



The Arizona
Native Plant
Society

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Figure 1. Sierra el Tigre Sky Island. Photo courtesy Dale S. Turner.

The Arizona Native Plant Society's Botany 2018 Conference explored the botanical diversity of the Madrean Sky Islands of Southern Arizona and Northern Mexico. In this expanded issue of *The Plant Press*, prepared with the cooperation and support of the GreaterGood.org organization, we present floras of five major Sonoran Sky Islands.

Preliminary Floras in the Madrean Archipelago, Sonora, Mexico

by Thomas R. Van Devender¹, Susan D. Carnahan², George M. Ferguson²,
Elizabeth Makings³, and José Jesús Sánchez-Escalante⁴

Introduction

In 2007, Conservation International designated the Mexican Madrean Pine-oak Woodlands as a global biodiversity hotspot. This is a very large area that includes both the Sierra Madre Oriental in eastern Mexico, the Sierra Madre Occidental (SMO) in western Mexico, and the Madrean Archipelago in Sonora and Arizona. The SMO extends in western Mexico from Jalisco and Zacatecas north to Chihuahua and Sonora, reaching its northern limit in Sonora in the Sierra Huachinera (30.3°N).

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¹GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718. ²University of Arizona

Herbarium, Tucson, AZ 85721. ³Arizona State University Herbarium, Tempe, AZ 85282.

⁴Herbario USON, Universidad de Sonora-DICTUS Edificio 1A, Niños Héroes entre Rosales y Pino Suárez, Col. Centro, Hermosillo, Sonora, Mexico, CP 83000.

President's Note by Douglas Ripley jdougripley@gmail.com

Hello Arizona native plant lovers! As we approach the end of the year, it's gratifying to reflect on the many activities and accomplishments undertaken by the Arizona Native Plant Society and its dedicated members in 2018. In addition to our ongoing activities such as chapter-sponsored meetings and field trips, and the publication of our journal *The Plant Press* and the *Happenings* newsletter, we have continued to pursue a wide array of other important efforts in support of our primary mission, which is to promote knowledge, appreciation, conservation, and restoration of Arizona native plants and their habitats.

Some of the activities undertaken this year included funding of native plant research, both through state and chapter-level grants, conducting a native plant identification workshop in cooperation with the University of Arizona Herbarium, a return to our three-day botanical workshop in the Chiricahua Mountains (see page 54 for highlights), and pursuing several important native plant restoration projects through the work of our Conservation Committee and the Phoenix Chapter.

A very exciting development this year was the establishment of a new Chapter (our seventh) representing Santa Cruz County! The new chapter has a nucleus of very enthusiastic members and is a welcome addition to the Society.

At the end of July, we hosted our annual Botany 2018 conference at the Sierra Vista campus of the Cochise College which was attended by 130 individuals. The theme of the meeting was "Exploring the Botanical Diversity and Ecology of the Madrean Sky Islands of Southern Arizona and Northern Mexico." Fifteen excellent presentations were made along with a number of great posters, followed by an evening dinner and an entertaining presentation by the ever-popular naturalist Petey Mesquitey (AKA Peter Gierlach). On the Sunday following the meeting we offered field trips to Garden Canyon on Fort Huachuca, the San Pedro River Riparian National Conservation Area, and Cochise Stronghold in the Dragoon Mountains.

Building on the theme of the Botany 2018 conference, and working in cooperation with the GreaterGood.org

organization, we have dedicated most of the current expanded issue of *The Plant Press* to a presentation of five Mexican Sky Island floras, which have been undertaken by a number of our members as well as many of our Mexican partners and friends. These floras provide an extremely informative and valuable introduction to Arizona's sister Sky Islands in Mexico and provide an outstanding basis for comparing the various differences and similarities between them. Since many of the Mexican Sky Islands had heretofore been poorly understood botanically, these floras are an especially valuable contribution to our overall knowledge of these extremely important, and in some cases, threatened habitats.

Looking to next year, we are exploring options for our Botany 2019 conference. One very interesting idea is to hold our one-day conference in conjunction with the Botanical Society of America (BSA) annual conference, which will take place on 27–31 July 2019 at the JW Marriott Starr Pass Resort in Tucson and which will be attended by approximately 1,000 botanical experts from throughout the world. We still need to work out details for our participation in this conference. If we do not collaborate with the BSA, we will hold our conference independently at a yet-to-be-determined date and location. But, stay tuned as we will keep you well informed of our decision once it is reached.

So, that is a summary of what your Society has been up to this year and some of our plans for 2019. I wish to thank all those who have made such important contributions to our efforts, such as the members of the Board of Directors, chapter officers, and many other volunteers. Of course, I can't end without encouraging more members to engage in some of our various activities. We could most definitely use your help, suggestions, and assistance with various projects, which I'm sure you would find rewarding. Finally, please don't neglect the Arizona Native Plant Society membership renewal notice most members will receive in December. Your continued membership is vital to our success.

All best wishes for Happy Holidays and a very successful New Year.



Preliminary Floras in the Madrean Archipelago *continued from page 1*

In the Madrean Archipelago between the SMO and the Mogollon Rim in central Arizona, there are 55 isolated Sky Island (*Isla Serrana* in Spanish) mountain ranges, or complexes of ranges, connected by oak woodland corridors (Deyo et al. 2013, Van Devender et al. 2013a). Sky Islands crowned with oak woodland or pine-oak forest emerge from lowland “seas” of Sonoran and Chihuahuan desertscrub, desert grassland, foothills thornscrub, or tropical deciduous forest (Figure 1).

The Madrean Archipelago is a convergence zone for six biotic regions (Figure 2). The Rocky Mountains and Colorado Plateaus to the north have temperate climates. Chaparral

vegetation and Mediterranean climates are Californian influences below the Mogollon Rim in Central Arizona. In the mid-continent, the grasslands of the Great Plains extend from Canada south onto the Mexican Plateau and westward into southeastern Arizona and northeastern Sonora. In the east, this is often a mosaic with desert grassland and Chihuahuan desertscrub. On the western edge of the Sky Island Region, Sonoran desertscrub surrounds Sky Island ranges. In the southern Sky Islands, foothills thornscrub and tropical deciduous forest are in the lowlands. Oak woodland and pine-oak forest are in the uplands of the Sky Islands and the Sierra Madre Occidental. Although the Tropic of Cancer is at 23.4°N, just north of Mazatlán, Sinaloa, the transition between the New World tropics and the northern temperate zone is at about 29°N in east-central Sonora, 680 km to the north-northwest. The northernmost tropical deciduous forest occurs in the Sierra San Javier, Sonora (28.6°N; Van Devender et al. 2013b). In southern Sonora, thornscrub is transitional between tropical deciduous forest and Sonoran desertscrub, with coastal thornscrub on the coastal plain along the Gulf of California and foothills thornscrub on rocky slopes inland. In central Sonora, foothills thornscrub is transitional between Sonoran desertscrub and oak woodland. The northern limits of foothills thornscrub are at about 30.18°N, east of Sinoquipe in the Río Sonora Valley, and 30.43°N, at Presa Angostura on the Río Bavispe. This biotic community does not reach Arizona, but the northern limits of quite a few of its species are in

desert grassland or oak woodland in southern Arizona (Van Devender et al. 1994).

Sonoran Biotic Expeditions

By the mid-2000s, a great deal had been learned about the animals and plants of the Sky Islands in Arizona, but relatively little in the 32 Sky Islands in Sonora. In 2009, Sky Island Alliance began the Madrean Archipelago Biodiversity Assessment (MABA) program to document the animals and plants of the Sonoran Sky Islands. Expeditions of 20 to 60 biologists from Mexico and the United States went to Sonoran Sky Islands to record animals and plants. These expeditions

were important, binational, cultural gatherings that often resulted in new collaborations, knowledge-sharing, long-term friendships, greater appreciation of the landscapes and natural history of Sonora, and the need to protect them.

In 2015, GreaterGood.org started the Madrean Discovery Expeditions (MDE) program to continue biotic inventories in the Sonoran Sky Islands. MDE Expeditions have gone to the Sierras la Buenos Aires, Cucurpe, la Elenita, Juriquipa, and el Tigre, and Cajón Bonito in the Madrean Archipelago, and Mesa Tres Ríos in the SMO (Figure 3). In total, there have been 15 MABA/MDE

Expeditions and 21 Mini-Expeditions of smaller groups. In 2009, the all-species MABA database was created, with MABA FLORA directly linked to the SEINet herbarium databases. The MDE database (Madreandiscovery.org) was created in 2015 to continue documenting the Sky Island biodiversity. The MABA database is not active, but the records are accessible through a link in the MDE database.

Sky Island Floras

Previously there were very few floras published for Sonoran Sky Islands. White (1948) published his doctoral research at the University of Michigan on the flora and vegetation of the Río Bavispe. He collected plants in many areas, but the Sierra el Tigre was the core of his study area. Fishbein et al. (1995) published the flora of the Sierra de los Ajos. This important contribution focused on the high-elevation pine-oak forests.



Figure 2. Biotic Regions Merging in the Sky Islands Region. Drafted by Dennis Caldwell.

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Preliminary Floras in the Madrean Archipelago *continued*

Reina-G. and Van Devender (2005) compared the flora of the Huachuca Mountains in southern Arizona (Bowers and McLaughlin 1996) with the flora of the Municipality of Yécora in the Sierra Madre Occidental in eastern Sonora. They concluded that the flora of the SMO is about 30% more diverse than any other Sky Island. At that time, 994 taxa of plants were recorded from the Huachuca Mountains. Van Devender and Reina-G. (2016) reported 1,777 taxa from Yécora. Additional taxa from the Huachuca Mountains, discovered in floristic inventories of Coronado National Forest and Coronado National Memorial — available in the SEINet databases (<http://swbiodiversity.org/seinet/collections/index.php>) — would likely increase the Huachuca-Yécora floristic similarity.

Van Devender et al. (2013b) compared the tropical flora of the Sierra la Madera to the Yécora flora. Van Devender et al. (2013c) presented a preliminary flora of the Sierra Bacadéhuachi. The flora of the Municipality of Yécora covered the vegetation gradient from foothills thornscrub and tropical deciduous forest through oak woodland to pine-oak forest (Van Devender and Reina-G. 2016). None of these publications contained species lists. A list of the vascular plants of the Sierra Mazatán (= Huérfana) was published in Sánchez-E. et al. (2017).

In this series in *The Plant Press*, we summarize the preliminary floras of the Sierras La Púrica (2013), la Elenita–la Mariquita (2010, 2013, 2015–2016), la Buenos Aires (2016), and Juriquipa (2017), and the Lower Río Bavispe Valley (1995, 2005, 2010, 2012, 2016). Each of these represents the results of brief, intense floristic surveys during MABA-MDE biotic inventories or as part of other projects. Comprehensive floras of these areas are not likely to be produced in the near future. These floras are therefore important contributions to our understanding of the floristic diversity of the Sonoran Sky Island Region.

Acknowledgements

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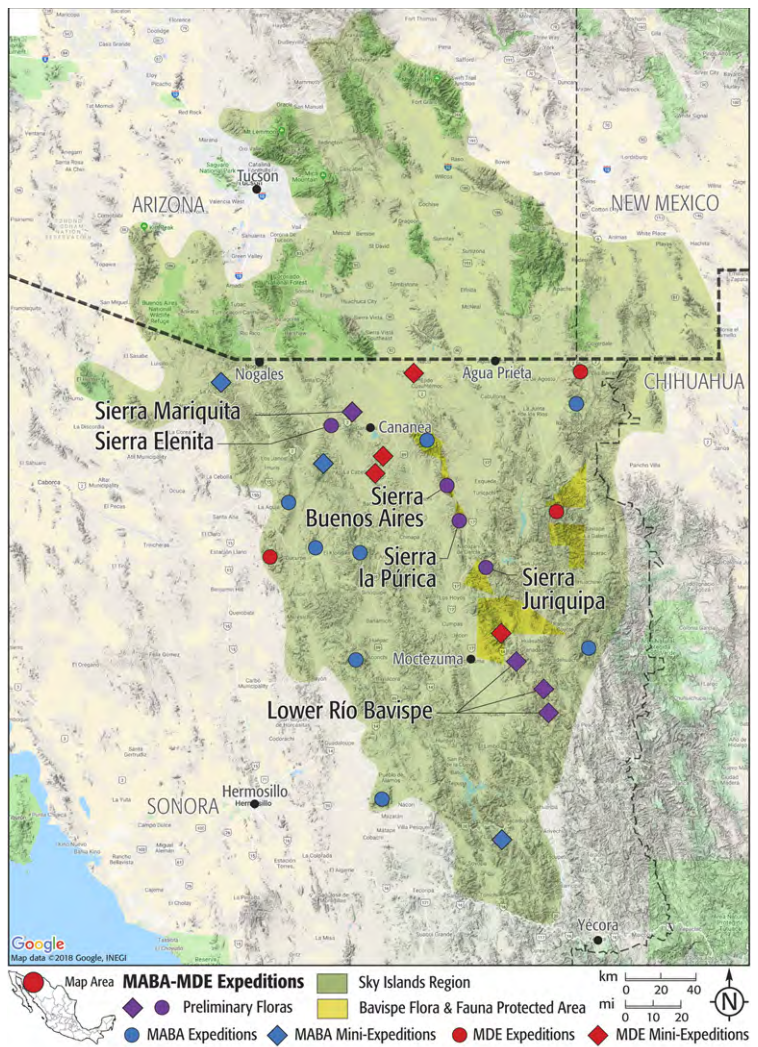


Figure 3. Map of Sky Islands Region. Spots and diamonds mark localities of MABA-MDE Expeditions and Mini-Expeditions. Purple spots and diamonds are preliminary floras in this series. *Drafted by Dennis Caldwell.*

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Andrew Salywon
Director at Large asalywon@dbg.org

John Scheuring
Director at Large, Conservation Committee
Chair jfscheuring@hotmail.com

AZNPS COLLABORATORS

Cass Blodgett
Web Editor
cblodgett2@cox.net

Patricia Sanchez
Administrative Assistant
aznpsinfo@yahoo.com

Shelley Silva
Happenings Editor
shelley.a.silva@gmail.com

Julie St. John
The Plant Press Layout Editor
julieStDesign@gmail.com



Figure 1. Oak woodland and pine-oak forest vegetation in the Sierra la Elenita. Photo by Thomas R. Van Devender.

Preliminary Flora and Vegetation of the Sierra la Elenita–la Mariquita Sky Island Complex, Sonora, Mexico

by Susan D. Carnahan¹, Thomas R. Van Devender², Ana-Lilia Reina-Guerrero², John L. Anderson³, José Jesús Sánchez-Escalante⁴, and Guillermo Molina-Padilla⁵

Abstract

We present a preliminary vascular flora for the Sierra la Elenita–la Mariquita Sky Island complex near Cananea, Sonora, Mexico. Expeditions and collecting trips between 2009 and 2018, along with historical collections, recorded 320 taxa in 65 families, with Asteraceae (55 taxa), Poaceae (41 taxa), and Fabaceae (36 taxa) as the most diverse families.

¹University of Arizona Herbarium, 1140 E. South Campus Dr., Tucson, AZ 85721. ²GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718. ³PO Box 20911, Wickenburg, AZ 85358. ⁴Herbario USON, Universidad de Sonora-DICTUS Edificio 1A, Niños Héroes entre Rosales y Pino Suárez, Col. Centro, Hermosillo, Sonora, Mexico, CP 83000. ⁵Av. Juarez No. 14, Cananea, Sonora, Mexico, CP 84620.

Introduction

In the 1860s, geologist and raconteur Raphael Pumpelly described the isolated mountain ranges in Arizona, New Mexico, and Sonora as “islands from the sea” (Wallace 1965). These Sky Islands (*Islas Serranas* in Spanish) are surrounded by “seas” of grassland, desertscrub, thornscrub, or tropical deciduous forest. Here, we present the preliminary vascular flora for the Sierra la Elenita–la Mariquita Sky Island complex in northern Sonora, Mexico.

The two sierras directly west and northwest of the town of Cananea are connected by a belt of oak woodland at 1,862 m. (6,108 ft.) elevation in Puerto Cananea, 34 kilometers (21.2 mi.) south of the Arizona border. The elevations are 1,307–

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Sierra la Elenita–la Mariquita Sky Island Complex *continued*

2,486 m. (4,288–8,156 ft., range of 1,179 m. [3,868 ft.]) in the Sierra la Elenita (Figure 1) and 1,230–2,498 m. (4,035–8,196 ft., range of 1,268 m. [4,161 ft.]) in the Sierra la Mariquita. The eastern slopes of the mountain complex are in the headwaters of the San Pedro River that flows northward into Arizona. The western slopes of both ranges drain toward the Arroyo Cuitaca, which joins the Río Cocóspera and eventually the Río Magdalena. The south end of the Sierra la Elenita drains to the Río Bacanuchi, which flows into the Río Sonora.

The Sierra la Elenita is owned by the private mining company Mina Buenavista del Cobre, with inholdings by Ejido Vicente Guerrero, Mina Frisco, and other private interests. General Ignacio Pesqueira, the Governor of Sonora, relocated to Cananea in the 1860s and reopened many silver and gold mines abandoned by the Spanish. He reportedly named the mountain range the Sierra la Elenita for his wife Elena. The Sierra la Mariquita is owned by the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE) and features the Observatorio Astrofísico Guillermo Haro (Figure 2), inaugurated in 1987 and named in honor of Mexican astronomer Guillermo Haro-Barraza (1913–1988). In 2015, the Sierra la Mariquita was designated a Voluntary Land Conservation Area in the Comisión de Áreas Naturales Protegidas federal system (Van Devender and Reina-G. 2015, Van Devender 2017). It is named for the *mariquitas* or

convergent lady beetles (*Hippodamia convergens*) that gather on its peak (Figure 3B).

Numerous collecting trips and expeditions to Sierra la Elenita–la Mariquita complex have resulted in the establishment of a rich databank of plant and animal specimens and observations. Dale and Allan Zimmerman collected plants in la Mariquita in 1972, and Victor Steinmann, Michael Wilson, and Jared Shortman collected plants there in 1996. Aaron D. Fleisch and Jeremy Russell recorded tree species on bird transects in la Mariquita in May–June 2009 and the Sierra la Elenita in May 2011. Madrean Archipelago Biodiversity Assessment (MABA) trips to la Mariquita in June 2009, September 2010, and August 2013 documented plants. Madrean Discovery Expedition (MDE) Sierra la Elenita documented plants in April–May 2016; other visits took place in September 2015 and August 2016. La Catalina, on the east slope of the Sierra la Elenita, was visited ten times from 2016 to 2018 by MDE. Although the results of these studies were not formally published, details about their collections and observations are available through SEINet and MABA/MDE portals.

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Figure 2. Observatorio Astrofísico Guillermo Haro on the Sierra la Mariquita. *Photo courtesy of INAOE.*



Figure 3. Southwestern white pine (*Pinus strobiformis*) in the Sierra la Mariquita. A. Branch with cones. B. Branch with needles and convergent lady beetles (*Hippodamia convergens*). *Photos by Thomas R. Van Devender.*



Figure 4. Quaking aspen (*Populus tremuloides*) in the Sierra la Mariquita. Photo by Ana Lilia Reina-G. Figure 5. Huachuca Mountain Indian paintbrush (*Castilleja patriotica*) in the Sierra la Mariquita. Photo by J. Jesús Sánchez-E.

Sierra la Elenita–la Mariquita Sky Island Complex *continued*

Flora

A total of 320 plant taxa in 65 families are recorded for Sierra la Elenita–la Mariquita complex, 207 (65%) of which have been vouchered or photographed. Dominant families are Asteraceae (55 taxa, including 2 non-natives), Poaceae (41 taxa, including 11 non-natives), Fabaceae (36 taxa, including 2 non-natives), Pteridaceae (9 taxa), Euphorbiaceae (8 taxa), Amaranthaceae (7 taxa, including one non-native), Asparagaceae (7 taxa), Brassicaceae (7 taxa, including 2 non-natives), Lamiaceae (7 taxa, including 2 non-natives), and Solanaceae (7 taxa). The most diverse genera are *Aristida* (6 taxa), *Euphorbia* (6 taxa), *Ipomoea* (6 taxa), *Brickellia* (5 taxa), *Pinus* (5 taxa), *Quercus* (5 taxa), and *Eragrostis* (4 taxa). Twenty-six species (8.1%) are non-native. The vegetative communities of this Sky Island complex include scrub grassland at the lowest elevations, oak woodland on the slopes, and pine-oak forest at the highest elevations. The summits feature regionally significant populations of southwestern white pine (*Pinus strobiformis*) (Figure 3) as well as Apache pine (*P. engelmannii*), Gambel oak (*Quercus gambelii*), and quaking aspen/álamo temblón (*Populus tremuloides*) (Figure 4). These high-elevation trees are familiar features of Arizona Sky Islands but are much rarer in Sonora. Other noteworthy

plants in the study area are mostly shared with Arizona, such as: Huachuca Mountain Indian paintbrush (*Castilleja patriotica*) (Figure 5), lesser Indian paintbrush (*C. minor* var. *minor*), Heller's draba (*Draba helleriana*) (Figure 6), Sonoran bird's-foot trefoil (*Hosackia alamosana*) (Figure 7), Wilcox nipple cactus (*Mammillaria wrightii* var. *wilcoxii*) (Figure 8), mutton grass (*Poa fendleriana*), Navajo cinquefoil (*Potentilla subviscosa* var. *ramulosa*), and ponderosa violet (*Viola umbraticola*). Perilla (*Lopezia gracilis*) is an annual member of the Onagraceae with delicate white and pink flowers (Figure 9) found in the Sierra Madre Occidental and reaching its northern distribution limit in the Sierra la Mariquita.

Although the Sierra la Mariquita is a federally-protected range, the Sierra la Elenita is entirely privately owned and

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Figure 6. Heller's draba (*Draba helleriana*). Figure 7. Sonoran bird's-foot trefoil (*Hosackia alamosana*). Photos by Susan D. Carnahan.

Sierra la Elenita–la Mariquita Sky Island Complex *continued*

faces grave threats from human activities, including mineral exploration, deforestation, tailings accumulation, and pollution. In 2014, 40 million liters (approx. 11,000 gallons) of a copper sulfate solution spilled from a Buenavista del Cobre leaching pond into the Ríos Bacanuchi and Sonora. The spill jeopardized the water source for approximately 25,000 people in seven municipalities. Guillermo Molina reports that as of May 2018 much of the east flank of the Sierra la Elenita was being actively deforested; there have been few or no biological surveys of this part of the mountain.

The Huachuca Mountains in Arizona are the sister range of the Sierra la Elenita–la Mariquita complex. Bowers and McLaughlin (1996) published the flora of the Huachucas with 994 taxa. Additional taxa from the Huachuca Mountains, discovered in floristic inventories by the Coronado National Forest and the Coronado National Memorial, are available in the SEINet databases (<http://swbiodiversity.org/seinet/collections/index.php>). A total of 281 species in the Sierra la Elenita–la Mariquita flora (89.0%) are shared with the Huachuca Mountains. This similarity is not surprising considering that the northern edge of the Sierra la Mariquita is only 28 km south-southeast of Montezuma Pass. Exploration of the northern Sierra la Mariquita should increase the similarity.

The preliminary flora of the Sierra la Elenita–la Mariquita is an important contribution to our knowledge of the floristic diversity of the Sonoran Sky Islands.

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Figure 8. Wilcox nipple cactus (*Mammillaria wrightii* var. *wilcoxii*). Photo by Susan D. Carnahan. Figure 9. Perilla (*Lopezia gracilis*) in the Sierra la Mariquita. Photo by Jeff Sartain.

CHECKLIST: Sierra la Elenita–la Mariquita Sky Island Complex page 1 of 4

An asterisk (*) denotes non-native status.

Pteridophytes

DENNSTAEDTIACEAE

Pteridium aquilinum (L.) Kuhn

EQUISETACEAE

Equisetum hyemale L.

PTERIDACEAE

Argyrochosma limitanea (Maxon) Windham

Bommeria hispida (Mett. ex Kuhn) Underwood

Myriopteris aurea (Poir.) Grusz & Windham

Myriopteris fendleri (Hook.) E. Fourn.

Myriopteris lindheimeri (Hook.) J. Sm.

Myriopteris rufa Fée

Pellaea atropurpurea (L.) Link

Pellaea wrightiana Hook.

Gymnosperms

CUPRESSACEAE

Juniperus deppeana Steud.

PINACEAE

Pinus arizonica Engelm.

Pinus chihuahuana Engelm.

Pinus discolor D.K. Bailey & Hawksworth

Pinus engelmannii Carr.

Pinus strobiformis Engelm.

Eudicots

ACANTHACEAE

Dicliptera resupinata (Vahl) Juss.

Dyschoriste decumbens (A. Gray) Kuntze

AMARANTHACEAE

* *Alternanthera caracasana* Kunth

Amaranthus palmeri S. Wats.

Chenopodium arizonicum Standl.

Chenopodium neomexicanum Standl.

Dysphania graveolens (Willd.)

Mosyakin & Clemants

Gomphrena nitida Rothr.

Guilleminea densa (Humb. & Bonpl. ex Willd.) Moq.

ANACARDIACEAE

Rhus aromatica Ait.

Rhus virens Lindh. ex A. Gray var. *choriophylla* (Wooton & Standl.) L.D. Benson

Toxicodendron radicans (L.) Kuntze var. *divaricatum* (Greene) Barkl.

APIACEAE

Eryngium lemmonii J.M. Coult. & Rose

APOCYNACEAE

Apocynum androsaemifolium L.

Asclepias elata Benth.

Asclepias lemmonii A. Gray

ARALIACEAE

Aralia humilis Cav.

ASTERACEAE

Ageratina herbacea (A. Gray) R.M. King & H. Rob.

Aldama cordifolia (A. Gray) E.E. Schill. & Panero

Amauriopsis dissecta (A. Gray) Rydb.

Ambrosia confertiflora DC.

Antennaria parvifolia Nutt.

Artemisia dracunculus L.

Artemisia ludoviciana Nutt.

Baccharis salicifolia (Ruiz & Pav.) Pers.

Baccharis sarothroides A. Gray

Baccharis thesioides Kunth

Bidens pilosa L. [*B. odorata* Cav.]

Brickellia betonicifolia A. Gray

Brickellia californica (Torr. & A. Gray) A. Gray

Brickellia floribunda A. Gray

Brickellia rusbyi A. Gray

Brickellia simplex A. Gray

Carminatia tenuiflora Dc.

Carphochaete bigelovii A. Gray

Cirsium arizonicum (A. Gray) Petr.

Cirsium undulatum (Nutt.) Spreng.

Cosmos parviflorus (Jacq.) Pers.

Erigeron flagellaris A. Gray

Erigeron neomexicanus A. Gray

Galinsoga parviflora Cav.

Gutierrezia sarothrae (Pursh) Britton & Rusby

Gutierrezia wrightii A. Gray

Helianthus annuus L.

Heliopsis parvifolia A. Gray

Heterosperma pinnatum Cav.

Hieracium fendleri Sch. Bip.

Hymenothrix wrightii A. Gray

Iostephane heterophylla (Cav.) Benth.

* *Lactuca serriola* L.

Lasiantha podocephala (A. Gray) K.M. Becker

Leibnitzia lyrata (Sch. Bip.) G.L. Nesom

Melampodium longicorne A. Gray

Packera neomexicana (A. Gray) W.A. Weber & Á. Löve

Psacalium decompositum (A. Gray) H. Rob. & Brettell

Pseudognaphalium arizonicum (A. Gray) Anderb.

Pseudognaphalium leucocephalum (A. Gray) Anderb.

Roldana hartwegii (Benth.) H. Rob. & Brettell var. *carlomasonii* (B.L. Turner & T.M. Barkley) Funston

Senecio wootonii Greene

Solidago wrightii A. Gray

Stevia salicifolia Cav.

Tagetes lemmonii A. Gray

Tagetes micrantha Cav.

Tagetes minuta L.

* *Taraxacum officinale* F.H. Wigg.

Verbesina longifolia (A. Gray) A. Gray

CHECKLIST: Sierra la Elenita–la Mariquita Sky Island Complex page 2 of 4

Viguiera dentata (Cav.) Spreng.
Xanthisma gracile (Nutt.) D.R. Morgan & R.L. Hartm.
Xanthisma spinulosum (Pursh) D.R. Morgan & R.L. Hartm.
Xanthocephalum gymnospermoides (A. Gray) Benth. & Hook. f.
Zinnia grandiflora Nutt.
Zinnia peruviana (L.) L.

BIGNONIACEAE

Chilopsis linearis (Cav.) Sweet

BORAGINACEAE

Lithospermum cobrense Greene

BRASSICACEAE

* *Capsella bursa-pastoris* (L.) Medik.
Descurainia pinnata (Walter) Britton
Draba helleriana Greene
Hesperidanthus linearifolius (A. Gray) Rydb.
Noccaea fendleri (A. Gray) Holub
Pennellia longifolia (Benth.) Rollins
* *Sisymbrium irio* L.

CACTACEAE

Cylindropuntia spinosior (Engelm.) F.M. Knuth
Echinocereus fendleri (Engelm.) Sencke ex J.N. Haage
Echinocereus rigidissimus (Engelm.) Engelm. ex J.N. Haage
Echinocereus santaritensis W. Blum & Rutow
Mammillaria wrightii Engelm. var. *wilcoxii* (Toumey ex K. Schum.) W.T. Marshall

Opuntia chlorotica Engelm. & J.M. Bigelow

CAMPANULACEAE

Lobelia cardinalis L.

CARYOPHYLLACEAE

Arenaria lanuginosa (Michx.) Rohrb. subsp. *saxosa* (A. Gray) Maguire
Cerastium texanum Britton

Silene antirrhina L.

Silene laciniata Cav.

COMANDRACEAE

Comandra umbellata (L.) Nutt.

CONVOLVULACEAE

Ipomoea costellata Torr.
Ipomoea cristulata Hallier f.
Ipomoea longifolia Benth.
Ipomoea purpurea (L.) Roth
Ipomoea ternifolia Cav. var. *leptotoma* (Torr.) J.A. McDonald
Ipomoea thurberi A. Gray
Jacquemontia agrestis (Mart. ex Choisy) Meisn.

CUCURBITACEAE

Cucurbita foetidissima Kunth

ERICACEAE

Arbutus arizonica (A. Gray) Sarg.
Arctostaphylos pungens Kunth

EUPHORBIACEAE

Acalypha neomexicana Müll. Arg.
Cnidoscolus angustidens Torr.
Euphorbia chamaesula Boiss.
Euphorbia cuphosperma (Engelm.) Boiss.
Euphorbia densiflora (Klotzsch & Garcke) Klotzsch
Euphorbia heterophylla L.
Euphorbia pediculifera Engelm.
Euphorbia prostrata Aiton
Tragia nepetifolia Cav.

FABACEAE

Acaciella angustissima (Mill.) Britton & Rose
Acmispon greenei (Wooton & Standl.) Brouillet
Acmispon oroboides (Kunth) Brouillet
Aeschynomene villosa Poir.
Amorpha fruticosa L.
Astragalus nothoxys A. Gray

Astragalus nuttallianus DC.

Calliandra humilis Benth. var. *humilis*
Calliandra humilis var. *reticulata* (A. Gray) L.D. Benson

Chamaecrista nictitans (L.) Moench

Cologania angustifolia Kunth

Cologania obovata Schtdl.

Crotalaria pumila Ortega

Dalea albiflora A. Gray

Dalea filiformis A. Gray

Dalea pringlei A. Gray

Dalea versicolor Zucc.

Desmodium batocaulon A. Gray

Erythrina flabelliformis Kearney

Eysenhardtia orthocarpa (A. Gray) S. Watson

Hosackia alamosana Rose

Lathyrus graminifolius (S. Watson) T.G. White

Lupinus argenteus Pursh

Lupinus huachucanus M.E. Jones

Lupinus neomexicanus Greene

Mariosousa millefolia (S. Watson) Seigler & Ebinger

* *Medicago lupulina* L.

* *Medicago polymorpha* L.

Mimosa dysocarpa Benth.

Mimosa grahamii A. Gray

Phaseolus grayanus Wooton & Standl.

Prosopis velutina Wooton

Robinia neomexicana A. Gray

Tephrosia tenella A. Gray

Tephrosia thurberi (Rydb.) C.E. Wood

Vicia pulchella Kunth

FAGACEAE

Quercus arizonica Sarg.

Quercus emoryi Torr.

Quercus gambelii Nutt.

Quercus hypoleucoides A. Camus

Quercus oblongifolia Torr.

CHECKLIST: Sierra la Elenita–la Mariquita Sky Island Complex page 3 of 4

GARRYACEAE

Garrya wrightii Torr.

GERANIACEAE

* *Erodium cicutarium* (L.) L'Hér. ex Ait.
Geranium caespitosum E. James
Geranium richardsonii Fisch. & Trautv.

HYDRANGEACEAE

Philadelphus microphyllus A. Gray

JUGLANDACEAE

Juglans major (Torr.) A. Heller

LAMIACEAE

Agastache pallida (Lindl.) Cory
Hedeoma dentata Torr.
* *Lamium amplexicaule* L.
* *Marrubium vulgare* L.
Monarda citriodora Cerv. ex Lag. var.
austromontana (Epling) B.L. Turner
Salvia betulifolia Epling
Stachys coccinea Ortega

LINACEAE

Linum lewisii Pursh

LYTHRACEAE

Cuphea wrightii A. Gray var. *wrightii*

MALVACEAE

Anoda cristata (L.) Schltld.
Ayenia filiformis S. Watson
Sida abutilifolia Mill.
Sphaeralcea fendleri A. Gray
Sphaeralcea incana Torr. ex A. Gray

MARTYNIACEAE

Proboscidea parviflora (Wooton)
Wooton & Standl.

MONTIACEAE

Calandrinia ciliata (Ruiz & Pav.) DC.

NYCTAGINACEAE

Boerhavia coccinea Mill.
Boerhavia erecta L.
Mirabilis albida (Walter) Heimerl

Mirabilis linearis (Pursh) Heimerl

Mirabilis longiflora L.

OLEACEAE

Fraxinus velutina Torr.

ONAGRACEAE

Lopezia gracilis S. Watson
Oenothera elata Kunth subsp.
hirsutissima (A. Gray ex S. Watson) W.
Dietr.
Oenothera podocarpa (Wooton &
Standl.) Krakos & W.L. Wagner [*Gaura*
hexandra Ortega subsp. *gracilis*
(Wooton & Standl.) P.H. Raven & D.P.
Greg]
Oenothera primiveris A. Gray
Oenothera toumeyi (Small) Tidestr.

OROBANCHACEAE

Brachystigma wrightii (A. Gray)
Pennell
Castilleja minor (A. Gray) A. Gray var.
minor
Castilleja patriotica Fernald
Castilleja tenuiflora Benth.
Conopholis alpina Liebm. var.
mexicana (A. Gray ex S. Watson) R.R.
Haynes

OXALIDACEAE

Oxalis corniculata L.
Oxalis decaphylla Kunth
Oxalis cf. *latifolia* Kunth
Oxalis metcalfei (Small) R. Knuth

PAPAVERACEAE

Argemone pleiacantha Greene
Corydalis aurea Willd.

PHRYMACEAE

Erythranthe guttata (DC.) G.L. Nesom

PLANTAGINACEAE

Nuttallanthus texanus (Scheele) D.A.
Sutton
Penstemon barbatus (Cav.) Roth
Penstemon campanulatus (Cav.)
Willd.

Penstemon parryi (A. Gray) A. Gray

Penstemon stenophyllus A. Gray

* *Plantago major* L.

PLATANACEAE

Platanus wrightii S. Watson

POLEMONIACEAE

Ipomopsis thurberi (A. Gray) V.E. Grant

POLYGALACEAE

Monnina wrightii A. Gray

POLYGONACEAE

Eriogonum abertianum Torr.
Eriogonum polycladon Benth.
Eriogonum wrightii Torr. ex Benth.
* *Polygonum aviculare* L.
* *Rumex crispus* L.

PORTULACACEAE

* *Portulaca oleracea* L.

RANUNCULACEAE

Aquilegia chrysantha A. Gray
Thalictrum fendleri Engelm. ex A. Gray

RHAMNACEAE

Ceanothus buxifolius Willd. ex Schult. f.
Frangula betulifolia (Greene) Grubov

ROSACEAE

Cercocarpus montanus Raf. var.
paucidentatus (S. Watson) F.L. Martin
Holodiscus discolor (Pursh) Maxim.
Potentilla subviscosa Greene var.
ramulosa (Rydb.) Kearney & Peebles
Prunus serotina Ehrh. var. *virens*
(Wooton & Standl.) McVaugh

RUBIACEAE

Bouvardia ternifolia (Cav.) Schltld.
Galium microphyllum A. Gray

SALICACEAE

Populus fremontii S. Watson
Populus tremuloides Michx.
Salix bonplandiana Kunth
Salix exigua Nutt.

CHECKLIST: Sierra la Elenita–la Mariquita Sky Island Complex page 4 of 4

SAXIFRAGACEAE

Heuchera sanguinea Engelm.

SIMAROUBACEAE

* *Ailanthus altissima* (Mill.) Swingle

SOLANACEAE

Calibrachoa parviflora (Juss.) D'Arcy

Datura innoxia Mill.

Physalis caudella Standl.

Physalis hederifolia A. Gray

Physalis pubescens L.

Solanum elaeagnifolium Cav.

Solanum fendleri A. Gray

VERBENACEAE

Aloysia gratissima (Gillies & Hook.)
Tronc.

Glandularia chiricahensis Umber

Glandularia gooddingii (Briq.) Solbrig

Glandularia latilobata (L.M. Perry)
G.L. Nesom

VIOLACEAE

Viola umbraticola Kunth

VITACEAE

Vitis arizonica Engelm.

Monocots

AMARYLLIDACEAE

Allium plummerae S. Watson

ASPARAGACEAE

Agave palmeri Engelm.

Agave parryi Engelm. var.
huachucensis (Baker) Little

Dasyllirion wheeleri S. Watson ex
Rothr.

Echeandia flavescens (Schult. &
Schult. f.) Cruden

Milla biflora Cav.

Nolina microcarpa S. Watson

Yucca madrensis Gentry

COMMELINACEAE

Commelina dianthifolia Delile

Commelina erecta L.

Tradescantia pinetorum Greene

CYPERACEAE

Carex praegracilis W. Boott

Cyperus fendlerianus Boeckl.

Cyperus pallidicolor (Kük.) G.C. Tucker

Cyperus sphaerolepis Boeckl.

Cyperus squarrosus L.

Eleocharis montevidensis Kunth

JUNCACEAE

Juncus mexicanus Willd. ex Schult. &
Schult. f.

Juncus saximontanus A. Nelson

POACEAE

Aristida adscensionis L.

Aristida havardii Vasey

Aristida pansa Wooton & Standl.

Aristida schiedeana Trin. & Rupr. var.
orcuttiana (Vasey) Allred & Valdés-
Reyna

Aristida ternipes Cav. var. *gentilis*
(Henrard) Allred

Aristida ternipes Cav. var. *ternipes*

* *Avena fatua* L.

Blepharoneuron tricholepis (Torr.)
Nash

Bothriochloa barbinodis (Lag.) Herter

Bouteloua curtispindula (Michx.) Torr.

Bouteloua hirsuta Lag.

Bouteloua repens (Kunth) Scribn. &
Merr.

* *Bromus catharticus* Vahl

Bromus inermis Leyss.

Chloris virgata Sw.

* *Cynodon dactylon* (L.) Pers.

Dasyochloa pulchella (Kunth) Willd. ex
Rydb.

Disakisperma dubium (Kunth) P.M.
Peterson & N. Snow

* *Echinochloa crus-galli* (L.) P. Beauv.

Elymus arizonicus (Scribn. & J.G. Sm.)
Gould

Elymus elymoides (Raf.) Swezey

* *Eragrostis cilianensis* (All.) Vignolo ex
Janch.

Eragrostis intermedia Hitchc.

* *Eragrostis lehmanniana* Nees

Eragrostis mexicana (Hornem.) Link

Heteropogon contortus (L.) Beauv. ex
Roem. & Schult.

Koeleria pyramidata (Lam.) P. Beauv

* *Melinis repens* (Willd.) Zizka

Muhlenbergia alopecuroides (Griseb.)
P.M. Peterson & Columbus

Muhlenbergia emersleyi Vasey

Muhlenbergia longiligula Hitchc.

Muhlenbergia rigens (Benth.) Hitchc.

* *Pennisetum ciliare* (L.) Link

Piptochaetium fimbriatum (Kunth)
Hitchc.

* *Poa annua* L.

Poa fendleriana (Steud.) Vasey

* *Polypogon viridis* (Gouan) Breistr.

Setaria liebmannii E. Fourn.

* *Sorghum halepense* (L.) Pers.

Sporobolus wrightii Munro ex Scribn.

Zuloagaea bulbosa (Kunth) E. Bess



Figure 1. Sierra la Buenos Aires summit, looking north-northwest to Sierra de los Ajos and north to Sierra San José (on the right). *Photo by George M. Ferguson.*

Preliminary Flora of the Sierra la Buenos Aires, Sonora, Mexico

by George M. Ferguson¹, Susan D. Carnahan¹, Thomas R. Van Devender², Ana Lilia Reina-Guererro^{1,2}, John L. Anderson³, Frank W. Reichenbacher⁴, Stephen F. Hale⁵, and James Malusa⁶

Abstract

A preliminary vascular flora is presented for the Sierra la Buenos Aires west of Fronteras, Sonora, based on historical collections and collections and observations made during two Madrean Discovery Expedition trips in 2016. The known flora contains 408 taxa in 82 families and 257 genera, with Asteraceae (52 taxa), Fabaceae (47 taxa), and Poaceae (46 taxa, including 8 non-natives) the most diverse families.

Introduction

The floras of the Sky Islands mountain ranges in southeastern Arizona are inherently richer than those of other parts of the

western United States (Bowers and McLaughlin 1996). While there are floras for at least eight Sky Islands in the United States, Sonoran Sky Islands have not been well studied, except for floras in the Sierras el Tigre (White 1948), de los Ajos (Fishbein et al. 1995), and Mazatán (Sánchez-E. et al. 2017). Here we present a preliminary vascular plant flora of the Sierra la Buenos Aires.

Study Area and Methods

The Sierra la Buenos Aires (2,305 m., 7,562 ft.) represents the middle portion of a NNW-SSE trending Sky Island mountain range complex, with the higher Sierra de los Ajos on the north (Figure 1) and the Sierras La Púrcia and Nacozari to the south. The Sierra la Buenos Aires is bound on the north by Puerto Mababi (1,600 m., 5,249 ft.) and on the south by Puerto Valdeza (1,570 m., 5,150 ft.). This mountain range lies roughly in the center of the Sky Island region at ca. 70 km (42 mi.) south from the United States–Mexico border near Naco, Arizona–Sonora, and divides the watersheds of the Ríos

¹University of Arizona Herbarium, 1140 E. South Campus Dr., Tucson, AZ 85721. ²GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718. ³PO Box 20911 Wickenburg, AZ 85358. ⁴8657 E. Clydesdale Tr., Scottsdale, AZ 85258. ⁵EcoPlan Associates Inc., 3610 N. Prince Village Pl., Suite 140, Tucson, AZ 85719. ⁶School of Natural Resources and the Environment, University of Arizona, 1064 E. Lowell St., Tucson, AZ 85721.

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Figure 2. *Diphysa thurberi* (Thurber's *Diphysa*) in Arroyo San Vicente, Sierra la Buenos Aires. Photo by Susan D. Carnahan. Figure 3. *Cracca* (*Tephrosia*) *thurberi* Rydb. isotype collection by G. Thurber # 410, Mababi, June 1851. Image courtesy of the C.V. Starr Virtual Herbarium of The New York Botanical Garden (<http://sweetgum.nybg.org/science/vh/>).

Sierra la Buenos Aires *continued*

Sonora and Bavispe (Yaqui). The Sierra la Buenos Aires is within the Área de Protección de Flora y Fauna Bavispe, a federal reserve managed by the Comisión Nacional de Áreas Naturales Protegidas.

The Sierra la Buenos Aires study area is bounded by Puertos Mababi and Valdeza on the north and south ends, and by the elevational contours at the base of the mountain of 1,400 m. (4,593 ft.) on the eastern and 1,140 m. (3,740 ft.) on the western sides of the range. Plant records were compiled for the area, about 21,000 ha., in the Municipalities of Bacoachi and Fronteras. The elevational range for the Sierra la Buenos Aires is 1,165 m. (3,822 ft.). The land area above 1,500 m. (4,921 ft.) elevation consists of roughly 7,300 ha., with an area above 2,000 m. (6,561 ft.) of about 800 ha. The majority of the higher elevation surrounds the 2,305 m. (7,562 ft.) elevation summit at the north end of the range (30.7256°N 109.8388°W), with a ridge connecting a secondary summit of 2,200 m. (7,217 ft.) elevation eight kilometers to the south-southeast. The areas we visited in the range consist of granitoid rock outcrops forming steep, rugged slopes with boulders and decomposed granite gravels in the drainages and bajadas. A few limestone outcrops at ca. 1,580 m. (5,183 ft.) elevation are on the east slope.

Our collections-based plant inventory trips sponsored by **GreaterGood.org** spent two days in July and four days in August 2016, with field work conducted primarily in the northern half of the range from a base camp at 1,710 m. (5,610 ft.) elevation in Arroyo Santa Gertrudis (30.7273°N 109.8215°W). A colorful account of the expedition was featured in *The Plant Press* (Van Devender et al. 2016). Field

excursion by foot followed an old road toward the high ridge at Puerto el Apache, and then without trails up to the summit. Our specimens were deposited into the University of Arizona (ARIZ), Arizona State University (ASU), Universidad de Sonora (USON), and the Universidad Nacional Autónoma de México (MEXU) herbaria. Records and observations are available in databases in the SEINet network (<http://swbiodiversity.org/seinet/collections/index.php>), especially the Madrean Discovery Expeditions (madreandiscovery.org). In addition to our own collections, online records in SEINet were searched for previous museum specimens from the Sierra la Buenos Aires study area. Plant collections were made under a SEMARNAT (Secretaría de Medio Ambiente y Recursos Naturales) permit to J. Jesús Sanchez-Escalante.

Results and Discussion

The earliest collections in the Sierra la Buenos Aires study area were by George Thurber in June 1851 on the United States–Mexico boundary survey. He discovered new species of plants from “near Bacoachi” (*Opuntia thurberi* = *Cylindropuntia thurberi*), and “Mabibi” or “Mububi” (= Mababi, *Daubentonia thurberi* [= *Diphysa thurberi*, Figure 2], *Cracca thurberi* [= *Tephrosia thurberi*, Figure 3], *Carex thurberi*, *Castilleja tomentosa* [= *Castilleja integra*], and *Ranunculus hydrocharoides*). In March and June 1970, Lyle McGill and Donald J. Pinkava collected along the Mababi road. In March 1991, Rigoberto A. López-E. and Marielos A. Quintana collected in the western foothills of Sierra el Apache (= la Buenos Aires). Stephen G. Weller and A.K. Sakai made a few

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Sierra la Buenos Aires

continued

collections in the Sierra la Buenos Aires in September 2002.

All other Sierra la Buenos Aires plant collections and observations were made by the authors. George Ferguson and Mark Fishbein made collections in July 1993 and April 1995 from west of Rancho la Volanta through Arroyo Agua Escondido and Puerto Mababi to Rancho Mababi. Reina-G. and Van Devender made a few collections in Puerto Valdeza in June 2010. The previous collections and those made on the 2016 MDE Sierra la Buenos Aires represent 350 plant taxa. Another 58 taxa were observed in the study area.

Flora. A total of 408 species and infraspecific taxa were identified from the Sierra la Buenos Aires in 257 genera and 82 plant families. The plant families with the most species are Asteraceae (52, 12.7%), Fabaceae (47, 11.5%), Poaceae (46, 11.3%, including 8 non-natives), Euphorbiaceae (13, 3.2%), Apocynaceae (12, 2.9%), Cyperaceae (12, 2.9%), Pteridaceae (11, 2.7%), Lamiaceae (11, 2.7%), Boraginaceae (10, 2.5%), and Cactaceae (9, 2.2%). The genera with the most species are *Muhlenbergia* (9), *Asclepias* (8), *Quercus* (6), and *Myriopteris* (6). Only 14 species are non-native (3.4%).



Figure 4. Desert grassland at 1,140 m. (3,740 ft.) on the west bajada of Sierra la Buenos Aires near Rancho la Volanta. Photo by George M. Ferguson.

Vegetation. The lower elevations on the west side of the mountain support desert grassland dominated by velvet mesquite (*Prosopis velutina*) among junipers (*Juniperus arizonica*), ocotillos (*Fouquieria splendens*), and yuccas (Figure 4). Plains grassland with scattered *Yucca baccata* var. *brevifolia* and *J. deppeana* is near Mababi on the east bajada of Sierra la Buenos Aires. Puerto Mababi at 1,600 m. (5,249 ft.) is a grassland-oak woodland transition with *Quercus emoryi* and *Q. oblongifolia* (Figure 5). At higher elevations, oak woodland merges into pine-oak forest dominated by *Pinus arizonica* on the higher peaks (Figures 6a and b). Riparian deciduous forest trees in upper drainages are *Populus fremontii*, *Platanus wrightii*, *Juglans major*, *Acer grandidentatum*, *Fraxinus velutina*, and *Quercus arizonica*. A widespread wildfire in June 2013 burned in the north portion of the range, although most trees survived and the vegetation recovered.

Floristic Comparisons. While the Huachuca Mountains flora of southern Arizona is more complete with 994 taxa in 106 families, at least 310 (76%) taxa in the Buenos Aires preliminary also occur in the Huachuca Mountains. Of the species which did not overlap, many are Sonoran desertscrub and thornscrub taxa. Additional Huachuca taxa, discovered in floristic inventories by the Coronado National Forest and the Coronado National Memorial, are available in the SEINet databases and likely to increase the Buenos Aires–Huachuca similarity. Three noteworthy species in the Sierra la Buenos Aires which are now thought to be extirpated from the Huachuca Mountains are



Figure 5. Oak woodland-grassland ecotone at 1,400 m. (4,593 ft.) on the east bajada of Sierra la Buenos Aires near Rancho Mababi. Photo by George M. Ferguson.

continued next page

Sierra la Buenos Aires *continued*

Clitoria mariana (Figure 7), *Diphysa thurberi* (Figure 2), and *Rubus arizonensis*. The Huachuca Mountains comprise a more sizeable area (31,000 ha.) and higher summit (Miller Peak, 2,886 m. (9,470 ft.) at 86 km. (53.4 mi.) NNW of Sierra la Buenos Aires. A major difference in the two ranges is that the elevational range of the Huachuca Mountains is large but has a lower limit of 1,524 m. (5,000 ft.) on the western base, while Sierra la Buenos Aires is 1,140 m. (3,740 ft.) on the western base, providing for a greater presence of a Sonoran floristic element. The difference is reflected in the spring annuals found in the Sierra la Buenos Aires but relatively lacking in the Huachuca Mountains. There are also a number of more southerly distributed species present in the Buenos Aires range (e.g., *Ageratum corymbosum*, *Mandevilla stans*, and *Tecoma stans*) that do not occur in the Huachuca Mountains.

The adjacent Sierra de los Ajos at 2,621 m. (8,599 ft.) is also a higher mountain with a larger area and potentially a larger flora than Sierra la Buenos Aires, although the documented species of its preliminary flora (Fishbein et al. 1995) only accounted for 376 species of vascular plants in 93 families for

Sierra de los Ajos. As in Sierra la Buenos Aires, the dominant families are Asteraceae, Poaceae, and Fabaceae, accounting for 43% of the specific and infraspecific taxa in the known flora. On the MABA Sierra de los Ajos Expedition in 2014, we added over 80 taxa to the existing Sierra de los Ajos flora. Some noteworthy plants that occur in both the Sierra de los Ajos and la Buenos Aires but are unknown from the Huachuca Mountains are *Agastache pallida*, *Coryphantha recurvata*, *Cylindropuntia thurberi*, *Quercus viminea*, *Penstemon campanulatus*, *Salvia parryi*, *Sambucus nigra*, *Seymeria bipinnatisecta*, and *Yucca baccata* var. *brevifolia*. The collections and observations from our 2016 inventory of Sierra la Buenos Aires added 190 species that had not been collected in the Sierra de los Ajos. Noteworthy species in the Sierra la Buenos Aires which are unknown from both the Huachuca Mountains and Sierra de los Ajos include *Aquilegia desertorum*, (Figure 9), *Arbutus xalapensis*, *Brickellia parvula* (first record for Sonora), *Bromus mucroglumis*, *Draba helleriana*, *Graptopetalum rusbyi*, *Malaxis soulei*, *Penstemon pinifolius* (Figure 8), *Ranunculus hydrocharoides*, and *Woodwardia fimbriata*.

continued next page



Figure 6. *Pinus arizonica* (Arizona pine). A. Pine-oak forest near the summit of Sierra la Buenos Aires, and evidence of 2013 fire. B. Needles and cones. Photos by George M. Ferguson.



Figure 7. *Clitoria marina* (butterfly pea) in Arroyo San Vicente, Sierra la Buenos Aires. Photo by Susan D. Carnahan.

Figure 8. *Penstemon pinifolius* (pineneedle penstemon) near the summit of Sierra la Buenos Aires. Photo by George M. Ferguson.

Figure 9 (inset). *Aquilegia desertorum* (desert columbine) in Arroyo San Vicente, Sierra la Buenos Aires. Photo by George M. Ferguson.

Sierra la Buenos Aires *continued*

Rare plants were discovered in the Sierra la Buenos Aires, including *Bouteloua eludens*, *Carex ultra*, and seven USDA sensitive species for Southwestern Region in the United States: *Asclepias lemmonii*, *Coryphantha recurvata*, *Erigeron arisolius*, *Hosackia alamosana*, *Laennecia eriophylla*, *Lupinus huachucanus*, and *Viola umbraticola*. An earlier collection of *Asclepias rusbyi* is reported here as the first record for Sonora and Mexico. An *Erigeron* discovered in the 2016 Sierra la Buenos Aires inventory is a new species (Guy L. Nesom, pers. comm.).

Floras continue to evolve with additional collections, introductions, local extinctions, and changes in taxonomy. Bowers and McLaughlin (1996) demonstrated a relationship between elevational range and species diversity among 24 local floras from Arizona and New Mexico. As the elevational ranges in the Sierra la Buenos Aires (1,165 m. elevation) (3,822 ft.) and the Animas Mountains, New Mexico, are similar, the latter with just over 600 known taxa, then both are expected to have complete floras of about 600 taxa.

The preliminary flora of the Sierra la Buenos Aires is an important contribution to our knowledge of the floristic diversity of the Sonoran Sky Islands.

Acknowledgements

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CHECKLIST: Sierra la Buenos Aires page 1 of 5

An exclamation mark (!) denotes observation only and an asterisk (*) denotes non-native

Lycophytes

SELAGINELLACEAE

Selaginella rupincola Underw.

Pteridophytes

AZOLLACEAE

Azolla microphylla Kaulf.

BLECHNACEAE

Woodwardia fimbriata Sm.

DENNSTAEDTIACEAE

Pteridium aquilinum (L.) Kuhn

PTERIDACEAE

Astrolepis sinuata (Lag. ex Sw.) D.M. Benham & Windham

Bommeria hispida (Mett. ex Kuhn) Underw.

Myriopteris aurea (Poir.) Grusz & Windham

Myriopteris fendleri E. Fourn.

Myriopteris lendigera (Cav.) J. Sm.

Myriopteris lindheimeri (Hook.) J. Sm.

Myriopteris rufa Fée

Myriopteris wootonii (Maxon) Grusz & Windham

Myriopteris yavapensis (T. Reeves ex Windham) Grusz & Windham

Pellaea intermedia Matt. ex Kuhn

Pellaea wrightiana Hook.

WOODSIACEAE

Cystopteris reevesiana Lellinger

Woodsia phillipsii Windham

Gymnosperms

CUPRESSACEAE

Juniperus arizonica (R.P. Adams) R.P. Adams

Juniperus deppeana Steud.

PINACEAE

Pinus arizonica Engelm.

Pinus chihuahuana Engelm.

Pinus discolor D.K. Bailey & Hawksworth

ANGIOSPERMS

Magnoliids

ARISTOLOCHIACEAE

Aristolochia watsonii Wooton & Standl.

Eudicots

ACANTHACEAE

Anisacanthus thurberi (Torr.) A. Gray

Dyschoriste decumbens (A. Gray) Kuntze

! *Ruellia nudiflora* (Engelm. & A. Gray) Urb.

ADOXACEAE

Sambucus nigra L. subsp. *canadensis* (L.) Bolli

AIZOACEAE

Trianthema portulacastrum L.

AMARANTHACEAE

! *Alternanthera caracasana* Kunth

! *Amaranthus palmeri* S. Watson

! *Dysphania graveolens* (Willd.)

Mosyakin & Clemants

Gomphrena caespitosa Torr.

Guilleminea densa (Humb. & Bonpl. ex Willd.) Moq.

ANACARDIACEAE

Rhus aromatica Ait.

Rhus glabra L.

Rhus virens Lindh. ex A. Gray var. *choriophylla* (Wooton & Standl.) L.D. Benson

Toxicodendron radicans (L.) Kuntze

APIACEAE

Eryngium heterophyllum Engelm.

Pseudocymopterus montanus (A. Gray) J.M. Coult. & Rose

APOCYNACEAE

Asclepias asperula (Decne.) Woodson

Asclepias elata Benth.

Asclepias rusbyi (Vail) Woodson

Asclepias hypoleuca (A. Gray) Woodson

Asclepias lemmonii A. Gray

Asclepias nummularia Torr.

Asclepias nyctaginifolia A. Gray

Asclepias tuberosa L.

Funastrum crispum (Benth.) Schltr.

Funastrum heterophyllum (Engelm. ex Torr.) Standl.

Mandevilla brachysiphon (Torr.) Pichon

Mandevilla stans (A. Gray) J.K. Williams

ARALIACEAE

Aralia humilis Cav.

ASTERACEAE

Ageratum corymbosum Zuccagni

Amauriopsis dissecta (A. Gray) Rydb.

! *Ambrosia confertiflora* DC.

Ambrosia monogyra (Torr. & A. Gray) Strother & B.G. Baldwin

Antennaria parvifolia Nutt.

! *Artemisia dracunculus* L.

! *Artemisia ludoviciana* Nutt.

! *Baccharis pteronioides* DC.

Baccharis salicifolia (Ruiz & Pav.) Pers.

! *Baccharis sarothroides* A. Gray

Berlandiera monocephala (B.L. Turner) Pinkava

! *Brickellia betonicifolia* A. Gray

Brickellia parvula A. Gray

Carphochaete bigelovii A. Gray

Chaenactis stevioides Hook. & Arn.

Chaetopappa ericoides (Torr.) G.L. Nesom

Cirsium arizonicum (A. Gray) Petrak

Cirsium neomexicanum A. Gray

Coreocarpus arizonicus (A. Gray) S.F. Blake

Diaperia verna (Raf.) Morefield

CHECKLIST: Sierra la Buenos Aires page 2 of 5

Erigeron arisolius G.L. Nesom

Erigeron divergens Torr. & A. Gray

Erigeron L. sp. nov.

Erigeron tracyi Greene

Guardiola platyphylla A. Gray

! *Gutierrezia microcephala* (DC.) A. Gray

Gutierrezia wrightii A. Gray

Gymnosperma glutinosum (Spreng.) Less.

Helianthus annuus L.

Heterotheca subaxillaris (Lam.) Britton & Rusby

Hieracium fendleri Sch. Bip.

Lactuca graminifolia Michx.

Laennecia eriophylla (A. Gray) G.L. Nesom

Lasiantha podocephala (A. Gray) K. Becker

Malacothrix fendleri A. Gray

Pectis longipes A. Gray

Pectis prostrata Cav.

! *Porophyllum macrocephalum* DC.

! *Roldana hartwegii* (Benth.) H. Rob. & Breitel var. *carlomasonii* (B.L. Turner & T.M. Barkley) Funston

Senecio flaccidus Less. var. *flaccidus*

Senecio flaccidus Less. var. *monoensis* (Greene) B.L. Turner & T.M. Barkley

Senecio parryi A. Gray

Solidago velutina DC. subsp. *sparsiflora* (A. Gray) Semple

Stevia salicifolia Cav.

Stevia serrata Cav.

Symphyotrichum subulatum (Michaux) G.L. Nesom

Tagetes lemmonii A. Gray

Uropappus lindleyi (DC.) Nutt.

Verbesina longifolia (A. Gray) A. Gray

! *Xanthisma gracile* (Nutt.) D.R. Morgan & R.L. Hartm.

Xanthisma spinulosum (Pursh) D.R. Morgan & R.L. Hartm. var. *chihuahuanum* (B.L. Turner & R.L. Hartm.) D.R. Morgan & R.L. Hartm.

Xanthocephalum gymnospermoides (A. Gray) Benth. & Hook. f.

BETULACEAE

Alnus oblongifolia Torr.

BIGNONIACEAE

Chilopsis linearis (Cav.) Sweet subsp. *arcuata* (Fosberg) Henrickson

Tecoma stans (L.) Juss. ex Kunth var. *angustata* Rehder

BORAGINACEAE

Cryptantha barbiger (A. Gray) Greene

Cryptantha maritima (Greene) Greene

Eremocarya micrantha (Torrey) Greene

Lithospermum multiflorum Torr. ex A. Gray

Nama hispidum A. Gray

Pectocarya platycarpa (Munz & I.M. Johnst.) Munz & I.M. Johnst.

Phacelia gentryi Constance

Phacelia platycarpa (Cav.) Spreng.

Plagiobothrys arizonicus (A. Gray) Greene ex A. Gray

Plagiobothrys pringlei Greene

BRASSICACEAE

Descurainia pinnata (Walter) Britton

Draba helleriana Greene

Hesperidanthus linearifolius (A. Gray) Rydb.

Lepidium lasiocarpum Nutt. ex Torr. & A. Gray

Lepidium thurberi Wooton

Pennellia micrantha (A. Gray) Nieuwl.

BUDDLEJACEAE

Buddleja sessiliflora Kunth

CACTACEAE

Coryphantha recurvata (Engelm.) Britton & Rose

! *Cylindropuntia spinosior* (Engelm.) F.M. Knuth

Cylindropuntia thurberi (Engelm.) F.M. Knuth

Echinocereus fendleri Engelm. var. *rectispinus* (Peebles) L.D. Benson

! *Echinocereus rigidissimus* (Engelm.) Engelm. ex Haage

! *Echinocereus santaritensis* W. Blum & Rutow

Mammillaria macdougalii Rose

! *Mammillaria* cf. *viridiflora* (Britton & Rose) Boed.

! *Opuntia chlorotica* Engelm. & J.M. Bigelow

CAMPANULACEAE

Lobelia cardinalis L.

CANNABACEAE

! *Celtis reticulata* Torr.

CARYOPHYLLACEAE

Arenaria lanuginosa (Michx.) Rohrb. ssp. *saxosa* (A. Gray) Maguire

Cerastium nutans Raf.

Silene antirrhina L.

Silene laciniata Cav.

Silene thurberi S. Watson

CLEOMACEAE

! *Polanisia dodecandra* (L.) DC.

CONVOLVULACEAE

! *Convolvulus equitans* Benth.

Evolvulus alsinoides L. var. *angustifolia* Torr.

Evolvulus arizonicus A. Gray

Evolvulus sericeus Sw. var. *discolor* Sw.

Ipomoea capillacea (Kunth) G. Don

Ipomoea longifolia Benth.

CRASSULACEAE

Graptopetalum rusbyi (Greene) Rose

Sedum stelliforme S. Watson

ERICACEAE

Arbutus arizonica (A. Gray) Sarg.

Arbutus xalapensis Kunth

Arctostaphylos pungens Kunth

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EUPHORBIACEAE

Acalypha ostryifolia Riddell ex J.M. Coult.
Croton texensis (Klotzsch) Müll. Arg.
! *Euphorbia albomarginata* Torr. & A. Gray
Euphorbia davidii Subils
Euphorbia heterophylla L.
Euphorbia hirta L.
Euphorbia hyssopifolia L.
Euphorbia indivisa (Engelm.) Tidestrom
Euphorbia lurida Engelm.
Euphorbia melanadenia Torr.
Euphorbia pediculifera Engelm.
Tragia nepetifolia Cav.
Tragia ramosa Torr.

FABACEAE

Acaciella angustissima (Mill.) Britton & Rose
! *Acmispon greenei* (Wooton & Standl.) Brouillet
Acmispon oroboides (Kunth) Brouillet
! *Amorpha fruticosa* L.
Astragalus nuttallianus DC.
Calliandra eriophylla Benth.
Calliandra humilis Benth. var. *reticulata* (A. Gray) L.D. Benson
Chamaecrista nictitans (L.) Moench
Chamaecrista serpens (L.) Greene
Clitoria mariana L.
Cologania obovata Schltld.
Coursetia caribaea (Jacq.) Lavin var. *caribaea*
! *Coursetia glandulosa* A. Gray
Crotalaria pumila Ortega
Dalea lumholtzii B.L. Rob. & Fernald
Dalea nana Torr. ex A. Gray var. *carnescens* (Rydb.) Kearney & Peebles
Dalea pringlei A. Gray var. *multijuga* Barneby
Dalea pulchra Gentry
Dalea versicolor Zucc. var. *sessilis* A. Gray

Desmanthus cooleyi (Eaton) Branner & Coville

Desmodium arizonicum S. Watson
Desmodium cf. *batocaulon* A. Gray
Diphysa thurberi (A. Gray) Rydb. ex Standl.
Erythrina flabelliformis Kearney
Eysenhardtia orthocarpa (A. Gray) S. Watson
Galactia wrightii A. Gray
Hosackia alamosana Rose
Lathyrus graminifolius (S. Watson) T.G. White
Lathyrus lanszwertii Kellogg
Lupinus concinnus J.G. Agardh
Lupinus huachucanus M.E. Jones
Lupinus sparsiflorus Benth.
Macroptilium gibbosifolium (Ortega) A. Delgado
* *Medicago polymorpha* L.
Mimosa dysocarpa Benth.
! *Mimosa grahamii* A. Gray
Phaseolus grayanus Wooton & Standl.
Phaseolus parvulus Greene
Phaseolus ritensis M.E. Jones
! *Prosopis velutina* Wooton
Rhynchosia senna Gillies ex Hook.
! *Robinia neomexicana* A. Gray
Senna hirsuta (L.) H.S. Irwin & Barneby var. *glaberrima* (M.E. Jones) H.S. Irwin & Barneby
Tephrosia tenella A. Gray
Tephrosia thurberi (Rydb.) C.E. Wood
Vicia pulchella Kunth
Zornia reticulata Sm.

FAGACEAE

Quercus arizonica Sarg.
Quercus emoryi Torr.
Quercus hypoleucoides A. Camus
Quercus oblongifolia Torr.
Quercus rugosa Née

Quercus viminea Trel.

FOUQUIERIACEAE

! *Fouquieria splendens* Engelm.

GARRYACEAE

Garrya wrightii Torr.

GERANIACEAE

Geranium caespitosum E. James
! *Geranium richardsonii* Fisch. & Trautv.
Geranium wislizeni S. Watson

HYDRANGEACEAE

Philadelphus microphyllus A. Gray

JUGLANDACEAE

Juglans major (Torr.) A. Heller

KRAMERIACEAE

Krameria erecta Torr.

LAMIACEAE

Agastache pallida (Lindl.) Cory var. *pallida*
Hedeoma dentata Torr.
Hedeoma oblongifolia (A. Gray) A. Heller
! * *Marrubium vulgare* L.
Monarda citriodora Cerv. ex Lag. var. *austromontana* (Epling) B.L. Turner
Monarda fistulosa L. subsp. *menthifolia* (Graham) L.S. Gill
Salvia parryi A. Gray
Salvia subincisa Benth.
Scutellaria potosina Brandegees var. *tessellata* (Epling) B.L. Turner
Stachys coccinea Ortega
Trichostema arizonicum A. Gray

LINACEAE

Linum neomexicanum Greene

LOASACEAE

Mentzelia albicaulis (Douglas) Douglas ex Torr. & A. Gray
Mentzelia isolata Gentry

LYTHRACEAE

Cuphea wrightii A. Gray var. *wrightii*

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Lythrum californicum Torr. & A. Gray

MALVACEAE

! *Gossypium thurberi* Tod.

! *Rhynchosida physocalyx* (A. Gray) Fryxell

Sida abutilifolia Mill.

MARTYNIACEAE

! *Proboscidea altheifolia* (Benth.) Decne.

Proboscidea parviflora (Wooton) Wooton & Standl.

MOLLUGINACEAE

* *Mollugo verticillata* L.

MORACEAE

! *Morus microphylla* Buckley

NYCTAGINACEAE

! *Boerhavia coccinea* P. Mill.

Mirabilis albida (Walter) Heimerl

Mirabilis linearis (Pursh) Heimerl var. *linearis*

Mirabilis longiflora L.

OLEACEAE

Fraxinus velutina Torr.

ONAGRACEAE

Eulobus californicus Nutt. ex Torr. & A. Gray

Oenothera albicaulis Pursh

Oenothera elata Kunth subsp. *hirsutissima* (A. Gray ex S. Watson) W. Dietr.

Oenothera podocarpa (Wooton & Standl.) Krakos & W.L. Wagner

Oenothera primiveris A. Gray subsp. *primiveris*

Oenothera toumeyii (Small) Tidestr.

OROBANCHACEAE

Brachystigma wrightii (A. Gray) Pennell

Castilleja integra A. Gray

Castilleja tenuiflora Benth.

Seymeria bipinnatisecta Seem.

OXALIDACEAE

Oxalis corniculata L.

Oxalis metcalfei (Small) R. Knuth

PAPAVERACEAE

! *Argemone pleiacantha* Greene

Corydalis aurea Willd.

Eschscholzia californica Cham. subsp. *mexicana* (Greene) C. Clark

PHYTOLACCACEAE

Phytolacca icosandra L.

PLANTAGINACEAE

Penstemon barbatus (Cav.) Roth

Penstemon campanulatus (Cav.) Willd.

Penstemon pinifolius Greene

Plantago patagonica Jacq.

Plantago virginica L.

Schistophragma intermedia (A. Gray) Pennell

PLATANACEAE

Platanus wrightii S. Watson

POLEMONIACEAE

Eriastrum diffusum (A. Gray) Mason

Gilia mexicana A.D. Grant & V.E. Grant

Gilia scopulorum M.E. Jones

Ipomopsis thurberi (A. Gray) V.E. Grant

Linanthus bigelovii (A. Gray) Greene

Microsteris gracilis (Douglas ex. Hook.) Greene

POLYGALACEAE

Hebecarpa obscura (Benth.) J.R. Abbott

Polygala alba Nutt.

Polygala hemipterocarpa A. Gray

POLYGONACEAE

Eriogonum abertianum Torr.

! *Eriogonum polycladon* Benth.

PORTULACACEAE

* *Portulaca oleracea* L.

Portulaca suffrutescens Engelm.

Portulaca umbraticola Kunth

PRIMULACEAE

* *Anagallis arvensis* L.

Androsace occidentalis Pursh

RANUNCULACEAE

Aquilegia chrysantha A. Gray

Aquilegia desertorum (M.E. Jones)

Cockerell ex Heller

Clematis drummondii Torr. & A. Gray

Thalictrum fendleri Engelm. ex A. Gray

Ranunculus hydrocharoides A. Gray

RHAMNACEAE

Ceanothus buxifolius Willd. ex Schult. f.

Frangula betulifolia (Greene) Grubov

ROSACEAE

Holodiscus discolor (Pursh) Maxim.

Prunus serotina Ehrh.

Purshia stansburyana (Torr.) Henrickson

Rubus arizonensis Focke

RUBIACEAE

Bouvardia ternifolia (Cav.) Schldtl.

* *Galium aparine* L.

Galium microphyllum A. Gray

Galium proliferum A. Gray

Galium wrightii A. Gray

Houstonia wrightii A. Gray

RUTACEAE

Ptelea trifoliata L.

SALICACEAE

Populus fremontii S. Watson

! *Salix bonplandiana* Kunth

! *Salix gooddingii* C.R. Ball

Salix lasiolepis Benth.

! *Salix taxifolia* Kunth

SANTALACEAE

! *Phoradendron serotinum* (Raf.) M.C.

Johnst. subsp. *tomentosum* (DC.) Kuijt

SAPINDACEAE

Acer grandidentatum Nutt.

Dodonaea viscosa Jacq. var. *angustifolia* (L. f.) Benth.

! *Sapindus drummondii* Hook. & Arn.

CHECKLIST: Sierra la Buenos Aires page 5 of 5

SAXIFRAGACEAE

Heuchera sanguinea Engelm.

SOLANACEAE

! *Datura innoxia* Mill.

Physalis hederifolia A. Gray

Physalis solanacea (Schltdl.) Axelius

Solanum americanum P. Mill.

Solanum douglasii Dunal

! *Solanum elaeagnifolium* Cav.

Solanum stoloniferum Schltdl. & Bouché

VERBENACEAE

Glandularia latilobata (L.M. Perry) G.L. Nesom

Phyla nodiflora (L.) Greene

Verbena carolina L.

Verbena neomexicana (A. Gray) Small

VIOLACEAE

Viola umbraticola Kunth

VITACEAE

Vitis arizonica Engelm.

ZYGOPHYLLACEAE

! *Kallstroemia grandiflora* Torr. ex A. Gray

Monocots

ASPARAGACEAE

! *Agave palmeri* Engelm.

Dasyllirion wheeleri S. Watson ex Rothr.

Echeandia flavescens (J.A. & J.H. Schultes) Cruden

! *Milla biflora* Cav.

Nolina microcarpa S. Watson

! *Yucca baccata* Torr. var. *brevifolia* L.D. Benson & R.A. Darrow

! *Yucca elata* (Engelm.) Engelm.

! *Yucca madrensis* Gentry

COMMELINACEAE

Commelina tuberosa L.

Tradescantia pinetorum Greene

CYPERACEAE

Bulbostylis capillaris (L.) Kunth ex C.B. Clarke

Bulbostylis juncooides (Vahl) Kük. ex Osten

Carex chihuahuensis Mackenzie

Carex leucodonta Holm

Carex thurberi Dewey

Carex ultra L.H. Bailey

Cyperus hypopitys G.C. Tucker

Cyperus mutisii (Kunth) Andersson

Cyperus pallidicolor (Kük.) G.C. Tucker

Cyperus sphaerolepis Boeckl.

Eleocharis montevidensis Kunth

Eleocharis parishii Britton

JUNCACEAE

Juncus saximontanus A. Nelson

ORCHIDACEAE

Bletia coccinea La Llave & Lex.

Malaxis corymbosa (S. Watson) Kuntze

! *Malaxis soulei* L.O. Williams

POACEAE

Agrostis scabra Willd.

Aristida adscensionis L.

Aristida schiedeana Trin. & Rupr. var. *orcuttiana* (Vasey) Allred & Valdés-Reyna

Aristida ternipes var. *ternipes* Cav.

! *Bothriochloa barbinodis* (Lag.) Herter

* *Bothriochloa ischaemum* (L.) Keng

Bouteloua aristidoides (Kunth) Griseb.

Bouteloua curtipendula (Michx.) Torr.

Bouteloua eludens Griffiths

Bouteloua gracilis (Kunth) Lag. ex Griffiths

Bromus ciliatus L.

Bromus mucroglumis Wagnon

Cenchrus spinifex Cav.

Chloris virgata Sw.

* *Cynodon dactylon* (L.) Pers. var. *dactylon*

* *Digitaria sanguinalis* (L.) Scop.

Disakisperma dubium (Kunth) P.M. Peterson & N. Snow

* *Eragrostis cilianensis* (All.) Vignolo ex Janch.

Eragrostis intermedia Hitchc.

* *Eragrostis lehmanniana* Nees

Eragrostis mexicana (Hornem.) Link subsp. *mexicana*

Eragrostis pectinacea (Michx.) Nees

Eriochloa acuminata (J. Presl) Kunth

Eriochloa aristata Vasey

Eriochloa lemmonii Vasey & Scribn.

Festuca octoflora Walter var. *hirtella* (Piper) Hitchc.

Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.

Hopia obtusa (Kunth) Zuloaga & Morrone

Koeleria pyramidata (Lam.) P. Beauv. subsp. *pyramidata*

! * *Melinis repens* (Willd.) Zizka

! *Muhlenbergia alopecuroides* (Griseb.) P.M. Peterson & Columbus

Muhlenbergia arizonica Scribn.

! *Muhlenbergia emersleyi* Vasey

Muhlenbergia fragilis Swallen

Muhlenbergia montana (Nutt.) Hitchc.

Muhlenbergia phleoides (Kunth) Columbus

! *Muhlenbergia rigens* (Benth.) Hitchc.

Muhlenbergia tenuifolia (Kunth) Kunth

Muhlenbergia unisetata (Lag.) Columbus

Panicum hallii Vasey

Panicum hirticaule J. Presl

Paspalum setaceum Michx.

Setaria grisebachii E. Fourn.

* *Setaria pumila* (Poir.) Roem. & Schult.

* *Sorghum halepense* (L.) Pers.

Zuloagaea bulbosa (Kunth) E. Bess



Figure 1. View from the summit of the Sierra La Púrica. Photo by Charles Hedgcock.

Preliminary Flora of the Sierra La Púrica, Sonora, Mexico

by José Jesús Sánchez-Escalante¹, Thomas R. Van Devender², and Ana Lilia Reina-Guerrero²

Abstract

The Sierra La Púrica is a Sky Island mountain range north-northwest of Nacozari de García (municipality of the same name), Sonora, Mexico, in the Área de Protección de Flora y Fauna Bavispe in the Comisión Nacional de Áreas Naturales Protegidas. The Madrean Archipelago Biodiversity Assessment Expedition Sierra La Púrica took place in July and September 2013. The preliminary flora contains 306 plant taxa in 215 genera and 71 families. Families with the most taxa were Poaceae (49 taxa), Asteraceae (43 taxa), and Fabaceae (32 taxa). Genera with the most species were *Bouteloua* (9), *Quercus* (8), *Muhlenbergia* (7), *Eragrostis* (6), *Euphorbia* (6), *Ipomoea* (5), and *Solanum* (5). Sixteen species (5.2%) are non-native. *Stevia puricana*, described by Billie L. Turner in 2015, is only known from the Sierra La Púrica.

¹Herbario USON, Universidad de Sonora-DICTUS, Edificio 1A (museo), planta baja, Niños Héroes entre Rosales y Pino Suárez, Col. Centro, Hermosillo, Sonora, Mexico, CP 83000. ²GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718.

Introduction

There are 55 isolated mountain ranges or complexes of several ranges connected by oak woodland corridors in the Madrean Archipelago (= Sky Island Region) between the Sierra Madre Occidental in eastern Sonora and the Mogollon Rim in central Arizona (Van Devender et al. 2013). These Sky Islands are crowned with oak woodland or pine-oak forest. The lowland “seas” below them are Sonoran and Chihuahuan desertscrub, desert grassland, foothills thornscrub, or tropical deciduous forest. In this paper, we present the preliminary vascular flora of the Sierra La Púrica, a Sky Island mountain range located north-northwest of Nacozari de García in northeastern Sonora, Mexico.

Study Area

The Sierra La Púrica is part of a federally protected area managed by the Comisión Nacional de Área Naturales Protegidas (CONANP; Figure 1). It was designated the Reserva Forestal Nacional y Refugio de la Fauna Silvestre “Bavispe” in 1939 (Diario Oficial de la Federación 1939) and

continued next page



Figure 2. A. Pine-oak forest in the Sierra La Púrica. B. Arizona pine (*Pinus arizonica*). Photos by Ana L. Reina-G.

Sierra La Púrica *continued*

reorganized as the Área de Protección de Flora y Fauna “Bavispe” in 2017 (Diario Oficial de la Federación, 2017). The Comisión Nacional para el Uso y Conocimiento de la Biodiversidad en México (CONABIO) included the Sierra La Púrica within the Región Terrestre Prioritaria RTP-42 (Arriaga 2000).

The Sierra La Púrica is part of a Sky Island complex in northeastern Sonora with the Sierras la Buenos Aires and de los Ajos to the north and Sierra Nacozari to the south. The east side of the Sierra La Púrica drains into the Río Cabullona, an upper tributary of the Río Bavispe-Yaqui drainage. The western slopes drain into the Río Sonora. The southeastern edge of the Sierra La Púrica and the connecting Sierra Nacozari drain into the Río Santa Rosa to the Río Moctezuma, and eventually the Río Yaqui.

The Sierra La Púrica study area is in the municipalities of Bacoachi and Nacozari, Sonora, in the CONANP APFF Bavispe and several nearby localities outside the reserve in an area delimited by the coordinates 30.6378°N 109.7778°W and 30.5142°N 109.66°W. The elevation is 1,435–2,450 m. (4,708–8,038 ft.), an elevational range of 1,015 m. (3,330 ft.).

Plant Collections

Historically, there have not been many records of plants in the Sierra La Púrica. In 2010, Aaron D. Fleisch made observation of trees along breeding bird transects. Most of the collections and observations in this paper were made by the authors and Stephen F. Hale as part of the Sky Island Alliance’s Madrean Archipelago Biodiversity Assessment (MABA) Expedition Sierra La Púrica on July 16–18 (scouting trip) and September 7–11, 2013. Nearly 500 species of animals and plants were

recorded by 46 participants. The flora was documented by 945 botanical specimens deposited in the Universidad de Sonora, University of Arizona, and University of Texas herbaria. Herbarium records and field observations are available in the MABA database (accessible online through the Madrean Discovery Expedition [MDE, madreandiscovery.org] and Red de Herbarios del Noroeste de México [herbanwmex.net] databases).

Results

Vegetation. The vegetative communities of this Sky Island include desert grassland at the lowest elevations, oak woodland on the slopes, and pine-oak forest at the highest elevations (Figures 2A and B).

Desert Grassland. Grasses are common with several species of *Aristida*, *Bouteloua*, *Eragrostis*, and *Muhlenbergia*. Pinyon ricegrass (*Piptochaetium fimbriatum*), Pringle needlegrass (*P. pringlei*), yellow foxtail (*Setaria pumila*), liverseed grass (*Urochloa panicoides*), and bulb panicgrass (*Zuloagaea bulbosa*) are also present. Trees and shrubs include Arizona juniper (*Juniperus arizonica*), velvet mesquite (*Prosopis velutina*), and mimosas (*M. biuncifera*, *M. dysocarpa*). Succulents include cane cholla (*Cylindropuntia spinosior*) (Figure 3A), dark-spined pricklypear (*Opuntia phaeacantha*), and banana yucca (*Yucca baccata*). Tufted milkweed (*Asclepias nummularia*) (Figure 3B) is an unusual, tiny milkweed.

Oak Woodland. The slopes support Arizona white oak (*Quercus arizonica*), blue oak (*Q. oblongifolia*), Emory oak/bellota (*Q. emoryi*), Toumey oak (*Q. toumeyii*), willowleaf oak (*Q. viminea*), and alligator juniper (*J. deppeana*). Shrubs

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Figure 3. Desert grassland plants. A. Cane cholla (*Cylindropuntia spinosior*). Photo by Doug Danforth. B. Tufted milkweed (*Asclepias nummularia*). Photo by Thomas R. Van Devender.

Sierra La Púrica *continued*

include point-leaf manzanita (*Arctostaphylos pungens*), silk tassel (*Garrya wrightii*), evergreen sumac (*Rhus virens*), and lemonade berry (*R. aromatica*). Succulents are Arizona rainbow cactus (*Echinocereus rigidissimus*) (Figure 4a), scarlet hedgehog cactus (*E. santaritensis*), pancake pricklypear (*O. chlorotica*), mountain yucca (*Yucca madrensis*), and Huachuca century plant (*Agave parryi* var. *huachucensis*) (Figure 4B).

Pine-oak Forest. Plants in the higher elevations include Arizona pine (*Pinus arizonica*) (Figure 2B), Chihuahuan pine (*P. chihuahuana*), quaking aspen (*Populus tremuloides*), Arizona madrone (*Arbutus arizonica*), creambush (*Holodiscus discolor*), Gambel oak (*Q. gambelii*) (Figure 5A), netleaf oak (*Q. rugosa*), silverleaf oak (*Q. hypoleucoides*), buckbrush (*Ceanothus buxifolius*), Cardinal catchfly (*Silene laciniata*) (Figure 5B), Arizona sage (*Salvia arizonica*) (Figure 6A), Chiricahua mountain eryngo (*Eryngium lemmonii*) (Figure 6B), green death camas (*Zigadenus virescens*) (Figure 6C), five-nerve helianthella (*Helianthella quinquenervis*), alpine wood sorrel (*Oxalis alpina*), tenleaf wood sorrel (*O. decaphylla*), and hairy brackenfern (*Pteridium aquilinum* var. *pubescens*).

Riparian Deciduous Forest. In areas with riparian forest and tributary streams, Fremont cottonwood (*Populus fremontii*), huérigo (*P. monticola*), Goodding willow (*Salix gooddingii*), Arizona walnut (*Juglans major*), Arizona sycamore (*Platanus wrightii*), bigtooth maple (*Acer grandidentatum*), black cherry (*Prunus serotina* subsp. *virens*), poison ivy (*Toxicodendron radicans*), and junco (*Adolphia infesta*) are present.

Flora. A total of 306 plant taxa in 215 genera and 71 families was recorded. Families with the most species are Poaceae (49 taxa, 12 non-native), Asteraceae (43 taxa), and Fabaceae (32 taxa). Genera with the most species are *Bouteloua* (9), *Quercus* (8), *Muhlenbergia* (7), *Eragrostis* (6), *Euphorbia* (6), *Ipomoea* (5), and *Solanum* (5). Sixteen species (5.2%) are non-native. Noteworthy species include green death camas (*Zigadenus virescens*), elusive grama (*Bouteloua eludens*), five-nerve helianthella, Sonoran bird's-foot trefoil (*Hosackia alamosana*), hierba del piojo (*Mandevilla stans*), Pringle needlegrass (*Piptochaetium pringlei*), quaking aspen (*Populus tremuloides*), Gambel oak (*Quercus gambelii*), and *Stevia puricana*. Species protected in the Mexican endangered species law NOM 059-2010 (Diario Oficial de la Federación, 2010) include saya (*Amoreuxia palmatifida*, *Protegida* – Protected), *Zigadenus virescens* (*Protegida* – Protected), and Arizona walnut (*Juglans major*, *Amenazada* – Threatened). Although *J. major* is listed as a protected species, it is widespread and common in riparian habitats in many areas in northeastern Sonora. *Stevia puricana* was recently described from a specimen collected in the Sierra La Púrica (Turner 2015).

Discussion

Although this flora is just a beginning, it serves as an instrument for conservation, land management, research, and education. This preliminary plant checklist, including several rare and protected species, will support continued federal protection of the lands and furthering conservation of wildlife in the area.

continued next page



Figure 4. Oak woodland plants. A. Rainbow hedgehog cactus (*Echinocereus rigidissimus*). Photo by Thomas R. Van Devender. B. Huachuca century plant (*Agave parryi* var. *huachucensis*). Photo by Charles Hedgcock.

Sierra La Púrica *continued*

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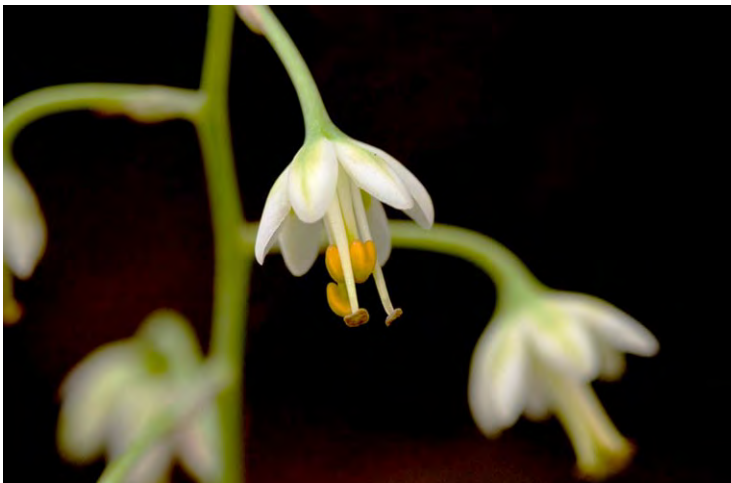
(APFF Bavispe) helped organize the Expedition. We thank Noah Horton and GreaterGood.org for funding the Expedition.



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Figure 5. Pine-oak forest plants. A. Gambel oak (*Quercus gambelii*). Photo by Thomas R. Van Devender. B. Cardinal catchfly (*Silene laciniata*). Photo by Michael McNulty.



Sierra La Púrica *continued*

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Figure 6. Pine-oak forest plants.

A. Arizona sage (*Salvia arizonica*). Photo by J. Jesús Sánchez-E.

B. Chiricahua mountain eryngo (*Eryngium lemmonii*). Photo by Chris Roll.

C. Death camas (*Zigadenus virens*). Photo by Patrick Alexander.

CHECKLIST: Sierra La Púrica page 1 of 4

An asterisk (*) denotes non-native status.

Pteridophytes

DENNSTAEDTIACEAE

Pteridium aquilinum (L.) Kuhn var. *pubescens* Underwood

PTERIDACEAE

Adiantum patens Willd.

Argyrochosma limitanea (Maxon) Windham

Astrolepis sinuata (Lag. ex Sw.) Benham & Windham

Bommeria hispida (Mett. ex Kuhn) Underwood

Myriopteris aurea (Poir.) Grusz & Windham

Myriopteris lindheimeri (Hook.) J. Sm.

Myriopteris wrightii (Hook.) Grusz & Windham

Pellaea ternifolia (Cav.) Link subsp. *ternifolia*

Gymnosperms

CUPRESSACEAE

Juniperus arizonica (R.P. Adams) R.P. Adams

Juniperus deppeana Steud.

PINACEAE

Pinus arizonica Engelm.

Pinus chihuahuana Engelm.

Pinus engelmannii Carr.

Eudicots

ACANTHACEAE

Elytraria imbricata (Vahl) Pers.

Tetramerium nervosum Nees

AMARANTHACEAE

Alternanthera caracasana Kunth

Amaranthus palmeri S. Watson

Amaranthus powellii S. Watson

Chenopodium neomexicanum Standl.

Dysphania graveolens (Willdenow)

Mosyakin & Clemants

Gomphrena nitida Rothrock

Gomphrena sonora Torr.

Guilleminea densa (Humb. & Bonpl. ex Willd.) Moq.

ANACARDIACEAE

Rhus aromatica Aiton

Rhus virens Lindh. subsp. *choriophylla* (Wooton & Standl.) Young

Toxicodendron radicans (L.) Kuntze

APIACEAE

Eryngium lemmonii Coult. & Rose

APOCYNACEAE

Asclepias elata Benth.

Asclepias hypoleuca (A. Gray) Woods.

Asclepias nummularia Torr.

Asclepias nyctaginifolia A. Gray

Mandevilla stans (A. Gray) J.K. Williams

ARALIACEAE

Aralia humilis Cav.

ARISTOLOCHIACEAE

Aristolochia watsonii Wooton & Standl.

ASTERACEAE

Acourtia thurberi (A. Gray) Reveal & King

Adenophyllum cancellatum (Cass.) Villareal

Adenophyllum porophylloides (A. Gray) Strother

Ambrosia confertiflora Dc.

Artemisia ludoviciana Nutt.

Baccharis pteronioides Dc.

Baccharis salicifolia (Ruiz & Pav.) Pers.

Baccharis thesioides Kunth

Bidens bigelovii A. Gray

Bidens pilosa L.

Brickellia betonicifolia A. Gray

Brickellia californica (Torr. & A. Gray) A. Gray

Carminatia tenuiflora DC.

Cirsium arizonicum (A. Gray) Petrak

Cirsium neomexicanum A. Gray

Cosmos parviflorus (Jacq.) Pers.

Erigeron arisolius G.L. Nesom

Gutierrezia wrightii A. Gray

Gymnosperma glutinosum (Spreng.) Less.

Helianthella quinquenervis (Hook.) A. Gray

Heterosperma pinnatum Cav.

Hieracium albiflorum Hook.

Hieracium fendleri Schultz-Bip.

Lasianthaea podocephala (A. Gray) K. Becker

Machaeranthera tagetina Greene

Melampodium appendiculatum B.L. Robins.

Melampodium longicorne A. Gray

Pectis prostrata Cav.

Porophyllum macrocephalum DC.

Schkuhria pinnata (Lam.) Kuntze ex Thell.

Senecio wootonii Greene

Simsia amplexicaulis Pers.

Stephanomeria pauciflora (Torr.) A. Nels.

Stevia palmeri A. Gray var. *palmeri*

Stevia puricana B.L. Turner

Symphotrichum expansum (Poepp. ex Spreng.) G.L. Nesom

Tagetes lemmonii A. Gray

Tithonia thurberi A. Gray

Verbesina longifolia (A. Gray) A. Gray

Xanthisma gracile (Nutt.) D.R. Morgan & R.L. Hartm.

Xanthium strumarium L.

Xanthocephalum gymnospermoides (A. Gray) Benth. & Hook. f.

Zinnia peruviana (L.) L.

BIGNONIACEAE

Chilopsis linearis (Cav.) Sweet
Tecoma stans (L.) Juss. ex Kunth

BIXACEAE

Amoreuxia palmatifida Moc. & Sessé ex DC.

BORAGINACEAE

Lithospermum cobrense Greene

BRASSICACEAE

Hesperidanthus linearifolius (A. Gray) Rydb.
Lepidium thurberi Wooton
 * *Nasturtium officinale* R. Br.
Pennellia longifolia (Benth.) Rollins

CACTACEAE

Coryphantha recurvata (Engelm.) Britt. & Rose
Cylindropuntia spinosior (Engelm.) Knuth
Echinocereus rigidissimus (Engelm.) Hort.
Echinocereus santaritensis W. Blum & Rutow
Opuntia chlorotica Engelm. & Bigelow
Opuntia phaeacantha Engelm.

CAMPANULACEAE

Lobelia anatina F. Wimmer

CANNABACEAE

Celtis reticulata Torr.

CARYOPHYLLACEAE

Drymaria leptophylla (Cham. & Schlecht.) Fenzl ex Rohrb.
Silene laciniata Cav. var. *greggii* (Gray) S. Watson
Silene thurberi S. Watson

CONVOLVULACEAE

Evolvulus alsinoides L. var. *angustifolia* Torr.
Evolvulus arizonicus A. Gray
Ipomoea costellata Torr.

Ipomoea cristulata Hallier f.

Ipomoea longifolia Benth.
Ipomoea purpurea (L.) Roth
Ipomoea thurberi A. Gray

CRASSULACEAE

Graptopetalum rusbyi (Greene) Rose

CUCURBITACEAE

Apodanthera undulata A. Gray
Cucurbita digitata A. Gray
Cucurbita foetidissima Kunth
Echinopepon wrightii (A. Gray) S. Watson

ERICACEAE

Arbutus arizonica (A. Gray) Sarg.
Arctostaphylos pungens Kunth

EUPHORBIACEAE

Acalypha neomexicana Muell.-Arg.
Cnidoscolus angustidens Torr.
Euphorbia dioica Hieron.
Euphorbia heterophylla L.
Euphorbia hirta L.
Euphorbia hyssopifolia L.
Euphorbia indivisa (Engelm.) Tidestrom
Euphorbia lurida Engelm.
Jatropha macrorhiza Benth.
Manihot angustiloba (Torr.) Muell. Arg.
Tragia laciniata (Torr.) Muell. Arg.
Tragia nepetifolia Cav. var. *dissecta* Muell. Arg.

FABACEAE

Acacia farnesiana (L.) Willd.
Acaciella tequilana (S. Watson) Britton & Rose
Acmispon greenei (Wooton & Standl.) Brouillet
Acmispon oroboides (Kunth) Brouillet
Aeschynomene villosa Poir.
Amorpha fruticosa L.

Calliandra humilis Benth. var. *humilis*
Calliandra humilis Benth. var. *reticulata* (A. Gray) L. Benson

Chamaecrista absus (L.) H.S. Irwin & Barneby var. *meonandra* (Irwin & Barneby) Irwin & Barneby

Chamaecrista nictitans (L.) Moench

Chamaecrista serpens Greene var. *wrightii* (A. Gray) Irwin & Barneby

Cologania angustifolia Kunth

Coursetia caribaea (Jacq.) Lavin

Crotalaria pumila Ortega

Dalea versicolor Zucc.

Desmodium hartwegianum Hemsl.

Desmodium retinens Schlecht.

Desmodium rosei Schub.

Erythrina flabelliformis Kearney

Eysenhardtia orthocarpa (A. Gray) S. Watson

Hosackia alamosana Rose

Lupinus sparsiflorus Benth.

Macroptilium gibbosifolium (Ortega) A. Delgado

Mimosa biuncifera Benth.

Mimosa dysocarpa Benth.

Mimosa grahamii A. Gray

Parkinsonia aculeata L.

Phaseolus acutifolius A. Gray

Prosopis velutina Wooton

Robinia neomexicana A. Gray

Vicia pulchella Kunth

Zornia reticulata Sm.

FAGACEAE

Quercus arizonica Sarg.

Quercus emoryi Torr.

Quercus gambelii Nutt.

Quercus hypoleucooides A. Camus

Quercus oblongifolia Torr.

Quercus rugosa Née

Quercus toumeyii Sarg.

CHECKLIST: Sierra La Púrica page 3 of 4

Quercus viminea Trel.

FOUQUIERIACEAE

Fouquieria splendens Engelm.

GARRYACEAE

Garrya wrightii Torr.

JUGLANDACEAE

Juglans major (Torr.) Heller

LAMIACEAE

Agastache pallida (Lindl.) Cory var.
coriacea R.W. Sanders

Hedeoma hyssopifolia A. Gray

Hedeoma oblongifolia A. Heller

Monarda citriodora Cerv. var.
austromontana (Epling) B.L. Turner

Salvia arizonica A. Gray

Salvia setosa Fernald

Salvia subincisa Benth.

Stachys coccinea Ortega

Trichostema arizonicum A. Gray

LOASACEAE

Mentzelia isolata Gentry

LYTHRACEAE

Cuphea wrightii A. Gray

MALPIGHIACEAE

Aspicarpa hirtella L.C. Rich.

MALVACEAE

Anoda cristata (L.) Schlecht.

Gossypium thurberi Todaro

* *Malva parviflora* L.

Sida procumbens Sw.

MARTYNIACEAE

Proboscidea parviflora (Wooton)
Wooton & Standl.

MELANTHIACEAE

Zigadenus virescens (Kunth) J.F. Macbr.

MOLLUGINACEAE

Mollugo verticillata L.

MONTIACEAE

Phemeranthus aurantiacus (Engelm.)
Kiger

NYCTAGINACEAE

Boerhavia coccinea P. Mill.

Boerhavia erecta L.

Mirabilis longiflora L.

ONAGRACEAE

Epilobium canum (Greene) P.H. Raven
subsp. *latifolium* (Hook.) Raven

Oenothera podocarpa (Wooton &
Standl.) Krakos & W.L. Wagner

OXALIDACEAE

Oxalis alpina (Rose) Rose ex R. Knuth

Oxalis decaphylla Kunth

PAPAVERACEAE

Argemone pleiakantha Greene

PHRYMACEAE

Erythranthe guttata (Fisch. ex DC.) G.
L. Nesom

PLANTAGINACEAE

Penstemon campanulatus (Cav.) Willd.

Schistophragma intermedia (A. Gray)
Pennell

PLATANACEAE

Platanus wrightii S. Watson

POLEMONIACEAE

Ipomopsis macombii (Torr. ex A. Gray)
V. Grant

POLYGALACEAE

Monnina wrightii A. Gray

Polygala obscura Benth.

POLYGONACEAE

Eriogonum abertianum Torr.

PORTULACACEAE

Portulaca oleracea L.

Portulaca suffrutescens Engelm.

Portulaca umbraticola Kunth

RANUNCULACEAE

Clematis ligusticifolia Nutt.

Delphinium andesicola Ewan

Thalictrum fendleri Engelm. ex A. Gray

RHAMNACEAE

Adolphia infesta (Kunth) Meisn.

Ceanothus buxifolius Willd. ex Schult. f.

Sageretia wrightii S. Watson

ROSACEAE

Holodiscus discolor (Pursh) Maxim.

Prunus serotina Ehrh. var. *virens*
(Wooton & Standl.) McVaugh

RUBIACEAE

Bouvardia ternifolia (Cav.) Schlecht.

Crusea hispida (Mill.) B.L. Rob.

Houstonia wrightii A. Gray

Mitracarpus hirtus (L.) DC.

SALICACEAE

Populus fremontii S. Watson

Populus monticola Mert. ex Loud.

Populus tremuloides Michx.

Salix gooddingii Ball

SAPINDACEAE

Acer grandidentatum Nutt.

Dodonaea viscosa Jacq. var.
angustifolia (L. f.) Benth.

SAXIFRAGACEAE

Heuchera sanguinea Engelm.

SCROPHULARIACEAE

Buddleja sessiliflora Kunth

SOLANACEAE

Datura inoxia P. Mill.

Datura quercifolia Kunth

Physalis angulata L.

Solanum elaeagnifolium Cav.

Solanum houstonii Martyn

Solanum lumholtzianum Bartlett

CHECKLIST: Sierra La Púrica page 4 of 4

Solanum nigrescens M. Martens & Galeotti

Solanum stoloniferum Schltldl. & Bouché

TALINACEAE

Talinum paniculatum (Jacq.) Gaertn.

ULMACEAE

* *Ulmus pumila* L.

VERBENACEAE

Glandularia latilobata (L.M. Perry) G.L. Nesom

VIOLACEAE

Viola nephrophylla Greene

VITACEAE

Vitis arizonica Engelm.

ZYGOPHYLLACEAE

* *Tribulus terrestris* L.

Monocots

AMARYLLIDACEAE

Allium plummerae S. Watson

ASPARAGACEAE

Agave palmeri Engelm.

Agave parryi Engelm. var. *huachucensis* (Baker) Little ex L. Benson

Dasyllirion wheeleri S. Watson

Echeandia flavescens (J.A. & J.H. Schultes) Cruden

Milla biflora Cav.

Nolina microcarpa S. Watson

Yucca baccata Torr.

Yucca madrensis Gentry

COMMELINACEAE

Commelina tuberosa L.

Commelina erecta L.

CYPERACEAE

Carex leucodonta Holm

Cyperus elegans L.

Cyperus pallidicolor (Kük.) G.C. Tucker

ORCHIDACEAE

Malaxis soulei L.O. Williams

POACEAE

Aristida adscensionis L.

Aristida ternipes var. *ternipes* Cav.

Bothriochloa barbinodis (Lag.) Herter

Bouteloua aristidoides (Kunth) Griseb.

Bouteloua chondrosioides (Kunth) Benth. ex S. Watson

Bouteloua curtipendula (Michx.) Torr.

Bouteloua eludens Griffiths

Bouteloua hirsuta Lag.

Bouteloua radicata (E. Fourn.) Griffiths

Bouteloua repens (Kunth) Scribn. & Merr.

Bromus frondosus (Shear) Wootton & Standl.

Bromus richardsonii Link

Cenchrus spinifex Cav.

Chloris virgata Sw.

* *Cynodon dactylon* (L.) Pers.

* *Dactyloctenium aegyptium* (L.) Willd.

* *Digitaria sanguinalis* (L.) Scop.

Disakisperma dubium (Kunth) P.M. Peterson & N. Snow

* *Echinochloa colona* (L.) Link

* *Echinochloa crus-galli* (L.) Beauv.

* *Eleusine indica* (L.) Gaertn.

Elymus arizonicus (Scribn. & J.G. Sm.) Gould

* *Eragrostis cilianensis* (All.) Vign. ex Janchen

Eragrostis intermedia A.S. Hitchc.

Eragrostis mexicana (Hornem.) Link

Eragrostis pectinacea (Michx.) Nees var. *pectinacea*

Eriochloa acuminata (J. Presl) Kunth var. *minor* (Vasey) R.B. Shaw

Eriochloa lemmonii Vasey & Scribn.

* *Hackelochloa granularis* (L.) Kuntze

Heteropogon contortus (L.) Beauv. ex Roemer & J.A. Schultes

Heteropogon melanocarpus (Ell.) Ell. ex Benth.

Hilaria belangeri (Steud.) Nash

Hopia obtusa (Kunth) Zuloaga & Morrone

Koeleria macrantha (Ledeb.) J.A. Schultes

* *Lolium perenne* L.

* *Melinis repens* subsp. *repens* (Willd.) Zizka

Muhlenbergia alopecuroides (Griseb.) P.M. Peterson & Columbus

Muhlenbergia arizonica Scribn.

Muhlenbergia emersleyi Vasey

Muhlenbergia fragilis Swallen

Muhlenbergia longiligula A.S. Hitchc.

Muhlenbergia montana (Nutt.) A.S. Hitchc.

Muhlenbergia rigens (Benth.) A.S. Hitchc.

Panicum hirticaule J. Presl

Piptochaetium fimbriatum (Kunth) A.S. Hitchc.

Piptochaetium pringlei (Beal) Parodi

* *Setaria pumila* (Poir.) Roemer & J.A. Schultes

* *Urochloa panicoides* Beauv.

Zuloagaea bulbosa (Kunth) Bess



Figure 1. View from the summit of the Sierra Juriquipa of steep slopes with oak woodland and a few pines. Photo by Ana L. Reina-G.

Preliminary Flora of the Sierra Juriquipa, Sonora, Mexico

by Elizabeth Makings¹, Thomas R. Van Devender², Ana Lilia Reina-Guerrero², and Stephen F. Hale³

Abstract

The Sierra Juriquipa mountain range is a small but important part of the Madrean Sky Islands in northeastern Sonora, and an area previously unexplored botanically until the Madrean Discovery Expedition (MDE) in the summer of 2017. In this preliminary flora, we document 282 taxa in 72 families, and 198 genera. Eleven species (3.9%) are non-native.

Introduction

The Madrean Archipelago is located between the Sierra Madre Occidental (SMO) and the Mogollon Rim in central Arizona. In this area there are 55 Sky Island isolated mountain ranges or complexes of several ranges connected by oak woodland corridors (Van Devender et al. 2013). Sky Islands are crowned

with oak woodland or pine-oak forest. The lowland “seas” are Sonoran and Chihuahuan desertscrub, desert grassland, foothills thornscrub, or tropical deciduous forest.

Study Area and Methods

This preliminary flora is based on observations from a scouting trip on July 14–16, and intense collecting during the Madrean Discovery Expedition (MDE) Sierra Juriquipa on August 12–16, 2017 (Figure 1). This Sky Island is a little over an hour’s drive from Agua Prieta to the mining town of Nacozari de García, then about 19 kilometers (12 miles) southeast on winding dirt roads through the small mining village of Santo Domingo. The range is directly south of one of the largest copper mines in Mexico — *La Mina de la Caridad*. Our camp at Rancho Zulema in the northwestern section of Juriquipa occupied a narrow mesa with just enough room for the vehicles, gear, and tents of the 35 participants. To document the floristic diversity we inventoried Ranchos Orégano Viejo and San Felipe, and the slopes and ridgetops

¹Arizona State University Herbarium, 734 West Alameda Drive, Tempe, AZ 85282. ²GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718. ³EcoPlan Associates Inc., 3610 N. Prince Village Place, Suite 140, Tucson, AZ 85719.

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Sierra Juriquipa

continued

near Rancho Zulema, all on Ejido Santo Domingo, Municipality of Nacozari de García.

The Sierra Juriquipa is approximately 6,900 hectares of rugged mountain terrain and V-shaped valleys. The highest peaks reach a little over 2,000 m. (6,561 ft.) elevation with north slopes forested by mostly Chihuahua and Engelmann pine (*Pinus chihuahuana*, and *P. engelmannii*), and an occasional Arizona madrone (*Arbutus arizonica*) (Figure 2). Typical landscapes explored near Rancho Zulema were steep slopes with alligator juniper (*Juniperus deppeana*) and oaks.

The oak diversity was noteworthy, with seven species (*Quercus arizonica*, *Q. chihuahuensis*, *Q. emoryi*, *Q. hypoleucoides*, *Q. oblongifolia*, *Q. toumeyi*, and *Q. viminea*) distributed across the range, the dominants changing frequently according to habitat preference. An assortment of grasses, shrubs, and succulents occupy the understory including desert spoon/*sotol* (*Dasyllirion wheeleri*) from the desert grasslands, and oak woodland species such as firecracker bush (*Bouvardia ternifolia*) and velvetpod mimosa/*gatuño* (*Mimosa dysocarpa*). Lower elevations (~1000 m., 3,280 ft.) are foothills thornscrub landscapes with mostly boat-thorn acacia/*güinolo* (*Acacia cochliacantha*), *tepeguaje* (*Lysiloma watsonii*), and velvet mesquite (*Prosopis velutina*).



Figure 2. Pine-oak forest on the summit. Photo by Ana L. Reina-G.

Flora. We observed or vouchered a total of 282 taxa in 72 families and 198 genera. Our study includes all biases that go along with a short, single-season window of collecting events. Only 11 species (3.9%) are non-native. The most important families are Fabaceae (35 taxa), Poaceae (31 taxa), and Asteraceae (25 taxa), and align with other Sonoran floras. The regional story is told by the second-tier families that bring out the personality of the local flora. For the Sierra Juriquipa, the Euphorbiaceae (15 taxa), Solanaceae (15 taxa), Convolvulaceae (12 taxa), Apocynaceae (11 taxa), Cyperaceae (10 taxa), Cactaceae (7 taxa), Fagaceae (7 taxa), and

continued next page



Figure 3. A. The charismatic *Asclepias lemmonii*. Photo by Elizabeth Makings. B. *Mandevilla stans*. A single Arizona record in the Santa Rita Mountains. Photo by Ana L. Reina-G.



Figure 4. Plants with Sierra Madre Occidental affinities that reach Arizona. A. *Hybanthus attenuatus*. B. The Mexican star, *Milla biflora*. Photos by Elizabeth Makings.

Sierra Juriquipa *continued*

Pteridaceae (6 taxa) are especially important. The genera with the most species were *Cyperus* (9), *Ipomoea* (7), *Euphorbia* (7), *Quercus* (7), *Asclepias* (6), and *Solanum* (6). *Asclepias* milkweeds were scattered but showy and hard to miss, especially the very large and charismatic *Asclepias lemmonii* (Figure 3A). However, in the Sierra Juriquipa, the oaks are the stars of the show in a classic Madrean oak woodland or *encinal*. One or two species tend to dominate locally, but it is not unusual to encounter four or more species on a single slope that are, for the most part, easy to distinguish by leaf shape, color, and texture, as well as habit.

Floristic affinities. Botanists have the tendency to take interest in things that are unfamiliar, out of place, or showy and irresistible. In addition, botanists love learning different species and are absorbed with the biogeographical component of floristics, pointing out interesting distributions: disjuncts, new records, endemics, range extensions, etc. The Sierra Juriquipa certainly provided examples of these categories. The plants are the collective narrative of the region and there are several recurring distributional themes for taxa of the Sierra Juriquipa flora. A few are northern species at their southern

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Figure 5. Plants restricted to the Sky Island Region. A. *Coyphantha recurvata*. Photo by Stephen F. Hale. B. *Mandevilla brachysiphon*. Photo by Elizabeth Makings.



Figure 6. SMO species that do not occur in Arizona. A. *Penstemon companulatus*. Photo by Liz Makings. B. *Begonia gracilis*. Photo by Stephen F. Hale.

Sierra Juriquipa *continued*

limits (e.g., *Lathyrus lanszwertii* var. *arizonicus* and *Opuntia chlorotica*). Many more species have northern distributions that extend into Arizona from the SMO and the Sonoran Sky Islands, such as *Browallia eludens*, *Eysenhardtia orthocarpa*, *Fraxinus gooddingii*, *Hybanthus attenuatus* (Figure 4A), *Hypoxis mexicana*, *Mandevilla stans* (Figure 3B), *Milla biflora* (Figure 4B), *Quercus viminea*, *Roldana hartwegii*, and *Tripsacum lanceolatum*. Other species in this category with more tropical affinities are widespread in thornscrub, e.g., *Capsicum annuum*, *Desmanthus bicornutus*, and *Havardia mexicana*. *Bouteloua diversispicula* (formerly *Cathetecum brevifolium*) is ubiquitous in foothills thornscrub (FTS), and Plains of Sonora desertscrub. It is only known in Arizona from the vicinity of Ragged Top Mountain west of Tucson (Wiens 2000). This dwarf, tufted, stoloniferous perennial grass plays an important but underappreciated role in arid habitats where it forms turf that

prevents erosion as well as enriching the microfauna diversity, but it can easily disappear with plowing and other surface disturbances.

Cnidocolus angustidens, *Coryphantha recurvata* (Figure 5A), *Mandevilla brachysiphon* (Figure 5B), and *Quercus emoryi* mostly occur in the Madrean Archipelago. The Sky Island phytogeographic pattern is not fully appreciated and often called “Madrean,” even if the species does not occur in the

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Figure 7. Mexican species not in Arizona. A. *Cyclanthera minima*. Photo by Stephen F. Hale. B. *Tigridia pavonia*, a captivating species — flowers only briefly open. Photo by Elizabeth Makings.

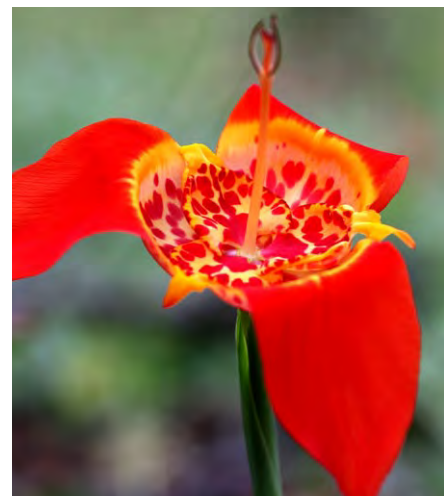




Figure 8. Mexican species not in Arizona. A. *Manihot rubricaulis*. Photo by Susan D. Carnahan. B. *Solanum houstonii*. Photo by Stephen L. Minter.

Sierra Juriquipa *continued*

SMO. Other SMO species that reach Arizona include *Quercus viminea*, *Roldana hartwegii*, and *Tripsacum lanceolatum*. *Bursera fagaroides* var. *elongata* is a widespread tropical species that reaches its northwestern distributional limit in thornscrub and Sonoran desertscrub in Sonora, except for a single 1929 collection by Robert H. Peebles in Fresnal Canyon in the southern Baboquivari Mountains. Since then, attempts to relocate this population were not successful. Other SMO plants that approach but do not occur in Arizona include *Begonia gracilis* (Figure 6B), *Buddleja parviflora*, *Cyclanthera minima* (Figure 7A), *Penstemon campanulatus* (Figure 6A), and *Tigridia pavonia* (Figure 7B). Thornscrub species that occur just south of Arizona are *Manihot rubricaulis* (Figure 8A), *Milleria quinqueflora*, and *Solanum houstonii* (Figure 8B). *Lantana camara* is a widespread tropical species reaching its northwestern distributional limit in thornscrub and Sonoran desertscrub in Sonora and Baja California. *Merremia palmeri* is a showy white-flowered vine typical of thornscrub and the adjacent Plains of Sonora desertscrub. *Populus monticola* is a tropical riparian tree that would have Sky Islands distribution, except that it also occurs in Baja California Sur. All in all, the Sierra Juriquipa has a diverse collection of biogeographical affinities.

While investigating previous botanical work in the Sierra Juriquipa, we were quite surprised to discover that previous botanical work was non-existent — not a single herbarium specimen had been vouchered prior to our 2017 expedition. To work in an area so rich and yet so unexplored was remarkable and gratifying. Clearly, there is still a lot to learn about the floras of the Sonoran Sky Island and many other areas in Sonora. Physical vouchers and many images are available in the Arizona State University and University of

Arizona SEINet databases (<http://swbiodiversity.org/seinet/collections/index.php>). Field observations are available in the Madrean Discovery Expedition (MDE) (madreandiscovery.org).

Acknowledgements

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CHECKLIST: Sierra Juriquipa page 1 of 4

An asterisk (*) denotes non-native status.

Lycophytes

SELAGINELLACEAE

Selaginella rupincola Underwood

Pteridophytes

ASPLENIACEAE

Asplenium palmeri Maxon

PTERIDACEAE

Bommeria hispida (Mett. ex Kuhn) Underwood

Myriopteris aurea (Poir.) Grusz & Windham

Myriopteris lindheimeri (Hook.) J. Sm.

Myriopteris wrightii (Hook.) Grusz & Windham

Pellaea wrightiana Hook.

Gymnosperms

CUPRESSACEAE

Juniperus deppeana Steud.

PINACEAE

Pinus chihuahuana Engelm.

Pinus engelmannii Carr.

Eudicots

ACANTHACEAE

Elytraria imbricata (Vahl) Pers.

Ruellia nudiflora (Engelm. & A. Gray) Urban

Tetramerium nervosum Nees

ADOXACEAE

Sambucus cerulea Raf.

AMARANTHACEAE

Alternanthera caracasana Kunth

Amaranthus dubius Mart. ex Thell. (new Sonoran voucher)

Amaranthus palmeri S. Watson

Gomphrena caespitosa Torr.

Gomphrena nitida Rothrock

Gomphrena sonora Torr.

Guilleminea densa (Humb. & Bonpl. ex Willd.) Moq.

ANACARDIACEAE

Rhus aromatica Aiton

Rhus virens Lindheimer ex A. Gray

Toxicodendron radicans (L.) Kuntze

APOCYNACEAE

Asclepias asperula (Dcne.) Woods.

Asclepias elata Benth.

Asclepias lemmonii A. Gray

Asclepias linaria Cav.

Asclepias nummularia Torr.

Asclepias ovata Steud.

Cynanchum ligulatum (Benth.) Woods.

Mandevilla brachysiphon (Torr.) Pichon

Mandevilla stans (A. Gray) J.K. Williams

Matelea tristiflora (Standl.) Woodson

Metastelma mexicanum (Brandege) M. Fishbein & R. Levin

ARALIACEAE

Aralia humilis Cav.

ASTERACEAE

Acourtia thurberi (A. Gray) Reveal & King

Ambrosia ambrosioides (Cav.) W.W. Payne

Ambrosia confertiflora Dc.

Artemisia ludoviciana Nutt.

Baccharis salicifolia (Ruiz & Pav.) Pers.

Baccharis sarothroides A. Gray

Carphochaete bigelovii A. Gray

Conyza canadensis (L.) Cronquist

Erigeron flagellaris A. Gray

Hieracium fendleri Schultz-Bip.

Hieracium pringlei A. Gray

Laennecia eriophylla (A. Gray) G.L. Nesom

Lasianthaea podocephala (A. Gray) K. Becker

Melampodium appendiculatum B.L. Robins.

Melampodium cupulatum A. Gray

Melampodium longicorne A. Gray

Milleria quinqueflora L.

Porophyllum macrocephalum DC.

Psacalium decompositum (A. Gray) H.E. Robins. & Brett.

Roldana hartwegii (Benth.) H. Rob. & Brettell

Symphytotrichum expansum (Poepp. ex Spreng.) G.L. Nesom

Tagetes lemmonii A. Gray

Verbesina longifolia (A. Gray) A. Gray

Zinnia peruviana (L.) L.

Zinnia zinnioides (Kunth) Olorode & A.M. Torres

BEGONIACEAE

Begonia gracilis Vilmorin-Andrieux

BIXACEAE

Amoreuxia palmatifida Moc. & Sessé ex DC.

BORAGINACEAE

Lithospermum cobrense Greene

BRASSICACEAE

Hesperidanthus linearifolius (A. Gray) Rydb.

Pennellia micrantha (A. Gray) Nieuwl.

BURSERACEAE

Bursera fagaroides (Kunth) Engl. var. *elongata* McVaugh & Rzed.

CACTACEAE

Coryphantha recurvata (Engelm.) Britt. & Rose

Cylindropuntia versicolor (Engelm. ex J. M. Coult.) Knuth

Echinocereus rigidissimus (Engelm.) Haage f.

Mammillaria grahamii Engelm.

CHECKLIST: Sierra Juriquipa page 2 of 4

Opuntia chlorotica Engelm. & Bigelow

Opuntia engelmannii Salm-Dyck

Opuntia cf. wilcoxii Britton & Rose

CANNABACEAE

Celtis pallida Torr.

Celtis reticulata Torr.

CARYOPHYLLACEAE

Drymaria effusa A. Gray

Drymaria leptophylla (Cham. & Schlecht.)
Fenzl ex Rohrb.

Drymaria molluginea (Lag.) Didr.

CONVOLVULACEAE

Cuscuta americana Thunb. ex Engelm.

Dichondra brachypoda Wootton & Standl.

Evolvulus alsinoides (L.) L.

Evolvulus arizonicus A. Gray

Ipomoea capillacea (Kunth) G. Don

Ipomoea costellata Torr.

Ipomoea cristulata Hallier f.

Ipomoea hederacea Jacq.

Ipomoea plummerae A. Gray

Ipomoea tenuiloba Torr.

Ipomoea thurberi A. Gray

Merremia palmeri (S. Watson) Hallier f.

CRASSULACEAE

Sedum stelliforme S. Watson

CUCURBITACEAE

Cucurbita digitata A. Gray

Cyclanthera minima (S. Watson) Kearns &
C.E. Jones

ERICACEAE

Arbutus arizonica (A. Gray) Sarg.

Arctostaphylos pungens Kunth

EUPHORBIACEAE

Acalypha neomexicana Muell. Arg.

Acalypha ostryifolia Riddell ex J. M. Coult.

Acalypha papillosa Rose

Cnidoscolus angustidens Torr.

Euphorbia bilobata Engelm.

Euphorbia cuphosperma (Engelm.)
Boiss.

Euphorbia heterophylla L.

Euphorbia hirta L.

Euphorbia hyssopifolia L.

Euphorbia indivisa (Engelm.) Tidestrom

Euphorbia macropus (Klotzsch &
Garcke) Boiss.

Manihot angustiloba (Torr.) Müll. Arg.

Manihot rubricaulis I.M. Johnst.

Tragia laciniata (Torr.) Müll. Arg.

Tragia nepetifolia Cav.

FABACEAE

Acacia angustissima (Mill.) Kuntze

Acacia cochliacantha Humb. & Bonpl.
ex Willd.

Acacia farnesiana (L.) Willd.

Aeschynomene villosa Poir.

Calliandra humilis Benth. var. *humilis*

Calliandra humilis Benth. var. *reticulata*
(A. Gray) L.D. Benson

Chamaecrista absus (L.) Irwin & Barneby

Chamaecrista nictitans (L.) Moench

Chamaecrista serpens (L.) Greene

Cologania angustifolia Kunth

Cologania obovata Schlecht.

Coursetia caribaea (Jacq.) Lavin

Crotalaria pumila Blanco

Crotalaria sagittalis L.

Dalea versicolor Zucc.

Desmanthus bicornutus S. Watson

Desmanthus covillei (Britt. & Rose)
Wiggins ex B.L. Turner

Erythrina flabelliformis Kearney

Eysenhardtia polystachya (Ortega) Sarg.

Galactia wrightii A. Gray

Havardia mexicana (Rose) Britton &
Rose

Indigofera sphaerocarpa A. Gray

Lathyrus lanszwertii Kellogg var.
arizonicus (Britton) S.L. Welsh

* *Leucaena leucocephala* (Lam.) de Wit

Mimosa distachya Cav.

Mimosa dysocarpa Benth.

Mimosa grahamii A. Gray

Nissolia schottii (Torr.) A. Gray

Parkinsonia aculeata L.

Phaseolus acutifolius A. Gray

Phaseolus ritensis M.E. Jones

Prosopis velutina Wootton

Senna hirsuta (L.) Irwin & Barneby

Zornia reticulata Sm.

FAGACEAE

Quercus arizonica Sarg.

Quercus chihuahuensis Trel.

Quercus emoryi Torr.

Quercus hypoleucoides A. Camus

Quercus oblongifolia Torr.

Quercus toumeyii Sarg.

Quercus viminea Trel.

FOUQUIERIACEAE

Fouquieria splendens Engelm.

GERANIACEAE

Geranium richardsonii Fisch. & Trautv.

Geranium wislizeni S. Watson

JUGLANDACEAE

Juglans major (Torr.) Heller

LAMIACEAE

Agastache wrightii (Greenm.) Wootton &
Standl.

Monarda citriodora Cerb. var.
austromontana (Epling) B.L. Turner

Salvia subincisa Benth.

LINACEAE

Linum neomexicanum Greene

LOASACEAE

Mentzelia aspera L.

LYTHRACEAE

Cuphea wrightii A. Gray

CHECKLIST: Sierra Juriquipa page 3 of 4

MALPIGHIACEAE

Aspicarpa hirtella L.C. Rich.

MALVACEAE

Anoda cristata (L.) Schlecht.

Ayenia filiformis S. Watson

Corchorus hirtus L.

Gossypium thurberi Todaro

Sida rhombifolia L.

MARTYNIACEAE

Proboscidea parviflora (Wooton)
Wooton & Standl.

MELIACEAE

* *Melia azedarach* L.

MOLLUGINACEAE

Mollugo verticillata L.

MORACEAE

Morus microphylla Buckl.

NYCTAGINACEAE

Allionia incarnata L.

Boerhavia coccinea P. Mill.

Boerhavia erecta L.

OLEACEAE

Fraxinus gooddingii Little

ONAGRACEAE

Oenothera kunthiana (Spach) Munz

Oenothera tetraptera Cav.

OROBANCHACEAE

Castilleja tenuiflora Benth.

OXALIDACEAE

Oxalis latifolia Kunth

PAPAVERACEAE

Argemone pleiacantha Greene

PASSIFLORACEAE

Passiflora bryonioides Kunth

PLANTAGINACEAE

Mecardonia procumbens (P. Mill.) Small

Penstemon campanulatus (Cav.) Willd.

Schistophragma intermedium (A. Gray)
Pennell

POLYGALACEAE

Hebecarpa obscura (Benth.) J. R. Abbott

POLYGONACEAE

Eriogonum abertianum Torr.

PORTULACACEAE

Portulaca oleracea L.

Portulaca suffrutescens Engelm.

Portulaca umbraticola Kunth

PRIMULACEAE

Samolus vagans Greene

RANUNCULACEAE

Clematis ligusticifolia Nutt.

Thalictrum fendleri Engelm. ex A. Gray

RHAMNACEAE

Ceanothus buxifolius Willd. ex Schult.f.

Condalia correllii M.C. Johnston

Sageretia wrightii S. Watson

ROSACEAE

Prunus serotina Ehrh.

RUBIACEAE

Bouvardia ternifolia (Cav.) Schlecht.

Crusea hispida Robinson

Galium proliferum A. Gray

Mitracarpus hirtus (L.) DC.

Randia sonorensis Wiggins

SALICACEAE

Populus monticola Mert. ex Loud.

Salix gooddingii Ball

SANTALACEAE

Phoradendron californicum Nutt.

Phoradendron macrophyllum (Engelm.)
Cockerell

Phoradendron serotinum (Raf.) M. C.
Johnst. ssp. *tomentosum* (DC.) Kuijt

SAPINDACEAE

Dodonaea viscosa Jacq.

SCROPHULARIACEAE

Buddleja parviflora Kunth

SOLANACEAE

Browallia eludens R.K. Van Devender &
P.D. Jenkins

Capsicum annuum L.

Datura discolor Bernh.

Jaltomata procumbens (Cav.) J.L. Gentry

Lycium berlandieri Dunal

* *Nicotiana glauca* Graham

Physalis hederifolia A. Gray

Physalis philadelphica Lam.

Physalis pubescens L.

Solanum elaeagnifolium Cav.

Solanum houstonii Martyn

Solanum lumholtzianum Bartlett

Solanum nigrescens M. Martens &
Galeotti

Solanum stoloniferum Schlttdl. & Bouché

TALINACEAE

Talinum paniculatum (Jacq.) Gaertn.

VERBENACEAE

Aloysia gratissima (Gillies & Hook.) Tronc.

Lantana camara L.

VIOLACEAE

Hybanthus attenuatus (Humb. & Bonpl.
ex J.A. Schultes) G. K. Schulze

VITACEAE

Vitis arizonica Engelm.

ZYGOPHYLLACEAE

Kallstroemia grandiflora Torr. ex A. Gray

Monocots

ASPARAGACEAE

Agave palmeri Engelm.

Dasylyrion wheeleri S. Watson

Echeandia flavescens (J.A. & J.H. Schultes)
Cruden

Milla biflora Cav.

BOOK REVIEW *Ries Lindley, University of Arizona Herbarium, Tucson; and Arizona Native Plant Society, Tucson Chapter*

Thirty-Seven Years on a Mountain Trail: Vascular Flora and Flowering Phenology of the Finger Rock Canyon Watershed, Santa Catalina Mountains, Arizona

by C. David Bertelsen, *Desert Plants*, Vol. 34, Nos. 1 & 2: 1–290, July 2018.

Available by mail order (\$27.00, post paid) from the Boyce Thompson Arboretum, 37615 E US Highway #60, Superior, AZ 85173. Available online at: <https://cals.arizona.edu/desertplants/floras.html>. For more information, contact: DesertPlants@cals.arizona.edu.

Thirty-seven years. No, that is not a typo. Although the title could just as well have been *Thirty-Seven Years on a Mountain Trail: A Love Story*. There is no other explanation for the dedication and attention to detail in this flora of the Santa Catalina Mountains.

Dave Bertelsen conducted 1,627 surveys of Finger Rock Canyon walking a total of 16,270 miles in thirty-seven years. The trail begins at 3,100 feet elevation and ends at 7,258 feet, an elevation gain of 4,158 feet going up, and a loss of the same going down. That is an elevation gain of about 1,300 miles in one direction, for the statistically inclined. It was always a day hike. He could complete it during the day when he was younger, and near the end of the project, the hike still required a day, or at least 19 hours of it. He recorded 173,470 observations of plants in flower and 79,821 observations of vertebrate fauna.

In this flora, each species is listed with a name, synonyms, and notes on elevation, growth habit, morphology, etc. Unique to this flora are the graphs that accompany each species. The trail was partitioned into five segments of approximately one mile each. There are three bar graphs for each species depicting total frequency of flowering in each of the five trail segments,

frequency of flowering during each month, and lastly, presence/absence of flowers for each month of the year over the course of the study (Figure 1). Henry David Thoreau would have been proud.

There are discussions in *Thirty-Seven Years* of climate, vegetative communities, non-native species, fire, and drought. Each is succinctly discussed, thoroughly explained, and clearly written. Yet, this summary inadequately describes the true value in this flora. This work does not suffer a total dependence on academic discussions of the setting and history of Finger Rock Canyon. Bertelsen, like Verrier (*Flora of the Santa Catalina Mountains: Pima and Pinal Counties, Southeastern Arizona*; *Desert Plants*, Vol. 33, No. 2: 1–290, January 2018), imbues every discussion with his own

personal knowledge of the canyon. This is not done in the sense of someone who has hiked the trail, but as a scientist who has lived and breathed the canyon.

In the case of vegetative-community discussions, this means the dryness that often accompanies such

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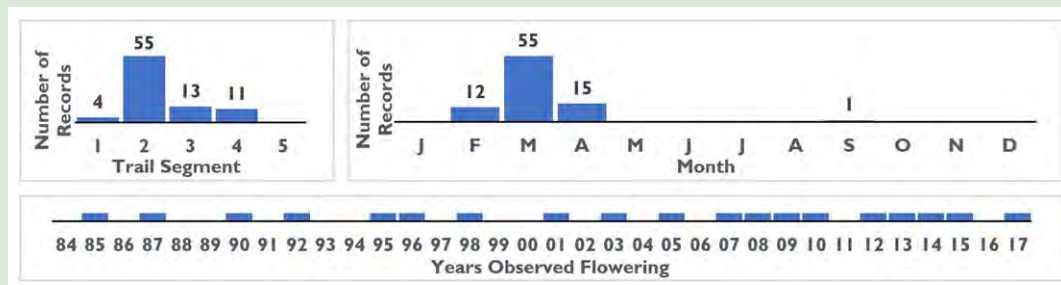
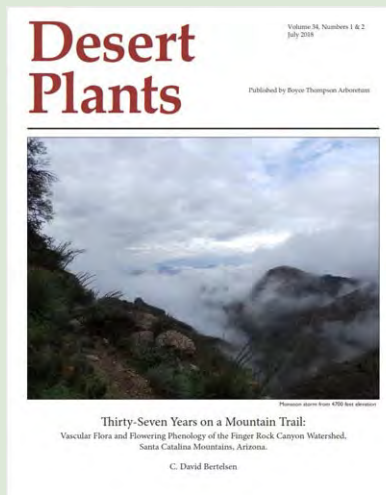


Figure 1

Thirty-Seven Years on a Mountain Trail *continued*

descriptions is lacking. Each description here is grounded with some subtle explanations that bring a plant community to life for the reader, making it feel more memorable and understandable. These distinctive comments are subtle but worth noting. Of Desert Scrub, Bertelsen says, "Many typical desert species in the Tucson area are uncommon to rare, or altogether absent, in the study area. This is probably due to a number of factors, including elevation and the absence of bajada, sandy washes, or silty soils." This last sentence describes an essential difference between Desert Scrub in Finger Rock Canyon and Desert Scrub in flatter topography. This nuanced descriptive writing is woven into the entire flora. *Thirty-Seven Years* brings with it a lot of finely parsed information.

There are almost eight thousand specimens from the Catalina Mountains in the University of Arizona

Herbarium alone. It is a mountain range that has enjoyed the attention of many collectors. Bertelsen has brought botanical science in this mountain range to the next rung on the ladder by providing context, context that can only come of a deep personal understanding of the data. In *Thirty-Seven Years*, we are treated to a slice of what must be a much bigger pie. The data Bertelsen have amassed extend well beyond what is on display in this flora. We may find ourselves a little anxious to see what comes of this seminal work in the future, and we may feel a kinship with the mountain that wasn't there before.

Two Supplements: (1) *Corrections and Editions* and (2) *Flora Nomenclature Index* may be obtained upon request from the author, David Bertelsen, david.bertelsen8@gmail.com.



CHECKLIST: Sierra Juriquipa *page 4 of 4*

Nolina microcarpa S. Watson

Yucca madrensis Gentry

COMMELINACEAE

Commelina tuberosa L.

Commelina erecta L.

Tradescantia pinetorum Greene

CYPERACEAE

Bulbostylis juncooides (Vahl) Kükenth.

Cyperus dipsaceus Liebamann

Cyperus esculentus L.

Cyperus hermaphroditus (Jacq.) Standl.

Cyperus hypopitys G. Tucker

Cyperus manimae Kunth

Cyperus odoratus L.

Cyperus pallidicolor (Kükenth.) G. Tucker

Cyperus seslerioides Kunth

Cyperus squarrosus L.

HYPOXIDACEAE

Hypoxis mexicana J.A. & J.H. Schultes

IRIDACEAE

Sisyrinchium cernuum (Bickn.) Kearney

Tigridia pavonia (L. f.) DC.

POACEAE

Aristida adscensionis L.

Aristida ternipes Cav. var. *ternipes*

Bouteloua curtispindula (Michx.) Torr.

Bouteloua diversispicula Columbus

Bouteloua hirsuta Lag.

Bouteloua repens (Kunth) Scribn. & Merr.

Chloris virgata Sw.

* *Cynodon dactylon* (L.) Pers.

* *Digitaria sanguinalis* (L.) Scop.

Dinebra panicea ssp. *brachiata* (Steud.)

P.M. Peterson & N. Snow

Disakisperma dubium (Kunth) P.M.

Peterson & N. Snow

* *Echinochloa colona* (L.) Link

* *Eragrostis cilianensis* (All.) Vignolo ex Janch.

Eragrostis intermedia A.S. Hitchc.

Eragrostis pectinacea (Michx.) Nees ex Steud.

Eriochloa acuminata (J. Presl) Kunth

Eriochloa lemmonii Vasey & Scribn.

Heteropogon contortus (L.) P. Beauv. ex Roemer & J.A. Schultes

* *Hordeum vulgare* L.

* *Melinis repens* (Willd.) Zizka

Muhlenbergia alopecuroides (Griseb.)

P.M. Peterson & Columbus

Muhlenbergia emersleyi Vasey

Panicum alatum var. *minus* (Andersson)

F. Zuloaga & O. Morrone

Panicum hirticaule J. Presl

Paspalum setaceum Michx.

Setaria liebmannii E. Fourn.

* *Sorghum halepense* (L.) Pers.

Tripsacum lanceolatum Rupr. ex Fourn.

* *Triticum aestivum* L.

Zuloagaea bulbosa (Kunth) Bess



Figure 1. View of Río Bavispe Valley from Cruz del Diablo. Photo by Luis Gutiérrez.

Preliminary Flora of the Lower Bavispe Valley, Sonora, Mexico

by Thomas R. Van Devender¹, Ana L. Reina-Guerrero¹, and José Jesús Sánchez-Escalante²

Abstract

The flora of the lower Río Bavispe Valley from the Huásabas area south to the Río Áros at 430 to 1,510 m. elevations (1,410 to 4,954 ft.) was studied from 1995 to 2016. A total of 401 plant taxa in 74 families and 274 genera were recorded in the lower Río Bavispe Valley study area, including 24 non-native species (6.0%). The families with the most species were Asteraceae (50), Fabaceae (50), Poaceae (42), Euphorbiaceae (20), Malvaceae (19), Cactaceae (13), Solanaceae (15), and Pteridaceae (11), representing 54.9% of the flora. The genera with the most species were *Acacia* (8), *Bouteloua* (7), *Euphorbia* (6), *Quercus* (6), *Boerhavia* (5), *Muhlenbergia* (5), and *Opuntia* (5).

¹GreaterGood.org, 6262 N. Swan Rd., Suite 150, Tucson, AZ 85718.

²Herbario USON, Universidad de Sonora-DICTUS, Edificio 1A, Niños Héroe entre Rosales y Pino Suárez, Col. Centro, Hermosillo, Sonora, Mexico, CP 83000.

Introduction

Although the Tropic of Cancer is located at 23.4°N, just north of Mazatlán, Sinaloa, the northernmost tropical deciduous forest occurs in the Sierra San Javier, Sonora (28.6°N), 680 km. (422 mi.) to the north-northwest (Van Devender et al. 2013a). The northernmost tropical vegetation in Sonora is foothills thornscrub in the Ríos Bavispe and Sonora Valleys. In this paper, we summarize the flora of foothills thornscrub and adjacent desert grassland in the lower Río Bavispe Valley south of Huásabas, Sonora.

Study Area and Methods

The Río Bavispe begins in the northernmost Sierra Madre Occidental near Mesa Tres Ríos on the Chihuahua border. The river flows from Huachinera northward, west around the Sierra el Tigre, and then southward through Huásabas and

continued next page



Figure 2. View of Río Bavispe and foothills thornscrub on Rancho Pueblo Viejo. Photo by Thomas R. Van Devender.

Lower Bavispe Valley *continued*

Granados. The Río Yaqui proper begins where the Ríos Bavispe and Áros join. Plants were collected and observed in the lower Río Bavispe Valley as part of various projects. In May 1995, plants were collected at Cruz del Diablo, a spectacular overlook canyon east-northeast of Huásabas (Figure 1). Surprisingly, *Dalea tentaculoides*, a former candidate for listing under the U.S. Endangered Species Act, was found. This was the first record for Sonora and Mexico, 248 km. (154 mi.) southeast of the previously known population in Sycamore Canyon west of Nogales, Arizona. In June 2005, the area was extensively resurveyed as part of a U.S. Fish and Wildlife Service status survey. We made a few more collections in this area in March 2012. A few additional collections from the Cruz del Diablo area in the SEINet database were made by Gary P. Nabhan (December 1978, February 1988), Elayne Joyal (June 1992), and Wendy Hodgson (July 2003).

A Madrean Archipelago Biodiversity Assessment (MABA) Expedition to the Sierra la Madera near Moctezuma in August 2010 visited various areas, including Rancho Mesa Quemada in the foothills thornscrub-oak woodland transition just west of the present study area. Transects were done in various areas in foothills thornscrub and in the riparian deciduous forest along the Río Bavispe in the Municipality of Huásabas in June

2005 (Cajón de los Pilares), September 2010, March 2012, and May 2016. The latter date was on a Madrean Discovery Expedition (MDE) Education trip for the purpose of giving a natural history presentation for the *Secundaria Técnica* (a middle school) in Huásabas.

In July 2011 and March 2012, we visited additional thornscrub areas in the Municipality of Granados. In November 2015, **GreaterGood.org** began Project WILDCAT to protect predators in the lower Río Bavispe Valley in the Municipalities of Divisaderos and Granados (Van Devender et al., in press) (Figure 2). In March–April and November 2016, we inventoried plants in 12 wildlife camera study areas on Ranchos el Barragán, el Carricito, el Carrizal, las Gallinas, el Hoyo, Pueblo Viejo, and many areas between them. Voucher specimens are mostly deposited in the herbaria at the University of Arizona (ARIZ) and Universidad de Sonora (USON). Records and observations are available in databases in the SEINet network (<http://swbiodiversity.org/seinet/>), especially the MDE (madreandiscovery.org) and Red de Herbarios del Noroeste de México (<http://herbanwmex.net/>) databases. The MABA database is no longer active, but the records are accessible through a link in the MDE database. Simple biological observations from areas are in the MDE database.

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Lower Bavispe Valley *continued*

The study area in this paper is from Cajón del Diablo west through Huásabas to the foothills of the Sierra la Madera and south to the junction of the Ríos Bavispe Valley and Áros in the Municipalities of Divisaderos, Granados, and Huásabas (Figures 1 and 2). The dominant vegetation at lower elevations (430–1,000 m., 1,410–3,280 ft.) in this area is foothills thornscrub (FTS) (Figure 3). At higher elevations on Ranchos el Barragán (1,384–1,510 m. elevation, 4,540–4,954 ft.); 12.2 km. (7.5 mi.) SW of Granados and las Gallinas (1,004–1,283 m. elevation, 3,293–4,209 ft.); 16.0 km. (10 mi.) ESE of Divisaderos, and Cruz del Diablo (1,000–1,300 m. elevation, 3,280–4,265 ft.); 7.1 km. (4.5 mi.) ENE of Huásabas, FTS transitions into desert grassland. On the lower slopes of the Sierra la Madera, FTS transitions into oak woodland. Riparian deciduous forest is found along the Río Bavispe, Arroyo Bacadéhuachi, and larger arroyos.

Results and Discussion

Flora. A total of 401 plant taxa in 74 families and 274 genera has been recorded in the lower Rio Bavispe Valley study area. This includes 24 non-native species (6.0%). The families with the most species were Asteraceae (50), Fabaceae (50), Poaceae (42), Euphorbiaceae (20), Malvaceae (19), Cactaceae (13),

Solanaceae (15), and Pteridaceae (11), representing 54.9% of the flora. The genera with the most species were *Acacia* (8), *Bouteloua* (7), *Euphorbia* (6), *Quercus* (6), *Muhlenbergia* (5), *Boerhavia* (5), and *Opuntia* (5).

Tropical species typical of tropical deciduous forest (TDF) and foothills thornscrub (FTS) include *Alvaradoa amorphoides*, *Brahea brandegeei*, *Ceiba acuminata* (Figures 4A and B), *Diphysa suberosa*, *Ficus petiolaris*, *Fouquieria macdougalii*, *Haematoxylum brasiletto* (Figure 5), *Heliocarpus attenuatus*, *Lasiacis ruscifolia*, *Lysiloma divaricatum*, *Parkinsonia praecox*, *Parthenium tomentosum* var. *stramonium* (Figures 6A and B), *Rhynchosia precatoria*, and *Solanum umbellatum*. Oak woodland species are *Lasianthaea podocephala*, *Quercus emoryi*, *Q. viminea*, and *Rhus virens*. Sonoran desertscrub species are *Cylindropuntia fulgida*, *Encelia farinosa*, and *Olneya tesota*. Isolated stands of *O. tesota* near Rancho el Hoyo (29.6425°N 109.2405°W) and Pueblo Viejo (109.2373°W, both Municipality of Divisaderos) and between Granados and Huásabas (29.8914°N 109.3131°W, Municipality of Huásabas) in FTS, and in Arroyo Palo Pinto southwest of San Nicolás (28.3758°N 109.2581°W, Municipality of Yécora) in TDF are the easternmost stands of

continued next page



Figure 3. Foothills thornscrub on Rancho el Hoyo. *Stenocereus thurberi* and *Hechtia montana* are visible. Photo by Thomas R. Van Devender.



Figure 4A and B. *Ceiba acuminata* thorns and fruit in the Sierra Mazatán. Photos by Robert A. Villa.

Figure 5. *Haematoxylum brasiletto* near Nácori Grande. Photo by Thomas R. Van Devender.

Lower Bavispe Valley *continued*

this iconic desert tree. *Hibiscus acicularis* is an interesting species that is widespread in the Chihuahuan Desert in northeastern Mexico. It is a small woody shrub that resembles *H. coulteri*, except that the flower is canary yellow (Figure 7). Its presence in Sonora was only recognized in 1979 but it is presently known from 15 localities in Sonoran deserts scrub and FTS. It is not yet known for Arizona.

Riparian trees along the Río Bavispe include *Populus fremontii*, *Salix bonplandiana*, *S. gooddingii*, *Platanus wrightii*, *Fraxinus velutina*, and *Juglans major*. The latter has *Amenazada* (Threatened) protection status in the Mexican endangered species law (Diario Oficial de la Federación, NOM-059-SEMARNAT-2010), even though it is widespread and common in riparian habitats in many areas in northeastern Sonora. Tropical riparian trees in the flora include *Guazuma ulmifolia*, *Havardia mexicana*, *Sapindus saponaria*, and *Vitex mollis*. Previously, *S. saponaria* was thought to have varieties *drummondii* and *saponaria*. Felger et al. (2001) pointed out that the two taxa do not intergrade, and that *S. drummondii* of the southwestern United States is a



separate species. The two species are sympatric in Arroyo los Pavos on the Northern Jaguar Reserve. The population of *S. saponaria* on Rancho Pueblo Viejo is the northernmost locality for the species.

Noteworthy species include *Bernardia myricifolia* (Chihuahuan species known from three localities in Sonora), *Dalea tentaculoides* (see above), *Mabrya geniculata* (genus of two species in Chihuahua and Sonora), and *Metastelma mexicanum* (former U.S. Endangered Species Act candidate species as *Cynanchum wigginsii*). Noteworthy succulents

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Figure 6A and B. *Parthenium tomentosum* var. *stramonium* near Bacanora. Photos by Thomas R. Van Devender.



Figure 7. *Hibiscus acicularis* near Mazatán. Photo by Thomas R. Van Devender.

Figure 8. *Agave ocahui* in the Sierra Mazatán. Photo by Stephen F. Hale.



Lower Bavispe Valley

continued

include *Agave ocahui* (Sonoran endemic described by Howard S. Gentry, Figure 8), *A. parviflora*, *Nolina matapensis* (tree nolina in Sonora and adjacent Chihuahua and Sinaloa and Sonora; named for Mátape, Sonora, Figures 9A and B), *O. puberula* (small, brittle, spiny tropical *siviri* near its northern limits), and *Yucca grandiflora* (big tree yucca in Sonora and adjacent Chihuahua). The small Santa Cruz striped agave (*A. parviflora*) is a species of Special Concern in Arizona. The species has *Amenazada* (Threatened) protection status in the Mexican endangered species law (NOM 059 SEMARNAT 2010). There are three subspecies in Sonora: *A. p.* var. *parviflora* is in southern Arizona and adjacent Sonora. The *A. p.* ssp. *flexiflora* is endemic to eastern Sonora from the Mátape-Moctezuma area east to the Huásabas-Nácori Chico area. The *A. p.* ssp. *densiflora* in the Maycoba area in the Sierra Madre Occidental in eastern Sonora is a larger variety (Starr and Van Devender 2011). All are locally common and not in danger.

The flora of foothills thornscrub is an important part of the flora of Sonora and the transition from the New World tropics to the north temperate

continued next page





Figure 9A and B. *Nolina matapensis* on Ranchos Pueblo Viejo and las Gallinas. Photos by Thomas R. Van Devender.

Lower Bavispe Valley *continued*

zone. The lower Río Bavispe Valley flora presented here is the first detailed thornscrub plant list to be published.

Acknowledgements

GreaterGood.org supported the Project WILDCAT predator protection project in the lower Río Bavispe Valley. We thank José Manuel (Memo) Galaz-Galaz for guiding us to the Project WILDCAT camera localities.



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CHECKLIST: Lower Bavispe Valley page 1 of 5

An asterisk (*) denotes non-native status.

Lycophytes

SELAGINELLACEAE

Selaginella rupincola

Pteridophytes

ASPLENIACEAE

Asplenium palmeri Maxon

DRYOPTERACEAE

Phanerophlebia auriculata
Underwood

Woodsia plummerae Lemmon

PTERIDACEAE

Argyrochosma incana (C. Presl)
Windham

Argyrochosma limitanea (Maxon)
Windham

Astrolepis cochisensis (Goodding)
Benham & Windham

Astrolepis sinuata (Lag. ex Sw.)
Benham & Windham

Bommeria hispida (Mett. ex Kuhn)
Underwood

Myriopteris pringlei (Davenp.) Grusz &
Windham

Myriopteris wrightii (Hook.) Grusz &
Windham

Notholaena lemmonii D.C. Eaton var.
lemmonii

Pellaea intermedia Mett. ex Kuhn

Pellaea wrightiana Hook.

Gymnosperm

CUPRESSACEAE

Juniperus arizonica (R.P. Adams) R.P.
Adams

Eudicots

ACANTHACEAE

Anisacanthus thurberi (Torr.) A. Gray

Carlwrightia arizonica A. Gray

Dicliptera resupinata (Vahl) Juss.

Elytraria imbricata (Vahl) Pers.

Henrya insularis Nees ex Benth.

Justicia candicans (Nees) L.D. Benson

Justicia sonora Wasshausen

Ruellia nudiflora (Engelm. & A. Gray)
Urban

Tetramerium nervosum Nees

ACHATOCARPACEAE

Phaulothamnus spinescens A. Gray

AIZOACEAE

Trianthema portulacastrum L.

AMARANTHACEAE

Amaranthus palmeri S. Watson

Atriplex elegans (Moq.) D. Dietr

Chenopodium ambrosioides L.

Chenopodium neomexicanum Standl.

Froelichia interrupta (L.) Moq.

Gomphrena sonora Torr.

Iresine hartmanii Uline

Tidestromia lanuginosa (Nutt.) Standl.

ANACARDIACEAE

Rhus virens Lindh. ex A. Gray subsp.
choriophylla (Wooton & Standl.)
Young

APIACEAE

* *Bowlesia incana* Ruiz & Pav.

Daucus pusillus Michx.

Spermolepis lateriflora G.L. Nesom

APOCYNACEAE

Asclepias leptopus I.M. Johnst.

Asclepias linaria Cav.

Funastrum clausum Schltr.

Funastrum hartwegii (Vail) Schltr.

Gonolobus arizonicus (A. Gray) Woods.

Marsdenia edulis S. Watson

Metastelma mexicanum (Brandege) M.

Fishbein & R. Levin

Vallesia glabra Link

ARALIACEAE

Hydrocotyle umbellata L.

ARISTOLOCHIACEAE

Aristolochia watsonii Wooton & Standl.

ASTERACEAE

Acourtia thurberi (A. Gray) Reveal &
King

Ambrosia ambrosioides (Cav.) W.W.
Payne

Ambrosia confertiflora DC.

Ambrosia cordifolia (A. Gray) W.W.
Payne

Artemisia dracunculus L.

Artemisia ludoviciana Nutt.

Baccharis pteronioides DC.

Baccharis salicifolia (Ruiz & Pav.) Pers.

Baccharis sarothroides A. Gray

Baccharis thesioides Kunth

Bebbia juncea (Benth.) Greene

Brickellia coulteri A. Gray

Brickellia venosa (Wooton & Standl.)
B.L. Robins.

Calycoseris wrightii A. Gray

Carminatia tenuiflora DC.

Carphochaete bigelovii A. Gray

Coreocarpus arizonicus (A. Gray) Blake

Diaperia verna (Rafinesque) Morefield

Eclipta prostrata (L.) L.

Encelia farinosa A. Gray ex Torr.

Gamochoeta purpurea (L.) Cabrera

Gamochoeta stagnalis (I.M. Johnst.)
Anderb.

Helenium thurberi A. Gray

Hymenoclea monogyra Torr. & A. Gray
ex A. Gray

Lagascea decipiens Hemsl.

Lasianthaea podocephala (A. Gray) K.
Becker

Malacothrix glabrata (A. Gray ex D.C.
Eat.) A. Gray

Parthenium hysterophorus L.

Parthenium tomentosum DC. var.
stramonium (Greene) Rollins

Pectis filipes Harvey & A. Gray

Pectis prostrata Cav.

Perityle californica Benth.

Perityle cordifolia S.F. Blake

Perityle microcephala A. Gray

Perityle microglossa var. *saxosa*
(Brandege) A.M. Powell

Porophyllum gracile Benth.

Porophyllum macrocephalum DC.

Rafinesquia neomexicana A. Gray

* *Sonchus oleraceus* L.

Symphyotrichum expansum (Poepp.
ex Spreng.) G.L. Nesom

Thymophylla anomala Rydb.

Thymophylla concinna (A. Gray)
Strother

Tithonia thurberi A. Gray

Trixis californica Kellogg

Verbesina encelioides (Cav.) Benth. &
Hook. f. ex A. Gray subsp. *exauriculata*
(B.L. Rob. & Greenm.) J.R. Coleman

Viguiera dentata (Cav.) Spreng.

Xanthisma gracile (Nutt.) D.R. Morgan
& R.L. Hartm.

Xanthium strumarium L.

Zinnia peruviana (L.) L.

Zinnia zinnioides (Kunth) Olorode
& A.M. Torres

BIGNONIACEAE

Tecoma stans (L.) Juss. ex Kunth var.
angustatum Rehd.

BIXACEAE

Amoreuxia palmatifida Moc. & Sessé
ex DC.

BORAGINACEAE

Cordia sonora Rose

Cryptantha barbiger (A. Gray) Greene

Nama hispidum var. *sonora* C.L.
Hitchc.

Nama jamaicense L.

Phacelia affinis A. Gray

Phacelia gentryi Constance

Phacelia scariosa Brandege

BRASSICACEAE

* *Brassica tournefortii* Gouan

* *Nasturtium officinale* W.T. Aiton

* *Sisymbrium irio* L.

Descurainia pinnata (Walter) Britton

Erysimum capitatum (Douglas ex
Hook.) Greene

Lepidium lasiocarpum Nutt.

BURSERACEAE

Bursera fagaroides (Kunth) Engl. var.
elongata McVaugh & Rzed. McVaugh
& Rzed.

Bursera laxiflora S. Watson

CACTACEAE

Coryphantha recurvata (Engelm.)
Britton & Rose

Cylindropuntia fulgida (Engelm.)
Knuth

Cylindropuntia leptocaulis (DC.) Knuth

Cylindropuntia spinosior (Engelm.)
Knuth

Cylindropuntia thurberi (Engelm.) F.M.
Knuth in Backeb. & F.M. Knuth

Echinocereus rigidissimus (Engelm.)
Haage f.

Mammillaria grahamii Engelm. subsp.
grahamii

Mammillaria standleyi Orcutt.

Opuntia cf. *durangensis* Britton & Rose

Opuntia cf. *wilcoxii* Britton & Rose

Opuntia engelmannii Salm-Dyck

Opuntia gosseliniana A. Weber

Opuntia puberula Hort. Vindob. ex
Pfeiff.

Stenocereus thurberi (Engelm.)
Buxbaum

CANNABACEAE

Celtis pallida Torr.

Celtis reticulata Torr.

CONVOLVULACEAE

Evolvulus alsinoides L. var. *angustifolia*
Torr.

Evolvulus arizonicus A. Gray

Ipomoea arborescens (Humb. & Bonpl.)
G. Don var. *glabrata* (A. Gray) Gentry

Ipomoea hirsutula Jacq. f.

Ipomoea leptotoma Torr.

Jacquemontia pringlei A. Gray

CROSSOSOMATACEAE

Crossosoma bigelovii S. Watson

CUCURBITACEAE

Cucurbita digitata A. Gray

Echinopepon wrightii (A. Gray) S.
Watson

Schizocarpum palmeri Cogn. & Rose

EUPHORBIACEAE

Acalypha papillosa Rose

Argythamnia adenophora auct. non A.
Gray

Argythamnia serrata (Torr.) Müll. Arg.

Bernardia myricifolia (Scheele) S.
Watson

Cnidoscolus angustidens Torr.

Croton ciliatoglandulifer Ortega

Croton sonora Torr.

Croton texensis (Klotzsch) Müll. Arg.

Euphorbia cymosa Poir.

Euphorbia florida Engelm.

Euphorbia gracillima S. Watson

Euphorbia graminea Schlecht. & Cham.

Euphorbia hyssopifolia L.

Euphorbia setiloba Engelm. ex Torr.

Jatropha cardiophylla (Torr.) Müll. Arg.

Jatropha cordata Müll. Arg.

* *Ricinus communis* L.

Sebastiania bilocularis S. Watson

CHECKLIST: Lower Bavispe Valley page 3 of 5

Tragia jonesii Radcl.-Sm. & Govaerts

Tragia nepetifolia Cav.

FABACEAE

Acacia angustissima (Mill.) Kuntze

Acacia cochliacantha Humb. & Bonpl. ex Willd.

Acacia constricta Benth.

Acacia crinita Brandegee

Acacia farnesiana (L.) Willd.

Acacia millefolia S. Watson

Acacia occidentalis Rose

Acacia russelliana (Britton & Rose) Lundell

Acmispon micranthus (Nutt. ex Torr. & A. Gray) Brouillet

Astragalus nuttalianus DC.

Caesalpinia caladenia Standl.

Caesalpinia pulcherrima (L.) Sw.

Calliandra eriophylla Benth.

Chamaecrista serpens Greene var. *wrightii* (A. Gray) H.S. Irwin & Barneby

Coursetia caribaea (Jacq.) Lavin var. *caribaea*

Coursetia glandulosa A. Gray

Dalea pringlei A. Gray var. *multijuga* Barneby

Dalea pulchra Gentry

Dalea tentaculoides Gentry

Desmanthus covillei (Britton & Rose) Wiggins ex B.L. Turner

Desmodium angustifolium (Kunth) DC.

Desmodium psilocarpum A. Gray

Diphysa suberosa S. Watson

Erythrina flabelliformis Kearney

Eysenhardtia orthocarpa (A. Gray) S. Watson

Galactia wrightii A. Gray

Haematoxylum brasiletto Karst.

Havardia mexicana Britton & Rose

* *Leucaena leucocephala* (Lam.) de Wit

Lupinus bicolor Lindl.

Lupinus sparsiflorus Benth.

Lysiloma divaricatum (Jacq.) J.F. Macbr.

Lysiloma watsonii Rose

Marina parryi (Torr. & A. Gray) Barneby

Mimosa biuncifera Benth.

Mimosa distachya Cav. var. *laxiflora* (Benth.) Barneby

Mimosa dysocarpa Benth.

Nissolia schottii (Torr.) A. Gray

Olneya tesota A. Gray

Parkinsonia aculeata L.

Parkinsonia praecox (Ruiz & Pav.) J.A. Hawkins

Piscidia mollis Rose

Prosopis velutina Wooton

Rhynchosia discolor M. Martens & Galeotti var. *discolor* Grear

Rhynchosia precatoria DC.

Senna covesii (A. Gray) Irwin & Barneby

Senna pallida (Vahl) H.S. Irwin & Barneby var. *shreveana* H.S. Irwin & Barneby

Zapoteca formosa (Kunth) H.M. Hern. subsp. *rosei* (Wiggins) H.M. Hern.

Zapoteca formosa (Kunth) H.M. Hern. subsp. *schottii* (Torr. ex S. Watson) H.M. Hern.

Zornia reticulata Sm.

FAGACEAE

Quercus chihuahuensis Trel.

Quercus emoryi Torr.

Quercus oblongifolia Torr.

Quercus toumeyii Sarg.

Quercus tuberculata Liebm.

Quercus viminea Trel.

FOUQUIERIACEAE

Fouquieria macdougalii Nash

Fouquieria splendens Engelm.

JUGLANDACEAE

Juglans major (Torr.) Heller

KRAMERIACEAE

Krameria bicolor S. Watson

Krameria erecta Willd. ex J.A. Schultes

LAMIACEAE

Clerodendrum coulteri (A. Gray) Govaerts

Hedeoma nanum (Torr.) Briq.

Hyptis albida Kunth

* *Marrubium vulgare* L.

Salvia setosa Fernald

Stachys coccinea Ortega

Vitex mollis Kunth

LOASACEAE

Eucnide hypomalaca Standl.

Mentzelia multiflora (Nutt.) A. Gray

MALPIGHIACEAE

Callaeum macropterum (Moc. & Sessé ex DC.) D.M. Johnson

Cottisia californica (Benth.) W.R. Anderson & C. Davis

Cottisia linearis (Wiggins) W.R. Anderson

MALVACEAE

Abutilon abutiloides (Jacq.) Garcke ex Britton & Wilson

Abutilon incanum (Link) Sweet

Abutilon mollicomum (Willd.) Sweet

Abutilon reventum S. Watson

Ayenia filiformis S. Watson

Bastardiastrum cinctum (Brandege) D.M. Bates

Ceiba acuminata Rose

Gossypium thurberi Todaro

Guazuma ulmifolia Lam.

Heliocarpus attenuatus S. Watson

Herissantia crispa (L.) Briz.

Hibiscus acicularis Standl.

Hibiscus coulteri Harvey ex A. Gray

CHECKLIST: Lower Bavispe Valley page 4 of 5

* *Malva parviflora* L.

Malvastrum bicuspidatum (S. Watson)
Rose

Malvastrum coromandelianum (L.)
Garcke

Sida abutifolia P. Mill.

Sida rhombifolia L.

Waltheria indica L.

MARTYNIACEAE

Proboscidea parviflora (Wooton)
Wooton & Standl.

MENISPERMACEAE

Cocculus diversifolius DC.

MORACEAE

Ficus petiolaris Kunth subsp. *petiolaris*

NYCTAGINACEAE

Allionia incarnata L.

Boerhavia coccinea P. Mill.

Boerhavia erecta L.

Boerhavia purpurascens A. Gray

Boerhavia triquetra S. Watson

Boerhavia xanti S. Watson

Commicarpus scandens (L.) Standl.

OLEACEAE

Fraxinus gooddingii Little

Fraxinus velutina Torr.

ONAGRACEAE

Oenothera curtiflora W.L. Wagner &
Hoch

Oenothera primiveris A. Gray

Oenothera rosea L'Hér. ex Ait.

OROBANCHACEAE

Castilleja tenuiflora Benth.

OXALIDACEAE

Oxalis corniculata L.

PAPAVERACEAE

Argemone ochroleuca Sweet

Eschscholzia californica Cham. subsp.
mexicana (Greene) C. Clark

PASSIFLORACEAE

Passiflora foetida L. var. *gossypiifolia*
(Desv. ex Ham.) Mast.

Turnera diffusa Willd. ex Schult.

PHRYMACEAE

Erythranthe guttata (Fisch. ex DC.) G.L.
Nesom

PICRAMIACEAE

Alvaradoa amorphoides Liebm.

PLANTAGINACEAE

* *Plantago major* L.

Mabrya geniculata (B.L. Rob. &
Fernald) Elisens

Maurandya antirrhiniflora Humb. &
Bonpl. ex Willd.

Penstemon parryi (A. Gray) A. Gray

Plantago patagonica Jacq.

Stemodia durantifolia (L.) Sw.

Veronica peregrina L. subsp. *xalapensis*
(Kunth) Pennell

PLATANACEAE

Platanus wrightii S. Watson

PLUMBAGINACEAE

Plumbago zeylanica L.

POLEMONIACEAE

Loeselia glandulosa (Cav.) G. Don

POLYGONACEAE

Antigonon leptopus Hook. & Arn.

Eriogonum abertianum Torr.

PORTULACACEAE

Portulaca oleracea L.

Portulaca suffrutescens Engelm.

Portulaca umbraticola Kunth

Talinum paniculatum (Jacq.) Gaertn.

PRIMULACEAE

Androsace occidentalis Pursh

RANUNCULACEAE

Clematis drummondii Torr. & A. Gray

Thalictrum fendleri Engelm. ex A. Gray

RHAMNACEAE

Condalia correllii M.C. Johnston

Condalia warnockii M.C. Johnston

Karwinskia humboldtiana Zucc.

Ziziphus obtusifolia (Hook. ex Torr. & A.
Gray) A. Gray

RUBIACEAE

Galium microphyllum A. Gray

Galium proliferum A. Gray

Hintonia latiflora Bullock

Randia laevigata Standl.

Randia sonorensis Wiggins

Randia thurberi S. Watson

RUTACEAE

Esenbeckia hartmanii B.L. Rob. &
Fernald

Zanthoxylum fagara Sargent

SALICACEAE

Populus fremontii S. Watson

Salix bonplandiana Kunth

Salix gooddingii Ball

SANTALACEAE

Phoradendron californicum Nutt.

Phoradendron serotinum (Raf.) M.C.
Johnst. subsp. *tomentosum* (DC.) Kuijt

SAPINDACEAE

Cardiospermum corindum L.

Dodonaea viscosa Jacq. var.
angustifolia (L. f.) Benth.

Sapindus saponaria L.

SAPOTACEAE

Sideroxylon occidentale (Hemsl.) T.D.
Penn.

SAURURACEAE

Anemopsis californica (Nutt.) Hook. &
Arn.

SCROPHULARIACEAE

Buddleja parviflora Kunth

Buddleja sessiliflora Kunth

CHECKLIST: Lower Bavispe Valley page 5 of 5

SOLANACEAE

- * *Nicotiana glauca* Graham
- Capsicum annuum* L. var. *glabriusculum* (Dunal) Heiser & Pickering
- Datura discolor* Bernh.
- Datura innoxia* P. Mill.
- Lycium andersonii* A. Gray
- Lycium berlandieri* Dunal
- Lycium exsertum* A. Gray
- Nicotiana obtusifolia* Mertens & Galeotti
- Petunia parviflora* Juss.
- Physalis acutifolia* (Miers) Sandw.
- Physalis wrightii* A. Gray
- Solanum americanum* P. Mill.
- Solanum houstonii* Martyn
- Solanum lumholtzianum* Bartlett
- Solanum umbellatum* Willd. ex Roem. & Schult.

TAMARICACEAE

- * *Tamarix aphylla* (L.) Karst.

URTICACEAE

- Parietaria hespera* Hinton

VERBENACEAE

- Aloysia gratissima* (Gillies & Hook.) Troncoso
- Glandularia pumila* (Rydb.) Umber
- Lantana achyranthifolia* Desf.
- Lantana camara* L.
- Lantana urticifolia* Mill.
- Verbena neomexicana* (A. Gray) Small

ZYGOPHYLLACEAE

- Guaiaacum coulteri* A. Gray
- Kallstroemia grandiflora* Torr. ex A. Gray
- Kallstroemia parviflora* J.B.S. Norton

Monocots

ARECACEAE

- Brahea brandegeei* (C. Purpus) H. E. Moore

ASPARAGACEAE

- Agave angustifolia* Haw.
- Agave ocahui* Gentry
- Agave parviflora* Torr. subsp. *flexiflora* Gentry
- Agave shrevei* Gentry subsp. *matapensis* Gentry
- Dasyilirion gentryi* D.J. Bogler
- Nolina matapensis* Wiggins
- Yucca grandiflora* Gentry
- Yucca madrensis* Gentry

BROMELIACEAE

- Hechtia montana* Brandegee
- Tillandsia recurvata* (L.) L.

CYPERACEAE

- * *Cyperus rotundus* L.

POACEAE

- Aristida adscensionis* L.
- Aristida schiediana* Trin. & Rupr.
- Aristida ternipes* Cav. var. *gentilis* (Henrard) Allred
- Aristida ternipes* Cav. var. *ternipes*
- * *Arundo donax* L.
- * *Avena sativa* L.
- Bothriochloa barbinodis* (Lag.) Herter
- Bouteloua aristidoides* (Kunth) Griseb.
- Bouteloua barbata* Lag.
- Bouteloua curtipendula* (Michx.) Torr.
- Bouteloua diversispicula* J.T. Columbus
- Bouteloua hirsuta* Lag.
- Bouteloua radicata* (E. Fourn.) Griffiths
- Bouteloua repens* (Kunth) Scribn. & Merr.
- Brachiaria arizonica* (Scribn. & Merr.) S.T. Blake

- Chloris virgata* Sw.

- * *Cynodon dactylon* (L.) Pers.

- * *Dactyloctenium aegyptium* (L.) Willd.
- Digitaria californica* (Benth.) Henr.
- Dinebra panicea* (Retz.) P.M. Peterson & N. Snow subsp. *brachiata* (Steud.) P.M. Peterson & N. Snow
- Disakisperma dubium* (Kunth) P.M. Peterson & N. Snow
- * *Echinochloa colona* (L.) Link
- * *Eragrostis cilianensis* (All.) Vignolo ex Janch.

- Eragrostis intermedia* A.S. Hitchc.
- Eragrostis pectinacea* (Michx.) Nees var. *pectinacea*
- Heteropogon contortus* (L.) Beauv. ex Roemer & J.A. Schultes

- Lasiacis ruscifolia* (Kunth) Hitchc.
- * *Melinis repens* (Willd.) Zizka
- Muhlenbergia dumosa* Scribn. ex Vasey
- Muhlenbergia elongata* Scribn. ex Beal
- Muhlenbergia emersleyi* Vasey
- Muhlenbergia microsperma* (DC.) Trin.
- Muhlenbergia rigens* (Benth.) A.S. Hitchc.

- Panicum hirticaule* J. Presl
- Paspalum hartwegianum* E. Fourn. ex Hemsl.

- * *Pennisetum ciliare* (L.) Link
- * *Polypogon monspeliensis* (L.) Desf.
- * *Polypogon viridis* (Gouan) Breistr.
- Setaria liebmannii* E. Fourn.
- Setaria macrostachya* Kunth
- Setaria parviflora* (Poir.) Kerguelen
- * *Sorghum halepense* (L.) Pers.

- Tripsacum lanceolatum* Rupr. ex E. Fourn.

TYPHACEAE

- Typha domingensis* Pers.



From left: Sue Carnahan leading field trip near Bear Springs. Mountain Malaxis Orchid (*Malaxis soulei*) at Barfoot Park. Photos courtesy Bob Behrstock. Fly Agaric Mushroom (*Amanita muscaria*) and cup fungus (*Peziza* sp.) at Barfoot Park. Photo courtesy Doug Ripley.

Arizona Native Plant Society Botanical Adventure to the Chiricahua Mountains

by Ries Lindley, Arizona Native Plant Society, Tucson Chapter, and Douglas Ripley, Arizona Native Plant Society, Cochise Chapter

On 15–17 September 2018, 37 members of the Arizona Native Plant Society enjoyed a long weekend in Cochise County’s beautiful Chiricahua Mountains where they participated in the Society’s annual Botany Workshop. With an elevation of 9,795 feet at their highest point (Chiricahua Peak), the Chiricahua Mountains are among the most biologically rich and scenic of all the Madrean Sky Islands in southern Arizona.

The Southwestern Research Station, operated by the American Museum of Natural History, provided accommodations for the workshop participants wishing to stay at the station. Others camped on their own in one of the many nearby campsites in

the Coronado National Forest while participating in day and evening programs offered as part of the workshop.

Activities for Day One consisted of arriving at the Station, socializing at a “Happy Hour” event and then enjoying dinner in the Station’s dining hall. Following dinner, participants assembled in the Station’s classroom building for an orientation lecture on the biology and ecology of the Chiricahua Mountains by Ries Lindley. The Chiricahuas contain seven major geological formations, five of the six Merriam Life Zones, 83 mammal species, 375 avian species, and a remarkable 1,464 taxa of

continued next page



From left: Marion Anthonisen collecting plants near Bear Springs. “Happy Hour” at the Southwestern Research Station. Plant Identification Lab (L-R: Lyn Loveless, Deb Sparrow, and Sue Carnahan). Photos courtesy Doug Ripley.

SPOTLIGHT ON A NATIVE PLANT *Douglas Ripley, Arizona Native Plant Society, Cochise Chapter*

Woodland Pinedrops (*Pterospora andromedea*)

The Woodland Pinedrops is a strikingly interesting and colorful parasitic plant that occurs mainly in the moist to dry, often deep humus, of mixed-deciduous or coniferous forests throughout parts of Northern Mexico, much of the Western and Northeastern United States, and Canada. In Arizona it occurs in Apache, Coconino, Yavapai, Pima, Graham, and Cochise Counties. Notwithstanding its wide distribution and relative abundance, it is always a delightful plant to encounter. The plant spends most of its life as a mass of parasitic underground roots that live in a relationship with mycorrhizal fungi (several species of the genus *Rhizopogon*) and only produces its above ground flowering stalks (inflorescences) from June to August.

A member of the Heather Family (Ericaceae), the genus and species were described in 1818 by the famous British botanist Thomas Nuttall. The genus name is derived from the Greek, *pteros*, wing, and *spora*, seed. The species was apparently named for the Greek mythology character, *Andromeda*, for reasons that were not explained.



Woodland Pinedrops in the Pinal Mountains, Tonto National Forest, Gila County, Arizona. *Photo courtesy Doug Ripley.*



Adventure to the Chiricahua Mountains *continued*

vascular plants (including sub species and varieties), a number equal to approximately one-third of the entire Arizona flora! Doug Ripley then made a presentation on the natural history of the Dragoon Mountains, a smaller “Sky Island” located approximately 40 miles west of the Chiricahuas, and the subject of a floristic study he has been engaged in for several years with his botanical partner Jim Verrier. The final event of the evening was an overview briefing by Ries Lindley on the four guided field trips that would be offered the following day. Those included an early morning birding walk of the Station grounds led by Arlene Ripley, the South Fork of Cave Creek, and two high elevation trips to the Barfoot Park and Rustler Park. The trips were led by our botanical expert for the workshop, Sue Carnahan (Arizona Native Plant Society, Santa Cruz and Tucson Chapters), local experts Elaine Moisan and Dave Jasper (Cochise Chapter members), Ries Lindley, and Doug Ripley.

Returning from the field trips to the station by late afternoon, the participants enjoyed pre-dinner drinks and conversation,

then dinner at the Station dining hall. The evening’s activities consisted of a plant identification workshop in the Station classroom where the participants assisted each other in identifying the plants they had collected during the day. Individuals contributed to a common plant list with their collections and observations. The list of 157 taxa can be viewed on the SEINet portal at: <http://swbiodiversity.org/seinet/checklists/checklist.php?clid=5127&pid=&dyncid=0>.

Following breakfast on the final day, individuals returning to their homes west of the Station were invited to return in a group via a biologically interesting route along the North Tex Canyon Road and Camp Rucker south of the Chiricahua Mountains.

If you like good conversation, and if you love nature, join us for next year’s Chiricahua workshop. The 2019 dates have not yet been established but will be announced as soon as they have been confirmed with the Southwestern Research Station.





THE ARIZONA NATIVE PLANT SOCIETY

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People interested in native plants are encouraged to become members. People may join chapters in Cochise County (Sierra Vista), Flagstaff, Phoenix, Prescott, Santa Cruz County, Tucson, or Yuma, or may choose not to be active at a chapter level and simply support the statewide organization.

For more information, please drop us a line, visit www.aznativeplantsociety.org, or get in touch with one of the chapter contacts below:

Cochise: Doug Ripley, 520.909.3132,
jdougripley@gmail.com

Flagstaff: Dorothy Lamm, 928.779.7296

Phoenix: Kara Barron and Steve Blackwell,
kbarron@dbg.org, sblackwell@dbg.org,
480.941.1225

Prescott: Vacant

Santa Cruz County: Francesca Claverie,
santacruz.aznps@gmail.com

Tucson: Jessie Byrd, 520.370.1667,
jessie_byrd@hotmail.com

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