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Contribution to the Floristic Knowledge of the Sierra Mazateca of Oaxaca, Mexico

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Abstract: The Sierra Mazateca is located in the northern mountainous region of Oaxaca, Mexico, between the Valley of Tehuacán-Cuicatlán and the Gulf Coastal Plains of Veracruz. It is part of the more extensive Sierra Madre de Oaxaca, a priority region for biological research and conservation efforts because of its high levels of biodiversity. A floristic study was conducted in the highlands of the Sierra Mazateca (at altitudes of ca. 1,000–2,750 m) between September 1999 and April 2002, with the objective of producing an inventory of the vascular plants found in this region. Cloud forests are the predominant vegetation type in the highland areas, but due to widespread changes in land use, these are found in different levels of succession. This contribution presents a general description of the sampled area and a checklist of the vascular flora collected during this study that includes 648 species distributed among 136 families and 389 genera. The five most species-rich angiosperm families found in the region are: Asteraceae, Orchidaceae, Rubiaceae, Melastomataceae, and Piperaceae, while the largest fern family is Polypodiaceae.

Resumen: La Sierra Mazateca se ubica en el noreste de Oaxaca, México, entre el Valle de Tehuacán-Cuicatlán y la Planicie Costera del Golfo de México. La región forma parte de una más extensa, la Sierra Madre de Oaxaca, que por su alta biodiversidad es considerada como prioritaria para la investigación biológica y la conservación. Se realizó un estudio en la Sierra Mazateca (a alturas de ca. 1,000–2,750 m) entre septiembre de 1999 y abril del 2002, que tuvo como objetivo compilar un inventario de las plantas vasculares de esta zona. El bosque mesófilo es el tipo de vegetación predominante en esta área, pero a causa de cambios extensos en el uso de suelo, esta vegetación se encuentra en diferentes etapas de sucesión. Esta contribución presenta una descripción general del área muestreada y un catálogo de la flora vascular de la región colectada durante el presente estudio que incluye 648 especies, distribuidas en 136 familias y 389 géneros. Las cinco familias de angiospermas más abundantes en la región en términos de su diversidad de especies son: Asteraceae, Orchidaceae, Rubiaceae, Melastomataceae y Piperaceae. La familia de helechos con la mayor diversidad es Polypodiaceae.

Keywords: Sierra Mazateca, Oaxaca, cloud forests

In Mexico, cloud forests (*bosques mesófilos de montaña, bosques de neblina* or *bosques húmedos de montaña*) occupy 0.6–1% of the country's territory and harbor approximately 10% of its known plant species (Rzedowski, 1991; Villaseñor, 2010). Human activities have reduced these cloud forests to mere fragments, making them highly vulnerable and a priority for conservation (Rzedowski, 1991, 1996; CONABIO 2010; Ponce-Reyes *et al.*, 2012; Gual-Díaz & Rendón-Correa, 2014). Cloud forests in Mexico are generally found in mountainous regions, at elevations of 1,000–2,500 m, where precipitation levels range from 1,000–3,000 mm, and the average annual temperature is 12–23°C (53–73°F). They typically have a constant cloud cover and are characterized by high levels of humidity (Torres-Colín, 2004; Villaseñor, 2010; Gual-Díaz & Rendón-Correa, 2014). The states of Chiapas, Oaxaca, and Veracruz have the largest areas of cloud forests (Villaseñor, 2010). The Sierra Madre de Oaxaca has an extensive area of cloud forests that has been identified as a priority region for biological research and conservation actions (Arriaga *et al.*, 2000; Ponce-Reyes *et al.*, 2012). While

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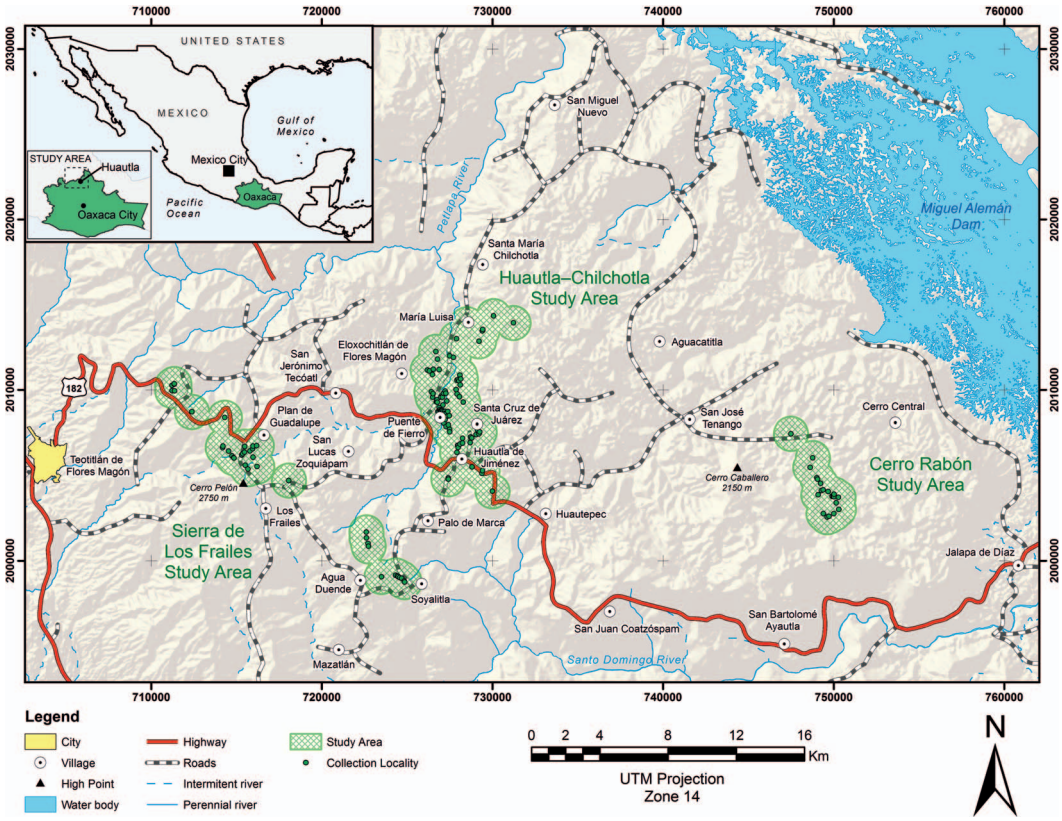


FIG. 1. A map of the study areas.

several floristic studies have been conducted in this region, there are still areas that remain under collected. Such was the case of the Sierra Mazateca, located in northeastern Oaxaca. The objective of the present study is to contribute to the knowledge and documentation of the vascular plant diversity found in the highlands of the Sierra Mazateca, at altitudes of 1,000–2,750 m (3,250–9,000 ft).

The Sierra Mazateca is located between 18°00′–18°22′ N latitude, and 96°30′–97°15′ W longitude and occupies approximately 1,050 km^2 (105,000 ha). Its northern limit is the Petlapa River (Fig. 1), which separates it from the Sierra de Zongolica of Puebla-Veracruz, and its southern limit is the canyon of the Santo Domingo River, which separates it from the southern Cuicatec region and Sierra de la Chinantla (Fig. 1). The region encompasses an altitudinal range of 250–2,750 m (800–9,000 ft). Generally, its rugged topography is characterized by steep slopes and deep ravines, although in some areas there are small open valleys. The inhabitants of the Sierra Mazateca make a distinction between two zones within the region, based on climatic differences: a *tierra fría* or *Mazateca Alta* (high-altitude areas), where the climate is generally temperate; and a *tierra caliente* or *Mazateca Baja* (low-altitude areas), where it is generally much warmer. The altitudinal limits of these areas are subjective, but the transition zone between lowland and highland areas generally begins at about 1,000 m. The average annual temperature in the highlands is 16–22° C (62–72° F), and the average annual precipitation is 1,498–4,942 mm, making it one of the highest-precipitation regions in

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Mexico (INEGI, 1983; Servicio Metereológico Nacional, 2017). There are two annual seasons in the region: a rainy season from June to October, and a dry season from November to May. Different types of soils are found in the highlands, including umbrisols, luvisols, cambisols, acrisols, regosols and phaezems (INEGI, 2007).

In terms of its substrate composition, the Sierra Mazateca can be divided into a western noncarbonate rock area composed of allochthonous Jurassic rocks (sandstones and shales), and an eastern area composed of Cretaceous karstic limestone. The dividing line between the two areas is east of the town of Huautla de Jiménez and runs in a N–SW direction from the village of San Andrés to the Santo Domingo River. In the western noncarbonate areas, limestone outcrops sometimes also occur. These outcrops are Lower Cretaceous limestones that have been exposed because of erosion through the thrust sheet caused by the Petlapa River (Smith, 1994). In the karstic part of the Sierra Mazateca there are many large cave systems. One of them is located just east of Huautla de Jiménez, in the area where the region's two different rock substrates come into contact. This cave system, known as *Sistema Huautla*, is 78.3 km (256,890 ft) long and 1,560 m (5,118 ft) deep. It is the deepest known cave in the Western Hemisphere and the ninth deepest cave in the world. This cave system has been explored and mapped since the 1960s, but a new long-term expedition project, *Proyecto Espeleológico Sistema Huautla* (PESH), is working to extend its known length and depth (Steele, 2017).

The geological history of the Sierra Mazateca, like that of south central Mexico in general, is complex. The region belongs to the Sierra de Juárez Geological Subprovince, characterized by flat-lying, NE-directed overthrusts and fold-structures that have complex internal structures. Geological studies indicate that the northern mountain range of Oaxaca was formed by folding and faulting processes during the Laramide Orogeny that took place from the late Cretaceous to Paleocene, approximately 80 to 55 Ma (Johnston & Stephen, 2004). The uplift of the Sierra de Juárez, including the Sierra Mazateca, is thought to have begun 16 Ma, in the middle Miocene (Centeno-García, 2004). The largest structures within the Sierra de Juárez are thrust faults overlain by different rock types. Three of them are associated with the Sierra Mazateca: (1) the *Cuicateco Fault* in the western part of the sierra, near Teotitlán de Flores Magón, characterized by rocks of the Cuicatlán Complex consisting of metavolcanics, schists (Charleston, 1980) and lens of serpentines (Carfantan, 1981; Campa & Coney, 1983); (2) the *Huautla Fault* in the central part of the sierra, east of Huautla de Jiménez, characterized by allochthonous Jurassic sandstones, shales, mudstones, and thin bedded limestones (Moreno, 1980); and (3) the *Cerro Rabón Fault* in the eastern part of Sierra, characterized by coraline limestones from the Lower to Middle Cretaceous (Smith, 1994; 2002) of the Cordoba Platform (González, 1976).

The Sierra Mazateca is located within the Papaloapan River basin, the second most important fluvial system in Mexico—after the Grijalva-Usumacinta system— in terms of its streamflow (Pereyra-Díaz *et al*., 2010; CONAGUA, 2016). Within the region, the two largest rivers are: 1) the Santo Domingo River, in the southern part of the sierra, which eventually becomes the Papaloapan River and discharges into the Gulf of Mexico, and 2) the Petlapa River, in the northern part of the sierra, which discharges into the Miguel Alemán dam in the eastern lowlands. Throughout the region there are perennial and intermittent streams. In the western part of the Sierra Mazateca, where the substrate is composed of mostly impermeable noncarbonate rocks, several springs and waterfalls are present. However, in the dry season, their flow decreases dramatically and some even disappear completely. In the eastern karstic part of the sierra, there are no significant surface streams, as all the rainwater percolates into the karst. In the Cerro Rabón massif area, the water collects near the base level creating a number of subterranean rivers (Bitterli & Jeanin, 1996).

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In the western part of the Sierra Mazateca there is a large mountain range, known as the Sierra de los Frailes, that lies diagonally in a N–SE direction. In the central part of the region there is a major gorge formed by a tributary of the Petlapa River that runs northward from a locality known as Puente de Fierro. Maps refer to it as the Puente de Fierro River (INEGI, 2015) although locals rarely refer to it by a specific name. In the eastern part of the sierra, the karstic massif known as Cerro Rabón, rises prominently from the lowlands. The SE portion of this massif has a spectacular rock cliff that rises from the ground almost vertically for at least 1,000 m (3,300 ft). Smaller, exposed rock cliffs are frequent in the central portion of the region.

Like other areas of Oaxaca, the Sierra Mazateca has a rich cultural history. Its population is composed of indigenous Mazatec people with different degrees of acculturation to modern Mexican society. Their tonal language—Mazatec—is the third most widely spoken in the state of Oaxaca after Zapotec and Mixtec. Mazatecs represent the ninth largest indigenous group in Mexico, based on the number of individuals who speak Mazatec (INEGI, 2010). Nahuatl and Mixtec communities are also found in the region. Some of the earliest evidence of human settlements in the Sierra Mazateca is found in tombs, archaeological sites, and caves scattered throughout the region. Based on the artifacts found in these sites, there is evidence of habitation going back to 500–750 CE (Hapka & Rouvinez, 1997; Munn, 2014), although further studies are required to establish a detailed chronology of the pre-Hispanic history of the region. While many residents of the Sierra Mazateca live in the region's large towns and urban centers where there is access to a wide selection of goods and services, a substantial number live in smaller, rural communities where they grow different crops including maize, beans, squash, and a variety of edible greens, and raise livestock including chickens, turkeys, pigs, and goats. The Sierra Mazateca was, until recently, a major coffee-growing region in Oaxaca. Since the early 1900s, coffee cultivation was the main source of work and income for Mazatec people. However, due to the sharp decline in the international coffee prices of this crop in the 1990s, most of the plantations have been abandoned, and current coffee production is primarily for local consumption.

The oldest reference to the highland vegetation of the Sierra Mazateca is found in the *Relación de Teotitlán*, a 1581 description of the town of Teotitlán de Flores Magón (also known as Teotitlán del Camino) and its adjacent areas. This is part of a series of documents written in the 16th century to inform King Phillip II about the characteristics of the territories in New Spain. The *Relación* says that:

> *Guauhtla* [referring to present-day Huautla de Jiménez] is cold and humid, and it rains there most of the year. . .it has few grasses, as most of the land is covered with thick forests. . .corn, beans, and squashes abound. . .it has large hills of pines, cedars, cypresses, oaks, and *madroños*. . .[the people] live from agriculture, hunting, and the sale of *ocote* [pine wood used for making torches and as fuel wood] (Acuña, 1984, pp. 206–207).

In January 1906, Mexican geologist Manuel Villada visited the region to explore and document the cave of "Nindó-Da-Gé" (Mazatec for: Cerro del Agua Crecida or Mountain of High Water), located in the central area of the Sierra Mazateca, near the town of San Antonio Eloxochitlán. In addition to presenting information about the geology of the area, he also provided brief descriptions of the topography and weather, and he identified some of the most "notable" plants he saw during his visit. He began his expedition in the town of "Teotitlán del Camino", and as he made his way into the sierra, he traveled through the Sierra de Los Frailes, which he described as follows:

> As one advances, an interminable series of eminent peaks appear, of different altitudes and shapes, simulating the waves of an agitated

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> ocean. After the small town of San Bernardino, one arrives at the highest point of the sierra...known as "Cumbre de los frailes" which has an altitude of approximately 2,470 m. Unfortunately, we made the trip on a bad day...a sky dark as lead hovered over our heads...an impetuous wind was blowing incessantly...layers of ice covered the tree tops...the temperature was two or three degrees below zero...making our stay in the area very painful...so we hurried our departure...(Villada, 1906, pp. 487–488).

He then described the plants he saw in the highest elevations of the region and in the area near the cave he explored:

> The always magnificent forests of oaks and conifers crown the highest altitudes, although they have been diminished by immoderate cutting. Of the first [oaks] I will only mention *Quercus repanda* K. in H.B...On the branches of the second [conifers] grow a few false parasites, such as that called Soluche or *Tillandsia recurvata* L., as well as others of the same genus. *Sedum dendroideum* Moc. y Ses., *Penstemones*, *Salvias*, *Senecios*, etc., and various grasses are interspersed at the base of the trees, beautifying those places with their showy bouquets of red, blue, and yellow flowers (Villada, 1906, p. 503).
>
> ...in the canyon of Nindó-Da-Gé, which has a warmer and humid climate...there is a noticeable change in the aspect of the flora, which to a certain degree becomes exuberant. I will first mention a voluptuous tree of short stature with elegant panicles of white flowers...that grows along the edges of the stream at the entrance to the canyon...It is *Saurauja villosa*... known as Pipicho...Another tree of much greater stature and corpulence than the latter, and which is also a lover of water, is *Platanus occidentalis* L., or Alamo...I will enumerate some of the species found among the shrubs that emerge from the stream, and that are also found on the mountain sides. The one that stands out above all others is known in horticulture by the names of Monte de oro or Pluma de oro, because of the color of its flowers, which rise in tight racemes: it is *Jacobinia aurea* of Hemsl. in the beautiful Acanthaceae family...*Aphelandra schiedeana* Ch. y Sch. is another representative of the same family that lives here, but not in the water. Of the Gesneriad family, there is the *Isoloma deppeana*...of the Bignon family there is *Tecoma stans* Juss., or *Nextamaxochitl*...of the Verbenaceae family there is the *Lantana camara* L. so well-known in our gardens by the same genus name. The most notable of the legumes is *Cassia multiflora* Mart. and Gal., or Retama, which is another ornamental plant, with flowers disposed in racemes of an intense yellow. Of *Iresine celosioides* L., in the Amaranthaceae, of *Peperomia edule* L., in the Piperaceae, and of a beautiful terrestrial orchid in the genus *Laelia,* I conserve vivid memories of my peregrination through those mountains...It would be strange not to mention an interesting group of trees that are typically found in certain regions of the country, such as the one we are currently discussing. I am referring to the Amates or Higuerones, trees that produce adventitious roots in their branches, which descend vertically until they embed themselves in the ground, and which from their exterior aspect appear to be other trunks. I was only able to ascertain the presence of one species, yet unidentified, that has a certain affinity with *Ficus padiaefolia* K. in H.B, known as Cozahuique...Because of its beautiful fo-

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> liage it is a truly ornamental tree, of medium, elliptic, thin, and somewhat rigid leaves, a bit lustrous and of a pleasant green; that when shaken by the wind, produces a strong noise that stands out from the others of its kind (Villada 1906, pp. 503–504).

Villada's account is significant, not only because it is one of the earliest records of geological research in the Sierra Mazateca, but also because it provides an indication that the region's forests were already being impacted by wood harvesting activities.

In the late 1930s, Richard Evans Schultes conducted a botanical study in the Sierra Mazateca as part of his Ph.D. research at Harvard University. In his dissertation (Schultes, 1941), entitled *The Economic Aspects of the Flora of Northeastern Oaxaca*, Schultes wrote:

> To be sure, the survival of many culture-traits was the most convincing argument in favor of investigating north-eastern Oaxaca ethnobotanically. But it was not the only argument. A glance at any flora of southern Mexico or at any monograph which includes species from southern Mexico reveals at once that the mountainous districts of the northeastern part of Oaxaca are of peculiar botanical interest. Floristically, this region is the richest part of the state, and it is probably more varied than any other area of equal size in Mexico (Schultes, 1941: xiii).

One of the most important culture-traits that attracted Schultes' attention to northeastern Oaxaca was the use of psychoactive mushrooms by Mazatec people. Early colonial documents noted the use of psychoactive mushrooms by the Aztecs as part of their religious and healing traditions, but this practice subsequently went unreported until the 1930s, when it became evident that some communities in Oaxaca were still using fungi as part of ritual ceremonies. In 1937, Schultes received specimens of these fungi for identification. The specimens were so poorly preserved that Schultes was unable to identify them, but the news that they existed sparked his interest so much that he headed to Huautla de Jiménez to investigate the matter personally. During his stay in the Sierra Mazateca, Schultes confirmed the use of psychoactive mushrooms by the Mazatecs, but he erroneously identified them as a species of *Panaeolus* (Schultes, 1939). Nevertheless, his publications on this topic prompted others to visit the Sierra Mazateca, and in the late 1950s, French mycologist Roger Heim properly identified the mushrooms as a species in the genus *Psilocybe* (Guzmán, 2008). To this day, the region is famous worldwide for these mushrooms which have attracted both Mexicans and foreigners interested in consuming them for either medicinal or recreational use.

As the title of Schultes' thesis implies, his research focused on economically useful plants. Therefore, many of the species he includes in his work are cultivated plants. For the Mazatec region, Schultes listed 164 species of vascular plants (130 dicots, 26 monocots, 2 conifers, and 6 ferns) that he found to be of economic importance (Schultes, 1941).

In 1993, the *Sociedad para el Estudio de los Recursos Bióticos de Oaxaca* (SERBO) wrote a brief report on the botanical observations their team made on a visit to the plateau of the Cerro Rabón massif. The report has not been published by SERBO, but it was used to write a brief description of the Cerro Rabón forests for a speleological publication (Bitterli *et al*., 1996). In the latter, the authors note the presence of *Cupressus lusitanica* var. *benthamii* (Endl.) Carrière and *Oreomunnea mexicana* (Standl.) J.F.Leroy in the region, two species with limited distributions in Mexico. *Oreommunea* is a relict species from the Miocene, and its presence points to the ancient origin of the region's cloud forests (Rzedowski & Palacios-Chávez, 1977; Palacios-Chávez & Rzedowski, 1993; Rzedowski, 1996, Herrera *et al*., 2014).

In 1994, Carlos Ruíz-Jiménez made a structural analysis of the vegetation found in a portion of the Sierra de los Frailes as part

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of his undergraduate studies at Mexico's National Autonomous University. In his thesis, *Análisis Estructural del Bosque Mesófilo de la Region de Huautla de Jiménez (Oaxaca), México*, Ruíz-Jiménez listed 178 species (3 lycophytes, 25 ferns, 3 gymnosperms, 147 angiosperms) for an area known as Puerto Soledad (Ruiz-Jiménez, 1995; Ruiz-Jiménez et al., 2000). The present study includes 75 of the species in Ruiz-Jiménez' work. However, a careful analysis of synonymy has not been made of the rest of the species.

The biological diversity of the Tehuacán-Cuicatlán Valley, located west of the sierra, has been studied extensively. This mostly semi-arid region, encompassing approximately 10,000 km^2 (1,000,000 ha), maintains 36 different plant communities and its flora represents 10–11.4% of Mexico's national plant diversity. In the region's higher elevations there are oak forests, pine-oak forests, and to a smaller extent, cloud forests, particularly in the southernmost part of the valley (Dávila *et al.*, 2002; Ruiz-Jiménez, 2003; Vaiente-Banuet *et al.* 2009; Canseco-Márquez & Gutiérrez-Mayén, 2010; SEMARNAT, 2013).

Beyond these studies, botanists from various Mexican and international institutions have made collections in the Sierra Mazateca, but no concerted efforts, apart from those already outlined, have been made to study the flora of the Sierra Mazateca.

I am a native of the Sierra Mazateca and undertook this study to better document its floristic diversity and to provide baseline data that could support the development of educational materials about the region's biodiversity. The present study does not attempt to synthesize previous work by others in the area; rather, it aims to contribute to the knowledge of the region by enumerating the plants collected and identified during the project.

Methods

This study was conducted in two phases: the first focused on the collection of specimens, and the second on the identification of vouchers. The exploration of the Sierra Mazateca focused on three study areas which were selected because they present dense vegetation cover and have distinct geological, altitudinal, and landscape characteristics. The study areas selected were: the Sierra de los Frailes, the canyon area between the towns of Huautla de Jiménez and Chilchotla, and the Cerro Rabón plateau (Fig. 1). The collection sites in these three areas are described in Appendix 1.

Study Area Number 1. *Sierra de los Frailes*: This area is the westernmost mountain range of the Sierra Mazateca, located in the noncarbonate portion of the region (Fig. 1). Its highest peak (and that of the region in general) is the Cerro Pelón at 2,750 m (9,000 ft). Five general localities (see Appendix 1, Localities 1–5) were surveyed in this area, ranging in altitude from 2,020–2,750 m. The tree canopy in the Sierra de los Frailes generally reaches heights of 20–30 m, as observed in this study.

The Sierra de los Frailes is readily accessible by a major two-lane road—Mexican Federal Highway 182—that provides access to the Sierra Mazateca, and by other unpaved roads. If approached from Teotitlán de Flores Magón in the Tehuacán Valley, the Sierra de los Frailes will be encountered after making an ascent of approximately 1,000 m (3,280 ft) from that town. As the altitude increases, the climate becomes noticeably cooler and the vegetation more lush. As one approaches 2,000 m (6,561 ft), the landscape changes dramatically and epiphyte-covered trees of 15–20 m (50–65 ft) in height become a common sight. This change in landscape and climatic conditions marks the beginning of the Sierra de los Frailes. Continuing along highway 182 toward the community of Plan de Guadalupe, at about 2,300 m (7,545 ft), one finds extensive stands of mature cloud forests in the north-facing slopes of the area. Some of the trees present in these forests are: *Quercus corrugata*, *Q. ocoteifolia*, *Q. scytophylla*, *Podocarpus matudae*, *Clethra hartwegii*, *Cleyera integrifolia*, *Styrax ramirezii*, *Drimys granadensis* var. *mexicana*, *Ocotea betazensis*, *Cinnamomum effusum*, *Osmanthus ameri-*

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FIG. 2. Aspect of Study Area 1. View from Cerro Pelón, Sierra de los Frailes. Several species of oaks are common in this area. Photo by Diana X. Munn-Estrada.

canus, *Phyllonoma laticuspis*, *Prunus brachybotrya*, and *Ternstroemia tepezapote*, among others. These forests have a canopy of 20–30 m (65–100 ft) and do not present a significant understory except for the areas where they may have been disturbed by human activities, or where there are gaps in the vegetation due to natural events (i.e., falling of trees). In the fringes of the forests and along the highway, many Asteraceae herbs can be found including *Dahlia australis* and *Senecio callosus*.

In comparison to the other areas studied in the Mazateca region, these forests present a much lower degree of human disturbance.

At the Plan de Guadalupe one can continue along highway 182 toward Huautla de Jiménez, ascend the Cerro Pelón by foot, or travel to the southeastern portion of the study area.

On the slopes of the Cerro Pelón one can find: *Arbutus xalapensis*, *Clethra hartwegii*, *Cornus excelsa*, *Ocotea betazensis*, *Quercus ocoteifolia*, *Ugni myricoides*, and *Weinmannia pinnata*, among other trees. In the higher parts of the Cerro Pelón, starting at about 2,600 m (8530 ft), trees on the slopes exposed to the northeastern winds, such as *Clethra hartwegii*, present many morphological deformations in their trunks and branches. At the very top of the mountain there are no trees, only dwarf shrubs measuring 40–70 cm (1.3–2.3 ft), including *Gaultheria erecta*, *Pernettya prostrata, Vaccinium confertum*, and *Quercus depressa*. A few herbs such as *Osbertia stolonifera*, *Ottoa oenanthoides*, *Lycopodium clavatum*, and *L. thyoides*, as well as a *Calamagrostis* grass and a terrestrial orchid can be found growing among the stunted shrubs. Whether this vegetation is natural or a result of human activities is unknown.

Toward the southeastern part of the Sierra de los Frailes, along the road to Agua Duende, one can find large specimens of *Clethra lanata*, as well as *Myrsine juergensenii*, *Pinus patula*, *Ternstroemia tepezapote*, and *Citharexylum mocinnoi*. Further south, near the communities of Agua de Cerro and San Pedro de los Encinos (between Agua Duende and Soyaltitla), an excursion into the forested slopes leads to similar forests such as those in the previous site, but populated with *Quercus* aff. *corrugata*, *Oreopanax liebmannii*, *Chiococca* sp., and many specimens of *Cyathea fulva*, among others. An interesting and quite particular aspect of the areas near the community of San Pedro de los Encinos is the presence of dense stands of oaks—5–7 m tall—with very narrow trunks. The inhabitants of San Pedro de los Encinos (named after the oak trees described, *encino* being the Spanish term for oak) have indicated that these stands grew after a major fire devastated parts of the area many years ago (the exact date is unknown). The vegetation found in the Sierra de los Frailes study area is predominantly evergreen, although some of its elements are deciduous (e.g., *Alnus*).

STUDY AREA 2. *HUAUTLA–CHILCHOTLA*: This area is located in the central part of the Sierra Mazateca, between the noncarbonate and the karstic portions of the region. Its geographical reference point is a large river gorge that begins at a location known as Puente de Fierro—near the town of Huautla de Jiménez—and continues north to the town of Chilchotla. This area presents mosaics of vegetation with different degrees of human disturbance, and different successional stages. Eleven general localities (Appendix 1, Localities 6–16) were surveyed in this area, with altitudes ranging from 1,069–2,151 m. Because of its large extension and distinct physical characteristics, the river

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gorge can best be described if divided into three sub-parts: (1) the areas immediately adjacent to the river, (2) the mountain in the western part of the gorge (known among Mazatecs as *Nindo-Ntahe*, or Mountain of the High Water, located near the town of San Antonio Eloxochitlán, and (3) the mountain range in the eastern part of the gorge, which is the location of many large villages and communities, including Huautla de Jiménez in the south, and Santa María Chilchotla in the north.

Starting from the Puente de Fierro, and following the river—a tributary of the Petlapa River—to the north, the vegetation is best described as riparian forest with deciduous elements, interspersed with secondary vegetation. Among the trees found along the river and its adjacent areas are: *Ulmus mexicana*, *Platanus mexicana* var. *mexicana*, *Cinnamomum effusum*, *Ficus* sp., *Glossostipula concinna*, *Litsea glaucescens*, *Ocotea bernoulliana*, *Damburneya salicifolia*, *Mollinedia viridiflora*, *Oecopetalum mexicanum*, *Quercus sartorii*, *Saurauia* aff. *villosa*, *Symplocos limoncillo*, *Deppea erythrorhiza, Citharexylum mocinnoi*, *Juglans* aff. *mollis*, *Capparidastrum mollicellum*, *Telanthophora grandifolia,* and *Liquidambar styraciflua* in the nearby slopes. In the understory of the riparian forest, *Chamaedorea* palms are common, as well as many begonias and ferns such as *Llavea cordifolia* and *Niphidium crassifolium*. Among the epiphytes, species of *Peperomia* abound, as well as many orchids.

The slopes of the *Nindo-Ntahe*, west of the river (1,060–1,450 m; 3,477–4,757 ft), present mosaics of disturbed cloud forests, areas of subsistence agriculture, and secondary vegetation. Despite being highly disturbed, one still finds many large specimens of oaks in this area including: *Quercus candicans*, *Q. eugeniifolia*, *Q. lancifolia*, *Q. ocoteifolia*, and *Q. polymorpha,* and other trees such as *Turpinia* sp., *Wimmeria bartletti*, *Hedyosmum mexicanum*, *Inga acrocephala*, *Liquidambar styraciflua*, *Ocotea bernoulliana*, *Palicourea padifolia*, and the tree fern *Sphaeropteris horrida*. An interesting aspect of this area is the flora growing in the exposed rock faces in the road cuts of the road from Puente de Fierro to San Antonio Eloxochitlán. These rocks generally harbor many ferns, a wide variety of herbs, and small shrubs. At higher altitudes (ca.1,430 m; 4,691 ft), an intermittent stream that travels from San Antonio toward the river below supports a riparian forest with *Platanus mexicana* var. *mexicana*, *Ficus* sp., *Deppea grandiflora*, and *Cornutia pyramidata*.

In the winter, many trees on this mountain range lose their leaves, making the vegetation appear quite different from that found in the Sierra de los Frailes, where the vegetation tends to be nearly evergreen. The presence of *Heliocarpus* on the slopes of the mountain range is an indicator of the secondary nature of the vegetation.

The mountain range east of the gorge also has highly disturbed areas, which is expected given that it is the most populated part of the Sierra Mazateca. Wherever one goes in this mountain range, one is sure to find remnants of coffee plantations interspersed with cloud forest. Therefore, its vegetation is best described as secondary. Altitudes in this area range from 1,200–2,150 m (3,937–7,050 ft.). The highest peak is the Cerro de la Adoración, located southeast of Huautla de Jiménez at 2,150 m (7,053 ft).

Trees found in this range include: *Liquidambar styraciflua*, *Inga vera*, *Alchornea latifolia*, *Myrsine coriacea*, *Quercus sartorii*, *Persea americana*, *Solanum aphyodendron*, *Frangula capreifolia*, *Miconia sylvatica*, *Buddleja americana*, *Berberis gracilis*, and *Clusia* sp. In the southern parts of this area, near the Cerro de la Adoración, the following species were found: *Clethra hartwegii*, *Miconia hemenostigma*, *Phyllonoma laticuspis*, *Alnus acuminata* subsp. *arguta*, *Vaccinium leucanthum*, and *Solanum nigricans*, among others.

To the northeast of Huautla, towards the town of Santa Cruz de Juárez, one can encounter: *Dendropanax arboreus*, *Garrya* aff. *laurifolia*, *Persea americana*, *Prunus brachybotrya*, *Saurauia leucocarpa, Solanum nigricans, Vaccinium leucanthum, Deppea*

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FIG. 3. Study Area 3. View of Cerro Rabón from Jalapa de Díaz where a member of the walnut family is among the dominant trees. Photo by Diana X. Munn-Estrada.

grandiflora, Myriocarpa longipes, and *Psychotria fruticetorum*.

Along the road toward Santa María Chilchotla (1,070–1,230 m; 3,510–4,035 ft), north of Puente de Fierro, the vegetation is also mostly secondary. Some of the trees found here are: *Persea schiedeana*, *Acalypha* cf. *longipes*, *Dendropanax arboreus*, *Juglans mollis*, *Alchornea latifolia*, *Tonduzia longifolia*, *Wimmeria bartletti*, and *Coccoloba hirtella*. The black limestone outcrops that border the road, harbor many locality-restricted species and many ferns and gesneriads.

East of María Luisa, and near the community of Agua de Gancho, there are a few patches of forest growing on a limestone substrate that contain: *Ardisia verapazensis*, *A. liebmannii*, *Cojoba arborea*, *Glossostipula concinna*, *Psychotria fruticetorum*, *Sommera arborescens*, *Deppea grandiflora*, *Hoffmannia nicotianifolia*, *Psychotria mexiae*, *Coccoloba* sp., many *Chamaedorea* palms, ferns, orchids, and other epiphytes such as *Marcgravia stonei*. North of these forests, at an altitude of 1,700 m (5,577 ft) there are areas that have been highly disturbed by fires and consequently, their vegetation is secondary in nature.

STUDY AREA 3. *CERRO RABÓN*: This area is located in the easternmost karstic front range of the Sierra Mazateca. It is the plateau of the Cerro Rabón massif that rises west of the Miguel Alemán dam. The plateau has a rugged landscape composed of cone karst and large dolines. The highest peak in the region is Cerro Caballero at 2,150 m (7,054 ft). This area is the most difficult to access, as there are no roads that go close to the plateau. One can enter the area by foot from three localities: the town of San José Tenango, the community of Rancho Avendaño which is east of Cerro Central, and the town of Jalapa de Díaz. The altitudinal range of the five localities (Appendix 1, Localities 17–21) explored in the northeastern and southeastern portions of the plateau is 1,100–1,645 m.

Although the Cerro Rabón is difficult to access and has no surface streams because of its karstic, porous substrate, its plateau is quite populated, contrary to the popular belief among many Mazatecs that no one lives on this mountain.

The vegetation in the populated portions of the plateau is generally disturbed, but it is well conserved in the less populated areas. The mature cloud forests found in the explored areas are very distinct in floristic composition from others found in the Sierra Mazateca, particularly because one of their dominant elements is *Oreomunnea mexicana*, a large tree not found anywhere else in this sierra. The specimens of *Oreomunnea* observed were 25–30 m (82–100 ft) in height, and grew in close association with trees of *Sloanea cruenta*, also reaching the same heights. Other species living among the *Oreomunnea* trees are: *Weinmannia pinnata*, *Pinus* sp., *Ardisia liebmannii*, *Randia matudae*, *Psychotria galeottiana*, *P. sarapiquiensis*, *Parathesis leptopa*, and *Sommera arborescens*. In the understory, especially in areas with light gaps, numerous *Chamaedorea* species thrive, in conjunction with many species of Acanthaceae, and other herbs. Epiphytic ferns and orchids are a common component of these forests. Other species present in this area but not as abundant as *Oreomunnea* forests are: *Saurauia villosa*, *Clethra conzattiana*, *Fuchsia paniculata*, *Glossostipula concinna*, *Myriocarpa longipes*, *Oreopanax xalapensis*, and *Arachnothryx heteranthera*. Many begonias, ferns, mints, and asters thrive in the open area of the limestone

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trails found in the Cerro Rabón plateau. In the southern portion of the plateau one can find: *Clethra conzattiana*, *Ardisia liebmannii*, and *Hedyosmum mexicanum*.

Preliminary collecting expeditions to the study areas were carried out in September 1999 and the summer of 2000. Intensive collecting began in March 2001 and continued through April 2002. A short expedition to the region was also made in December 2002. In total, 21 general localities distributed in the three study areas were selected, and frequent expeditions were made to these areas (see Appendix 1). Collections were carried out with permits DOO.02.1463 and SGDPA/DGVS/3312 issued by Mexico's Secretariat of Environment and Natural Resources (SEMARNAT, 2010), and additional permits were provided by local authorities. The coordinates of localities were recorded with a GPS system. Specimens were pressed in the field and dried in Huautla de Jiménez, using standard methods (Bridson & Forman, 1992). All of the collections were made by the author with the assistance of local guides, colleagues, and family. The focus, throughout the study, was on collecting fertile vouchers. The identification of specimens began in June 2002 at The University of Texas at Austin. Many specialists contributed to the final identification of specimens (see Acknowledgments).

Species Checklist: The species checklist (Appendix 2) is based entirely on the collections made by the author and collaborators during the present study; collections made by other collectors, whether or not cited in previous published works (Schultes, 1941; Ruiz-Jiménez, 1995; Ruiz-Jiménez et al. 2000, 2012) are not included. The species checklist thus does not attempt to reflect current knowledge of the flora of the study areas but rather the contributions of the current study, the largest undertaken in the Sierra Mazateca. Species are presented alphabetically according to four major categories: Lycophytes, Ferns, Gymnosperms, and Angiosperms. Authors of plant names are cited after Brummit and Powell (1992). The classification of lycophytes follows Christenhusz *et al.* (2011). Ferns are presented following the classification of Smith *et al.* (2006) and Christenhusz *et al.* (2011), which are congruent with each other except for the recognition of Nephrolepidaceae and Athyriaceae, which follows Christenhusz. Gymnosperms are classified according to Christenhusz *et al.* (2011). Angiosperms follow the classification system of the Angiosperm Phylogeny Group IV (APG IV, 2016; Stevens, 2017). Scientific names were confirmed in journals and database systems (The Plant List, 2013; Tropicos.org, 2017; Villaseñor, 2010).

Species names are followed by a description of the plant's general habit, the altitudinal range represented by the specimens collected, and the localities where they were collected (see localities, Appendix 1), with voucher numbers in parentheses. Species are terrestrial unless otherwise stated. The localities of species recognized as endangered, threatened, or protected by Mexican law are not disclosed (SEMARNAT, 2010).

In Mexico, specimens were deposited at the Instituto de Ecología, A.C. (XAL), and the National Autonomous University (MEXU). In the US they were deposited at The University of Texas at Austin (TEX) and the Smithsonian's National Museum of Natural History (US); there are additional partial sets to be distributed. Vouchers sent to specialists for identification may be found in select herbaria in the US (see Acknowledgments).

There are several collections that remain unidentified even to the rank of family. As new determinations are received, and when a critical mass of newly identified material is available, the author will publish an update of the checklist.

Results and Discussion

A total of 1,200 collections made by the author are included in this study. These collections represent 648 species distributed among 136 families and 389 genera (Appendix 2). Twenty-nine of the species are only determined to genus, but are recognized as distinct taxa and counted as individual species.

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TABLE 1. Distribution of taxa according to vascular plant groups.

	Families	Genera	Species
Lycophytes	2	3	9
Ferns	18	39	85
Gymnosperms	4	4	4
Angiosperms	112	343	550
Total	**136**	**389**	**648**

In terms of the number of species they contain, angiosperms represent the largest of the vascular plant groups (84%), followed by ferns (14%), lycophytes (1.5%), and gymnosperms (0.5%) (Table 1).

Based on the records included in this paper, the five largest families of angiosperms found in the Sierra Mazateca, in terms of their number of genera and species, are: Asteraceae, Orchidaceae, Rubiaceae, Melastomataceae, and Piperaceae. The Polypodiaceae is the largest family of ferns. Twenty-one of the recorded species are protected by Mexican law because they are endangered or threatened with extinction, or very close to becoming threatened (SEMARNAT, 2010). These species are noted, without specific locality, in Appendix 2.

The 648 species collected through this study give a positive indication of the biological richness found in the Sierra Mazateca, but further research in herbaria and exploration of the region will surely increase the checklist included in this work. The Sierra de los Frailes and the Cerro Rabón plateau, in particular, merit further study.

A preliminary report of this study available online (Lorea-Hernández & Munn-Estrada, 2005) was one of the data sets used in a study to determine the floristic affinities among Mexican cloud forests. The findings indicate that the flora of the Sierra Mazateca has close affinities to other cloud forests in Oaxaca including: Chinantla, Cerro Salomón, Sierra de Juárez, Tiltepec, El Rincón and Santa Cruz Tepetotutla (Ruiz-Jiménez *et al.*, 2012). This author feels that any further analysis of the data should await completion of the identification of remaining material collected during this study as well as and further fieldwork in the areas mentioned above. In addition to supporting a better understanding of cloud forests in Mexico, the relevance of this study is its potential to contribute to the conservation and sustainable management of vegetation in the Sierra Mazateca, as well as to the development of educational materials for the communities in this region.

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cots; UAMIZ), Vicki Funk (Asteraceae; US), Peter Fritsch (Styracaceae; CAS), Abisaí García Mendoza (Agavaceae; MEXU), James Henrickson (Rosaceae; TEX), Hugh Iltis (Capparaceae; WIS), Rolando Jiménez (Orchidaceae; AMO), Lawrence Kelly (Actinidaceae, Aristolochiaceae, Symplocaceae; NY), Blanca León (Ferns; TEX), Ana Rosa López Ferrari (Monocots; UAMIZ), Francisco Lorea (Lauraceae; XAL), David Lorence (Rubiaceae; PTBG), Lucio Lozada (Apocynaceae/Asclepiadoideae; FCME), James Luteyn (Ericaceae; NY), Andrew McDonald (Convolvulaceae; UT-Rio Grande Valley), John Mickel (Ferns; NY), Juan Carlos Montero (Solanaceae; MEXU), Mike Nee (Solanaceae; NY), Guy Nesom (Asteraceae; TEX), Kevin Nixon (Fagaceae; BH), José Panero (Asteraceae; TEX), Hermilo Quero Rico (Arecaceae; MEXU), Jon Ricketson (Rubiaceae; MO), Lourdes Rico-Arce (Fabaceae; K), Gerardo Salazar (Orchidaceae; MEXU), Elizabeth Skendzic (Poaceae; Kutztown University), Lawrence Skog (Gesneriaceae; US), Mario Sousa Sánchez (Fabaceae; MEXU), Charlotte Taylor (Rubiaceae; MO), Rafael Torres-Colín (Fabaceae; MEXU), Leticia Torres-Colín (Fabaceae; MEXU), Billie Turner (Asteraceae; TEX), Luz María Villareal (Clethraceae; Universidad de Guadalajara), Grady Webster (Euphorbiaceae; DAV), Tom Wendt (various taxa; TEX), Justin Williams (Apocynaceae; Sam Houston State University), and George Yatskievych (Ferns; TEX). Celia del Carmen Zúñiga Ríos Zertuche produced the map of the region, and Carlos E. Arroyo Cruz (CONABIO) provided key information on soils. The following individuals provided academic guidance and logistics support: USA: José Panero, Thomas Wendt, Beryl Simpson, Billie Turner, Robert Nicholson, Gustavo Romero, Ernie Garza; MEXICO: Francisco Lorea, Claudia Gallardo, Mario Sousa Sánchez, Rafael Torres-Colín; SIERRA MAZATECA, OAXACA: Estrada-Pineda Family, Francisco Mendoza, Juárez Family, Cerqueda Family, Renato García. I thank the various municipal presidents and authorities who provided permits to work, the Mazatec families who housed me in different communities, the many individuals who guided me through their land, and my own family which provided key contacts, and guidance in the region, and financial support.

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APPENDIX 1

Collecting localities within the three study areas of the Sierra Mazateca

Study Area Number 1. *Sierra de los Frailes:* (Western portion of the Sierra Mazateca)

Locality 1: *Puerto de la Soledad*
Municipio: Teotitlán de Flores Magón. Location: 29–32 km (18–20 mi) from Teotitlán de Flores Magón, along highway Mex 182 to Huautla de Jiménez. Altitude: 2,300–2,340 m (7,545–7,677 ft) Vegetation: Mature cloud forest presenting slight human disturbance (compared to other localities).

Locality 2: *Plan de Guadalupe–Cerro Pelón*
Municipio: San Jerónimo Tecóatl. Location: Plan de Guadalupe; approximately 40 km (25 mi) from Teotitlán de Flores Magón, along highway Mex 182 to Huautla de Jiménez. Altitude: 2,242–2,742 m (7,355–8,996 ft). Vegetation: Mature cloud forest presenting slight human disturbance (compared to other localities).

Locality 3: *Plan de Guadalupe – San Martín Zoquiapan*
Municipio: San Lucas Zoquiápam. Location: Along the road from Plan de Guadalupe toward Agua Duende. Altitude: 2,167–2,259 m (7,109–7,411ft). Vegetation: Mature cloud forest presenting slight human disturbance (compared to other localities).

Locality 4: *Agua de Cerro – San Pedro de los Encinos*
Municipio: Mazatlán Villa de Flores. Location: Between the communities of Agua de Cerro and San Pedro de los Encinos (SE of Agua Duende, and before Soyaltitla); accessible from the road that connects Plan de Guadalupe with Palo de Marca, and continues towards Huautla de Jiménez. Altitude: 2,020–2,345 m (6,627–7,693 ft). Vegetation: Mature cloud forest that presents a higher degree of disturbance than that found in the previous localities (mainly from wood–cutting for fuel). The forests of this locality have also been disturbed by major fires, but details about their last occurrence is unknown.

Locality 5: *San Juan la Unión Zoquiápan*
Municipio: San Lucas Zoquiápan. Location: Areas surrounding the community of San Juan la Unión. Accessible by the terracería from Huautla de Jiménez to Palo de Marca. Altitude: 2,183–2,333 m (7,162–7,654 ft). Vegetation: Cloud forests highly disturbed by fire in the lower elevations, mature cloud forests in the higher elevations.

Study Area 2. *Huautla–Chilchotla*: (Central portion of the Sierra Mazateca)

Locality 6: *Puente de Fierro*

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Municipio: Huautla de Jiménez. Location: Areas adjacent to the Puente de Fierro (approximately 8 km (5 mi) from Huautla de Jiménez on the road to Teotitlán de Flores Magón), alongside the Petlapa River, and along the *terracería* to Santa María Chilchotla. Altitude: 1,150–1,270 m (3,772– 4,166 ft). Vegetation: Riparian forest along the river.

Locality 7: *Puente de Fierro – San Antonio Eloxochitlán*
Municipio: San Antonio Eloxochitlán. Location: East facing mountain slopes of gorge. Altitude: 1,069–1,450 m (3,507–4,757 ft). Vegetation: Cloud forest disturbed by agricultural activities.

Locality 8: *San Antonio Eloxochitlán – San José Buenavista*
Municipio: San Antonio Eloxochitlán. Location: Locality begins at the bridge on the outskirts of the village of San Antonio Eloxochitlán that leads to the *terracería* to San José Buenavista. Altitude: 1,316–1,436 m (4,317–4,711 ft). Vegetation: Cloud forest and riparian forest disturbed by human activities.

Locality 9: *Huautla de Jiménez – Puente de Fierro*
Municipio: Huautla de Jiménez. Location: Trail between the outskirts of Huautla de Jiménez and the area of Puente de Fierro (see Locality 11). Altitude: 1,229–1,673 m (4,032–5,488 ft). Vegetation: Disturbed cloud forest, secondary vegetation.

Locality 10: *Huautla de Jiménez – Cerro de la Adoración*
Municipio: Huautla de Jiménez. Location: Urban area of Huautla de Jiménez and the adjacent mountain, Cerro de la Adoración. Altitude: 1,650–1,800 m (5,413–5,905 ft) in town area, 1,800–2,150 m (5,905–7,053 ft) in adjacent mountain. Vegetation: Huautla de Jiménez has been inhabited for a very long time and its vegetation has been decimated for the most part. However, throughout the area one can find elements of cloud forest vegetation. The Cerro de la Adoración is considered a sacred place for the Mazatec people of the highlands, and to this day it remains unpopulated. Nevertheless, the vegetation is highly disturbed and only at its very top can one find a small patch of forest composed of oak trees.

Locality 11: *Huautla de Jiménez – Santa Cruz de Juárez*
Municipios: Huautla de Jiménez and Santa Cruz de Juárez. Location: Path between Huautla de Jiménez and the town of Santa Cruz de Juárez. Altitude: 1,554–1,819 m (5,098–5,967 ft). Vegetation: Disturbed cloud forest.

Locality 12: Agua de Fierro – Aguacatitla
Municipio: Huautla de Jiménez. Location: Approximately 3–4 km north of Puente de Fierro, along the *terracería* to the town of Santa María Chilchotla; west facing mountain slopes approaching the town of Aguacatitla. Altitude: 1,188–1,590 m (3,897–5,216 ft). Vegetation: The area is highly disturbed by agricultural activities, but it still maintains elements of cloud forest vegetation. The area had until recently been used to grow coffee, but given the current low profits of this crop, most plantations have been abandoned. This has given way to the regrowth of the natural vegetation. The area presents mosaics of vegetation at different successional stages.

Locality 13: *Agua de Fierro – Santa María Chilchotla*
Municipio: Santa María Chilchotla. Location: 5–7 km (3–4.5 mi) N from Puente de Fierro, along the road to the town of Santa María Chilchotla, and below it, towards the Petlapa River. Altitude: 1,070–1,230 m (3,510–4,035 ft). Vegetation: The area has also been highly disturbed by agricultural activities, mainly coffee plantations. The talus of black limestone that borders some parts of the road is extremely interesting: many locality-restricted species grow on this substrate.

Locality 14: *María Luisa – Agua de Gancho*
Municipio: Santa María Chilchotla. Location: Approximately 8 km (5 mi) N of Puente de Fierro, along the road to the town of Santa María Chilchotla; west facing mountain slopes approaching the community of Agua de Gancho. Altitude: 1,289–1,483 m (4,229–4,865 ft).Vegetation: In the populated parts of this locality the vegetation is highly disturbed by agricultural activities. Because of the presence of pre-Hispanic ruins in the area, it is likely that the area has been heavily impacted by human activities for a long period of time. However, towards the NE of Agua de Gancho, there are forested areas that are peculiar in that their substrate is composed of large limestone blocks.

Locality 15: *Zongolica Chilchotla*
Municipio: San José Tenango. Location: Altitude: 1,709 m (5,606 ft). Vegetation: Highly disturbed by fire. Cloud forest remnants include an *Ulmus* tree that is at least 40 m (131 ft) in height.

Locality 16: *San Miguel Nuevo*
Municipio: San José Tenango. Location: San Miguel Nuevo. Altitude: Approximately 1,100–1,200 m (3,608–3,937 ft). Vegetation: Disturbed cloud forest.

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STUDY AREA 3. *CERRO RABÓN*: (Eastern portion of the Sierra Mazateca)

Locality 17: *San Martín Caballero*
Municipio: San José Tenango. Location: Cerro Rabón plateau. Accessible by paths from San José Tenango or Jalapa de Díaz. Altitude: 1,250–1,645 m (4,101–5,396 ft). Vegetation: Mature cloud forest in non-populated areas; disturbed cloud forest in populated areas.

Locality 18: *San Martín Caballero – Cerro Caballero*
Municipio: San José Tenango. Location: Along paths east of the town of San Martín Caballero. Altitude: 1,360–1,515 m (4,461–4,970 ft). Vegetation: Mosaic of areas with mature cloud forest and areas with disturbed vegetation.

Locality 19: *San Martín Caballero – San José Tenango*
Municipio: San José Tenango. Location: Along paths leading to San Martín Caballero. Altitude: 1,200–1,424 m (3,937–4,672 ft). Vegetation: Mosaic of areas with mature cloud forest and areas with disturbed vegetation.

Locality 20: *Rancho Avendaño – San Martín Caballero*
Municipio: San José Tenango. Location: Path from the Rancho Avendaño, accessible from Cerro Central, toward San Martín Caballero. Altitude: Approximately 1,100–1,450 m (3,608–4,757 ft). Vegetation: Highly disturbed cloud forest.

Locality 21: *Cerro Rabón – Cerro Alamo*
Municipio: San José Tenango. Location: Between the communities of Cerro Rabón and Cerro Alamo. Because of its remoteness from the field base and the costs involved in reaching the site, this locality was not explored in detail. The one trip made to the site revealed that the locality has cloud forests on limestone substrates that deserve more study. Altitude: 1,100–1,555 m (3,608-5,101 ft). Vegetation: Mature cloud forest in non-populated areas; disturbed cloud forest in populated areas.

APPENDIX 2

SPECIES CHECKLIST

See "Methods" for explanation of format and content. Families, genera and species are listed alphabetically by family etc. within the four major groups: Lycophytes, Ferns, Gymnosperms, and Angiosperms.

LYCOPHYTES

LYCOPODIACEAE

Huperzia pringlei (Underw. & F.E.Lloyd) Holub
Epiphytic herb; 2242 m; 2 (*2323*).
Huperzia taxifolia (Sw.) Trevis
Epiphytic herb; 1458–1515 m; 14 (*621A*), 18 (*1775*).
Lycopodium clavatum L.
Herb; 1589–2742 m; 2 (*1719*), 11 (*1006*).
Lycopodium thyoides Humb. & Bonpl. ex Willd.
Herb; 2223–2742 m; 2 (*1714*), 3 (*2077*), 4 (*2282*), 5 (*1628*).

SELAGINELLACEAE

Selaginella guatemalensis Baker
Herb; 1600 m; 17 (*1754*).
Selaginella martensii Spring
Herb; 1530 m; 12 (*1002A*).
Selaginella oaxacana Spring
Herb; 1560 m; 17 (*532*).
Selaginella silvestris Aspl.
Herb; 2321 m; 4 (*2300*).
Selaginella stellata Spring
Herb; 1233 m; 6 (*1115*).

FERNS

ANEMIACEAE

Anemia phyllitidis (L.) Sw.
Herb; 1352 m; 7 (*1963*).

ASPLENIACEAE

Asplenium auriculatum Sw.
Epiphytic herb; 1645 m; 17 (*1759*).
Asplenium cuspidatum Lam.
Epiphytic herb; 1323 m; 7 (*1928*).
Asplenium fragrans Sw.
Epiphytic herb; 1600 m; 17 (*1746*).
Asplenium monanthes L.
Herb; 2300–2340 m; 1 (*1939*), 4 (*1676*), 21 (*762*).
Asplenium nesioticum Maxon
Herb; 7 (*1191*).

ATHYRIACEAE

Diplazium* cf. *urticifolium Christ
Herb; 1180 m; 16 (*705*).

BLECHNACEAE

Blechnum appendiculatum Willd.
Herb; 1352 m; 7 (*1966*).
Blechnum falciforme (Liebm.) C.Chr.
Herb; 2340 m; 4 (*1681*).

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Blechnum polypodioides Raddi
Herb; 1197 m; 12 (*1650*).
Blechnum schiedeanum (Schltdl. ex C.Presl) Hieron.
Herb; 1418 m; 9 (*2368*).
Blechnum wardiae Mickel & Beitel
Herb; 1560 m; 17 (*1730*).
Woodwardia spinulosa M.Martens & Galeotti, vel aff.
Herb; 1426 m; 9 (*2367*).

CYATHEACEAE

Alsophila firma (Baker) D.S.Conant
Tree fern; 2 (*2201*).
Cyathea divergens Kunze
Tree fern; 1233 m; 6 (*1177*).
Cyathea fulva (M.Martens & Galeotti) Fée
Tree fern; 1515–2345 m; 4 (*2287*), 5 (*1620*), 18 (*1783*).
Sphaeropteris horrida (Liebm.) R.M.Tryon
Tree fern; 1300 m; 7 (*1421*).

DICKSONIACEAE

Lophosoria quadripinnata (J.F.Gmel.) C.Chr.
Herb; 2242 m; 2 (*2235*, *2334*).

DRYOPTERIDACEAE

Arachniodes denticulata (Sw.) Ching
Herb; 1600–2345 m; 4 (*2286*), 10 (*1079*), 17 (*1755*).
Dryopteris wallichiana (Spreng.) Hyl.
Herb; 2300–2611 m; 1 (*1481*), 2 (*1609*, *1712*), 4 (*2294*).
Elaphoglossum erinaceum (Fée) T.Moore var. ***erinaceum***
Epiphytic herb; 1560–1645 m; 17 (*536*, *1726*, *1758*).
Elaphoglossum glaucum T.Moore
Epiphytic herb; 2328 m; 4 (*1670*).
Elaphoglossum leebrowniae Mickel
Herb; 2487 m; 2 (*1688*).
Elaphoglossum paleaceum (Hook. & Grev.) Sledge
Epiphytic herb; 2320–2473 m; 1 (*1456*), 2 (*1690*).
Elaphoglossum peltatum (Sw.) Urb.
Epiphytic herb; 1600 m; 17 (*1753*).
Elaphoglossum sartorii (Liebm.) Mickel
Epiphytic herb; 2340–2487 m; 2 (1683), 4 (*1674*, *1677*).
Elaphoglossum squamipes (Hook.) T.Moore
Epiphytic herb; 2611 m; 2 (*1703*).
Elaphoglossum vestitum (Schltdl. & Cham.) T.Moore
Herb; 1197–1515 m; 12 (*1648*), 18 (*1785*).
Elaphoglossum viride (E.Fourn.) C.Chr.
Epiphytic herb; 1600 m; 17 (*1742*).
Phanerophlebia macrosora (Baker) Underw.
Herb; 2300 m; 1 (*1478*).
Phanerophlebia remotispora E.Fourn.
Herb; 1200 m; 7 (*1111*).

EQUISETACEAE

Equisetum myriochaetum Schltdl. & Cham.
Herb; 1200 m; 7 (*1104*).

GLEICHENIACEAE

Sticherus bifidus (Willd.) Ching
Herb; 1632 m; 10 (*802*).
Sticherus palmatus (W.Schaffn. ex E.Fourn.) Copel
Herb; 1418 m; 9 (*2369*).

HYMENOPHYLLACEAE

Hymenophyllum fucoides (Sw.) Sw.
Epiphytic herb; 2611 m; 2 (*1704*).
Hymenophyllum myriocarpum Hook.
Epiphytic herb; 2242 m; 2 (*2328*), *2330*).
Hymenophyllum polyanthos (Sw.) Sw.
Epiphytic herb; 1515 m; 18 (*1776*).
Trichomanes collariatum Bosch
Epiphytic herb; 21 (*761*).

LINDSAEACEAE

Odontosoria schlechtendalii (C.Presl) C.Chr.
Herb; 1460 m; 12 (*1381*).

MARATTIACEAE

Marattia laxa Kunze
Herb; 2345 m; 2 (*2237*), 4 (*2283*).

NEPHROLEPIDACEAE

Nephrolepis cordifolia (L.) C.Presl.
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Nephrolepis pectinata (Willd.) Schott
Herb; 1185–1474 m; 6 (*875*), 14 (*1288*).

POLYPODIACEAE

Campyloneurum amphostenon (Kunze ex Klotzsch) Fée
Epiphytic herb; 1197–2487 m; 2 (*1682*), 12 (*1643*).
Campyloneurum angustifolium (Sw.) Fée
Epiphytic herb; 1184 m; 6 (*922*).
Campyloneurum ensifolium (Willd.) J. Sm.
Herb; 1185–1203 m; 6 (*854*, *931*).

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Campyloneurum serpentinum (Christ) Ching
Herb; 1226 m; 13 (*2142*).

Campyloneurum xalapense Fée
Epiphytic herb; 1197–2313 m; 5 (*1623*), 7 (*1128*, *1932*, *1965*), 12 (*1644*).

Cochlidium linearifolium (Desv.) Maxon ex C.Chr.
Epiphytic herb; 2604 m; 2 (*1695*).

Lellingeria prionodes (Mickel & Beitel) A.R.Sm. & R.C.Moran
Epiphytic herb; 2313 m; 5 (*1631A*).

Melpomene leptostoma (Fée) A.R.Sm. & R.C.Moran
Epiphytic herb; 1515–2313 m; 5 (*1631*), 18 (*1779*).

Niphidium crassifolium (L.) Lellinger
Epiphytic herb; 1184–1560 m; 6 (*921*), 7 (*1129*), 17 (*535*).

Pecluma alfredii (Rosenst.) M.G.Price var. ***cupreolepis*** (A.M.Evans) A.R.Sm.
Herb; 1197–1515 m; 9 (*1038*), 12 (*1649*), 13 (*2148*), 18 (*1790*).

Phlebodium areolatum (Humb. & Bonpl. ex Willd.) J.Sm.
Herb; 1197–1375 m; 6 (*1262*), 12 (*1645*), 13 (*2145*), 19 (*1822*).

Pleopeltis angusta Humb. & Bonpl. ex Willd. var. ***stenoloma*** (Fée) Farw.
Herb; 1197–1226 m; 12 (*1641*), 13 (*2144*).

Pleopeltis crassinervata (Fée) T.Moore
Herb; 1197–1352 m; 7 (*1970*), 8 (*2063*), 9 (*1059*), 12 (*1642*), 13 (*2149*).

Pleopeltis fallax (Schltdl. & Cham.) Mickel & Beitel
Epiphytic herb; 1229 m; 9 (*1033*).

Pleopeltis polylepis (Roem. ex Kunze) T.Moore var. ***interjecta*** (Weath.) E.A.Hooper
Epiphytic herb; 2151–2151 m; 2 (*1693*), 10 (*1088*).

Polypodium echinolepis Fée
Herb; 1226 m; 13 (*2139*).

Polypodium furfuraceum Schltdl. & Cham.
Epiphytic herb; 1226–1352 m; 6 (*1115A*), 7 (*1972*), 13 (*2140*).

Polypodium hartwegianum Hook.
Epiphytic herb; 2611 m; 2 (*1706*).

Polypodium longepinnulatum E.Fourn.
Epiphytic herb; 1645 m; 17 (*1766*).

Polypodium loriceum L.
Herb; 21 (*773*).

Polypodium munchii Christ
Epiphytic herb; 2611–2640 m; 2 (*1160*, *1708*).

Polypodium plebeium Schltdl. & Cham.
Epiphytic herb; 1197–2340 m; 2 (*2347*), 3 (*2095*), 4 (*1679*), 5 (*1622*), 10 (*1082*), 12 (*1653*), 13 (*2178*), 19 (*1834*).

Polypodium plesiosorum Kunze
Epiphytic herb; 1323–2300 m; 1 (*1480*), 7 (*1929*).

Polypodium pleurosorum Kunze ex Mett.
Epiphytic herb; 2313–2328 m; 4 (*1669*), 5 (*1621*).

Polypodium polypodioides (L.) Watt
Herb; 1197–1226 m; 7 (*1192*), 12 (*1638*), 13 (*2150*).

Polypodium puberulum Schltdl. & Cham.
Epiphytic herb; 2300–2340 m; 1 (*1479*), 4 (*1680*).

Terpsichore delicatula (M.Martens & Galeotti) A.R.Sm.
Epiphytic herb; 2333 m; 5 (*1632*).

PTERIDACEAE

Adiantum andicola Liebm.
Herb; 1290–2223 m; 3 (*2072*), 7 (*1408*), 7 (*1969*), 7 (*1408*).

Adiantum capillus-veneris L.
Herb; 1185–1327 m; 6 (*1656*), 8 (*2064*).

Adiantum poiretii Wikstr.
Herb; 1637 m; 11 (*1994*).

Cheilanthes bonariensis (Willd.) Proctor
Herb; 2313 m; 5 (*1634*).

Llavea cordifolia Lag.
Herb; 1185–1266 m; 6 (*814*, *855*).

Mildella fallax (M.Martens & Galeotti) G.L.Nesom
Herb; 1197 m; 12 (*1640*).

Mildella intramarginalis (Kaulf. ex Link) Trevis.
Epiphytic herb; 2242 m; 2 (*2344*).

Myriopteris lendigera (Cav.) J.Sm.
Herb; 2242 m; 2 (*2346*).

Pteris longifolia L.
Herb; 1290 m; 7 (*1413*).

Pteris orizabae M.Martens & Galeotti
Herb; 2345 m; 4 (*2284*).

Pteris podophylla Sw.
Herb; 1197 m; 12 (*826*).

Vittaria graminifolia Kaulf.
Epiphytic herb; 1184–2604 m; 2 (*1696*), 6 (*906*), 17 (*533*, *1745A*).

TECTARIACEAE

Tectaria heracleifolia (Willd.) Underw.
Herb; 1184–1226 m; 6 (*918*), 13 (*2141*).

THELYPTERIDACEAE

Thelypteris atrovirens (C.Chr.) C.F.Reed
Herb; 1637 m; 11 (*1993*).

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Thelypteris concinna (Willd.) Ching
Herb; 1197 m; 12 (*1651*).
Thelypteris paucipinnata (Donn.Sm.) C.F.Reed
Herb; 1200 m; 7 (*1113*).

GYMNOSPERMS

CUPRESSACEAE

Cupressus lusitanica Mill.
Huautla–Chilchotla and Cerro Rabón Areas, specific locality not disclosed; species is protected under Mexican law.

PINACEAE

Pinus patula Schiede ex Schltdl. & Cham.
Tree; 2183–2223 m; 1 (*2231A*), 3 (*2100*), 5 (*1615*).

PODOCARPACEAE

Podocarpus matudae Lundell
Sierra de los Frailes Area, specific locality not disclosed; species is protected under Mexican law.

TAXACEAE

Taxus globosa Schltdl.
Sierra de los Frailes Area, specific locality not disclosed; species is protected under Mexican law.

ANGIOSPERMS

ACANTHACEAE

Aphelandra schiedeana Schltdl. & Cham.
Shrub; 1180–1350 m; 7 (*1505*), 13 (*943*).

Dicliptera sumichrastii Lindau
Herb; 1266 m; 6 (*819*, *1875*).
Justicia aurea Schltdl.
Shrub; 1184–1434 m; 6 (*900*, *1655*), 9 (*1861*).
Justicia fimbriata (Nees) V.A.W.Graham
Shrub; 1180 m; 16 (*713*).
Odontonema callistachyum (Schltdl. & Cham.) Kuntze
Herb; 1185–1226 m; 6 (*869*), 13 (*2152*).
Stenandrium chameranthemoideum Oerst.
Herb; 1250–1560 m; 14 (*969*), 17 (*437, 566, 1720*), 18 (*1773*).
Stenostephanus haematodes (Schltdl.) T.F.Daniel
Shrub; 1185–1560 m; 6 (*2126*), 14 (*954*, *1531*), 17 (*1721*), 19 (*441*).

ACTINIDIACEAE

Saurauia leucocarpa Schltdl.
Tree; 1589 m; 11 (*1007*).
Saurauia pedunculata Hook.
Tree; 1323 m; 8 (*1240*).
Saurauia villosa DC.
Tree; 1513 m; 18 (*1806*).
Saurauia* aff. *villosa DC.
Tree; 1184–1300 m; 6 (*828*, *1428*), 7 (*1410*, *1422*, *1899*).

ADOXACEAE

Viburnum hartwegii Benth
Treel 1262–1424 m; 7 (*1400, 1402*); 19 (*462*).

ALSTROEMERIACEAE

Bomarea acutifolia (Link & Otto) Herb
Woody vine; 1424–1458 m; 14 (*631*), 19 (459), 21 (*746*).

ALTINGIACEAE

Liquidambar styraciflua L.
Tree; 1229–1412 m; 7 (2037), 9 (1066).

AMARANTHACEAE

Alternanthera lanceolata (Benth.) Schinz
Herb; 1185 m; 6 (*2124*), 17 (*435*).
Iresine diffusa Humb. & Bonpl. ex Willd.
Herb; 1185–1637 m; 6 (*834*), 11 (*1995*), 14 (*1494*).
Iresine hebanthoides **Suess**
Shrub; m; 13 (*2183*).

ANACARDIACEAE

Toxicodendron radicans (L.) Kuntze
Woody vine; 1184 m; 6 (*926*).

APIACEAE

Eryngium carlinae F.Delaroche
Herb; 2636 m; 2 (*1347*).
Ottoa oenanthoides Kunth
Herb; 2725 m; 2 (*1154*).
Sanicula liberta Cham. & Schltdl.
Herb; 1350 m; 7 (*1254*), 17 (*565*).

APOCYNACEAE

Alstonia longifolia (A.DC.) Pichon
Tree; 1226 m; 13 (*2165*).
Asclepias curassavica L.
Herb; 1184 m; 6 (*1289*)
Mandevilla oaxacana (A.DC.) Hemsl.
Woody vine; 1226 m; 13 (*1306*).
Matelea velutina (Schltdl.) Woodson
Herb; 1184 m; 6 (*1291*)
Stemmadenia litoralis (Kunth) L.Allorge

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Tree; 1233 m; 6 (*1175*).

ARACEAE

Anthurium lucens Standl.
Herb; 1323–1350 m; 8 (*1298*), 17 (*570*, *571*).

Anthurium podophyllum (Schltdl. & Cham.) Kunth
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.

Monstera deliciosa Liebm.
Herb; 1180–1645 m; 16 (*681*), 17 (*1761*).

Philodendron smithii Engl.
Herb; 1474 m; 14 (*1286*).

Xanthosoma robustum Schott
Herb; 1323 m; 7 (*1923*).

Xanthosoma sagittifolium (L.) Schott
Epiphytic herb; 1600 m; 17 (*1750*).

ARALIACEAE

Dendropanax arboreus (L.) Decne. & Planch.
Tree; 1184–1589 m; 6 (*896*), 11 (*2009*), 13 (*2166*).

Oreopanax capitatus (Jacq.) Decne. & Planch.
Tree; 1323 m; 8 (*1235*).

Oreopanax liebmannii Marchal
Tree; 2321–2335 m; 1 (*1919*, *2229*), 4 (*2297*).

Oreopanax xalapensis (Kunth) Decne. & Planch.
Tree; 1360–2320 m; 1 (*1463*), 18 (*1812*).

ARECACEAE

Chamaedorea oblongata Mart.
Herb; 1323 m; 8 (*1236*).

Chamaedorea oreophila Mart.
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.

Chamaedorea rojasiana Standl. & Steyerm.
Cerro Rabón Area, specific locality not disclosed; species is endangered and protected under Mexican law.

Chamaedorea tepejilote Liebm.
Herb; 1560 m; 17 (*1731*).

Chamaedorea sp.
Herb; 1424–1560 m; 17 (*541*, *542*, *549*), 19 (*488*).

ARISTOLOCHIACEAE

Aristolochia tricaudata Lem.
Shrub; 1069–1375 m; 7 (*1214*, *1250*), 19 (*1824*).

ASPARAGACEAE

Agave ellemeetiana K.Koch subsp. ***ellemeetiana***
Epiphtic; 1233–1460 m; 6 (*1181*), 8 (*1442*), 12 (*1387A*).

Agave obscura Schiede
Epiphtic; 1226 m; 13 (*1308*).

Maianthemum macrophyllum (M.Martens & Galeotti) LaFrankie
Herb; 1100–1200 m; 16 (*663*).

Maianthemum paniculatum (M.Martens & Galeotti) LaFrankie
Epiphytic herb; 1350 m; 17 (*567*).

Maianthemum scilloideum (M.Martens & Galeotti) LaFrankie
Herb; 2300 m; 1 (*1468*).

Yucca sp.
Tree; 1418 m; 9 (*2379*).

ASTERACEAE

Achyrocline sp.
Shrub; 1650 m; 11 (*1991*).

Acmella oppositifolia (Lam.) R.K.Jansen
Herb; 1184–1415 m; 6 (*891*).

Acmella* cf. *oppositifolia (Lam.) R.K.Jansen
Herb; 1250 m; 17 (*412*).

Ageratina glauca (Sch. Bip. ex Klatt) R.M.King & H.Rob
Shrub; 2473–2742 m; 2 (*1613*, *1717*).

Ageratina grandifolia (Regel) R.M.King & H.Rob. (*Ageratina conspicua* (Kunth & Bouché) R.M.King & H.Rob.)
Shrub; 1658 m; 11 (*1987*).

Ageratina isolepis (B.L. Rob.) R.M.King & H.Rob.
Herb; 1412 m; 7 (*2044*).

Ageratina ligustrina (DC.) R.M.King & H.Rob.
Shrub; 1515–2473 m; 1 (*1452*), 2 (*1614*), 4 (*1667*), 18 (*1789*).

Ageratina malacolepis (B.L.Rob.) R.M.King & H.Rob.
Herb; 1458 m; 14 (*993*).

Ageratina mazatecana B.L.Turner
Herb; 1466 m; 14 (*981*).

Ageratina ovilla (Standl. & Steyerm.) R.M.King & H.Rob.
Woody vine; 2335 m; 1 (*1914*).

Ageratina pichinchensis (Kunth) R.M.King & H.Rob.
Herb; 1466 m; 14 (*980*).

Ageratina pringlei (B.L.Rob. & Greenm.) R.M.King & H.Rob.
Herb; 1185–1229 m; 6 (*881*), 9 (*1030*).

Ageratina prunellifolia (Kunth) R.M.King & H.Rob.
Shrub; 2640 m; 2 (*1156*).

Ageratina rubricaulis (Kunth) R.M.King & H.Rob.
Tree; 1203 m; 6 (*930*).

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Ageratina vernalis (Vatke & Kurtz) R.M.King & H.Rob.
Shrub; 1632 m; 10 (*801*).

Ageratum houstonianum Mill.
Herb; 1412–1673 m; 7 (*2046*), 9 (*1856*), 10 (*799*), 11 (*2002*), 14 (*979*).

Aldama dentata La Llave & Lex.
Herb; 1184–1458 m; 6 (*789*), 14 (*1488*).

Alloispermum integrifolium (DC.) H.Rob.
Herb; 1300–1626 m; 7 (*1952*, *2045*), 10 (*804*), 14 (*982*), 14 (*994*).

Archibaccharis schiedeana (Benth.) J.D.Jacks.
Herbaceous vine; 1184 m; 6 (*1430*).

Baccharis conferta Kunth
Shrub; 1709–2725 m; 2 (*1146*, *2213*), 3 (*2088*), 10 (*1093*), 11 (*1014*), 15 (*950*).

Baccharis trinervis (Lam.) Pers.
Shrub; 1229–2335 m; 4 (*2270*), 7 (*1125*), 9 (*1029*, *1060*), 11 (1999).

Bartlettina karwinskiana (DC.) R.M.King & H.Rob.
Shrub; 2223–2300 m; 1 (*1937*), 3 (*2099*).

Bartlettina oresbia (B.L.Rob.) R.M.King & H.Rob.
Shrub; 2223 m; 3 (*2096*).

Bartlettina sordida (Less.) R.M.King & H.Rob.
Shrub; 1185–2220 m; 3 (*2028*), 6 (*868*, *888*), 14 (*966*), 18 (*1796*), 21 (*771*).

Bartlettina tuerckheimii (Klatt) R.M.King & H.Rob.
Shrub; 2325–2328 m; 4 (*2262*).

Bidens triplinervia Kunth
Herb; 2151 m; 10 (*1091*).

Calea urticifolia (Mill.) DC.
Herb; 1458 m; 14 (*985*).

Chionolaena salicifolia (Bertol.) G.L.Nesom
(*Gnaphaliothamnus salicifolius* (Bertol.) G.L. Nesom)
Herb; 1632–2742 m; 2 (*1716*), 3 (*2076*), 10 (*803*).

Cirsium sp.
Herb; 1300 m; 7 (*1951*).

Critonia daleoides DC.
Tree; 1466 m; 14 (*984*).

Critonia hospitalis (B.L.Rob.) R.M.King & H.Rob.
Tree; 1515 m; 18 (*1780*).

Dahlia australis (Sherff) P.D.Sorensen
Herb; 2300 m; 1 (*1467*).

Erechtites valerianifolia (Link ex Wolf) Less. ex DC.
Herb; 1250 m; 17 (*434*).

Erigeron karvinskianus DC.
Herb; 1185–1474 m; 6 (*813*, *885*), 14 (*636*), 19 (*448*), 21 (*748*).

Erigeron longipes DC.
Herb; 1229 m; 9 (*1052*).

Fleischmannia pycnocephala (Less.) R.M.King & H.Rob.
Herb; 1229 m; 9 (*1020*).

Fleischmannia seleriana (B.L.Rob.) R.M.King & H.Rob.
Herb; 1185–1327 m; 6 (*883*, *887*), 8 (*2061*).

Fleischmanniopsis mendax (Standl. & Steyerm.) R.M.King & H.Rob.
Herb; 2 (*2202*).

Galinsoga quadriradiata Ruiz & Pav.
Herb; 21 (*749*).

Gnaphalium sp.
Herb; 1300 m; 7 (*1951A*).

Jaegeria hirta (Lag.) Less.
Herb; 1185–1426 m; 6 (*873*), 9 (*2354*), 19 (*442*), 20 (*584*).

Koanophyllon pittieri (Klatt) R.M.King & H.Rob.
Tree; 1184 m; 6 (*907*).

Lagascea helianthifolia Kunth
Herb; 1229–1261 m; 7 (*1887*), 9 (*1069*).

Leiboldia serrata (D.Don) Gleason
Shrub, 1266 m, 6 (*815*)

Lepidaploa tortuosa (L.) H. Rob.
(*Vernonia tortuosa* (L.) S.F.Blake)
Shrub; 1266 m; 7 (*1890*).

Melampodium divaricatum (Rich. ex Rich.) DC.
Herb; 1184–1458 m; 6 (*1426*), 7 (*1117*), 14 (*1489*), 19 (*405*).

Microspermum debile Benth.
Herb; 2314 m; 2 (*1331*).

Mikania cordifolia (L.f.) Willd.
Woody vine; 1229–1631 m; 9 (*1048*, *1858*).

Mikania pyramidata Donn.Sm.
Woody vine; 1513 m; 18 (*1799*).

Montanoa speciosa (DC.) Sch.Bip. ex C.Koch
Tree; 20 (*574*).

Neomirandea araliifolia (Less.) R.M.King & H.Rob.
Tree; 1185 m; 6 (*1877A*).

Osbertia stolonifera (DC.) Greene
Herb; 2725 m; 2 (*1153*).

Oxylobus oaxacanus S.F.Blake
Herb; 2742 m; 2 (*1717A*).

Pentacalia parasitica (Hemsl.) H.Rob. & Cuatrec.
(*Pentacalia wilburii* H.Rob.)
Shrub; 2604 m; 2 (*1699*).

Perymeniopsis ovalifolia (A. Gray) H.Rob.
Herbaceous vine; 1184 m; 6 (*795*, *1368*).

Perymenium gracile Hemsl.
Shrub; 2203 m; 4 (*1659*).

Piqueria trinervia Cav.

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Herb; 1434–1658 m; 9 (1860), 11 (1983), 14 (975).

Podachaenium eminens (Lag.) Sch.Bip.
Tree; 1285 m; 7 (*1900*).

Roldana jurgensenii (Hemsl.) H.Rob. & Brettell
Shrub; 1278–2335 m; 1 (*1903*), 7 (*1896*, *1921*).

Roldana lanicaulis (Greenm.) H.Rob. & Brettell
Herb; 2223 m; 3 (*2098*).

Roldana mazatecana B.L.Turner
Shrub; 2320 m; 1 (*1947*)

Roldana mexicana (McVaugh) H.Rob. & Brettell
Herb; 2611 m; 2 (*1713*).

Roldana schaffneri (Sch.Bip. ex Klatt) H.Rob. & Brettell
Herb; 1229–1466 m; 9 (*1065*), 14 (*974*).

Schistocarpha bicolor Less.
Herb; 1412–1412 m; 7 (*2042*).

Schistocarpha pedicellata Klatt
Herb; 2327–2604 m; 2 (*1702*), 4 (*1671*).

Senecio callosus Sch.Bip.
Herb; 2223–2335 m; 1 (*1901*), 3 (*2103*), 4 (*1663*).

Senecio salignus DC.
Tree; 2170 m; 3 (*2022*).

Sigesbeckia jorullensis Kunth
Herb; 2242 m; 2 (*2327*).

Sinclairia andromachioides (Less.) Sch.Bip. ex Rydb.
Shrub; 1180–1226 m; 13 (*2128*), 13 (*2169*).

Sinclairia deppeana (Less.) Rydb.
Shrub; 1180–2335 m; 1 (*1913*), 13 (*2127*), 18 (*1798*).

Sinclairia discolor Hook. & Arn.
Shrub; 1185–2204 m; 3 (*2034*), 6 (*871*).

Smallanthus uvedalia (L.) Mack.
Shrub; 1226–1290 m; 7 (*1419*), 13 (*1318*).

Stevia jorullensis Kunth
Herb; 2604 m; 2 (*1701*).

Stevia monardifolia Kunth
Herb; 2604 m; 2 (*1700*).

Tagetes filifolia Lag.
Herb; 1460 m; 12 (*1382*).

Tanacetum parthenium (L.) Sch.Bip.
Herb; 1601 m; 9 (*1171*).

Telanthophora grandifolia (Less.) H.Rob. & Brettell
Shrub; 1184–1360 m; 6 (*879*, *1433*), 18 (*1815*).

Tetrachyron manicatum Schltdl.
Herb; 1180–1709 m; 6 (*807*), 6 (*889*, *1878*), 8 (*2060*), 9 (*1026*), 11 (*1980*), 12 (*1002*), 13 (*942*), 15 (*946*).

Tithonia diversifolia (Hemsl.) A.Gray
Tree; 1266–1266 m; 6 (*808*), 7 (*1889*), 7 (*1889*).

Trigonospermum melampodioides DC.
Herb; 1184–1658 m; 6 (*788*), 6 (*1290*), 9 (*1019*), 9 (*2374*), 11 (*1985*).

Verbesina hypoglauca Sch.Bip. ex Klatt
Shrub; 2242–2611 m; 2 (*1710*, *2338*).

Vernonia arctioides Less.
Tree; 1185–1570 m; 6 (*815*, *886*), 9 (*1866*), 11 (*2011*).

Vernonia heydeana J.M.Coult.
Shrub; 1380 m; 7 (*1974*).

Vernonia jonesii B.L.Turner
Shrub; 1589–1645 m; 11 (*1009*), 17 (*1770*).

Vernonia patens Kunth
Tree; 1300–1415 m; 6 (*2310*), 7 (*1126*).

Viguiera cordata (Hook. & Arn.) D'Arcy
Shrub; 1185 m; 6 (*880*).

Villasenoria orcutti (Greenm.) B.L.Clark
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.

Youngia japonica (L.) DC.
Herb; 21 (*747*).

BALSAMINACEAE

Impatiens walleriana Hook.f.
Herb; 1290 m; 7 (*1416*), 20 (*582*).

BEGONIACEAE

Begonia caroliniifolia Regel
Herb; 1185 m; 6 (*865*, *2112*).

Begonia crassicaulis Lindl.
Herb; 1460 m; 12 (*1390*).

Begonia glabra Aubl.
Herb; 7 (*1185*).

Begonia heracleifolia Schltdl. & Cham.
Herb; 1346 m; 19 (*1840*).

Begonia ludicra A.DC.
Herb; 1474 m; 14 (*1283*).

Begonia manicata Brongn. ex F.Cels
Herb; 1150–1327 m; 6 (*820*, *864*, *1869*, *2109*), 8 (*2056*).

Begonia nelumbiifolia Schltdl. & Cham.
Epiphytic herb; 1203 m; 6 (*934*).

Begonia pustulata Liebm.
Herb; 1180 m; 16 (*674*).

Begonia sartorii Liebm.
Herb; 1323 m; 7 (*1926*).

BERBERIDACEAE

Berberis gracilis Hartw. ex Benth.
(*Berberis gracilis* Hartw. ex Benth. var. *madrensis* Marroq.)

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Tree; 1229 m; 9 (*1018*).

BETULACEAE

Alnus acuminata Kunth subsp. ***arguta*** (Schltdl.) Furlow
Tree; 2151–2340 m; 1 (*1447*, *1911*), 3 (*2019*, *2020*), 10 (*617*, *1076*).

Carpinus tropicalis (Donn.Sm.) Lundell
Sierra de los Frailes and Huautla–Chilchotla Areas, specific locality not disclosed; species is endangered and protected under Mexican law.

BORAGINACEAE

Cynoglossum amabile Stapf & J.R.Drumm.
Herb; 1589 m; 12 (*1179*).

Tournefortia acutiflora M.Martens & Galeotti
Tree; 2220 m; 2 (*2194*), 3 (*2030*).

Wigandia urens (Ruiz & Pav.) Kunth
Tree; 1626 m; 10 (*798*).

BROMELIACEAE

Pitcairnia recurvata (Scheidw.) K.Koch
Epiphytic herb; 1289 m; 14 (*1274*).

Tillandsia butzii Mez
Epiphytic herb; 1474 m; 14 (*970*).

Tillandsia filifolia Schltdl. & Cham.
Epiphytic herb; 1270–1350 m; 6 (*1273A*), 7 (*1257*).

Tillandsia grandis Schltdl.
1474–1589 m; 12 (*1182*), 14 (*958*).

Tillandsia gymnobotrya Baker
Epiphytic herb; 2328 m; 4 (*1660*).

Tillandsia imperialis E. Morren ex Roezl
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.

Tillandsia leiboldiana Schltdl.
Epiphytic herb; 1323–1375 m; 8 (*1237*), 19 (*1829*).

Tillandsia multicaulis Steud.
Epiphytic herb; 1315 m; 12 (*1371*).

Tillandsia punctulata Schltdl. & Cham.
Epiphytic herb; 1375–1515 m; 18 (*1774*), 19 (*1821*).

Tillandsia tricolor Schltdl. & Cham.
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.

BRUNELLIACEAE

Brunellia mexicana Standl.
Tree; 1330 m; 12 (*1374*).

CACTACEAE

Disocactus martianus (Zucc. ex Pfeiff.) Barthlott
(*Aporocactus conzattii* Britton & Rose)
Epiphytic succulent; 2242–2450 m; 2 (*1164*, *2236*).

***Disocactus* sp.**
(*Nopalxochia* sp.)
Epiphytic succulent; 1069–2340 m; 1 (*2226*), 7 (*1245*).

Rhipsalis baccifera (J.S.Muell.) Stearn
Epiphytic succulent; 1184–1185 m; 6 (*1321*, *2122*).

CALCEOLARIACEAE

Calceolaria mexicana Benth.
Herb; 1185–1226 m; 6 (*860*), 13 (*2163*), 16 (*716*).

Calceolaria tripartita Ruiz & Pav.
Herb; 1673 m; 9 (*1857*).

CAMPANULACEAE

Lobelia cardinalis L.
Herb; 1500 m; 17 (*555*), 20 (*401*).

Lobelia laxiflora Kunth
(*Lobelia laxiflora* Kunth subsp. *laxiflora*)
Herb; 1229–1604 m; 9 (*1042*), 11 (*2004*).

Lobelia sartorii Vatke
Herb; 1185–2450 m; 2 (*1162*), 3 (*2091*), 6 (*847*), 6 (*2125*).

Lobelia xalapensis Kunth
Herb; 1226 m; 13 (*2175*).

CANNABACEAE

Trema micrantha (L.) Blume
Tree; 1323 m; 8 (*1228*).

CAPPARACEAE

Capparidastrum mollicellum (Standl.) Cornejo & Iltis
Tree; 1184–1350 m; 6 (*935*), 7 (*1249*).

CAPRIFOLIACEAE

Sambucus sp.
Shrub; 9 (*605*).

Valeriana candolleana Gardner
Herb; 1185–1226 m; 6 (*850*), 13 (*2180*).

Valeriana scandens L.
Herbaceous vine; 1350–1424 m; 17 (*560*), 19 (*467*).

CARYOPHYLLACEAE

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Arenaria lanuginosa (Michx.) Rohrb.
Herb; 1658–2223 m; 3 (*2092*), 11 (*1981*).
Drymaria cordata (L.) Willd. ex Schult.
Herb; 1185 m; 6 (*2105*).

CELASTRACEAE

Celastrus liebmannii Standl.
Shrub; 2321 m; 4 (*2299*).
Maytenus sp.
Tree; 1474 m; 14 (*961*)
Wimmeria bartletti Lundell
Tree; 1226–1352 m; 7 (*1958*), 13 (*2129*, *2130*).
Zinowiewia integerrima Turcz.
Tree; 2167–2220 m; 3 (*2025, 2027*).

CHLORANTHACEAE

Hedyosmum mexicanum C.Cordem.
Tree; 1330–1431 m; 7 (*1243*), 12 (*1376*, *756*), 21 (*782*).

CLETHRACEAE

Clethra conzattiana L.M.González
Tree; 1513–1515 m; 18 (*1781*, *1804, 1817*).
Clethra hartwegii Britton
Tree; 2300–2604 m; 1 (*1460*, *1485*), 2 (*1344*, *1698*).
Clethra lanata M.Martens & Galeotti
Tree; 1100–2223 m; 3 (*2080*), 10 (*1085*), 21 (*752*).

CLUSIACEAE

Clusia guatemalensis Hemsl.
Tree; 1226–1600 m; 9 (*612*), 13 (*2170*), 14 (*973*), 17 (*1747*), 19 (*1841*)
Clusia sp.
Tree; 1226–1474 m; 8 (*1233*), 14 (*514*)

COMMELINACEAE

Matudanthus nanus (M.Martens & Galeotti) D.R.Hunt
Herb; 2400 m; 2 (*1340*).
Tradescantia zanonia (L.) Sw.
Herb; 1184–1474 m; 6 (*916, 2118*), 14 (*639, 963*), 17 (*546*).
Tripogandra purpurascens (Schauer) Handlos
Herb; 1100–1450 m; 20 (*579*).
Tripogandra serrulata (Vahl) Handlos
Herb; 1100–1300 m; 6 (*1266*), 7 (*1127*), 13 (*2146*), 16 (*676*), 17 (*433*).

CONVOLVULACEAE

***Cuscuta* sp.**
Vine; 2314 m; 19 (*1837*).
Dichondra repens J.R.Forst & G.Forst
Herb; 1226 m; 13 (*2143*).
Dichondra sericea Sw.
Herb; 1426 m; 9 (*2360*).
Ipomoea batatas (L.) Lam.
Woody vine; 1233 m; 7 (*1395*).
Ipomoea batatoides Choisy
Herbaceous vine; 1226 m; 13 (*1311*).
Ipomoea cholulensis Kunth
Herbaceous vine; 1229–1458 m; 9 (*1053*), 14 (*1491*).
Ipomoea funis Schltdl. & Cham.
Woody vine; 1380 m; 7 (*1973*).
Ipomoea mairetii Choisy
Herbaceous vine; 1436 m; 8 (*2053*).
Merremia tuberosa (L.) Rendle
Herbaceous vine; 20 (*578*).

CORNACEAE

Cornus excelsa Kunth
Tree; 2 (*2190*).

CRASSULACEAE

Echeveria rosea Lindl.
Succulent; 2328 m; 1 (*1666*).
Kalanchoe pinnata (Lam.) Pers.
Succulent; 1200–1604 m; 6 (*933*), 11 (*2006*).
Sedum sp.
Succulent; 1226 m; 13 (*2181*).

CUCURBITACEAE

Hanburia mexicana Seem.
Herbaceous vine; 1100–1555 m; 21 (*743*).

CUNONIACEAE

Weinmannia pinnata L.
Tree; 1560–2520 m; 2 (*1345*), 4 (*2273*), 17 (*509*).

CYPERACEAE

Cyperus hermaphroditus (Jacq.) Standl.
Herb; 1424 m; 19 (*495*).
Rhynchospora aristata Boeck.
Herb; 1100–1200 m; 16 (*677, 679*).
Rhynchospora radicans (Schltdl. & Cham.) H.Pfeiff
Herb; 1424 m; 19 (*447*).

DIPENTODONTACEAE

Perrottetia longistylis Rose
Tree; 1180–1460 m; 12 (*1392*), 16 (*710*), 19 (*451*).

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ELAEOCARPACEAE

Sloanea cruenta Lundell
Tree; 1505–1600 m; 17 (*504*, *1745*, *1748*), 18 (*1773A*).

ERICACEAE

Arbutus xalapensis Kunth
Tree; 2473 m; 2 (*1689*).

Comarostaphylis discolor (Hook.) Diggs
Sierra de los Frailes Area, specific locality not disclosed; species is protected under Mexican law.

Gaultheria acuminata Schltdl. & Cham.
Tree; 1185 m; 6 (*849*).

Gaultheria erecta Vent.
Tree; 2170–2725 m; 1 (*1904*), 2 (*1145*, *1161*), 3 (*2017*, *2067*), 4 (*2246*, *2288*).

Lyonia squamulosa M.Martens & Galeotti
Shrub; 2151–2325 m; 4 (*2253*), 10 (*616*, *1095*).

Macleania insignis M.Martens & Galeotti
Epiphytic woody vine; 1184–2321 m; 4 (*2290*), 6 (*919*), 13 (*2156*), 14 (*630*), 15 (*947*), 19 (*1830*).

Pernettya prostrata (Cav.) DC.
Shrub; 2725–2742 m; 2 (*1152*, *1718*).

Vaccinium confertum Kunth
Shrub; 2725 m; 2 (*1148*).

Vaccinium leucanthum Schltdl.
Tree; 1737–2325 m; 3 (*2074*), 4 (*2255*, *2291*), 5 (*1619*), 10 (*620*, *1073*), 11 (*1012*).

Vaccinium matudae Lundell
Epiphytic shrub; 2321 m; 4 (*2293*).

EUPHORBIACEAE

Acalypha* cf. *longipes S.Watson
Herb; 1185–1226 m; 6 (*846*, *848*), 13 (*2132*), 16 (*661*).

Alchornea costaricensis Pax & K.Hoffm.
Tree; 1250 m; 6 (*1263*).

Alchornea latifolia Sw.
Tree; 1070–1415 m; 6 (*2318*), 9 (*1041*), 12 (*996*), 13 (1213).

Croton draco Schltdl.
Tree; 6 (*608*), 7 (*1888*).

Euphorbia nutans Lag.
Herb; 1229 m; 9 (*1045*).

Euphorbia xalapensis Kunth
Herb; 1226 m; 13 (*1363*, *2138*).

Gymnanthes riparia (Schltdl.) Klotzsch
Tree; 1226 m; 13 (*2159*).

FABACEAE

Calliandra houstoniana (Mill.) Standl.
Shrub; 1184 m; 6 (*1431*).

Canavalia glabra (M.Martens & Galeotti) J.D.Sauer
Herbaceous vine; 1290 m; 7 (*1409*).

Centrosema sp.
Herbaceous vine; 1262 m; 7 (*1399*).

Cojoba arborea (L.) Britton & Rose
Tree; 1474 m; 14 (*962*).

Crotalaria sp.
Tree; 1300 m; 7 (*1954*).

Desmodium helleri Peyr.
Herbaceous vine; 1185–1278 m; 6 (*831*, *2114*), 7 (*1898*).

Desmodium intortum (Mill.) Urb.
Herbaceous vine; 1233 m; 7 (*1398*).

Desmodium strobilaceum Schltdl.
Herb; 1233 m; 7 (*1397*).

Erythrina sp.
Tree; 7 (*1207*).

Indigofera thibaudiana DC.
Tree; 1233 m; 7 (*1396*).

Inga acrocephala Steud.
Tree; 1320 m; 7 (*1510*).

Inga tuerckeimii Pittier
Tree; 1315 m; 12 (*1372*).

Inga vera Willd.
Tree; 1229 m; 9 (*1021*).

Leucaena diversifolia (Schltdl.) Benth.
Tree; 1570 m; 11 (*2013*).

Lupinus sp.
Shrub; 2203 m; 4 (*1658*).

Lysiloma auritum (Schltdl.) Benth.
Tree; 1320 m; 8 (*1440*).

Mimosa albida Humb. & Bonpl. ex Willd.
Shrub; 1270 m; 6 (*1270*).

Phaseolus chiapasanus Piper
Woody vine; 1290 m; 7 (*1415*).

Phaseolus glabellus Piper
Woody vine; 1184–1290 m; 6 (*1551*), 7 (*1414*).

Senna pallida (Vahl) H.S.Irwin & Barneby var. ***trichocraspedon*** (Sandwith) H.S.Irwin & Barneby
Tree; 1233–1320 m; 7 (*1393*), 8 (*1437*).

FAGACEAE

Quercus candicans Née
Tree; 1300 m; 7 (*1420*).

Quercus corrugata Hook.
Tree; 2300 m; 1 (*1471*).

Quercus* aff. *corrugata Hook.
Tree; 2340 m; 4 (*1675*).

Quercus depressa Bonpl.

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Shrub; 2725 m; 2 (*1150*).

Quercus elliptica Née
Tree; 1930 m; 10 (*615*).

Quercus eugeniifolia Liebm.
Tree; 7 (*1189*).

Quercus lancifolia Schltdl. & Cham.
Tree; 1300 m; 7 (*1141*).

Quercus ocoteifolia Liebm.
Tree; 1450–2450 m; 1 (*1450*), 7 (*1434*), 12 (*1391*).

Quercus* aff. *ocoteifolia Liebm.
Tree; 1184 m; 6 (*920*).

Quercus polymorpha Schltdl. & Cham.
Tree; 1320–1320 m; 7 (*1187*), 8 (*1438*, *1441*).

Quercus sartorii Liebm.
Tree; 1229–1250 m; 6 (*1268*), 9 (*1043*).

Quercus scytophylla Liebm.
Tree; 2320 m; 1 (*1457*).

GARRYACEAE

Garrya laurifolia Hartw. ex Benth.
Shrub; 2223–2223 m; 3 (*2086*, *2087*).

Garrya* aff. *laurifolia Hartw. ex Benth.
Tree; 1570 m; 11 (*2012*).

GENTIANACEAE

Lisianthius nigrescens Schltdl. & Cham.
Herb; 1226 m; 13 (*1307*).

Lisianthius quichensis Donn.Sm.
Shrub; 1275–1709 m; 7 (*1893*), 14 (*977*), 15 (*945*).

GERANIACEAE

Geranium sp.
Herb; 2242 m; 2 (*2343*).

GESNERIACEAE

Achimenes grandiflora (Schiede) DC.
Herb; 1184 m; 6 (*1369*).

Columnea schiedeana Schltdl.
Epiphytic woody vine; 1070–1226 m; 6 (*929*), 13 (*1211*), 13 (*2137*).

Moussonia deppeana (Schltdl. & Cham.) Klotzsch ex Hanst.
Shrub; 1180–2328 m; 3 (*2079*), 4 (*1661*), 5 (*1624*), 7 (*2048*), 16 (*658*), 17 (*431*), 19 (*1846*), 20 (*402*).

Smithiantha multiflora (M.Martens & Galeotti) Fritsch
Herb; 1184–1226 m; 6 (*1370*), 13 (*1361*), 20 (*400*).

HELICONIACEAE

Heliconia tortuosa Griggs
Herb; 1100–1200; 16 (*673*).

HYPERICACEAE

Hypericum sp.
Herb; 1424 m; 19 (*449*).

Vismia baccifera (L.) Triana & Planch.
Tree; 1250 m; 17 (*430*).

HYPOXIDACEAE

Hypoxis decumbens L.
Herb, 1185–1424 m; 6 (*2107*), 19 (*446*).

IRIDACEAE

Crocosmia* × *crocosmiiflora (Lemoine) N.E.Br.
Herb, 1100–1850 m, 10 (*613*), 20 (*404*).

JUGLANDACEAE

Juglans mollis Engelm.
Tree; 1226–1589 m; 12 (*1180*), 13 (*2187*).

Oreomunnea mexicana (Standl.) J.F.Leroy
Tree; 1560 m; 17 (508).

LAMIACEAE

Cornutia pyramidata L.
Tree; 1323–1408 m; 8 (*1210*, *1297*).

Holmskioldia sanguinea Retz.
Herb; 1180 m; 16 (*703*).

Hyptis lantanifolia Poit.
Herb; 1229 m; 9 (*1323*).

Hyptis mutabilis (Rich.) Briq.
Herb; 1184–1458 m; 6 (*796*), 14 (*1490*), 19 (*407*).

Salvia sp.
Herb; 1229–1460 m; 7 (*1123*), 9 (*1057*), 12 (*1383*).

Scutellaria sp.
Herb; 2400 m; 2 (*1341*).

Stachys sp.
Herb; 2151–2640 m; 2 (*1157*), 10 (*1087*).

LAURACEAE

Cinnamomum effusum (Meisn.) Kosterm.
Tree; 1184 m; 1 (*2224*), 6 (923).

Damburneya salicifolia (Kunth) Trofimov & Rohwer
Tree; 1233 m; 6 (*1097*).

Litsea glaucescens Kunth
Tree; 1185 m; 6 (*853*).

Ocotea bernoulliana Mez
Tree; 1184–1323 m; 6 (*911*), 7 (*1933*).

Ocotea betazensis (Mez) van der Werff
Tree; 1404–2335 m; 1 (*1912*, *2222*), 2 (*2212*, *2238*), 19 (*1839*).

Ocotea disjuncta Lorea-Hern.
Tree; 1 (*2217*).

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Persea americana Mill.
Tree; 1589–1673 m; 9 (*1853*), 11 (*2008*).
Persea pallescens (Mez) Lorea-Hern.
Shrub; 2170 m; 3 (*2018*).
Persea schiedeana Nees
Tree; 1180–1375 m; 13 (*940*), 19 (*1820*).

LENTIBULARIACEAE

Pinguicula macrophylla Kunth
Herb; 1229 m; 9 (*1070*), 10 (*614*).

LINACEAE

Linum nelsonii Rose
Herb; 1185 m; 6 (*856*).

LORANTHACEAE

Psittacanthus ramiflorus (Moc. & Sessé ex DC.) G.Don
Shrub; 1474 m; 14 (*648*).

LYTHRACEAE

Cuphea sp.
Herb; 1185 m; 6 (*835*).

MAGNOLIACEAE

Magnolia dealbata Zucc.
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Magnolia schiedeana Schltdl.
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.

MALPIGHIACEAE

Bunchosia lindeniana A.Juss. *sens. lat*.
Shrub; 1360 m; 18 (*1813*), 21 (*766*)

MALVACEAE

Anoda cristata (L.) Schltdl.
Herb; 1185 m; 6 (*2113*), 20 (*581*).
Anoda* cf. *cristata (L.) Schltdl.
Herb; 1184 m; 6 (*915*).
Hampea integerrima Schltdl.
Tree; 1460 m; 12 (*1380*).
Heliocarpus americanus L.
Tree; 1342–1380 m; 7 (*1955*), 9 (*1864*).
Heliocarpus appendiculatus Turcz
Tree; 1233–1513 m; 6 (*812, 818*), 7 (*1883*), 9 (*1863*), 18 (*1809*), 19 (*1842*).
Heliocarpus sp.
Tree; 1275 m; 7 (*1895*).
Malvaviscus achanioides (Turcz.) Fryxell
Shrub; 1424 m; 19 (*472*).
Malvaviscus arboreus Cav.
Herb; 1180 m; 16 (*695*).
Pavonia schiedeana Steud.
Herb; 1424–1560 m; 17 (*539*), 19 (*469*).
Pavonia uniflora (Sessé & Moc.) Fryxell
Shrub; 1226 m; 13 (*1308A*).
Sida glabra Mill.
Herb; 1300 m; 7 (*1142*).
Sida rhombifolia L.
Herb; 1185–1229 m; 6 (*2111*), 9 (*1322*), 16 (*694*).
Trichospermum galeottii (Turcz.) Kosterm.
Tree; 1180 m; 16 (*717*)
Triumfetta bogotensis DC.
Herb; 1184–1424 m; 6 (*1433B*), 17 (*563*), 19 (*468*)
Triumfetta grandiflora Vahl
Tree; 1180 m; 13 (*941*)

MARCGRAVIACEAE

Marcgravia stonei Utley
Shrub; 1424–1560 m; 17 (*531*), 19 (*463*).

MELASTOMATACEAE

Arthrostemma ciliatum Pav. ex D.Don
Herb; 1458 m; 14 (*989*).
Centradenia grandifolia (Schltdl.) Endl.
Herb; 1474 m; 14 (*1278*).
Conostegia arborea Steud.
Tree; 1589 m; 11 (*1004*).
Conostegia xalapensis (Bonpl.) D.Don ex DC.
Tree; 1458 m; 14 (*990*).
Heterocentron subtriplinervium (Link & Otto) A.Braun & C.D.Bouché
Shrub; 1250 m; 6 (*1265*).
Miconia anisotricha (Schltdl.) Triana
Shrub; 2223–2300 m; 3 (*2093*).
Miconia costaricensis Cogn.
Shrub; 1645 m; 17 (*1756*).
Miconia glaberrima (Schltdl.) Naudin
Tree; 1330–1381 m; 12 (*1375*).
Miconia globulifera Naudin
Shrub; 1381 m; 12 (*997*).
Miconia hemenostigma Naudin
Tree; 2151–2300 m; 1 (*1476*), 3 (*2068*), 10 (*1077*), 10 (*1094*).
Miconia lonchophylla Naudin
Tree; 1645 m; 17 (*1765*).
Miconia mazatecana de Santiago
Tree; 1709 m; 15 (*944*).

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Miconia sylvatica (Schltdl.) Naudin
Shrub; 1229 m; 9 (*1049*).
Monochaetum floribundum (Schltdl.) Naudin
Shrub; 1200–1424 m; 9 (*2370*), 19 (*1832*, *1835*, *1847*).
Tibouchina longifolia (Vahl) Baill
Shrub; 1604 m; 11 (*2005*).
Tibouchina scabriuscula (Schltdl.) Cogn.
Shrub; 2223 m; 3 (*2084*).
Topobea laevigata (D.Don) Naudin
Tree; 1184–1513 m; 6 (*903*, *869A*), 18 (*1807*).

MELIACEAE

Trichilia havanensis Jacq.
Tree; 1185–1637 m; 2 (*2239*), 6 (*837*, *2051*), 11 (*1997*).

MENISPERMACEAE

Cissampelos pareira L.
Woody vine; 1424 m; 19 (*487*).

METTHENIUSACEAE

Oecopetalum mexicanum Greenm. & C.H.Thomps.
Tree; 1184 m; 6 (*910*).

MONIMIACEAE

Mollinedia viridiflora Tul.
Tree; 1184–1474 m; 6 (*909*, *912*), 14 (*1280*).

MORACEAE

***Ficus* sp.**
Tree; 1270–1350 m; 6 (*1269*), 7 (*1258*).
Trophis mexicana (Liebm.) Bureau
Herb; 1250–1300 m; 17 (*411*), 7 (*1131*).

MYRTACEAE

***Eugenia* sp.**
Tree; 1184 m; 6 (*899*).
Ugni myricoides (Kunth) O.Berg
Tree; 2611 m; 2 (*1705*).

NYCTAGINACEAE

Mirabilis longiflora L.
Herb; 1320 m; 8 (*1439*).

OLEACEAE

Osmanthus americanus (L.) A.Gray
Tree; 2302–2340 m; 1 (*1454*, *1465*).

ONAGRACEAE

Fuchsia arborescens Sims
Tree; 1483 m; 14 (*1540*).
Fuchsia microphylla Kunth
Shrub; 2325–2640 m; 2 (*1159*), 4 (*1662*, *2256*).
Fuchsia paniculata Lindl.
Tree; 1513 m; 18 (*1808*), 21 (*755*).
Lopezia racemosa Cav.
Herb; 1185–1658 m; 6 (*840*, *2120*), 11 (*1984*), 17 (*421*), 19 (*471*).

ORCHIDACEAE

Aulosepalum pyramidale (Lindl.) M.A.Dix & M.W.Dix
Terrestrial; 1226 m; 13 (*2182*).
Beloglottis costaricensis (Rchb.f.) Schltr.
Epiphytic herb; 1200 m; 7 (*1098*).
Brassia verrucosa Lindl.
Epiphytic herb; 1450 m; 7 (*1199*).

Calanthe calanthoides (A.Rich. & Galeotti) Hamer & Garay
Terrestrial; 1474 m; 14 (*632*).
Campylocentrum schiedei (Rchb.f.) Benth ex Hemsl.
Epiphytic herb; 1184–1200 m; 6 (*793*), 7 (*1110*).
Coelia macrostachya Lindl.
Epiphytic herb; 21 (*764*).
Coelia triptera (Sm.) G.Don ex Steud.
Epiphytic herb; 1226 m; 13 (*2147*).
Comparettia falcata Poepp. & Endl.
Epiphytic herb; 1474 m; 9 (*607*), 14 (*633*).
Dichaea glauca (Sw.) Lindl.
Epiphytic herb; 7 (*1200*).
Dichaea muricatoides Hamer & Garay
Epiphytic herb; 1180 m; 16 (*666*).
Dichaea suaveolens Kraenzl.
Epiphytic herb; 1474 m; 14 (*1287*).
Elleanthus cynarocephalus (Rchb.f.) Rchb.f.
Epiphytic herb; 1180–1424 m; 16 (*659*), 19 (*1850*).
Epidendrum laucheanum Bonhof ex Rolfe
Epiphytic herb; 21 (*744*).
Epidendrum polyanthum Lindl.
Epiphytic herb; 1458 m; 14 (*622*).
Epidendrum* cf. *polyanthum Lindl.
Epiphytic herb; 1474 m; 14 (*1287A*).
Epidendrum radicans Pav. ex Lindl.
Epiphytic herb; 1229–1380 m; 7 (*1975*), 9 (*1055*).
Epidendrum ramosum Jacq.
Epiphytic herb; 1424 m; 19 (*473*).
Habenaria* cf. *distans Griseb.
Terrestrial; 1250 m; 17 (*427*).
Isochilus oaxacanus Salazar & Soto Arenas
Epiphytic herb; 2450 m; 2 (*1163*).

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Jacquiniella leucomelana (Rchb.f.) Schltr.
Epiphytic herb; 1560 m; 17 (*543*).
Lepanthes disticha Garay & R.E.Schult.
Epiphytic herb; 1100–1555 m; 21 (*745*).
Lepanthes rekoi R.E.Schult.
Epiphytic herb; 2242 m; 2 (*2322*).
Lycaste aromatica (Graham) Lindl.
Epiphytic herb; 1069 m; 7 (*1218*).
Malaxis histionantha (Link) Garay & Dunst.
Epiphytic herb; 1350 m; 17 (*492*).
Maxillaria cucullata Lindl.
Epiphytic herb; 21 (*763*).
Maxillaria densa Lindl.
Epiphytic herb; 1226–1352 m; 7 (*1959*), 13 (*2158*).
Maxillaria variabilis Bateman ex Lindl.
Epiphytic herb; 1226–1226 m; 13 (*2155*), 21 (*751*).
Nidema boothii (Lindl.) Schltr.
Epiphytic herb; 1226–1352 m; 6 (*904*), 7 (*1960*), 13 (*2167*).
Oestlundia luteorosea (A.Rich. & Galeotti) W.E.Higgins
Epiphytic herb; 1240 m; 6 (*1261*).
Platanthera vulcanica Lindl.
(*Platanthera limosa* Lindl.)
Terrestrial; 2313–2742 m; 2 (*1715*), 5 (*1627*).
Pleurothallis cardiothallis Rchb.f.
Epiphytic herb; 1424–1560 m; 17 (*1733*), 19 (*465*).
Prosthechea cochleata (L.) W.E.Higgins
Epiphytic herb; 1069–1458 m; 7 (*1217*, *1972A*), 14 (*627*).
Prosthechea ochracea (Lindl.) W.E.Higgins
Epiphytic herb; 7 (*1198*).
Prosthechea pseudopygmaea (Finet) W.E.Higgins
Epiphytic herb; 1424–1474 m; 14 (*645*), 19 (*439*).
Prosthechea varicosa (Bateman ex Lindl.) W.E.Higgins
Epiphytic herb; 2313–2473 m; 2 (*1687*), 5 (*1630*).
Prosthechea vitellina (Lindl.) W.E.Higgins
Sierra de los Frailes Area, specific locality not disclosed; species is protected under Mexican law.
Rhynchostele beloglossa (Rchb.f.) Dressler & N.H.Williams
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Rhynchostele cordata (Lindl.) Soto Arenas & Salazar
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Rhynchostele rossii (Lindl.) Soto Arenas & Salazar
Sierra de los Frailes Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Sobralia macrantha Lindl.
Terrestrial; 1229–1673 m; 9 (*611*).
Stanhopea tigrina Bateman ex Lindl.
Huautla–Chilchotla Area, specific locality not disclosed; species is endangered and protected under Mexican law.
Stelis argentata Lindl.
(*Stelis endresii* Rchb.f)
Epiphytic herb; 1184–1474 m; 6 (*654A*), 14 (*644*).
Stelis cobanensis (Schltr.) Pridgeon & M.W.Chase
Huautla–Chilchotla Area, specific locality not disclosed; species is protected under Mexican law.
Stelis ornata (Rchb.f.) Pridgeon & M.W.Chase
Epiphytic herb; 1184 m; 6 (*792*).
Stelis purpurascens A.Rich. & Galeotti
Epiphytic herb; 1150–1226 m; 6 (*1872*), 13 (*2157*).
Stelis rubens Schltr.
Epiphytic herb; 1184 m; 6 (*654*).
Stelis veracrucensis Solano
Epiphytic herb; 2151 m; 10 (*1081*).
Trichocentrum pachyphyllum (Hook.) R.Jiménez & Carnevali
Epiphytic herb; 1327 m; 8 (*2055*).

OROBANCHACEAE

Castilleja integrifolia L.f.
Shrub; 1819 m; 2 (*2192*), 11 (*1015*).
Conopholis alpina Liebm.
Herb; 2223–2345 m; 1 (*1941*), 2 (*2208*), 3 (*2071*), 4 (*2274*).
Lamourouxia dasyantha (Cham. & Schltdl.) W.R.Ernst
Herb; 1226 m; 13 (*1317*).
Lamourouxia xalapensis Kunth
Herb; 2328 m; 4 (*1664*).
Seymeria mazatecana B.L. Turner
Herb; 2640 m; 2 (1351).

OXALIDACEAE

Oxalis latifolia Kunth
Herb; 2369 m; 2 (*1338*).

PAPAVERACEAE

Bocconia frutescens L.
Tree; 1290 m; 7 (*1418*).

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PASSIFLORACEAE

Passiflora sp.
Woody vine; 1100–1426 m; 1 (*2257*), 7 (*1248*, *1403*, *1411*, *1423*), 9 (*2351*), 16 (*699*).

PENTAPHYLACACEAE

Cleyera integrifolia (Benth.) Choisy
Tree; 2320–2340 m; 1 (*1449*, *1944*).
Ternstroemia tepezapote Schltdl. & Cham.
Tree; 2167–2640 m; 1 (*1455*, *1945*), 2 (*1332*, *1348*), 3 (*2023*, *2078*), 4 (*2295*), 5 (*1618*).

PHYLLANTHACEAE

Phyllanthus niruri L.
Herb; 1250–1290 m; 7 (*1407*), 17 (*432*).
Phyllanthus aff. ***purpusii*** Brandegee
Tree; 1560–1645 m; 17 (*520*, *1764*).

PHYLLONOMACEAE

Phyllonoma laticuspis (Turcz.) Engl.
Tree; 2151–2340 m; 1 (*1448*), 2 (*2215*), 10 (*1080*).

PHYTOLACCACEAE

Phytolacca rugosa A.Braun & C.D.Bouché
Shrub; 2151 m; 10 (*1086*).

PICRAMNIACEAE

Picramnia antidesma Sw.
Tree; 1323–1375 m; 7 (*1927*), 19 (*1831*).

PIPERACEAE

Peperomia angustata Kunth
Herb; 1150 m; 6 (*1871*).
Peperomia dendrophila Schltdl. & Cham.
Herb; 1184–1300 m; 6 (*859*, *925*), 7 (*1130*, *1111A*).
Peperomia galioides Kunth
Epiphytic herb; 2328–2487 m; 2 (*1684*), 4 (*1665*).
Peperomia hernandiifolia (Vahl) A.Dietr.
Herb; 1600 m; 17 (*1744*).
Peperomia liebmannii C.DC.
Herb; 1460 m; 12 (*1384*).
Peperomia magnoliifolia (Jacq.) A.Dietr.
Herb; 1460–1560 m; 12 (*1385*), 17 (*1737*).
Peperomia obtusifolia (L.) A.Dietr.
Herb; 16 (*684*).
Peperomia rotundifolia (L.) Kunth
Epiphytic herb; 1233 m; 6 (*1176*).
Peperomia tenerrima Schltdl. & Cham.
Epiphytic herb; 2220 m; 2 (*2206*), 3 (*2029*).
Peperomia tetraphylla (G.Forst.) Hook. & Arn.
Epiphytic herb; 1226–1645 m; 11 (*1008*), 13 (*2177*), 17 (*1768*), 18 (*1778*).
Piper amalago L.
Shrub; 1184–1327 m; 6 (*901*), 8 (*2058*), 9 (*1062*), 16 (*685*).
Piper hispidum Sw.
Shrub; 1229–1515 m; 9 (*1058*), 18 (*1786*).
Piper martensianum C.DC.
Shrub; 1184 m; 6 (*913*).
Piper obliquum Ruíz & Pav.
Tree; 1474 m; 14 (*1279*).
Piper umbellatum L.
Herb; 1560 m; 17 (*547*).
Piper yzabalanum C.DC. ex Donn.Sm.
Shrub; 1184–1424 m; 6 (*995*), 7 (*1920*), 19 (*476*).

PLANTAGINACEAE

Lophospermum erubescens D.Don
Herb; 1290–1458 m; 7 (*1190*, *1412*), 8 (*1238*), 14 (*629*).
Plantago australis Lam. subsp. ***hirtella*** (Kunth) Rahn
Herb; 1185–1458 m; 6 (*2106*), 14 (*991*), 17 (*413*).

PLATANACEAE

Platanus mexicana Moric. var. ***mexicana***
Tree; 1185–1412 m; 6 (*890*, *2308*), 7 (*2039*), 8 (*719*).

POACEAE

Agrostis semiverticillata (Forssk.) C.Chr.

(*Polypogon viridis* (Gouan) Breistr.)
Herb; 1226 m; 13 (*2161*).
Arundinella deppeana Ness
Herb; 1185–1300 m; 6 (*844*, *851*, *878*, *2119*), 7 (*1144*).
Cynodon dactylon (L.) Pers.
Herb; 1229 m; 9 (*1051*).
Dichanthelium laxiflorum (Lam.) Gould
Herb; 2223 m; 3 (*2085*).
Isachne arundinacea (Sw.) Griseb.
Herbaceous vine; 1229–1466 m; 7 (*1922*), 9 (*1027*), 14 (*976*).
Lasiacis divaricata (L.) Hitchc.
Herb; 21 (*772*).
Lasiacis procerrima (Hack.) Hitchc.
Herb; 1300 m; 7 (*1424*).
Muhlenbergia sp.
Herb; 1197 m; 12 (*1637*).

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Oplismenus hirtellus (L.) P.Beauv. subsp. ***setarius*** (Lam.) Mez ex Ekman
Herb; 1424 m; 19 (*444*).
Otatea aztecorum (McClure & E.W.Sm.) C.E. Calderón ex Soderstr.
Herb; 2333 m; 5 (*1629*).
Paspalum convexum Humb. & Bonpl. ex Flüggé
Herb; 1229 m; 9 (*1054*).
Paspalum langei (E.Fourn.) Nash
Herb; 1184 m; 6 (*1365*).
Sporobolus indicus (L.) R.Br.
Herb; 1229 m; 9 (*1032*).

POLEMONIACEAE

Cobaea biaurita Standl.
Herbaceous vine; 21 (*783*).

POLYGALACEAE

Monnina xalapensis Kunth
Shrub; 2151–2313 m; 3 (*2075*), 5 (*1625*), 10 (*1083*).
Polygala paniculata L.
Herb; 1233–1424 m; 7 (*1394*), 19 (*445*).
Securidaca diversifolia (L.) S.F.Blake
Shrub; 1323 m; 8 (*1300*).

POLYGONACEAE

Coccoloba hirtella Lundell
Tree; 1226–1515 m; 13 (*2174*), 14 (*964*), 18 (*1772*).

PRIMULACEAE

Anagallis arvensis L.
Herb; 1185 m; 6 (845).
Ardisia liebmannii Oerst.
Shrub; 1474–1645 m; 14 (*650*, *1538*), 17 (*517*, *1760*).
Ardisia verapazensis Donn.Sm.
Tree; 1323–1474 m; 8 (*1301*), 14 (*640*, *1282*), 19 (*454*).
Myrsine coriacea (Sw.) R.Br. ex Roem. & Schult.
Tree; 1229 m; 9 (606), 9 (*1050*).
Myrsine juergensenii (Mez) Ricketson & Pipoly
Tree; 2223–2320 m; 1 (*1459*), 2 (*2198*), 3 (*2082*).
Parathesis leptopa Lundell
Tree; 1505 m; 17 (*503*).
Parathesis macronema Bullock
1320–1350 m; 7 (*1259, 1508*), 17 (497).
Parathesis melanosticta (Schtdl.) Hemsl.
Tree; 1320–2335 m; 1 (*1472*, *1918*, *1938*), 2 (*2234*), 3 (*2073*), 17 (*1727*).
Parathesis rekoi Standl.
Tree; 2300 m; 1 (1477).

RANUNCULACEAE

Anemone mexicana Kunth
Herb; 21 (*780*).
Clematis grossa Benth.
Woody vine; 1323–1372 m; 7 (*1924*), 9 (*1862*).
Ranunculus petiolaris Humb., Bonpl. & Kunth ex DC.
Herb; 1601 m; 9 (*1166*).

RHAMNACEAE

Frangula capreifolia (Schltdl.) Grubov
Tree; 1229–2345 m; 4 (*2280*), 6 (*1264*), 9 (*1067*), 12 (*1000*), 12 (*1183*).

ROSACEAE

Alchemilla pectinata Kunth
Herb; 2640 m; 2 (*1158*).
Cercocarpus pringlei (C.K.Schneid.) Rydb.
Tree; 1270 m; 6 (*1271*), 7 (*1203*).
Prunus brachybotrya Zucc.
Tree; 1571–2320 m; 1 (*1943*), 11 (*2001*).
Prunus lundelliana Standl.
Tree; 1323 m; 8 (*1241*).
Prunus matudae Lundell
Tree; 1 (*2219*).
Rubus fagifolius Schltdl. & Cham.
Woody vine; 1513 m; 18 (*1802*).
Rubus glaucus Benth.
Woody vine; 1513 m; 18 (*1805*).
Rubus sapidus Schltdl.
Woody vine; 1229 m; 9 (*1056*).

RUBIACEAE

Arachnothryx heteranthera (Brand.) Borhidi
Tree; 1515 m; 18 (*1771*).
Arachnothryx ovadensis (Lundell) Borhidi
Shrub; 6 (*1294*), 18 (*1794*)
Bouvardia ternifolia (Cav.) Schltdl.
Herb; 1229 m; 9 (*1063*).
Chiococca alba (L.) Hitchc.
Herbaceous vine; 1180 m; 16 (*670*).
Chiococca phaenostemon Schltdl.
Tree; 1 (*2227*).
Chomelia brachypoda Donn.Sm.
Tree; 1300 m; 7 (*1137*).
Crusea calocephala DC.
Herb; 1180–1601 m; 9 (*1168*, *2357*), 14 (*988*), 16 (*692*), 17 (*416*).
Crusea coccinea DC.

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Herb; 2151–2325 m; 4 (*2258*), 10 (*1078*).

Deppea erythrorhiza Schltdl. & Cham.
Tree; 1200 m; 7 (*1101*).

Deppea grandiflora Schltdl.
Shrub; 1327–2335 m; 1 (*1908*, *2221*), 8 (*2062*), 11 (*1010*, *1992*), 14 (*967*), 15 (948).

Deppea scoti (J.H.Kirkbr.) Lorence
(*Bellizinca scoti* (J.H.Kirkbr.) Borhidi)
Shrub; 2223 m; 3 (*2097*).

Galium hypocarpium (L.) Endl. ex Griseb.
Herb; 2320 m; 1 (*1461*).

Glossostipula concinna (Standl.) Lorence
Tree; 1184–1513 m; 6 (*895*), 7 (*1132*), 14 (*971*), 16 (*704*).

Hamelia calycosa Donn.Sm.
Tree; 1226 m; 13 (*1314*)

Hedyotis exigula W.H.Lewis
(*Mexotis latifolia* (M.Martens & Galeotti) Terrell & H.Rob.)
Herb; 1185–1327 m; 6 (*839*), 8 (*2057),* 9 (*610*, *1040*), 13 (*2168*).

Hoffmannia nicotianifolia (M.Martens & Galeotti) L.O.Williams
Shrub; 1270–1474 m; 2 (*2196*), 7 (*1499*), 14 (*641*), 18 (*1801*), 19 (452, *453*, *1845*), 21 (*767*).

Hoffmannia psychotrifolia (Benth.) Griseb.
Shrub; 1323 m; 8 (*1305*).

Hoffmannia aff. ***psychotrifolia*** (Benth.) Griseb.
Tree; 1560 m; 17 (*515*).

Notopleura hondurensis C.M.Taylor
Herb; 1424–1560 m; 17 (*1722*), 19 (*457*).

Palicourea padifolia (Willd. ex Roem. & Schult.) C.M.Taylor & Lorence
Tree; 1300–1560 m; 7 (*1143*), 14 (*983*), 17 (*518*, *527*), 18 (*1787*).

Posoqueria coriacea M.Martens & Galeotti
Tree; 1316 m; 8 (*1445*).

Psychotria elata (Sw.) Hammel
Tree; 1180 m; 16 (*667*).

Psychotria fruticetorum Standl.
Shrub; 1483–1589 m; 11 (*1005*), 14 (*1528*).

Psychotria galeottiana (M.Martens) C.M.Taylor & Lorence
Tree; 1600–2320 m; 1 (*1464*), 17 (*1751*).

Psychotria mexiae Standl.
Tree; 1320–1560 m; 7 (*1251*, *1511*), 12 (*1378*), 14 (*1533*), 17 (*1728*), 18 (*1788*, *1795*).

Psychotria sarapiquiensis Standl.
Tree; 1300–1560 m; 7 (*1136*), 17 (*1724*, *1736*).

Randia matudae Lorence & Dwyer
Tree; 1560 m; 17 (*505*).

Rogiera edwardsii (Standl.) Borhidi
Tree; 1350 m; 7 (*1253*).

Rogiera stenosiphon (Hemsl.) Borhidi
Tree; 1185 m; 6 (*832*).

Sommera arborescens Schltdl.
Tree; 1184–1483 m; 6 (*908*), 7 (*1102*, *1247*), 14 (*1535*).

Spermacoce assurgens Ruíz & Pav.
(*Spermacoce remota* Lam.)
Herb; 1184 m; 6 (*1427*).

Spermacoce remota Lam.
Shrub; 1226 m; 13 (*2151*).

RUTACEAE

Citrus sp.
Tree; 1184 m; 6 (*928*).

Amyris aff. ***attenuata*** Standl.
Tree; 1180 m; 16 (*706*).

SALICACEAE

Hasseltiopsis dioica (Benth.) Sleumer
Tree; 1184 m; 6 (*917*)

Salix paradoxa Kunth
Shrub; 2223 m; 3 (*2101*), 3 (*2102*).

Xylosma quichensis Donn.Sm.
Tree; 2242–2742 m; 2 (*2193*).

SAPINDACEAE

Serjania flaviflora Radlk.
Woody vine; 1185–1203 m; 6 (*932*), 6 (*2108*).

SAPOTACEAE

Sideroxylon persimile (Hemsl.) T.D.Penn subsp. ***persimile***
Tree; 1323 m; 8 (*1303*).

SCHOEPFIACEAE

Schoepfia schreberi J.F.Gmel.
Tree; 1233 m; 7 (*1885*), 7 (*1886*).

Schoepfia vacciniiflora Planch. ex Hemsl.
Tree; 1184–1352 m; 6 (*927*), 7 (*1962*).

SCROPHULARIACEAE

Buddleja americana L.
Tree; 1673 m; 9 (*1854*).

Russelia coccinea (L.) Wettst.
Herb; 1266–1270 m; 6 (*810*), 6 (*1273*).

Russelia ternifolia Kunth
Herb; 1185 m; 6 (*867*).

SMILACACEAE

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Smilax domingensis Willd.
Herbaceous vine; 1226–2325 m; 4 (*2268*), 13 (*2153*).
Smilax glauca Walter
Herbaceous vine; 1229 m; 9 (*1064*).
Smilax subpubescens A.DC.
Herbaceous vine; 1229–1300 m; 7 (*1135*), 9 (*1072*).

SOLANACEAE

Cestrum elegans (Brongn.) Schltdl.
Tree; 1460–1530 m; 12 (*1003*, *1387*).
Cestrum fasciculatum (Schltdl.) Miers
Shrub; 2335 m; 1 (*1917*).
Cestrum laxum Benth.
Shrub; 2327 m; 4 (*1672*).
Cestrum nocturnum L.
Tree; 1184 m; 6 (*1320*).
Lycianthes anomala Bitter
Tree; 1226 m; 13 (*1315*).
***Physalis* sp.**
Herb; 1184 m; 6 (*914*).
Schraderanthus viscosus (Schrad.) Averett
Tree; 2325 m; 4 (*2263*).
Solanum aligerum Schltdl.
Tree; 2300 m; 1 (*1474*).
Solanum americanum Mill.
Herb; 1185 m; 6 (*841*).
Solanum aphyodendron S.Knapp
Shrub; 1185–1431 m; 6 (*838*), 7 (*1244*), 9 (*1061*).
Solanum appendiculatum Dunal
Woody vine; 1184 m; 6 (*1546A*).
Solanum chrysotrichum Schltdl.
Tree; 1069–1184 m; 6 (*894*), 7 (*1216*).
Solanum lanceolatum Cav.
Tree; 2300 m; 1 (*1475*).
Solanum nigricans M.Martens & Galeotti
Tree; 1381–2314 m; 2 (*1333*), 10 (*1092*), 11 (*1011*), 12 (*1001B*).

STAPHYLEACEAE

Turpinia insignis (Kunth) Tulasne
Tree; 1278–1323 m; 7 (*1897, 1925*).
Turpinia occidentalis (Sw.) G.Don
Tree; 2204 m; 3 (*2033*), 4 (*2275*).

STYRACACEAE

Styrax ramirezii Greenm.
Tree; 2300–2320 m; 1 (*1458*, *1473*, *1935*, *1936*).

SYMPLOCACEAE

Symplocos coccinea Bonpl.
Sierra de los Frailes Area, specific locality not disclosed; species is protected under Mexican law.
Symplocos limoncillo Bonpl.
Tree; 1069–1280 m; 6 (*1260*), 7 (*1204*), 7 (*1219*), 7 (*1401*).

ULMACEAE

Trema micrantha (L.) Blume
Tree; 1380 m; 7 (*1957*).
Ulmus mexicana (Liebm.) Planch.
Tree; 1185 m; 6 (*882*, *884*, *2117*).

URTICACEAE

Cecropia obtusifolia Bertol.
Tree; 7 (*1186A*).
Myriocarpa longipes Liebm.
Shrub; 1185–1658 m; 6 (*829*, *1880*), 11 (*1990*), 18 (*1792*, *1803*, *1816*).
Pilea hyalina Fenzl
Herb; 1323 m; 8 (*1304*).
Pilea microphylla (L.) Liebm.
Herb; 1250 m; 7 (*1193*), 17 (*438*).
Pilea pubescens Liebm.
Herb; 1250 m; 17 (*425*), 21 (*781*).
Pilea tridentata Killip
Herb; 1424 m; 19 (*458*).
Urera caracasana (Jacq.) Gaudich. ex Griseb.
Tree; 1226 m; 13 (*1312*).

VERBENACEAE

Citharexylum mocinnoi D.Don
Tree; 1266–2259 m; 3 (*1486*), 6 (*811*, *816*), 8 (*1239*), 9 (*1852*), 19 (*1818*).
Lantana camara L.
Herb; 1229–1460 m; 9 (*1024*), 12 (*1379*).
Lippia myriocephala Schltdl. & Cham.
Tree; 1184–1460 m; 6 (*794*), 9 (*1037*), 12 (*1389*), 14 (*1492*), 19 (*406*).
Verbena carolina L.
Herb; 1229–1350 m; 9 (*1047*), 17 (*559*).

VIOLACEAE

Viola scandens Humb. & Bonpl. ex Schult.
Herb; 2151 m; 10 (*1084*).

VITACEAE

Vitis popenoei Fennell
Woody vine; 1290–1320 m; 7 (*1417, 1506*).
Vitis tiliifolia Humb. & Bonpl. ex Roem. & Schult.

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Woody vine; 1229 m; 7 (*2047*), 9 (*1046*).

WINTERACEAE

Drimys granadensis L.f. var. ***mexicana*** (DC.) A.C.Sm.
Tree; 2300 m; 1 (*1482*).

ZINGIBERACEAE

Renealmia mexicana Klotzsch ex Petersen
Herb; 1180–1350 m; 7 (*1504*), 16 (*675*).

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