unappreciated, importance to both water supply and nature conservation, there is year-to-year variation. At Tindja, on the eastern shore of the lake, annual rainfalls of less than 490 mm (80 percent of the annual average) can be expected once every five years. Once every 20 years there may be a fall of less than 380 mm (60 percent). The mean annual rate of open water evaporation at Tindja is three times the mean annual rainfall. In a very dry year five or even six times as much water can leave the lake in evaporation as enters it as rain. Outflow to the sea through the Oued Tindja varies from nearly 600 million m<sup>3</sup> in a wet year to as low as 70 million m<sup>3</sup> in a dry year. Inflow via the Tindja varies from 20 million m<sup>3</sup> in a wet year to well over 50 million m<sup>3</sup> in a dry year. Elsewhere in the catchment actual evapotranspiration leaves only about ¼ of the rainfall to feed the lake. The four main rivers contribute, on average, 272 million m<sup>3</sup> to the lake. The most important contributor, the Sedjenane (117.9 million m<sup>3</sup>), has flows of less than 105 million m<sup>3</sup> every other year and one year in ten the flow can be less than 50 million m<sup>3</sup>.

The balance of inflow and outflow controls the lake level and therefore the area of marshland that is inundated. In summer the lake is 89 km<sup>2</sup> in extent (Figure 2) but the average winter area is 102 km<sup>2</sup>, representing a

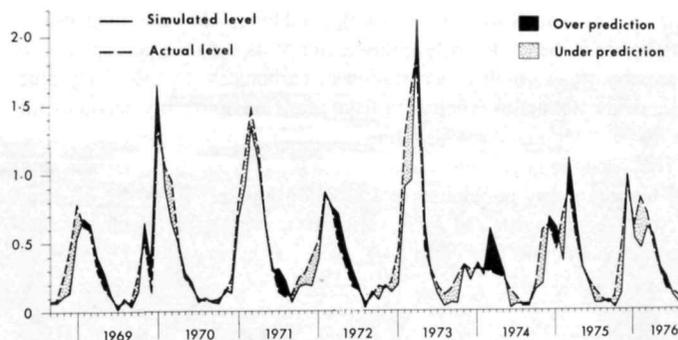


Fig. 3. Simulated and actual lake level.

level of 0.8 m above sea level. Three years in every ten, on average, the land between 1.0 and 1.25 m is flooded (the area of the lake is then 108 km<sup>2</sup>). Between elevations of 0.7 and 0.8 m flooding occurs 7 years in ten, but in dry years the level does not even reach 0.4 m.

The variation in hydrology controls the fluctuating salinity of the lake. Inputs of salts come mostly from the marine summer inflow, but there are also small amounts in river water, notably from the Oued Malah (which means "salt") whose dissolved load is three times greater than that of the Sedjenane and 1/10th that of the sea-water inflow through the Tindja. The average chloride content of the lake rises from less than 5 grams per liter throughout in winter, to well over 20 g/L at the eastern end in September. At that time the western end has a chloride content of about 15 g/L. Overall average salinity never reaches that of the sea, but in a small zone near Tindja it may approach it.

The strikingly brown, turbid color of the lake comes from the enormous quantities of sediment poured in by the rivers from the bare hillsides. From September 1955 to August 1956 the Sedjenane, Malah and Djoumine contributed 987 metric tonnes of suspended sediment into the basin. At the same time about 756 tonnes were carried out to discolor the Gulf of Bizerte leaving 231 tonnes in the lake (or about 124,000 m<sup>3</sup>). Over the years continued inflow has meant the gradual silting of the

Fig. 4. A view eastward along the southern shore of the Lake as it abuts Djebel Ichkeul. Potamogeton pondweed grows in rings off-shore.

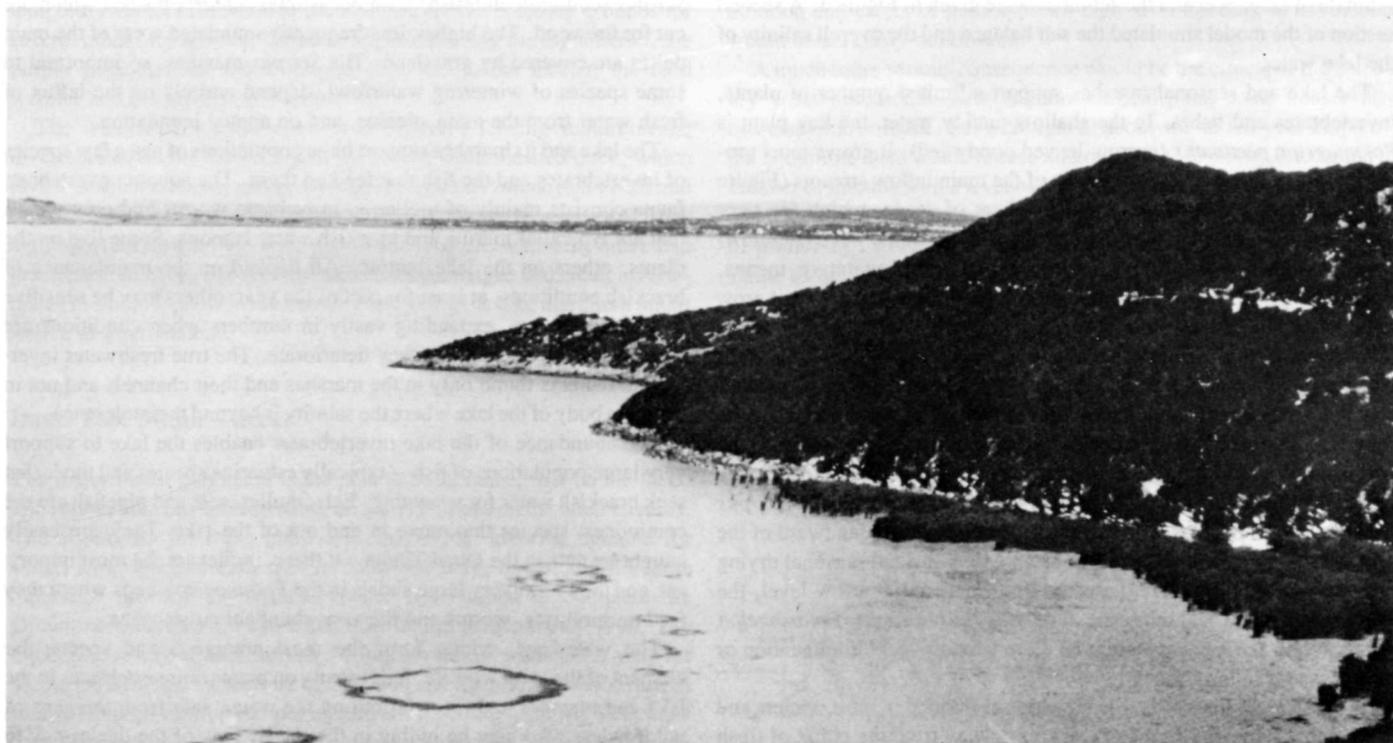




Fig. 5. A view from Jebel Ichkeul (foreground) of the southwestern marshes showing the zone of *Phragmites* that surrounds the low-water level of the lake and the landward zone covered by salt-tolerant *Salicornia*.

basin; in Roman times the Djebel was surrounded by the lake and it is still slowly contracting. Sediment entering it is moved by waves in the shallow water to produce a remarkably level floor of soft mud about 2 m beneath the surface.

In order to make predictions for wet and dry years, and for what might happen if dams are built, we used the available hydrological data to calibrate a computer model of the water balance of the lake. The model's estimate of lake level and the actual data are given in Figure 3. A second section of the model simulated the salt balance and the overall salinity of the lake water.

The lake and seasonal marshes support a limited number of plants, invertebrates and fishes. In the shallow muddy water, the key plant is *Potamogeton pectinatus* (narrow-leaved pondweed). It grows most prolifically just offshore from the deltas of the main inflow streams (Figure 2) and although it produces great numbers of seeds, which are very palatable to some ducks, the huge circular patterns of the weed (Figure 4) seem to indicate that it reproduces mostly by vegetative means. *Potamogeton* will withstand temporarily high salinity, but does not grow in permanently saline water. Its survival probably depends partly on the lack of competition from other plant species. One of these, the tall, picturesque *Phragmites* reed, (Figure 5) at present grows in another characteristic pattern around the shores of the lake in a position where its roots are permanently swamped, but where its crown will also be permanently out of the water: in other words, its distribution is closely tied to the fluctuations of water level. Another water plant is the *Scirpus* reed that grows in areas with fluctuating water levels to landward of the *Phragmites* (Figure 6). It seems to be able to withstand seasonal drying but not high salinity. Were the lake to be stabilized at a low level, the *Phragmites* might colonize the lake bed and exclude *Potamogeton* species. The *Scirpus* beds might be eliminated by lack of inundation or by increasing salinity.

To landward of the reeds, the marshes are flooded in most winters and dry in most summers. In the driest areas, away from the influx of fresh

water from the main streams, salinity builds up very considerably in the dry soil as water is brought up by capilarity, and few but the most salt tolerant plants, such as *Salicornia* (glasswort) and *Suaeda* (annual seablite) can survive (Figure 5). Most of the marshes are covered by *Scirpus* (common clubrush) with occasional *Tamarix* bushes which are cut for firewood. The higher, less frequently inundated areas of the main deltas are covered by grassland. The *Scirpus* marshes, so important to some species of wintering waterfowl, depend entirely on the influx of fresh water from the main streams, and on annual inundation.

The lake and its marshes support huge populations of just a few species of invertebrates and the fish that feed on them. The aquatic invertebrate fauna consists mainly of molluscs, polychaete worms and crustaceans that are typical of marine and brackish water lagoons. Some live on the plants, others on the lake bottom. All depend on the maintenance of brackish conditions, at least for part of the year; others may be sensitive to salinity change, expanding vastly in numbers when conditions are right and being killed when they deteriorate. The true freshwater invertebrate fauna is found only in the marshes and their channels and not in the main body of the lake where the salinity is beyond their tolerance.

The abundance of the lake invertebrates enables the lake to support very large populations of fish—typically estuarine species and those that seek brackish water for spawning. Eels, mullet, sole and pipefish are the commonest species that move in and out of the lake. They are easily caught by nets in the Oued Tindja. Of these, mullet are the most important, and they form very large shoals in the *Potamogeton* beds where they feed on molluscs, worms and the very abundant crustaceans.

The waterfowl, which form the most numerous and spectacular element of the local wildlife, feed mostly on plants or invertebrates in the lake and marshes and roost far out on the water, safe from the guns of wildfowling who may be hiding in the reeds. Few of the ducks stay to



Fig. 6. *Scirpus rush* growing in winter flood water.

breed at Ichkeul, although the flock of 600 white-headed duck which we encountered may well do so, and thus form the most important breeding group of this species in the Mediterranean basin. However, from November to February, and especially when other North African wetlands are dry, vast numbers of birds resort to Ichkeul from their breeding grounds in Europe. Over 110,000 pochard and wigeon and more than 180,000 coot have been counted, along with 9,000 greylag geese, 5,000 teal and shoveler, 2,000 pintail and tufted duck and lesser numbers of a further seven species of ducks. Rings have been recovered from some of these birds shot at Ichkeul and reveal that their bearers came from as far as the Netherlands, Sweden, Finland, Czechoslovakia and Kazakhstan. Wading birds are less numerous, but a great variety occur as migrants or temporary visitors. In summer the marshes are the breeding grounds for several other bird species, the most important being the night heron, the purple gallinule, the black-winged stilt, the marsh harrier, the reed warbler and the great reed warbler.

The waterfowl species each have different feeding requirements: invertebrates on the lake bed provide for the white-headed duck, which dive to reach them; coot and greylag geese feed on *Potamogeton* beds and especially the protein-rich seeds of this plant. Similarly, seeds of *Scirpus* are important for greylag, teal, pintail and wigeon, whilst the latter also graze these marshes extensively. Shovelers find algae and small invertebrates in shallow pools in the marshes and along the lake margins a major source of nourishment.

### Dams Pose Major Threat

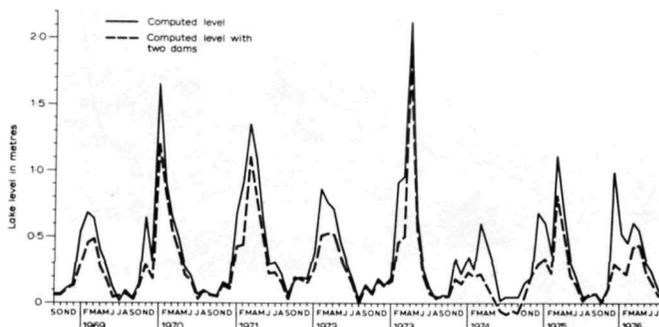
The major threat to Ichkeul is the plan to build dams, first on the Oued Djoumine, then on the Sedjenane, and later perhaps on the other streams. The arguments for these plans are compelling: growing demand for water; an absence of dam sites on more southerly rivers; and the large "unused" flow of the Ichkeul rivers. It is hoped to complete the Djoumine Dam by 1985 and a dam low on the Sedjenane by 1990. The Djoumine reservoir will furnish 70 million m<sup>3</sup> of water each year for Tunis, the irrigated agriculture of Cap Bon and the tourist centres further south. Later 68 million m<sup>3</sup> per annum would come from the Sedjenane dam. These first two dams would therefore roughly halve the average

inflow to the lake, but their effect would be much greater during the initial period of reservoir filling and during dry years.

The computer model was used to predict what would happen to the lake in the event of first one and two, and then all the proposed dams (Figure 7). It was found that the Djoumine Dam alone would have little effect on average lake levels, although it would increase average salinity. The average frequency of inundation above 0.9 m above sea level would be reduced by half. Dams on the Sedjenane and Djoumine would, however, reduce average lake levels at all times and marshes above 0.6 m would flood only as frequently as those over 1.0 m do now (Figure 3). If all the dams were built the duration of low levels in the lake, and so the inflow through the Tindja, would only change marginally, but the duration and extent of the important high level flooding of the marshes would be seriously diminished.

A much more serious consequence would be the effects of the dams in dry years. Prediction here is more difficult, but some conservative estimates can be made. For a drought of about one-in-ten-year frequency, the Djoumine Dam would reduce maximum lake levels by 0.13 m and the number of months with a level over 0.4 m above sea level from 3 to none, and it would increase the inflow through the Tindja from 54 million m<sup>3</sup> to 61 million m<sup>3</sup>. In extreme cases the whole of the lake could become as saline as the sea. These predictions do not include the effects of many

Fig. 7. The possible effect that two dams would have had on the levels of Lake Ichkeul between 1969 and 1976.



complicating factors such as evaporation of water from the new reservoirs which could exacerbate the problems.

It can confidently be predicted that Garaet el Ichkeul would suffer seriously if any of the dams were built: its summer level might not appear too different, but the winter flooding of the *Scirpus* marsh and its overall salinity would change substantially. The obvious question is: Can the effects of the almost unavoidable dam-building be mitigated?

### Reducing the Impact

The first and most striking possibility would be the regulation of the Oued Tindja with a gated sluice. Such a construction would be very cheap in comparison to the cost of the dams. It could be closed to allow a reduced winter fresh water flow to inundate a sufficiently large area of marsh, and it could be closed when lake levels or salinities threatened to pass critical levels. A fish pass in this sluice could permit the migration of fish.

A sluice needs some guidelines for operation, in particular some "specified limits" beyond which the marshes or lake are thought to be in danger. At present these can only be rather arbitrarily set because of our lack of knowledge of the ecology of many species. As a preliminary, we believe that the critical winter level should be set at 0.95 m above sea level, and a maximum level at 2 m, as at present. To avoid loss of the *Potamogeton* the salt content of the lake water should always be kept at less than 35 g/L.

The Tindja sluice, however, would answer only part, albeit a major part, of the question. It was found that the 0.95 m level behind the sluice could only be maintained, when both Djoumine and Sedjenane dams are completed, if a residual flow of 35 million m<sup>3</sup> were allowed to pass down the Djoumine and Sedjenane. The higher parts of the *Scirpus* zone on the Djoumine marsh would not be inundated after the dam construction and soil salinity might build up in summer to the extent that the less valuable *Salicornia* would replace *Scirpus*. The answer here is more involved: a fairly high specified minimum winter flow down the Djoumine and eventually down the Sedjenane would be required. This would have to occur during the dam-filling stage and afterwards. It would lengthen the period of filling and, more seriously, reduce the supply to the south in dry years. In view of the short life cycles of the *Scirpus*, the minimum flows were calculated on the "one-in-five" year drought. The minimum flows for the Djoumine would need to be 56 million m<sup>3</sup> annually (14.0 million m<sup>3</sup> maximum in February). Even with these flows, salinity on the marsh would probably increase and larger fresh water flushes might be needed from time to time. This estimate, then, of the needs of the Djoumine Marsh show that almost half the present annual flow is critical to its

survival. This puts some pressure on the planning process, for this would considerably reduce the yield of water for off-site consumption from the dam-building project.

For the Ichkeul project, the University College group used a Management Plan Format that they had previously prepared for use by the British Nature Conservancy Council. It is intended to highlight policy formation by first describing the area under consideration; second, evaluating it; third, discovering the limitations to action, be they legal, natural, economic or social; and fourth, setting down objectives. These are finally translated into action in various Project Groups.

Description and evaluation at Ichkeul are by no means finished. The process of policy formation has thrown up some vital gaps in our knowledge and some critical questions. First is the question of the status of the proposed Park. Is it indeed the last major wetland in North Africa? What percentage of the critical wintering population of various species does it harbour? What are the minimum necessary numbers for the survival of these? What are their real feeding and roosting requirements? What degree of salinity can *Potamogeton* survive? Is competition from *Phragmites* a significant factor? Above all, how critical are the Djoumine and other marshes to the system or to individual species, and how critical is the Djoumine flow itself to these marshes? It is here that the real conflict is seen to be focused. One of the major types of project specified in our plan concerns just such research questions.

*Dr Andrew Warren is a senior lecturer at University College London where he directs the M.Sc. Conservation course. He has co-authored a textbook, Geomorphology in Deserts (1973) and served as an editor of Conservation in Practice (1974). He prepared a background paper on Ecological Change for the U.N. Conference on Desertification.*

*Dr. G. E. Hollis is a lecturer at University College London. He has edited Man's Impact on the Hydrological Cycle in the U.K. (1979) and is now engaged in research into the impact of urbanization on hydrology and of water engineering works on ecology.*

*Dr. J. B. Wood is a lecturer at University College London. He trained as a forester/ecologist and has conducted research in ornithology in Afghanistan, Nigeria and Britain.*

*Dr. M. D. Hooper is a plant ecologist with the Institute of Terrestrial Ecology, Monk's Wood (U.K.). He has specialized recently on island biogeography theory as it relates to nature reserves.*

*Dr. R. C. Fisher is a senior lecturer in zoology at University College London. His interests include invertebrates and the conservation of their freshwater habitats.*

Walter L. Hartmann Crespo

# Belgica Lagoon, First Mexican Educational Park

Belgica Lagoon, the first Mexican Educational Park established by the Chiapas Nature Protection Counsel, is situated 18 km north of Ocozocoautla on the road to Malpasó, or a little more than one hour from the Chiapas state capital of Tuxtla Gutiérrez.

Created for teaching purposes for state schools, its goals are to improve the understanding of natural sciences for present and future generations and to stimulate the understanding of the value of natural resources. This unique Latin American park is supported in part by the World Wildlife Fund.

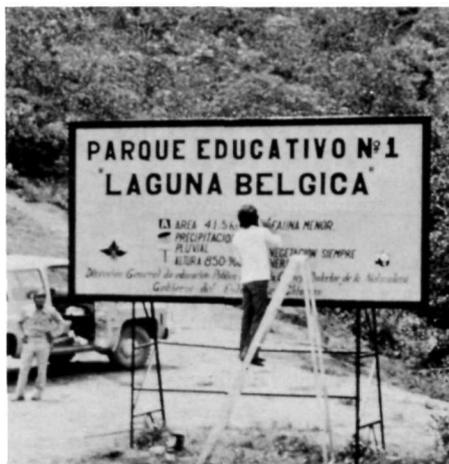
The park consists of approximately 42 ha, the majority of which is covered with a lush semi-tropical vegetation. This area is nearly surrounded by cultivated and pasture lands. Although oak (*Quercus skinnerii*) and several important marketable species predominate, there are extensive areas of wild shrubs and fruit trees that support a rich fauna and many bird species.

The elevation of the park lies between 850 and 915 m above sea level and the topography is exceptionally varied, one of the principal characteristics supporting its status as an educational reserve.

## Trails and “Mushrooms”

In order to develop the site and initiate the “practical-education” program proposed, the Nature Protection Counsel initiated planning for three footpaths, no wider than 2 m, to be situated in the principal sectors of the park. They include: 1) the *Lagoon Trail*, approximately 850 m in length, encircling the lagoon; 2) the *Mountain Trail*, approximately 2 km in length culminating at the highest point of elevation in the park affording a magnificent panoramic view of the surrounding area; and 3) the *Forest Trail*, approximately 950 m in length, originating at the same point as the other trails, near the parking lot, and passing through the major concentrations of the diverse flora.

In accordance with the development plan, six trail kiosks were installed. Called “educational mushrooms” for their shape, the construction includes a wooden center post that supports an aluminum roof. The structures — covering 13 m<sup>2</sup> — are painted in a variety of green tones. Nearby tables and benches permit class groups of 8 to 12 persons to observe, identify and study the development and habitat of



Sign marking the entrance to Educational Park No. 1, Belgica Lagoon, in Chiapas, Mexico.

An aluminum shelter, one of six “educational mushrooms” in the park, provides a center for student activity.



A group of students arriving at an area of virgin forest to begin first-hand observations of regional flora and fauna. A limited number of parents also participate in the educational field trip.



Students travel to selected areas for observations and collection of materials in a bus donated by the World Wildlife Fund (WWF).





*A teacher-guide discusses flora and fauna species which are permanent inhabitants and play definite ecological roles.*

local flora and fauna. It is hoped that through the use of these facilities students can study and ultimately comprehend the importance of ecological relationships and begin to develop an ethic for the value of the natural world and man's place in it.

Each trail offers a variety of panoramas within distinct ecosystems providing the teacher the opportunity to select the one most appropriate for study by his group and for the type of lecture he will present.

### Objectives of the Field Trips

The necessity of improving natural sciences education and raising the level of understanding and appreciation for our renewable natural resources in Mexico are the underlying reasons for the establishment of the park. In order to accomplish this, first hand experience with an area largely unaffected by the hand of man is considered indispensable. As such, the Belgica Lagoon as a pilot project will sooner or later become a model for a series of similar projects the Mexican government plans to establish.

Thus, the primary goal of this Educational Park is to modify and improve the student's education in a practical sense, overcoming traditional antiquated systems. For this the student is situated in an appropriate environment, free of noise and other inconveniences that regularly distract him in a natural science class most commonly carried out in a closed environment with poor ventilation and without a trace of life in it.

In the Educational Park we try to demonstrate and teach in a practical form varieties of regional flora and fauna that form the ecological chain within the habitat that man shares with them. In the same manner we are seeking to instill a respect for ecological balance; not to destroy but to protect and conserve this balance which benefits mankind.

It should not be assumed that with these field trips all natural science educational problems are being solved, but they do facilitate the complex task of teaching made even more difficult because of a lack of adequate facilities. We consider, therefore, that the "Pilot Education Plan" can bring about a clearer understanding of the meaning of conservation of natural resources, which have been disappearing at an alarming rate.

### Staff and Equipment

It is advisable of course that sometime before the students take their first field trips — for which parental permission is necessary — the teacher



*Three students proudly display arrangements of plant samples prepared following field trips to the Educational Park.*

prepare them. A limited number of parents may also participate in the excursion.

The duration of their visit will be short, a maximum of four hours, during which the student must dedicate himself to observation and investigation, preparing a field notebook and in special cases, supporting notes with photographs. The Natural Resources Institute loans teachers and students binoculars and measurement instruments. The students bring their own food and drink in a backpack.

### Educational Activities

Making use of the advantages for observation and research offered by the six kiosks and the three principal trails, each class of approximately 30 students is divided into three groups. A teacher is in charge of each group and they can spend several hours in the areas designated for field study. The children enjoy a half hour break for lunch.

The following is a summary of the distinct activities in which groups may participate during their visit.

1. Observe and collect specimens (insects, leaves, flowers, etc.) for the formulation of regional herbariums.
2. Identify the collected material, noting at least their respective botanical families.
3. Observe sounds of different animals in the environment and the climatic variations of different ecosystems such as temperature and moisture, through the use of thermometers, hydrothermographs, and other measuring devices.
4. Noting personal impressions perceived during the completion of the first outing.

The area is managed exclusively for education and therefore games, firearms, or sound-producing devices are not permitted. It is the responsibility of the teacher to forewarn students of the restrictions so that field trips are conducted in an orderly manner, and maximum benefits afforded.

---

*Ing. Walter L. Hartmann Crespo is the Technical Coordinator for the State Nature Protection Counsel, Apartado Postal No. 6, Tuxtla Gutiérrez, Chiapas, Mexico.*

New Zealand Walkway Commission Staff

# New Zealand's National Walkway Network

The idea of a national walkway, which would run from one end of New Zealand to the other, providing ready access to the countryside for both town dweller and dedicated tramper, caught the imagination of the country's legislators about four years ago.

Parliament passed an Act in 1975 setting up the legal framework to establish a network of tracks that would eventually join up, like links in a chain, to provide a walking route from North Cape, at the northernmost tip of the North Island, to the Bluff in the far south, a distance of some 1770 kilometres.

It was an ambitious and imaginative project, and one that was never expected to be quickly or easily realized. Today, four years after the passing of the New Zealand Walkways Act, 18 walkways totalling 160 km have been officially opened.

Inevitably, practical difficulties and the lessons of experience have brought about some rethinking. The original concept of providing a walking track from North Cape to the Bluff has not been lost sight of. But the first priority is now the development of walkways close to urban centers, where they can be most used. This puts into most immediate effect the prime aim of the legislation, which is to provide walking access to the countryside for as many people as possible.

Unlike the older established European countries, New Zealand has no traditional right-of-ways established by the custom of centuries across

farm and forest land. The first settlers brought with them ideas of exclusive land ownership which have persisted down the years. Public pathways across farm fields had little place in a system whose symbol was the "no trespassing" sign. So an Act of Parliament, providing safeguards for landowners and a promise of governmental control, was in many ways a necessity for opening up the countryside.

Parliament approached its job cautiously. The Act contains many provisions designed to protect the rights of the landowner. These will be discussed later. What the Act does give, however, is a clear statement of intent. The object, it says, is to provide: "Walking tracks over public and private land so that the people of New Zealand shall have safe, unimpeded foot access to the countryside for the benefit of physical recreation as well as for the enjoyment of the outdoor environment and the natural and pastoral beauty and historical and cultural qualities of the area they pass through."

## The Act

The Act is designed to provide the legal means for setting up such a network of tracks, while protecting the rights of landowners.

It embodies a number of principles. The prime purpose of the tracks



Close to the capital city of Wellington, the Colonial Knob Walkway provides ready access to the bush and countryside for town dwellers.

will be for walking, but other uses are not necessarily ruled out. Where conditions do not preclude it, other activities such as riding horses, carrying firearms (to hunting areas) and taking dogs may be allowed. There is no power to acquire land compulsorily, nor is there power to purchase land. A walkway right must be obtained by lease or easement, gifted or negotiated.

The rights of the property owners must be fully protected, and there are stiff penalties for transgressions. It is an offense to damage the landowner's property in any way or disturb or endanger livestock. Compensation must be paid if it can be shown that this loss is directly attributable to use of the walkway. The owner may impose special conditions setting limitations on the times a walkway may be open to fit in with lambing, or periods of high fire risk.

**Administration**

The body responsible for the overall administration of the walkway system is the New Zealand Walkway Commission, which is serviced by the Department of Lands and Survey. The seven-member Commission comprises representatives of government departments (3), local authorities (2), and farming and sporting interests (2).

At regional levels, the walkways are administered by 12 regional committees, with a membership similar to that of the Commission. They undertake the investigation, planning and development of walkway proposals.

**Application**

The Commission has set up a system of track classification, providing for three types of walkways:



*Walk* — Well-formed and suitable for the average family.

*Track* — Well-defined walking track suitable for people of good average physical fitness.

*Route* — A lightly marked route for use only by well equipped and experienced trampers.

As most of the walkways so far established are close to urban areas they have tended to fall into the first category, though plans are underway for walkways coming under the other two classifications.

The Commission has seen one of its tasks as being to develop understanding between farmers and town dwellers. Although New Zealand is viewed as a largely agricultural country, in fact only 17 percent of the people are rural dwellers, and there is a noticeable population drift to the cities and towns. At the same time the rate of population growth is much higher in the urban areas. Thus New Zealand is faced with a population largely divorced from the farming sector on which its livelihood is based.

The walkway system is seen as one way of bridging the gap which is now developing between farmers and "townies" and promoting a healthy respect for farmers and their problems.

As most walkways will cross farm land the goodwill of farmers is crucial to the success of the programme. There has been some initial reluctance from private landowners to embrace the walkway system, but that is being gradually overcome.

The Department of Lands and Survey, which services the commission, is also the country's largest single farmer, and as such, is leading the way by opening up its own farms. Its own farm managers, though hesitant about the scheme at the beginning, have found their fears groundless. In some cases, where trespassers were a problem in the past, walkways have been a boon to farm management, by encouraging people to keep to the defined path.

From its inception, any walkway is a co-operative venture between the landowner and the developing agency (usually the Department of Lands



*Travelers on the Ross Historic Goldfields Walkway are served by this simple timber footbridge which spans a steep gully section of the route.*



*A bushy glade on the Ross Historic Goldfields Walkway. Note the simple surfacing and width. This is classed as a "walk."*

and Survey). It has been found essential that the landowner be involved in the planning process from the beginning, because only he may be in possession of certain details of how the land is managed. It should be stressed here that walkways are a secondary land use and should not take over from the existing use of the land.

So far the system has not been expensive to set up. The first year cost \$25,000, the second — \$50,000, the third — \$125,000, and this year the estimated cost is about \$200,000.

To some extent the walkway system has benefited from the current economic recession in New Zealand. The formation of walkways is a labor intensive operation, and so is suitable for the employment of special workers under a government and local body scheme for providing work for the unemployed. This work is done at no cost to the Walkway Commission.

**Ross Historic Goldfields Walk**

Although it is only one km long, the Ross Historic Goldfields Walk embodies much of what is sought from any walkway. It has scenic, historic and cultural values and it provides a recreational facility. Situated on the west coast of the South Island, the Ross goldfield was established in the west coast goldrush of 1865 and remained open until the 1930's.

Thus the walkway is steeped with history. Most of the equipment and working techniques known to the mining industry in the 19th and 20th centuries were used at Ross. It was where New Zealand's largest gold nugget of 99 ounces was discovered, and the variety and nature of the mining industry there has resulted in a wealth of documentation and photographs.

Development of the walkway grew from an awareness that the historical mining heritage of the west coast was fast slipping into obscurity beneath bush mantles.

At an early stage, the landowner was approached and the proposal discussed with him. Although he was initially sceptical, he readily agreed once the full project and potential was outlined. This in fact set the



*The longest walkway to be established so far, the Cape Reinga Walkway takes visitors to a lighthouse on the northern coast of New Zealand.*

scene for the project. The walkway was physically completed in six weeks and the community donated many relics of former mining equipment, some of which were still in working order.

The walkway follows a circuit route along miners' pack tracks, water races, and a dray road. It passes by the original Ross cemetery where the headstones reflect the cosmopolitan make-up of the mining population, the hazards of mining — accidents and mining claimed most of the lives — and the social history of the old town.

Points of interest along the walkway have been signposted and interpreted using both narrative and pictorial signs, which include copies of original photographs taken at actual working locations.

A replica of a miner's slab hut has been built and this doubles as a shelter for users of the walkway.

A former miner's cottage which had fallen into an advanced state of disrepair since it was built 93 years ago was given to the Commission, taken to pieces and completely rebuilt on a nearby reserve for use as a visitor center. It now houses interesting displays on the history of Ross.

Region	Name	Type	Length (Km)
North Auckland	Cape Reinga	Coastal	29
North Auckland	Mt. Auckland	Farm/Bush	8
Auckland	Motutapu Farm	Offshore Island/Farm	3.5
South Auckland	Mt. William	Farm/Bush	8.5
Hamilton	Hakarimata	Hills/Bush	8.8
Coromandel Peninsula	Coromandel	Coastal/Farm	7
Rotorua	Okataina	Lakeshore	18
Taupo	Huka/Aratiatia	Riverside	8
Wellington	Colonial Knob	Farmland/Hilly	7.5
Nelson	Dun Mountain	Old Railway Line	9.5
Blenheim	Wither Hills	Farmland	6
Kaikoura	Kaikoura Peninsula	Coastal/Farm	9.8
Hokitika	Mahinapua	Former Sawmilling Area	5.5
Ross	Ross Historic Goldfields	Former Goldfield	1
Christchurch	Crater Rim	Plantation/Farm/Hills	20.5
Dunedin	Pineapple-Flagstaff	Bush/Grassland Hilltops	5
North Auckland	Kaitaia	Bush/Hilly	9
Auckland	Mangawhai	Coastal	5

**Future**

While only 18 walkways have so far been officially opened another 60 proposals have been approved "in principle" and are currently being investigated in more detail.

It is difficult to measure the success of the system, but the intense local interest which follows notification and opening of a walkway would seem to augur well for the concept. In addition, many of the walkways are receiving the interest of visitors from other parts of New Zealand and overseas.

It will evolve over 50 or more years, but the continual development of a national walkway network and the encouragement of local walkways should provide New Zealand with an excellent recreational facility.

\* \* \*

*The article was prepared for PARKS by the New Zealand Walkway Commission staff.*

# PARK TECHNIQUES

## Designing Good, Basic Visitor Centers *Donald F. Benson and Robert W. Baird*

First of all, what is a visitor center? In the United States it usually means an information or interpretive facility serving a park or recreation area. There are other examples of visitor centers at tourist attractions and even large-scale industrial developments such as hydroelectric and nuclear-power plants. But generally the term refers to structures serving visitors to park and recreation sites. They house and complement the interpretive programs that have been established at such areas.

Next, what is interpretation? It is the communication or educational process of putting people in touch with the natural or cultural environments which are the park or recreation areas' reasons for being. Interpretation should help people relate, identify with, understand, and develop an attitude toward the resources of a park or recreation area. A visitor center is just one tool, or medium, of the interpretive program. Guided walks or live demonstrations, outdoor exhibits, brochures, and audio-visual presentations are other ways of interpreting the resources to people. All of these interpretive tools may be parts of the total management scheme to encourage visitors to understand and appreciate the resources available, and to be aware of what kind of behavior is needed to keep the resources in their present state.

Sometimes these structures are called "interpretive centers," or "nature centers," or even "park museums." They may be called "orientation centers," or even "ranger stations." But their primary purpose is to serve the people, the visitors. In that respect, "visitor center" is perhaps the most appropriate term.

Visitor centers exist for visitors, and are functional facilities. They are not meant to be architecturally ostentatious, although impressive features have marked some more elaborate ones in recent years in the interests of skillful siting, accommodation of exhibits, enhancing interpretive techniques, and energy-efficient design.

The National Park Service has been a leader in the art of visitor center design in the U.S. since the 1930's when a large amount of construction work was started in parks and natural areas. Much of this featured construction of service buildings, using rough-hewn timbers and natural stone. Using native materials is always a good rule-of-thumb, although mass-production techniques, use of relatively

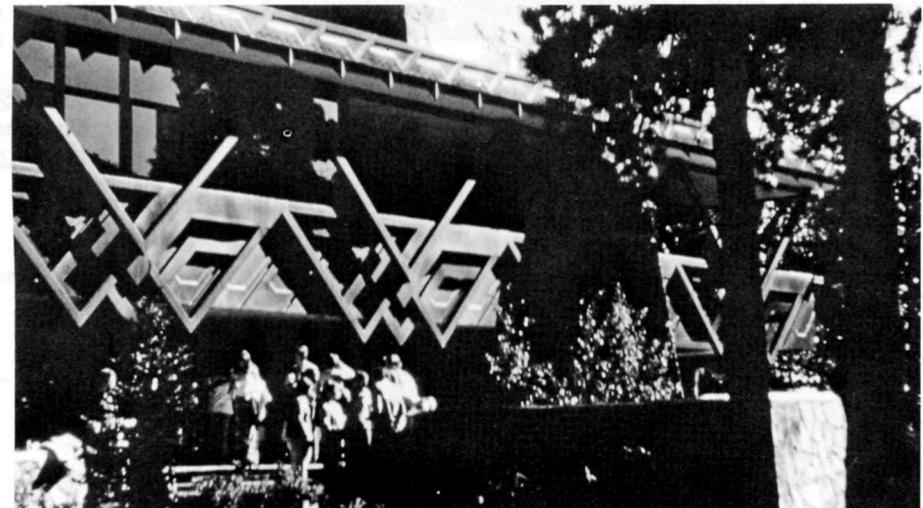
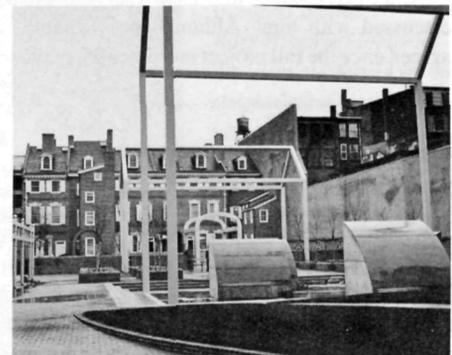
maintenance-free materials, and sophisticated equipment and construction methods have brought about some elaborate, even exotic, solutions in more recent times. In general design and construction techniques should be tailored to local economies and local interpretive needs, and the basic principles of visitor center design hold true whatever their size or wherever they are built. Some of the more outstanding examples in the U.S. may prove inspirational to park and resource managers in other countries, although there are more modest examples of good, basic visitor centers that many prefer. Size can be reduced only so much in economizing so as not to jeopardize functional use of space. The National Park Service has minimal space standards for various components of visitor centers, based on number of visitors anticipated per hour at peak periods. For the lobby, or reception area, where visitors first arrive and need orientation, a space standard of 1.11 square meters (12 square feet) per person is recommended. For exhibit areas where objects and artifacts are on display, 1.86 square meters (20 square feet) per person is recommended. And for assembly areas where audio-visual programs or special presentations are given, .84 square meters (9 square feet) is suggested.

What are some of the outstanding examples of visitor center design in the U.S.? At Rocky Mountain National Park in Colorado, the *Headquarters Visitor Center, Rocky Mountain N.P.*

*Headquarters Visitor Center is a sprawling, bi-level, 1,486-square meter (16,000-square foot) facility of mortared panels of individually*  
*Morristown National Historical Park*



*Franklin Court, Philadelphia*





Dinosaur National Monument, Utah ▲  
 Gettysburg National Military Park,  
 Pennsylvania ▼



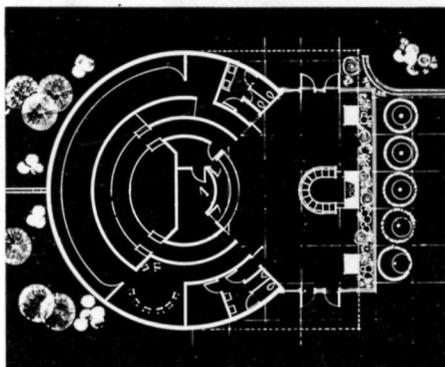
Painted Canyon Overlook, Theodore Roosevelt NMP



Emigrant Springs,  
 Oregon Trail, Oregon



Smokey Bear Historical State Park,  
 New Mexico



selected native Colorado sandstone and Cor-Ten steel, a brand of steel that oxidizes and turns rusty, with a tinge of purple. This was quite appropriate to blend in with the "purple mountain majesties" of the Rocky Mountains, as they are described in a well-known American anthem.

At Morristown National Historical Park in New Jersey, commemorating a battlefield site of the American Revolution, a visitor center liberally uses glass to afford views toward a historic woods where some 10,000 soldiers chopped down trees to build huts in which to brave wintry conditions.

In Philadelphia, Pennsylvania, at the site of American statesman Benjamin Franklin's home, a visitor center is augmented with an outdoor display featuring "ghost architecture" of white, enamelled steel frames that outline the dimensions of Franklin's home, newspaper office and stable, according to available historical information. These data are insufficient to authentically reconstruct the buildings as they must have been.

Under the Saarinen-designed Gateway Arch, a 192-meter (620-foot) high stainless steel arch in St. Louis, Missouri, an underground Museum of Westward Expansion depicts various epochs in the shaping of the American West. At Haleakala National Park, in Hawaii, a visitor center is perched on the edge of a crater, and one at Dinosaur Quarry National Monument, in Utah, is etched into a cliff. A "Cyclorama Visitor Center" at Gettysburg National Military Park in Pennsylvania commemorates the site where the sixteenth U.S. President, Abraham Lincoln, gave an immortal unity address following one of the greatest and bloodiest battles of the American Civil War.

One of the most recently completed NPS facilities at Theodore Roosevelt National Memorial Park is the Painted Canyon Overlook visitor contact station which has solar energy collectors and will have a wind generator for supplemental electric energy.

The high design standards of the National Park Service, which has its own design center in Denver, Colorado, are being adopted by

other U.S. Federal agencies, namely the U.S. Forest Service, the Army Corps of Engineers, and the Fish and Wildlife Service, all prominent in the development and management of natural areas in the U.S. Last year the Forest Service inaugurated a uniquely shaped, circular facility interpreting rock climbing and other rugged, outdoor sports available at the new Spruce Knob-Seneca Rocks National Recreation Area in West Virginia.

The Fish and Wildlife Service contracted with planners and landscape architects Maas & Grassli of Ogden, Utah, to standardize recreational and interpretive facility design throughout the National Wildlife Refuge System. The State of Oregon instituted a series of design-coordinated visitor centers along its highways. At John Pennekamp Coral Reef State Park in Florida, the visitor center rests astride a coral reef. At Smokey Bear Historical State Park in New Mexico, there is a glassed-in greenhouse lobby with a solar energy system to heat and cool the building. Some municipalities in the U.S. have launched outstanding visitor center programs, such as Cleveland's Metroparks System which introduced a Solar Environmental Interpretive Center with solar panels on the roof, and the Rocky River Interpretive Center that has an observation deck cantilevered over a creek. Now a visitor center is proposed to handle the throngs coming to see American architect Frank Lloyd Wright's classic residential design, "Falling-water," in Pennsylvania.

There are some basic similarities in design of all visitor centers. From the start it must be determined whether, indeed, a visitor center is needed to provide ingredients of the interpretive program that can't be provided any other way. If information can be conveyed adequately through a brochure, then a visitor center may not be needed. If on-site, wayside exhibits, perhaps along a trail or in an outdoor area, provide the interpretive messages that are necessary, then a visitor center may be superfluous. Visitor centers should be built only if needed. This is a basic principle. They should satisfy specific objectives of the interpretive program as spelled out in the interpretive prospectus, or plan. Such a carefully prepared prospectus is



*Cave Run Lake, Kentucky*

the best assurance that only that which is needed is provided.

An interpretive prospectus should be prepared only after development of the master plan for the entire park or recreation area, and should fit into the framework set by the master plan. Often the master plan states how facilities such as visitor centers may fit into the total management and development program, as well as the regional setting and the population served. The master plan very well may locate the site of the proposed visitor center. But the interpretive prospectus, which should contain much more detail than the master plan, identifies what is to be interpreted and how. Once it has been determined where the facility will be sited and the numbers of people it will need to serve, the prospectus serves as a guide to the designer on how the facility will function and fit into the interpretive program. It does not dictate how the visitor center will look or be shaped. That is up to the designer.

The interpretive prospectus is best conceived within a multi-disciplinary framework, with inputs from an exhibit designer, architect, landscape architect, and perhaps an interior designer. For good, basic visitor centers, the

*De Soto National Memorial, Florida*



*Rocky River Interpretive Center*

designer may have to integrate all of these skills.

“Attack the whole program,” says Art Schlott, visitor center designer with Hardaway Associates, an architectural firm in Nashville, Tennessee, which collaborated with Miller/Wihry/Lee of Louisville, Kentucky in a design proposal for an overlook facility at Cave Run Lake, a man-made flood-control reservoir developed by the Army Corps of Engineers in eastern Kentucky. Since the budget was relatively tight for a substantial overlook facility with on-site utilities, an alternative was needed.

“We got away from a building,” recalls Schlott in describing the open-air facility with outdoor deck that the design team arrived at, with exhibits oriented to the outdoors. In the

end a more conventional enclosed multi-purpose room with an outdoor deck was the course selected, but the open-air concept demonstrates the flexibility and imagination that Schlott thinks visitor centers should express.

At Big Bone State Park in Tennessee, which features a cave, Schlott developed a “non-building” design that buries a visitor center in the back side of a slope. Cost restraints kept the design simple. Schlott doesn’t anticipate much glass in the building since that raises costs and there really isn’t much that can be viewed from a visitor center serving a cave. The non-building approach, getting wider acceptance in visitor center design, blends the facility into the environment so the emphasis is purely upon the resources to be interpreted. Earthy colors help





*Brandywine Creek State Park, Delaware*

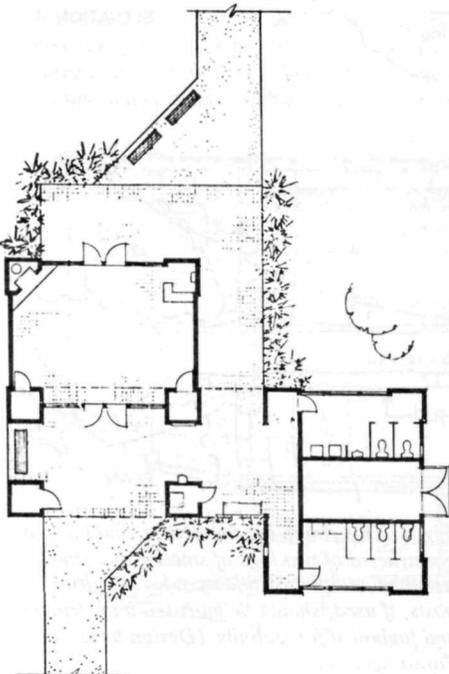


*Tims Ford Rustic State Park, Tennessee*

maintain a harmonious effect with the environment and also reduce maintenance costs. Pressure-treated woods, prepared in part with copper salt solutions, sometimes give the wood a greenish cast that is especially harmonious. Native construction materials help ensure harmony.

Sensitive siting is one of the more crucial elements of good, basic visitor center design. Thoughtful, skilled siting not only harmonizes but cuts down on costs. Rustic finishes are permissible, and landscaping materials can soften and unify rough textures. Woods such as black locust, ponderosa and white pine, treated Douglas fir and treated Western hemlock can be used effectively for retaining walls, according to an evaluation done by the American Institute of Architects and various construction-material associations. Stained and treated woods are especially weather-durable and eliminate painting requirements. Yellow poplar, red cedar, bald cypress, and old-growth redwood are especially weather-durable woods. Cedar siding was specified for the relatively low-cost Indian Spring Nature Center at Brandywine Creek State Park in Delaware and for the visitor center at Tims Ford Rustic State Park in Tennessee.

*Colbert Ferry, Natchez Trace Parkway*



Use of native materials reduces transportation costs, and pre-fabricated modular units minimize labor costs. Stucco, adobe, and wood are common native construction materials.

A resounding battle cry for good, basic visitor center design is flexibility. Combining functions may be desirable to efficiently use space. De Soto National Memorial, in Florida, has one of the smallest visitor centers in the U.S. National Park System, 232 square meters (2,500 square feet) of space. Exhibits of 16th century arms and armor are efficiently integrated into the lobby, depicting the times of Spanish explorer Hernando de Soto.

The Bailey Homestead Entrance Facility at Indiana Dunes National Lakeshore, with 186 square meters (2,000 square feet) of area, was designed to convey a residential character compatible with existing historic structures. But contemporary design keeps the facility from being mistaken for one of the historic buildings. Two modular units were connected with a low, horizontal roof, yielding two wall surfaces for limited display of interpretive materials. Still smaller is the Colbert Ferry visitor contact station, Natchez Trace Parkway, 121 square meters (1,300 square feet).

*Bailey Homestead, Indiana Dunes NL*



Contemporary design has been getting generous acceptance in the U.S. because of its flexibility and its tendency not to be confused with historic structures. Nevertheless, in small parks, the National Park Service has stipulated a need for consistency in design so a unity of theme can be achieved. Visitor centers should never be passed off as historic, or as mimicking historic structures.

The essential point in all this is that visitor centers must be designed for people. They must reflect, physically, what is needed to communicate. Good communication is not tied to modern technology, either. Expensive audiovisual and motion picture projection equipment are not always necessary. Well-selected photographs and exhibits can convey a wealth of ideas, impressions and awareness.

In designing the "flow pattern" for visitor movement through the facility, the varying patterns of human interest must be borne in mind. People speed up, move back and linger, avoiding straight lines and rigid geometric patterns; the human gait is unpredictable. Nevertheless, the flow must be structured somewhat, to help influence definite visitor experience, but not so rigidly that spontaneity is lost or flexibility

hampered. Ramps and corridors are often employed to “move” visitors through, give them structured directions but not so much that they can’t turn back or meander.

There should be no preconceived solutions to visitor center design. Each site, each park or recreation area, is unique in its environment and its interpretive needs. Design can stimulate visitor appreciation and heighten visitor interest in the park and its resources. It can truly help the visitor to experience what he came to find.

*Donald F. Benson, a senior architect with the U.S. National Park Service, is Chief of Professional Support of the NPS Denver Service Center in Denver, Colo. He has been involved in design services for visitor centers since 1954.*

*Robert W. Baird, a journalist and geographer, is an environmental and marketing writer with Miller/Wihry/Lee, Louisville, Ky., landscape architects, engineers, and planners. He has researched and written about a number of design subjects, including visitor centers.*

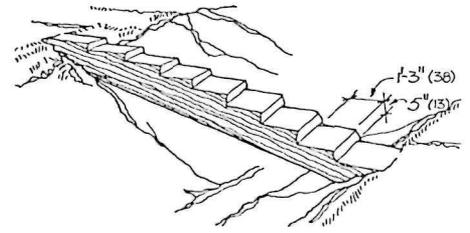


Fig. 2: Hewn steps or cleats are advisable when on an incline. Non-slip surfacing is also necessary. Drawing by Desmond Thomas. Design courtesy of Elisabeth Beazley, Designed for Recreation, 1969. Faber and Faber, 24 Russell Square, London.

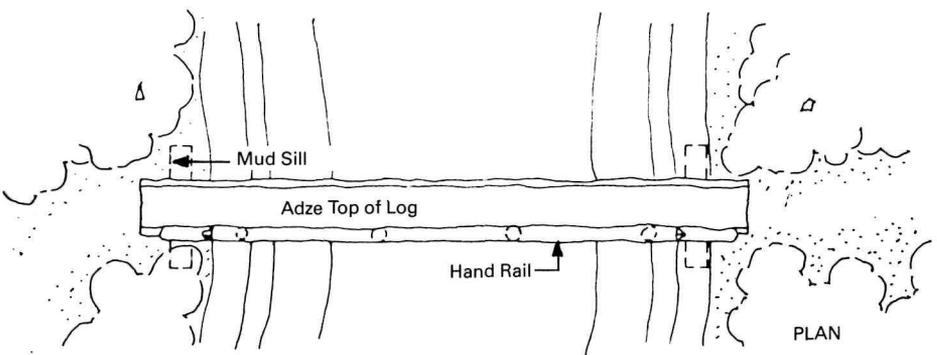
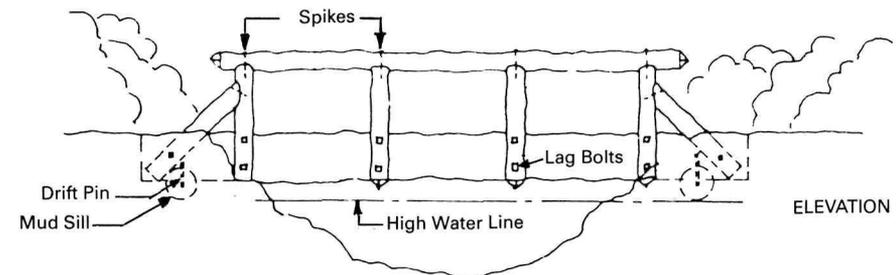
## Simple Footbridges *Merrick Smith*

Probably the first bridge was a fallen tree. In some wilderness situations this may still be the most appropriate solution to crossing obstacles. Simplicity in the design of bridges can be an objective in at least two situations: (1) where materials, equipment or skills for more highly engineered structures are not available, or (2) where there is need for a bridge of simple, unobtrusive form, and materials used are intended to be in harmony with its purpose and setting.

Whereas in the first instance the materials and methods must perforce be rude and simple, the latter might make use of either rustic or sophisticated materials and techniques, such as steel or laminated wood members, to achieve a structure of simple appearance—the possibilities are limited only by the designer’s imagination and ingenuity (and perhaps budget) and are beyond the scope of this discussion. Regardless of type, questions of width, height, need for security, type of surface, etc., will be determined by the numbers, physical ability, dress, and equipment of the user. Obviously a back-country trail bridge will not be used by the elderly, infirm, or ladies wearing high heels. A certain amount of hazard is expected (and appreciated) by the wilderness trekker. The volume of traffic and the length of the span may necessitate 2-way traffic and thus sufficient width with handrails on both sides or centered. In all cases footbridges should be stable underfoot and firmly seated on natural or constructed abutments. They may be pitched in profile as much as 8:1, somewhat more if stepped. Unless they are to be replaced seasonally they should be constructed high enough above the normal high water mark to clear floodwater and the ice or debris it might carry.

In remote situations in open country or above timberline it may be necessary to pack in pre-cut materials of a size that can be carried by pack animals or helicopter. Careful measurement is advisable. In such situations it may be possible to reduce the size of members through the use of simple trusses or suspension cables. Such structures may require engineering calculation for load capacity or at least test loading.

If crossings are not too high and there is suitable bearing surface, spans and structural members may be reduced by placing timber supports or piers of rock or cribbing inter-



mediate to the crossing. Their design and placement should take floodwaters, erosion, ice and debris into account.

In timbered country spans may be limited only by the size and structural characteristics of

Fig. 1: This single-log footbridge could also be constructed of two logs of smaller diameter, trimmed and placed side by side. Handrail posts, if used, should be mortised into stringer and lagbolted for stability. (Design by U.S. Forest Service)

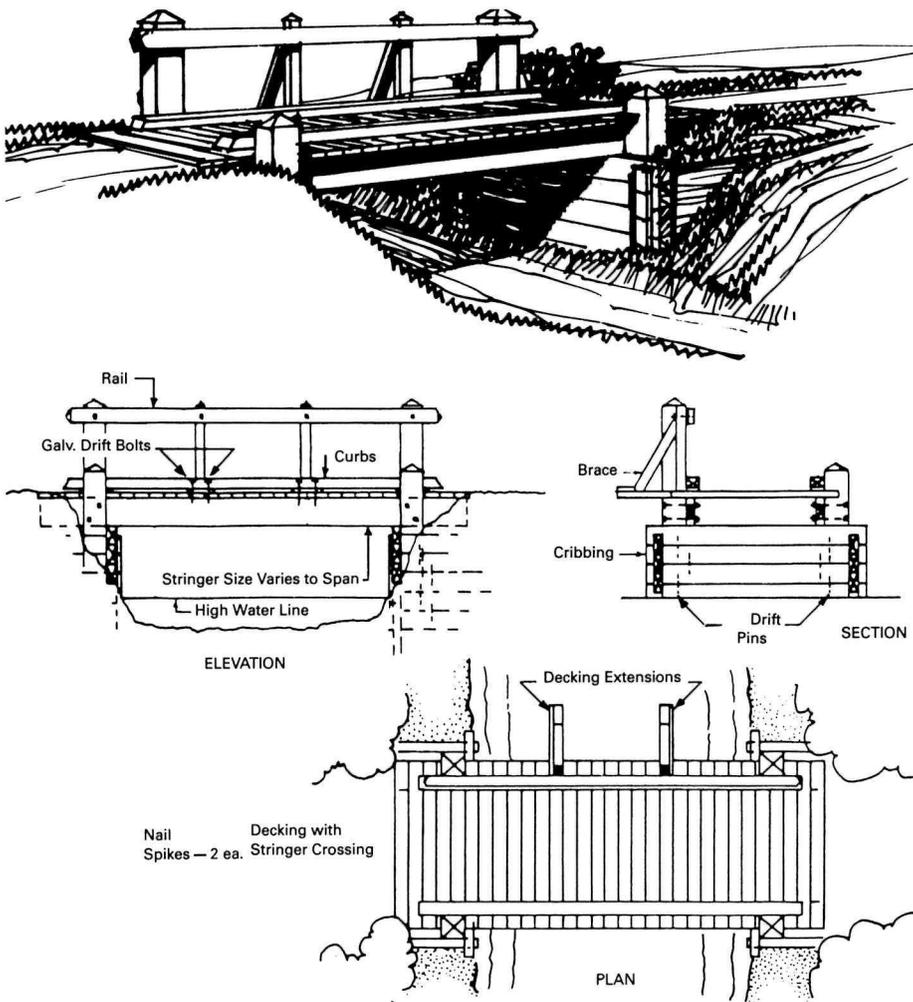


Fig. 3: Although dimensioned lumber is shown, this basic design can be adapted to log construction and the span and abutment design to local site conditions. (Design by USFS).

available trees. On the other hand size may be determined by the availability of manpower, draft animals, tools and rigging materials needed to cut, drag and place the stringers.

Illustrated (Figs. 1 through 4) are several simple bridges that can be constructed by a two or three man crew with simple handtools and a few imported materials such as spikes, bolts or

wire. A chain saw can greatly speed construction time but its use may not be appropriate in a wilderness environment.

Backpackers carrying heavy loads appreciate a handrail to help maintain balance. If double handrails are used they should be spaced far enough apart that packs and loose gear do not snag. If pack animals are to use the bridge

local packers should be consulted for the widths of their loads. Clearance between handrails or other obstacles and packs should equal about 8-inches (20 cm) each side. Handrails always should be used over any considerable height.

Decking may be locally improvised from small logs of roughly equal diameter. These may be simply laid on the stringers and nailed in place, but notching them over their supports will make them more stable and of more uniform height. Splitting or adzing to produce a half-log (puncheon) surface is best if time and manpower permit. Deckboards can be extended at intervals to support handrail bracing without the need for heavy bolts or lags.

The walking surface should not be slippery when wet, particularly if pitched. A coat of pitch or tar, if available, sprinkled with sand, or the use of cleats nailed to the decking might solve this problem.

If possible wood members such as footers or mudsills, stringers, and cribbing in contact with ground moisture should be dry timber and should be soaked with a preservative such as creosote oil to prolong life. Bark should be removed to reduce rot and insect damage. Rock abutments, natural or hand laid, are better drained and less apt to settle than wood footers or cribbing. Deck members can be earth covered for better footing (sometimes used for pack animals) but this holds moisture and shortens the life of underlying wood members.

Constructing a footbridge that is reasonably safe and durable in remote country with limited materials and equipment can be a real challenge to the ingenuity of the designer. A bridge that is pleasing to the eye and appropriate to its purpose and setting requires sensitivity and good judgement.

Merrick Smith is a consulting landscape architect in the Professional Support Branch, USNPS Denver Service Center.

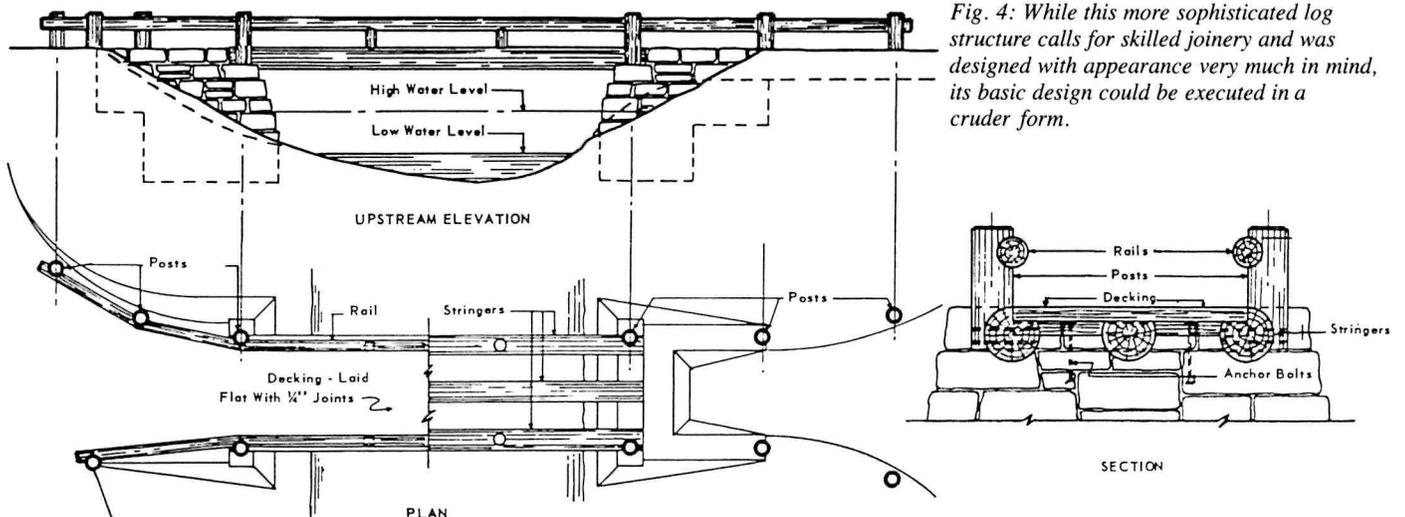


Fig. 4: While this more sophisticated log structure calls for skilled joinery and was designed with appearance very much in mind, its basic design could be executed in a cruder form.

## Resource Management

Vehicles and human or animal feet must be managed on beach dunes or they will destroy the fragile vegetation which does so much to control erosion. Here is an example of good restorative management using brush matting to aid and hasten natural regeneration of plant

growth, fencing, waymarking and the location of walking tracks, all by the department of Crown Lands and Survey installed near Warrnambool in Victoria, Australia. Photos: A. H. Arnold (Courtesy of the Natural Resources Conservation League of Victoria).



▲ April 1977—old vehicular tracks before work commenced.  
 ▼ Same site in January 1978 after fencing and brush matting.



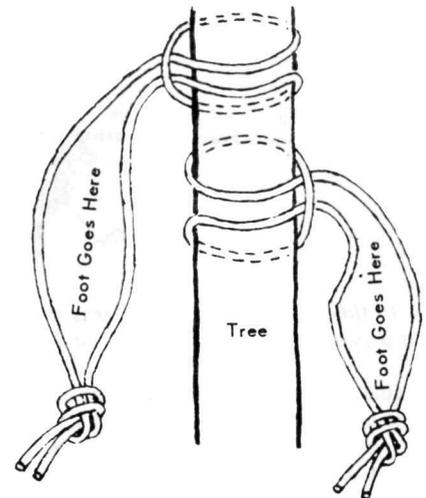
## Climbing Aid

If it is essential to climb a tree or wood pole and you haven't a ladder, climbing irons or some patented climbing device, you can climb for a short distance with several lengths of stout rope . . . and the ability to make two very simple knots.

The drawing shows a pair of ropes, each tied around a tree with a lark's head knot, and with the ends fastened with a common loop knot. You would need to tie on and position a separate loop for each step you take, of course.

Getting back down could be a problem if you have taken more than a couple of steps since the loops are difficult to get a foot into. They tend to collapse. This could be prevented by incorporating a bit of old garden hose as part of the loop to form the "step" and keep the loop standing open. Wrapping part of the loop with tape might do the same thing.

This note was adapted from an idea that originally appeared in GRIST, July-August, 1966.



## Some DOs and DON'Ts on the Care of Museum Furniture

1. **Do** keep any part or piece (veneer, glue block, broken drawer pull, caster, parts from carvings, etc.) with the piece from which it came. It may be put in an envelope, labeled and put inside a drawer.

2. **Do** use all floor cleaning equipment with care. A great amount of damage is done to the base (legs, feet, bottom rails) of furniture by improper use of floor cleaning equipment.

3. When painting walls or woodwork and the furniture cannot be moved out of the room, **do** cover it completely. A surprising amount of furniture which comes to us for restoration has dry, hard paint spatters on the finish.

4. **Do** check for insect infestation, mice, excessive moisture, molds, etc.

5. **Do not carry:** (1) Chairs by the top rail; (2) heavy pieces (desks, heavy tables, sideboards, etc.) by the top; (3) upholstered pieces by the arms. **INSTEAD**, pick them up by the frame, seat rails, or bases.

6. **Do not** move heavy pieces through doorways, corridors, etc. without covering them to protect against bumps, scratches and rubbing against painted surfaces which might imbed

paint in the finish. This is very difficult to remove, and does permanent damage to the finish.

7. **Do not** place furniture in direct sunlight. This will cause fading and deterioration of finish and fabric.

8. **Do not** attach stick-on's, scotch, masking or any other gummed tapes to the finish. They are difficult to remove and may damage the finish.

9. **Do not** use linseed oil mixtures as a polish. You will eventually get a buildup of oils which collect dirt and darken the finish.

10. **Do not** wax on unfinished wood. Wax is not a finish itself. It is a protective coating to be used over a finish. Once wax is applied to bare wood it is very difficult to remove and will discolor with age.

11. **Do not** wax over a dirty finish. Clean first!

12. **Do** rewax when a finish becomes worn and dull and will not shine when buffed with a hard cloth.

— Ralph Sheetz, from "Conserve-o-grams,"  
USNPS Division of Museum Services

## How to "Subscribe" to PARKS

The editors receive a great many letters from people who have seen or heard about PARKS Magazine and would like to have it sent to them on a regular basis.

The following information is published for the benefit of these people, and in the hope that regular readers will pass along the information when they are asked about the magazine.

At the present time PARKS Magazine is not available on a normal paid subscription basis. It is distributed without charge, by surface mail, to people who are actively and professionally involved in the planning, management or operation of national parks, nature parks, regional parks, nature or game reserves, cultural or historic reserves or monuments, museums, etc., or in related governmental activities and their ministries or departments. We interpret this to include natural and cultural conservation organizations (NGO, governmental or international), libraries, teachers, and university staffs, technical writers, researchers and others whose professional activity embraces the basic subject matter.

Request should be addressed to the Editor, PARKS Magazine, c/o National Park Service, U. S. Department of the Interior, Washington, D. C. 20240.

## Good Idea

Heavy timber trail markers into which direction pointers and messages were cut and then painted. This troublefree, long-lasting, vandal-resistant sign is at a roadside rest and information area on US Interstate Highway 75, Michigan Department of State Highways and Transportation. Photo: R. Standish



## Gentle Persuasion



Sign in the Shalimar Gardens, Srinagar, Kashmir, India.  
Photo: Bruce E. Weber

# BOOKS AND NOTICES

**Bibliografía Selecta Sobre: Manejo de Areas Silvestres de Utilidad Para Centroamerica y el Caribe.** 1978. Arne Dalfelt. CATIE. Turrialba, Costa Rica 37 pp. (Available free upon request.)

This bibliography of selected reference documents related to wildland management in Central America and the Caribbean is one of a series of important works currently being produced by the Wildlands and Watershed Project at CATIE. The bibliography lists by author 765 books, theses, periodical articles, monographs and papers presented at conferences and meetings. The work was completed in partial fulfillment of one of the recommendations of the 1974 Central American Conference on Management of Natural and Cultural Resources which called for regional coordination and interchange of knowledge on wildland management. The booklet contains both indices of subject matter and geographical area which facilitate cross references. — *G.B. Wetterberg*

**Systematic Botany, Plant Utilization and Biosphere Conservation,** 1979. Edited by Inga Hedberg. Almqvist & Wiksell International, P.O. Box 62, S-101 20 Stockholm, Sweden, 158 pages, Hardback. Sw. Kr. 98.

This is the proceedings of a symposium sponsored by the University of Upsala in commemoration of its 500th anniversary, and by the Swedish Natural Science Research Council and the Swedish Council for Forestry and Agricultural Research. The World Wildlife Fund of Sweden funded its publication.

The spirit of Linnaeus is evident throughout this fine book. His pioneer work in the 18th century stressed the practical usefulness of plants and of systematic botany to man. However, the participants at this symposium all seem to agree that the gap between basic knowledge of plants and their extinction or threatened extinction is widening at an alarming rate. They emphasize the need for systematic exploration and conservation of the flora of the world, particularly in the tropics, before it is too late. The flora of vast areas of the earth's surface remain imperfectly known, if at all, while the destruction of habitats continues at an accelerated pace.

The distinguished scientists who participated and whose papers appear in the proceed-

ings represented a broad cross-section of professional world opinion, although regrettably few representatives from Africa and South America were present. They unanimously resolved that "... although plants are the world's basic life support system, our plant knowledge is not adequate to be able to make satisfactory suggestions for plant conservation in any but a few temperate areas of the world." They urged governments most strongly to provide immediate increased support, both financial and academic, for the development of systematic studies to fill the gaps in basic floristic knowledge and urged increased facilities for training people to do this essential work. Moreover, they pressed "... for the preparation of ecologically appropriate land management plans *now*, even if the preliminary floristic data are incomplete."

To the professional botanist, the proceedings contain a wealth of information leading up to these conclusions. To the rest of us they provide sound reasons to support their resolution. — *Gordon Fredine*

**Children's Experimental Workshop, Expanding the Park Experience to Children with special needs.** 1978. Wendy Ross, U.S. Department of the Interior, National Park Service, Washington, D.C. For sale at US \$4.50 by Superintendent of Documents (Stock Number 024-005-00735-1), U.S. Government Printing Office, Washington, D.C. 20402. Add 25% to the price on orders from outside the USA.

This is a warm and deeply touching book which documents the six-year history of an exciting and successful USNPS program, a program designed for children for whom normal park access and program participation had been limited by social, physical or mental barriers.

The program, which was developed and conducted by the author, drew on the performing and visual arts communities for both inspiration and teaching assistance, and found the practice of these arts — drama, puppetry, pottery, dance and other forms — ideal channels for reaching the children and providing them with enrichment.

The book has become significant as a source for developing similar programs in other areas. The lessons of its pioneering work can be adapted anywhere. — *Robert I. Standish*

## Third Annual International Wildlife Film Festival

To encourage the production of high quality wildlife films, the University of Montana Student Chapter of The Wildlife Society in 1980 will host the Third Annual International Wildlife Film Festival. Amateur and professional films pertaining to wildlife will be judged by a panel of highly qualified film makers and biologists. Winning entries will receive awards, and the results will be internationally publicized.

The deadline for submission of applications and films is February 1, 1980. All entries must have a predominantly wildlife theme and have been produced or released in 1979. Judging will be held prior to the festival, and the winning films will be shown in early spring at the University of Montana.

Information, rules of eligibility, and application forms will be available October 1 by writing:

Wildlife Film Festival  
Wildlife Biology Program  
University of Montana  
Missoula, Montana 58912/USA

## European Heritage Landscape Conference 1980

A European conference on land management and conservation will be held at Losehill Hall, April 7-11, 1980.

Local managers and staff of Europe's protected landscapes will exchange information and discuss problems of planning and management.

Further details are available from Peter Townsend, Principal, Peak National Park Study Centre, Losehill Hall, Castleton, Derbyshire, S30 2WB, England.



*Waterfowl are the most numerous and spectacular wildlife found at Lake Ichkeul. Many varieties of ducks are present, along with geese, wading birds, predators and song birds. They add up to a vast number. This duck is the shoveler (Spatula clypeata), present in the thousands. Photo: © Karl Weber.*

*Back cover: The Honourable John A. Fraser, Canadian Minister of the Environment, stands with local school children Denise Konisenta and Paul Gauthier before the UNESCO-World Heritage Convention plaque which recognizes Canada's Nahanni National Park as part of the World's outstanding natural and cultural heritage. With the ceremony, September 4, 1979, Nahanni became the first World Heritage site to be formally identified with a plaque. The two children symbolically accepted the Heritage dedication on behalf of all children in this Year of the Child.*

*Visible in the background are the rapids of the South Nahanni River, just above Virginia Falls (bottom photo), a spectacular cataract twice the height of Niagara Falls.*

*The objective of the World Heritage Convention is to identify, protect, preserve and interpret for all peoples those cultural and natural sites throughout the world which are considered to be of outstanding universal value. Photos: Parks Canada*

#### **Staff**

EDITOR: Robert I. Standish,  
U. S. National Park Service

ASSISTANT EDITOR: C. Gordon  
Fredine, U. S. National Park Service

FRENCH EDITION EDITOR:  
Jacques Fleury, Parks Canada

SPANISH EDITION:  
Montgomery Translations, Inc.  
Bethesda, Maryland

DESIGN: James True, Inc.

#### **Advisory Board**

George A. Yeates,  
Director-General, Parks Canada

William J. Whalen, Director,  
U. S. National Park Service

T. M. Pasca, FAO-Rome

Mona Björklund, UNEP-Nairobi

Dr. Michel Batisse, UNESCO-Paris

Braulio Orejas-Miranda, OAS-Washington

Harold K. Eidsvik, IUCN  
Gland, Switzerland

Dr. Lee Talbot,  
World Wildlife Fund · Gland, Switzerland

Jean R. Brown, Chief, External Relations,  
Liaison and Consultation, Parks Canada

Dr. Kenton R. Miller, Chairman,  
Commission on National Parks and  
Protected Areas (IUCN)

Jean C. Henderer, Chief, Office of  
Cooperative Activities, USNPS

Robert C. Milne, Chief, Division of  
International Park Affairs, USNPS

