

124.6 Sinaloan Deciduous Forest

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The Sinaloan deciduous forest is a heterogenous drought-deciduous forest with a strong infusion of tropical elements. It also alternates periods of growth with periods of dormancy, relative to the two wet seasons and the two dry seasons. Though it intergrades with Sinaloan thornscrub, it is in the aggregate distinguished from it by greater height, by larger leafage, by a greater proportion of mesomorphic and hydromorphic elements, and by the relative infrequency of thorny and succulent plants. Larger trees are present, dominating lesser trees (Fig. 38). The variable but unbroken forest canopy is 10 to 15 m above ground, with a mixed perennial population in typical stands numbering 3,000 to 5,000 individuals per acre (7,500 to 12,300 per ha).

The Sinaloan deciduous forest lies principally within the canyons, is nearly confined to the barranca region, and is characterized by steep slopes. Its range in elevation is from about 300 to 1,050 m above sea level. It is bordered on the east by Madrean evergreen woodland. To the north it is like a tail pinching out in the northern barrancas. Its southern extensions are unknown, but it merges with semi-deciduous forest in the region of Jalisco. Its position is phytogeographically peculiar, being a long, tough transitional salient, by way of which the tropics have all but put a finger in northern climes.

The tropical element is represented in the Sinaloan deciduous forest by the hydromorphic *Ficus*, the lianas *Arrabidaea littoralis*, *Mardensia edulis*, and *Gouania mexicana*, and the scandent form of *Pisonia capitata*. Epiphytes are exemplified by the orchid *Oncidium cebolleta*, and the bromeliads by *Tillandsia inflata* and *Hechtia* sp. Other prominent plants of tropical distribution are: *Guazuma ulmifolia*, *Solanum verbascifolium*, *S. umbellatum*, *S. madrense*, *Cestrum lanatum*, *Drypetes lateriflora*, *Bursera grandifolia*, *B. stenophylla*, *Coutarea latiflora*, *Stemmadenia palmeri*, *Cassia emarginata*, *C. occidentalis*, *Trichilia hirta*, *Sassafridium macrophyllum*, *Vitex mollis*, *Urera caracasana*, and many others. Most of these plants have leaves or leaflets of comparatively large size, of a mesomorphic character, and without hirsute covering, epidermal thickening, or other features commonly found in arid environments. The largest leaf is that of *Solanum tequilense*, which is about 320 by 450 mm. Many of the leaves are deciduous, however, so that their existence is confined to the warm, moist summer.

The leaf of *Conzattia sericea* is interesting as displaying the probable maximum development of size in the leguminous pinnatifid type of leaf. Though the leaflets are small—8 by 24 mm—they number 500 to 600 and are spread over an area of nearly half a square meter. The entire leaf is about 45 by 75 dm in size, and forms a thin, lacy canopy 12 to 18 m above ground and overtopping the lesser forest trees.

Jarilla chocola, which may be endemic to Sinaloan deciduous forest of the Rio Mayo, admirably reflects the nature of its environment. It is a dioecious, tolerant forest underling, perennial from a crown of erectly placed tubers. It springs forth quickly with the summer rains, putting out leafy, turgid stems, which in several brief weeks attain heights of 60 to 90 cm. It fades quickly with the last dwindling rains, leaving its fruit to lie on the ground for an indefinite period. It is typical of the general behavior of plants of the barrancas in its rapid response to summer moisture and tropical temperatures, alternating with a long period of dormancy through the



Figure 37. Tamaulipan semideciduous forest along the Rio Grande at Bentsen State Park, Texas. Present are Winged Elm (*Ulmus crassifolia*), Granjeno (*Celtis pallida*), Texas Ebony (*Pithecellobium flexicaule*), Hackberry (*Celtis reticulata*), Huisache (*Acacia smallii*) and Mesquite (*Prosopis glandulosa*). Spanish Moss (*Tillandsia usneoides*) grows on branches.

months of drought and lower temperatures. In its location among the forest shrubbery it receives the double advantage of constant soil moisture and the reduced transpiration afforded by shade. Its ability to persist in the highly competitive "jungle" growth is also a characteristic of tropical vegetation. The two other known species of *Jarilla* occur in tropical or subtropical climate: *J. heterophylla* in southern Mexico, *J. caudata* from Baja California to Sinaloa and southern Mexico. Yet coupled with the hydromorphic activity of the three summer months are xeric adjustments, adapting *Jarilla chocola* to existence through the nine months of the year which are characterized by drought and higher temperatures. Besides the regular annual production of seeds, *Jarilla* forms each year of its mature life a new plant, rising from the old underground root crown.

Many other plants have root storage systems, providing them with the reserve which enables them to make a quick response to summer rains, and giving them the advantage of a longer growing season. Among the plants with subterranean reserves adjusting their activities to the wet and dry seasons of the Sinaloan deciduous forest are the following: *Ceiba acuminata* (tree; young plant with storage root), *Ipomoea arborescens* (tree; young plant with storage root), *Exogonium bracteatum* (vine with tuberous root), *Dioscorea convolvulacea* var. *grandifolia* (vine with tuberous root), *Hymenocallis sonoriensis* (lily with bulb), *Phaseolus caracala* (vine with thickened root), *Amoreuxia palmatifida* (tuberous root), *Vincetoxicum caudatum* (tuber), *Manihot angustiloba* (tuber), *M. isoloba* (tuber), *Salpianthus macrodontus* (tuberous root), *Tigridia pringlei* (bulb).



Figure 38. Sinaloan deciduous forest 1.8 km southwest of El Taymuco and 56 km northeast of Alamos, Sonora, ca. 460 m elevation. Summer (wet season) aspect on August 9, 1980. The cacti (*Pachycereus pecten-aboriginum*, *Stenocereus thurberi*) are now almost completely hidden in the leafy foliage of *Cassia emarginata*, *Brongniartia alamosana*, *Jatropha platanifolia*, *Alvaradoa amorphoides*, *Randia echinocarpa*, *Croton ciliato-glandulosa*, *Bursera* spp. and other deciduous components of the forest. Photograph by R.M. Turner.

The forest stature is highly variable. The lesser trees, including *Bursera confusa*, *Coutarea pterosperma* and *Haematoxylum brasiletto*, rarely exceed 8 m in height, whereas among the tallest are *Conzattia sericea*, *Cochlospermum vitifolium*, *Ceiba acuminata*, *Bursera inopinata*, and *Lysiloma watsoni*, rising 12 to 18 m above ground. Along the arroyos are leafy mounds of *Celtis*, *Guazuma ulmifolia*, *Montanoa rosei*, and many other shrubs, as well as the large spreading trees *Taxodium mucronatum*, *Platanus racemosa*, and special species of *Ficus*, rising to heights of 18 to 25 m. On the whole one may safely indicate the average height of the forest as about 12 m.

The Sinaloan deciduous forest lacks the broken canopy characteristics of much of the thornscrub. Except for the interruptions of clearing and arroyos, it presents an unbroken

canopy of luxuriant leafage in the summer rainy season and a myriad of living sticks in the spring dry season. Though the dominant color of moist summer is green, it is highly varied between the pale, ashy leaf of *Manihot isoloba* and the deep green of *Ficus* species. In fall and winter it is broken and colored by trees in various stages of deciduation. Variegation of autumn coloring includes the continued green of *Tabebuia* (Amapa), the red and vermilion of *Caesalpinia platyloba*, the changing yellow leaves of *Ipomoea arborescens* (Palo Santo), and countless other hues determined by the pigmental variation of the plants. In winter its beauty is continued by the bright red flowers of *Tabebuia palmeri*, the intense yellow flowers of *Tabebuia chrysantha*, the white starlike canopies of *Ipomoea arborescens*, and other winter bloomers.

Table 7. Precipitation data from stations in or near Sinaloan Deciduous Forest.

Station	Elevation (in m)	Mean Monthly Precipitation in mm												Total
		J	F	M	A	M	J	J	A	S	O	N	D	
Alamos, Sonora*	389	39	17	8	2	1	35	173	173	92	48	10	42	640
Minas Nuevas, Sonora	518	31	14	6	1	1	46	188	182	95	45	10	45	664
Nuri, Sonora*	440	41	17	9	4	4	58	180	165	83	36	17	45	659
San Bernardo, Sonora*	308	46	14	8	5	2	50	179	144	76	34	8	52	618
Quiriego, Sonora*	252	28	13	6	3	2	28	187	181	107	38	12	35	640
Palo Dulce, Sinaloa	800	47	31	16	1	2	64	207	271	110	83	14	80	926

* Outside or at lower edge of subtropical deciduous forest.

In the long spring dry season the forest is a dreary scene: a naked infinite host of trunks and branches, spreading interminably over the volcanic hills and mesas, bared to the fiery sun, under which the last leaf seems to have withered and died (Fig. 39). He who walks this land in the month of May walks with a parched throat. The plants are waiting for the rains and their union with the soil, when like a piece of magic they turn the look of the dead into a fiesta of voluptuous growth, all in a few brief days. The sudden starting of new leaves with the first summer rain is aided greatly in many plants by the advanced development they have attained in the bud. Ten days is sufficient to bring the bare forest into green leaf, though it requires several weeks to bring the leaves to maturity.

Like the thornscrub area, the Sinaloan deciduous forest is composed of two major vegetative types: the deciduous uniform forest of the slopes, and the partially evergreen cover of the canyon bottoms and arroyo margins. Thus the Sinaloan deciduous forest proper is indented and irregularly striate with ribbons of green in the dry season. These are riparian plants of variable associations, which will be discussed below under "Wetlands." In general it is a mesic group less markedly affected by drought. Many of the plants have established root systems in the subtterranean waters and are evergreen, as some of the species of *Ficus*, *Sassafridium macrophyllum*, and *Celtis iguanea*, or partially spring deciduous, as *Taxodium mucronatum*, *Guazuma ulmifolia*, *Montanoa rosei*, and others. In the hot spring months the arroyos are oases between the arid and dull hillsides. Small grasses and various flowers enliven the scene, cool air eddies down the deep channels, and shade and water may be found to refresh the traveler. Trails often take advantage of the clear strip offered by the stream beds and follow them for miles.

The Sinaloan deciduous forest tends to form three layers of foliage. The top-layer dominants are, however, usually scattered, with the most common members not adapted to colonial existence, hence the forest level is uneven in appearance. Dominant species forming the leafy mounds above the more uniform middle layer are the following: *Ceiba acuminata*, *Lysiloma watsoni*, *L. divaricata*, *Bursera inopinata*, and *Cochlospermum vitifolium*, the tops of which are 12 to 15 m above ground. *Conzattia sericea* is the only high dominant forming colonies in itself, and its presence leads to the most definite three-layered forest.

Because of the wide and thin spacing of the leaves, *Conzattia sericea* forms a light shade which is a benefit rather

than a deterrent in the light factor for many plants. The association is found only on steep slopes with a gradient of 40° to 60°. Annuals and herbaceous species are, however, greatly restricted because of the shade aggregate of the several arborescent forms. The association occurs high in the Sinaloan deciduous forest, above 600 m altitude, in the heart of the area.

Lists follow of prominent plants found on the Sinaloan deciduous forest slopes and in the arroyo and canyon bottoms.

Slopes (Deciduous)

Acacia coulteri
Arundinaria longifolia
Bursera fragilis
B. grandifolia
B. epinnata
B. stenophylla
Caesalpinia platyloba
C. standleyi
Calliandra rupestris
Cassia biflora
C. emarginata
Ceiba acuminata
Cephalocereus alensis
Stenocereus thurberi
Conzattia sericea
Coutarea latiflora
C. pterosperma
Croton fragilis
Haematoxylon brasiletto
Hybanthus mexicanus
Ipomoea arborescens
Jatropha cordata
J. platanifolia
Lemaireocereus montanus
Lysiloma divaricata
L. watsoni
Pachycereus pecten-aboriginum
Pisonia capitata
Tabebuia chrysantha
T. palmeri
Willardia mexicana
Wimmeria mexicana

Bottoms (Evergreen-deciduous)

Ambrosia ambrosioides
Baccharis salicifolia
Caesalpinia pulcherrima
Cassia emarginata
C. occidentalis
Celtis iguanea
Cochlospermum vitifolium
Ficus cotinifolia
F. padifolia
Guazuma ulmifolia
Haematoxylon brasiletto
Hymenoclea monogyra
Leucaena lanceolata
Lysiloma divaricata
Montanoa rosei
Opuntia spp.
Pachycereus pecten-aboriginum
Piscidia mollis
Pisonia capitata
Pithecellobium dulce
P. mexicanum
P. undulatum
Platanus racemosa
Randia echinocarpa
Sassafridium macrophyllum
Solanum madrense
S. verbascifolium
Stemmedenia palmeri
Taxodium mucronatum
Tithonia fruticosa
Urexa caracasana
Vitex mollis

The fauna is distinctly Neotropical, and these communities are the northern terminus for a large number of tree and forest-requiring vertebrates of more southern distribution. The avifauna in particular is exceptionally rich and diverse—even by Southwestern standards, and this biotic community is deservedly famous as a "Mecca" for bird-watching. Although several of the mammalian inhabitants of the subtropical



Figure 39. Sinaloan deciduous forest near Alamos, Sonora, ca. 550 m elevation. Spring season (March) aspect of the drought-deciduous "thorn forest" of southern Sonora and Sinaloa. Note that the height of the tree overstory (*Lysiloma watsoni*, *Acacia cymbispina*) exceeds the layers of scrub and cacti (*Pachycereus pecten-aboriginum*) contained within the short tree forest canopy.

deciduous forest such as the White-tailed Deer (*Odocoileus virginianus*) and Coati (*Nasua nasua*) extend northward into wooded habitats in the Southwestern United States, other species such as the Margay Cat (*Felis wiedii*), Sonoran Squirrel (*Sciurus truei*), and Mexican Cottontail (*Sylvilagus cunicularius*) are "exotic" to Norteamericanos. Although the Beaded

Lizard (*Heloderma horridum*), Boa (*Constrictor constrictor*), and Iguana (*Iguana iguana*) are among its best known reptiles, they are but a small sample. Hardy and McDiarmid (1969) list around 70 species of reptiles and amphibians as being abundant to moderately abundant in their analogous *Tropical Semiarid Forest* in Sinaloa.