

# "MEXICO AND CENTRAL AMERICA"

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## ENVIRONMENT

## Climate and Weather

### Physiography and Ecoregions

The extensive landmass embracing Mexico and the Central America isthmus represents an assemblage of geographic elements influenced by diverse climatic conditions. Thousands of volcanoes and igneous extrusions form mountain chains, and numerous rivers empty their waters into the Pacific Ocean or the Caribbean Sea. Several volcanic lakes—such as Atitlan in Guatemala, and Managua and Nicaragua in the Republic of Nicaragua—are impressive bodies of water.

Alpine forests of fir, pine and oak give way to moist evergreen forests at lower altitudes (Figure 99). These in turn merge with the vegetation of the coastal lowlands. Tropical rain forests exist in some areas, particularly on the Atlantic slope. Arid sectors often predominate, notably in Mexico and Guatemala. Cultivated lands of excellent to poor productivity are found scattered throughout. Grazing lands and typical savannahs are concentrated on the Pacific slopes, particularly in Costa Rica and Panama, and within the tidal influence of both coasts. The intertidal zones support impenetrable mangrove swamps.

The four seasons characteristic of North America are clearly distinguishable over most of Mexico. In contrast, only dry and wet periods are identifiable for the Central American countries. Rainfall is abundant in the Atlantic lowlands and foothills, but is scant west of the mountain chains and in areas where the local climate has been influenced by burning, felling of trees and other activities.

*Mexico.* About 40 percent of the Mexican territory is tropical, with a mean annual temperature above 24 degrees Celsius (75 degrees Fahrenheit). The temperate zone has a mean temperature of 18 to 24 degrees Celsius (65–75 degrees Fahrenheit); and in the cool zone the mean temperature is 13 to 18 degrees Celsius (55–65 degrees Fahrenheit). There are areas of the country 3,000 meters (9,840 feet) above sea level, with a mean annual temperature below 10 degrees Celsius (50 degrees Fahrenheit). On volcanic peaks above 4,300 meters (14,100 feet), the mean annual temperature is less than 0 degree Celsius (32 degrees Fahrenheit).

On the Atlantic slope, annual precipitation may reach 400 centimeters (157 inches). The Pacific slope is much drier, and rainfall usually is less than 40 centimeters (16 inches) per year.

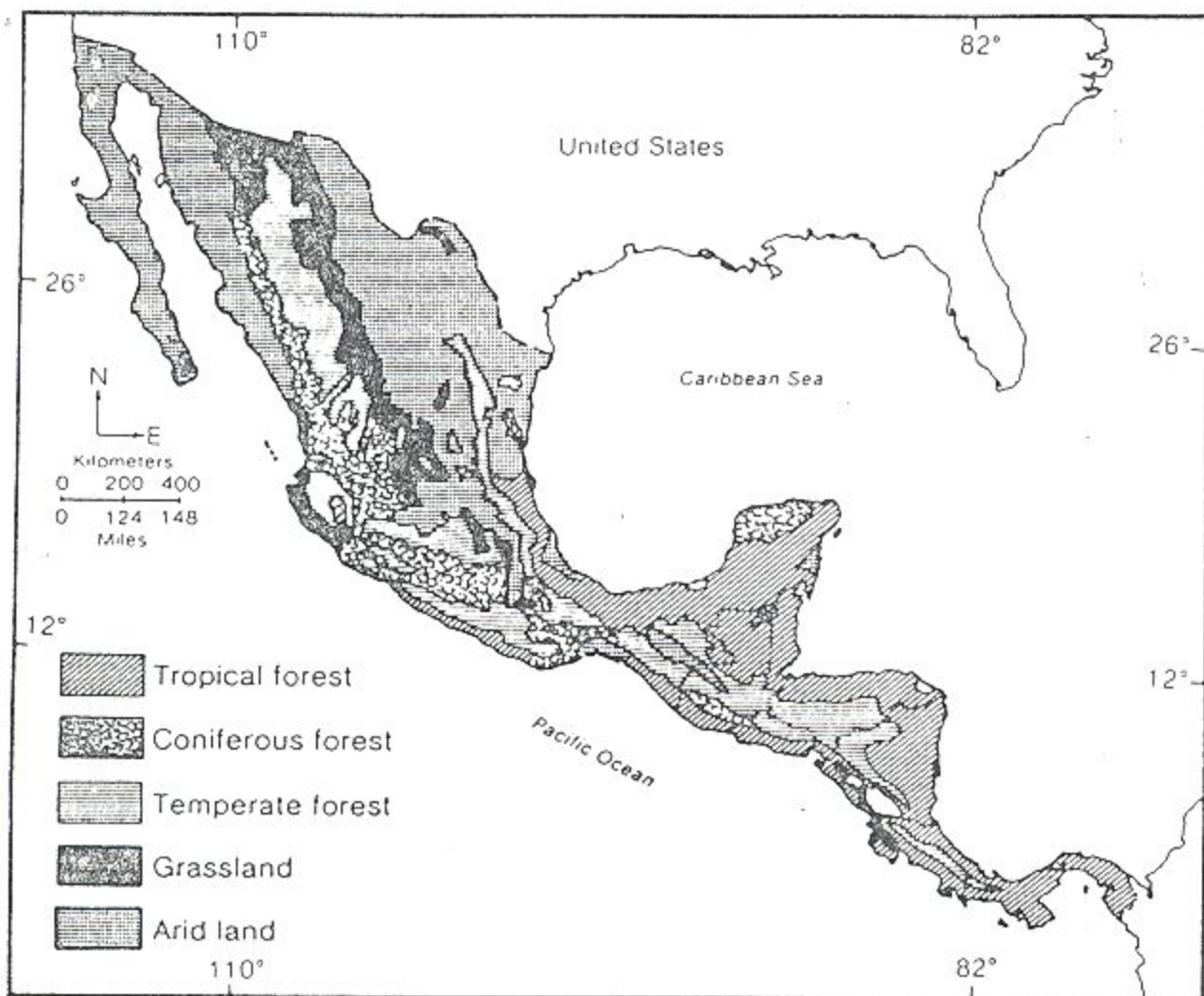


Figure 99. Major vegetational regions of Mexico and Central America.

Mean annual precipitation for Mexico is estimated at 58 centimeters (23 inches).

**Guatemala.** Guatemala has a complex climate. In the lowlands, from sea level to 600 meters (1,970 feet) elevation, the average annual temperature is about 32 degrees Celsius (90 degrees Fahrenheit). From 600 to 1,800 meters (1,970–5,900 feet) elevation, there is a temperate climate, with an average annual temperature of 22 degrees Celsius (72 degrees Fahrenheit). The higher basins of western Guatemala, between 1,800 and 3,250 meters (5,900 and 10,660 feet) above sea level, display an average temperature of 15 degrees Celsius (59 degrees Fahrenheit).

On the Caribbean slope, rainfall is heavy and exceeds 500 centimeters (197 inches) annually. In the much drier areas, mean annual precipi-

itation is less than 100 centimeters (39 inches). **Belize.** The tropical climate of Belize is influenced by the Caribbean waters. In the mountains, however, temperatures are slightly cooler. In northern and southeastern parts of the country, the mean annual temperature is about 28 degrees Celsius (82 degrees Fahrenheit), while in the uplands, it is approximately 22 degrees Celsius (72 degrees Fahrenheit). Average mean temperature for all of Belize is 25 degrees Celsius (77 degrees Fahrenheit).

Rainfall in Belize is more concentrated in the southern portion, where it reaches about 500 centimeters (197 inches) annually. In the North it is about 155 centimeters (61 inches). Average annual precipitation in Belize is 328 centimeters (129 inches).

**Honduras.** The climate of Honduras is hot and



humid in the coastal lowlands, and temperate in areas between 300 and 600 meters (985 and 1,970 feet) altitude, where the mean annual temperature is 26 to 28 degrees Celsius (79–82 degrees Fahrenheit). In valleys and mountain basins from 600 to 1,300 meters (1,970–4,265 feet) elevation, the mean annual temperature is 19 to 23 degrees Celsius (66–74 degrees Fahrenheit). Above 2,000 meters (6,560 feet), it drops to about 14 degrees Celsius (58 degrees Fahrenheit).

The northern and eastern coastal lands of Honduras get 170 to 300 centimeters (67–118 inches) of rain annually. The Pacific plains and mountain slopes receive 150 to 203 centimeters (59–80 inches) of annual precipitation, but some of the higher mountains are more humid and receive more than 300 centimeters (118 inches). Some valleys and mountain basins are relatively dry, with annual precipitation ranging from 102 to 170 centimeters (40–67 inches). The average annual precipitation for Honduras is 115 centimeters (45 inches).

*El Salvador.* Two seasons are characteristic of El Salvador. The wet or winter season extends from May to November, and the dry or summer season occurs from November to May. In Pacific lowlands and coastal areas of the country, the mean temperature is 29 degrees Celsius (85 degrees Fahrenheit). The higher regions are somewhat cooler, with the temperature fluctuating from 17 to 23 degrees Celsius (63–73 degrees Fahrenheit).

On El Salvador's coast and the Pacific inland, annual precipitation averages about 173 centimeters (68 inches). The northern and southern mountain ranges have more than 200 centimeters (79 inches) of mean annual precipitation. On valleys and plateaulike areas, annual rainfall averages about 130 centimeters (51 inches). The average annual amount of precipitation known for the country as a whole is about 254 centimeters (100 inches).

*Nicaragua.* In the eastern lowlands of Nicaragua, the climate is hot and humid, with a mean annual temperature of 26 degrees Celsius (79 degrees Fahrenheit). The western lowlands are drier, and the mean annual temperature is 29 degrees Celsius (85 degrees Fahrenheit). Mountain ranges in the central part of the country have a humid, temperate climate, and the temperature ranges approximately from 9 to 22 degrees Celsius (48–72 degrees Fahrenheit) on the highest mountain peak.

On the country's Atlantic coast, the average

annual rainfall is 634 centimeters (250 inches). The Pacific coast, which is much drier, has a mean annual precipitation of 191 centimeters (75 inches). In the central highlands, precipitation is moderate, averaging about 200 centimeters (79 inches) per year. Nicaragua's mean annual precipitation is about 191 centimeters (75 inches).

*Costa Rica.* Costa Rica has both tropical and subtropical climates. Regions less than 900 meters (2,950 feet) in altitude are more torrid and have mean annual temperatures of 22 to 27 degrees Celsius (72–80 degrees Fahrenheit). Between 900 and 2,300 meters (2,950 and 7,545 feet) elevation, the climate is temperate, and the mean annual temperature is about 16 degrees Celsius (61 degrees Fahrenheit). Above 2,300 meters (7,545 feet), the climate is cooler, with a mean annual temperature of about 10 degrees Celsius (50 degrees Fahrenheit).

East of the continental divide in Costa Rica, rainfall is heavy; in critical areas the mean annual precipitation is more than 600 centimeters (236 inches). On the Pacific slope, mean annual rainfall is about 250 centimeters (98 inches). In general, the country's annual precipitation averages about 185 centimeters (73 inches).

*Panama.* Panama has a tropical climate modified by ocean winds. In the lowlands, from sea level to 600 meters (1,970 feet), it is very hot and humid, the temperature ranging from 24 to 34 degrees Celsius (75–95 degrees Fahrenheit). At higher elevations the climate becomes moderate, with temperatures from 16 to 23 degrees Celsius (61–73 degrees Fahrenheit)—and about 9 degrees Celsius (48 degrees Fahrenheit) at Volcan Baru, in the western mountain range.

The Caribbean slope, with no distinct dry season, receives 495 to 627 centimeters (195–247 inches) of rain per year. On the Pacific slope, precipitation decreases to less than 100 centimeters (39 inches) on western lands. However, rainfall is high in evergreen forests of the eastern part of the country, with more than 500 centimeters (197 inches) of rain per year. Collectively, Panama has a mean annual precipitation of 300 centimeters (118 inches).

### Human Dimensions

The size and human population characteristics of Mexico and the Central American countries are shown in Table 82.

Table 82. Area and human population size and density of Mexico and Central American countries, 1980.

Country	Area		Human population	Human population density	
	Square kilometers	Square miles		Square kilometer	Square mile
Mexico	1,972,546	761,600	62,944,000	34.1	88.3
Belize	22,965	8,866	158,000	5.8	15.0
Guatemala	108,889	42,042	7,006,000	64.3	166.5
Honduras	112,088	43,277	3,691,000	31.8	82.3
El Salvador	21,156	8,168	4,436,000	211.0	546.4
Nicaragua	127,664	49,291	2,732,500	22.0	56.9
Costa Rica	50,900	19,653	2,183,600	42.7	110.5
Panama	77,082	29,761	1,830,200	23.7	61.3
Total	2,493,290	962,658	88,981,300		
Average				54.4	140.9

### WHITETAIL POPULATIONS

Since antiquity, the white-tailed deer has been an important game animal in Mexico and Central America. Archaeological searches in Mexico, Panama and other Latin American countries have revealed abundant remains of white-tailed deer and confirmed its important role in the development of pre-Columbian cultures (Bennett 1968, Linares 1976, Linares and White 1980, MacNeish 1964, MacNeish et al. 1967, Willey and McGimsey 1954, Willey et al. 1965). The deer extensively served as food and as a source of leather, sinew and other products such as awls, projectile points, tine flakers, bone scrapers, hammers and needles fashioned from the bones and antlers.

Over most of Middle America the whitetail is known by the Spanish names "venado" and "venado cola blanca." Mexican Indian groups have given to the whitetail such names as "Axuni" (the Tarascos), "Guej" (the Lacandones), "Macha" (the Huicholes), "Matzatl" (the Mexicas), "Muxati" (the Coras), and "Phatehe" (the Otomis). Central American Mayan names for whitetails are "Ceh" and "Uac Nac." In Panama, the deer is called "Beguí Torro" by Choco Indians and "Coéé Pebenicat" by Cuna Indians.

There is a paucity of information on current populations, distribution and mortality of white-tailed deer (Figure 100). Only a minority of the local people regard deer hunting as recreation, but the whitetail still remains an important source of food and a primary source of animal protein.

Well-watered, natural pasturelands interspersed with wooded areas are the preferred whitetail habitat. However, the deer have spread

into a variety of habitats, ranging from dense tropical rain forests to upland desert. Intensive agriculture, cattle ranching, lowland drainage, destruction of forests, pollution of water, indiscriminate hunting, and excessive use of insecticides and herbicides are responsible for a severe decline in deer numbers throughout Latin America since the 1950s.

The sucking louse *Solenopotes bipinosus*, the biting louse *Tricholipeurus lipeuroides*, and the deer ked *Lipoptena (Lipoptenella) mazamae* are found throughout Mexico and Central America. In this region the whitetail also is an occasional host of the human bot fly *Dermatobia hominis*. Nasal bot flies (*Cephenemyia*) also have been detected in deer but have not been reported heretofore in the literature. *Amblyomma cajanense*, *A. oblongoguttatum*, *Anocentor nitens*, *Haemaphysalis juxtatochi*, *Ixodes affinis*, *I. boliviensis* and other species of ticks have been found on the whitetails of Middle America.

In Mexico and Central America, the whitetail is host to various helminths, including the serpentine trichostrongyle (*Trichostrongylus colubriformis*), the small intestinal roundworm *Cooperia pectinata*, the sheep wireworm *Haemonchus contortus*, the thread lungworm *Dictyocaulus filaria*, the nodular worm *Oesophagostomum venulosum* and the gullet worm *Gongylonema pulchrum* among the nematodes, the sheep tapeworm *Moniezia expansa* among the cestodes, and the large American fluke *Fascioloides magna*, the lancet fluke *Dicrocoelium dendriticum* and the "rumen fluke" *Paramphistomum cervi* among the trematodes.

In Middle America, brucellosis does not appear to be a real problem and, at present, foot-and-mouth disease does not exist. Such dis-



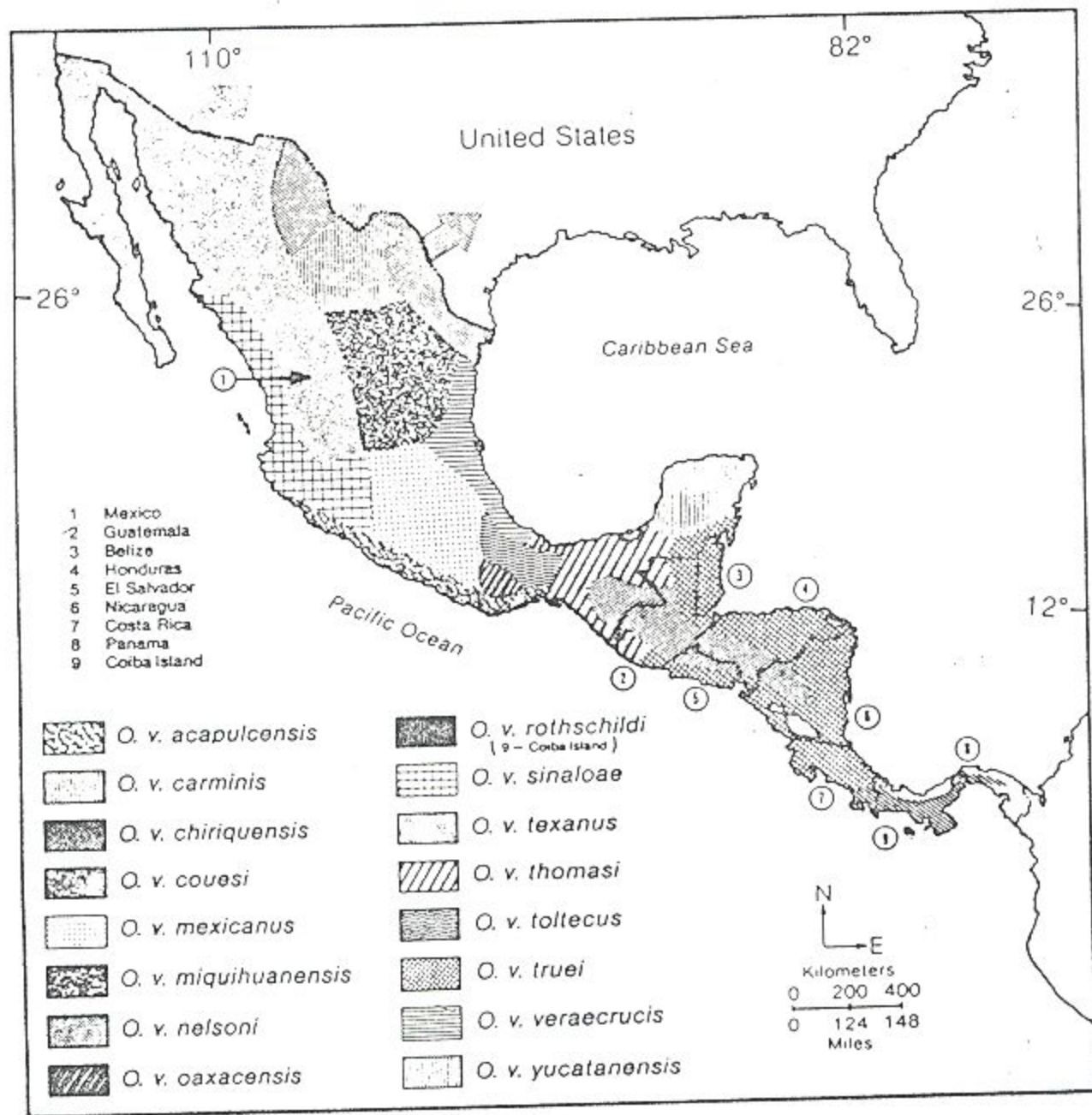


Figure 100. Approximate distribution of white-tailed deer in Mexico and Central America.

cases as rabies, Q fever, anaplasmosis, tuberculosis, necrotic stomatitis and others have not been evaluated.

The food preferred by deer, and their competition with other herbivores, are not well-known in certain areas of Latin America.

Whitetails are victims of various predators. The jaguar ranks first, followed by the mountain lion. These cats occur throughout Mexico and Central America, but are decreasing rapidly. The coyote ranges in Mexico and Central

América as far south as Panama (Méndez et al. 1981). The gray wolf is restricted to isolated regions in the northern half of Mexico. Black and grizzly bear occasionally prey on deer, but are becoming rare; the grizzly has been almost extirpated.

Strategies of managing deer in Mexico and Central America should take into consideration the ways that various cultures perceive and utilize the natural resources available to them (Bennett 1976). A major concern in this

connection should be with understanding the ecology and traditions of the Indian and non-Indian cultures that constitute the human population of this vast and diverse region. Among the major factors contributing to the loss of various important wildlife populations (including white-tailed deer) in some areas of Central America are (1) scant attention to conservation education and (2) lack of prudent land use.

## Mexico

Most of Mexico consists of an elevated plateau transected by the Sierra Madre Occidental and the Sierra Madre Oriental mountain chains. These ranges come together to form the Sierra Madre del Sur, an extremely volcanic chain containing the country's highest peaks. The coastal plains generally are low, flat and sandy.

Mexico is undergoing profound change as a consequence of continuous human population growth and resulting pressure on natural resources. However, it has one of the leading systems of natural parks and wildlife reserves in America. At present there are more than 20 national parks, several of which support white-tailed deer.

The white-tailed deer is the most common animal in Mexican zoos. Although the whitetail probably is the most important game animal in Mexico (Leopold 1959), its population is scattered and unstable in some areas. According to Ezcurra and Gallina (1981), high population densities of whitetails are concentrated in mixed pine/oak forest, mainly in the Sierra Madre Occidental. Areas of El Gavilán in Chihuahua, of the mountains south of Durango, of the mesas of the Sierra de Tamaulipas and of the Sierra del Carmen, in the State of Coahuila, maintain the highest deer densities (12–16 whitetails per square kilometer; 31–41 per square mile). The whitetail is absent from Baja California. In northern Mexico, the whitetail population has declined steadily since 1900 due to continuous habitat destruction and overharvest, and its future there is problematical (Baker 1957). In areas such as Morelos and the Valley of Mexico, whitetails have been extirpated completely. In some regions of the State of Chiapas, deer have been killed on the primary premise that they feed on and destroy bean trees.

The Mexican Wildlife Conservation Department presently is introducing whitetails into

previously occupied habitats. Also, the San Cayetano Experimental Station in the State of Mexico, a unit of the Wildlife Conservation Department, is raising white-tailed deer in captivity (Hernández 1964). And pilot management projects currently are underway in El Ocotil Recreational Park, of the State of Mexico, as well as in other research areas (Alcocer and Velásquez 1978). Also, since 1968 a few cooperative cynegetic farms have been established successfully in lands not suitable for agriculture, mainly in the State of Tamaulipas (B. Villa personal communication; 1983).

White-tailed deer in Mexico eat a variety of grasses, ferns, weeds, algae, sedges, mosses, mushrooms, fruits and other plant material. Observations in 1976 on seasonal foods of whitetails at La Michilía Biosphere Reserve, State of Durango, revealed that during the dry season, bushes such as cypress mistletoe, pointleaf manzanita and others are preferred (see Alcocer and Velásquez 1978). Buds of oaks, pines and other trees are highly selected. During the rainy season, whitetail consumption of grasses is increased, but bushes still are preferred. After autumn, the fruits of *Arbutus glandulosa* are very esteemed.

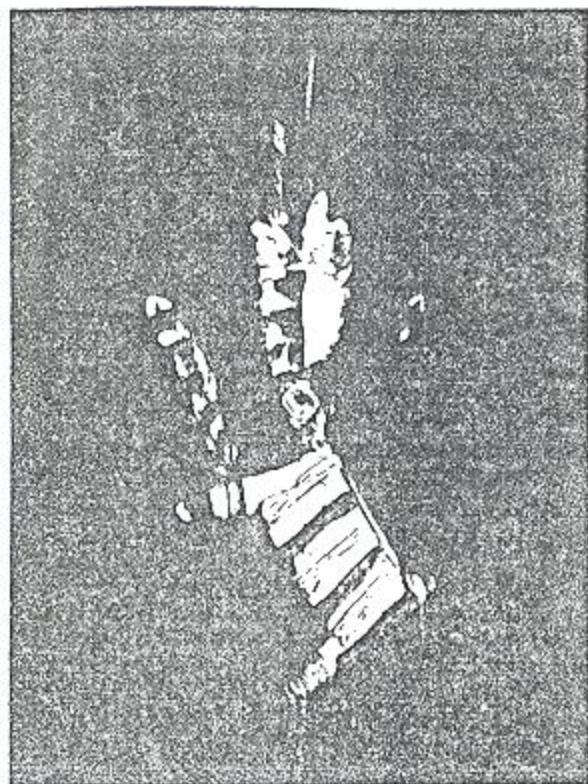
At La Michilía Biosphere, the whitetail breeding season has been observed to begin in November and end in January.

Subsistence, commercial and recreational hunting are practiced in Mexico. Venison is consumed by natives and foreigners. The hide, antlers and other parts of white-tailed deer are used in the production of such by-products as wallets, travel bags, knife handles, key cases and ornamental objects.

Maya hunters lure deer with wooden whistles, imitating calls during the breeding season. According to Leopold (1959), 30 to 40 percent of the whitetail population could be harvested annually, but hunting pressure usually was not that intense. Recently more pressure is being placed on deer. Whitetails often are hunted illegally with dogs and by jacklighting at night.

A federal hunting law issued in 1952 allows only one adult buck per hunter per year. Throughout most of Mexico the open season extends from 1 October to 31 December. Hunting of whitetails is prohibited in the States of Mexico, Morelos, Quaretaró, Jalisco, Michoacán, Hidalgo, Tlaxcala and the Federal District. In the warmer areas of Mexico, the season is closed only from 1 August to 30 September.





A prayer stick used by a Huichol Indian of La Mesa in Nayarit, Mexico, to bring good luck in deer hunting. Photo courtesy of the Museum of the American Indian, Heye Foundation.

## Belize

The terrain of Belize generally is low and flat, particularly in the northern half. The highest mountains reach an altitude of about 1,128 meters (3,700 feet) in the Cockscomb range of the southern half. Extensive savannahs occur south of these mountains. Coastal lands consist of mangrove swamps.

Cattle raising and exploitation of forests have eliminated much of the deer habitat. Even so, deer commonly are found in second-growth forests and thickets, forest edges, pine savannahs, and sometimes in milpas and other terrains near forests. Despite considerable clearing, deer have not increased in most areas, and in some areas sharp decreases have been noted, due mainly to overhunting for meat (Frost 1974, 1977).

The whitetail diet in Belize includes fruits, nuts, grasses and browse. Hunters set fire to savannahs in the lowlands to stimulate new shoots for deer to eat. During the flood season (June-July), whitetails go near rice fields and other high areas to obtain food.

In Belize, whitetails tend to be solitary, but occasionally two or three animals may be seen together. Groups of more than three deer are unusual.

In 1945, the Belize government approved a wildlife protection ordinance to control hunting of deer and other animals. This legislation established a closed season from 1 July to 30 September for bucks and to 31 December for does. Hunting is permitted by license. Jack-lighting is prohibited. Enforcement of regulations is not effective, however, since there is no control on private lands.

The white-tailed deer is harvested actively by natives and foreign hunters. Venison is in great demand and often included in hotel menus. Frost (1974) reported that it was sold at the Belize City market for \$0.23 to 0.27 per kilogram (\$0.10-0.12 per pound) in British Honduras currency and for \$0.34 per kilogram (\$0.15 per pound) at Orange Walk Town.

Two areas of the country have been set aside as national parks. A 5-square-kilometer (2-square-mile) park in northern Belize is a typical rainforest and contains whitetails that probably are hunted by Indians. A 206-square-kilometer (80-square-mile) park in the south is administered by the Belize Audubon Society, but does not contain deer.

## Guatemala

Guatemala is a land of contrasting topography. Highlands are prevalent on the central and the southern sectors. Vast and sparsely populated forests are found in the north. A strip of land between Belize and Honduras constitutes the Atlantic coastline. The Pacific slope, where human population is more concentrated, is characterized by marshes and grasslands.

Wild or semiwild conditions are prevalent in four areas: Peten; the Caribbean lowlands; the mountains of Alta Vera Paz and northern Quiche; and the Pacific lowlands, which is the most heavily hunted (Handley 1950).

The white-tailed deer is common except near human settlements, particularly on the Pacific and Atlantic slopes. It is found in lowland rainforests, brush lands, savannahs, semicleared farmlands, mountain cloud forest and dry oak woods (Handley 1950), but where the white-tailed deer is abundant, it is destructive to crops such as sugarcane, grasses, cucurbits and legumes (Aguilar 1971).



The Tikal National Park, in the jungles of Peten (northern Guatemala), sustains more white-tailed deer than the area did in ancient times. Other national parks with deer are Río Dulce, Atitlán, Fraternidad or Trifinio, Cuchumatanes, La Pasión, Lachá, Bisis, Sierra de Las Minas, Sierra de Santa Cruz and Ixcán. Whitetails also are found in the Río Mopán and Poptún wildlife reserves.

White-tailed deer is the primary game animal (Handley 1950) and is sought persistently by sportsmen, commercial hunters and, to a lesser degree, Indians. Although Indians represent the major segment of the nation's population, they have limited access to firearms. The usual practices of deer hunting in the country are driving, following a hound and stalking (Handley 1950). Venison is very much esteemed in Guatemala, and deer antler, hooves and hides are prized highly, by all ethnic groups, as hunting trophies and for art crafts. Hides contribute to an important leather industry.



A whitetail mask worn by a Quiche (Mayan) Indian representing the species during the Deer Dance in Guatemala. Photo courtesy of the Museum of the American Indian, Heye Foundation.



Mayan Indians of Guatemala reportedly still perform an annual Deer Dance that has its origin in the pre-Spanish Conquest period. It is a serious and demanding ritual that symbolizes the struggle between mankind and animals. Participants (men only) must endure purification and physical training in advance of the event. The actual ceremony involves persons dressed and masked elaborately—as are the Zutugil Indians shown here—to represent various animals and mankind, who then dance around a centerpole almost continuously for up to 15 days. The objective is for the mankind representative to outlast the animal characters, thereby evincing domination (see Kelsey and Osborne 1939, Osborne 1965, Pettersen 1976). The Deer Dance is not to be confused with another Mayan ceremony described by Bancroft (1886), that featured a deer head and served as a devotional display to the gods of chase. Photo courtesy of the Museum of the American Indian, Heye Foundation.



A general hunting law, issued by the Guatemalan government in April 1970, helps protect the white-tailed deer and a number of vertebrates by regulation of hunting and the establishment of national parks, wildlife reserves and hunting districts. The hunting season is closed from November to March. Jack-lighting is prohibited for hunting deer.

### Honduras

The Republic of Honduras, the second largest country in Central America, essentially is a plateau with fertile plains interrupted by deep valleys and by mountains that reach altitudes of over 3,000 meters (9,840 feet). Because of the country's rapidly expanding human population, much of the natural wildlife habitat has been lost. However, white-tailed deer still are found in vast, sparsely inhabited tracts, forest edges, clearings and prairies. They are abundant in the thinly populated Departamentos of Gracias a Dios and Olancho.

A survey made by Varela (1980) in the Departamento de Olancho showed that the white-tail is predominantly a night feeder and consumes common bean, sensitive-plant, jagua, wild fig, corn, nance, guacimo, encino and rose-apple.

In 1974, a Wildlife Conservation Department was created. Since then it has been actively engaged in evaluating the utilization of deer. A law promoting the conservation, protection and management of wildlife has been prepared and awaits passage. Such legislation would prohibit hunting white-tailed deer from 15 October to 15 November for does and from 15 April to 15 November for bucks. At present, whitetails are overhunted without discrimination as to age, but there is a tendency to kill more bucks than does. During daytime, the deer are hunted from ambush and with the aid of dogs. Night hunting with spotlights is done on occasion.

The whitetail's mating season in Honduras is from August through November, and fawns are born from March through June. Antlers are renewed in February and March, and normally have a dichotomous branch.

In view of the intensive deforestation and an alarming decline of wildlife, there is a great need in Honduras for the creation of national parks and other types of wildlife refuges. Various projects have been initiated in order to set aside these conservation areas.

### El Salvador

The Republic of El Salvador is the smallest but most densely populated country in Central America (see Table 82). Much of its rich and diversified flora has given way to agriculture and settlements. A few strips of lush and undisturbed land are found, primarily in the southwest. These natural areas represent about 20 percent of the country.

El Salvador is largely a plateau with a general elevation of about 610 meters (2,000 feet). High volcanic mountains are located on the north and central portions, and mangrove forests occur along the coasts.

The white-tailed deer ranges from coastal areas to second-growth forests up to 2,000 meters (6,560 feet), and is found chiefly in prairies and forest margins. Although its numbers have progressively declined, the whitetail has survived in El Salvador under tremendous pressure from man. Little protection is afforded the deer, and it is hunted indiscriminately year round for food and for its other by-products. It seems to be replaced in heavy forests by brocket deer.

In recent years, conservation has received a great deal of attention in El Salvador. Attempts are being made to establish several national parks and wildlife refuges in the hope that they will preserve the white-tailed deer and its habitat. The most important national park project concerns El Trifino, a mountainous area connecting Guatemala, Honduras and El Salvador. Unless strong efforts are made to stop the destruction of forest habitat, the future of white-tailed deer and other wildlife will be in jeopardy.

### Nicaragua

Nicaragua's volcanic topography includes a great depression that extends diagonally across the country from northwest to southeast. This basin, in which most of the country's inhabitants live, contains Lake Managua and Lake Nicaragua near the Pacific coast. The rest of the country is primarily mountainous. The major portion of the Atlantic coast is bordered by mangroves and swamps. The climate is hot and humid along the coasts, but cool in the mountains.

White-tailed deer occur along the low plains and the gentler mountains of the Caribbean and Pacific slopes, and are quite common in





Twin female whitetail fawns in Nicaragua. Photo by Arleen Mayorga-Law; courtesy of the Nicaragua National Parks and Wildlife Service.

some of the pine forests. Deer are hunted heavily near populated areas, but their current population decrease is due mainly to habitat destruction as a result of excessive forest cutting and burning.

The Indians, particularly the Miskitos, are skillful hunters and place a high premium on white-tailed deer meat. The hide is used to make shoes, wallets, purses, drums, belts and other commercial leather goods.

The absence of effective law enforcement severely curtails proper management of deer and other wildlife in Nicaragua. Many areas that supported deer populations in the past now are used to raise cattle. The need for creation of wildlife refuges and national parks is urgent. The Cosigüina Peninsula wildlife reserve was established in the southwestern corner of the country in the 1970s, but several more reserves are needed.

### Costa Rica

Costa Rica essentially is an elevated plateau. Most of the inhabitants live in the central part, called the Meseta Central. Many of the subtropical zones have been converted to coffee plantations, cornfields or grazing lands. The native vegetation has been extensively destroyed along both coasts, but most severely on the Atlantic slope. Despite human population pressures, some wild areas remain practically undisturbed, and the government is attempting to preserve them. Since the early

1970s, more than six national parks have been created, and Costa Rica probably is doing more to preserve its natural resources than any other Central American country.

The whitetail in Costa Rica is distributed widely and prefers second-growth forests, plantations of evergreen oaks and pastures. Peasants, recreational hunters and Indians hunt the deer in daytime and by night with the aid of battery lamps. Dogs commonly are used in deer hunts in which several persons frequently participate.

In Costa Rica, the whitetail breeding season is from September to October. Fawns are born in May or June. Hunting pressure and habitat destruction have reduced the deer population seriously along the western Pacific slope. Here, whitetails probably were common on large farms that had a combination of forest, pasture, chaparral and crops. Approximately 60,000 whitetail hides were exported to South America in 1944, and the majority of them were from the Province of Guanacaste (Mena 1978).

Venison is a highly favored food of the country's Indians, Hispano-Indians, Europeans and Asiatics, and is offered in some restaurants. Antlers are used as trophies and to adorn native huts. Whitetail hides are converted into a variety of leather goods and used as carpets to dry beans, rice, corn and coffee. The Bribri and Cabécare Indians use the hides to manufacture hatchet bindings, slingshots, drums and bed ornaments (R. A. Schlabach personal communication:1975).

In 1970, the National Assembly created a law protecting wild animals and regulating their use. Commercial hunting was prohibited, and recreational hunting was permitted during established seasons. In 1973, conservation authorities prohibited deer hunting for two years, but the results were unsatisfactory because of weak law enforcement. Currently, Costa Rica is divided into four hunting zones for big game (including whitetail and brocket deer). Killing of deer is limited to two animals per year per hunter in three of the zones. Hunting is prohibited completely in a major portion of the zone along the Atlantic slope.

Telemetric studies of whitetail home range and daily movements are being conducted by Dr. Miguel A. Rodriguez at the Palo Verde Wildlife Refuge, an area of 75 square kilometers (29 square miles) in the northeastern part of the country (C. Vaughan personal communication:1983).



## Panama

The Republic of Panama has a diversified topography, including two major mountain chains, grasslands, valleys, mangrove forests and several rivers.

Once abundant in Panama, the white-tailed deer declined rapidly with destruction of the primeval forest habitat, development of the cattle industry and agriculture, and excessive hunting. It now is restricted to the zone from the central and western coastline to the mountains, primarily in open areas where the original forest has been disturbed (Méndez 1968). Whitetails sometimes make incursions into croplands and pastures. Their food consists of tender grasses, tree bark, tender branches, small mushrooms and fruits such as yellow mombin and purple mombin.

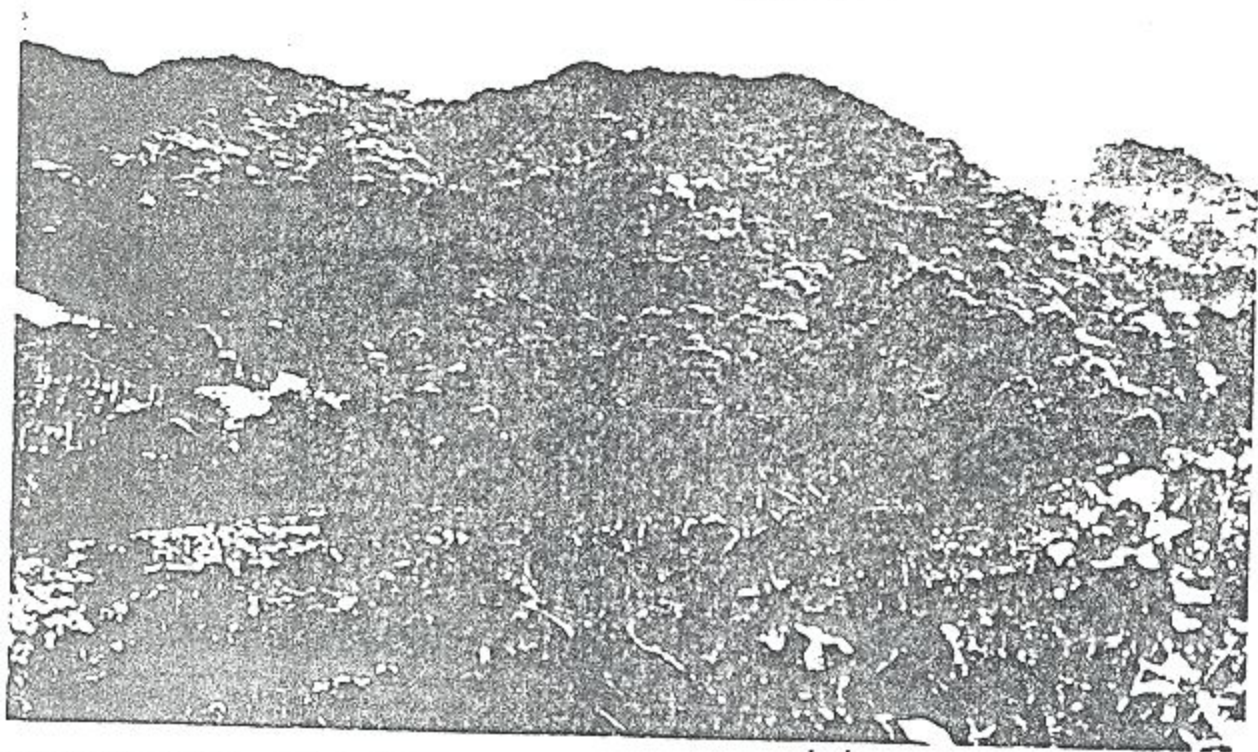
The whitetail is hunted in Panama for recreation, market and subsistence. Its meat is highly desired. Deer often are kept as pets, and some people raise them for profit. A fawn is worth about \$50 in U.S. currency.

An insular race, *O. v. rothschildi*, inhabits Coiba Island—about 35 kilometers (22 miles) long and 21 kilometers (13 miles) wide and located near the Pacific Coast of Panama. This

small subspecies stands about 0.7 meter (2.3 feet) tall at the shoulders, about the size of a domestic goat. Carnivores and other predators are absent on Coiba. The government maintains a penal settlement on the island, and agriculture and cattle raising are practiced. The deer frequently are hunted, but remain common in undisturbed and isolated areas.

In the early 1970s, white-tailed deer were introduced to Contadora Island, a tourist resort in the northern part of the Pearl Islands Archipelago. The island has an area of about 120 hectares (300 acres) and is partly covered with a dry, deciduous, broad-leaf forest and partly occupied by a human settlement. In less than 10 years, the deer population has grown from 2 bucks and 18 does originally introduced to more than 200, as estimated in 1981, showing the vigorous reproductive potential of the species when undisturbed.

The survival of the white-tailed deer on the Panama isthmus is uncertain, and an effective law for its protection should be passed as soon as possible. This action should be accompanied by the establishment of breeding areas, wildlife reserves, national parks and refuges, and through creation of conservation education programs.



Typical white-tailed deer habitat in Chiriqui Province, Panama. Courtesy of the Panamanian Department of Renewable Natural Resources.



## OUTLOOK

The available information reveals that the whitetail is declining throughout most of its range in Mexico and Central America. The principal reasons for this situation are the destruction of habitat, illegal hunting, uncontrolled burning, and increasing use of land for lumbering, agriculture and livestock production. In addition, pollution of land, air and water also contributes to the degradation of the deer environment. It is obvious that the status of whitetails is more serious in some areas than in others. It is quite critical in El Salvador, for example, in view of the country's reduced forests and large human population. In addition, internal political conflict has increased ecological disturbances, with serious consequences for wildlife.

Unless more actions are taken soon throughout Mexico and Central America, the rapid rate of deer decline will lead to the loss, in certain areas, of a resource of inestimable economic, aesthetic and scientific value. It is urgent that more attention be placed on habitat protection and the enforced regulation of hunting. In this regard, closed seasons should be established and rigorously observed. Traditional hunting methods used by peasants and Indians should be encouraged, and the sophisticated and intensive methods used by other hunters should be prohibited.

Fires to clear areas must be strictly controlled, particularly during the dry season, and agriculture and other land exploitation should follow a scientific scheme in harmony with the environment. The use of cumulative pesticides, such as the chlorinated hydrocarbons, must be avoided. They can be replaced with less toxic, nonpersistent chemicals that are not as dangerous to wildlife and people.

The ever-growing food crisis facing the people of this region is promoting the search for sources of protein. Steps need to be taken to ensure the conservation of whitetails since, if properly managed, they can be a valuable resource in this regard, perhaps superior to any of the other native animals. In addition, conservation and management of deer as a vital food source could have favorable impact on pasturelands overgrazed by domestic livestock. The excellent adaptation of white-tailed deer to the region's environmental conditions heightens the prospect of "game-farming" this

animal, even on small ranches, and increasing its reproductive capacity at the same time. Therefore, private landholders should be encouraged to allow production of deer, which can provide both personal and societal benefits.

More attention should be focused on utilization of deer by-products. At present, the hides and other usable parts of harvested whitetails are not always retained or utilized. This represents a substantial loss of potential income.

Inasmuch as there is little public understanding of the value of deer and deer management, educational and pilot programs are an important need, to make people aware of the significance of the whitetail resource and teach them how to utilize it wisely. This can be achieved through concerted media campaigns, literature dissemination and other mass communication means. In any case, the effort must emphasize the food value of conserved and managed whitetail populations.

Laws governing conservation programs need to be strengthened and enforced. And political decisions regarding white-tailed deer must be based on sound ecological principles that take social and cultural factors into consideration.

Research is needed on whitetail reproductive patterns, the species' actual range and density in every country of the region, and the carrying capacity of those habitats that can support whitetails on a sustained-yield basis. Examination should be made of the feasibility of reintroducing whitetails to areas from which they have been extirpated. More effort should be made to determine the rate of consumption by deer of the various nutrients utilized. These studies can be made by observation of food habits and analysis of stomach contents. It also is important to develop pilot projects to manage whitetail populations and habitats to enhance venison per deer and by unit of land.

The conservation and management of white-tailed deer require more and better cooperation among countries of the region, since they share the same problems. Improved communication among scientists and political authorities can result in a valuable and rewarding interchange of ideas and information. There also is need for technical and financial support of international organizations, such as the World Wildlife Fund, Agency for International Development, World Bank, International Union for Conservation of Nature and Natural Resources, and other conservation groups.