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Tree and tree-like species of Mexico: gymnosperms, monocotyledons, and tree ferns

Especies arbóreas y arborescentes de México: gimnospermas, monocotiledóneas y helechos arborescentes

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Abstract. Trees or tree-like plants are defined here broadly as perennial, self-supporting plants with an adult height of at least 5 m (without ascending leaves or inflorescences), and with 1 or several erect stems with a diameter of at least 10 cm. We present an updated list of all Mexican tree species under that definition in the Gymnospermae (86 species, 38% endemic to Mexico), Monocotyledonae (75 species, 55% endemic), and Pteridophyta (9 species, none endemic). The list contains a total of 170 species in 37 genera and 12 families, with 74 species (44%) being endemic to Mexico. The list was compiled consulting recent literature, the National Herbarium of Mexico (MEXU), and taxonomic specialists.

Key words: biodiversity, flora, tree definition.

Resumen. Las plantas arbóreas o arborescentes se definen aquí en un sentido amplio como plantas perennes que se pueden sostener por sí solas, con una altura del adulto de al menos 5 m (sin considerar hojas o inflorescencias ascendentes), y con 1 o varios tallos erectos de un diámetro de al menos 10 cm. Presentamos aquí una lista actualizada bajo esta definición de todas las especies arbóreas mexicanas que pertenecen a las Gymnospermae (86 especies, 38% endémicas de México), Monocotyledonae (75 especies, 55% endémicas), y Pteridophyta (9 especies, ninguna endémica). La lista contiene un total de 170 especies en 37 géneros y 12 familias, con 74 especies (44%) endémicas de México. La lista fue compilada al consultar fuentes bibliográficas recientes, el Herbario Nacional de México (MEXU), y taxónomos especialistas.

Palabras clave: biodiversidad, flora, definición de árbol.

Introduction

Trees and tree-like plants characterize many landscapes, and create the structure of forest ecosystems. Mexico lacks a taxonomically updated inventory of tree species, despite and because of its high plant diversity. For many years, the classical and most useful reference for botanists interested in the Mexican tree and shrub flora was Standley´s book (1920-26). After over 80 years, however, the taxonomy of this work is largely outdated for many plant groups. Taxonomic investigations carried out over the last several decades have much improved our understanding of the diversity and systematics of groups containing tree species (e.g., Farjon, 2001; Henderson et al., 1995; Judziewicz et al., 2000; Mickel and Smith, 2004). In addition, there are several ongoing regional floristic inventories, such as Flora Neotropica, Flora Mesoamericana, Flora de Veracruz, Flora del Bajío, Flora Novo-Galiciana, and Flora del Valle de Tehuacán-Cuicatlán, that updated and systematized knowledge of the Mexican tree flora during the last decades.

There is a great need from scientists, foresters, and conservationists for an updated checklist of tree species for Mexico (e.g., Ricker et al., 2007). To produce such a list is a dynamic enterprise from the taxonomist´s viewpoint, as molecular information continuously provides new evidence, resulting in constant taxonomic adjustments, and different specialists frequently express contrasting taxonomic viewpoints. We are nevertheless convinced that a compilation and update of current knowledge is important to inform and guide the above-mentioned user groups. Such lists are also important for carrying out floristic projects and for exploring the possibilities of molecular barcoding as a species identification tool (e.g., Lahaye et al., 2008).

A recent attempt to produce a list of tree species names for the area from Canada to Panama is *Elsevier's Dictionary of Trees* (Grandtner, 2005). It includes tree species of at least 5 m height, with synonymy, distribution at the country level, common names in English and French, and

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sometimes Spanish and other languages. Unfortunately, this work does not include specific literature references for each taxonomic group, nor is it based on a thorough revision by specialists, and thus can only be considered an approximation to an updated list.

Before presenting a checklist of tree species, we need to circumscribe what we mean by the term "tree". There is no single definition of what constitutes a tree. For example Hora (1986: 11) states that "ordinarily our image of a tree is that of a perennial plant, capable of attaining at least 6 m, with a single woody self-supporting trunk or stem which is usually unbranched for some distance above ground." For Barwick (2004: vi) "the definition of a tree is based on the loose scientific description of species that have a columnar, woody stem supporting branches, and whose height varies according to the species, the environment and other factors". Raven and Crane (2007) write that "The popular concept of a tree, which encompasses everything from tree-ferns and Joshua trees to coconut palms and oaks, confounds any simple botanical definition. Nevertheless, almost all 'trees' have one (rarely a few) above ground, perennial vegetative shoots, of a size requiring significant non-hydrostatic structural support..." And Mori et al. (1997) define trees as "erect, usually single-stemmed woody plants $\geq$5 cm DBH", while "some trees have multiple trunks but at least some of them $\geq$5 cm diameter". Hallé et al. (1978: 1-2) concluded that it is "unwise to offer rigid definitions where they are not needed", and included palms, banana plants, and many other species of diverse growth form in their book on architecture of tropical trees. Finally, in *Elsevier's Dictionary of Trees* (Grandtner, 2005: xiii) "A tree is defined as a woody plant, with a single, erect and persistent stem of at least 10 cm in diameter, measured at 1.3 m above the mean ground level, and with a total height of at least 5 m… Willows (*Salix*), birches (*Betula*), palms (Palmae) and bamboos (*Bambusa*, *Guadua*), with several stems branching from the same root system, as well as cacti (Cactaceae) are considered as trees, provided that they meet the diameter and height criteria."

In the present paper, we adapt Grandtner's definition as follows: *Trees or tree-like plants are defined broadly as perennial, self-supporting plants with an adult height of at least 5 m (without ascending leaves or inflorescences), and with one or several, erect stems with a diameter of at least 10 cm (measured at 1.3 m above the ground level or measured above buttresses if these are present). A tree species or tree-like species contains individuals with tree characteristics at least somewhere in its geographic range, but not necessarily everywhere*. Our definition avoids the often arbitrary distinction of "trees" with a dominant trunk, from large "shrubs" with multiple stems. The term "self-supporting" excludes lianas, but the definition includes large tree-like plants like some massive bamboo species. Thus, our definition includes not only the usually considered conifers and dicotyledoneous tree species, but also tree ferns, some monocotyledons (e.g., palm and *Yucca* species), and unusual gymnosperms such as a few cycads.

Trees are usually associated with the presence of wood. Wood in a narrow sense is sometimes defined as being the result of secondary diameter growth (e.g., Judd et al., 2002: 82). Tree ferns and monocotyledonous flowering plants such as palms would not contain "true" wood under that definition. In monocotyledons, the acquisition of the tree habit via true stems is either by enhanced primary growth of the axis (e.g., palms) or by a form of anomalous secondary growth (e.g., *Dracaena*). Other monocotyledons, such as *Musa* (e.g., banana), acquire a treelike habit by developing pseudostems that consist of embracing sheaths of foliage leaves (Porembski, 2006: 129). Finally, the trunks of tree ferns are formed of a large central area (pith) and an outer region (cortex) of soft, thin-walled parenchyma cells, which often stores starch (Large and Braggins, 2004: 17). The literature does nevertheless refer to non-herbaceous stems that are at least to some extend lignified, as containing wood. For example, Parthasarathy and Klotz (1976) analyzed the anatomy of palm stems, and speak of "palm wood." While not insisting in our definition of trees on the presence of wood, the species presented here all contain wood in a wide sense.

Materials and methods

Given the definition of "tree species" in the introduction, the first step consisted of reviewing recent literature that treated the taxonomic groups of interest, including bibliography that described species and world checklists, as well as treatments up to date in the *Flora Mesoamericana* and *Flora Neotropica*. Only native species and no hybrids were included in our compilation in Appendix 1. Maybe the most notable example of a naturalized (and thus not included) species in the groups treated here is the coconut palm (*Cocos nucifera* L.). It is widely found on Mexico´s coastal areas, even though it originated in Melanesia (Harries, 1978; Harries, 1992).

Subsequently, we compared our list with the following publications (in chronological order), to detect additional species or resolve taxonomic problems:

1) The compilation of tree species in the tropical dry forest around the Chamela biological research station in Jalisco (Lott, 1993).
2) The compilation of canopy tree species of the Mexican Atlantic slope rain forests by Wendt

(1993).

3) The list of tree species for the Yucatán Peninsula by Ibarra-Manríquez et al. (1995).
4) The compilation of tree species in the tropical evergreen forest around the Los Tuxtlas biological research station in Veracruz (Ibarra-Manríquez and Sinaca, 1995; Ibarra-Manríquez and Sinaca, 1996a; Ibarra-Manríquez and Sinaca, 1996b).
5) The already mentioned dictionary of trees from Grandtner (2005).
6) The book on tropical tree species in Mexico from Pennington and Sarukhán (2005).
7) The list of tree species for the State of Michoacán by Cué-Bär et al. (2006).

These lists frequently contain synonyms that were resolved with the literature cited in Appendix 1 or consulting specialists; synonyms are only mentioned here when the cited literature contains different opinions and we had to follow one.

Family names are those recognized by Farjon (2001) for conifers (class Coniferae), by Whitelock (2002) for cycads (class Cycadopsida), Heywood et al. (2007) for monocots (class Monocotyledonae), and Mickel and Smith (2004) for tree ferns (class Filicopsida). Taxonomic literature for the recognized species names is cited in Appendix 1. In order to verify and sometimes update the taxonomic nomenclature, sections of the list were reviewed by several specialists (see acknowledgments). The authors of species names and original publications were double-checked in TROPICOS (www.tropicos.org).

When information on maximum height, distribution, and endemism in Mexico was not available from the literature, it was added after revision of specimens in the National Herbarium of Mexico (MEXU). The heights in Appendix 1 refer to the maximum heights reported in the literature and/or on herbarium specimens that are supposedly reached by the species anywhere in Mexico (with exceptional values for Mexico given in parentheses). In the case of species that are not endemic to Mexico, it is difficult to know whether there is a difference between maximum heights in Mexico and elsewhere. In 2 cases we mention such a difference (*Pseudotsuga menziesii* y *Pinus jeffreyi*). Endemism refers to the species being restricted to Mexico, as far as is currently known.

Results and discussion

The total number of tree species listed in Appendix 1 is 170, of which 74 species (44%) are endemic to Mexico. This high proportion is still below the calculated endemism rate of 46% for Mexican legume trees by Sousa et al. (2001), and the endemism estimate of 52% for the whole Mexican flora by Rzedowski (1993: 129). None of the 37 genera in 12 families in the appendix is endemic to Mexico.

There are 86 tree species of Gymnospermae (of which 33 species or 38% are endemic to Mexico), 75 Monocotyledonae (41 species or 55% endemic), and 9 Pteridophya (none endemic). Summary information for each of the 12 families is given in Table 1. The table mentions also the taxonomic classes, subdivisions, and divisions to which the plant families belong. The highest number of species (56) is found in the Pinaceae, followed by the Arecaceae (36). The genus with the higest number of species is *Pinus* with 46 (18 or 39% endemic), followed by *Yucca* with 18 (11 or 61% endemic). Farjon (2001) provides a worldwide list of gymnosperm species. For *Pinus*, he recognizes 109 species worldwide of which 44 species are found in Mexico. Consequently, according to Farjon's data, 40% of the worldwide species diversity in *Pinus* is found in Mexico. We recognized in addition *Pinus discolor* and *Pinus johannis* at the species rank in Appendix 1.

Many grass species (Poaceae) reach a height of 5 m, but not a diameter of 10 cm. In Mexico there are 40 grass species that reach a height of at least 5 m, found in the genera *Arthrostylidium*, *Aulonemia*, *Chusquea*, *Guadua*, *Gynerium*, *Olmeca*, *Olyra*, *Otatea*, *Pennisetum*, *Phragmites*, and *Rhipidocladum* (see www.kew.org/data/grasses-db/). Only 4 *Guadua* species, however, reach a diameter of 10 cm and are included in Appendix 1. Notable grass species that are not included in the appendix are *Chusquea simpliciflora* Munro with a height of up to 25 m, *Olmeca recta* Soderstr. (15 m) and *Olmeca reflexa* Soderstr. (12 m), the only 2 species of an endemic genus, and *Rhipidocladum martinezii* Davidse et R. W. Pohl (8 m), known only from the type collection in Chiapas.

The family with the highest endemism rate is the Zamiaceae, with all 4 reported Mexican species being endemic. With 92% and 68% endemic species, respectively, the Nolinaceae and Agavaceae are also outstanding in this regard. Finally, the high absolute number of endemic species in the Pinaceae (23 species) and Arecaceae (14 species) is worth mentioning. It is also interesting to note that there are only 9 species of tree ferns, none of which is endemic to Mexico.

Of the species in Appendix 1, the ones observed to reach in Mexico the largest maximum heights are *Abies religiosa* and *Pinus ayacahuite* (both 70 m; see Table 1). Notable for their heights are also some species in the family Arecaceae (45 m), Podocarpaceae (30 m), the large bamboos in the family Poaceae (30 m), and 1 tree fern

Table 1. Summary information for the 12 tree families in this study

Group and family	*Number of genera*	*Number of species*	*Species and maximum height in Mexico*
Division Spermatophta (= seed plants):			
Subdivision Gymnospermae (= gymnosperms):			
Class Coniferopsida or Coniferae (= conifers):			
Cupressaceae	4	22 (6 endemic to Mexico)	*Calocedrus decurrens* (69 m)
Pinaceae	4	56 (23)	*Abies religiosa*, *Pinus ayacahuite* (both 70 m)
Podocarpaceae	1	3 (0)	*Podocarpus matudae*, *Podocarpus oleifolius* (both 30 m)
Taxaceae	1	1 (0)	*Taxus globosa* (25 m)
Class Cycadopsida (= cycads):			
Zamiaceae	1	4 (4)	*Dioon spinulosum* (12 m)
Subdivision Angiospermae (= flowering plants):			
Class Monocotyledonae (= monocots):			
Agavaceae	2	22 (15)	*Yucca decipiens*, *Yucca periculosa* (both 15 m)
Arecaceae	16	36 (14)	*Attalea butyracea*, *Attalea cohune* (both 45 m)
Dracaenaceae	1	1 (0)	*Dracaena americana* (18 m)
Nolinaceae	2	12 (11)	*Beaucarnea pliabilis* (22 m)
Poaceae	1	4 (1)	*Guadua angustifolia* (30 m)
Division Pteridophyta (= ferns):			
Class Filicopsida (= leptosporangiate ferns):			
Cyatheaceae	3	8 (0)	*Sphaeropteris horrida* (20 m)
Dicksoniaceae	1	1 (0)	*Dicksonia sellowiana* (5 m)
TOTAL:	**37**	**170 (74 endemic to Mexico)**	

species (20 m).

The native tree species of Mexico in this paper are in 4 taxonomic classes (Coniferae, Cycadopsida, Monocotyledonae, and Filicopsida) that are interesting in terms of their habitat specialization, economic uses, and inclusion of several record-breaking species. Many tree-like monocyledoneous species, such as the *Yucca* species and several Nolinaceae, are adapted to very dry and hot desert conditions, while most gymnosperm species are dominant elements of high altitude ecosystems in Mexico. The gymnosperms, and in particular the pines, are the most important timber species in terms of processed volume. They include also the oldest-living and tallest-growing trees, while the bamboos include the fastest-growing plants. Trees of *Pinus longaeva* D.K. Bailey in California attain ages of almost 5 000 years (LaMarche, 1969, there under the name *P. aristata*), but the distribution of *Pinus longaeva* does not reach Mexico. Trees of *Taxodium mucronatum*, with ages up to almost 2 000 years, are the longest-living known tree species in Mexico, forming trees of impressive size. Famous is the "árbol de Tule" near Oaxaca City, with 14 m diameter and 40 m height (Villanueva et al., 2006). One of the world's tallest trees belonged to *Pseudotsuga menziesii*: in British Columbia (Canada) a specimen was felled in 1895 that was reported to measure 133 m (Mabberley, 2008: 711). The species is also widely distributed in Mexico, though herbarium specimens report a height of up to only 50 m there. Finally, *Bambusa bambos* (L.) Voss from India is reported to grow up to 91 cm per day in height, reaching eventually up to 37

m (Mabberley, 2008: 90). In Mexico, the closely related *Guadua angustifolia* reaches a height of 30 m, an amazing size for a grass (*Guadua* was originally included in the genus *Bambusa*; Young and Judd, 1992). All in all, the 170 species in this paper are an interesting representation of Mexico´s high biodiversity.

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Appendix 1. Species with original publication, reference of recent taxonomic revision, maximum height in Mexico, and indication if endemic to Mexico.

Gymnospermae

Cupressaceae (including Taxodiaceae)

Calocedrus decurrens (Torr.) Florin, Taxon 5: 192. 1956. (Thieret, 1993: 412; Farjon, 2001: 40; Farjon, 2005: 402-404). 60(-69) m.

Cupressus arizonica Greene, Bull. Torrey Bot. Club 9: 64. 1882. (Eckenwalder, 1993: 406; Farjon, 2001: 47; Felger et al., 2001: 36; Farjon, 2005: 179-185). Five varieties, three in Mexico (Farjon, 2005). 20(-30) m.

Cupressus guadalupensis S. Watson, Proc. Amer. Acad. Arts 14: 300. 1879. (Eckenwalder, 1993: 408; Farjon, 2001: 49; Farjon, 2005: 206-209). Two varieties, both in Mexico (Farjon, 2005). 15(-20) m.

Cupressus lusitanica Mill., Gard. Dict. (ed. 8): *Cupressus* No. 3. 1768. (Farjon, 2001: 49; Felger et al., 2001: 36; Farjon, 2005: 209-213). Two varieties, both in Mexico (Farjon, 2005). 35 m.

Juniperus angosturana R.P. Adams, Biochem. Syst. Ecol. 22: 704. 1994. (Farjon, 2001: 59; Adams, 2004: 63-64; Farjon, 2005: 236-239). 8(-10) m. Endemic.

Juniperus ashei J. Buchholz, Bot. Gaz. 90: 329. 1930. (Farjon, 2001: 59; Adams, 2004: 64-66; Farjon, 2005: 239-241). 10(-15) m.

Juniperus blancoi Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 17: 73. 1946. (Farjon, 2001: 60; Adams, 2004: 69-70; Farjon, 2005: 247-250). Two varieties, both in Mexico (Farjon, 2005). 10(-15) m. Endemic.

Juniperus californica Carrière, Rev. Hort. 3: 352. 1854. (Adams, 1993: 419; Farjon, 2001: 60; Adams, 2004: 72-73; Farjon, 2005: 252-254). 7(-10) m.

Juniperus coahuilensis (Martínez) Gaussen ex R. P. Adams, Phytologia 74: 413. 1993. (Adams, 1993: 420; Farjon, 2001: 61; Felger et al., 2001: 38; Adams, 2004: 81-82; Farjon, 2005: 262-263). Two varieties, one in Mexico (Farjon, 2005). 10 m.

Juniperus comitana Martínez, Anales Inst. Biol. Univ. Nac. México 15: 12. 1944. (Farjon, 2001: 61; Adams, 2004: 84; Farjon, 2005: 263-265). 10 m.

Juniperus deppeana Steud., Nomencl. Bot. (ed. 2) 1: 835. 1840. (Farjon, 2001: 63-64; Felger et al., 2001: 38; Adams, 2004: 96-104; Farjon, 2005: 278-282). Five varieties, all in Mexico (Farjon, 2005). 15(-25) m, the largest *Juniperus* in Mexico and southwestern North America according to Felger et al. (2001).

Juniperus durangensis Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 17: 94. 1946. (Farjon, 2001: 64; Felger et al., 2001: 40; Adams, 2004: 106; Farjon, 2005: 285-287). 6 m. Endemic.

Juniperus flaccida Schltdl., Linnaea 12: 495. 1838. (Farjon, 2001: 65-66; Adams, 2004: 109-112; Farjon, 2005: 295-298). Three varieties, all in Mexico (Farjon, 2005). 15 m.

Juniperus gamboana Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 15: 7. 1944. (Farjon, 2001: 67; Adams, 2004: 116-117; Farjon, 2005: 304-305). 12 m. Endemic.

Juniperus jaliscana Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 17: 69. 1946. (Farjon, 2001: 68; Adams, 2004: 124; Farjon, 2005: 315-316). 10 m. Endemic.

Juniperus monosperma (Engelm.) Sarg., Silva N. Amer. 10: 89. 1896. (Adams, 1993: 420; Farjon, 2001: 68; Adams, 2004: 131-132; Farjon, 2005: 318-321). 7(-12) m. In Mexico the species is known from only one specimen in the state of Chihuahua.

Juniperus monticola Martinez, Anales Inst. Biol. Univ. Nac. Autón. México 17: 79. 1946. (Farjon, 2001: 68-69; Adams, 2004: 133-136; Farjon, 2005: 321-324). 10 m.

Juniperus pinchotii Sudw., Forestry & Irrig. 11: 204. 1905. (Adams, 1993: 420; Farjon, 2001: 71; Adams, 2004: 148; Farjon, 2005: 340-343). 6 m.

Juniperus saltillensis M. T. Hall, Fieldiania, Bot. 34: 45. 1971. (Farjon, 2001: 74; Adams, 2004: 165; Farjon, 2005: 371-372). 7 m. Endemic.

Juniperus scopulorum Sarg., Gard. & Forest 10(505): 420. 1897. (Adams, 1993: 416; Farjon, 2001: 74; Felger et al., 2001: 41; Adams, 2004: 169-170; Farjon, 2005: 375-378).

15(-20) m.

Juniperus standleyi Steyerm., Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 3. 1943. (Farjon, 2001: 75; Adams, 2004: 176; Farjon, 2005: 386-388). 20 m.

Taxodium mucronatum Ten., Ann. Sci. Nat. Bot., sér. 3, 19: 355. 1853. (Farjon, 2001: 99; in Felger et al., 2001: 41 as *T. distichum* var. *mexicanum*; Farjon, 2005: 129-132, distinguishes *T. mucronatum* from *T. distichum*). 30(-43) m.

Pinaceae

Abies concolor (Gordon) Lindl. ex Hildebr., Verh. Naturhist. Vereines Preuss. Rheinl. Westphalens 18: 261. 1861. (Farjon, 1990: 94-95; Hunt, 1993: 360-361; Farjon, 2001: 112-113; Felger et al., 2001: 44). 40 m.

Abies durangensis Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 13: 621. 1942. (Farjon, 1990: 96-97; Farjon, 2001: 113; Felger et al., 2001: 44). Two varieties, both in Mexico (Farjon, 2001). 40 m. Endemic.

Abies guatemalensis Rehder, J. Arnold Arbor. 20: 285. 1939. (Farjon, 1990: 98-99; Farjon, 2001: 117). Two varieties, both in Mexico (Farjon, 2001). 35 m.

Abies hickelii Flous et Gaussen, Bull. Soc. Hist. Nat. Toulouse 64: 24. 1932. (Farjon, 1990: 104-105; Farjon, 2001: 117). Two varieties, both in Mexico (Farjon, 2001). 30 m. Endemic.

Abies hidalgensis Debreczy, I. Rácz et Guízar, Phytologia 78: 220. 1995. (Farjon, 2001: 117). 18 m. Endemic.

Abies religiosa (Kunth) Schltdl. et Cham., Linnaea 5: 77. 1830. (Farjon, 1990: 100-101; Farjon, 2001: 121-122). 45(-70) m.

Abies vejarii Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 13: 629. 1942. (Farjon, 1990: 102-103; Farjon, 2001: 124). Three varieties, all in Mexico (Farjon, 2001). 40 m. Endemic.

Picea chihuahuana Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 13: 31. 1942. (Farjon, 1990: 240-241; Farjon, 2001: 153). 40 m. Endemic.

Picea engelmannii Parry ex Engelm., Trans. Acad. Sci. St. Louis 2: 212. 1863. (Farjon, 1990: 292-293; Farjon, 2001: 153-154). Two varieties, one in Mexico (Farjon, 2001). 25 m.

Pinus arizonica Engelm., Rep. U.S. Geogr. Surv., Wheeler 6: 260. 1878. (Perry, 1991: 99-102; in Kral, 1993: 391, as *P. ponderosa* var. *arizonica*; Farjon and Styles, 1997: 103-109; Farjon et al., 1997: 46-47; Farjon, 2001: 170; Felger et al., 2001: 47). Three varieties, all in Mexico (Farjon, 2001). 35 m.

Pinus attenuata Lemmon, Mining Sci. Press 64: 45. 1892. (Perry, 1991: 164-166; Kral, 1993: 398; Farjon and Styles, 1997: 190-192; Farjon et al., 1997: 88-89; Farjon, 2001: 171). 25 m.

Pinus ayacahuite C. Ehrenb. ex Schltdl., Linnaea 12: 492. 1838. (Perry, 1991: 52-54; Farjon and Styles, 1997: 199-204; Farjon et al., 1997: 94-95; Farjon, 2001: 171). Two varieties, both in Mexico (Farjon, 2001). 45(-70) m.

Pinus caribaea Morelet, Rev. Hort. Côte d'Or 1: 107. 1851. (Perry, 1991: 199-201; Farjon and Styles, 1997: 85-91; Farjon et al., 1997: 42-43; Farjon, 2001: 172-173). Three varieties, one in Mexico (Farjon, 2001). 25 m.

Pinus cembroides Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 1: 392. 1832. (Perry, 1991: 64-69; Kral, 1993: 382; Farjon and Styles, 1997: 231-241; Farjon et al., 1997: 112-113; Farjon, 2001: 173). Three subspecies, all in Mexico (Farjon, 2001). 25 m.

Pinus chiapensis (Martínez) Andresen, Phytologia 10: 417. 1964. (Perry, 1991: 54-57; as *P. strobus* var. *chiapensis* in Farjon and Styles, 1997: 215-218; Farjon et al., 1997: 102-103; Farjon, 2001: 202). We follow here Syring et al. (2007), who carried out molecular analysis and kept *P. chiapensis* at the species rank. 40 m.

Pinus contorta Douglas ex Loudon, Arbor. Frutic. Brit. 4: 2292. 1838. (Perry, 1991: 156-158; Kral, 1993: 395-396; Farjon and Styles, 1997: 80-82; Farjon et al., 1997: 38-39; Farjon, 2001: 174). Three varieties, one in Mexico (Farjon, 2001). 33 m.

Pinus coulteri D. Don, Trans. Linn. Soc. London 17: 440. 1836. (Perry, 1991: 201-203; Farjon and Styles, 1997: 195-198; Farjon et al., 1997: 92-93; Farjon, 2001: 174). 25 m.

Pinus culminicola Andresen et Beaman, J. Arnold Arbor. 42: 437. 1961. (Perry, 1991: 77-79; Farjon and Styles, 1997: 241-244; Farjon et al., 1997: 114-115; Farjon 2001: 175). 5 m. Endemic.

Pinus devoniana Lindl., Edwards's Bot. Reg. 25: 62. 1839. (Farjon and Styles, 1997: 137-142; Farjon et al., 1997: 58-59; Farjon, 2001: 175). 30 m.

Pinus discolor D.K. Bailey et Hawksw., Phytologia 44: 130. 1979. (Perry, 1991: 69-71; Felger et al., 2001: 47; the species name is discussed in Farjon and Styles, 1997: 234, 239, 240, under *P. cembroides* subsp. *cembroides* var. *bicolor*, together with *P. johannis)*. We follow here David Gernandt et al. (2003 and personal communication 2008), who carried out molecular analysis and kept *P. discolor* at the species rank. 15 m.

Pinus douglasiana Martínez, Madroño 7: 4. 1943. (Perry, 1991: 118-120; Farjon and Styles, 1997: 142-144; Farjon et al., 1997: 60-61; Farjon, 2001: 177). 45 m. Endemic.

Pinus durangensis Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 13: 23. 1942. (Perry, 1991: 104-106; Farjon and Styles, 1997: 171-175; Farjon et al., 1997: 76-77; Farjon, 2001: 177). 40 m. Endemic.

Pinus engelmannii Carrière, Rev. Hort., sér. 4, 3: 227. 1854. (Perry, 1991: 102-104; Kral, 1993: 392-393; Farjon and Styles, 1997: 112-116; Farjon et al., 1997: 50-51; Farjon, 2001: 178; Felger et al., 2001: 50). 27 m.

Pinus flexilis E. James, Account Exped. Pittsburgh 2. 1823. (Perry, 1991: 45-46; Kral, 1993: 381; Farjon and Styles, 1997: 207-211; Farjon et al., 1997: 98-99; Farjon, 2001: 178-179). Two varieties, one in Mexico (Farjon, 2001). 20 m.

Pinus greggii Engelm. ex Parl., Prodr. 16: 396. 1868. (Perry, 1991: 166-168; Farjon and Styles, 1997: 192-195; Farjon et al., 1997: 90-91; Farjon, 2001: 179). Two varieties, both in Mexico (Farjon, 2001). 25 m. Endemic.

Pinus hartwegii Lindl., Edwards's Bot. Reg. 25: 62. 1839. (Perry, 1991: 126-128; Farjon and Styles, 1997: 116-121; Farjon et al., 1997: 52-53; Farjon, 2001: 180). 30 m.

Pinus herrerae Martínez, Anales Inst. Biol. Univ. Nac. Autón. México 11: 76. 1940. (Perry, 1991: 197-198; Farjon and Styles, 1997: 82-85; Farjon et al., 1997: 40-41; Farjon, 2001: 181; Felger et al., 2001: 50). 35 m. Endemic.

Pinus jaliscana Pérez de la Rosa, Phytologia 54: 290. 1983. (Perry, 1991: 182-184; Farjon and Styles, 1997: 164-166; Farjon et al., 1997: 72-73; Farjon, 2001: 181). 35 m. Endemic.

Pinus jeffreyi Balf., in Murray, Bot. Exped. Oregon 8: 2. 1853.

(Perry, 1991: 96-98; Kral, 1993: 392; Farjon and Styles, 1997: 109-112; Farjon et al., 1997: 48-49; Farjon, 2001: 181). 30 m (Kral, 1993, reports up to 61 m in the U.S.).

Pinus johannis Rob.-Pass., Adansonia (ser. 2) 18: 366. 1978. (Perry, 1991: 71-72; the species name is discussed in Farjon and Styles, 1997: 234, 239, 240, under *P. cembroides* subsp. *cembroides* var. *bicolor*, together with *P. discolor)*. We follow here David Gernandt et al. (2003 and personal communication 2008), who carried out molecular analysis and kept *P. johannis* at the species rank. 5(-10) m. Endemic.

Pinus lambertiana Douglas, Trans. Linn. Soc. London 15: 500. 1827. (Perry, 1991: 44-45; Kral, 1993: 381; Farjon and Styles, 1997: 204-207; Farjon et al., 1997: 96-97; Farjon, 2001: 182). 40 m.

Pinus lawsonii Roezl ex Gordon, Pinetum Suppl. 64. 1862. (Perry, 1991: 195-196; Farjon and Styles, 1997: 175-177; Farjon et al., 1997: 78-79; Farjon, 2001: 182). 30 m. Endemic.

Pinus leiophylla Schiede ex Schltdl. et Cham., Linnaea 6: 354. 1831. (Perry, 1991: 90-92; Kral, 1993: 385-386; Farjon and Styles, 1997: 71-77; Farjon et al., 1997: 36-37; Farjon, 2001: 183; Felger et al., 2001: 50). Two varieties, both in Mexico (Farjon, 2001). 35 m.

Pinus lumholtzii B. L. Rob. et Fernald, Proc. Amer. Acad. Arts 30: 122. 1894. (Perry, 1991: 94-96; Farjon and Styles, 1997: 148-151; Farjon et al., 1997: 64-65; Farjon, 2001: 183; Felger et al., 2001: 52-53). 20 m. Endemic.

Pinus luzmariae Pérez de la Rosa, Bol. Inst. Bot. (Univ. Guadalajara) 5: 127. 1998. (Farjon, 2001: 183). 15 m.

Pinus maximartinezii Rzed., Ciencia (México) 23: 17. 1964. (Perry, 1991: 83-84; Farjon and Styles, 1997: 221-224; Farjon et al., 1997: 106-107; Farjon, 2001: 184). 15 m. Endemic.

Pinus maximinoi H. E. Moore, Baileya 14: 8. 1966. (Perry, 1991: 144-146; Farjon and Styles, 1997: 144-148; Farjon et al. 1997: 62-63; Farjon, 2001: 184; Felger et al., 2001: 53). 50 m.

Pinus monophylla Torr. et Frém., in Frémont, Rep. Exped. Rocky Mts. 2: 319. 1845. (Perry, 1991: 58-59; Kral, 1993: 383; Farjon and Styles, 1997: 247-251; Farjon, 2001: 184). 20 m.

Pinus montezumae Lamb., Descr. Pinus (ed. 8) 1: 39. 1832. (Perry, 1991: 110-116; Farjon and Styles, 1997: 129-137; Farjon et al., 1997: 56-57; Farjon, 2001: 184-185). Two varieties, both in Mexico (Farjon, 2001). 30 m. Endemic.

Pinus muricata D. Don, Trans. Linn. Soc. London 17: 441. 1836. (Perry, 1991: 161-164; Kral, 1993: 398; Farjon and Styles, 1997: 184-186; Farjon et al., 1997: 84-85; Farjon, 2001: 192). 10 m.

Pinus nelsonii Shaw, Gard. Chron., ser. 3, 36: 122. 1904. (Perry, 1991: 84-86; Farjon and Styles, 1997: 224-226; Farjon et al., 1997: 108-109; Farjon, 2001: 193). 10 m. Endemic.

Pinus oocarpa Schiede ex Schltdl., Linnaea 12: 491. 1838. (Perry, 1991: 172-182; Farjon and Styles, 1997: 151-156; Farjon et al., 1997: 66-67; Farjon, 2001: 195; Felger et al., 2001: 53). 35 m.

Pinus patula Schiede ex Schltdl. et Cham., Linnaea 6: 354. 1831. (Perry, 1991: 168-172; Farjon and Styles, 1997: 160-164; Farjon et al., 1997: 70-71; Farjon, 2001: 195-196). Two varieties, both in Mexico (Farjon, 2001). 40 m. Endemic.

Pinus pinceana Gord., Pinetum: 204. 1858. (Perry, 1991: 81-82; Farjon and Styles, 1997: 226-231; Farjon et al., 1997: 110-111; Farjon, 2001: 197). 12 m. Endemic.

Pinus ponderosa Douglas ex P. Lawson et C. Lawson, Agric. Monogr. U.S.D.A.: 354. 1836. (Kral, 1993: 390-392 [where *P. ponderosa* var. *arizonica* is *P. arizonica* here]; Farjon and Styles, 1997: 100-103; Farjon et al., 1997: 44-45; Farjon, 2001: 198; Felger et al., 2001: 53-56). Two varieties, one crossing the border from the U.S. into Mexico (Farjon, 2001). 40 m.

Pinus praetermissa Styles et McVaugh, Contr. Univ. Michigan Herb. 17: 310. 1990. (Farjon and Styles, 1997: 156-160; Farjon et al., 1997: 68-69; Farjon, 2001: 198). 20 m. Endemic.

Pinus pringlei Shaw, Trees et Shrubs 1: 211. 1905. (Perry, 1991: 184-185; Farjon and Styles, 1997: 177-180; Farjon et al., 1997: 80-81; Farjon, 2001: 198). 25 m. Endemic.

Pinus pseudostrobus Lindl., Edwards's Bot. Reg. 25: 63. 1839. (Perry, 1991: 137-143; Farjon and Styles, 1997: 121-129; Farjon et al., 1997: 54-55; Farjon, 2001: 199; in Felger et al., 2001: 56, as *P. yecorensis*). Two varieties, both in Mexico (Farjon, 2001). 45(-60) m.

Pinus quadrifolia Parl. ex Sudw., U.S.D.A. Div. Forest Bull. 14: 17. 1897. (Perry, 1991: 74-75; Kral, 1993: 383; Farjon and Styles, 1997: 251-255; Farjon et al., 1997: 120-121; Farjon, 2001: 200). 15 m.

Pinus radiata D. Don, Trans. Linn. Soc. London 17: 442. 1836. (Perry, 1991: 159-161; Kral, 1993: 397-398; Farjon and Styles, 1997: 186-190; Farjon et al., 1997: 86-87; Farjon, 2001: 200). Two varieties, one in Mexico (Farjon, 2001). 33 m.

Pinus remota (Little) D. K. Bailey et Hawksw., Phytologia 44: 129. 1979. (Perry, 1991: 61-63; Farjon and Styles, 1997: 244-247; Farjon et al., 1997: 116-117; Farjon, 2001: 200). 9 m.

Pinus rzedowskii Madrigal et M. Caball., Bol. Técn. Secr. Agric. Ganad. Subsecr. Forest. Fauna 26: 1. 1969. (Perry, 1991: 86-88; Farjon and Styles, 1997: 218-221; Farjon et al., 1997: 104-105; Farjon, 2001: 201). 30 m. Endemic.

Pinus strobiformis Engelm., Mem. Tour N. Mexico: 102. 1848. (Perry, 1991: 46-48; Kral, 1993: 381-382; Farjon and Styles, 1997: 211-215; Farjon et al., 1997: 100-101; Farjon, 2001: 202; Felger et al., 2001: 56). 30 m.

Pinus tecunumanii Eguiluz et J. P. Perry, Ci. Forest. (México) 8(41): 4. 1983. (Perry, 1991: 186-191; Farjon and Styles, 1997: 166-171; Farjon et al., 1997: 74-75; Farjon, 2001: 205). 55 m.

Pinus teocote Schiede ex Schltdl. et Cham., Linnaea 5: 76. 1830. (Perry, 1991: 191-195; Farjon and Styles, 1997: 180-184; Farjon et al., 1997: 82-83; Farjon, 2001: 207). 25 m. Endemic.

Pseudotsuga menziesii (Mirb.) Franco, Conif. Duarum Nom., p. 4. 1950. (Farjon, 1990: 182-183; Lipscomb, 1993: 366; Farjon, 2001: 239-241; Felger et al., 2001: 58). Two varieties, both in Mexico (Farjon, 2001). 50 m (in U.S. and Canada up to 133 m according to Mabberley, 2008: 711).

PODOCARPACEAE

Podocarpus guatemalensis Standl., Proc. Biol. Soc. Wash. 37: 49. 1924. (Farjon, 2001: 276). 20 m.

Podocarpus matudae Lundell, Phytologia 1: 212. 1937. (Farjon, 2001: 278). 30 m.

Podocarpus oleifolius D. Don, Descr. Pinus 2: 20. 1824.

(Farjon, 2001: 279). 30 m.

Taxaceae

Taxus globosa Schltdl., Linnaea 12: 496. 1838. (Farjon, 2001: 299). 25 m.

Zamiaceae

Dioon holmgrenii De Luca, Sabato et Vázq.-Torres, Brittonia 33: 552. 1981. (Whitelock, 2002: 165). 6 m. Endemic.

Dioon purpusii Rose, Contr. U.S. Natl. Herb. 12: 260. 1909. (Whitelock, 2002: 168-169). 5 m. Endemic.

Dioon rzedowskii De Luca, A. Moretti, Sabato et Vázq.-Torres, Brittonia 32: 225. 1980. (Whitelock, 2002: 169-170). 5 m. Endemic.

Dioon spinulosum Dyer, Gart. Zeit., p. 411. 1883. (Whitelock, 2002: 171-171). 12 m. Endemic.

Monocotyledonae

Agavaceae

Furcraea longaeva Karw. et Zucc., Flora 15, Beiblatt 5: 94. 1832. (García-Mendoza, 2000: 119-121). 6(-9) m. Endemic.

Furcraea macdougallii Matuda, Cact. Suc. Mex. 1: 24. 1955. (García-Mendoza, 2000: 125-127; Thiede, 2001: 82). 9 m. Endemic.

Furcraea martinezii García-Mend. et L. de la Rosa, Bol. Soc. Bot. México 66: 121. 2000. 4(-15) m. Endemic.

Furcraea parmentieri (Roezl ex Ortgies) García-Mend., Bol. Soc. Bot. México 66: 115. 2000. (In Thiede, 2001: 79-80 as *Furcraea bedinghausii*). 4(-8) m. Endemic.

Yucca aloifolia L., Sp. Pl. 1: 319. 1753. (Matuda and Piña, 1980: 107-109; Thiede, 2001: 88; Hochstätter, 2002: 26-29; Verhoek and Hess, 2002: 429). 8 m. Endemic.

Yucca carnerosana (Trel.) McKelvey, Yuccas Southw. U.S. 1: 24. 1938. (Matuda and Piña, 1980: 60-61; Thiede, 2001: 91; Hochstätter, 2002: 19-20). 6(-10) m.

Yucca decipiens Trel., Annual Rep. Missouri Bot. Gard. 18: 228. 1907. (Matuda and Piña, 1980: 93-96; Thiede, 2001: 92). 15 m. Endemic.

Yucca declinata Laferrière, Cact. Succ. J. (Los Angeles) 67: 347. 1995. (Felger et al., 2001: 336; Thiede, 2001: 92). 6 m. Endemic.

Yucca elephantipes Regel, Gartenflora 8: 35. 1859. (Matuda and Piña, 1980: 104-107; Thiede, 2001: 93). 10 m.

Yucca faxoniana Sarg., Man. Trees: 121. 1905. (Matuda and Piña, 1980: 61-64; Thiede, 2001: 93; Hochstätter, 2002: 18-19; Verhoek and Hess, 2002: 427). 7 m.

Yucca filifera Chabaud, Rev. Hort. 48: 432. 1876. (Matuda and Piña, 1980: 102-104; Thiede, 2001: 94). 13 m. Endemic.

Yucca grandiflora Gentry, Madroño 14: 51. 1957. (Matuda and Piña, 1980: 71-72; Felger et al., 2001: 337; Thiede 2001: 96). 6 m. Endemic.

Yucca jaliscensis Trel., Contr. U.S. Natl. Herb. 23: 92. 1920. (Matuda and Piña, 1980: 88-90; Thiede, 2001: 96-97). 12 m. Endemic.

Yucca madrensis Gentry, Agave Fam. Sonora (U.S. Dept. Agric. Handb. 399): 159. 1972. (Matuda and Piña, 1980: 85-88; Thiede, 2001: 97; Verhoek and Hess, 2002: 428). 5 m.

Yucca mixtecana García-Mend., Acta Bot. Mex. 42: 1. 1998. (Thiede, 2001: 98). 5 m. Endemic.

Yucca periculosa Baker, Gard. Chron. 1870: 1088. 1870. (Matuda and Piña, 1980: 90-93; Thiede, 2001: 98). 15 m. Endemic.

Yucca potosina Rzed., Ciencia (México) 15: 90. 1955. (Matuda and Piña, 1980: 99-102; Thiede, 2001: 98). 7 m. Endemic.

Yucca queretaroensis Piña, Cact. Suc. Mex. 34: 51. 1989. (Thiede, 2001: 99). 5 m. Endemic.

Yucca schidigera Roezl ex Ortgies, Gartenflora 20: 110. 1871. (Matuda and Piña, 1980: 81-83; Thiede, 2001: 100; Hochstätter, 2002: 22-23; Verhoek and Hess, 2002: 429). 5 m.

Yucca torreyi Shafer, N. Amer. Trees: 157. 1908. (Matuda and Piña, 1980: 79-81; Thiede, 2001: 101; Hochstätter, 2002: 24-25). 5 m.

Yucca treculeana Carrière, Rev. Hort. 1858: 580. 1858. (Matuda and Piña, 1980: 75-79; Thiede, 2001: 101-102; Hochstätter, 2002: 21-22; Verhoek and Hess, 2002: 428-429). 7 m.

Yucca valida Brandegee, Proc. Calif. Acad. Sci., ser. 2, 2: 208. 1889. (Matuda and Piña, 1980: 96-99; Thiede, 2001: 102). 12 m. Endemic.

Arecaceae

Acoelorraphe wrightii (Griseb. et H. Wendl. ex Becc.) H. Wendl. ex Becc., Webbia 2: 109. 1907. (Henderson et al., 1995: 53, 261; Zona, 2000: 103; Govaerts and Dransfield, 2005: 1). 7(-11) m.

Acrocomia aculeata (Jacq.) Lodd. ex Mart., Hist. Nat. Palm. 3: 286. 1845. (Henderson et al., 1995: 166-167, 261; Pennington and Sarukhán, 2005: 112-113; Govaerts and Dransfield, 2005: 1-2). 15 m.

Astrocaryum mexicanum Liebm. ex Mart., Hist. Nat. Palm. 3: 323. 1850. (Henderson et al., 1995: 205, 264; Govaerts and Dransfield, 2005: 15). 8(-12) m.

Attalea butyracea (Mutis ex L.f.) Wess. Boer., Pittieria 17: 292. 1988. (Henderson et al., 1995: 158-159, 265; Pennington and Sarukhán, 2005: 114-115; Govaerts and Dransfield, 2005: 17). 30(-45) m.

Attalea cohune Mart. [*Orbignya cohune* (Mart.) Dahlgren ex Standl. is a synonym according to Henderson et al. 1995: 265], Voy. Amér. Mér. 7: 121. 1844. (Henderson et al., 1995: 159, 265; Pennington and Sarukhán, 2005: 116-117; Govaerts and Dransfield, 2005: 17). 30(-45) m.

Brahea aculeata (Brandegee) H. E. Moore, Principes 24: 91. 1980. (Henderson et al., 1995: 55, 272; Felger et al., 2001: 342; Govaerts and Dransfield, 2005: 36). 9 m. Endemic.

Brahea armata S. Watson, Proc. Amer. Acad. Arts 11: 146. 1876. (Henderson et al., 1995: 55, 272; Govaerts and Dransfield, 2005: 36). 15 m. Endemic.

Brahea brandegeei (Purpus) H. E. Moore, Baileya 19: 168. 1975. (Henderson et al., 1995: 55, 273; Felger et al., 2001: 342; Govaerts and Dransfield, 2005: 36). 20 m. Endemic.

Brahea dulcis (Kunth) Mart. [*B. calcarea* Liebm. ex Mart. is a synonym according to Henderson et al. 1995: 273], Hist. Nat. Palm. 3: 244. 1838. (Henderson et al., 1995: 56, 273; Felger et al., 2001: 343-345; Govaerts and Dransfield, 2005: 37). 7 m.

Brahea edulis H. Wendl. ex S. Watson, Proc. Amer. Acad. Arts 11: 120, 146. 1876. (Henderson et al., 1995: 56, 273; Govaerts and Dransfield, 2005: 37). 12 m. Endemic.

Brahea nitida André [*B. prominens* L. H. Bailey is a synonym according to Henderson et al. 1995: 273], Bull. Soc. Tosc. Ortic. 12: 304. 1887. (Henderson et al., 1995: 56, 273; Felger et al., 2001: 345-347). 12 m.

Brahea pimo Becc., Webbia 2: 103. 1907. (Henderson et al., 1995: 56, 273; Govaerts and Dransfield, 2005: 37). 5 m.

Endemic.
Brahea sarukhanii H. J. Quero, Palms 44: 110. 2000. (Govaerts and Dransfield, 2005: 37). 6 m. Endemic.
Chamaedorea tepejilote Liebm. ex Mart. [*Chamaedorea alternans* H. Wendl. is a synonym according to Henderson et al. 1995: 279], Hist. Nat. Palm. 3: 308. 1849. (Hodel, 1992: 252, 254, 256; Henderson et al., 1995: 104, 279; Govaerts and Dransfield, 2005: 73). 7(-12) m.
Chamaedorea woodsoniana L. H. Bailey, Gentes Herb. 6: 238. 1943. (Hodel, 1992: 218, 220, 222; Henderson et al., 1995: 105, 279; Govaerts and Dransfield, 2005: 74). 12 m.
Coccothrinax argentata (Jacq.) L. H. Bailey, Gentes Herb. 4: 223. 1939. (Henderson et al., 1995: 47, 280; Zona, 2000: 100; Govaerts and Dransfield, 2005: 78). 10 m.
Coccothrinax readii H. J. Quero, Principes 24: 118. 1980. (As *Coccothrinax argentata* in Henderson et al. 1995: 47. 280; Govaerts and Dransfield, 2005: 81). 7 m. Endemic.
Cryosophila nana (Kunth) Blume ex Salomon, Palmen 158. 1887. (Henderson et al., 1995: 41, 282; Govaerts and Dransfield, 2005: 86-87). 5 m. Endemic.
Cryosophila stauracantha (Heynh.) R. Evans, Syst. Bot. Monogr. 46: 57. 1995. (Henderson et al., 1995: 41, 282; Govaerts and Dransfield, 2005: 87). 15 m.
Euterpe precatoria Mart., Voy. Amér. Mér. 7(3): 10. 1842. (Henderson et al., 1995: 124, 285; Govaerts and Dransfield, 2005: 111). Two varieties, one in Mexico (Henderson et al., 1995). 12 m.
Gaussia gomez-pompae (H. J. Quero) H. J. Quero, Syst. Bot. 11: 153. 1986. (Henderson et al., 1995: 78, 285; Govaerts and Dransfield, 2005: 112). 14 m. Endemic.
Gaussia maya (O. F. Cook) H. J. Quero, Syst. Bot. 11: 152. 1986. (Henderson et al., 1995: 78, 285; Govaerts and Dransfield, 2005: 112). 20 m.
Geonoma interrupta (Ruiz et Pav.) Mart., Hist. Nat. Palm. 2: 8. 1823. (Henderson et al., 1995: 227, 286; Govaerts and Dransfield, 2005: 116). Two varieties, one in Mexico (Henderson et al., 1995). 10 m.
Pseudophoenix sargentii H. Wendl. ex Sarg., Bot. Gaz. 11: 314. 1886. (Henderson et al., 1995: 73, 293; Zona, 2000: 112). Two subspecies, one in Mexico, the other with 2 varieties (Henderson et al., 1995; Govaerts and Dransfield, 2005: 186). 8 m.
Roystonea dunlapiana P. H. Allen, Ceiba 3: 15. 1952. (Henderson et al., 1995: 134-135, 294; Zona, 1996: 19-21; Govaerts and Dransfield, 2005: 197). 30 m.
Roystonea regia (Kunth) O. F. Cook, Science 12(300): 479. 1900. (Henderson et al., 1995: 135, 294; Zona, 1996: 25-28; Govaerts and Dransfield, 2005: 197). 30(-40) m.
Sabal gretheriae H. J. Quero, Principes 35: 219. 1991. (Henderson et al., 1995: 65, 295). 8 m. Endemic.
Sabal mauritiiformis (H. Karst) Griseb. et H. Wendl., Fl. Brit. W. I.: 514. 1864. (Henderson et al., 1995: 66, 295; Govaerts and Dransfield, 2005: 198). 30 m.
Sabal mexicana Mart. [*Sabal guatemalensis* Becc. is a synonym according to Hermilo J. Quero, personal communication 2008], Hist. Nat. Palm. 3: 246. 1839. (Henderson et al., 1995: 66, 295; Pennington and Sarukhán, 2005: 118-119; Zona, 2000: 108; Govaerts and Dransfield, 2005: 198). 20 m.
Sabal pumos (Kunth) Burret, Repert. Spec. Nov. Regni Veg. 32: 101. 1933. (Henderson et al., 1995: 67, 295; Govaerts and Dransfield, 2005: 199). 15 m. Endemic.
Sabal rosei (O. F. Cook) Becc., Webbia 2: 83. 1907. (Henderson et al., 1995: 67, 295; Govaerts and Dransfield, 2005: 199). 15 m. Endemic.
Sabal uresana Trel., Annual Rep. Missouri Bot. Gard. 12: 79. 1901. (Henderson et al., 1995: 67, 295; Felger et al., 2001: 348-349; Govaerts and Dransfield, 2005: 199). 20 m. Endemic.
Sabal yapa C. Wright ex Becc., Anales Acad. Ci. Med. Habana 7: 562. 1870[1871]. (Henderson et al., 1995: 67, 295; Govaerts and Dransfield, 2005: 199). 20 m.
Thrinax radiata Lodd. ex Schult. et Schult. f., Syst. Veg. 7: 1301. 1830. (Henderson et al., 1995: 44, 298; Zona, 2000: 99; Govaerts and Dransfield, 2005: 211). 12 m.
Washingtonia filifera (Linden ex André) H. Wendl. ex de Bary, Bot. Zeitung (Berlin) 37: LXI. 1879. (Henderson et al., 1995: 62, 299; Zona, 2000: 106; Govaerts and Dransfield, 2005: 214). 15 m.
Washingtonia robusta H. Wendl., Gart.-Zeitung (Berlin) 2: 198. 1883. (Henderson et al., 1995: 62, 299; Zona, 2000: 106; Felger et al., 2001: 349-350; Govaerts and Dransfield, 2005: 215). 22 m. Endemic.

Dracaenaceae
Dracaena americana Donn. Sm., Trees and Shrubs 1(4): 207. 1905. 18 m.

Nolinaceae
Beaucarnea goldmanii Rose, Contr. U.S. Natl. Herb. 12: 261. 1909. (Hernández-Sandoval, 1993: 120-122; Walker, 2001: 287). 10(-18) m. Endemic.
Beaucarnea gracilis Lem., Ill. Hort. 8: 61. 1861. (Hernández-Sandoval, 1993: 123-126; Walker, 2001: 287). 12 m. Endemic.
Beaucarnea hiriartiae L. Hern., Acta Bot. Mex. 18: 25. 1992. (Hernández-Sandoval, 1993: 132-134; Walker, 2001: 288). 8 m. Endemic.
Beaucarnea pliabilis (Baker) Rose, Contr. U.S. Natl. Herb. 10: 89. 1906. (Hernández-Sandoval, 1993: 139-141; Walker, 2001: 288). 12(-22) m.
Beaucarnea purpusii Rose, Contr. U.S. Natl. Herb. 10: 89. 1906. (Hernández-Sandoval, 1993: 144-146; as *Beaucarnea stricta* in Walker, 2001: 288). 12 m. Endemic.
Beaucarnea recurvata Lem. [*Beaucarnea inermis* (S. Watson) Rose is a synonym according to Abisaí García, personal communication 2009], Ill. Hort. 8: 61. 1861. (Hernández-Sandoval, 1993: 147-150; Walker, 2001: 288). 15 m. Endemic.
Beaucarnea sanctomariana L. Hern., Novon 11: 50. 2001. 7 m. Endemic.
Beaucarnea stricta Lem., Ill. Hort. 8: 61. 1861. (Hernández-Sandoval, 1993: 154-156; Walker, 2001: 288-289). 10 m. Endemic.
Nolina beldingii Brandegee, Zoë 1: 305. 1890. 7 m. Endemic.
Nolina matapensis Wiggins, Contr. Dudley Herb. 3: 65. 1940. (Felger et al., 2001: 352; Walker, 2001: 292). 6 m. Endemic.
Nolina nelsonii Rose, Contr. U.S. Natl. Herb. 10: 92. 1906. 8 m. Endemic.
Nolina parviflora (Kunth) Hemsl., Biol. Cent.-Amer., Bot. 3: 372. 1884. (Galván 2005: 1240, 1242). 5 m. Endemic.

Poaceae
Guadua aculeata Rupr. ex E. Fourn., Mexic. Pl. 2: 130. 1886.

(Judziewicz et al., 1999: 242; Judziewicz et al., 2000: 58-59; Dávila et al., 2006: 49). 20 m.

Guadua amplexifolia J. Presl, Reliq. Haenk. 1(4-5): 256. 1830. (Pohl and Davidse, 1994: 194-195; Judziewicz et al., 1999: 242; Judziewicz et al., 2000: 59; Dávila et al., 2006: 50). 20 m.

Guadua angustifolia Kunth, Syn. Pl. 1: 253. 1822. (Young and Judd, 1992; Pohl and Davidse, 1994: 195; Judziewicz et al., 1999: 242; Judziewicz et al., 2000: 59; Dávila et al., 2006: 50). Three varieties, one in Mexico (Judziewicz et al., 2000). 30 m.

Guadua velutina Londoño et L. G. Clark, Nordic J. Bot. 11: 328. 1991. (Pohl and Davidse, 1994: 195; Judziewicz et al., 1999: 243; Judziewicz et al., 2000: 62; Dávila et al., 2006: 50). 5 m (and up to 10 cm in diameter). Endemic.

Pteridophyta (tree ferns)

CYATHEACEAE

Alsophila firma (Baker) D. S. Conant, J. Arnold Arbor. 64: 372. 1983. (Riba 1995: 89; Mickel and Smith, 2004: 45-46). 11 m.

Alsophila salvinii Hook, Syn. Fil. 36. 1866. (Riba 1995: 90; Mickel and Smith, 2004: 46). 9 m.

Cyathea costaricensis (Mett. ex Kuhn) Domin, Acta Bot. Bohem. 9: 107. 1930. (Moran and Pérez-García, 1995: 96; Mickel and Smith, 2004: 236). 8 m.

Cyathea divergens Kunze, Linnaea 9: 100. 1834. (Moran and Pérez-García, 1995: 97; Mickel and Smith, 2004: 236-237). Two varieties, one in Mexico (Mickel and Smith, 2004). 15 m.

Cyathea fulva (M. Martens et Galeotti) Fée, Mém. Foug. 9: 34. 1857. (Moran and Pérez-García, 1995: 97-98; Mickel and Smith, 2004: 237). 12 m.

Cyathea godmanii (Hook.) Domin, Pterid. Dominica 262. 1929. (As *Cyathea valdecrenata* Domin in Moran and Pérez-García, 1995: 102-103; Mickel and Smith, 2004: 237-238). 10 m.

Cyathea myosuroides (Liebm.) Domin, Pterid. Dominica 263. 1929. (Moran and Pérez-García, 1995: 99; Mickel and Smith, 2004: 238-239). 5 m.

Sphaeropteris horrida (Liebm.) R. M. Tryon, Contr. Gray Herb. 200: 20. 1970, non *Cyathea horrida* (L.) Sm., 1793. (Palacios-Rios, 1995: 103; Mickel and Smith, 2004: 603). 20 m.

DICKSONIACEAE

Dicksonia sellowiana Hook., Sp. Fil. 1: 67. 1844. (Pérez-García 1995: 87-88; Mickel and Smith, 2004: 249-250). 8(-10) m.