Geography and Climate

Costa Rica's geography is dominated by two coasts and by mountains that cover more than half the land area, greatly influencing the climate. Variations in temperature and rainfall and a wide range of elevations combine to produce the rich and varied vegetation that supports the country's wealth of birds.

In this section we briefly describe Costa Rica's landforms, vegetation, and climates, in effect setting the stage for the birds. The geographical terms and regional names presented here are illustrated in Maps 1 and 2 and will be used throughout the book to describe the distributions of the birds. We recommend that people planning extensive field trips purchase more detailed maps. Excellent topographic maps of Costa Rica, on various scales, are available at the Universal, López, and Lehmann bookstores in the center of San José (gas stations in Costa Rica do not offer road maps). These maps are in Spanish, with metric units. We use the Spanish regional names in this guide to help the reader interpret the maps and ask directions. Graphs for converting metric to English units appear on the inside of the cover.

Coasts and Islands

The Caribbean coast is smooth and monotonous for most of its length, with steep sandy beaches flanked by scrub and coconut palms (Figure 1). Relief is afforded only by limestone outcrops and promontories around Puerto Limón and Cahuita and south of Puerto Viejo. The only island of any size is Isla Uvita, off Limón. There are almost no tides, and there are only three small, isolated mangrove swamps, the largest lying just north of Moín. Behind the immediate coast and separated from it by swamp forest (now being cleared for rice fields and pastures in many areas) lies the intracoastal (inland) waterway, a series of natural lagoons, sloughs, and rivers joined by artificial canals to form the major artery of coastal transportation between Moín and the Río San Juan. Waterbirds are rather sparse along this coast, with appreciable concentrations only at the river mouths, or *barras*, and in Limón harbor; the only small seabird colony (of Brown Boobies) is on a small islet next to Isla Uvita.

The Pacific coast is wholly different: the coastline itself is irregular and varied; rugged, rocky headlands alternate with broad, sandy beaches (Figure 2); mangrove swamps are common. The strong tidal fluctuations produce a broad intertidal zone that offers excellent foraging for shorebirds and other waterbirds, especially on the mudflats exposed at low tide in the two major bays, the Golfo de Nicoya and the Golfo Dulce. Scattered around the former are numerous salt-collecting ponds, or *salinas*, to which thousands of shorebirds—gulls, terns, and other birds—repair at high tide to rest or to sleep. Minor upwelling along this coast provides abundant food for many seabirds. Notable concentrations of shorebirds and herons are also found at many river mouths, especially where these are flanked by mangroves.

Along the Pacific coast are numerous islands, ranging from small stacks and pinnacles of naked rock to wooded islands with varied terrain, several square kilometers in area. The largest islands, hilltops of a sunken river basin, occur in the Golfo de Nicoya;

Maps, photos, and glossary figures by F. Gary Stiles, except for Figure 17G by L. Rosselli.

Figure 1. Northern Caribbean coast, looking south from Cerro Tortuguero: inland waterway left and right of center, swamp forest in foreground. Note lack of relief.

Figure 2. Pacific coast: Playa Naranjo, Parque Nacional Santa Rosa. Broad sandy beach, river mouth, and estuary with some mangroves; rocky headlands in background.

they are the only ones with permanent fresh water and human settlement. A number of the smaller, uninhabited islands all along the coast support breeding seabirds, mostly Brown Boobies. Isla Guayabo, inside the Golfo de Nicoya, has a large colony of Brown Pelicans. Herons breed on a few small islets.

Lying in the eastern Pacific Ocean some 300mi (500km) south of Puntarenas, Isla del Coco (Cocos Island) is notable for its precipitous terrain and high rainfall (Figure 3). With only a few acres of (swampy) level ground in its entire 10mi^2 (25km^2), Cocos has never supported more than intermittent, marginal human habitation in spite of its abundant fresh water. The dense forests that cover most of the island are diverse in aspect but contain relatively few species of plants or land birds, most of which are endemic. Many seabirds breed in the treetops as well as on offshore islets.

Mountains and Valleys

The backbone of Costa Rica is a series of mountain ranges running from northwest to southeast and becoming progressively larger, higher, and geologically older as they near Panama. The northernmost range, the Cordillera de Guanacaste, consists of four volcanic massifs (Figure 4) separated by low, windswept passes. Although these massifs have eroded to varying degrees, they all preserve at least some vestiges of a conical shape, with steep slopes on their single or double peaks. Rincón de la Vieja, the only active Guanacaste volcano, has a small, active crater alongside its main peak. Except for extensive barren ash fields on Rincón de la Vieja, the upper slopes of all the Guanacaste volcanoes are covered by dense, tangled, moss-festooned cloud forest—a true elfin forest no more than 10ft (3m) high where it is exposed to strong winds. As we descend toward the Pacific, the climate of these volcanoes becomes drier. The lower slopes support a beautiful moist forest with tall, large, small-leaved trees, few epiphytes, and a very open understory of small-leaved shrubs. Farther down, this vegetation merges into the deciduous forests and savannas of lowland Guanacaste. The lower Caribbean slopes of these volcanoes support wet, lush forests that grade into tropical evergreen forests in the lowlands and in the passes, which provide a corridor that enables Caribbean flora and fauna to extend locally onto the Pacific slope. Despite considerable deforestation of the Pacific sides of the volcanoes and in the passes, the forests are mostly intact above 2500ft (750m); on the wet Caribbean slope, deforestation is slight but advancing. On the lower Pacific faces of most of these volcanoes occur old lava flows that have probably never been wooded. One may find Rock Wrens and Botteri's Sparrows at their southern geographic limit on these barren, grassy, boulder-strewn slopes.

South of a series of low hills and the deep valley of the Lago de Arenal (now much enlarged since the damming of the Río Arenal in the 1970s) lies the Cordillera de Tilarán, a broader range whose highest peaks reach 6000ft (1850m). On the Caribbean slope of this range is a lush rain forest. Windswept elfin forests and cloud forests dominate the continental divide and higher peaks (Figure 5). Continuing down the Pacific slope, one encounters progressively drier forests and pastures until the mountains drop off abruptly to the mostly deforested foothills and lowlands. To the east of this cordillera lies Volcán Arenal, a nearly symmetrical volcanic cone that exploded in 1968 after centuries of silence. This volcano and its lower neighbor, Cerro Chato with its lovely crater lake, are essentially southern outliers of the Cordillera de Guanacaste.

The Cordillera de Tilarán is itself the northern extension of the Cordillera Central, a group of four volcanic massifs that together form the northern and eastern walls of the central intermountain valleys. Much taller and older than the Guanacaste volcanoes

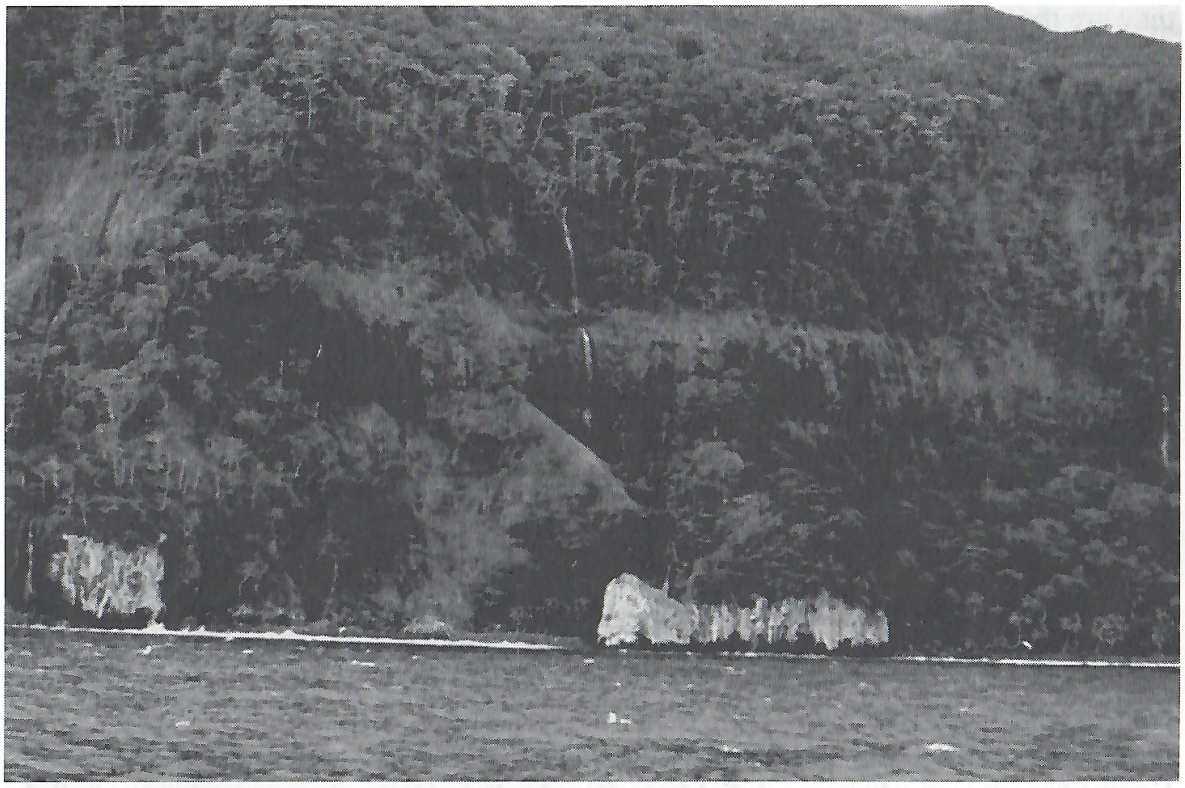


Figure 3. Isla del Coco (Cocos Island). Note steep, heavily wooded terrain.

Figure 4. Volcán Orosí, the northernmost Guanacaste volcano, as seen from Hacienda Los Inocentes. Note conical form, heavily wooded slopes, clearings, and cattle ranch below.

Figure 5. Windswept elfin forest along the continental divide of the Cordillera de Tilarán above Monteverde.

these central massifs do not rise to symmetrical cones but have small cones and sometimes enormous craters on their rather flat tops. Progressively higher from west to east are four massifs that include the active volcanoes Poás and Irazú, each with extensive, desolate expanses of ash and cinders around their craters. Both Poás and Barva have cold, clear lakes in extinct craters. Fumaroles smoke in the small, elfin forest-covered cinder cone of Volcán Turrialba, the easternmost part of the Irazú massif.

All these massifs slope gently down to the intermountain valleys on the south; to the north and east they descend to the Caribbean lowlands in long, steep-sided ridges separated by deeply incised valleys that are often spectacular canyons and gorges (Figure 6). Where it has not been altered by volcanic activity, the vegetation of the upper levels of the Cordillera Central is predominantly oak forest, which on the southern slopes, toward the central valleys, has been mostly replaced by pastures for dairy cattle down to about 5500ft (1700m); much of the land down to the valley floors is in coffee plantations. Many vegetables, especially potatoes, are grown on Volcán Irazú above Cartago. Narrow fingers of forest stretch down toward the central valleys along streams, and coffee plantations are shaded by trees and banana plants, providing habitats for a variety of birds. (Unfortunately, these old-style plantations are being replaced by monocultures with little shade that use chemicals heavily for disease control, with distinctly unfavorable consequences for the birds.) Forests are much more continuous on the wetter northern and eastern slopes of this cordillera, but they are rapidly being replaced by low-grade cattle pastures, especially in the foothills.

In the geographic center of Costa Rica are two intermountain valleys separated by the low Ochomogo pass at the continental divide: the Valle Central on the Pacific slope and the much smaller Valle del Guarco on the Caribbean side, together often known as the

Figure 6. The Caribbean slope of the Cordillera Central, looking up the canyon of the Río Sucio toward Volcán Irazú from Carrillo. The flat-topped steep-sided ridges are old lava flows.

Meseta Central. The majority of Costa Ricans inhabit these valleys; the former contains the capital city of San José, the provincial capitals Alajuela and Heredia, and a number of large towns (Figure 7); the latter's major city is Cartago, at the foot of Volcán Irazú. These valleys have a pleasant climate, with elevations of mostly 3200–4500ft (1000–1400m), rolling terrain, and rich volcanic soils that are unfortunately becoming lost for agriculture because of urban sprawl. Coffee and sugarcane, with smaller areas of other crops and pasture, dominate the rural landscape of the Meseta Central; most of the little woodland that remains is second growth.

The major rivers of the Valle Central drain toward the Pacific in steep-walled wooded gorges. South and west of Ciudad Colón, Atenas, and San Ramón, the valley drops off through rugged hills to the coastal lowlands. The Valle del Guarco is flat and marshy in places; a small but distinctive avifauna, including the Sedge Wren and White-throated Flycatcher, inhabits wet scrub south and west of Cartago. Farther south and east this valley drops off abruptly to the Orosi valley, a major coffee-growing area. Here the Río Grande de Orosi flows down from the Cordillera de Talamanca to the large reservoir and hydroelectric plant at Cachí, where boating is good but waterbirds rather scarce. Below the reservoir the Río Reventazón descends in its broad canyon between rich plantations of coffee and sugarcane to the fertile valley of Turrialba and then to the lowlands at Siquirres. This valley between the Cordillera Central and the Cordillera de Talamanca, which for a century has been the main route between the Meseta Central and the Caribbean lowlands, has long been extensively deforested.

The Cordillera de Talamanca, southern Central America's highest mountain range, occupies most of southern Costa Rica. Its northern outliers, the Cerros de Escazú and the Candelaria and Puriscal ranges, form the southern wall of the Valle Central. Long

Figure 7. Panorama of the Valle Central, with Volcán Poás in the background. A mosaic of coffee plantations (dark green), pastures (light green) and sugarcane (the flat, light green area right of center).

deforested, these rugged hills are now occupied mainly by coffee farms and poor, often severely eroded cattle pastures, with mostly small patches of second-growth woodland.

The main part of the Cordillera de Talamanca consists of several large massifs rising well over 10,000ft (3200m), mostly connected by a high central ridge nearly everywhere above 8200ft (2500m), with major lateral ridges stretching to the northeast and a spur, the Dota Mountains, or Fila de Bustamante, extending toward the Pacific. The natural vegetation of the upper parts of these mountains, to timberline at about 9500ft (3000m), is a magnificent oak forest, whose understory is more or less dominated by bamboos. Above timberline lies the páramo, a chaparrallike formation of tall, gnarled shrubs in sheltered situations, a small, stiff, broomlike bamboo in open sites, and a cycadlike tree fern in the numerous swampy spots. The páramo biota descends to lower elevations where the forest has been cut or burned, as on the northernmost major massif, the Cerro de la Muerte, or ''Mountain of Death,'' so named because many ill-prepared people ''caught their death of a cold'' while crossing it going to and from the Valle del General to the south, before the highway was built. The upper regions of the Talamancas were glaciated during the Pleistocene, and the highest massif, Cerro Chirripó (12,530ft, 3820m), has several fine glacial valleys with lakes formed behind old moraines (Figure 8). This massif also has the most extensive páramos, which unfortunately were burned in the last few years in fires set by man. The southernmost major massif is Volcán Barú, or Chiriquí, in Panama, the only part of the entire range with evidence of recent vulcanism.

The Caribbean slope of the Talamanca range is extremely wet. Much dense forest covers the rugged terrain, intersected by many deep, swift, rocky rivers that make travel

Figure 8. Glacial valley in the Chirripó massif, Cordillera de Talamanca; Cerro de la Muerte in background. The vegetation is páramo, with oak forest on the darker, lower ridges just visible at center.

difficult. Because of its inaccessibility, this area is the principal remaining stronghold of Costa Rica's Indian population. Along many major rivers, up to 3200ft (1000m) locally, lie extensive areas of second growth of various ages, the product of the Indians' slash-and-burn agriculture. Although extensively forested, the lower ridges of the Talamancas, where Indians hunt, support few large raptors or quadrupeds. In general, the altitudinal zonation of forest types on the Caribbean slope of the Talamancas resembles that on the Cordillera Central but is displaced slightly upward. In the southern Talamancas, many lowland birds and plants thus extend up to 3200ft (1000m) or more, in contrast to 1650–2300ft (500–700m) on the Cordillera Central. Features of special interest include Sabana Dúrika, essentially a large highland swamp at about 7000ft (2150m), which, surprisingly, has many páramo plants and birds, and several isolated lakes, such as Lago Dabagri, with a diverse aquatic biota far from other, similar areas.

On the Pacific slope of the Talamancas, lower spurs extend parallel to the main range southeast from the Cerro de la Muerte and northwest from the Chiriquí massif to form the southern coastal ranges. These low mountains, mostly below 5000ft (1500m) in elevation, support impressive rain forests on their steep Pacific slopes. Deforestation is proceeding rapidly, especially on the drier and gentler interior slopes. The San Vito–Cañas Gordas region on the Panama border, where the coast range joins the Chiriquí massif, is now a major center of coffee cultivation.

Between the coastal ranges and the Cordillera de Talamanca lies a long intermountain valley. The longer northern part, Valle del General, and the southern part, Valle de Coto Brus, were named for the major rivers draining them. Near Paso Real the Río General and Río Coto Brus join to form the Río Grande de Térraba, which flows through a

narrow gap in the coastal ranges to the Pacific Ocean near Puerto Cortés. The lower General and Coto Brus valleys, between about Buenos Aires and Potrero Grande, and the slopes of the coastal ranges adjacent to the Río Grande de Térraba, are often collectively called the Térraba region.

Protected by the double rain shadow of the Talamancas and the coastal ranges, these interior valleys have a much more pronounced dry season than do the coastal lowlands. The rolling terrain has been mostly deforested, though scattered patches of beautiful evergreen tropical forest remain, as at "Los Cusingos," near El Quizarrá. In the upper reaches of the General and Coto Brus valleys, much coffee is grown; much of the central part of the Valle del General is planted to sugarcane; below, cattle pastures cover most of the land. In the Térraba region are patches of dry, open savanna with small, twisted trees and scrub. These grasslands probably date to pre-Columbian times; like most pastures, they are perpetuated by burning in the dry season. As deforestation proceeds rapidly uphill along much of the Pacific face of the Cordillera de Talamanca, the beautiful, moist-to-wet forests yield to steep, rapidly eroded pastures. In the Las Tablas area near the Panama border, however, somewhat drier conditions still support a magnificent middle-elevation forest characterized by giant cedro (*Cedrela*) and fig trees, many small-leaved trees and shrubs, and few epiphytes.

In addition to the major mountain ranges, there are smaller and more isolated mountains on the Nicoya and Osa peninsulas. Much of the Península de Nicoya has rough, hilly country, with the major massifs reaching about 3000ft (900–1000m). With heavier rainfall than in the lowlands and frequent cloud cover to mitigate the dry season, the vegetation of these peaks is somewhat lusher than that of the lowlands. Some peaks even support breeding populations of bellbirds! Unfortunately, deforestation of these mountains has been extensive. The highest hills of the much wetter Península de Osa reach 2500ft (750m) and support a beautiful cloud forest, including oak trees, a bamboo-choked understory, and a profusion of epiphytes.

Lowlands

The Caribbean coastal plain is very broad in the north and narrow in the southeast. The wettest area is the extreme northeast, toward Barra del Colorado, with its mean annual rainfall of more than 200″ (5m). To the west and south, the country becomes progressively drier, up to the foothills of the mountains. The prevalent vegetation of the Llanura de Tortuguero of the extreme northeast, as well as in the immediate vicinity of most of the Caribbean coast itself, is evergreen swamp forest, with extensive stands of the huge-leaved *Raphia* palm as well as broadleaved trees. Much of the ground in these forests is under water most or all of the year; decaying vegetation and poor drainage allow tannins to accumulate, producing the characteristic "blackwater." Such swamps are the principal habitat of a few birds, such as the rare Green-and-rufous Kingfisher.

Farther west the dry season becomes more pronounced, especially south of the Lago de Nicaragua, and forests from the Río Frío region westward are partly deciduous at this time. An extensive area of lowlands just south of the lake and along the watershed of the Río Frío (sometimes called the Llanura de los Guatusos) floods during the rainy season and dries almost completely in the dry season. The rains convert dry cattle pastures to grassy marshes, sloughs, and lagoons; the change is most dramatic at Caño Negro, where a lake 2½mi (4km) wide and more than 15ft (5m) deep forms with the rains and contracts into the bed of the Río Frío in the dry season (Figure 9). Much rice is grown on flat, partly flooded land (as at Upala), and cacao is often planted on higher ground.

virtually no forest remains on level to gently rolling terrain in the lowlands south of Limón.

On the Pacific side of Costa Rica are two major lowland areas: the dry- to moist-forested northwest, south to the mouth of the Golfo de Nicoya, and, in the extreme south of the country, the much wetter lowlands around the Golfo Dulce and on the Península de Osa. The northern and southern lowlands are connected by a narrow strip of coastal country nearly as wet as the Golfo Dulce region, except in the somewhat drier vicinity of Parrita and Quepos. Climatically, the division between the drier northwest and wetter south falls along the hills that form the southern wall of the watershed of the Río Grande de Tárcoles, from Cerro Turrubares to the Carara region.

The northern Pacific lowlands, or "Pacific northwest," are the driest major region of Costa Rica, with a severe, windy dry season lasting five to six months. The mostly rolling terrain is dissected by rivers whose valleys become increasingly steep-sided and narrow upstream toward the northern ranges and the Nicoya hills. Around the Golfo de Nicoya and in the lower basins of the Río Tempisque and Río Bebedero are flat alluvial plains, broken here and there by sharp limestone hills (Figure 10). Small alluvial plains are also scattered along the outer Pacific coast, but most of the Santa Elena and Nicoya peninsulas are rough and hilly to the ocean. The natural vegetation of most of this region is tropical deciduous forest, with most trees and shrubs leafless during the dry season. Many large trees have a characteristic umbrella shape, and the understory is dominated by tough, often spiny shrubs and vines, including some cacti. In river bottoms and other spots with a high water table, the forest is more evergreen. In moister parts of this region—for example, along the outer Península de Nicoya and south of Puntarenas—the *Scheelea* palm is abundant and the forests are partly evergreen.

In the lower Tempisque and Bebedero basins lie extensive seasonal marshes and lagoons that become largely or wholly dry toward the end of the dry season. In the region as a whole, nearly all the forest has been replaced by extensive cattle pastures, or *sabanas*, maintained by dry-season burning. Particularly in the moister areas, rice, cotton, and sugarcane are grown. More than half of the Tempisque wetlands have been drained in the last fifteen to twenty years, and a major irrigation system is planned to convert much of the remainder to rice and sugarcane fields.

In the Golfo Dulce lowlands of the southern Pacific region, the dry season, although pronounced, usually lasts only two or three months, and the forest is almost entirely evergreen. On the extensive Palmar and Coto plains, the magnificent forests have been felled, and they are rapidly diminishing in the hilly areas around the gulf and on parts of the Península de Osa. The flat lowlands are devoted mainly to rice and bananas, which in many areas are being replaced by African oil palms. The hills, which are usually covered with pasture after supporting a few crops of corn and beans, are subject to severe erosion. The only major expanse of mostly intact lowland forest in the region is the Corcovado basin (Figure 11), which in addition to truly impressive stands of trees, especially in the Llorona–San Pedrillo area, contains extensive swamps of grasses and *Raphia* palms surrounding a small lagoon. This basin will undoubtedly be the last stronghold of a number of plants, birds, and other animals endemic to southern Pacific Costa Rica and western Chiriquí, Panama.

Climate

Costa Rica has basically two seasons: the dry season, or *verano* (literally "summer"), and the rainy season, or *invierno* (literally "winter"). Much to the confusion of

Figure 10. Aerial view of the Río Tempisque basin at the end of the wet season; limestone hills of the Nicoya peninsula in the background. Note extensive seasonal marshes in foreground.

Figure 11. View of the Corcovado basin, Península de Osa; Laguna Corcovado at center. The only extensive lowland wet forest remaining in southwest Costa Rica.

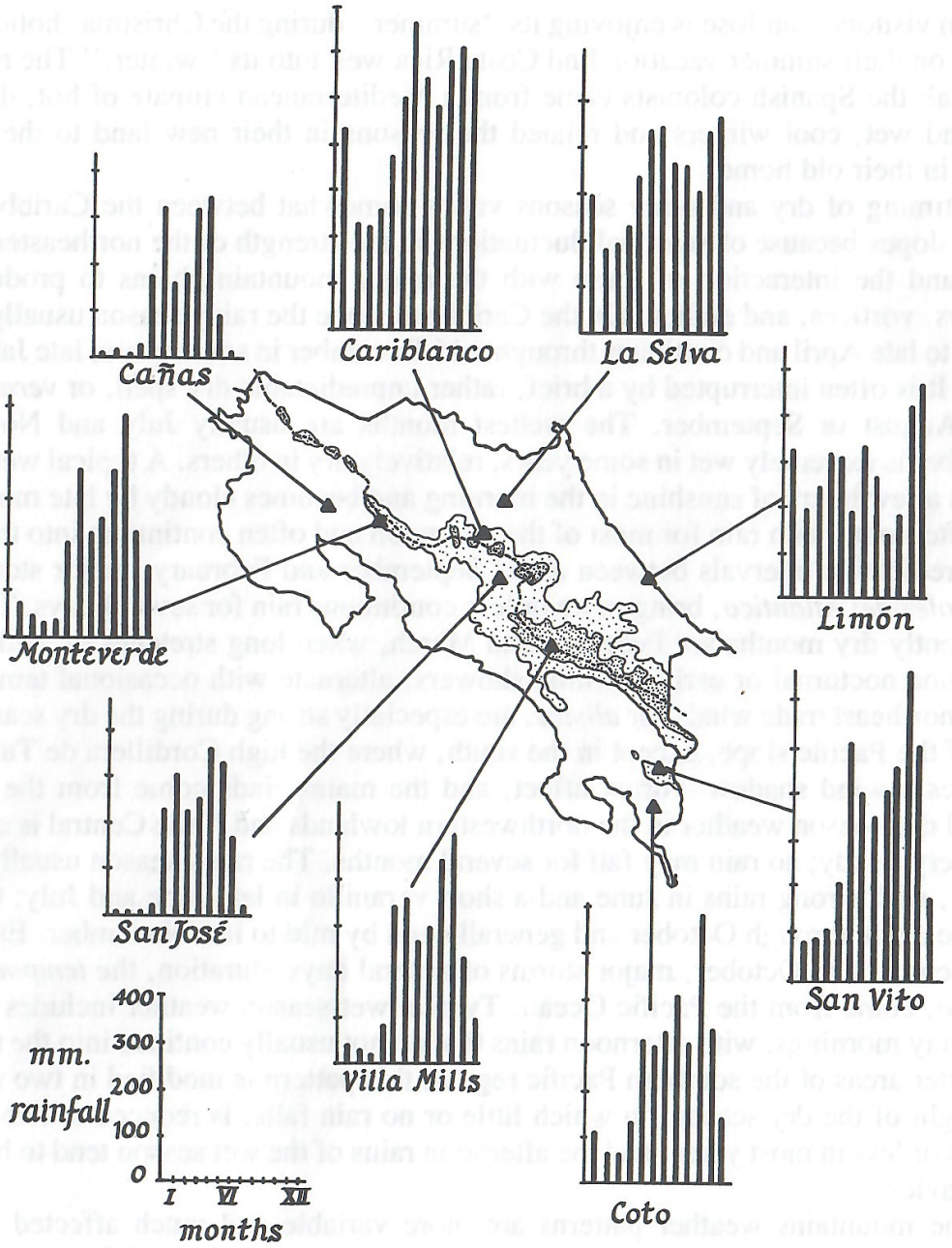
northern visitors, San José is enjoying its ''summer'' during the Christmas holiday, and tourists on their summer vacation find Costa Rica well into its ''winter.'' The reason is historical: the Spanish colonists came from a Mediterranean climate of hot, dry summers and wet, cool winters and related the seasons in their new land to the rainfall regime in their old home!

The timing of dry and rainy seasons varies somewhat between the Caribbean and Pacific slopes because of seasonal fluctuations in the strength of the northeasterly trade winds and the interaction of these with the major mountain chains to produce rain shadows, vortices, and eddies. On the Caribbean slope the rainy season usually begins by mid to late April and continues through mid-December in some years, late January in others. It is often interrupted by a brief, rather unpredictable dry spell, or *veranillo*, in about August or September. The wettest months are usually July and November; December is extremely wet in some years, relatively dry in others. A typical wet-season day has a few hours of sunshine in the morning and becomes cloudy by late morning or early afternoon, with rain for most of the afternoon and often continuing into the night. At unpredictable intervals between about September and February, major storms, the *temporales del Atlántico*, bring more or less continuous rain for several days. The most consistently dry months are February and March, when long stretches of sunny days, with some nocturnal or early-morning showers, alternate with occasional temporales.

The northeast trade winds, or *alisios*, are especially strong during the dry season over most of the Pacific slope, except in the south, where the high Cordillera de Talamanca produces a wind shadow–vortex effect, and the main winds come from the Pacific. Typical dry-season weather in the northwestern lowlands and Valle Central is clear and often very windy; no rain may fall for several months. The rainy season usually begins in May, with strong rains in June and a short veranillo in late June and July; the rains increase again through October and generally end by mid to late November. Especially in September and October, major storms of several days' duration, the *temporales del Pacífico*, come from the Pacific Ocean. Typical wet-season weather includes more or less sunny mornings, with afternoon rains that do not usually continue into the night. In the wetter areas of the southern Pacific region, this pattern is modified in two respects: the height of the dry season, in which little or no rain falls, is reduced to two to three months or less in most years, and the afternoon rains of the wet season tend to be longer and heavier.

In the mountains weather patterns are more variable and much affected by local topography. Often the dry season is characterized by long periods of fine, wind-driven rain or ''mist'' alternating with brief periods of clear, calm, sunny weather when the trade winds decrease temporarily in strength. The wettest areas in Costa Rica are the Caribbean slopes of the mountains, from the foothills well into upper elevations, where even in the dry season long spells of rainy or misty weather are not infrequent. Many of the highest peaks, especially in the Cordillera de Talamanca, are above the level of greatest rainfall; during the dry season, long spells of clear weather often occur, and many rainy-season mornings are sunny. Here the most striking aspects of the climate are the sharp and sudden changes in temperature between sun and shade and the intensity of the ultraviolet radiation in the thin, transparent air (beware of sunburn!).

Temperatures in Costa Rica vary principally with elevation rather than with time of year: the lowlands are always hot, the middle elevations cool, the high mountains cold. Daily variations in wind and cloud cover are also important: in clear weather the temperature climbs higher by day but drops lower at night. In the dry season, nighttime frosts are frequent in the mountains above 8200ft (2500m); they rarely occur in the wet



Place	Elevation	MAP[a]	MAT[a]
Cariblanco	3597ft (1090m)	223″ (5675mm)	69°F (20.4°C)
La Selva	300ft (90m)	155″ (3940mm)	76°F (24.3°C)
Puerto Limón	10ft (3m)	132″ (3350mm)	79°F (25.8°C)
San Vito	3350ft (1019m)	157″ (3988mm)	71°F (21.7°C)
Coto	100ft (30m)	118″ (3005mm)	81°F (27°C)
Villa Mills	10,170ft (3100m)	106″ (2690mm)	51°F (10.7°C)
San José	3840ft (1170m)	77″ (1951mm)	69°F (20.6°C)
Monteverde	4525ft (1380m)	96″ (2429mm)	66°F (19°C)
Cañas	145ft (45m)	70″ (1770mm)	82°F (27.8°C)

Note: The map above shows the 1000m and 2000m contours; the broken line represents the continental divide.

Source: Weather Data, Instituto Meteorológico de Costa Rica.

[a]MAP = mean annual precipitation; MAT = mean annual temperature.

Figure 12. Mean monthly rainfall of nine representative Costa Rican localities.

season. Because of differences in cloud cover, localities on the Pacific slope usually average slightly warmer than localities at the same elevation on the Caribbean slope. The only real exception to the rule of little seasonal temperature change occurs during the North Temperate winter months, when the southernmost edges of the great cold fronts penetrate the tropics and bring several days of cooler weather and strong winds locally known as the *nortes*.

These patterns are summarized briefly in the climate diagram shown in Figure 12. We have chosen a representative locality from each of the following areas: Caribbean coast (Puerto Limón), Caribbean lowlands (La Selva), wet middle elevations of the Caribbean slope (Cariblanco), the high mountain peaks (Villa Mills), the Pacific slope of the northern cordilleras (Monteverde), the Valle Central (San José), the northwestern lowlands (Cañas), the Golfo Dulce lowlands of the south (Coto), and the southern Pacific coastal range (San Vito).