

Volume 11, No. 4, 1986

PARCS PARKS PARQUES

International Union for Conservation of Nature and Natural Resources

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Unión Internacional para la Conservación de la Naturaleza y de los Recursos Naturales

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Union internationale pour la conservation de la nature et de ses ressources



Commission on National Parks and Protected Areas
Commission des parcs nationaux et des aires protégées
Comisión de Parques Nacionales y Areas Protegidas



PARKS PARQUES PARCS

An international journal for managers of national parks, historic sites, and other protected areas

Una revista internacional para directores de parques nacionales, campos arqueológicos y otras áreas protegidas

Revue internationale pour gestionnaires de parcs nationaux, de lieux historiques et autres lieux protégés

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Aims and objectives

PARKS is a practical journal for technical and management personnel dealing with natural, historical and cultural values of national parks and other protected areas. It covers all aspects of the planning, use and operation of these areas throughout the world. The aim of PARKS is to promote more effective management of protected areas and to facilitate communication between protected area managers worldwide.

Published by Science and Technology Letters on behalf of IUCN

Executive Editor: Sara T. Nash

Prepared and published with the support of WWF; UNESCO; Parks Canada; U.S. National Park Service; Department of Lands and Survey, New Zealand.

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Editorial

This number completes the 1986 volume of four issues. The development and operation of new editorial, publishing and distribution systems have encountered inevitable hitches – but also a great deal of good will which has enabled us to keep going ahead confident that difficulties would be resolved. We believe that funding will be assured to carry us through the next year, and expect to be better prepared for producing future numbers regularly each quarter.

In our last editorial, we mentioned various themes for forthcoming issues – wetland park management, world heritage, marine protected areas, tourism in parks (“ecotourism”), protected landscapes – and solicited contributions about your thoughts and practices in these subject areas. While these themes may focus attention on particular directions of management effort, let us not forget the continuing need to address concerns of administrative and practical capability for day to day management of any protected area. We are anxious that nobody should be dissuaded from contributing ideas because they do not seem to conform to one of the above themes.

This issue presents two contrasting cases of creating a national park. One, based on many years of ecological research and a comprehensive methodological study, is an original project for realizing the vision of reconstituting a dry tropical forest ecosystem and providing for its management as a socially integrated and acceptable extension to an existing national park in Costa Rica. The other is a nostalgic account of how the first national park was fostered, from concept to fact, into being in Papua New Guinea. Each in its own context demonstrates the need for basic skills and techniques in providing essential infrastructure; a point also made in a “letter to the editor”. PARKS can continue to be of use in this respect only to the extent that it can get hold of the necessary material, so please help us to help you share your bright ideas by writing them up – with illustrations where appropriate – and letting us have them, however simple. A good example has been set by submission for this number from the Netherlands Antilles.

May 1987 bring some measure of success and satisfaction to our common efforts in safeguarding our precious heritage.
TONY MENCE (Editor)

News

Pan de Azucar: new park in Chile

Chile's Desert Ecological Region (part of Udvardy's Pacific Desert province) is poorly represented in the protected areas system. In May 1986 the 43,754 ha Pan de Azucar National Park was created (26°S–70°35'W) as a first step to fill this gap in the system. Atacama desert in northern Chile is the driest in the world, but in coastal ridges exposed to fog an outstanding array of plant species exist, many of them restricted endemics. Among them, cacti are particularly threatened by collectors. Within the boundaries of this coastal park are contained Humboldt Penguin rookeries, seabird nesting sites and sea otter reproduction sites.

Intern opportunities

Three internships of approximately 2 months duration are available in the Environment and Policy Institute of the East–West Center in Honolulu, Hawaii for young professionals in the Asia–Pacific region. This is an opportunity to join a small (six or seven) study team during July and August 1987 for a period of professional enrichment. The focus will be on use and conservation of biological diversity in protected areas through appropriate design, management measures, and involvement of local residents or land users.

Round trip air fare, housing in dormitory (separate rooms) facility, plus a modest subsistence allowance of US\$565 per month can be offered for from six to nine weeks. The East–West Center is on the campus of the University of Hawaii, and the facilities of that institution are available to the interns for library research, contact with

faculty, and interaction with the Co-operative National Park Service Unit.

Applicants must be current employees of a government park agency in one of the Asia–Pacific countries, and be returning to employment in that agency following the internship. They must have a university degree in some subject relating to natural resources and be nominated by their agency for this training program.

Send applications by 30 April 1987 to Dr Lawrence S. Hamilton, East–West Center, Environment and Policy Institute, 1777 East–West Road, Honolulu, Hawaii 96848 USA. Include biographical data, brief description of current park responsibilities, and an indication of employer's willingness to grant leave for at least six weeks beginning 1 July and preferably nine weeks, 1 July to 31 August 1987.

World Bank adopts wildlands management policy

In July, the World Bank promulgated a new policy on the treatment of wildlands in development projects that could significantly aid conservation in coming decades. The Bank recognizes that while further conversion of some natural land and water areas to more intensive uses will be necessary to meet development objectives, other pristine areas will yield more benefits to present and future generations if maintained in their natural state. To prevent the loss of these special wildlands, the policy specifies that the Bank will normally decline to finance projects in these areas and instead prefers projects on already converted lands. Conversion of even less important wildlands must be justified and compensated by financing the preservation of an ecologically similar area in a national park

or nature reserve, or by some other mitigatory measures. The policy provides systematic guidance and criteria for deciding which projects may need a wildland measure, which wildlands are in need of protection, and what types of wildland measures should be provided.

Nicaraguan President proposes international peace parks

In an address to his nation on 5 June, World Environment Day, Nicaraguan President Daniel Ortega proposed the creation of border parks and international biosphere reserves with neighbouring Costa Rica, El Salvador and Honduras to promote peace and sustainable development in Central America. Areas proposed include the mangrove forests of the Gulf of Fonseca shared by El Salvador, Honduras, and Nicaragua, the Mosquitia lowland tropical forest and pine savannas on both sides of the Coco River separating Honduras and Nicaragua, and the wildlands along the San Juan River between Costa Rica and Nicaragua. Improved cooperation in management of existing reserves with important turtle nesting beaches on the Pacific coast of Costa Rica and Nicaragua is also proposed. These ideas were discussed during a subsequent visit by officials of Nicaragua's Institute for Natural Resources and the Environment, including its director, Julio Castillo, to Costa Rica, in early July. During the visit, sponsored by IUCN and coordinated by the Costa Rican National Parks Foundation and CATIE's Wildlands Program, the officials discussed the proposed parks with Costa Rican officials including Natural Resources Minister Alvaro Umaña.

Guanacaste National Park

A tropical ecological and cultural restoration project under consideration with the Government of Costa Rica and various funding agencies (abridged version)

Daniel H. Janzen

Dry tropical forest is the most endangered of Mesoamerican habitat types. Less than 1 per cent of the original area is protected. A project is described for effecting managed recolonization of low-quality agricultural and pasture land by dry forest organisms present in the adjacent Santa Rosa National Park in northwestern Costa Rica. The ultimate objective is to restore the dry forest ecosystem within an extended National Park where existing social and cultural elements are fully integrated with ecological considerations through a comprehensive management and development plan. The scientific basis and the methodology are explained.

El bosque tropical seco es el hábitat Mesoamericano que está más en peligro. Menos del uno por ciento del área original está protegida. Se describe un proyecto para llevar a cabo la recolonización controlada de tierras agrícolas y pastizales de baja calidad por organismos de bosque seco presentes en el colindante Parque Nacional Santa Rosa en el noroeste de Costa Rica. El objetivo final es el restaurar el ecosistema de bosque seco dentro de un extendido Parque Nacional donde los elementos socio-culturales existentes sean completamente integrados con las consideraciones ecológicas a través de un plan extenso de manejo y desarrollo. Se explican las bases y metodología científicas.

De tous les types de biotopes méso-américains, la forêt tropicale sèche est le plus menacé. Moins de 1 pour cent de sa superficie d'origine est protégé. Un projet vise à réaliser la recolonisation aménagée des terres agricoles et d'élevage de médiocre qualité par les organismes de forêt sèche présents dans le parc national adjacent de Santa Rosa, au nord-ouest du Costa Rica. L'objectif ultime est de restaurer l'écosystème de forêt sèche à l'intérieur d'un parc national étendu où les facteurs sociaux et culturels seraient entièrement intégrés aux considérations écologiques, dans le cadre d'un plan global de gestion et de développement. Les bases et la méthodologie scientifiques sont expliquées.

Introduction

When the Spaniards arrived, there were 550,000 km² of dry forest on the Pacific side of lowland tropical Mesoamerica. Equal to about five times the size of Guatemala in area, this dry forest occupied as much or more of the Mesoamerican lowlands as did the rainforest. Today, less than 2 per cent of this dry forest exists as relatively undisturbed wildlands, and only 0.08 per cent of it lies within national parks or other kinds of conserved areas. To save what dry forest we still have, we must give some land back to it. Habitat restoration is essential before natural and anthropogenic fluctuations and perturbations extinguish many of the small populations and habitat remnants that have survived.

Likewise, when the Spaniards arrived, the dry forest habitat was occupied by peoples with an intimate, if pragmatic, factual knowledge and cultural understanding of the biology of dry forest. Today, schoolchildren of a Mesoamerican town have neither their predecessors' contract with the natural world nor the human cultural offerings of the large cities that are supported by their parents' agricultural activities.

The proposed new Guanacaste National Park (GNP) in north-western Costa Rica has three functions:

(1) *Use existing dry forest fragments as seed to restore about 700 km² of topographically diverse land to a dry forest that is sufficiently large and diverse to maintain in perpetuity all animal and plant species, and their habitats, that occupy the site. It also must be large enough to contain some habitat replicates that can absorb intense visitation and research use.*

(2) *Restore and maintain a tropical wildland so as to offer a menu of material goods such as plant and animal gene banks and stocking material, reforestation examples with native trees, watershed protection, manipulation of vegetation by livestock, recreation sites, tourism profits, wildlife management examples, fire manipulation examples, agroforestry research data, educational programs and basic wildland biology data.*

(3) *Use a tropical wildland as the stimulus and factual base for a reawakening to the intellectual and cultural offerings of the natural world; the audience will be local, national and international and the philosophy will be 'user-friendly'.*

The area contains 230 km² of established national parks and 470 km² of private land, and is about 1 per cent of the area of Costa Rica. One of the national parks (Santa Rosa) contains enough habitats and populations to serve as the seed; they will be supplemented by the population remnants throughout GNP and the pristine forest remaining on the nearby volcanic slopes.

GNP is new in area and concept from traditional Neotropical national parks, although it will contain the well-established Santa Rosa National Park which, together with the Murcielago National Park now incorporated within it, can offer 5-plus-year-old pilot studies in restoration, and is embedded in Costa Rican culture, a society that has long held education and cultural development to be noble and legitimate human activities.

The GNP plan is extremely site- and culture-specific, designed to function in the exact context of the sparsely occupied and low-quality pastures and degraded forests of a small part of north-central Guanacaste Province, which is otherwise a rich agricultural province. It must be evaluated in this context, even though major fragments of

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the philosophy and technology underlying the plan are relevant to agroecosystem design throughout the tropics. The trials and examples of GNP will be both training ground and models for the consolidation and development of the other portions of the Costa Rican national park system. Detailed planning of guidelines and their implementation will be conducted by committees of interested persons and organizations primarily or entirely of Costa Rican origin.

Within the next 5–10 years the wildland component of Costa Rican society will be forever fixed in place. It is clear that the Pacific coastal dry forest was destroyed faster and more thoroughly than was the Atlantic rainforest. What Costa Rican habitat is not in preserves will be dead, and the next stage is that of improving the quality of both wildland preserves and agriculture in the agroecosystem. The preserves that do not become adequately integrated in Costa Rican society will also die. If the terrain for GNP cannot be purchased or otherwise frozen in its currently mildly damaged and relatively unoccupied state within the next 1–3 years, the plan will have to be abandoned for GNP and applied to Santa Rosa alone.

This urgency came about because the social and economic stasis that has characterized the GNP area for the past 400 years is coming to an abrupt end as a consequence of: (1) the obliteration of almost all pioneer agriculture in Costa Rica; (2) the recent influx of outside influence from central Mesoamerica; (3) the liquidation of family-land holdings as owners pass retirement age; (4) the corporationization of the high-quality farm land in the remainder of the province; and (5) the realization by large

land owners that only a tiny fraction of the GNP terrain is of agricultural use and that this use can only be realized through labour-intensive farming. There is substantial risk that the current owners will subdivide their large properties and sell the valuable parts as luxury investment property and the other parts to gullible or desperate subsistence farmers. Removing it from “production” will have no significant negative impact on either the local or national economy.

The GNP plan follows the traditional format for conservation and land development plans. However, throughout there is the underlying philosophy that the traditions of tropical conservation in general, and certainly Costa Rica specifically, have to recognize the integration of the park into the social consciousness as dominant and central to the entire plan.

The region

In general: Guanacaste National Park sweeps from the 1,500 m peaks of Volcan Orosi and Volcan Cacao down to the Pacific Ocean, including the Santa Elena Peninsula, forming a wide band across the north central portion of Guanacaste Province straddling the Interamerican Highway. All surrounding communities are based on agricultural land of much greater value than that in GNP.

Ecological placement: GNP lies in the nearly continuous belt of what was once dry tropical lowland forest from north of Mazatlan, Mexico, to approximately the Panama Canal in Panama (Figure 1). Pacific Mesoamerican dry

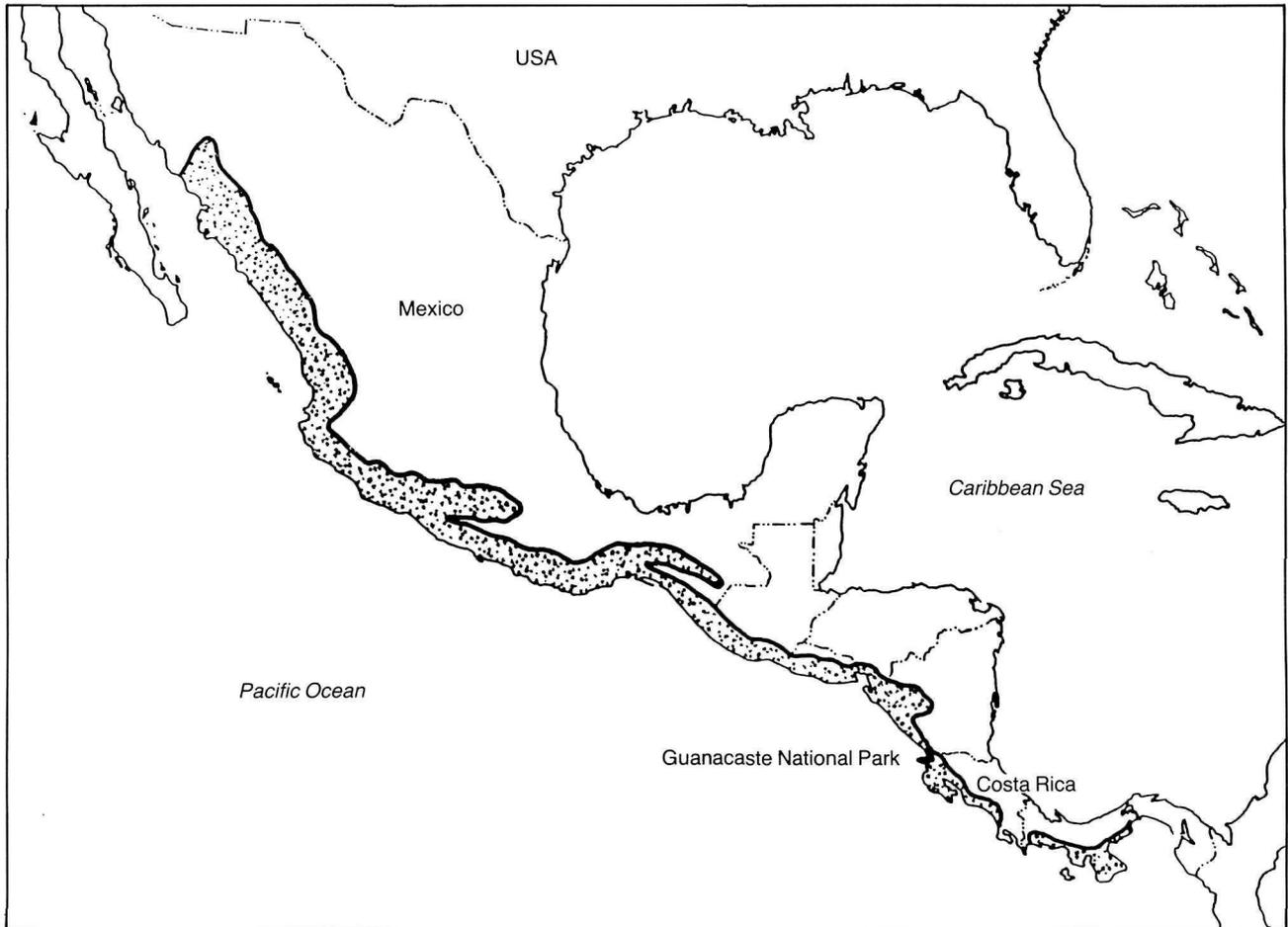


Figure 1 The distribution of Mesoamerican Pacific dry forest (stippled) at the time of the arrival of the Spanish conquistadores. Guanacaste National Park is indicated in black in northwestern Costa Rica; the other preserved areas are too small to be readily visible at this scale.

forest is characterized by receiving 900–2,400 mm of annual rainfall during 5–7 months of the year (April–May to October–December) and no rain during the 5–7 month dry season. The upper end of this rainfall regime generates rainforest in certain parts of the tropics (e.g., Nigeria), but these are not subjected to the strong winds that blow during the first half of the dry season at GNP and are characteristic of much of western Mesoamerica. Southern Mesoamerican dry forests also have a 0–6 week short dry season in the middle (July–August) of the rainy season; in GNP, the timing and intensity of this dry season is extremely variable. While average values can be derived from weather data for the GNP area, it is critical to recognize that the dry side of Mesoamerica is characterized by 2–10 year series of exceptionally wet or dry years. These have the effect of temporarily obliterating or reducing patches of fauna and flora in the fine-scale moisture mosaic. In natural conditions, such patches are reinvaded when the weather pattern changes. However, in small dry forest preserves surrounded by agricultural land, there is no place from which this re-invasion can occur.

Nocturnal low temperatures range from 16 to 23°C, and diurnal maxima from 26 to 38°C in most Mesoamerican lowland dry forest habitats. The dry season is substantially hotter than the rainy season.

In general, the lands once occupied by western Mesoamerican dry forest have been converted to agricultural use. Dry forest is easy to clear and keep clear with felling and fire. Overall, the dry forest environment is relatively similar to the tropical and extra-tropical habitats from which large-scale farming and ranching enterprises have been imported to Mesoamerica over the past 400 years.

It is commonplace to think of the Pacific Mesoamerican dry forests as ecologically distinct and separate from the rainforests and upper elevation forests of central and Atlantic Mesoamerica. However, recent studies of flying animals in Santa Rosa and other parts of Guanacaste Province's dry forests reveal that many "rainforest" insects and some birds spend the rainy season in the dry

forest and the dry season in the rainforest or in nearby moist forest refugia. Obliteration of either wet or dry forest will obliterate these animals. One cannot view Costa Rica's national park system as a series of islands but rather must view it as a network partly connected by migrants. Some migrants can and do move hundreds of kilometres (e.g., sphingid moths, birds) while for others, the moist refuge during the dry season must be as close as a few hundred metres. GNP contains both moist refugia and flyways between Guanacaste dry forest and rainforests on the Atlantic side of Costa Rica.

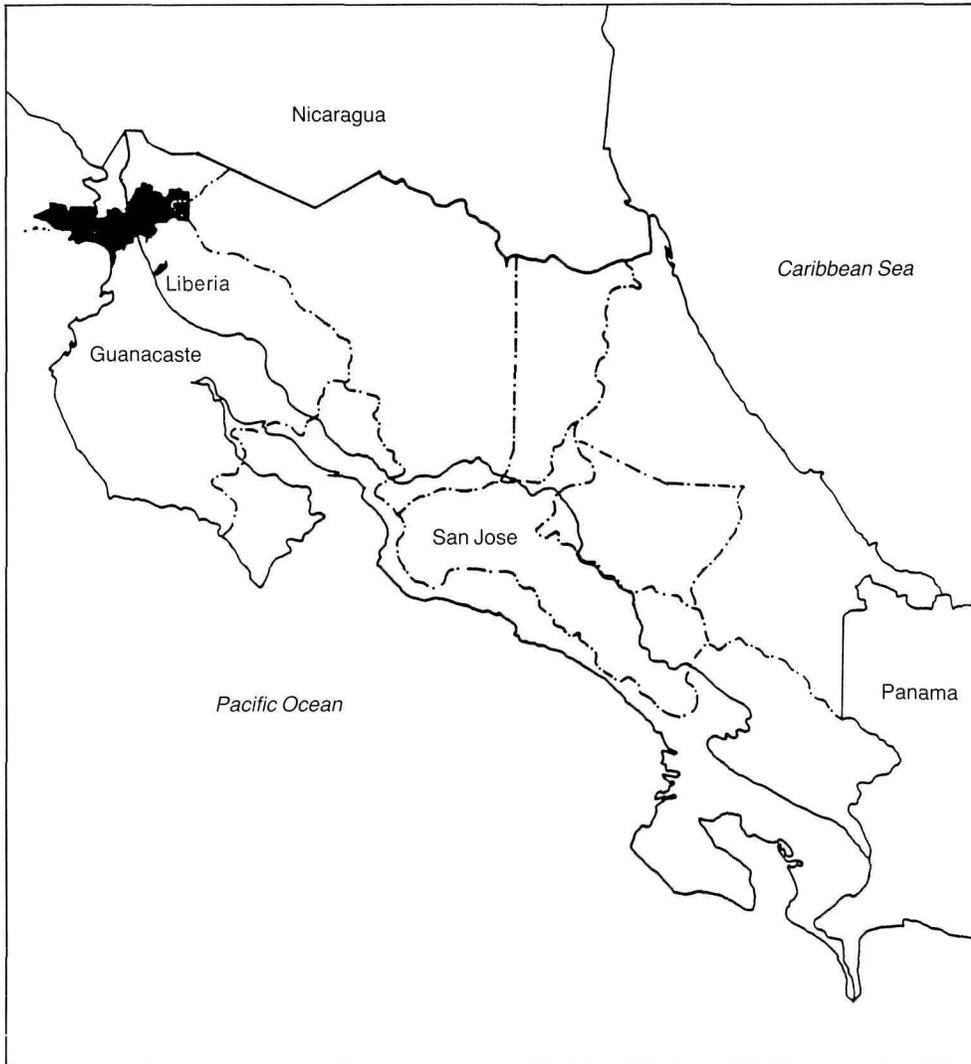
It will be many years before we know what fraction of the "dry forest" fauna has to have immediately adjacent evergreen forest, if it is to persist in the dry forest. However, these refuges are necessary if the dry forest fauna is not to be severely reduced in species-richness (such as is presently encountered in the dry forests of the Mexican Yucatan peninsula where there are no moist dry season refugia owing to the highly permeable limestone substrates).

Habitats: GNP consists of the Santa Elena peninsula (85 million years old and above the sea during that time: this is the oldest continually exposed surface in Mesoamerica; the Santa Rosa plateau (3–6 million year old volcanic ash flow deposit), the ancient volcanic core known as Cerro El Hacha, the twin young volcanoes of Orosi and Cacao (the most recent material being perhaps as young as 10,000 years), small areas of coastal marine deposits, and various alluvial fans eroded off all the above substrates. Volcan Orosi and Volcan Cacao are the most northern and most isolated of the string of volcanoes that extends south to Volcan Turrialba, which is east of San Jose.

The original GNP vegetation contains a few to tens of square kilometres of virtually all kinds of dry forest habitat to be found over the broad latitudinal range of Mesoamerican dry forest, covering the following Holdridge Life Zones: Tropical Dry Forest, Tropical Dry Forest Moist Forest Transition, Tropical Moist Forest, Premontane Wet Forest Basal Belt Transition, Premontane Wet Forest, Premontane Rainforest, and Montane Rainforest. The

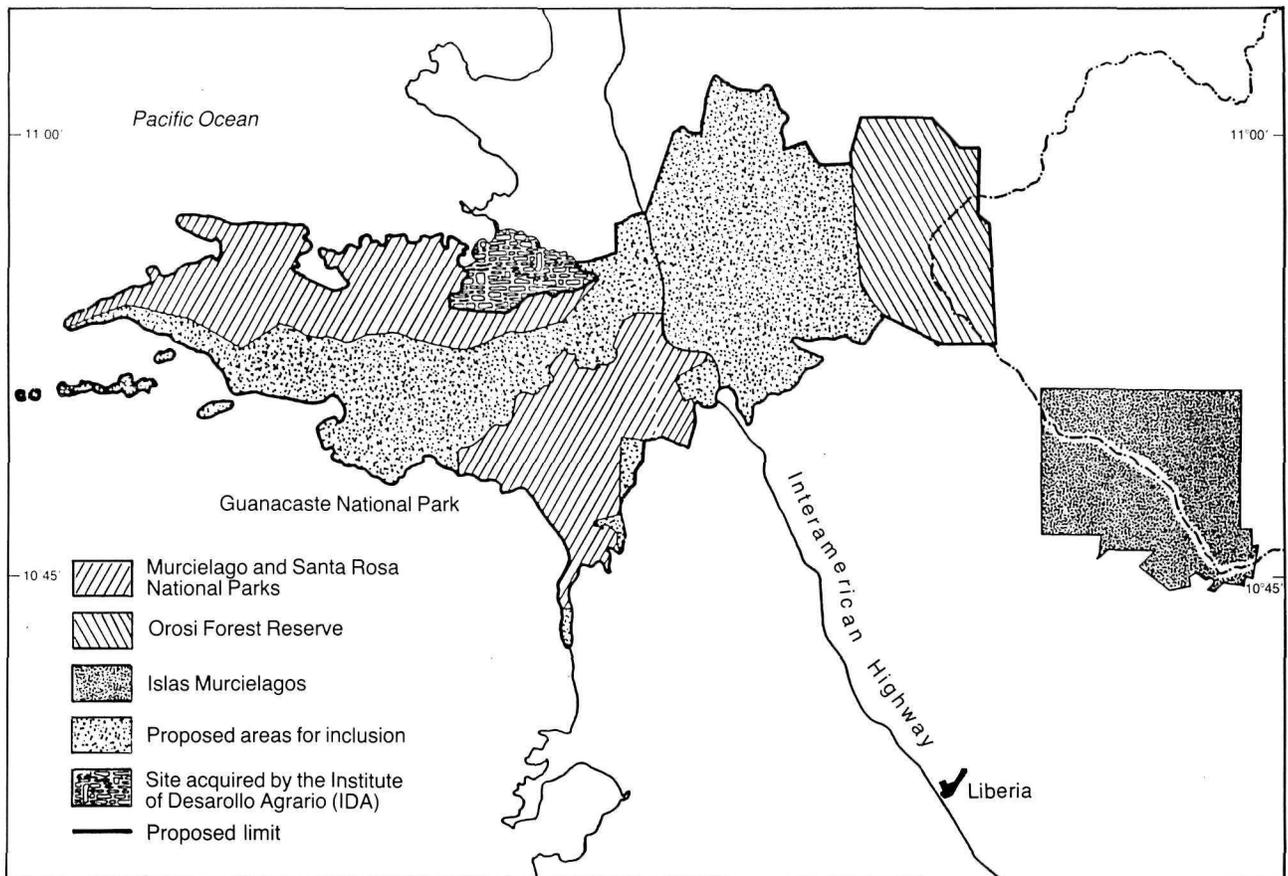


Overall view of major section of Guanacaste National Park (Orosi Volcano in background) that scientists are planning to turn back into a tropical dry forest (photo, Daniel H. Janzen).



◀ **Figure 2** The location of Guanacaste National Park in northwestern Guanacaste Province, Costa Rica. The Interamerican Highway passes through the centre of the park, and the Park forms a continuous swath from the volcano tops to the coast.

Figure 3 The new area to be added to Santa Rosa National Park and Murcielago National Park to form Guanacaste National Park. ▼



Islas Murciélagos and the tip of the Santa Elena peninsula are probably the driest sites in the country. At its margins and interior, GNP has a variety of interfaces with coastal vegetation, river-margin vegetation and evergreen rainforest. It has no natural lakes (but does contain seasonal swamps) and both seasonally dry and everflowing rivers. Its many habitats existed originally as a very complex mosaic. Today, these have been variously overlain and partly obliterated by a complex pattern of cutting, burning, grazing and farming, followed by secondary succession ranging from 0 to 400 years in age. However, somewhere within GNP there remain minute to large patches of all the original habitats and population fragments of all the plants and animals that were present when the Spaniards arrived. The most pristine habitats lie in Santa Rosa, in the ravines on the lower slopes of Cerro El Hacha, on the upper slopes (above 600 m) on the volcanoes, and in a few isolated patches up to a few tens of hectares scattered over the remainder of GNP. The most seriously altered areas are the upper parts of Cerro El Hacha, the Santa Elena peninsula (including parts of Murciélago National Park) and the wooded and brushy pastures in all of the ranches to the east of the Inter-American Highway.

Most GNP plant and animal species are widely distributed in the Neotropics. However, the widely distributed species tend to have distinctive dry forest populations, these also being distributed widely throughout the Mesoamerican dry forest, but with nearly all their populations reduced to the tiny local populations in small reserves. GNP is also the only Costa Rican home of *Ateleia herbert-smithii*, the world's only wind-pollinated legume and the tree that has become one of those

selected to be widely distributed as a tropical fuelwood species. GNP's namesake is the Guanacaste tree. It is the national tree of Costa Rica and one of the best-known trees in Guanacaste Province. This tree probably did not occur naturally in Costa Rica when the Spaniards arrived, being a more northern Mesoamerican tree that came to Costa Rica as seeds in the guts of the first Spanish horses and cattle and was distributed by them throughout Guanacaste. Today it is being extinguished in many habitats through restriction and reduction of horse populations, fire destruction of habitats and death of adult trees (senescence and lumbering).

The most prominent 15 dry forest habitats in GNP are briefly characterized below:

(1) *Seasonal (intermittent) rivers and creeks.* During the dry season, all watercourses within GNP dry up except for a few springs and the everflowing ones from evergreen forest. During the rainy season, the amount and duration of flow in the seasonal watercourses depends on the rainfall pattern. GNP's seasonal watercourses are important dry season water sources (pools and springs), and the more evergreen vegetation along the banks produces a cool and humid refuge as well. The watercourses and watercourse banks are a major natural habitat for a large fauna of ruderal plants and animals.

(2) *Everflowing rivers and creeks.* The everflowing rivers have their origin in the rainforested sides of the volcanoes, and then move out into the seasonally rain-free lowlands, generating linear dry season oases. Such rivers are a major part of western Mesoamerican dry forests ecology, but throughout most of western Mesoamerica they have been biologically obliterated by deforestation,



Streambed in dry season – Guanacaste National Park.



The same in rainy season (photos, Daniel H. Janzen).

irrigation schemes and agrochemicals. In GNP, these rivers contain a unique flora and fauna (including fish and aquatic invertebrates that cannot persist in the seasonally dry watercourses, but re-invade them each rainy season from the everflowing rivers), serve as major dry season refuges for animals, and have on their banks wet forest plants that do not otherwise occur in the area. No extant dry forest park in all of Mesoamerica contains an ever-flowing river system.

(3) *Mangrove swamps*. The small estuarine embayments along the coast from the southern boundary of Santa Rosa to Cuajiniquil contain fine examples of dry Pacific coast mangroves. This habitat has been generally destroyed over the past 200 years by bark (for commercial tannin), post and firewood collectors along the Mesoamerican coast. However, the area of the mouth of the Rio Potrero Grande in Santa Elena contains the only pristine mangrove stand that occurs in northern Pacific Costa Rica.

(4) *Dry forest marine intertidal*. Owing to inaccessibility, the marine intertidal habitat is still relatively intact along the GNP coast, in strong contrast to the remainder of northern Pacific Costa Rica, where snail and clam collecting for food has all but eliminated most molluscs, for example. The turtle nesting beach is protected within Santa Rosa but if farmers were to colonize Santa Elena, the nesting beach would be virtually impossible to protect from human egg gatherers and turtle meat hunters. The five coastal preserves (Corcovado, Manuel Antonio, Cabo Blanco, Ostional and GNP) would serve as an adequate national seashore for Costa Rica.

(5) *Islands*. The Islas Murcielagos off the tip of the Santa Elena peninsula contain a perturbed but naturally severely depauperate dry forest fauna and flora. In view of the decreasing rainfall gradient westward along the Santa Elena peninsula, and the total absence of dry season water on the islands, they are probably the driest terrestrial habitat in the entire country. They probably contain very peculiar combinations of plants and animals, and may have endemic populations. These islands are regularly visited by fishermen and are being progressively deforested by anthropogenic fires. Some, but not all, of the islands still have enough of their original vegetation to be able to return to their original forest if protected from fire and firewood collectors.

(6) *Fresh and brackish water seasonal marshes*. These marshes occur on the Santa Rosa plateau in the interior of Hacienda El Hacha and Orosi, near the highway intersection at the northeastern corner of Hacienda Santa Elena, and inland from the coast in the southern lowlands of Santa Rosa. Small in area and severely disturbed by deforestation, fire and cattle, these sites nevertheless contain a unique flora and fauna which would probably recover its original structure were it allowed to do so.

(7) *Post-mangrove Prosopis swamp*. Immediately behind the mangroves in Santa Rosa and a few places in Santa Elena and Murcielago are unique patches of cacti, mesquite, divi-divi and other dry-land perennials. This forest type has been obliterated by harvest of firewood in almost all other dry coastal Pacific sites in Costa Rica.

(8) *Alluvial semi-deciduous bottomland forest*. Behind the coastal beaches were expanses of tens to hundreds of hectares of flatland forest on rich and moist alluvial soil. They contained several hundred species of trees, about 20 per cent of which were evergreen. In Santa Rosa, as

well as elsewhere (e.g., Potrero Grande River valley bottom in Santa Elena), these forests were severely but patchily felled. However, within Santa Rosa a mere 14 years of protection has allowed them to replace all fields and pasture with 3–20 m tall secondary woody succession that contains the original animals and plant species, although in very different proportions than originally. Smaller versions of this forest occurred in Murcielago and behind other seasonal river mouths in Hacienda Santa Elena.

(9) *Strongly deciduous hillside forest*. The sides of the Santa Rosa plateau, the hillsides of the Santa Elena peninsula and the small slopes throughout GNP below 300 m elevation bear a complex deciduous forest ranging from 2 m tall and totally deciduous in the dry season to 30 m tall with as many as half of the trees evergreen. At least 600 species of broad-leaved plants occupy this vegetation. A salient feature of this forest is that after being cut, the woody regeneration first appearing in its place is much more deciduous than was the original until after the several hundred years necessary for the slow-growing evergreens to strongly reoccupy the site.

(10) *Evergreen canyon forest*. The many escarpments and small canyons of the Santa Rosa plateau bear (bore) a nearly evergreen forest that was more than 30 m in height and dominated by guapinol (*Hymenaea*), tempisque (*Mastichodendron*), ojoche (*Brosimum*), terciopelo (*Sloanea*), nispero (*Manilkara*), caoba (*Swietenia*), guavo (*Inga*), higo (*Ficus*) and other large evergreen trees lacking common names. These species also occur on the upper slopes of the two volcanoes, but intermixed with at least 100 other species of trees that do not occur at the elevation of the Santa Rosa plateau. Just as with the deciduous forest mentioned above, when this evergreen forest is cleared it first regenerates as strongly deciduous secondary successional forest. The shady and leafy evergreen canyon forests are extremely important local moist refugia for animals of the deciduous forest during the dry season. GNP will more than double the amount of this forest type under protection.

(11) *Evergreen oak forest*. The Santa Rosa plateau (200–350 m elevation) and its extension to the base of the modern volcanoes at about 500 m elevation, was once covered with a nearly monospecific stand of encino (*Quercus oleoides*) growing on a rockhard volcanic ash substrate with poor water retention and supporting only slow-growing plants. This unique forest, the southernmost lowland oak in the Neotropics, extended as far south as Bagaces and is the southernmost extension of what is known in the US as Virginia live oak (*Quercus virginiana*). Scattered throughout the GNP oak forest are members of at least 80 per cent of the deciduous and evergreen forest species of plants; when the oak forest is cleared, they then take over the site and convert it to deciduous or semi-evergreen forest. If pristine or partly cleared oak forest is protected from grass pasture fires, it very slowly reinvades the site. However, while virtually all of Santa Rosa's oak forest is too seriously perturbed to perpetuate itself, GNP contains at least five 5–20 ha patches of essentially pristine oak forest, and several thousand hectares of only mildly disturbed oak forest.

(12) *Pasture habitats*. Between 250 and 800 m elevation in GNP there are at least 200 km² of pasture (locally termed *sabanas* or *llanos*). They are arranged in a complex network and mosaic, and with many different histories. All GNP grasslands are maintained as grasslands

by anthropogenic fires every 1–3 years, most are occupied by introduced African grasses, all had their origin in forest clearing, and all begin to revert to woody vegetation as soon as the fires are stopped. While at least a quarter of GNP is now pasture, the configuration of the pastures and their proximity to forest fragments is such that they revert rapidly to woody vegetation; the process of this reversion is of great academic and applied interest, and is undergoing intensive field experimentation and analysis at Santa Rosa.

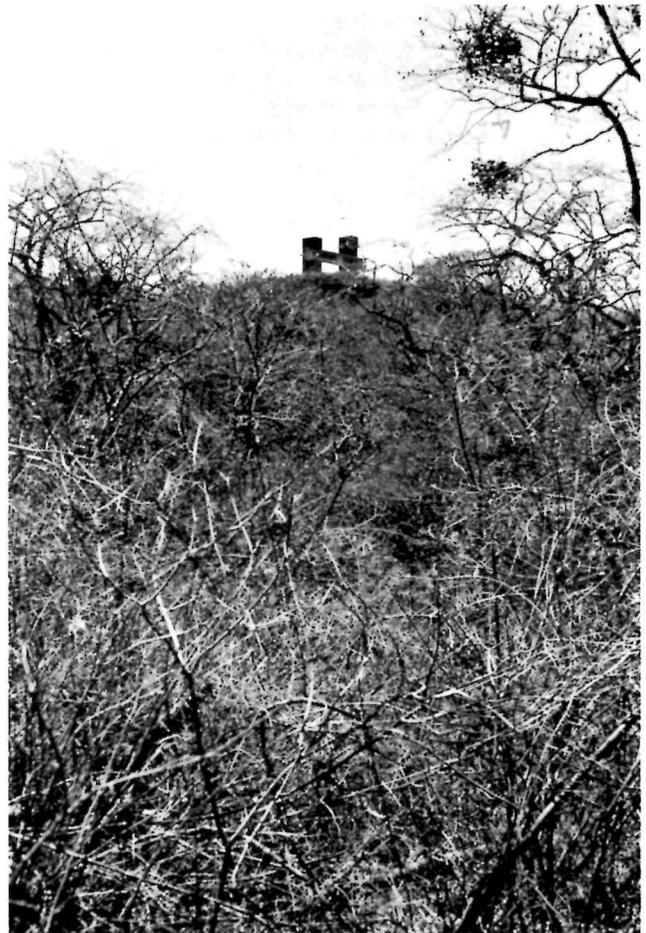
(13) *Atlantic–Pacific evergreen cove forest*. The broad erosion valleys and some lower slopes of Cerro El Hacha are still partly clothed in forest rich in Guanacaste dry forest tree species intermingled with trees, treelets and small plants characteristic of the Atlantic rainforests of Costa Rica. When cleared, this cove forest becomes grassland and its streams stop flowing in the dry season. If the cut forest is allowed to return to forest after a farming cycle, the vegetation is largely deciduous. During the dry season, this cove forest is extraordinarily rich in insects that are obviously local migrants from the nearby dry forest. It also contains Atlantic species of animals, such as the terciopelo (*Bothrops asper*).

(14) *Volcano slope evergreen rainforest*. From about 500 to 1,000 m elevation on the western slopes of Volcan Orosi and Volcan Cacao lies a nearly pristine rainforest containing an amazing number of Guanacaste dry forest species (but with much taller and more evergreen life forms) as well as many species of the wetter portions of Costa Rica. Likewise the animals in this forest are a mix of Atlantic and Pacific species. The extremely tall and large trees are very peculiar in that they bear almost no vascular epiphytes and vines. This suggests that the soil is moist but the air is dry. This forest, and the evergreen cove forest mentioned above, are major dry season refugia and corridors to Atlantic rainforests for the many animals that pass the dry season away from the dry forest.

(15) *Cloud forest*. The upper 500 m of elevation of 1,500 m Volcan Orosi and Volcan Cacao are bathed in clouds at least 11 months of the year. The forest is dwarfed, heavily laden with lichens and other non-vascular epiphytes, and drips continually. Its water is the starting point for the everflowing rivers passing through the lower reaches of GNP. Because the volcanoes are very conical and pointed, these are the smallest habitat islands of cloud forest in Costa Rica, and those at the lowest elevation. This vegetation and its animals have never been inventoried.

(16) *Atlantic rainforest*. Above about 600 m elevation, the eastern slopes of the two volcanoes are covered with nearly intact rainforest. This forest blends gradually into the evergreen forest on the western volcano sides. Inclusion of this relatively small area of rainforest in GNP is highly appropriate because it will maximize the survival of the numerous populations whose members occur on both sides of the volcanoes. These are, in turn, essential to the survival of the populations that occur only on the drier western sides of the volcanoes and use the western sides as moist refugia during the dry season.

GNP size: Guanacaste National Park needs its large size for five biological reasons: to maintain habitat diversity, to maintain adequate species population sizes, to provide dry season refugia and migration routes, to minimize edge effects, and to maintain some replicated habitats for human park users.



Tropical dry forest (deciduous) in dry season.



The same in rainy season (photos, Daniel H. Janzen).

(1) *Maintain habitat diversity.* Even a pristine “dry forest” habitat is fractured into a mosaic of hundreds of kinds of tiny habitats. This is because the physical and biotic diversity in slope, soil type, seasonal change in water flow, exposure to wind, bulk of vegetative cover, degree of evergreenness, fire regime, rainfall pattern, etc. becomes magnified through its impact on the amount and timing of water availability as the dry season comes and goes. The scarcity of water during a tropical dry season is less homogeneous than is the cold in a northern winter; the abundance of water in a tropical rainforest obliterates many of the potential inter-habitat differences that are so conspicuous in a tropical dry forest.

The high species richness of tropical dry forest is largely due to pooling across the many different habitat types created by the heterogeneity described above. Many species use different habitats at different times of the year. A riparian tree may be pollinated by bats that at other times of the year are visiting flowers on trees in open upland dry sites. Many animals spend all or part of the dry season in a fragment of evergreen forest understorey and then move into the more resource-rich canopy of deciduous forest when the rains come; others, such as seed weevils, may reproduce once per year in the dry season seeds of early successional herbs and then spend the rainy season hiding in rolled leaves in the deciduous forest understorey, waiting for next year’s seed crop.

To accumulate a reasonable area of any one of the dry forest habitat fragments, habitat fragments must be summed over hundreds of square kilometres. Three processes hamper the viewer’s ability to see this. First, until very recently, most research in the Costa Rican tropics was done by visitors from extra-tropical regions; being largely from universities, they visited during the northern summer, which is Costa Rica’s rainy season. In the rainy season, the dry forest is green and wet, and habitat differences blur. Second, humans are accustomed to thinking in terms of vertebrates and large plants, and these are the most generalist organisms, the organisms least likely to depend on very fine-scale inter-habitat differences. The white-tail deer, collared peccary, jaguar, mountain lion, tapir, and white-face monkey may be encountered in all GNP habitats, albeit at different densities. However, most of the species in GNP are small—for example, there are 3,000-plus species of moths and butterflies and many more. Such animals show high habitat fidelity in where they breed, mate, rest, etc. Third, animals wander and plants are widely dispersed. This means that habitats characteristically contain a large number of species that may best be described as strays. This blurs habitat distinctiveness. On the other hand, strays are also important parts of the food chain and pollinator and seed disperser networks.

There is another reason why a dry forest reserve must be large enough to contain many small replicates of habitats. From year to year, dry forest is subjected to frequent and violent changes in weather. At Santa Rosa, for example, the annual rainfall during the past 5 years has varied from 900 to 2,400 mm. The small dry season in the middle of the rainy season has varied from 0 to 8 weeks in length. Habitats altered by these weather changes recover largely through immigration from habitats and species pools in other sites that were less affected. In GNP, where the absolute number of habitats has been severely reduced through habitat destruction, the problem will be even greater until nearly total reforestation has been achieved.

(2) *Adequate species population sizes.* For large vertebrates such as the jaguar, mountain lion, and tapir, the breeding population in Santa Rosa (10–50 individuals) is simply not large enough to avoid inbreeding and subsequent genetic decay, genetic drift, and obliteration by disease epidemics. The same applies to at least 30 species of dry forest trees in Santa Rosa. Santa Rosa is not large enough to maintain even a single herd of white-lipped peccaries. The past 5 years of intensive census of moths at Santa Rosa has demonstrated enormous species-specific fluctuations in density among years, with the species seeming to disappear at the bottom of the fluctuation. Likewise, small animals and plants are often much more habitat-specific than are the large ones, with the consequence that a much smaller proportion of the overall habitat is suitable for them.

There is an important aspect of the loss of tropical animals from a habitat. Almost all play conspicuous roles in internal habitat structure through seed dispersal, seed predation, selective browsing, pollination, predation on herbivores, etc. The biotic impact of the loss of species is most dramatically displayed on islands, where whole suites of species display demographics and behaviours grossly different from that of conspecifics on nearby mainlands.

(3) *Provide dry season refugia and migration routes.* A substantial fraction of the dry forest animals use local moist areas as dry season refugia. Many of the mobile ones move as far as the evergreen cove forest on Cerro El Hacha and the evergreen slopes of the volcanoes (up to 20 km from the farthest point in GNP). Movements between the dry lowlands and moist rainforest are not restricted to movements to escape the dry season, however, Santa Rosa is visited by some species of rainforest birds only during the early dry season.

Strongly cross-tropical migratory species are also involved. For example, at least 40 species of sphingid moths arrive in Santa Rosa at the beginning of the rainy season from the rainforest, have one or two generations in Santa Rosa, and then fly back over to the Atlantic side of Costa Rica to spend the remainder of the year. A dry forest preserve the size of GNP is needed to maximize the survival of migration routes and maximize the area of breeding grounds available for the rainforest species.

(4) *Minimize edge effects.* As a general rule, when wildlands connect abruptly with agriculturized land, edge effects in biological and physical processes penetrate at least 1–2 km into the wildlands. Different animals and plants will experience this differentially, but at an absolute minimum the habitats on 50–100 km² will suffer edge effects. These habitats will be quite rich in vertebrates owing to the high productivity of vertebrate food by secondary succession and edges. These animals then use nearby pristine vegetation more heavily, and disperse many more secondary successional seeds in and into it than is normal. Even with all the protection that Santa Rosa receives, for example, this process is strongly altering the small pieces of pristine forest within the park.

(5) *Habitat replication for human use.* A user-friendly national park must have a variety of areas and habitats that are freely open for moderate to heavy public educational and recreational use. Humans have an impact, whether they are individual researchers, school groups, tourists or solitary hikers; there must be enough habitat replicates that some can be used by humans without fear of eliminating a unique habitat. Likewise,

some major research projects may require the relatively exclusive use of a particular habitat piece for many years. Finally, long-term manipulative reforestation model projects will require substantial space. GNP is large enough to contain small to moderate numbers of replicates of at least some of its more spectacular but fragile habitats. It also contains sufficient area for replicated substantial natural and manipulative reforestation projects.

Fauna: Of the area to be included in GNP, only Santa Rosa National Park has detailed faunistic surveys to date. Its 750 species of plants sustain at least 175 species of birds, 115 species of mammals, 3,140 species of moths and butterflies, and at least 10,000 other species of organisms. Extrapolating from preliminary visual surveys of the remainder of GNP and from surveys of other parts of Costa Rica, the birds of GNP should be about 300 species, the mammals about 140 species, the moths and the butterflies about 5,000 species, and the plants about 1,500 species when all of GNP is surveyed. Most of this increase is due to the inclusion of the evergreen forest on Cerro El Hacha and the western sides of the volcanoes. If these estimates err, they err on the low side. If the Atlantic rainforest on the eastern side of the volcanoes is included as well, the above figures would be increased by 30–50 per cent.

The GNP fauna overall is representative of that of dry forest throughout Pacific Mesoamerica. It contains many wide-ranging species that also range into rainforest and into South America. There is, however, an abundant distinctive dry forest fauna that is found only in the dry forest. When a GNP faunal list of a major group such as birds, moths, bats, or beetles is compared with one from a Costa Rican Atlantic rainforest, there is only a 10–20 per cent reduction in species richness. This reduction is so small because there are many dry forest species that do not occur in the rainforest; the latter category substantially lengthens the GNP species list. There are more species of butterflies, large moths, and mammals in GNP's 600 km² than in all of the US east of the Mississippi River.

Many animal life forms usually thought of as "rainforest animals" (e.g., sloths, tapirs, white-lipped peccaries, spider monkeys, howler monkeys, white-face monkeys, army ants, morpho butterflies, scarlet macaws, toucans, red-lore parrots, carnivorous bats, etc.) occur in GNP but at lower density or only as seasonal members of certain habitats.

Along with the many wide-ranging species that occupy Santa Rosa there are a very few endemic species. However, many of the dry forest species that once occupied all of the Costa Rican dry lowlands are having their populations dramatically reduced to tiny populations in widely scattered preserves such as GNP, thereby rendering them "anthropogenic endemics". In addition, many of the less-mobile animal species in GNP's dry forest belong to a population that is morphologically distinct from the same species on the wet side of Costa Rica. In general, GNP individual birds, moths, and monkeys are smaller and lighter in colour than are their rainforest conspecifics. We do not yet know how much of this difference is genetic and how much an ecological expression of the shorter rainy season, longer dry season, greater insolation, greater temperatures, and other seasonal forces.

The GNP fauna is conspicuous in that it re-invades abandoned pasture vegetation more rapidly than occurs in analogous habitats in Costa Rican rainforests. The

same is true for the woody vegetation, and the two are mutualistically related. The animals move seeds as well as eat the fruits and foliage. There is also a distinct gradient within GNP; pasture invasion by forest is much more rapid in the central and western parts of GNP (drier, warmer and lower elevation) than it is on the slopes of the volcanoes (moister and cooler).

Human occupation of Guanacaste National Park

Prehistoric: The GNP area overall has been at best trivially surveyed or developed for its archaeological sites. Santa Rosa contains a variety of unstudied ancient gravesites as well as at least one very large village site in the lowlands near the ocean. The headwaters of the Rio Sapoa on the lower slopes of Cerro El Hacha have been thoroughly studied and related to Indian groups living slightly more to the north. The recent spectacular results from intensive archaeological exploration of the Tilaran region (at the elevation of the volcanic slopes in GNP) 80 km to the south-east suggest that there may be still much of value to be understood about the site's archaeology.

Contemporary ownership: Land ownership of GNP is almost entirely in the form of large holdings managed as business investment and owned by persons living elsewhere. In 1986, seven owners of large properties, one owner of a small property, and one collective colony of settlers on small parcels are the people with which direct negotiations are necessary. In addition, several tiny land fragments need to be obtained from large ranches on the south boundary of Santa Rosa.

(1) *Santa Rosa National Park* (108 km²). On 27 June 1966, SRNP was expropriated and declared a National Monument (Law No. 3694). By Executive Decree No. 1562-A of 20 March 1971 it was declared a National Park. On 4 May 1977, Santa Rosa was enlarged by Executive Decree No. 7013-A so that the park's major drainage basins were almost completely enclosed by the park. Santa Rosa is occupied by a small staff of about 20 administrators and rangers, about 10 of whom are in the park at one time; all of them have homes elsewhere in Costa Rica.

(2) *Murcielago National Park* (122 km²). On 13 November 1980, Murcielago was expropriated and established as a National Park by Executive Decree No. 12062-A. Law No. 6794 of 25 August 1982 incorporated Murcielago into Santa Rosa National Park, so that officially they have the same name. This terminological tangle is locally resolved by referring to the Santa Rosa National Park of old as Santa Rosa and to the other area as Murcielago. Murcielago is occupied by a tiny staff of about four administrators and rangers, all of whom have homes elsewhere in Costa Rica.

(3) *Islas Murcielagos* (about 3 km²). These multiple small islands off the tip of the Santa Elena Peninsula belong to the Costa Rican government and are in the process of being officially declared part of Murcielago National Park. They are unoccupied but are frequently used as rest stops by fishermen from Cuajiniquil.

(4) *Hacienda Santa Elena* (about 130 km²). Santa Elena occupies the area between Santa Rosa and Murcielago on the north and south, and the Pacific and the Inter-American Highway on the west and east. Santa Elena is apparently owned as investment property and is currently

Editorial

Este número complementa el volumen de cuatro ediciones para 1986. El desarrollo y operación de nuevos sistemas editoriales, de publicación y de distribución han encontrado algunos obstáculos inevitables – pero también una gran buena voluntad la cual nos ha permitido continuar con la confianza de que las dificultades serán resueltas. Creemos que se asegurarán los fondos para sostenernos durante el año venidero, y esperamos estar mejor preparados para producir regularmente las futuras ediciones cada trimestre.

En la último editorial, mencionamos varios temas para las futuras ediciones – la administración de parques de humedales, patrimonio mundial áreas marinas protegidas, el turismo en los parques (“ecoturismo”) y los paisajes protegidos – y pedíamos artículos sobre sus opiniones y prácticas en estos campos. Aunque estos temas puedan concentrar atención en algunas direcciones de los esfuerzos de administración, no olvidemos la continua necesidad de tratar con los asuntos de capacidad práctica para el manejo diario de cualquier área protegida. No deseamos que nadie sea disuadido de contribuir con ideas aunque no se refieran a estos temas.

Esta edición presenta dos ejemplos contrastantes para crear un parque nacional. Uno, basado en muchos años de investigaciones geológicas y un estudio metodológico completo, es el proyecto original para realizar la visión de reconstituir un ecosistema de bosque tropical seco y proveer para su administración como una extensión socialmente integrada y aceptada de un parque nacional que ya existía en Costa Rica. El otro es un relato nostálgico de la creación, desde el concepto hasta la realidad, del primer parque nacional en Papua Nueva Guinea. Cada uno, en su propio contexto, demuestra la necesidad de habilidades y técnicas básicas para proporcionar la infraestructura esencial; que también se señaló en una “carta al editor”. PARQUES puede continuar siendo útil en este respecto solo si cuenta con el material necesario; por lo tanto, por favor ayúdenos a ayudarles a distribuir sus brillantes ideas, enviándonoslas escritas con ilustraciones en donde sea necesario. Un buen ejemplo es la contribución, para esta edición, desde las Antillas Holandesas.

TONY MENCE
(Editor)

Noticias

Conferencia Sobre las Reservas Mediterráneas de la Biósfera

La conferencia, co-patrocinada por el Comité Francés del Hombre y la Biósfera y UNESCO y organizada por el Parque Nacional de las Cevennes, fue celebrada en Florac, Francia del 9 al 12 de Septiembre. El objetivo de la conferencia fue evaluar el funcionamiento de la red de reservas de la biósfera en la región Mediterránea y formular un camino para implementar el plan de acción para las reservas de la biósfera dentro de la región. Más de 50 participantes de 8 países Mediterráneos (desafortunadamente sin representación de los países del este del Mediterráneo) incluyeron representantes de la UICN, UNESCO, UNEP, del Centro de Actividades Regionales para Áreas Especialmente Protegidas del Mediterráneo, y del Ministerio del Medio Ambiente de Francia.

Las conclusiones importantes incluyeron la necesidad de promover el establecimiento de reservas de la biósfera en algunos de los países Mediterráneos (Argelia, Marruecos y Turquía) con prioridad en la creación de reservas en las regiones marinas, áridas y esteparias, el uso de criterios científicos, un incremento en el cambio de información, y la promoción de cooperación eficiente entre países y dentro de los mismos. Las actas de la

conferencia y los discursos individuales serán publicados por el Comité Francés del Hombre y la Biósfera.

Se han Restablecido las Fronteras de Monte Apo

El nuevo gobierno Filipino ha revocado una proclamación de 1983 que reclasificó tierra del parque para el uso de establecimientos, y ha restaurado las fronteras del parque a su condición original. Sin embargo, todavía quedan 20,000 pobladores dentro del parque, y fuertes invasiones continúan.

Nueva Oportunidad de Entranamiento

Un Centro de la Herencia de Recursos (naturales y culturales) ha sido establecido en Canadá. Para información, escribir al Centre, c/o Environmental Studies, University of Waterloo, Waterloo, Ontario.

Se Eliminan más Áreas del Registro de las Áreas Protegidas que Están en Peligro

Las siguientes áreas han recibido acción correctiva y por esta razón se eliminan del registro:

1. Dungeness, Sitio de Interés Científico Especial, Reino Unido. Se nos ha notificado que las declaraciones de impacto medio ambiental sobre el efecto del Túnel del Canal de la

Mancha solo indican daños menores al sitio.

2. Reserva de la Sierra Madre, México. El día 22 de Agosto se celebró una ceremonia para proclamar oficialmente una reserva ecológica para proteger los lugares de invernación de la mariposa Monarca.
3. Parque Nacional del Lago Malawi. En respuesta a un reportaje sobre los efectos de la perca del Nilo en el Lago Victoria, el Oficial de Pesca de Malawi ha informado que no se permitirá la introducción de ningún pez exótico en el Lago Malawi.
4. Parque Nacional Bénoué, Camerún. Se construirá el embalse pero la reserva será extendida 1,400 hectáreas, se marcarán los límites y se asignarán más guardias para el parque.

Seis Nuevas Reservas Naturales Nacionales en el Reino Unido

Las nuevas reservas son Ashford Hill, Matin Down, Beacon Hill, Little London Wood, Coed Ty Canal y Rhos Llawr Cwrt en Gales. El lugar de Ashford Hill consiste de 20 hectáreas de praderas que son el centro de un valle arbolado y excepcionalmente rico en fauna silvestre. El medio ha sobrevivido porque se manejó durante muchos años sin el uso de fertilizantes ni pesticidas. Las 34 hectáreas en Kitt's

Grove han sido adquiridas como una extensión de la RNN de Martin Down, que es una de las áreas de creta más grandes y biológicamente importantes que no han sido mejoradas para la agricultura en la Gran Bretaña. En Beacon Hill, el Consejo para la Conservación de la Naturaleza (CCN) ha adquirido 40 hectáreas de pradera de creta antigua con bosques, que mantienen colectivamente una flora y fauna muy rica. Las 6 hectáreas de bosque en la RNN Little London Wood están plantadas en su mayor parte con árboles de haya de varias edades que fueron adquiridas de la Comisión de Silvicultura. No se hallan disponibles las dimensiones para las dos RNN en Gáles, donde las características distintivas incluyen crecimientos excepcionales de líquenes y pingos.

El Banco Mundial Adopta un Programa Para la Administración de las Tierras Agrestes

En Julio el Banco Mundial promulgó un nuevo programa sobre el tratamiento de tierras agrestes durante proyectos de desarrollo, que pudieran ayudar significativamente a la conservación en las décadas venideras. El Banco reconoce que, aunque sea necesaria la conversión de unas áreas terrestres o acuáticas naturales para usos más intensivos para alcanzar los objetivos de desarrollo, otras áreas prístinas rendirán mayores beneficios a las generaciones presentes y futuras si se mantienen en su estado natural. Estas son áreas que pueden proveer, entre otros beneficios, importantes servicios para el medio ambiente o hábitats esenciales para las especies que están en peligro.

Para prevenir la pérdida de estas tierras agrestes especiales, el programa especifica que el Banco normalmente rehusará la financiación de proyectos en estas áreas y en su lugar prefiere financiar proyectos en tierras que ya están convertidas. Aún la conversión de tierras agrestes de menor importancia, tiene que ser justificada y compensada mediante el financiamiento de la preservación de una área ecológicamente parecida, en un parque nacional o una reserva natural, o por otras medidas mitigantes. El programa proporciona una guía sistemática y los criterios para decidir que proyectos pueden necesitar una medida de tierra agreste, que tierras agrestes necesitan de protección y que tipo de medidas deberían proporcionarse. Estas medidas pueden incluir la ayuda para equipo, entrenamiento y preparación de planes de administración.

Los Parques Frontierizos de los Alpes Australianos

Un compromiso para la cooperación en la administración de parques nacionales en tres unidades adminis-

trativas de los Alpes Australianos fue anunciado en Noviembre 1985 por los Ministros Estatales y Federales responsables de los parques nacionales y otras áreas protegidas.

Los Alpes Australianos se extienden a través del Parque Nacional Namadji en el Territorio Capital de Australia, el Parque Nacional Kosciusko colindante al anterior en Nueva Gáles del Sur, y los parques nacionales en las montañas del estado de Victoria—Tingaringy, Snowy River, Bogong y Wonnangatta—Moroka.

Un acuerdo entre los tres estados resultará en programas complementarios para proteger el paisaje, zonas de captación de agua, plantas, animales y el patrimonio cultural de los Alpes. Los arreglos cooperativos se concentrarán en el intercambio de información y recursos, en los programas integrados de investigaciones, en la planificación de caminos interestatales y de oportunidades de recreación asociada y en la provisión de información y material educativo sobre los Alpes. Tanto el público como los parques se beneficiarán del mejor conocimiento de la importancia del área, de sus requerimientos para protección y de la variedad de oportunidades que existe para la recreación.

El acuerdo fomentará la coordinación y cooperación entre las organizaciones conservacionistas del Territorio Capital de Australia, de Nueva Gáles del Sur, de Victoria y de Australia. Ya se ha celebrado una conferencia en la que participaron representantes de las organizaciones para facilitar los arreglos cooperativos.

Italia Hace Gestiones Para Consolidar sus Parques Nacionales

Una nueva ley, un nuevo Ministerio del Medio Ambiente y un nuevo Director de Areas Protegidas son algunas de las iniciativas que se han anunciado. El Parque Nacional Stelvio va a recibir prioridad, debido a las graves amenazas a que está expuesto. Se pondrán además otros cuatro nuevos Parques Nacionales. Pero uno, (Calabria) podrá ser "reclasificado" ya que las autoridades locales lo han desarrollado gradualmente hasta el punto de ya no servir para objetivos de conservación de la naturaleza.

Nuevas Areas Protegidas en el Norte de las Islas Marianas

En Noviembre de 1985 los electores del Norte de las Islas Marianas aprobaron una Reforma Constitucional para la conservación y preservación de cuatro de las islas deshabitadas al norte del archipiélago. El Profesor L. G. Elredge del Laboratorio Marino de la Universidad de Guam, defensor durante muchos años de esta reforma que ha sido hasta ahora ratificada por los electores, ha elogiado el resultado de la

elección, manifestando que estas islas son únicas en el Pacífico. Tienen un gran valor como reservas genéticas y zona de crianza para aves y especies tales como el cangrejo cocotero y contiene muchas especies singulares de plantas e insectos. También son un "paraíso" para los geólogos, por sus volcánes activas, dormidos y apagados. Aunque se cree que la remota localización de estas islas contribuirá a su protección, se favorece un programa educacional para desarrollar un sentido de orgullo en estos recursos únicos.

El Presidente de Nicaragua Propone Nuevos Parques Internacionales para Promover la Paz

En un discurso a su nación el día 5 de Junio, Día Mundial de Medio Ambiente, el Presidente de Nicaragua, Daniel Ortega propuso la creación de Parques fronterizos y reservas internacionales de la biósfera en cooperación con sus vecinos Costa Rica, El Salvador y Honduras para promover la paz y el desarrollo sostenido en América Central. Las áreas propuestas incluyen las selvas de manglares en el Golfo de Fonseca, entre El Salvador, Honduras y Nicaragua, la selva tropical baja de Mosquitia y las sabanas de pino a ambos lados del Río Coco que separa Honduras y Nicaragua, y las tierras agrestes a lo largo del Río San Juan entre Costa Rica y Nicaragua. También se propone mejorar la cooperación de la administración de las reservas existentes, con importantes playas de nidaje para tortugas en las Costas del Pacífico de Costa Rica y Nicaragua.

Se trataron estas ideas durante una visita posterior de oficiales de Nicaragua del Instituto para Recursos Naturales y el Medio Ambiente, incluyendo a su director, Julio Castillo, a Costa Rica a principios de Julio. Durante la visita, patrocinada por la UICN y coordinada por la Fundación para Parque Nacionales de Costa Rica y por el Programa de CATIE para Tierras Agrestes, los oficiales trataron sobre los parques propuestos con los funcionarios de Costa Rica, entre ellos el Ministro de Recursos Naturales, Alvaro Umaña.

Se ha Firmado un Acuerdo que Establece a las Islas Ellesmere Como Parque Nacional

Unos 39,500 km² del área más al norte de Canadá serán Parque Nacional. Un acuerdo, firmado el 20 de Septiembre, inicia el proceso legal que va a requerir la indemnización a los nativos por demandas de tierras. El buey almizclero, el caribú y el oso polar están entre de la fauna de la nueva reserva. El ártico alto se identificó en la Estrategia Mundial de la Conservación como una prioridad para el establecimiento de áreas protegidas.

El bosque seco

Juan Fernando Cordero

El bosque tropical seco es el hábitat Mesoamericano que está más en peligro. Menos del uno por ciento del área original está protegida. Se describe un proyecto para llevar a cabo la recolonización controlada de tierras agrícolas y pastizales de baja calidad por organismos de bosque seco presentes en el colindante Parque Nacional Santa Rosa en el noroeste de Costa Rica. El objetivo final es el restaurar el ecosistema de bosque seco dentro de un extendido Parque Nacional donde los elementos socio-culturales existentes sean completamente integrados con las consideraciones ecológicas a través de un plan extenso de manejo y desarrollo.

Dry tropical forest is the most endangered of Mesoamerican habitat types. Less than 1 per cent of the original area is protected. A project is described for effecting managed recolonization of low-quality agricultural and pasture land by dry forest organisms present in the adjacent Santa Rosa National Park in northwestern Costa Rica. The ultimate objective is to restore the dry forest ecosystem within an extended National Park where existing social and cultural elements are fully integrated with ecological considerations through a comprehensive management and development plan.

De tous les types de biotopes méso-américains, la forêt tropicale sèche est le plus menacé. Moins de 1 pour cent de sa superficie d'origine est protégé. Un projet vise à réaliser la recolonisation aménagée des terres agricoles et d'élevage de médiocre qualité par les organismes de forêt sèche présents dans le parc national adjacent de Santa Rosa, au nord-ouest du Costa Rica. L'objectif ultime est de restaurer l'écosystème de forêt sèche à l'intérieur d'un parc national étendu ou les facteurs sociaux et culturels seraient entièrement intégrés aux considérations écologiques, dans le cadre d'un plan global de gestion et de développement.

Tan sólo un uno por ciento del medio millón de kilómetros cuadrados del bosque seco original, que se extendía desde Mazatlán, en la costa oeste de México, hasta Panamá, se halla protegido.

El resto fue arrasado o seriamente dañado, con lo cual desapareció o corre serio peligro de extinción la riqueza natural propia de este tipo de hábitat biológico.

Sin embargo, Costa Rica posee la porción más grande de ese porcentaje, principalmente dentro del Parque Nacional Santa Rosa, de 230 kilómetros cuadrados, al que un grupo de conservación del ambiente planea incorporar otras zonas adyacentes de igual importancia ecológica y de escaso valor agrícola.

Lo anterior dará origen al nuevo Parque Nacional Guanacaste, que incluirá a Santa Rosa, el área de Murciélagos y 470 kilómetros cuadrados más, desde las faldas del volcán Orosi y el cerro Cacao, por el este, hasta la península de Santa Elena, por el oeste.

Así, se estará resguardando el medio de vida de por lo menos 5 mil especies de mariposas –2 mil de las cuales todavía no han sido descritas–, alrededor de 1.500 variedades de plantas, 300 especies de pájaros y 140 tipos de mamíferos, entre ellos el saíno de trompa blanca, en vías de extinción.

El Hacha

El Parque Nacional Guanacaste recuperará también el cerro El Hacha, ubicado en el límite norte, en una cuña volcánica de seis millones de años de antigüedad.

El cerro posee una “mancha” de bosque seco de alrededor de 200 hectáreas y varios tamaños de entre 15 y 20 hectáreas, lo que lo hace único en este sentido en Costa Rica y en la ribera pacífica de Centroamérica.

Además, el área reúne la virtud de generar permanentemente nacientes de agua, a pesar de que durante por lo menos seis meses no llueve en la zona. Este fenómeno, a juicio de algunos especialistas, no ocurre en ninguna otra parte de las tierras bajas de Guanacaste.

El bosque seco tropical difiere del bosque lluvioso en algo más que estar mayormente amenazado de destruc-

ción. Durante la época seca, muchas clases de árboles pierden sus hojas y una gran cantidad de organismos nacen, crecen, se reproducen y mueren, aumentando o disminuyendo dramáticamente sus poblaciones de acuerdo con la estación.

En un área como el Parque Nacional Guanacaste –grande y rica en ecosistemas– la diversidad biológica total es de alrededor de un 20 por ciento menor a la normal en un bosque lluvioso; además, ambos tipos de floresta tienen menos de la mitad de sus respectivas especies en común. Sin embargo, cerca de una cuarta parte de la increíble diversidad de especies del trópico tiene como referencia el bosque seco.

Originalmente, el bosque seco ocupó una mayor proporción del área de los trópicos, pero hoy casi ha

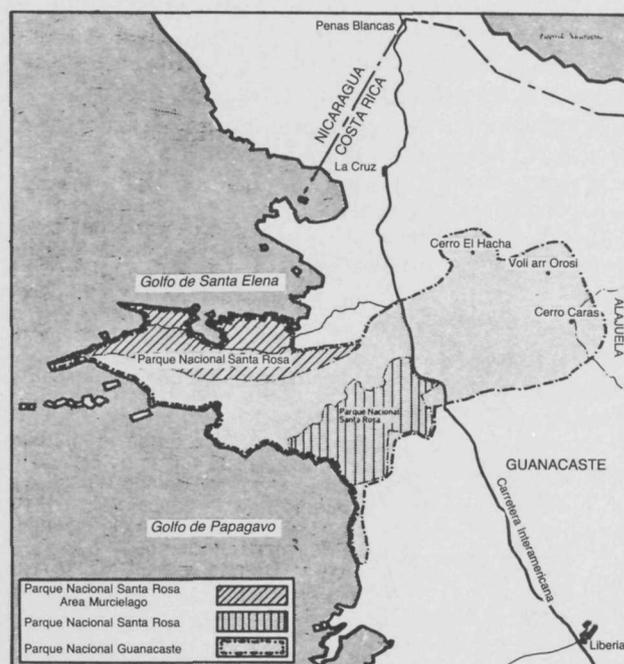


Figura 1 Parque Nacional Guanacaste.

desaparecido del todo a lo largo y ancho del mundo, sustituido por sembradíos y pastizales.

El nuevo parque resguardará además valiosas especies de maderas, como el cenízaro, caoba, ron ron, laurel, pochote, guapinol, encino y cristóbal.

Asimismo, otras como roble sabana, guácimo, guanacaste, cedro, marronio, chaperno, papagayo y guachipelín, algunos de cuyos ejemplares tienen hasta 450 años de edad.

También quedará protegida una especie de mariposa nocturna que vuela desde Santa Rosa hasta la zona de Tortuguero, en Limón, de forma tal que da origen a dos generaciones al año, una en casa sitio, y un árbol de una variedad de leguminosa polinizado por el viento, único caso descrito en el mundo.

Razones biológicas

Uno de los impulsores del proyecto, el Dr. Daniel H. Janzen, ecólogo norteamericano de renombre mundial, afirma que el Parque Nacional Guanacaste requiere del tamaño que se busca darle por cinco razones de naturaleza biológica.

Estas son: mantener la diversidad de ecosistemas; asegurar tamaños adecuados de las poblaciones de las especies; proveer refugio y rutas migratorias para la estación seca; minimizar los efectos sobre los procesos biológicos y físicos en los límites con tierras cultivadas, y conservar algunas áreas para uso de los guardaparques.

Este último aspecto vendría a introducir una novedad en lo que han venido siendo hasta ahora las normas de operación de las áreas protegidas, al tratar de encontrar fórmulas que resuelvan apropiadamente los problemas socioeconómicos de los guardaparques, haciéndolos parte activa de la vida y protección del parque.

Para el Dr. Janzen, quien realiza estudios del bosque seco costarricense por lo menos durante seis meses al año desde hace 20 años, son diversos los beneficios que obtendrá nuestro país de la creación del Parque Nacional Guanacaste.

Aparte de los ya expuestos, el especialista asegura que el parque se convertirá en un "reservorio de semillas", para la reproducción de especies en peligro de desaparecer. El Dr. Janzen ha efectuado experimentos de regeneración natural y controlada del bosque, que permitirán repoblar parte de las áreas que actualmente están cubiertas por pastizales y generar la información necesaria para el desarrollo de un plan nacional de reforestación, con el empleo de especies autóctonas.

A la vez, el parque se convertirá en una fuente de datos y campo de acción para estudios y proyectos con plantas de bosque seco y el manejo de estos ecosistemas para ese fin.

Estima el Dr. Janzen que el Parque Nacional Guanacaste será el primer intento por lograr que la biología llegue a ser una parte de la cultura del país, al actuar como recurso educativo y medio de instrucción, a la vez que demostrará que el Gobierno costarricense tiene la previsión y flexibilidad de desarrollar sus parques nacionales antes de limitarse únicamente a crearlos y controlarlos por ley.

Se tiene previsto, además, buscar procedimientos distintos para el manejo de las áreas de potreros y pastizales, que puedan generar recursos económicos para el parque. Esto resolvería problemas agropecuarios de la zona, todo dentro de un plan que integre las consideraciones ecológicas del programa de regeneración del bosque.

\$11,8 millones

En el plan de concepción del nuevo parque se hallan involucrados también la Fundación de Parques Nacionales y la Fundación Neotrópica, ambas entidades costarricenses, así como el organismo norteamericano Nature Conservancy International, en coordinación todos con el Servicio de Parques nacionales del Ministerio de Agricultura y Ganadería.

El costo de las tierras que deben adquirirse de manos de particulares se estima en \$8,8 millones. Se trata de 470 kilómetros cuadrados, entre los cuales estaría incluida la hacienda Orosi, que posiblemente sea donada para ese fin.

Según se ha informado, varios de los propietarios actuales, como Mario Burgos, Jorge y Arístides Baldano y Harold Peacock, están en la mejor disposición de colaborar con el proyecto.

Se calcula que el presupuesto de manejo del parque una vez en funcionamiento ascendería a \$300 mil anuales como mínimo, por lo que se está tratando de obtener un fondo de \$3 millones más para dedicarlo a inversiones que genera el gasto de operación.

El Dr. Daniel Janzen presentó ya, ante tres fundaciones estadounidenses, las solicitudes de ayuda para adquirir el cerro El Hacha, valorado en \$500 mil, y espera obtener resultados favorables.

Por medio de las fundaciones de Parques Nacionales y Neotrópica, así como el Nature Conservancy International, se está trabajando en campañas de más largo plazo para conseguir la totalidad de los \$11,8 millones.

Una forma de financiación complementaria consiste en lograr contribuciones pequeñas de parte de mucha gente, en distintos países, tratando de involucrar para ello a los medios de comunicación y a las organizaciones dedicadas a la conservación que gozan de mayor prestigio.

Recientemente, fueron enviados desde Suecia \$23 mil, recogidos en una campaña que propulsó un diario local, para adquirir la finca Jenny, una de las propiedades privadas ubicadas dentro de lo que será el parque, la cual tiene un valor de \$113 mil.

El Gobierno de la República, por intermedio de su Ministro de Industria, Energía y Minas, Dr. Alvaro Umaña, ha mostrado sumo interés en el proyecto del Parque Nacional Guanacaste.

Es así como se está planeando incluir en una próxima solicitud de crédito para reforestación o sembradíos, ante el Banco Interamericano de Desarrollo (BID) o el Banco Mundial, partidas destinadas al manejo del parque, con base en ofrecimientos que en ese sentido hicieron ambos organismos.

Precisamente se prepara en este momento un proyecto de reforestación en las zonas de Tilarán y Arenal, que se podría aprovechar para tal pedido de fondos, que no son re-embolsables.

De hacerse realidad el Parque Nacional Guanacaste, quedaría a salvo toda la riqueza natural descrita, entre ella el árbol de ese mismo nombre, símbolo nacional, que hace 10 mil años ya poblaba lo que sería el territorio costarricense, cuando perezosos herbívoros de 5 metros de altura dispersaban sus semillas por doquier.

undergoing infrastructure development, annually subject to free-running wildfires that then threaten Santa Rosa and enter Murcielago, and lightly grazed by cattle. It is occupied by a Costa Rican overseer with a few helpers and their families.

(5) *Cerro El Hacha* (about 50 km²). The north-east portion of Cerro El Hacha is part of Hacienda El Amo/El Hacha/Guitarra while the southern and southeastern portion belongs to the Colonia, a collection of small farms occupied by about 20 owners since 1980 and coming originally from the area of Santa Elena and Monteverde (Puntarenas Province). All owners are willing to discuss sale of their respective portions of Cerro El Hacha. The farm owners are in the process of clearing the forest to grow 1 or 2 corn or bean crops and "improve" the land value. The Colonia has already cleared approximately one third of the unique forest on Cerro El Hacha and will destroy much of the remainder in the 1987 and 1988 dry seasons.

(6) *Hacienda El Hacha de Ranchos Horizontes* (about 40 km²). This investment property is operated as a minimum density cattle ranch. It is occupied by about four administrators and their families.

(7) *Hacienda Orosi* (about 30 km²). This investment property has the same ownership as does Hacienda El Hacha de Ranchos Horizontes, which has kindly agreed to donate Hacienda Orosi, piece by piece, to the Nature Conservancy as part of GNP, and that GNP may begin patrolling Hacienda Orosi to prohibit hunting and other intrusions as from March, 1986.

(8) *Orosi Forest Reserve* (105 km²). The portions of Volcan Orosi and Volcan Cacao above about 550 m elevation are government forest reserves and cannot be cleared legally of forest. There is even a questionable law that declares the area within 2 km of the volcano craters as a national park. The land ownership, however, is still in the hands of private individuals. At present no one lives within the Orosi Forest Reserve on the west, north and east sides of the volcanoes, but settlement has crept well past the margin of the Orosi Forest Reserve on the southern flank of Volcan Cacao. While the Reserve is legally protected, in fact it is gradually being cleared because regulations are not enforced.

(9) *Hacienda Poco Sol* (about 40 km²). This operating ranch is willing to sell the property for fair market value. There are about three administrative families and several ranch helpers living at the Ranch Headquarters near the Interamerican Highway.

(10) *Hacienda Centeno* (about 40 km²). This investment property consists of three properties, Centeno, Guanacastillo and Mata Redonda; the latter is the most interior and on the slopes of Volcan Cacao. The owner has kindly agreed to stop development for 1986 in deference to GNP. He will consider sale of the entire Hacienda for a fair market value. Hacienda Centeno is occupied by one administrator and his family.

(11) *Hacienda San Josecito* (about 30 km²). The owner's eager to sell San Josecito and is currently receiving offers from other individuals; however, he is attracted to the idea of having it end up in GNP. He does not plan development during 1986. San Josecito is currently occupied by one administrator and his family.

(12) *Hacienda Tempisquito* (about 15 km²). This site is of interest to GNP. The owner is willing to consider selling the semi-forested portion of the northern part of Haci-

enda Tempisquito, leaving the ranch headquarters near the Interamerican Highway in his hands. He does not plan development of the area of most interest to GNP in 1986. Hacienda Tempisquito has two administrators and their families.

(13) *Finca Jenny* (4 km²). This small piece of investment property was carved out of the corner of Hacienda Santa Rosa more than 20 years ago as a real estate scheme. The owner is willing to sell Finca Jenny, but is asking a price roughly double its market value. This small piece of relatively intact forest is critical to the biological integrity of the largest and deepest evergreen canyon forest (Quebrada Puercos) in Santa Rosa National Park. Finca Jenny is occupied by an administrator and his family.

(14) *Finca Guapote* (about 2 km²). The site is a tiny corner of Finca Guapote which is in turn owned by a very large cattle ranch, Hacienda Ahogados. The site contains a large spring that is an important dry season watering site for animals from the park; Hacienda Ahogados prohibits hunting in Finca Guapote, but the prohibition is only partly effective because it is at the extreme northern boundary of the Hacienda. This site and Finca Jenny combined will seal off the Quebrada Puercos canyon forest from outside threat and intrusion. The possibility of sale of the site to GNP by Hacienda Ahogados is being investigated. No one lives at the site.

(15) *Hacienda Rosa Maria* (about 3 km²). This site is of interest to GNP. It is a strip of sorghum and cotton fields along the southern boundary of Santa Rosa National Park. A small border area drains into Santa Rosa and poses an imminent and serious threat to the finest of the large seasonally dry rivers in the park (Rio Poza Salada); agrochemical and silt drainage from these fields has already destroyed (1984) a major creek system within Santa Rosa. The owner has agreed to help with avoiding pesticide contamination for the time being, with the understanding that in the final negotiations over sale of this tiny fraction of Rosa Maria to GNP, there is discussion of the possibility of connecting Hacienda Rosa Maria to the Santa Rosa electricity line. No one lives on the site under consideration.

(16) *South-west margin of Santa Rosa* (about 10 km²?). While presently unthreatened, the southwestern corner of Santa Rosa was established through rough terrain and unbroken dry forest without consideration of the drainage details. This minute area has yet to be explored in conjunction with the Santa Rosa neighbours. No one lives at the site.

Human resources in the area: While overlapping in capabilities, inclinations and potential, three distinct groups of human resources are already present in GNP and its immediate vicinity.

(1) *Residents.* A large number of people living in the GNP region have residence roots two or more generations in length. Many of these people have grown up with minimal formal schooling (though all are literate) but have lived a varied life rich in the details of survival where farming, ranching, fishing, timber extraction, civil service, and small business are the primary occupations. The overall social structure is Spanish/European/US/modern to the extent that resources permit. Upward mobility is minimal and therefore individuals with strong mental and psychological ability are encountered at substantially lower income levels than would be the case were native ability to strongly determine an individual's economic

level and social status. Town and country residents display very strong curiosity about anyone or anything that approximates a learning experience, remember copious amount of materials and instructions without writing them down, and leap on opportunities to better their material goods.

The residents around GNP form an obvious and unexploited knowledge and labour pool for the day-to-day management of GNP. They already know how to carry out most of the technical aspects—fighting fires, placing fences, maintaining horses as riding and pack animals, maintaining trails and buildings, herding cattle, identifying and understanding vegetation and trees, dealing with biotic challenges (snakes, tick, diseases, thirst, hunger, wounds, etc.) and so on. They learn rapidly about vehicles if they are not already familiar with them. If they know it is part of their job, they are self-motivated to do these things. However, they need training in the facts of biology (a combination of organizing the biological miscellanea they have already accumulated and teaching them major biological facts), in how to tell biological stories to others, and in having the self-confidence to guide others through a learning routine. The major focus of park managers drawn from this pool will be on the interface between the users of GNP and GNP biology, although these managers will also have basic maintenance responsibilities. These will be minimized through the enactment of the principle that the park interior will largely take care of itself; if labour-intensive manipulation is required for a research or reforestation program, that labour will largely be provided by the program itself.

A minimum number of 50 well-trained and apprentice residents will be needed to manage GNP in the early stages. These people will have to live in or immediately adjacent to GNP, on homesteads that will belong to GNP (if they are inside GNP) but allow individual initiative in gardens and milk cows, and in house modification and upkeep. Some of them will be drawn from the personnel already managing the various haciendas in GNP while others will come from nearby farms and the towns of Cuajiniquil, La Cruz, Liberia, etc. The GNP resident managers will be maintained permanently in GNP and have individualized responsibilities. They will be sufficiently unisolated that their children have access to schools and the family has access to a normal social life.

It is assumed that certain local residents will sufficiently excel in the challenge outlined above and will climb through the GNP administrative structure. Likewise, some will probably find research and teaching activities to be sufficiently interesting and rewarding to use them to move into those worlds, either within or outside of the GNP area.

(2) *Costa Rican visiting managers.* Costa Rican managing visitors to GNP will range from students from other parts of the country who come to participate in a research/



Roberto Espinosa, Research Assistant monitoring plant growth in protected areas of Guanacaste National Park (photo, Daniel H. Janzen).

teaching program or do their own research/teaching, to technical advisors temporarily attached to the GNP managing staff. Some of these may stay on as part of the resident managing staff, but it is assumed that they would then become residents of the area. Such persons would often bring specific important skills with them, but would require training in the technical and philosophical peculiarities of living and working in the GNP area, and in the art of making the park user-friendly.

(3) *Foreign visiting managers.* Foreign visiting managers will be largely research scientists and research students. While they conduct their own studies they will also be active participants in the development of the user-friendly status of GNP. Their contribution will include responsibility for making their studies well-known to the resident managers, collecting and providing background data on what organisms are in GNP and on their natural history, being advisors for Costa Rican apprentices in field biology, aiding in planning specific management programs (including the development of the tourism value of the park), and giving public lectures on their research at GNP in other Costa Rican institutions as well as in their home societies.

The making of a national park

Neville Gare

Varirata National Park was the first national park in Papua New Guinea. Although a National Parks Board existed, there were no funds available, no infrastructure and a staff of one inexperienced forestry diploma graduate. The local people had never encountered the concept of national parks. The whole process of establishing the park for public use is described by the person charged with the task. The many and varied problems encountered are indicated and constitute an interesting record.

El Parque Nacional Varirata fue el primer parque nacional en Papua Nueva Guinea. Aunque existía un Comité de Parques Nacionales, no había fondos disponibles ni había una infraestructura y el personal consistía en un graduado en silvicultura sin experiencia. La gente local nunca se había encontrado con el concepto de parques nacionales. El proceso completo para establecer el parque para el uso público es descrito por la persona encargada de la tarea. Se indican los diversos problemas que se encontraron y que constituyen una relación interesante.

Le Parc national de Varirata fut le premier parc national de Papouasie-Nouvelle-Guinée. Bien qu'il y ait un conseil des parcs nationaux, il n'existe pas plus de budget que d'infrastructure et le personnel se résume à un forestier diplômé mais inexpérimenté. La population locale ignore le concept de parc national. Le processus d'établissement du parc dans l'intérêt du public est expliqué par la personne à laquelle incombe cette tâche. Les nombreux problèmes rencontrés sont décrits dans toute leur diversité, ce qui constitue un exemple intéressant.

The development of Varirata National Park as the first national park for public use in Papua New Guinea was not without incident, and its story is worth setting down. Although designated as early as 1963 and placed under the control of the National Parks Board in December 1969, no funds had been made available and no development had taken place.

When I first visited the Park in November 1970, one drove the last 4 miles over a rutted steep red clay track that became slippery and impassable, even in a four-wheel drive vehicle, after rain. Two and a half miles along this track one came to a sight, and smell, bound to raise the hackles of even the hardiest and most phlegmatic national parks man. Four thousand pigs grunted and squealed in and around rusting tin sheds sprawled over 20 acres in what had been a delightful little rainforest basin surrounded by savannah eucalypts and kunai grass. Bare red soil, scarred from the frequent rains, spread back up the spurs where a bulldozer had gouged apparently unrelated benches and access roads.

At the lower end of this area the red topsoil had been pushed to the edge of a remnant rainforest gully and down its eroding slope had been tumbled oil drums, old tyres, worn-out machinery and pig wastes. Odd lengths of iron and barbed wire emerged from the earth without rhyme or reason. From a series of concrete benches and drains the liquid pig wastes trickled down to pollute the beautiful creek for a mile or more. Below a concrete dam built on this creek the rocks were discoloured by the discarded sump oil from the water pump above. In a shallow pool lay a worn-out truck engine.

Over all hung the pungent smells of pigs and pig dung, exotically leavened by the contribution of a herd of brown and white goats and a mob of big Brahmin-cross cattle. But my map had warned me that I would come to a "pig farm" and a "polluted creek" before I reached the park proper, so I pressed on, holding my breath for very practical reasons.

Another mile further on across the undulating plateau was a breathtaking scene, which quickly cleared away the memory of the odoriferous piece of land-abuse I had just left. Suddenly there was the whole of the coastal plain spread out at my feet, with Port Moresby in the distance and the chartreuse Coral Sea sweeping away to the horizon. Below, some 1,500 feet or more, there was a thick dark green carpet of rainforest. Numerous birds floated across its canopy, their calls wafted on the cooling up-draught which made one so aware of the contrast between the Port Moresby heat and the mountain coolness of this 2,500-foot perch above the capital of the emerging nation of Papua New Guinea.

From this point the track skirted the edge of the escarpment for another mile or so, and then abruptly finished. We were at the northern boundary of the park. My guide told me, fearfully, that there were hunting tracks through the forest, and that the local people would chase us off if we endeavoured to develop any access into the park.

This first encounter with Varirata was but the beginning of a long, frustrating period with seemingly no progress. It was determined that no development of the park would begin before we had contacted the local Koiari people. There were too many examples of government projects which had started, only to find the local people angrily arrayed in confrontation, demanding payment for land purchased for a few tomahawks and beads from their grandfathers.

It was also obvious that the pig-farm must go. It perched on the same plateau as the park, and this plateau with its towering escarpments on the north and west formed a natural land-unit, a sentinel over the Laloki River and the coastal plain across which it flowed. Physiographically, the pig-farm site could make an ideal park headquarters, but the 640 acres of land on which it was situated was freehold, and would have to be acquired. And, of course, the road would have to be formed and gravelled, so that people could get to the plateau. There was also a rocky creek crossing that needed to be upgraded with a concrete causeway or a bridge.

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The National Park Board was anxious that Varirata, or Wariarata as it was then still known, should be developed, and agreed that we should move as quickly as possible to acquire the freehold land and develop the park. There was a feeling in the board that the owners of the land, the largest and oldest trading firm in Papua New Guinea, might be persuaded that a gift of it to the nation would be a wise move, not likely to harm the firm's standing with the new government. So delicate negotiations were set in motion.

In the meantime, there were other things to do. The Administration was approached in March 1971 to agree to the principle of building access roads to national parks. This they did, but stated that unfortunately the Varirata access road could not be programmed until the 1972–73 financial year. So we would have to wait at least 15 months, and probably longer, before we had reliable vehicular access on to the plateau and thus could develop the park for use by the public.

A preliminary management and development plan was prepared, in which the pig-farm lands would be zoned in part for visitor developments to cater for people coming in cars, buses and other vehicles. The pig-farm itself would become the site of the park's headquarters. In the park proper, development would be limited to a walking-track system, with suitable interpretation of items of interest along each track. Thus we would have a good basis of understanding with the Koiari people who had owned the park land—it would be subjected to minimum disturbance and development.

We secured agreement from the owners of the pig-farm to allow us to set up a base camp on their northern boundary on land which belonged to the Administration. Then we set about organizing the supply of demountable buildings, tents, tools and other gear. Then we had to start looking for staff.

The board had one Park Ranger, a diploma graduate from the Papua New Guinea Forestry College. He had no practical experience in national park establishment, development and management, apart from a 5 months study tour in Australia in 1969. He was keen, but "green".

That was the extent of the staff available to me when I began my job in February 1971. We soon recruited a young steno-secretary, so at least I could write letters to people in style! We also recruited a lad from Finschafen, Pano Manaha, to commence the 3-year diploma course at the Forestry College. A four-wheel drive light truck, with a set of tyre-chains, was purchased to provide transport over our steep and rutted mountain track. Meanwhile we waited for two huts to be prefabricated and a toolshed for the base camp.

I had asked Sylvanus Gorio, our Park Ranger, to establish first contact with the Koiari leaders. Eventually we met about six of them at Sogeri. We sat on the grass with a map and Sylvanus explained to them in Motu (the Papuan lingua franca) what we intended doing at Varirata. None of them had ever seen or heard of a national park, and the talking was slow and patient. We explained that the government was concerned about the disappearance of wildlife and wanted to create national parks for the future. We explained that Varirata was the first, and suggested that this was an important and proud thing for the Koiari people. We told them how tourists would come later and bring money to the Koiari community; that the land in the park would be protected against damage or wrong development

Their reaction was typically reserved and cautious, but they seemed to understand the principles. They particularly expressed their concern at the disappearance of magani (wallabies) and other game, their desire to protect their sacred places (e.g. burial places) in the park, and the wish to see the 640 acres of freehold land taken back from its expatriate owners.

At a key moment in the discussion, one of them produced a worn but still-used tomahawk and a string of beads from a small bag and placed them on the map. It represented part of the original payment in the land purchase back in 1894, when more than 5,000 acres were bought for 18 tomahawks, 18 half axes, 18 large knives, 18 small knives, 36 yards of Turkey Red cloth, 18 belts and 4½ lbs of beads.

The significance of the gesture was not lost. I told them through Sylvanus that I was not responsible for the payment made by a white administrator in 1894, any more than they were for the acceptance of the price by their ancestors. There was no argument, and we parted agreeing to meet again as the project progressed. I was pleased with our first discussions, and felt they augured well for the future. We had sat quietly, having brought a present of betel-nut for them, and we had talked man to man. Sylvanus felt that they understood our intentions, and would wait to see us carry them out.

In September, Pano Manaha was sent down from the Forestry College. He had been having difficulty with his maths and English. We decided to put him into field training for the rest of the year, and so he went up with Sylvanus and a couple of labourers to start setting up the base camp. In a short while, we had the camp established and Pano and his labourers had dug two of the deepest toilet pits I have ever seen. Time was dragging, and the next thing we knew we were in the "wet" season. Normally it lasts from December to about April, and it rains almost every day. Our track up to plateau became treacherous, and once Sylvanus turned the truck over, miraculously injuring no one. On many other days we could not get to the camp site at all.

Christmas 1971 came and went. Pano had buckled down to study, and he went back to Forestry College to try again. In January, we managed to secure as Park Assistants two young New Guineans who had worked with the Department of Forests after doing a short course of six months at the college. They were joined by a leading hand and some six or seven labourers, and we were now ready for some real action.

Up to now the progress had been painfully slow. There had been delays in getting equipment supplied and then difficulties in getting the prefabricated huts up the track and a water-supply established for the camp. Sylvanus had other jobs to do, and I was very conscious of the thinness of our ranks. But I could not give closer personal supervision to Varirata. We had begun investigating other potential areas throughout the country and much of my time was spent in laying down guidelines for our field investigations and developing working relationships with other departments and individuals.

With the arrival of Kipling and James, our two Park Assistants, we began to construct walking tracks. Neither of the lads had any idea of what a national park was, and I realized they would have to learn as they went, making mistakes and trying again. It made progress slow, but there was no other way. At the same time Sylvanus was sent to the Administrative College in Port Moresby to do a short introductory management course.

We managed to get the Department of Forests to make some picnic tables to our design, and we had several steel fireplaces prefabricated. Then at last the pigs, cattle and goats were gone and we were left with the remains of the pig farm to clean up.

Disaster befell us in June 1972. The Board's chairman and I had been to Sydney for the first South Pacific Conference on National Parks where the chairman had delivered a paper on "Preserving indigenous culture", which had been well received. We stepped off the plane at Port Moresby elated and keen to get on with the job.

Sylvanus met us with a face as long as the proverbial wet week. The Koiari leaders had confronted him and his men a few days before and refused to let them onto the park again to continue the walking track construction. It was their land, they said, and they had no idea we meant to work there when we had talked to them before.

This bombshell momentarily stopped us in our tracks, Sylvanus had reacted with good sense to the Koiari challenge. He had neither conceded their claim nor asserted our rights. He had agreed to a stay of proceedings until the matter was investigated.

So, the day after our return from Sydney, the chairman of the Board, Dirona Abe, went with Sylvanus and me to Sogeri to meet with the Koiari leaders.

We sat again on the grass, this time a mile or so from our first meeting place. Dirona spoke at length on the national park idea, and how important it was for Papua New Guinea. A native of Boregaina Village, in the Rigo Subdistrict, he was able to claim some relationship to the Koiari peoples, though he was not a Koiari. They listened to him, and then he asked them to tell us their story. A romantic tale unfolded.

It appeared that in 1894 a white land purchase officer came to the Sogeri Plateau and the Laloki Valley from Port Moresby. He was accompanied by a coastal Papuan who spoke Hiri Motu. There was only one of the Koiari people contacted who could speak and understand Motu. His name was Ienideumi, and he wanted to marry the daughter of one of the local clan leaders. The father would not have it. So Ienideumi decided to take his revenge in a novel way. As they stood on a ridge on the Varirata Plateau, he faced towards the west and spread his arms wide, so that his left arm pointed slightly west of south, and his right arm pointed slightly east of north. "We will sell you the land on my left to the cliff edge (of the Astrolabe Range), and on my right to the Laloki River", he said, and the Motu interpreter told the government agent that the deal was clinched.

18 tomahawks, 18 half axes, 18 large knives, 18 small knives, 36 yards of Turkey Red, 18 belts, and 4½ lbs of beads sealed the deal, and the land covered about 5,120 acres.

But the Koiari clan leaders had been deceived. They had believed they were only selling the land on the south as far as the ridge about a mile distant leading west to the Astrolabe escarpment. The land south of that line belonged to the girl's father. It was not until long after the deal was concluded that Ienideumi could no longer contain himself, and boasted of how he had secured his revenge on the old man.

The father of the the girl was annoyed, but he had no way of communicating his problem to the Administration, and as the latter did not enter upon his land and cut down any timber or plant any crops, he apparently decided to say and do nothing.

There is no record of anything untoward happening to

Ienideumi, but the story was passed down, together with the tomahawks and beads, to the descendents of the clans, so that in 1972 they suddenly realized that Ienideumi's story was true, and he had cheated the old man of his land.

Well, here was a pretty situation. While we had no proof that the Koiari story was correct, we had no real reason to doubt it either. There were many tales of trickery and misunderstanding about the early land deals in Papua New Guinea, and this particular one was not unusual, despite the romantic twist.

Dirona told the Koiari leaders they would receive just treatment. The purchase documents would have to be checked, and the matter would be taken up with the Minister for Lands, Albert Maori Kiki. In the meantime we would carry out no further work on the land they claimed.

Two weeks later we met with the leaders of the Omani, Madeka and Ienari clans and the Minister in the Cabinet Lounge in Port Moresby. The same story was told, and the Minister listened patiently and discussed the matter with them carefully in Motu. He explained to them why we wanted the land as a national park, and they promised to go away and talk the matter over among themselves. They would advise him when they were ready for another conference. It was July 1972.

We diverted our full efforts now to the pig-farm. The land had not yet been purchased, but the pigs, cattle, and goats had all gone, and the tin sheds had largely been demolished. We moved in to start the clean-up. It was hard to know where to start. There were stacks of old iron, smouldering wooden posts from the demolition fires, pieces of old motor cars, motor cycles and tractors, wire rope, barbed wire, empty oil drums, rusting steel hoppers, concrete slabs and blocks, old tyres, and a vertical boiler, complete with pressure gauge. Already thorny weeds were invading the bare earth areas among the pig manure. The manager's house was a collapsing wreck of fibro cement, timber and tar-paper, with old papers and kitchen utensils scattered where they had been left.

The dominant features were several large concrete pads, up to 40 yards long and 15 wide, most of which ran as terraces across the eroding slope. They were from 4 to 12 inches thick. The Valuer-General has allowed only \$600 to clean up the whole mess, including the estimated 400 cubic yards of concrete.

There was only one thing to do, and that was to design the park headquarters around the concrete terraces. It was many miles down the mountain to the nearest decent gravel, and it would cost hundreds of dollars to haul it up to build large car parks, and even more to provide new concrete foundations.

So the idea began to take shape. We got a lot of the initial clean-up done by hand labour, and then brought in a bulldozer for a few days. We pushed all the hard rubbish and the pig manure into a large hole and covered it with earth-fill. The dozer was an old and battered Caterpillar D7, and the tilt adjustment on the blade was unreliable, but we managed to trim up the whole area to form a new parking and access road bench, a gently sloping area ready for planting a Sogeri-grass lawn and suitable local shade trees, and a new pipe culvert and earth-fill over the small creek which ran down the valley alongside the old pig-farm.

The work we were doing was all new to our park rangers and assistants, and I tried to give them as much experience as possible in supervising and dealing with a contractor and his machinery, without hampering the

progress of the work. Mistakes were made, but it was the only way to develop supervisory skills and initiatives. Sometimes I champed at the bit at the slow rate of progress, but I realized this was more than a park development job; it was a project to develop initiative and responsibility among the young, inexperienced lads who were the beginnings of Papua New Guinea's National Park Service. This was the foundation being laid for the future.

When I got back from two months leave at the end of January 1973, the access road into the pig-farm was almost complete. Already cars and the odd motor cycle were travelling past the pig-farm and out to the lookout, and the first beer cans, and names carved on trees, had appeared. Papua New Guinea had had its first taste of the national park visitor.

We had to keep moving quickly. We set up two picnic tables and two fireplaces near the lookout, and a rubbish bin. I talked two of my Port Moresby friends, one a draftsman, and the other a bridge engineer, into designing a Visitor Centre to fit one of the concrete pads about 30-feet square. It was to be based on traditional Koiari architecture, and was to feature pressure-treated round timber poles and a kunai grass roof. We had to sort out ways to secure water-proofing under the kunai, and how to complete the walls and interior fittings in keeping with the general building design and materials.

Below the proposed Visitor Centre site there were several big concrete pads, mostly rough and broken at the edge. I decided to break up most of these, and use the resulting concrete pieces to pack up the terrace batters below the upper concrete benches which we would use for an access road and parking bays. One of the lower pads, a long narrow one, would be retained on the level just below the Visitor Centre as a foundation for four or five Koiari-style houses, each having a covered verandah reached from the ground by wooden steps perhaps two or three feet high. One would contain the flora interpretative display, another would feature the fauna, another the geology, another the Koiari history and culture, and so on.

The visitor would pass from the Visitor Centre, down a set of steps to the level of these "interpretative houses". He could pass from one to the other, and at the end of the line choose between a path back to his car, one to a grassy picnic area, or one leading to a wooden bridge across the rainforest gully, and thence on to a nature walk which wound up the main creek for over a mile to the outlook on the escarpment.

I succeeded in getting the help of Andree Miller, the hard-working creator of the Lae Botanic Gardens, and now building equally fine gardens at the University of Papua New Guinea, for planting shade trees, shrubs and other plants strategically throughout the Visitor Centre site, especially to relieve the starkness of the concrete and to enhance the amenities of the picnic area.

The weather at Varirata during my leave had not followed the normal pattern, and the "wet" did not set in until my return. This had enabled the road contractor to finish his job, but now we had to get Sogeri-grass planted and established while there was rain around.

Our rangers, assistants and labourers had stuck to their task, although I am sure that sometimes they wondered what it was all about. Sometimes I did too. It was hard work breaking up the huge concrete slabs with sledgehammers and crowbars, and then wheeling and carrying the pieces to be fitted into the batter walls we were building.

Bags of Sogeri-grass arrived and we began to plant it. It was slow work, for we had a big area of bare soil to cover. But we were making progress. Sylvanus went to Australia for a 7 week management course, but we had been fortunate to get Martin Hukula, another graduate of the Papua New Guinea Forestry College. Martin had to accept responsibility for supervising the work while Sylvanus was away, which he did well. There were problems of transport and logistics every week, and the performance of the labourers was inconsistent, so that the supervisor had to be on his toes to get things done effectively.

In March, several contracts were let to the Department of Public Works. On one of the concrete pads a new concrete base was to be laid, on which a round-timber frame would be erected for the construction of the Visitor Centre. On the frame would go roof battens, then chicken-wire, then hessian covered in wet cement, the waterproofing layer. Over this would go the traditional kunai thatch, hanging down in 4-feet wide eaves. Underneath the chicken-wire we would fix a ceiling of selo-matting, woven from sago-palm. The walls would be split bamboo, pressure treated with chemical to increase its life. The wall linings would be selo-matting, and on them would be mounted a series of simple displays to set the theme of the park for the visitor. In one corner would be the information desk.

There was also another car park to be graded and gravelled, and about one and a half miles of access road from the Visitor Centre to the Varirata Lookout. A ranger's house was to be built overlooking the park headquarters area, and a small workshop and store.

Things began to get busy. Andree Miller wanted to get going straight away on tree-planting while there was still some rain about, but we needed a water supply in a hurry to provide extra water for the lawns and trees.

We bought some galvanised iron water tanks and a long length of polythene pipe; we erected the tanks on an old road bench above the planting area and prepared a concrete base near the creek for our small firefighting pump. This had to do for a while until we could buy a larger pump. In a short time we had water in the tanks and two long hoses leading down to water the trees and Sogeri-grass as they were planted.

While the planting and watering continued, the road-works and graveling were quickly completed, due to a run of fine weather and a good performance by the Public Works Department supervisor and his plant operators. Now we had good all-weather road access to the Varirata Lookout, and two good gravel car parks.

Our first visitors started to trickle in by car as we pushed on with our other projects. Work on the Visitor Centre base and frame was painfully slow, as was that on the ranger's house and the workshop.

We kept as much pressure as we could on the Public Works Department on these jobs, and at the same time continued our clean-up of rubbish, clearing of weeds, planting of trees and Sogeri-grass and erection of picnic tables, signs and other facilities.

The Board met and decided we should have an official opening by the Chief Minister on 19 October 1973, if he was available. He was not available, so we made tentative arrangements for the Minister for Lands and Environment, Thomas Kavali, to perform the ceremony on 18 October 1973.

Now that we had a deadline we had to move things along. The framework of the Visitor Centre began to go

up, and we had one or two on-the-spot conferences to solve some minor problems. We decided that our own staff would erect the roof and walls, using kunai grass and woven bamboo. We had abandoned the idea of hessian cement and chicken-wire to waterproof the roof, preferring to rely on a well-laid thick kunai roof. All sorts of little problems arose—we had trouble getting enough battens and having them pressure-treated; bamboo and kunai had to be located, and so on.

By this time we had several young Koiari men working on the park, and they became closely involved in the building operations.

We had developed an architectural theme based on local traditional buildings, and this style was to be reflected in picnic shelters, toilets and other public buildings. I was not happy with the term “Visitor Centre” and toyed with other alternatives. Finally, I decided on “Welcome House,” and tried it out on Sylvanus and others of our staff; they liked it, and so this Melanesian-style building was given a Melanesian-type title.

As October came around, our activity became more feverish. The supply of kunai grass was difficult to maintain and finally we had to seek help of Koiari people. They did not fail us, and men and women spent several days cutting kunai which we bought from them and carted by truck to the Welcome House.

At the same time, we had several other things going. Split bamboo was being pressure-treated with chemical against borer attack, and woven into exterior and interior wall panels. Our selo-matting order from the Gulf of Papua did not appear to be coming, so we decided on bamboo anyhow. Public toilets were being completed out of the same materials at the magnificent Varirata Lookout which overlooked the Coral Sea, and at the headquarters area.

I was personally involved in the design and production of display panels, with maps, texts, photographs, and artifacts displays, to adorn the interior of the Welcome House. I co-opted our Investigation Officer, Romas Miniotas, to do the carpentry work, the Department of Information and Extension Services to paint the panels, silk-screen the texts and mount photographs, the Central Mapping Branch to produce a map, and the Department of Forests to help also with mapping and photographs. I sought photographs from friends in the USA, New Zealand and Australia, of Yellowstone, Tongariro and Royal National Park, the first such parks in those countries.

They duly arrived, as well as a photograph of Te Heuheu Tukino, the Maori Chief who gave the nucleus of Tongariro National Park in New Zealand. In our early talks with Kaleki and Warite, the Koiari leaders, we had used the example of Tongariro several times. It seemed appropriate to work into our displays a photograph of Te Heuheu Tukino and a copy of his statement when making the gift of land.

Back in June we had an important meeting with the leaders of the Omani, Nadeka and Ienari clans and Albert Maori Kiki, now Minister for Defence and Foreign Relations. The outcome of this meeting was that Kaleki Ada and Warite Koale, on behalf of the Omani and Nadeka clans, were fully in favour of the establishment of a national park on their customary land. The Ienari leaders wished to wait for 2 years to watch developments, before agreeing to any official use of their customary land as a national park.

A most interesting part of this discussion had been the

decision notified by Kaleki and Warite that they did *not* wish to *sell* their land, as they wanted to ensure it was used as a national park and not for other purposes.

In effect, they were making their customary land rights over to the government on certain conditions, and were anxious that these conditions should be adhered to. So as we prepared our display panels I had photographs of Kaleki and Warite included, and the text of Kaleki’s short but impressive speech which he had prepared for opening day.

During the last week things were hectic. Thomas Kavali, our new Minister, announced he would be unable to perform the opening ceremony, and Albert Maori Kiki was to act in his stead. In view of the part he had played in our negotiations, we were pleased that he was to be there on this important occasion.

We already had the electrical power line which had served the old pig-farm, and we had a contractor connect wiring to the Welcome House, mainly to illuminate the displays on the opening day. At the last moment there was a breakdown of communications between the Public Works Department, the Electricity Commission and the electrical contractors. We, the customers, had no power supply for the big day – which I suppose is about par for the course for such occasions.

The opening day, 18 October, dawned; and fortune smiled upon us. The weather was good, and as I drove up to the park with the chairman and Sylvanus Gorio, we found Warite Koale and his dancers camped outside the park. Arrayed in their finest tapa cloth, bird plumage and shell ornaments, they had been dancing most of the night in practice for the main performance. We had provided transport for many of them from outlying villages on the previous day, and they elected to camp outside the park so that no inadvertent damage to vegetation should



The opening ceremony – the palm frond waiting to be cut, behind the National Parks Board Chairman, Dirona Abe.

occur. How I wish more of our more sophisticated visitors to national parks would display this level of nature conservation awareness! When we reached the Welcome House we found preparations well in hand. Seating had been arranged, and several tables were set up in the Welcome House ready to serve refreshments to guests after the opening ceremony. A table stood in front of the Welcome House, covered with a PNG flag and a tapa cloth. To one side of the Welcome House sat the "Foggy Mates" string band, which consisted of our Koiari labourers who played guitars and sang island-style music in both Koiari and Motu. Across the Welcome House entrance stretched a "ribbon" of palm fronds, and the split bamboo walls were decorated with palm leaves. The surroundings were clean and tidy, the sky was blue with a few fluffy white clouds, and the birds sang in surrounding bush. Behind the Welcome House a copper was heating up the water for tea and coffee, and away to the south of the area was a "mumu" of meat and kau-kau wrapped in banana leaves and cooking amongst the stones. This was for a feast among the Koiari dancers and our park staff after official celebrations were over. People started to arrive in vehicles and on foot, and I was pleasantly surprised at the number of Koiari people who walked in, even though they were not members of the Omani and Nadeka clans.

By 10 a.m. Albert Maori Kiki, Minister for Defence and Foreign Relations, was seated at the official table with Dirona Abe, Chairman of the National Parks Board, and Kaleki Ada spokesman for the Omani and Nadeka clans. Near them, the PNG flag fluttered proudly on its flagpole.

We waited a few minutes for extra guests to move to their seats, and Dirona opened proceedings. He spoke of his pride in realizing the dream he had conceived seven years before, and of difficulties which had been overcome in arriving at this historic occasion. He stressed that the theme of Varirata was the culture, history and traditions of the Koiari people.

Then Kaleki Ada stood and spoke briefly. His words were simple but impressive. He said in Motu:

"My people and I are happy because this national park will preserve the land where our forefathers and great grandfathers used to wander, hunt wildlife and gather food, and will keep the area undefiled for us and our children to see and be proud of. Varirata is our traditional land and my people and I are proud to see the National Parks Board carry out its functions and purpose."

Finally Albert Maori Kiki rose and addressed the gathering, by now over 300 strong. Speaking in Motu, he stressed the importance of preserving the wildlife and cultural heritage of Papua New Guinea, and praised the wisdom and foresight of the Koiari people, particularly the Omani and Nadeka clans, in making their customary land at the Varirata available for national park purposes.

Then he turned and with a sharp bushknife cut the palm-frond ribbon, and the park and its Welcome House were officially opened. As the palm-frond dropped to the ground, the sound of kundu-drums came from the hill overlooking the headquarters area, and down the hill marched an impressive procession led by Warite Koale. Their dress was magnificent. The plumes of the Raggiana bird of paradise, of white cockatoos and other parrots nodded and danced with the head movements, and the beautifully fashioned and coloured grass skirts, dyed with natural vegetable-dyes by the Koiari women, swayed in tune with the beat of the kundu-drums.

Warite Koale looked most impressive in a head-dress fully four feet high, with Raggiana plumes topping it, and rosettes of red, green and white parrot feathers woven into the bamboo framework. His headband of shells on a cuscus fur base, nose-piece of cassowary bone, necklace of beads and pig-tusk, and short tapa-cloth "sporrán" back and front made him the obvious centre of attraction and he enjoyed it. His people danced with enthusiasm, the crowd enjoyed it, and Varirata National Park at long last was officially opened.



Koiari dancers prepare to celebrate at opening of Varirata National Park.

The R. T. buoy

a simple and inexpensive mooring buoy

Jeffrey Sybesma

Mooring buoys play an important role in the management of marine protected areas. Destruction of fragile coral reefs in popular diving and snorkeling sites by anchors can be minimized through the use of permanent mooring buoys. A simple and cheap mooring buoy made from readily available discarded vehicle wheels and tyres is described.

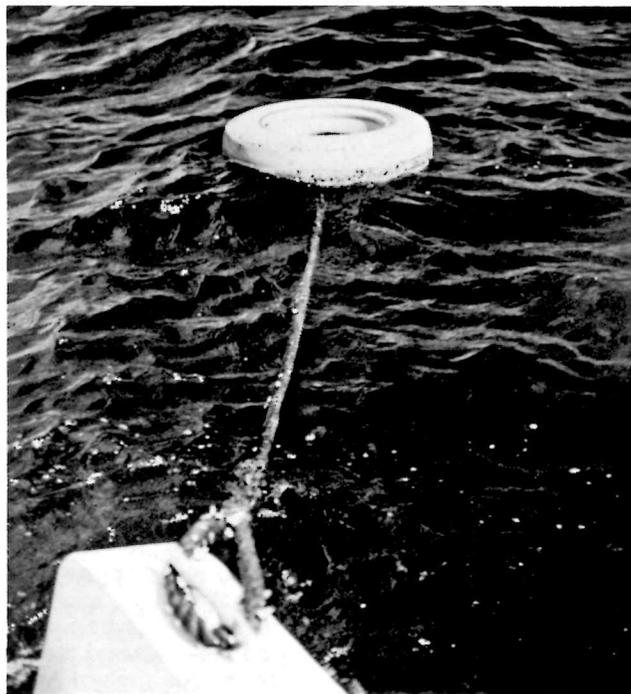
Las boyas de amare juegan un papel importante en la administración de las áreas protegidas marinas. La destrucción por anclas de frágiles arrecifes de coral en sitios populares de buceo puede ser minimizada con el uso de boyas de amarre permanentes. Se describe un tipo de boya de amarre simple y barata hecha facilmente con ruedas y neumáticos desechados.

Les bouées d'amarrage jouent un rôle important dans la gestion des aires protégées marines. Dans les sites de plongée très fréquentés, les dégâts causés par les ancrs aux récifs coralliens fragiles peuvent être atténués par l'utilisation de bouées d'amarrage permanentes. Le texte décrit des bouées d'amarrage simples et bon marché, faites avec des roues et pneus mis au rebut.

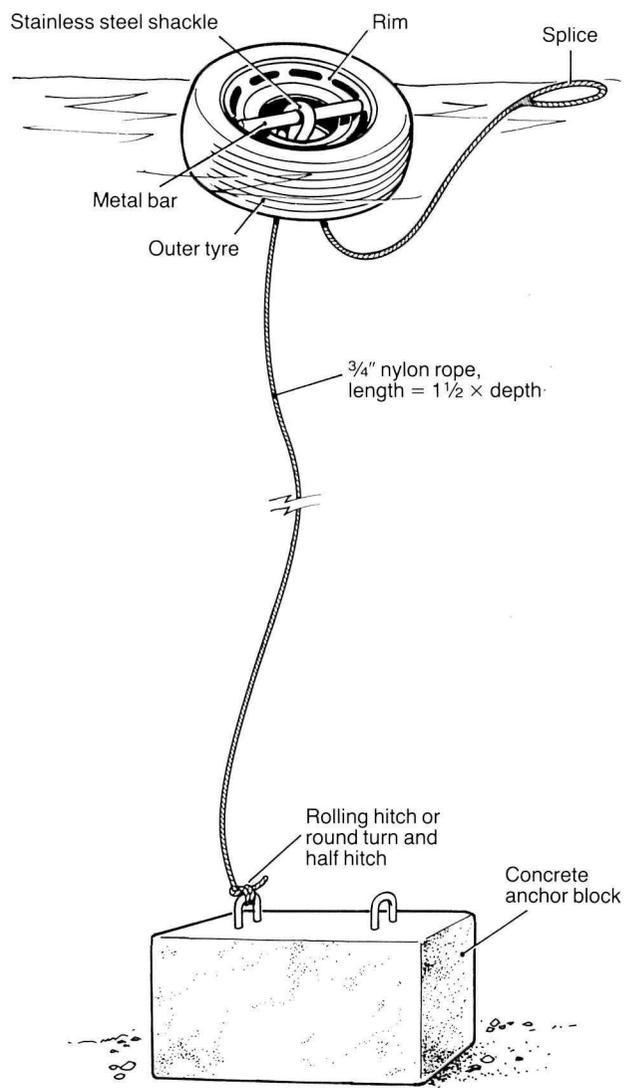
In the Curaçao Underwater Park are found healthy fringing reefs with a coral cover around 90–100 per cent. Water conditions are excellent for continuous growth of the reefs, while the sea is fairly choppy most of the year due to a steady tradewind blowing from the east (average year wind velocity is 7.2 m/s [\pm 14 knots]). This, and other factors, had limited development of a diving industry before the underwater park was established. The Curaçao Underwater Park is now trying to generate income for the island by attracting diving tourism in a regulated way to enhance sustainable use of the natural resources in the underwater park. Part of the facilities is the mooring buoy system. The first design, as described by Van't Hof in the Curaçao Underwater Park Management Plan, was based mainly on the following criteria: (1) the mooring system must be dependable; (2) the mooring system should have

minimal interference with the natural environment; (3) the buoys should be "theft proof".

The strength of the moorings depends on the weight of the anchor block and the length of the anchor line. In order to comply with the second criterion a long chain



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anchor line was undesirable in the design, because the moorings are placed in attractive coral areas where swaying chains would be highly destructive. Therefore the mooring buoys are attached with floating nylon ropes to a relatively heavy anchor block. The anchor block has a volume of 400 litres and consists of concrete with 25 per cent scrap iron with a combined specific weight of about 3. Thus the underwater weight is about 800 kg.

The buoys originally used were heavy, voluminous steel buoys, complying with criterion (3). Their major disadvantages were the difficulty of handling, expense of maintenance and the unnecessary strain they put on the ropes especially in bad weather conditions, sometimes even breaking the nylon ropes. Because of these experiences with the buoys new criteria were added: (4) the buoys should be inexpensive, and replaceable without too much cost; (5) the buoys should be easy to handle and rapidly replaceable by one person; (6) the buoys must be strong and durable; (7) the buoys must be visible.



Following these criteria we came up with the idea of using old tyres, which are available in large quantities around the island. Preliminary research found that the price for an old worn-out outer tyre, a new inner tube and a used metal rim would not exceed US\$ 15, sometimes even cheaper when bought in large quantities. After welding a small piece of metal over the rim's opening and then painting the complete tyre bright yellow, the R.T. buoy ("Recycled Tyre buoy") is ready to use.

The R.T. buoy is safe in use because it will not damage a boat that runs against it or over it. The outer will protect the inner tube, which is the actual floating device; and because it is easy to handle, it can be cleaned and replaced without any problem. Experience with the buoy for 6 months has proved it to be reliable. The R.T. buoy could be a handy alternative for small-budget marine parks around the world, especially in developing countries where recycling of waste material is a common practice.

Communications

SIR — Thank you for your kind words in the Editorial of the first issue of the new series of PARKS. May I hasten to add that the report referred to (Assessment and Proposed Revitalization of Parks International Journal) was prepared jointly with Robert Cahn and co-presented with him to the 24th Working Session of IUCN's 16th General Assembly in Madrid.

GARY B. WETTERBERG

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USA

Thank you for putting the record straight. We take the opportunity of expressing our appreciation to Robert Cahn for his efforts in getting PARKS into circulation again, and we apologize for not having given appropriate recognition in the Editorial. — *Editor*

SIR — As an avid reader and collector of PARKS, I am happy to see it published again. However, I would like to air three points.

The theme for this issue was set in the Foreword, which ends with the opening sentence thus: "... integrating the

management of protected areas which other forms of rural land use" (my emphasis). It is a pity that the first issue is so polarized inwards. I would suggest that coastal wetlands, estuaries, reefs, islands and beaches offer more opportunities for integrating protected area management and resource use—and with fewer conflicts than might be expected further inland. To help maintain a balanced policy toward the sea and seashore in the new PARKS terminology, may I suggest the replacement of "land use" by "resource use" (unless in the formal context of land use planning), "hinterlands" by

Advice to contributors

Contribution of manuscripts to PARKS

Authors are usually professional people engaged in management of, or in the many disciplines associated with, parks and protected areas. Authors may be invited to write on subjects selected by the editor, but those who wish to submit for consideration articles based on their own experience are encouraged to do so in consultation with the editor.

At present, manuscripts can be accepted only in English or Spanish, and will be published in the original language.

Suitability for publication is determined by many factors; including factual and technical content, timeliness and potential value to an international readership.

Letters to the editor are invited. These may refer to the subject matter of articles, introduce new ideas, or comment on topics of general interest. They may be published at the editor's discretion.

The editor would be pleased to be placed on the mailing list of magazines published by national park organizations with a view to reprinting appropriate articles in PARKS to enable them to reach an international readership.

General: Two copies of the manuscript should be submitted on paper of uniform size. Pages should be numbered consecutively. Each manuscript should be headed by a title, the author's full name, and the full postal address. Author's biodata should accompany the manuscript. Footnotes should not normally be used, but where considered to be essential they should be kept as brief as possible.

Nomenclature: Where the scientific name of a plant or animal follows the first mention of its common English or vernacular name, the scientific name should be underlined and enclosed within brackets. Common names should not be given initial capital letters unless they incorporate proper names, or, where confusion could otherwise result.

Names: Except where the anglicized version is well-established, for example "Rome" or "Moscow", the locally and presently used spelling or its accepted English transliteration should be used. In this, the National Geographic Society maps (US) or Times Atlas may generally be followed. The initials of organizations, for example, IUCN, UNESCO and ICSU, and abbreviations for countries, such as USSR, USA, DDR, and UK, require no full stops.

Units: The metric system should be used. Where, for any reason, figures based on other systems are quoted, the metric equivalents should always follow in brackets. The abbreviated forms—cm, kg, ha and so on—should not be followed by a full stop except at the end of a sentence. In dates, the full name of the month should be used.

Illustrations: Photographic prints should be glossy and should be identified by the author's name and caption reference lightly written in soft pencil on the back. Captions should be provided typed on a separate sheet, clearly identified. Tables should be included in the main body of the manuscript. Line drawings, maps or diagrams should be professionally prepared with black ink on white paper. Photos, drawings and other materials intended for reproduction should be mailed flat with protective stiffener or enclosed in a mailing tube. They should never be folded.

References: References should be cited in the text by naming the authors (or with *et al.* replacing all the names after the first if there are more than two) followed by the year of publication, for example:

(Smith, 1971); or (Smith & Jones, 1971); or (Smith *et al.*, 1971).

The reference list at the end of the text should be arranged in alphabetical order of authors surnames, in the following form:

- (1) for a scientific periodical:
Gee, E. P. 1956. Report on the status of the Kashmir stag, October 1966 *J. Bombay Nat. Hist. Soc.* 62(3): 379–393.
- (2) for a single author book:
Schaller, G. B. 1967. *The deer and the tiger*. Chicago & London: University of Chicago Press.
- (3) for a chapter from an edited book:
Packard, R. L. 1967. Octodontoid, Bathyergoid and Ctenodactyloid rodents. In *Recent Mammals of the World*, S. Anderson and J. Knox-Jones, eds. New York: Ronald Press. pp. 273–290.

Abbreviations of scientific journals should follow *The World List of Scientific Periodicals*. If this is not available the name of the journal should be given in full.

Proofs: Printers proofs will not normally be submitted for checking by authors as short time and often infrequent or interrupted mails make this practice unacceptable. Proofs will be read by the editors.

Communications continued

"upstream areas" (when the former is used as in the Foreword to mean adjacent areas linked by ecological process), and "adjacent lands" by "adjacent environments". There are many other examples of terrestrial bias in protected areas language to complement the above three which were culled from the Foreword.

Second, the greatest loss in the new format is the section "Park Techniques". There are enough well established journals dealing with the planning and management theory of protected areas. What we need is a publication that provides case studies of how theoretical prescriptions are applied to planning and management and that presents reviews and examples of management tactics and techniques. There is no other vehicle of publication

for these evolving and really useful items of information which are needed by managers working in and around the sea (and on land?). For example, there could be reviews of such practical management tasks as table and bench construction; underwater/land signage; garbage bin design and construction; moorings and marker buoys (with addresses for catalogues); docks and slipways; educational programmes for coral reefs, mangroves and other sensitive habitats; beach access over dunes; anchorages and parking lots; power generators; planning camp sites and ablation facilities; visitor control on turtle beaches, bird nesting islands and pinniped rookeries. It would also be extremely useful to see some economic systems and the relative contribution to revenue by gate fees, shop leases or returns camp-site charges and so on.

Finally, please consider running

abstracts of protected area planning and management literature that has been published elsewhere. Or, if this proves too bulky, just give their titles with key words, full references and authors' addresses.

RODNEY V. SALM

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PARKS is here, willing and waiting. As mentioned in the Editorial, it is intended to run a "theme" issue on marine protected areas, but we want regular feature articles as well. We welcome material from all who are prepared to take up Dr Salm's challenge. — Editor

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