The Arizona Native Plant Society

The Plant Press

THE ARIZONA NATIVE PLANT SOCIETY

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A Flora of the Tortolita Mountains, Pima and Pinal Counties, Arizona

by Ries Lindley[1] *All figures courtesy the author, except where noted.*

Figure 1 Looking east in the Tortolita Mountains from the Ridgeline Trail near its intersection with the Loop Trail. Some of the higher peaks of the eastern project area are in the foreground. This is typical of the semidesert grassland in the project area. The Santa Catalina Mountains are in the background.

Special Issue:

A Flora of the Tortolita Mountains, Pima and Pinal Counties, Arizona

Plus:

With Regular Features:

Introduction

On a hot day in June of 2012, I found myself bouncing along in the backseat of a big white SUV that belonged to the Desert Botanical Garden. In the front seat were Wendy Hodgson and Andrew Salywon. I had turned the conversation to my search for a botanical project, specifically a flora. Wendy's suggestion was the Tortolita Mountains, and the why was simple; not much work had been done there.

Floras are done for many reasons, including to gain a better understanding for land management, to measure change, to see how an area fits botanically or ecologically in the puzzle of its neighboring lands, or to fill in *terra incognita* on a map. The Tortolita project falls in the latter category.

Despite the seven million specimens available to the online database known as the Southwest Environmental Information Network (SEINet), there are still a number of places where common species exist and yet are not documented. Most collections are done along roadways, and then secondarily along trails, giving a very skewed view of

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President's Note *by Douglas Ripley*

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As the Arizona Native Plant Society celebrates its 40th anniversary, the Society has enjoyed a busy and productive spring. Initiatives on many levels have been undertaken throughout the state, including our monthly chapter meetings and chapter-sponsored field trips; innovative and timely restoration projects led by John Scheuring, our Conservation Committee Chairman and AZNPS Board member; sponsorship of citizen science projects through the Plant Atlas Project of Arizona (PAPAZ); the sponsorship of various research and publication projects through our state and chapter grants programs; and the hosting of our annual Botany 2017 Conference on 13-14 May at Prescott College in cooperation with the College's Natural History Institute.

The Arizona Native Plant Society was incorporated in August 1976. However, it did not hold its first meetings or issue its first publications until early 1977, so the latter year is probably the best to use to mark the Society's beginning.

A lot has changed since 1977, not the least of which is the attitude of many Americans and their elected officials toward the environment. The 1970s have been referred to as the "Golden Age" of environmental enlightenment in America. The Endangered Species Act, Clean Water Act, Clean Air Act, Coastal Zone Management Act, and many other landmark environment laws were enacted, or significantly strengthened, in that decade. It's very hard to imagine such legislation being enacted today. Indeed, our greatest fear now is knowing that many of those important laws are under brutal attack and may well be repealed or significantly diminished in the coming years.

Members of the Arizona Native Plant Society are clearly people who care about the environment and, in particular, the conservation, protection, and understanding of native plants. It therefore behooves our Society to increase its efforts to encourage those values in the citizens of Arizona. Many of our ongoing programs aim to do just that; however, much more can and must be done. I encourage all AZNPS members to contribute their efforts to our ongoing conservation and education initiatives and to suggest new ones.

Regular readers *of The Plant Press* will notice that this issue is different from recent issues — most of the issue is devoted to one paper, Ries Lindley's meticulous account of his PAPAZ project, which resulted in the compilation of a comprehensive flora of the Tortilita Mountains in Southern Arizona. We feel much is to be gained by publishing accounts such as this and look forward to periodically publishing similar works in the future.

All best wishes for an enjoyable and botanically rewarding summer!

A Flora of the Tortolita Mountains *continued*

how a species is actually distributed. And if an area is deemed to be boring, even these types of collections are absent. These little blind spots on botanical maps concern scientists like Wendy and Andrew.

Science that is thought to be newsworthy usually involves breakthroughs of huge proportion, something unexpected, or something that lends itself to spellbinding imagery. But all newsworthy science is built on much smaller building blocks put in place by workers slogging through tasks that are mostly invisible and incomprehensible to the rest of the world.

This is, hopefully, one of those smaller building blocks. This flora provides a formalized botanical record that will help fill in some small voids in the knowledge base that covers our earth, and most especially, this little patch of Arizona.

Boundaries and Ownership

The Tortolita Mountains are in two Arizona counties: Pinal County, which makes up the northern half of the mountains, and Pima County, the southern part. The project consists of lands owned by Pima County in both Pima and Pinal Counties and a few parcels owned by the United States government and managed by the Bureau of Land Management. The total area of land in the project is 3,515 hectares (8,700 acres or 20% of the total mountain area); 2,593 hectares (6,400 acres or 16%) are Pima County-owned land, and most of that is part of Tortolita Mountain Park. The remaining 921 hectares (2,300 acres or 6%) are controlled by the Bureau of Land Management. The total land area comprised by the Tortolita Mountains, including the project, is about 16,000 hectares (Figure 2).

Pima County has a history of purchasing land for open space and conservation. Tortolita Mountain Park was purchased for multiple uses. It serves as open space for recreation and also functions as part of a wildlife corridor from the Santa Catalina Mountains to the east and various desert mountain ranges to the west.

Permissions

Permission to collect plants was obtained from two landowners: the United States Bureau of Land

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A Flora of the Tortolita Mountains *continued*

Management, Tucson Field Office, and Pima County Natural Resources, Parks and Recreation. A permit for collecting specimens on Arizona State Trust land was cost-prohibitive, so state-owned land was not included in the project.

Effort

The first plant was collected on April 4, 2013, and the last specimens were collected on July 11, 2015. Forty-eight trips were made, including one day trip with four collectors, four days with three collectors, fifteen days with two collectors, and twenty-eight days with only one collector. Each trip generally entailed about two to three hours of travel to and from the project. Time spent actually hiking, surveying, and collecting specimens averaged about 6.5 hours per person per day. The total effort, excluding travel time, was about 480 hours (Table 1).

Table 1. Project Effort

	Days Collecting	Collectors per Day	Person Days
	1	4	4
	4	3	12
	15	2	30
	28	1	28
Totals	48		74

Although the Tortolitas are not particularly rugged when compared to other ranges in southeast Arizona, they presented their challenges for an aging botanist. Some slopes are steep, others remote, and some parts are both remote and steep. Fortunately, there were mitigating features that helped with accessibility, like roads that provided access to project lands. A large tract of BLM land in the northwest of the project is transected by an unmaintained dirt track that greatly facilitated sampling different altitudes and microhabitats. Another road along the Pinal County-Pima County line provided access to the northeast side of Tortolita Mountain Park. In the plant list this road is referred to as Rail X Ranch access. Parts of this road were actually in the project area and provided a way to do some quick, easy surveying from a high-clearance vehicle.

An excellent trail system built by the Town of Marana provided access to a large portion of the project that lies in Tortolita Mountain Park itself. These trails cut across canyons and washes, travel along the higher ridgelines, and traverse slopes with different aspects and geology. The trails offer walkable access to a number of different microhabitats.

The Cochie Canyon road is not publicly accessible below the boundary of Tortolita Mountain Park. Only two collecting trips were made up this road. Both trips were undertaken at times when they could be coordinated with an official visit by Pima County employees.

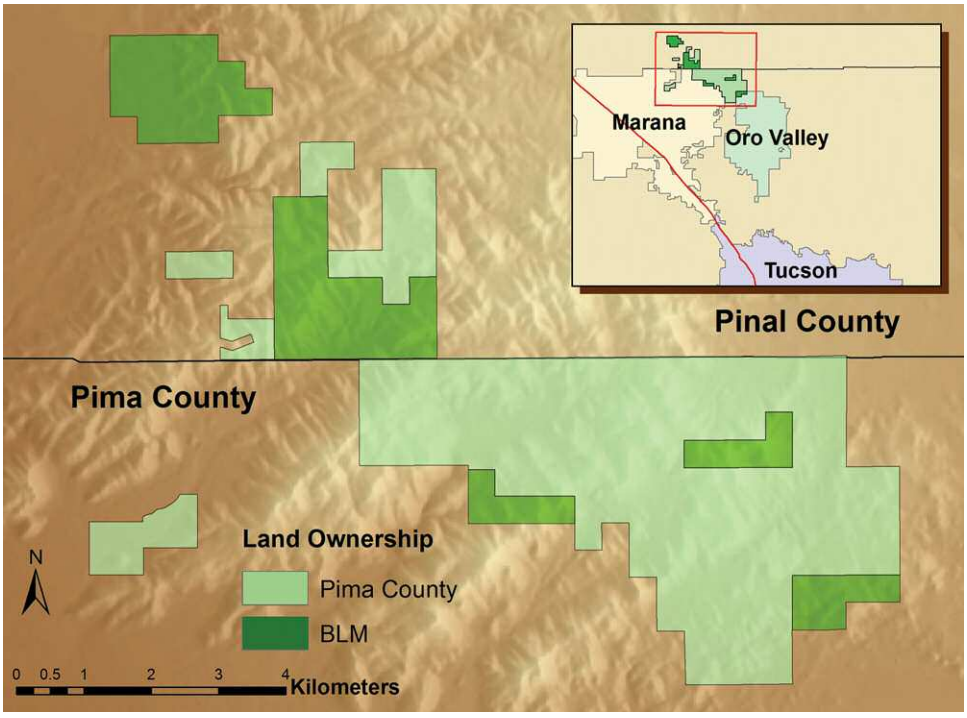

Figure 2 Showing the project lands in green tones as well as land ownership.

Geology

Contributed by Charles Ferguson, Reasearch Geologist, Arizona State Geological Survey

The Tortolitas lie in the Basin and Range Province, a vast expanse of North America that stretches from southern Oregon and Idaho, down through Nevada, most of Arizona, and along the west coast of Mexico to Puerto Vallarta and inland to Guadalajara in the state of Jalisco. This province is characterized by narrow rugged mountain ranges interspersed with wide flat valleys. This landscape was created by crustal stretching initiated in the middle Tertiary (~25 million years ago) when the western edge of North

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BOOK REVIEW *by Joseph Charboneau, Ph.D. Candidate, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson*

Intermountain Flora

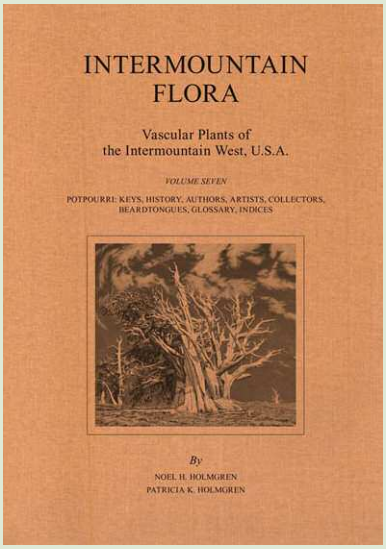
Vascular Plants of the Intermountain West, USA, Volume 7

Potpourri: Keys, History, Authors, Artists, Collectors, Beardtongues, Glossary, Indices

by Noel H. Holmgren and Patricia K. Holmgren

2017. 303 pages. The New York Botanical Garden Press. ISBN: 978-0-89327-545-4. $119.00

Forty-five years after the publication of its first volume, the *Intermountain Flora* has come to complete fruition with the publication of its final volume. Actually the ninth part in the series, Volume Seven: "Potpourri" provides a fitting conclusion to the monumental *Flora*, which is symbolically bookended by the cover images on the first, and this final volume, with bristlecone pines. In this volume are a new key to all families in the flora, a new treatment for *Penstemon*, a comprehensive glossary, and a cumulative index. You will also find the miscellaneous information and tidbits that didn't fit in any of the previous volumes, including acknowledgements for the whole series, authors' and publication information for all treatments and volumes, a detailed history and chronology of the project, biographies of significant contributors, and photographs of Intermountain West plant collectors through the years.



Ostensibly *Intermountain Flora* encompasses little of Arizona: the only included areas are on the Arizona Strip from the Vermillion Cliffs in the east across the Kaibab and other plateaus to the Grand Wash Cliffs in the west. Amusingly to fellow Arizona botanists, the southern boundary of the flora area (according to Arthur Cronquist's description of the *Flora* boundaries reprinted in this volume from Volume 1) wasn't extended to the Mogollon Rim because it "would add a considerable number of species to our *Flora*," and because in 1972 there was "a recent state flora of Arizona" available. He was referring to Kearney and Peebles's *Arizona Flora* first published in 1951 (with a supplement in 1960)! However, many of the species included within the whole series can also be found in other parts of Northern Arizona because the flora area includes the entire state of Utah.

A detailed chronology of the *Intermountain Flora* project, written by Noel Holmgren, gives a sense of the immensity of the undertaking and a look at what was going on behind the scenes. The idea for the *Flora* was first proposed back in 1931 by Bassett McGuire of what was then called Utah State Agricultural College (now Utah State University). McGuire was a new professor who had not yet finished his Ph.D. Two of his former master's students at Utah State, Arthur Holmgren and Arthur Cronquist, took up the reigns on the project after McGuire's interests became focused elsewhere geographically and he moved to the New York Botanical Garden in 1943. The *Flora* was also officially underway that year with the signing of an agreement between Utah State and NYBG. Noel Holmgren, as both a principal author and the son of principal author Arthur Holmgren, gives us his unique perspective, on this endeavor that began when he was a child. Biographies peppered with anecdotes and stories of the principal authors and other significant contributors are also included.

Readers looking more for utility in the present will find it in the new family keys, an updated treatment of *Penstemon*, a comprehensive glossary, and a cumulative index across all volumes of the *Flora*. Family keys can often be loaded with technical features, and they can be cumbersome, but the included keys here are intended for use in the field based on features evident without magnification. Multiple artificial groups split the families into shorter keys and ensure ease of identification in either flower or fruit and provide multiple endpoints for each family. The key even gives a starting point for getting to the genus of your unknown by providing genera (and sometimes species) that key out to most of each of the endpoints. The new *Penstemon* treatment is an update of the one first published in Volume 4 in 1984. Since then, 15 additional species have been

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Book Review *continued*

added to the *Flora*, including seven new to science, bringing the total number to 119 species. New artificial and technical keys are presented to include previously documented and new species, new or altered species, and variety descriptions corresponding with changes in taxonomy. Amazingly each of the 3,847 species and 1,517 varieties included in the whole *Flora* are illustrated with line drawings, and the new *Penstemon* species are no exception. Even more amazingly, over two-thirds of these drawings are by just two artists, Jeanne R. Janish and Bobbi Angell, who both have biographies included in this volume.

Sara and John Lemmon on their honeymoon on the slopes of what would later be named Mt. Lemmon in honor of Sara Lemmon in the Santa Catalina Mountains outside Tucson. *Image courtesy of the University and Jepson Herbaria Archives, University of California, Berkeley.*

Although you'll reach for the Potpourri Volume on the shelf for its family keys, glossary and cumulative index, you'll quickly find yourself enraptured with looking through the included photographs of over 350 Intermountain West plant collectors, whose specimens form the basis for the *Intermountain Flora*. Collectors photographs are arranged in alphabetical order, which provides interesting juxtapositions from different time periods and allows you to see what has changed for botanists in the last 150 years or so. There are fewer neckties and vascula; more synthetic fabrics and, encouragingly, women (although there were many early women botanists compared to some other fields). These amazing photographs also allow you to see how little has changed over time. There are many scenes of botanists working in herbaria or pressing plants in the field that could have just as easily been from the 1890s as the 1990s.

Intermountain Flora Volume 7 is a great and befitting conclusion to this monumental work that is the result of efforts by many dedicated collectors, herbarium staff, authors, illustrators, and reviewers. Like the bristlecone pines that grace the covers of the first and final volumes, the *Intermountain Flora* will endure long after future generations of botanists take up in our stead.

A Flora of the Tortolita Mountains *continued*

America overrode the East Pacific Rise (an oceanic spreading center). The East Pacific Rise transferred its westernmost edge (Baja and southwestern California) onto the Pacific tectonic plate whose northwesterly motion with respect to the rest of North America is literally pulling the continent apart. As the crust extends, regions below ~15 km respond by stretching, while regions higher in the crust respond by rigid block rotation. Most of the mountain ranges throughout the Basin and Range, especially the narrow ones, are tips of the tilted fault blocks, barely emergent, like icebergs, above a sea of surrounding basin sediment. Other ranges, like the Tortolitas, include large areas of the stretched middle crust known as metamorphic core complexes that were uplifted by a combination of upward ductile flow and removal of brittle overburden along low-angle, detachment faults. The Tortolitas were recently (~ 4 million years ago) continuous with the Santa Catalina Mountains core complex and are now separated by a narrow valley occupied by a keystone graben (a depressed block of the Earth's crust bordered by parallel faults), a portion of the once continuous core complex that after rising into the brittle regime, is now undergoing extensional collapse via block fault deformation

Most of the Tortolitas are in the footwall (south) of a north-dipping shear zone and fault called the Carpas Wash shear zone and Guild Wash fault that runs through the northern part of the mountains. The zone records the transition from upwelling of the core complex while rocks were still ductile, and the Carpas Wash shear zone was active, into the brittle regime when the Guild Wash fault took over and cut through the shear zone. To the west (Guild Wash), the two

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A Flora of the Tortolita Mountains *continued*

structures are nearly coincident, but to the east they diverge across another important, down-to-the-east, fault zone into two distinct widely separated structures: a southern ductile shear zone at Carpas Wash, and a northern fault zone with zones of cemented breccia. The Carpas Wash shear zone separates rocks in its hanging wall (north) that have resided in the upper crust since the Early Proterozoic (~one billion years ago) from rocks in its footwall (south) that were in the middle to lower crust and enjoying strong ductile stretching as recently as 20 million years ago. Since the Cretaceous, rocks in the footwall were intruded by four granitic plutons (bodies of intrusive igneous rock), three of them just prior to uplift in the Middle Tertiary. Their contrasting characteristics are expressed in several ways, including resistance to or susceptibility to erosion, geomorphology, and very importantly for this study, the kinds of soil(s) they generate.

The flora project lies entirely to the south of (in the footwall of) the Carpas Wash shear zone. This part of the Tortolitas can be divided into three geologically distinct regions based primarily on the type of granitic rock that occurs in its region. The "granites" are distinctive in composition and age. The oldest and largest is a granodiorite (more calcic and less alkalic than a granite) called the Chirreon Wash Granodiorite of latest Cretaceous (70 million years) age. The Chirreon Wash occupies the northeastern quarter of the footwall block and is intruded by a strongly interdigitate granite pluton to the west called the Fresnal Granite. The two northern plutons are bounded to the south by a highly stretched septum of recessive ~1.6 billion-year-old Pinal Schist that hosts a dark, coarse-grained quartz monzonite (slightly more deficient in SiO2 than a granite) called the Wild Burro that includes abundant, elongate stringers (enclaves) of quartzite, marble, and schist of probable Late Proterozoic to Phanerozoic (~1,000 to 250 million years old) age. The Wild Burro intrudes both of the northern plutons and is in turn intruded to the south and southeast by a light, massive granite called the Tortolita Mountains Granite. The two granite plutons to the northwest and southeast tend to be more resistant, forming highlands with rounded tors (abrupt rock outcrops) and with intervening dells floored with thin grussy soils, whereas the granodiorite in the northeast and quartz monzonite in the southwest, both containing over twice as many mafic (iron and magnesium-rich), more easily weathered minerals, are relatively recessive and tend to host thicker, more calcic soils.

Soils

The Tortolita Mountains comprise mostly granitic rock. These rocks are easily weathered and have created young alluvium (a deposit of clay, silt, sand, and gravel left by flowing streams in a river valley or delta, typically producing fertile soil) throughout the Tortolitas (McAuliffe 1999). There are twelve soil types in the project: three in Pinal County, and nine in Pima County (Figure 3). Most of the project area is covered in soils that range from ten to 50 cm (20 in) in depth. Some of the wash areas have soils with depths in excess of 200 cm (80 in).

The project encompasses two soil studies, one in Pinal County and the other in Pima County. This means soils that meet at the county boundaries have different names in different counties. For a detailed description of the soils named in Figure 2, see Natural Resources Conservation Service: **websoilsurvey.sc.egov.usda.gov**.

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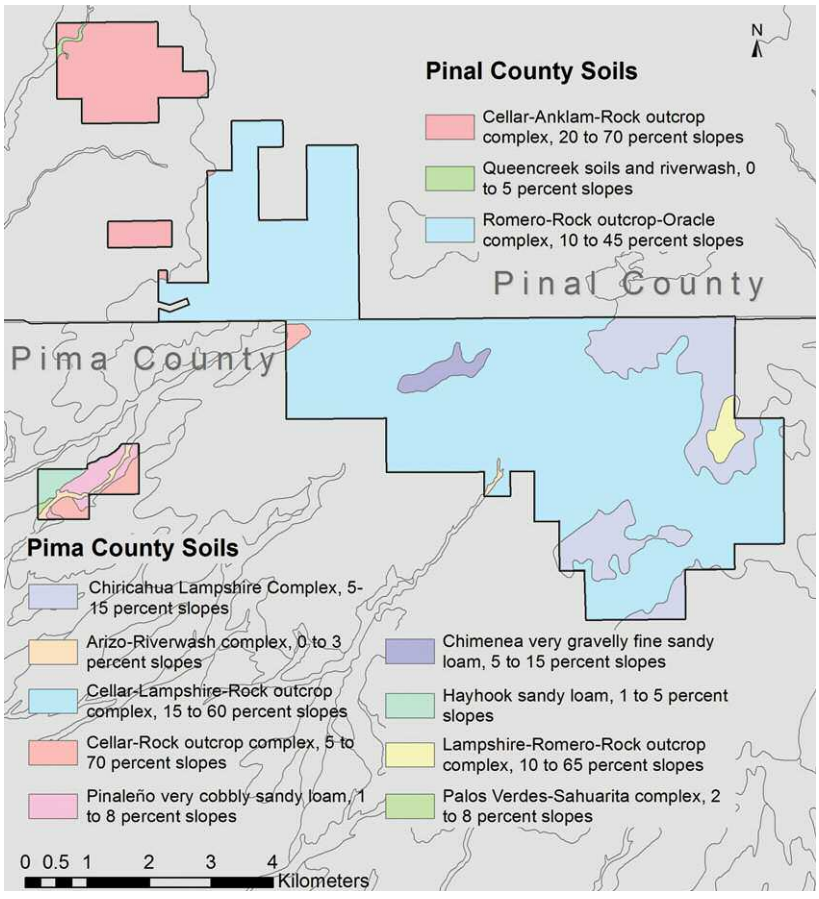


Figure 3 Soils in the flora project.

A Flora of the Tortolita Mountains *continued*

Climate and Weather

Cooling periods occur on Earth with about a 100,000-year periodicity. The last glacial maximum was 18,000 years ago. The end of the Pleistocene, about 10,000 years ago, was marked by the last retreat of the Laurentide Ice Sheet, the large ice mass that covered much of Canada and the northern United States. The climate in the southwest was wetter in the period between the glacial maximum and the retreat of the great ice sheet over Canada. Westerly winds, caused by the presence of this ice mass, pushed far to the south, creating an ecosystem in southwest Arizona more conducive to plants of wetter climes. Plants like redberry juniper and desert scrub oak grew at lower elevations during this time. From the end of the Pleistocene to the present, the Holocene in geological terms, was a modern period of warmer and drier conditions. These new conditions set the stage for today's deserts. The Sonoran Desert, as it is today, was probably established as recently as 6,000 years ago.

Streamflows estimated from tree ring data provide a record for the Gila River near Solomon, Arizona, that date to 1330 A.D. (Figure 4). Streamflows are extremely and frequently variable in the long term, with a low of 49 million cubic meters in 1685 to a high of 1,775 million cubic meters in 1849. The data since 1332 indicate a slight increase in the average rainfall (Arizona Department of Agriculture, Thompson and Anderson: **geochange.er.usgs.gov/sw/impacts/biology/pastclim**).

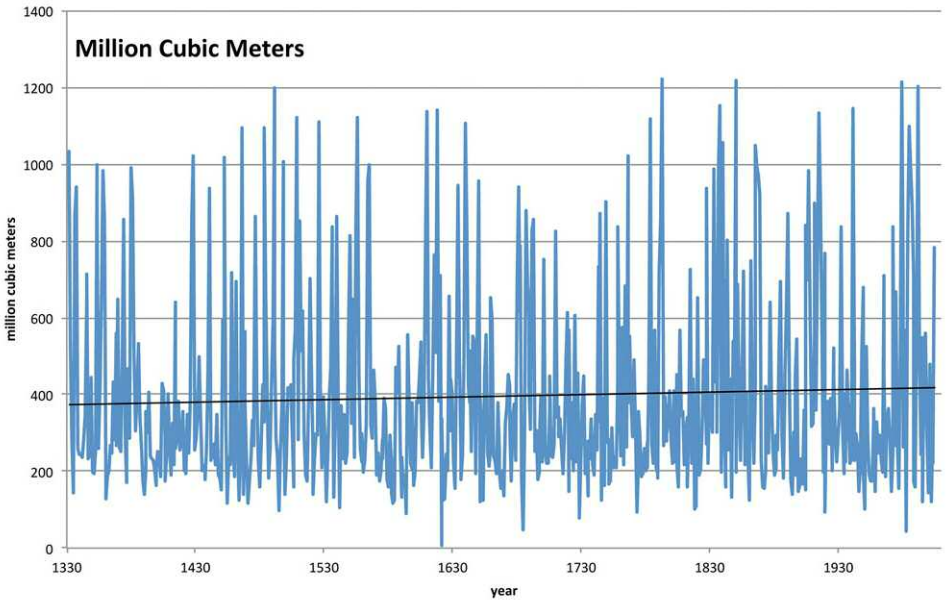
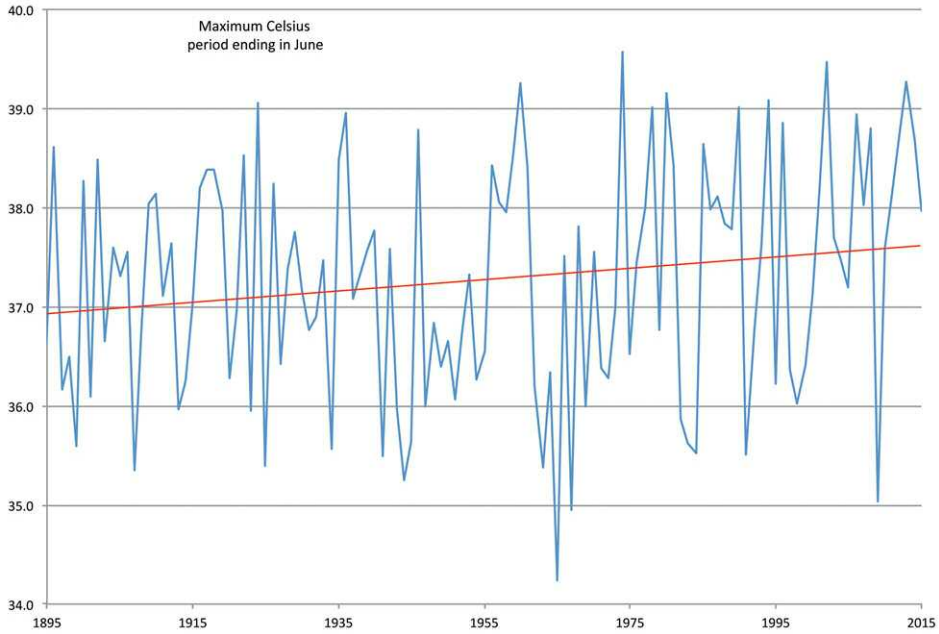


Figure 4 (above) Reconstructed streamflows in the Gila River near Solomon, Arizona. Data from **www.treeflow.info**.

Figure 5 (below) Minimum temperatures in January and maximum temperatures in June for Pima County from 1885 to the present. Data for chart from **www.cefa.dri.edu/Westmap/Westmap_home.php**.



Historic temperatures from 1895 to 2015 (available from WestMap: **www.cefa.dri.edu/Westmap**) show that only a scattering of January low temperatures were below freezing. Both the low temperatures for January and the high temperatures for June show an upward trend with increases approaching 1 degree Celsius for both since 1895 (Figure 5).

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A Flora of the Tortolita Mountains *continued*

Prehistory

The Tucson basin has been occupied by humans for 10,000 years, and the Tortolita Mountains show evidence of occupation, off and on, for the last 5,000 years (Wallace 2008). Early people in the Tucson basin were chiefly hunter-gatherers leading a nomadic lifestyle and leaving little evidence of their presence. One site in Ruelas Canyon dates to the Early Archaic Period (7500–5000 B.C.). This site is located just south of the project on the southern edge of the mountains.

The period from 2100–50 B.C. is known to archaeologists as the Early Agricultural Period. In these years early inhabitants established agriculture in the Tucson Basin, including the planting of maize by 2100 B.C. and building irrigation canal systems that date to as early as 1200 B.C. Pit houses in Wild Burro Canyon and bedrock mortars in Ruelas Canyon show that there was human use of the Tortolitas during the period of agricultural development in the Tucson Basin (Wallace 2008).

By the Sedentary Period (A.D. 950–1150) of the Hohokam Sequence, population density was increasing throughout the Tucson Basin. Settlements and periodic-use sites began to be established farther from the Santa Cruz River, and an increase in population occurred in the Tortolitas as well. By A.D. 1450, the Hohokam disappeared, leaving little in the archaeological record until Father Kino came to the Tucson Basin in 1697 (Wallace 2008).

Between forty and fifty archaeological sites have been studied in the area known as Dove Mountain. This tract of land sits at the base of the Tortolitas and is adjacent to Tortolita Mountain Park, where much of the plant-specimens for this project were collected. These sites were used in a number of different ways. Some likely provided permanent or, at least longer-term, habitation; others were more likely inhabited seasonally or intermittently. There is no clear evidence that any agriculture occurred here. Cactus fruit from prickly pear (*Opuntia*) and cholla (*Cylindropuntia*) were probably collected and eaten. Cultigens of maize, beans, and squash were used but do not appear to have been grown there with any regularity. On the western side of the mountains, in the alluvium nearer the Santa Cruz River, agave was cultivated.

European Settlement

Commencing in the mid 16th Century, European settlement in southern Arizona marked the beginning of many new human-related impacts on the native flora. The naming of the the Tortilita Mountains (Spanish for the Common Ground Dove) is obscure.

Cattle

Cattle were first brought to Arizona in the mid-1500s by Francisco Vásquez de Coronado of Spain. The first ranch of the area was formally established near the Tortolitas in 1844. Known as the Romero Ranch, it spanned lands that included the present-day Catalina State Park. In March 1880, the railroad came to nearby Tucson (Sonnichsen 1982). The railroad did not immediately create the anticipated business boom. Cattle had been so overstocked by then that range grasses were badly depleted (Wagoner 1949). An economic depression that began in the 1880s continued into the 1890s (Sonnichsen 1982).

Whatever the effects of cattle grazing on the desert in general, the impacts of cattle on this project have probably been moderated by the broken terrain and steep slopes. Cattle-grazing intensity falls off quickly once slopes are greater than ten percent (Mueggler 1965). Shrubby globemallows (*Sphaeralcea*) are common on the steeper slopes of the Tortolitas, almost completely absent from the gentle slopes of the alluvial flats, and then abundant along the rights of way of nearby roads where cattle are excluded by fencing. Much of this project was on slopes of ten percent or more and not likely grazed by cattle to any great extent.

Drought

It is clear from looking at streamflows in the upper Gila (Figure 4) that precipitation in southeast Arizona has been historically variable. Reconstructed streamflows for the period 1332 to 2006 show this stretch of the Gila has seen flows as low as 49 million cubic meters. The highest reconstructed streamflow was in 1849 at 1,775 million cubic meters. The average flow in this period was 419 million cubic meters. According to the Arizona Climate Office, 2016 is the twenty-first year of the state's current drought. The long-term effects of this shortage are visible in the Tortilitas (**azclimate.asu.edu/drought**). The average rainfall in the recent drought has been about three centimeters per year less than average, a seemingly small difference that nonetheless has had noticeable effects on the project area.

Fremont Cottonwoods (*Populus fremontii*) occur only in scattered patches of the largest drainages of the project area. This species is mostly represented by older trees, and these are suffering from lack of water (Figure 6). There are two species of willow in the project area, *Salix gooddingii* and *S. exigua*. Neither species is represented by larger or older trees. In fact, only two individuals of *S. exigua* were located during the study. Willows are somewhat more common than cottonwoods and are confined to the largest washes.

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Figure 6 A large Fremont Cottonwood (*Populus fremontii*) in Wild Burro Canyon shows drought damage in the distal branches and in structural weakness that caused the left trunk to collapse.

A Flora of the Tortolita Mountains *continued*

In May 2013 two soapberry trees (*Sapindus saponaria*) in eastern Wild Burro Canyon were found dead within a year of their discovery. These were small plants, two to three meters tall, and about three centimeters in diameter at breast height. No other trees of this species have been located. Other riparian tree species found were Arizona ash (*Fraxinus velutina*) and netleaf hackberry (*Celtis reticulata*). The Arizona ash was found only in the bottom of Derrio Canyon where it falls within the northwestern-most BLM parcel in the project. These trees appeared healthy but were never observed in bloom, and both were only about two meters tall with multiple trunks. The netleaf hackberry seems to have suffered much more with the drought. Some of these plants are in the bottom of Wild Burro Canyon about 450 meters south of the Pima-Pinal County line. A number of these trees are well-established older trees and many have died within the last few years.

Tree species that are less riparian-obligate seem to be faring better. Desert scrub oak (*Quercus turbinella*) and redberry juniper (*Juniperus coahuilensis*) grow on rocky hillsides at altitudes above a thousand meters and exhibit fewer signs of stress in these drier environments. Desert-adapted trees like mesquite (*Prosopis velutina*), palo verde (*Parkinsonia florida* and *P. microphylla*), and ironwood (*Olneya tesota*) seem to have suffered in seedling recruitment. Older established trees appear to be reasonably healthy, but young trees are scarce.

Introduced Species

Twenty-two of the species found in the Tortolita flora are introduced. Ten of the introduced species have a potential for high environmental impacts, at least locally. Nine of the ten potentially high-impact species are grasses, of which Lehmann's lovegrass (*Eragrostis lehmanniana*) and Weeping lovegrass (*E. curvula*) are already well established. Lehmann's lovegrass can be found throughout the project, and Weeping lovegrass is found near wash bottoms and on

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A Flora of the Tortolita Mountains

continued

steep slopes near the bottom of ravines. Weeping lovegrass grows well in the preferred habitats of the big bunch grasses in the genus *Sporobolus*.

Three other perennial grasses that may be able to cause heavy environmental impacts are Natal grass (*Melinis repens*), buffelgrass (*Pennisetum ciliare*), and fountain grass (*P. setaceum*). Natal grass, which may occur in scattered clumps for years in dry periods, can become deeply established with any increase in precipitation. Natal grass is not well established in the Tortolitas, but plants can be found in habitat that could quickly become ideal if the drought were to end. Scattered clumps of fountain grass could also become more widespread with an end in drought conditions, but its ability to colonize seems to be more limited than that of Natal grass. Bermuda grass (*Cynodon dactylon*) is found in about the same places as cottonwoods and willows. Because it needs higher soil moisture than desert plants, it is highly localized to areas with higher and longer-term soil moisture; when these conditions are met it easily crowds out competing natives. These wet areas are important to the diversity of the flora in the project area, and competing invasives serve only to limit the number of native species that could otherwise survive.

Other than Lehmann's lovegrass, the greatest threat from an invasive perennial grass in the project area is buffelgrass. This grass is becoming established in the low deserts of the western project area, and it is also in isolated patches in the higher grasslands. With or without a cessation of drought, this grass will out-compete native grasses in the long term. Buffelgrass has effectively displaced native grasses along the south-facing slopes of the front range in the Santa Catalina Mountains to the east, an area very similar to the higher semidesert grasslands of the Tortolitas.

Buffelgrass creates its own environment through fire. Plants are more closely spaced than native grasses, and the fuel load in each bunch is much greater as well. Buffelgrass fires burn at much higher temperatures than native grass fires, and these higher temperatures kill native perennials, including woody plants, leaving open space for buffelgrass with the next warm-weather rain.

The remaining high-impact potential resides with various annual grasses and one member of the Mustard Family (Brassicaceae), London rocket (*Sisymbium irio*). London rocket is a localized problem for native annuals. It grows in the late winter and early spring in the protection of native shrubs in areas with low slope. Although its area of impact is small, its effect in its particular microenvironment is great because of its success there. Mouse barley (*Hordeum*

continued next page

Figure 7 Bonker hedgehog; the left photo shows the form with short central spines. This form predominates at higher altitudes. The photo on the right is of the form with longer central spines, which is more common at lower elevations. This same elevational pattern is seen in the Santa Catalina Mountains to the east of the flora project. Note that both plants have about twenty ribs per stem.

A Flora of the Tortolita Mountains *continued*

murinum) behaves in much the same way. Red brome (*Bromus rubens*) is well established in the project area, and its dense stands in early winter replace native annuals. Its distribution is somewhat more general than that of mouse barley or London rocket, and like other invasives, it has a high impact in its own niche.

Soft feather pappus grass (*Enneapogon cenchroides*) is probably new to the Tortolita Mountains. The first collections in Arizona were in the Santa Catalina Mountains in 1976. Today it has colonized the elevations of the Catalinas below 1500 meters (4900 feet) in dense stands. The same potential exists in the Tortolitas. This grass now grows there in small, loose patches that, given time, may spread much the same as this species did in similar environments of the lower Catalinas.

Some Species Population Trends

The foot of the Tortolitas on the east side is as much as 300 meters (985 feet) higher than the west foot. In terms of vegetation, this makes the eastern Tortolitas very similar to parts of the western Santa Catalinas, and the western portion of the Tortolitas more related to the Ironwood Forest National Monument on the west and the Tucson Mountains to the south. The semidesert grasslands to the east have some kinship with the high Chihuahuan Desert (*Yucca elata* for example), and to the west at lower elevations with Sonoran desertscrub.

Some species of the flora, desert scrub oak (*Quercus turbinella*) and redberry juniper (*Juniperus coahuilensis*), are isolated on the "island" of the mountains. Others, plants that inhabit both the mountains and the valleys, change on an east-west trajectory as well as with elevation. Bonker hedgehog (*Echinocereus bonkerae*) occurs in central Arizona below the Mogollon Rim and reaches its southern limit in the Santa Catalina range (Figure 7). The plants that occur in the highest elevations of the Santa Catalinas have areoles with short central spines and stems with about twenty ribs. As this species approaches lower elevations, the central spines increase in length and the ribs are sometimes reduced in number, meaning the species slowly becomes more like *Echinocereus fasciculatus*, an inhabitant of the lower deserts. This same elevational cline may be seen in the eastern half of the Tortolitas except in reverse. Along the same east-to-west trajectory, Bonker hedgehog characteristics begin to appear with increased elevation and then fade away again beyond the crest of the Tortolitas.

Although the flora project area is well within the range of cane cholla (*Cylindropuntia spinosior*), this species is represented by a scattering of individuals on the eastern side and is almost absent on the west side in the lower deserts. A similar species limitation is noticeable in staghorn cholla (*C. versicolor*). Staghorn cholla is common in the semidesert grasslands of the east project and mostly absent in the west.

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A Flora of the Tortolita Mountains *continued*

Conversely, buckhorn cholla (*C. acanthocarpa*) is present in the west of the project and mostly absent in the east.

Threats

The Tortolitas are part Sonoran desertscrub and part semidesert grassland. These naturally dry habitats suffer with drought just as those with a better supply of water do. The large tree species like cottonwoods and willows are dependent on water retained in the soil through most or all of the dry months. In the big washes, where these trees are found, there are a number of bedrock outcrops that hold groundwater near the surface where these trees can use it. Water perched or moving downward on shallow bedrock is very responsive to drought and precipitation both, and no doubt, these areas are not holding water long enough during the drought to sustain the large riparian tree species. With no young or middle-aged trees to recruit from, it is not clear how these trees will replace themselves if the older trees are gone.

The mountains enjoy some protection from human impacts, in part because there are so few roads, and of the existing roads, few are paved. Trails allow hikers, mountain bikers, and horseback riders deep into the project area, but there is little mechanized traffic into the mountains, except in private neighborhoods on the south slopes. Cattle tend to graze only on the gentle slopes of the Tortolitas, leaving much of the steeper slopes in more pristine condition. There is, however, a herd of wild horses, and these animals are more mobile on somewhat steeper slopes. Of the unmaintained roads through the project, some are used by all-terrain vehicles or other types of off-road motorized vehicles. Damage done by these vehicles is mostly confined to the road, but plants are vandalized and washouts occur resulting in headcuts that propagate upstream (Figure 8).

Much of the land surrounding the project area is either privately owned or State land, which can be sold at auction for further development. Homebuilding is encroaching on the south side of the mountains, and may continue because both the southern, and some of the western, mountains are in the water service area of the towns of Marana or Oro Valley. The northern and eastern portions of the mountains are not in a water provider's service area, and the lack of easy access to a reliable water source may offer some protection to the mountains from development.

Comparison with the Tucson and Santa Catalina Mountains

For a comparison of the Tortolita flora and nearby mountains, plant lists were made using the "map search" function in SEINet. The polygon drawing tool was used to create an outline approximating the base of the mountains for both the Tucson Mountains and the Santa Catalinas. The resulting map searches were then culled for duplicates,

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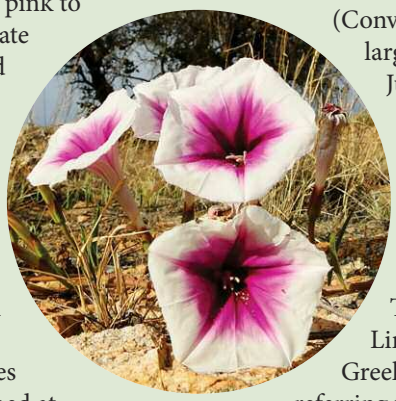
Figure 8 The saguaro on the left was knocked down by a motor vehicle within the Tortolita Mountain Park boundaries. In the photo on the right, wild horses graze on more rugged slopes than those frequented by cattle.

SPOTLIGHT ON A NATIVE PLANT *by Bob Herrmann, Arizona Native Plant Society, Cochise Chapter*

Pinkthroat or Longleaf Morning-glory (*Ipomoea longifolia*)

The Pinkthroat, or Longleaf morning-glory, will certainly catch the eye of an Arizona plant photographer. At first glance, just the size of the flower will raise your eyebrows. Their white funnel-like flowers are around 3 inches wide and 5 inches long and have a pink to purple throat. The linear leaves are alternate but arise in pairs from the same node and can grow to around 5 inches in length. This species doesn't climb like many other morning-glories. Instead, the thick stems hug the ground and rocky surfaces, growing to 10 or 15 feet in length.



Although most morning glories flower in the early morning and fade by mid-day (hence their common name), a few species such as the Pinkthroat can be photographed at night as they produce nocturnal flowers and are pollinated by moths. This was discovered and documented by the late, eminent botanist and morning-glory student Dr. Daniel Austin (1986), a long-time member of the Arizona Native Plant Society. Fortunately, some of the flowers will remain open during the day for the benefit of folks who don't wander around in the desert grasslands and oak foothills at night. *Ipomoea longifolia* is a perennial, but like most Arizona desert plants, it has better-than-average blooming years depending largely on summer rainfall. The plant illustrated here was photographed in mid-July in the Dragoon Mountains of Cochise County, growing in rocky soil at approximately 5,000 feet elevation.

A member of the Morning-glory Family (Convolvulaceae), *I. longifolia* grows from a large root and can be found flowering from June through August at 3,200 to 6,000 feet in the desert grasslands and oak woodlands of southern to southeastern Arizona. Its range extends into northern Sonora, Mexico. The species was described by the famous English botanist George Bentham (1800-1884). The genus *Ipomoea* was described by Linnaeus, with the name derived from the Greek: *ipos* (worm) and *homoios* (like, referring to its twining habit).

Ipomoea longifolia is a strikingly beautiful plant with a relatively limited distribution. Indeed, it has been designated as a state-listed rare plant (S2 state conservation status) and a U.S. Forest Service species of concern.

Reference

Austin, Daniel F. 1986. Moth pollinated *Ipomoea longifolia* (Convolvulaceae). Desert Plants 8(1), University of Arizona, Tucson.

A Flora of the Tortolita Mountains *continued*

illegitimate names, synonyms, etc. The end result was a plant list of 1,339 species rank plants in the Santa Catalinas and 573 in the Tucsons. The list used for the Tortolitas was the 334 species within the project area.

Looking at the number of species in the other ranges compared with those of the Tortolita Mountains, it seems most of the difference is a matter of botanical effort. The Tortolitas have not been well-collected compared with either the Tucson Mountains or the Santa Catalinas. Both the Tucsons and the Santa Catalinas are crossed by paved roads, other maintained roads, and trails with multiple trailhead access. Both of these ranges butt up against the urban area and attract many hikers, botanists included. The Tortolita Mountains have a more limited array of access points, and until the construction of Dove Mountain at the south edge of the range, the Tortolitas were more remote from the urban area than the other ranges. In addition, the Santa Catalinas rise to much higher altitudes and thus benefit from more rainfall.

Plant lists were compared for the purpose of finding any possible species unique to the Tortolitas. Comparing the Tortolitas and the Santa Catalinas, there were eleven species in the Tortolitas that may not exist in the Santa Catalinas. Most of those occur in the Tucson Mountains, because they are plants of lower and drier climes. The second comparison concerned the Tortolitas and the Tucsons. Between these two ranges, 54 species were unique to the Tortolitas. All but two of those can be found in the Santa Catalinas. Those two species seem to be truly confined to the Tortolitas; they are *Bouteloua parryi* (Parry's grama) and *Centrostegia thurberi* (red triangles). The Tortolitas are the southeastern limit of the range for red triangles and the northwestern limit of the range for Parry's grama.

The Tortolitas are an extension of the Santa Catalinas botanically, just as they are geologically. There are similarities in the rocks and soils, and there is overlap in the elevations of the two. The remnants of higher elevation plants scattered on the taller peaks of the Tortolitas may be found in greater abundance on the slopes of its eastern neighbor. Plants like *Fendlera rupicola, Muhlenbergia emersleyi,* and *Morus microphylla*, which are thinly scattered in pockets of the Tortolitas, are abundant in the Santa Catalinas where slopes of the same altitude are common. Elevation and rainfall may also account for most of the botanical differences between the Tortolitas and the Tucsons.

Because the Santa Catalinas and the Tucsons are much better documented botanically, there are many species found in those ranges that do not occur in the Tortolitas. No amount of collection effort in the Tortolitas will ever match the list of the Santa Catalinas. Setting aside exotics and cultivated plants that appear in the Tucson Mountains, the plants found there would make a reasonable list of what to expect from future collection efforts in the Tortolitas. The elevation overlap for these two ranges is almost complete, the geology is different but has resulted in similar opportunities for plants, the ranges are near each other, and the ranges are similar in size.

A Look to the Future

During that period of geologic time when the Tortolitas were being separated from the Santa Catalinas, the two ranges never became distantly isolated from each other. Plants of the Santa Catalina Mountains continued to survive in the Tortolitas, and those species of flora and fauna that didn't

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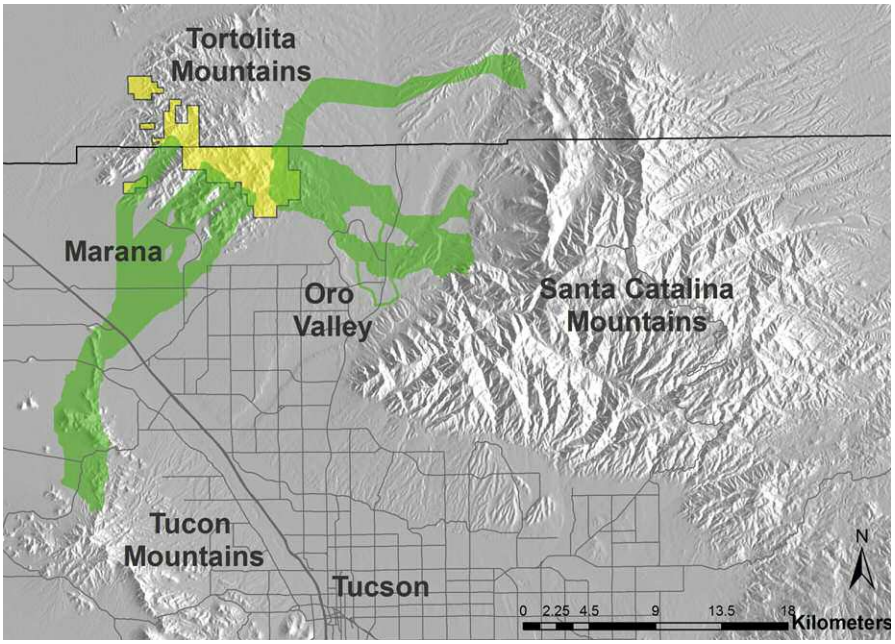

Figure 9 Wildlife corridors from Beier et al. (2006). The project lands are shown in yellow and the corridors in green.Of the sixteen linkages examined in Beier's study, "the Tucson-Tortolita-Santa Catalina linkage is the most compromised." Although the Tortolitas retain most of their value as habitat, their overall value in supporting a landscape-scale ecology is reduced by threats to the value of their wildlife linkages.

A Flora of the Tortolita Mountains *continued*

need the higher elevations of the sister range next door continued to survive. The physical distance to the Tucson Mountains was not that great either. Those distances have not changed, but the recent history of the region has brought barriers to the movement of animal species among these mountain ranges.

Time has brought many changes to this region, some of them cyclical, like the comings and goings of the ice sheets and the attendant changes in vegetation. In that snapshot of time that comprises the current millennium, the changes that affect the Tortolitas are not so much changes to the mountains themselves but the changes to their humanly habitable surroundings. The encroachment of civilization has brought human habitation to the valleys that intervenes between the Tortolitas and their neighbors, the Santa Catalinas to the east and and the Tucsons to the south. For wild animals, a road, a railroad, or a canal is as much a barrier as a wall, and the wider the road the greater the barrier.

The Tortolitas not only serve as a patch of habitat for common species of plants and animals but also as an important waystation for the movement of important animal species of the region (Figure 9) as noted by Beier et al. (2006):

> *Habitat loss and fragmentation are the leading threats to biodiversity, both globally and in Arizona. These threats can be mitigated by conserving well-connected networks of large wildland areas where natural ecological and evolutionary processes operate over large spatial and temporal scales. Large wildland blocks connected by corridors can maintain top-down regulation by large predators, natural patterns of gene flow, pollination, dispersal, energy flow, nutrient cycling, inter-specific competition, and mutualism. Corridors allow ecosystems to recover from natural disturbances such as fire or flood, and to respond to human-caused disturbance such as climate change and invasions by exotic species.*

To preserve the value of the Tortolitas as a part of natural wildlife linkages, local, regional, and state government agencies have devoted some planning and construction to providing artificial wildlife linkages among these mountain ranges. Two structures, a wildlife bridge and an underpass, have been built across State Route 77, creating a link between the Tortolitas and the Santa Catalinas. Proposed crossings for the Tucson Mountains-Tortolita Mountains link have not yet been built.

The Plant List

Families: 61

Genera: 229

Species: 334 (species rank)

Total Taxa: 339 (including subsp. and var.)

Introduced: 22 (species rank)

Specimens collected for this flora were deposited in four herbaria: ARIZ, the University of Arizona Herbarium; ASU, the Arizona State University Vascular Plant Herbarium; DES, the Desert Botanical Garden Herbarium; and SDSU, the San Diego State University Herbarium.

The collection numbers in this list are those of the author unless otherwise noted. The specimens are deposited at the University of Arizona Herbarium (ARIZ). Common names are from SEINet. The Spanish common names are italicized. The notation "native" means the plant is a native of the lower forty-eight states and "introduced" means the plant is not thought to be native. The Plants Database of the United States Department of Agriculture was used to determine the native status of plants on the list.

Species that appear on the Protected Plant List of Arizona are listed as one or more of four designations. In order of priorities they are: highly safeguarded, threatened or in danger of extinction; salvage restricted, subject to damage and vandalism; salvage assessed, valuable enough to support salvage; or harvest restricted, subject to over-harvesting due to commercial value.

ACANTHACEAE

Anisacanthus thurberi (Torr.) A. Gray – buckbrush, desert honeysuckle, Thurber's desert honeysuckle, *chuparosa, cola de gallo.* Uncommon in washes, mostly in semidesert grassland, native; 228.

Carlowrightia arizonica A. Gray – Arizona carlowrightia, Arizona wrightwort, lemilla, *rama toro, ramoneada flor blanco.* Uncommon, maybe rare in project, plants are difficult to detect, native; 237. SEINet observation, not collected due to relative rarity.

Justicia californica (Benth.) D. Gibson – beloperone, hummingbird bush, *chuparosa.* Uncommon in Sonoran Desert scrub, native; 407.

Justicia longii Hilsenb. – longflower tubetongue, siphonoglossa. Uncommon in Sonoran Desert scrub, native; 657.

The Plant List

AIZOACEAE

Trianthema portulacastrum L. – desert horse-purslane, *verdolaga blanca, verdolaga de cochi.* Uncommon, native; 603.

AMARANTHACEAE

Amaranthus fimbriatus (Torr.) Benth. ex S. Wats. – blite, fringed amaranth, fringed pigweed, pigweed, *bledo, quelite.* Uncommon in low-slope areas, native; 272.

Amaranthus palmeri S.Wats. – careless weed, Palmer amaranth, pigweed, *bledo, cuhugia, quelite.* Uncommon in alluvial flats, native; 534.

Atriplex canescens (Pursh) Nutt. – fourwing saltbush. Uncommon in Sonoran Desert scrub, native; 498.

Atriplex elegans (Moq.) D. Dietr. – wheelscale saltbush, *chamizo ceniz.* Rare in project area, Sonoran Desert scrub, native; 585.

Chenopodium neomexicanum *Standl.* – goosefoot, New Mexico goosefoot, *chual.* Uncommon in eastern project, native; 648.

Froelichia arizonica Thornb. ex Standl. – Arizona snakecotton, snakeweed. Rare in project area, semidesert grassland, native; 795.

Tidestromia lanuginosa (Nutt.) Standl. – honeymat, honeysweet, woolly tidestromia, *espanta vaqueras, hierba ceniza, hierba lanuda.* Uncommon in Sonoran Desert scrub, native; 274.

ANACARDIACEAE

Rhus aromatica Ait. – fragrant sumac, skunkbush, *aigritas, limita.* Rare to uncommon above 1,200 meters, native; 641.

APIACEAE

Bowlesia incana Ruiz & Pav. – bowlesia, hairy bowlesia, hoary bowlesia, miner's lettuce. Common winter/spring annual in shady patches, native; 147.

Daucus pusillus Michx. – American wild carrot, rattlesnake carrot, rattlesnake weed, seedticks, wild carrot, *zanahoria cimarrona, zanahoria silvestre.* Common in washes, native; 743.

APOCYNACEAE

Metastelma arizonicum A. Gray – Arizona swallowwort. Uncommon in Sonoran Desert scrub, native; 447.

Sarcostemma cynanchoides Dcne. – fringed twinevine. Uncommon in semidesert grassland washes, native; 230.

ARISTOLOCHIACEAE

Aristolochia watsonii Woot. & Standl. – birthwort, Indian root, snakeroot, Southwestern pipevine, dutchman's pipe, *guaco, hierba del indio.* Uncommon, native; 624.

ASPARAGACEAE

Dasylirion wheeleri S. Wats. – desert spoon, sotol, *cucharilla, palmilla de serrucho, saño.* Common in semidesert grassland, native; 254.

Dichelostemma capitatum (Benth.) Wood – blue dicks, desert hyacinth, *cobena, coveria.* Common in late winter and spring, native; 130.

Nolina microcarpa S. Wats. – Bear Grass, beargrass, *palmilla, sacahuista, sotol chiquito, tuyá.* Rare in project area, semidesert grassland, salvage restricted, harvest restricted, native; 790.

Yucca baccata Torr. – banana yucca, Spanish bayonet, *dátil.* Common above 1,200 meters, salvage restricted, harvest restricted, native; 66.

Yucca elata (Engelm.) Engelm. – soaptree yucca, soapweed, *cortadillo, palmilla, palmito, sota, soyate.* Common east of the Tortolita Mountains, three varieties salvage restricted in Arizona, native; 783.

ASTERACEAE

Acourtia wrightii (A. Gray) Reveal & King – brownfoot, pink perezia, Wright's desertpeony. Uncommon in washes of semidesert grassland, native; 218.

Adenophyllum porophylloides (A. Gray) Strother – San Felipe dogweed, San Felipe dyssodia. Common throughout the project, native; 206.

Ambrosia ambrosioides (Cav.) W.W. Payne – ambrosia bursage, big bursage, canyon ragweed, *chicura.* Common in washes throughout the project, native; 460.

Ambrosia confertiflora Dc. – ragweed, slimleaf bursage, slimleaf ragweed, *estafiate, istafiate.* Common summer composite, native; 511.

Ambrosia deltoidea (Torr.) W.W. Payne – triangle burr ragweed, triangle-leaf bursage, *ambrosia, chamizo forrajero, chicurilla, estafiate.* Common in Sonoran Desert scrub, native; 402.

Ambrosia monogyra (Torr. & A. Gray) Strother & B.G. Baldwin – burrobrush, cheeseweed burrobrush, singlewhorl burrobrush, *jécota, jejego, romerillo.* Uncommon in larger washes of lower elevations, native; 582.

Ambrosia salsola (Torr. & A. Gray) Strother & B.G. Baldwin – burrobrush, cheesebush, white burrobrush, *jécota.* Uncommon in Sonoran Desert scrub, abundant in flood-prone areas just west of the project boundaries at the Lower Cochie Canyon parcel, native; 728.

Artemisia ludoviciana Nutt. – absinth, cudweed sagewort, gray sagewort, Louisiana sagewort, mugwort wormwood, prairie sage, silver sage, white sagebrush, wormseed, wormwood, *ajenjo, chamizo cenizo, chicurilla, estafiate.* Common above 1,200 meters, native; 673 DES.

Baccharis pteronioides Dc. – *yerba de pasmo*. Rare in project area, semidesert grassland, native; 698.

Baccharis salicifolia (Ruiz & Pav.) Pers. – mule's fat, seepwillow, water wally, *batamote, hierba del pasmo, jarilla.* Rare in Wild Burro Canyon, native; 635.

Baccharis sarothroides A. Gray – broom baccharis, desert broom, desertbroom, rosin bush, *escoba amarga, hierba del pasmo, romerillo.* Common in flood-prone areas, native; 519.

The Plant List

Baileya multiradiata Harvey & A. Gray ex A. Gray – desert marigold, many-flowered desert marigold, *hierba amarilla.* Common throughout the project, native; 162.

Bebbia juncea (Benth.) Greene – sweetbush, bebbia. Uncommon, mostly in Sonoran Desert scrub, native; 249.

Bidens leptocephala Sherff – fewflower beggarticks, tickseed, *saitilla.* Uncommon to rare in washes of semidesert grassland, native; 617.

Brickellia californica (Torr. & A. Gray) A. Gray – brickellbush, false boneset, *hierba de la vaca, prodigiosa.* Uncommon in washes of semidesert grassland, native; 631.

Brickellia coulteri A. Gray – Coulter brickellbush, Coulter's brickellbush. Uncommon in washes of Sonoran Desert scrub, native; 217.

Cirsium neomexicanum A. Gray – lavender thistle, New Mexico thistle, thistle, *cardo santo.* Common in semidesert grassland, native; 164.

Dieteria asteroides Torr. – fall tansyaster, hoary aster, New Mexico tansy-aster, New Mexico tansyaster. Rare to uncommon above 1,200 meters, native; 612.

Encelia farinosa A. Gray ex Torr. – brittlebush, goldenhills, *hierba ceniza, hierba de las ánimas, hierba del bazo, incienso, palo blanco, rama blanca.* Abundant in semidesert grassland, native; 148.

Ericameria laricifolia (A. Gray) Shinners – ericameria, turpentine bush. Abundant in semidesert grassland, native; 421.

Erigeron divergens Torr. & A. Gray – desert fleabane, fleabane daisy, spreading daisy. Uncommon, mostly in semidesert grassland, native; 172.

Erigeron neomexicanus A. Gray – New Mexico fleabane, oakbelt daisy. Uncommon, mostly in semidesert grassland, native; 253 SEINet.

Erigeron oreophilus Greenm. – chaparral fleabane. Rare to uncommon in semidesert grassland, native; 665.

Gnaphalium palustre Nutt. – lowland cudweed, marsh everlasting, western marsh cudweed. Rare in project area, native; 749.

Gutierrezia serotina Greene – snakeweed. Common in semidesert grassland, native; 537.

Heterotheca fulcrata (Greene) Shinners – mountain camphorweed, rockyscree false goldenaster. Rare in eastern portion of project. 271 DES.

Hymenothrix wislizeni A. Gray – Trans-Pecos thimblehead. Rare in eastern portion of project, native; 599.

Hymenothrix wrightii A. Gray – Wright's thimblehead. Uncommon in semidesert grassland, native; 666.

Isocoma tenuisecta Greene – burrow goldenweed, burroweed. Uncommon throughout the project area, native; 587.

Koanophyllon solidaginifolium (A. Gray) King & H.E. Robins. – boneset, shrubby thoroughwort. Rare in project, This plant was locally common in a steep, rocky wash on BLM land in Pinal County, native; 451.

Lactuca serriola L. – China lettuce, compass plant, prickly lettuce, wild lettuce. Rare in project area, introduced; 784.

Lasthenia californica DC. ex Lindl. – California goldfields. Uncommon, native; 131.

Layia glandulosa (Hook.) Hook. & Arn. – white tidytips, whitedaisy tidytips. Uncommon in the northeastern portion of project, native; 173.

Logfia arizonica (A. Gray) J. Holub – Arizona cottonrose, Arizona fluffweed. Common spring annual, native; 754.

Machaeranthera tagetina Greene – mesa tansyaster, *flor de capita.* Common on eastern side of Tortolitas, native; 268.

Malacothrix sonorae W.S. Davis & Raven – Sonoran desert dandelion. Rare in project area, semidesert grassland, native; 772.

Packera neomexicana (A. Gray) W.A. Weber & A. Löve – New Mexico groundsel. Uncommon in semidesert grassland, native; 177.

Parthenice mollis A. Gray – annual monsterwort. Uncommon in protected areas of semidesert grassland, native; 616.

Pectis papposa* var. *papposa – manybristle cinchweed. Uncommon in Sonoran Desert scrub, native; 281.

Porophyllum gracile Benth. – odora, slender poreleaf, *yerba de venado, hierba del venado, siendre.* Common in Sonoran Desert scrub, native; 207.

Pseudognaphalium canescens (DC.) Anderb. – pearly everlasting, Wright's cudweed. Common in semidesert grassland, native; 633.

Psilostrophe cooperi (A. Gray) Greene – paper daisy, paper flower. Uncommon in semidesert grassland, native; 233.

Rafinesquia neomexicana A. Gray – desert chickory, New Mexico plumeseed. Uncommon in semidesert grassland, native; 134.

Senecio flaccidus* var. *monoensis (Greene) B.L. Turner & T.M. Barkl. – mono ragwort, sand wash groundsel. Rare in semidesert grassland, this plant is likely more common on the eastern side of the mountains in the valley, native; 747.

Senecio lemmonii A. Gray – Lemmon groundsel, Lemmon's ragwort. Common in semidesert grassland, native; 169.

Sonchus oleraceus L. – common cow thistle, sowthistle, *achicoria dulce, chinita, lechuguilla, muela de caballo.* Rare in project area, introduced; 780.

Stephanomeria pauciflora (Torr.) A. Nels. – brownplume wirelettuce, desert straw, fewflower wirelettuce. Common in semidesert grassland, native; 248.

Trixis californica Kellogg – American threefold, *hierba del aire, hierba del pasmo, ruina, santa lucía*. Uncommon in semidesert grassland, native; 247.

The Plant List

Uropappus lindleyi (DC.) Nutt. – Lindley's silverpuffs. Uncommon in semidesert grassland, native; 158.

Xanthisma gracile (Nutt.) D.R. Morgan & R.L. Hartm. – slender goldenweed, *tabacote.* Uncommon in semidesert grassland, native; 560.

Xanthisma spinulosum (Pursh) D.R. Morgan & R.L. Hartman – cutleaf goldenweed, lacy tansyaster, spiny goldenweed, spiny haplopappus. Uncommon in semidesert grassland, native; 212.

Zinnia acerosa (DC.) A. Gray – desert zinnia, spinyleaf zinnia, *hierba del burro.* Uncommon in Sonoran Desert scrub, native; 386.

BORAGINACEAE

Amsinckia menziesii (Lehm.) A. Nels. & J.F. Macbr. – Menzies' fiddleneck, smallflower fiddleneck. Common in Sonoran Desert scrub, native; 126.

Amsinckia tessellata A. Gray – bristly fiddleneck, checker fiddleneck, western fiddleneck. Uncommon in Sonoran Desert scrub, native; 409.

Cryptantha barbigera (A. Gray) Greene – bearded catseye, bearded cryptantha, narrowleaf, *nievitas, peluda.* Abundant in Sonoran Desert scrub, native; 455.

Cryptantha micrantha (Torr.) I.M. Johnston – purple-rooted forget-me-not, redroot catseye, redroot cryptantha, *nievitas, peluda.* Uncommon in Sonoran Desert scrub, native; 438.

Cryptantha nevadensis A. Nels. & Kennedy – Nevada catseye, Nevada cryptantha, wild forget-me-not, *nievitas, peluda.* Uncommon, native; 744.

Cryptantha nevadensis* var. *rigida I.M. Johnston – Nevada cryptantha. Uncommon, native; 770.

Cryptantha pterocarya* var. *cycloptera (Greene) J.F. Macbr. – wingnut cryptantha. Abundant in semidesert grassland, native; 415 SDSU.

Cryptantha pterocarya* var. *pterocarya – wingnut cryptantha. Uncommon, native; 431 SDSU.

Emmenanthe penduliflora Benth. – whispering bells, yellow whispering bells, *campanita de suspiro.* Uncommon in Sonoran Desert scrub, native; 826, SEINet observation. This plant was not collected due to relative rarity in the project.

Eucrypta chrysanthemifolia (Benth.) Greene – common eucrypta, spotted hideseed. Uncommon in Sonoran Desert scrub, native; 389.

Harpagonella palmeri A. Gray – Palmer's grapplinghook. Uncommon in Sonoran Desert scrub, native; 737.

Pectocarya heterocarpa (I.M. Johnston) I.M. Johnston – chuckwalla combseed. Uncommon in Sonoran Desert scrub, native; 398.

Pectocarya platycarpa (Munz & Johnston) Munz & Johnston – broad-wing comb-bur, broadfruit combseed, broadnut combseed. Abundant in Sonoran Desert scrub, native; 128.

Pectocarya recurvata I.M. Johnston – arched comb-bur, curvenut combseed, recurve combseed. Abundant in Sonoran Desert scrub, native; 101.

Phacelia distans Benth. – caterpillar phacelia, caterpillar weed, distant phacelia, distant scorpion-weed, wild heliotrope. Common in semidesert grassland, native; 127.

Pholistoma auritum (Lindl.) Lilja – blue fiesta-flower, desert fiestaflower. Uncommon in Sonoran Desert scrub, native; 391.

Plagiobothrys arizonicus (A. Gray) Greene ex A. Gray – Arizona popcorn flower, bloodweed, lipstick plant. Uncommon throughout the project, native; 129.

Plagiobothrys pringlei Greene – Pringle's popcornflower. Uncommon in Sonoran Desert scrub, native; 399.

BRASSICACEAE

Arabis perennans S. Wats. – perennial rockcress. Uncommon, native; 113.

Boechera perennans (S. Wats.) W.A. Weber – rock cress. Uncommon, native; 113.

Brassica tournefortii Gouan – African mustard, Asian mustard, Sahara mustard, Tournefort's birdrape, turnip weed, wild turnip, *mostaza del desierto, mostaza del Sahara.* Found near roads, introduced; 416.

Caulanthus lasiophyllus (Hook. & Arn.) Payson – California mustard, coast wild cabbage, hairyleaf wildcabbage. Uncommon throughout the project, native; 145.

Descurainia pinnata (Walt.) Britt. – green tansymustard, yellow tansymustard, *pamita, pamitón.* Uncommon, native; 439.

Draba cuneifolia* var. *integrifolia S. Wats. – wedgeleaf draba. Uncommon in Sonoran Desert scrub, native; 722.

Erysimum capitatum (Dougl. ex Hook.) Greene – coast wallflower, sanddune wallflower, western wallflower. Rare in project area, semidesert grassland, native; 188.

Lepidium lasiocarpum Nutt. – hairypod pepperweed, peppergrass, shaggyfruit pepperweed, *cucharitas, lentejilla, lipasote, pasote.* Uncommon throughout the project, native; 752.

Lepidium virginicum L. – peppergrass, poorman's pepper, Virginia pepperweed, Virginian peppercress, *lentejilla.* Uncommon throughout the project, native; 150.

Sisymbrium irio L. – London rocket, rocket mustard, tumble mustard, *mostaza, pamita.* Uncommon; found in washes, introduced; 429.

Streptanthus carinatus C. Wright ex A. Gray – lyreleaf jewelflower, silver bells. Uncommon in Sonoran Desert scrub, native; 734.

Thysanocarpus curvipes Hook. – lacepod, lacepod mustard, sand fringepod, sand lacepod. Uncommon throughout the project, native; 118.

CACTACEAE

Carnegia gigantea (Engelm.) Britt. & Rose – saguaro. Common in Sonoran Desert scrub, salvage restricted, salvage assessed, native; 481.

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Cylindropuntia acanthocarpa (Engelm. & Bigelow) F. M. Knuth – buckhorn cholla, *choya, tasajo.* Uncommon in Sonoran Desert scrub, salvage restricted, native; 222.

Cylindropuntia bigelovii (Engelm.) Knuth – teddybear cholla. Uncommon in Sonoran Desert scrub, salvage restricted, native. This plant was not collected.

Cylindropuntia fulgida* var. *fulgida (Engelm.) F.M. Knuth – jumping cholla, chain-fruit cholla, club cactus, *brincadora, choya.* Common in Sonoran Desert scrub, salvage restricted, native; 283.

Cylindropuntia fulgida* var. *mamillata (Schott) Backeb. – jumping cholla, chain-fruit cholla, club cactus, *brincadora, choya.* Uncommon in Sonoran Desert Scrub or on rocky slopes, salvage restricted, native; 805.

Cylindropuntia leptocaulis (DC.*)* Knuth – Christmas cholla, desert Christmas cactus, *alfilerillo, catalinaria, tasajillo.* Uncommon in Sonoran Desert scrub, salvage restricted, native; 485.

Cylindropuntia spinosior (Engelm.) Knuth – cane cholla, spiny cholla, walkingstick cactus. Uncommon at the eastern edge of the project, salvage restricted, native; 251.

Cylindropuntia versicolor (Engelm. ex J. M. Coult.) Knuth – staghorn cholla. Common throughout the project, salvage restricted, native; 194.

Echinocereus bonkerae Thornb. & Bonker – Bonker hedgehog cactus, pinkflower hedgehog cactus. Common in semidesert grassland, salvage restricted (as *Echinocereus fasciculatus* (Engelm. ex B. D. Jackson) L. Benson var. *bonkerae* (Thornber & Bonker) L. Benson), native; 165.

Echinocereus fasciculatus (Engelm. ex B.D. Jackson) L. Benson – pinkflower hedgehog cactus, robust hedgehog, strawberry hedgehog, *pitahayita.* Common on western edge of project area, salvage restricted, native; 195.

Ferocactus wislizeni (Engelm.) Britt. & Rose – Arizona barrel cactus, candy barrelcactus, Fishhook Barrel, fishhook barrel cactus, *biznaga de agua, viznaga hembra.* Common below 1,200 meters, salvage restricted, native; 209.

Mammillaria grahamii Engelm. – Graham pincushion cactus, Graham's nipple cactus, *cabeza de viejo, choyita.* Locally common in patches throughout the project, salvage restricted, native; 514.

Opuntia chlorotica Engelm. & Bigelow – dollarjoint pricklypear, pancake pricklypear. Uncommon above 1,200 meters, salvage restricted, native; 490.

Opuntia engelmannii Salm-Dyck – Engelmann prickly pear, *abrojo, joconostle, nopal, vela de coyote.* Uncommon throughout the project, salvage restricted, native; 200.

Opuntia phaeacantha Engelm. – brownspine pricklypear, tulip pricklypear, *nopal.* Uncommon throughout the project, salvage restricted, native; 221.

CANNABACEAE

Celtis pallida Torr. – desert hackberry, *acebuche, bainoro, capul, cumbro, garabato, garambullo, granjeno, huasteco, palo de guila, rompecapa, vaino blanco.* Uncommon in washes throughout the project, native; 279 DES.

Celtis reticulata Torr. – canyon hackberry, netleaf hackberry; *combro, cumaro, cumbro, garabato blanco.* Uncommon to rare, occurs in Wild Burro Canyon, native; 489.

CARYOPHYLLACEAE

Herniaria cinerea DC. – hairy rupturewort. Most likely rare in project, introduced; Michael Chamberland 1809.

Loeflingia squarrosa Nutt. – California loeflingia, spreading pygmyleaf. Rare in project area, semidesert grassland, native; Michael Chamberland 1808.

Silene antirrhina L. – catchfly, sleepy catchfly, sleepy silene. Uncommon to rare in Sonoran Desert scrub, this species appeared for the first time after good winter rains which began in December, native; 730.

COMMELINACEAE

Tradescantia occidentalis (Britt.) Smyth – prairie spiderwort, western spiderwort. Rare in project area, semidesert grassland, only one plant found in a wash bottom, native; 531.

CONVOLVULACEAE

Cuscuta indecora Choisy – bigseed alfalfa dodder, large-seed dodder, pretty dodder. Common in semidesert grassland, native; 701.

Evolvulus alsinoides (L.) L. – blue-eyes, slender dwarf morningglory, *fulgencia, ojo de víbora, oreja de ratón.* Uncommon in washes and protected areas, native; 522.

Evolvulus arizonicus A. Gray – Arizona blue-eyes, hairy evolvulus, wild dwarf morningglory, *oreja de ratón.* Uncommon, native; 564.

Ipomoea barbatisepala A. Gray – canyon morning-glory, *gloria de la mañana.* Uncommon in semidesert grassland, native; 593.

Ipomoea costellata Torr. – crestrib morning-glory, *trompillo.* Uncommon in washes of semidesert grassland, native; 643.

Ipomoea cristulata Hallier f. – scarlet creeper, scarlet morning-glory, Transpecos morning-glory, *trompillo.* Uncommon in washes of semidesert grassland, native; 592.

Ipomoea hederacea Jacq. – ivy-leaf morning-glory, Mexican morning-glory, *flor de verano, manto de la virgen, trompillo morado.* Uncommon in washes of semidesert grassland, introduced; 591.

Ipomoea ternifolia* var. *leptotoma (Torr.) J.A. McDonald – morning glory, tripleleaf morning-glory, *bejuquillo, trompillo.* Uncommon in washes of semidesert grassland, native; 551.

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CROSSOSOMATACEAE

Crossosoma bigelovii S. Wats. – ragged rock-flower, rhyolite bush. Uncommon in semidesert grassland, native; 107.

CUCURBITACEAE

Echinopepon wrightii (A. Gray) S. Wats. – wild balsam-apple. Uncommon, only found in large wash bottoms of semidesert grassland, native; 695.

Marah gilensis Greene – bigroot, Gila manroot, wild cucumber. Uncommon, found only in large wash bottoms of semidesert grassland, native; 111.

CUPRESSACEAE

Juniperus coahuilensis (Martinez) Gaussen ex R. P. Adams – one-seeded juniper, redberry juniper, rose-fruited juniper, *cedro, huata, táscale.* Uncommon above 1,200 meters, native; 123.

CYPERACEAE

Cyperus squarrosus L. – awned flat sedge, bearded flatsedge, bearded nutgrass, *tulillo.* Rare in project. Plants known from only one location, native; 290.

EPHEDRACEAE

Ephedra aspera Engelm. ex S. Wats. – mormon tea, rough jointfir. Common in Sonoran Desert scrub, native; 192.

EUPHORBIACEAE

Acalypha neomexicana Müll. Arg. – New Mexico copperleaf, three-seeded mercury, *hierba de cancer.* Rare in project, semidesert grassland, native; 598.

Argythamnia lanceolata (Benth.) Müll. Arg. – lanceleaf ditaxis, narrowleaf silverbush. Uncommon in Sonoran Desert scrub, native; 693.

Argythamnia neomexicana Müll. Arg. – common silverbush, New Mexico ditaxis, New Mexico silverbush. Uncommon in Sonoran Desert scrub, native; 584.

Chamaesyce florida (Engelm.) Millsp. – Chiricahua Mountain sandmat, spurge. Rare in project, native; 259.

Chamaesyce micromera (Boiss. ex Engelm.) Woot. & Standl. – desert spurge, Sonoran sandmat. Uncommon in Sonoran Desert scrub, native; 282 ASU.

Euphorbia albomarginata Torr. & A. Gray – rattlesnake weed, spurge, white-margin sandmat, whitemargin eupatorium, whitemargin euphorbia, whitemargin spurge, *golondrina.* Uncommon in Sonoran Desert scrub, native; 751.

Euphorbia capitellata Engelm. – head sandmat, spurge, *cuépari, golondrina.* 803 SEINet. Specimen was lost by the author.

Euphorbia eriantha Benth. – beetle spurge, desert poinsettia, Mexican pointsetta, *golondrina.* Uncommon, native; 408.

Euphorbia melanadenia Torr. – red-gland spurge, squaw sandmat. Abundant throughout the project, native; 154.

Euphorbia serpyllifolia Pers. – thymeleaf sandmat. Uncommon in Sonoran Desert scrub, native; 590.

Euphorbia setiloba Engelm. ex Torr. – bristle-lobed sandmat, fringed spurge, Yuma sandmat, Yuma spurge, *golondrina.* Uncommon throughout the project, native; 586.

Jatropha cardiophylla (Torr.) Müll. Arg. – limberbush, *sangre de cristo, sangre de drago, sangregado, sangrengado, torote.* Uncommon in washes of Sonoran Desert scrub, native; 503.

Tragia nepetifolia Cav. – catnip noseburn. Uncommon throughout the project, native; 404.

FABACEAE

Acacia constricta Benth. – twinthorn acacia, whitethorn acacia, *chaparro prieto, gigantillo, huizache, largoncillo, vara prieta, vinorama.* Rare in project area, semidesert grassland but uncommon at lower elevations in the valley east of the Tortolitas, native; 252.

Acacia greggii A. Gray – catclaw acacia, devilsclaw, gregg catclaw, texas catclaw, wait-a-minute bush, *algarroba, gatuño, palo chino, tepame, tésota, uña de gato.* Abundant throughout washes in the project, native; 214.

Astragalus lentiginosus Dougl. ex Hook. – freckled milkvetch, specklepod milkvetch, *tronador.* Uncommon throughout the project, native; 159.

Calliandra eriophylla Benth. – fairy duster, false mesquite, *cabeza de ángel, cosahui, huajillo, mezquitillo, pelo de ángel.* Common throughout the project, native; 182.

Coursetia glandulosa A. Gray – baby bonnets, coursetia, *chipile, chino, cousano, samo prieto, sámota.* Uncommon, mostly on southwest slopes in southern project area, native; 204.

Dalea pringlei A. Gray – Pringle dalea, Pringle's prairie clover. Uncommon in semidesert grassland, native; 675.

Galactia wrightii A. Gray – Wright's milkpea. Rare in semidesert grassland. native; 556.

Lotus humistratus Greene – foothill deervetch, hill locust, maresfat. Common in Sonoran Desert scrub, native; 735.

Lotus rigidus (Benth.) Greene – deer vetch, desert rock pea, shrubby deervetch. Uncommon in semidesert grassland, native; 109.

Lotus strigosus (Nutt.) Greene – Bishop's lotus, strigose bird's-foot trefoil. Uncommon in Sonoran Desert scrub, native; 736.

Lupinus concinnus J.G. Agardh – bajada lupine, elegant lupine, scarlet lupine, *lupino, trébola.* Uncommon in semidesert grassland, native; 119.

Lupinus sparsiflorus Benth. – desert lupine, Mojave lupine; *altramuz, chicharito, lupino, trébola.* Uncommon in semidesert grassland, native; 163.

Marina parryi (Torr. & A. Gray) Barneby – Parry dalea, Parry's false prairie-clover, Parry's indigobush. Uncommon in Sonoran Desert scrub, native; 413.

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Mimosa aculeaticarpa Ortega – catclaw mimosa, mimosa, wait-a-minute bush, *gatuño, uña de gato.* Rare in project area, native; 227.

Olneya tesota A. Gray – desert ironwood, ironwood, *comitín, palo de hierro, palo fierro, tésota.* Uncommon in Sonoran Desert scrub, salvage assessed, harvest restricted in Arizona, native; 483.

Parkinsonia florida (Benth. ex A. Gray) S. Wats. – blue paloverde, *palo verde azul.* Common in low desert washes of Sonoran Desert scrub, salvage assessed in Arizona. native; 213.

Parkinsonia microphylla Torr. – foothill palo verde, littleleaf palo verde, yellow paloverde, *palo verde de hoja finite.* Common in Sonoran Desert scrub, salvage assessed, native; 482.

Phaseolus acutifolius A. Gray – tepary bean. Uncommon in semidesert grassland, native; 627.

Prosopis velutina Woot. – mesquite, velvet mesquite, *algarroba, chachaca, mezquite amargo.* Common in washes below 1,200 meters, uncommon throughout, salvage assessed, harvest restricted, native; 203.

Rhynchosia senna Gillies ex Hook. – rosary bean, Texas snoutbean. Uncommon in large washes of semidesert grassland, native; 697.

Senna covesii (A. Gray) Irwin & Barneby – Coves' cassia, desert senna, rattlebox senna, *daisillo, ejotillo, ojosón, rosamaría.* Uncommon in Sonoran Desert scrub, native; 580.

FAGACEAE

Quercus turbinella Greene – scrub oak, Sonoran scrub oak, turbinella oak, *encinillo.* Uncommon above 1,200 meters in semidesert grassland, native; 171.

FOUQUIERIACEAE

Fouquieria splendens Engelm. – *albarda, barda, ocotillo.* Uncommon in Sonoran Desert scrub, salvage restricted, native; 193.

GERANIACEAE

Erodium cicutarium (L.) L'Hér. ex Ait. – alfilaree, alfilaria, California filaree, heron bill, redstem stork's bill, *aguja del pastor, agujitas, alfilerilla, peine de bruja.* Uncommon in Sonoran Desert scrub, introduced; 401.

HYDRANGEACEAE

Fendlera rupicola A. Gray – cliff fendlerbush. Uncommon on east portion of project above 1,200 meters, native; 191.

KRAMERIACEAE

Krameria erecta Willd. ex J.A. Schultes – littleleaf ratany, range ratany, *cósahui del norte, guisapol colorado, tamichíl.* Common throughout project, native; 201.

LAMIACEAE

Hyptis emoryi Torr. – desert lavender, *baibino, lavanda, salvia del desierto.* Uncommon in semidesert grassland, native; 250.

Salvia columbariae Benth. – chia, *hisopo, romerillo, salvia.* Common in semidesert grassland, native; 149.

Stachys coccinea Ortega – scarlet betony, scarlet hedgenettle, Texas betony, *mirto.* Rare in project area, semidesert grassland, native; 634.

LILIACEAE

Calochortus kennedyi Porter – desert mariposa lily, red mariposa lily, *cobena amarilla.* Uncommon in semidesert grassland, native; 178.

LOASACEAE

Mentzelia albicaulis (Dougl. ex Hook.) Dougl. ex Torr. & A. Gray – small-flowered blazing star, white blazingstar, whitestem blazingstar, whitestem stickleaf, *buena mujer, rama pegajosa.* Uncommon in semidesert grassland, native; 758.

MALPIGHIACEAE

Cottsia gracilis (A. Gray) W.R. Anderson – slender janusia, *fermina.* Common in Sonoran Desert scrub, native; 223.

MALVACEAE

Abutilon abutiloides (Jacq.) Garcke ex Britt. & Wilson – Indian mallow, *pintapan.* Uncommon in Sonoran Desert scrub, native; 454.

Abutilon incanum (Link) Sweet – Indian mallow, *malva, pelotazo chico, rama escoba, tronadora.* Common in washes of Sonoran Desert scrub, native; 470.

Abutilon parishii S. Wats. – Parish's Indian mallow. Uncommon in semidesert grassland, G2, S2 Imperiled, U.S. sensitive plant ranking, salvage restricted in Arizona, native; 707.

Abutilon parvulum A. Gray – dwarf abutilon, dwarf Indian mallow, small-leaved abutilon. Uncommon in semidesert grasslands of eastern Tortolitas, native; 687.

Ayenia filiformis S. Wats. – Trans-Pecos ayenia. Rare in the project, native; 411.

Gossypium thurberi Todaro – Thurber wild cotton, *algodoncillo.* Locally uncommon in major wash bottoms, native; 692.

Herissantia crispa (L.) Briz. – bladder mallow, *pelotazo.* Uncommon in Sonoran Desert scrub of west Tortolita, native; 151.

Hibiscus coulteri Harvey ex A. Gray – Coulter hibiscus, desert hibiscus, desert rosemallow, *hibisco, tulipán.* Uncommon in semidesert grassland, mostly on south, native; 656.

Sida abutifolia P. Mill. – prostrate sida, spreading fanpetals. Rare in project area, semidesert grassland, introduced; 608.

Sphaeralcea ambigua A. Gray – apricot mallow, desert globemallow, sore-eye poppy, *mal de ojo, malva.* Locally abundant in semidesert grassland along trails and on steep hillsides, native; 226.

Sphaeralcea ambigua* var. *rosacea (Munz & Johnston) Kearney – rose globemallow. Uncommon in both semidesert grassland and in Sonoran Desert scrub, native; 793.

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Sphaeralcea laxa Woot. & Standl. – caliche globemallow, *mal de ojo.* Uncommon throughout the project, native; 176.

MARTYNIACEAE

Proboscidea parviflora (Woot.) Woot. & Standl. – devil's claw, unicorn plant, *cuernitos.* Uncommon in semidesert grassland on east side of Tortolita Mountain Park, native; 615.

MONTIACEAE

Calandrinia ciliata (Ruiz & Pav.) DC. – desert rock purslane, redmaids. Uncommon on west side of Tortolitas in Sonoran Desert, native; 425.

Cistanthe monandra (Nutt.) Hershkovitz – common pussypaws, sandcress. Common in low-lying areas of semidesert grassland, native; 117.

Claytonia perfoliata Donn ex Willd. – miner's lettuce, miner's lettuce, winter purslane, *verdolaga de invierno.* Common in protected areas of Sonoran Desert scrub, native; 187.

MORACEAE

Morus microphylla Buckl. – Texas mulberry, *mora.* Rare in project above 1,300 meters, native; 426.

NYCTAGINACEAE

Allionia incarnata L. – trailing allionia, trailing four-o'clock, trailing windmills, *guapile, hierba de la golpe, hierba de la hormiga.* Uncommon throughout project, native; 202.

Boerhavia coccinea P. Mill. – red spiderling, scarlet spiderling, *juaninipili, mocha.* Uncommon in semidesert grassland, native; 472.

Boerhavia intermedia M.E. Jones – five-wing spiderling, Jones's boerhavia, *mochis.* Common in low-lying areas of semidesert grassland, native; 561.

Boerhavia spicata Choisy – creeping spiderling, *juanamipili, mochis.* Uncommon in low-slope areas of semidesert grassland, native; 544.

Boerhavia wrightii A. Gray – large-bract spiderling, Wright's boerhavia. Uncommon in low-slope areas of semidesert grassland, native; 275 DES.

Commicarpus scandens (L.) Standl. – climbing spiderling, climbing wartclub, wishbone vine, *miona, sonorita.* Uncommon in semidesert grassland, native; 232.

Mirabilis laevis (Benth.) Curran. – desert wishbone bush. Uncommon throughout the project, native; 170.

Mirabilis linearis* var. *decipiens (Standl.) Welsh – broad-leaf four-o'clock. Uncommon in semidesert grassland, native; 605.

Mirabilis multiflora (Torr.) A. Gray – Colorado four o'clock, desert four o'clock. Uncommon in semidesert grassland, native; 486.

OLEACEAE

Fraxinus velutina* var. *glabrata Lingelsh. Rare in major wash on BLM land at the northwest side of the project, native; 494.

Menodora scabra A. Gray – broom menodora, bull balls, rough menodora, twinberry, twinfruit. Uncommon in Sonoran Desert scrub, native; 219.

ONAGRACEAE

Camissonia californica (Nutt. ex Torr. & A. Gray) Raven – California evening primrose, California suncup. Uncommon in semidesert grassland, native; 125.

Camissonia chamaenerioides (A. Gray) Raven – long-capsuled primrose, long capsule suncup, willow-herb primrose. Uncommon, native; 198, SEINet.

Camissonia pallida (Abrams) Raven – pale-yellow suncup. Rare in the project, native; 745.

Oenothera albicaulis Pursh – halfshrub sundrop, prairie evening primrose, white-stem evening-primrose. Uncommon in semidesert grassland, native; 785.

OROBANCHACEAE

Castilleja exserta (Heller) Chuang & Heckard – Indian paintbrush, purple owl clover, *escobita.* Uncommon in semidesert grassland on the south face, native; 161.

Orobanche cooperi (A. Gray) Heller – Cooper's broomrape, desert broomrape, *flor de tierra.* Rare to uncommon in Sonoran Desert scrub, one collection after a near-normal winter rainy season, native; 731.

PAPAVERACEAE

Eschscholzia californica* subsp. *mexicana (Greene) C. Clark – California poppy, Mexican gold poppy, *amapola amarilla, amapolita del campo*. Uncommon throughout the project, native; 106.

Platystemon californicus Benth. – California creamcups. Rare to uncommon in semidesert grassland, native; 185.

PASSIFLORACEAE

Passiflora mexicana Juss. – Mexican passion flower, *díctamo real, itamo real, ojo de venado.* Locally uncommon in the mesquite bosques of Wild Burro Canyon, native; 517.

PHYTOLACCACEAE

Rivina humilis L. – bloodberry, bloodberry rougeplant, *baja tripa, colorines, coral, coralillo, hierba de la víbora.* Locally uncommon in Wild Burro Canyon, native; 639.

PLANTAGINACEAE

Maurandya antirrhiniflora Humb. & Bonpl. ex Willd. – blue snapdragon vine, climbing snapdragon, roving sailor. Uncommon in semidesert grassland, native; 669.

Penstemon parryi (A. Gray) A. Gray – desert penstemon, Parry penstemon, Parry's beardtongue, *alhelías del campo, jarritos, pichelitos, san josé de la sierra, varita de san josé.* Uncommon below 1,200 meters, native; 146.

Penstemon subulatus M.E. Jones – hackberry beardtongue, little beardtongue. Uncommon above 1,200 meters, native; 189.

Plantago patagonica Jacq. – Pursh plantain, woolly Indianwheat, woolly

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plantain, wooly, *pastora.* Uncommon in low-lying areas with little slope, native; 186.

POACEAE

Aristida adscensionis L. – sixweeks threeawn, *zacate cola de zorra, zacate de semilla, zacate tres barbas.* Common throughout the project, native; 210.

Aristida californica* var. *glabrata Vasey – Santa Rita threeawn. Rare to uncommon in semidesert grassland, native; 256 DES.

Aristida havardii Vasey – Havard threeawn. Uncommon in semidesert grassland, native; 649.

Aristida purpurea* var. *nealleyi (Vasey) Allred – blue threeawn, Nealley's Threeawn, purple three-awn, Reverchon threeawn, *tres barbas, tres barbas purpura.* Uncommon in semidesert grassland, native; 575.

Aristida purpurea* var. *purpurea – purple threeawn, *tres barbas purpura.* Rare to uncommon in semdesert grassland, native; 646.

Aristida ternipes* var. *gentilis (Henr.) Allred – Hook Threeawn, poverty three-awn, spidergrass, *zacate araña de tres barbas.* Uncommon in semidesert grassland, native; 231.

Aristida ternipes* var. *ternipes – spider grass, spidergrass, *zacate araña.* Common in semidesert grassland, native; 573.

Avena fatua L. – flaxgrass, oatgrass, wheat oats, wild oats, *avena cimarrona, avena loca, avena silvestre.* Rare in project, semidesert grassland, introduced; 781.

Bothriochloa barbinodis (Lag.) Herter – cane beardgrass, cane bluestem, Palmer's cane bluestem, pitted beardgrass, *cola de coyote, popotillo algodonero, zacate popotillo.* Uncommon in semidesert grassland, native; 549.

Bouteloua aristidoides (Kunth) Griseb. – needle grama, six-weeks needle grama, *aceitilla, pasto de cabra, tochite.* Abundant, especially in semidesert grassland, native; 263 DES.

Bouteloua barbata* var. *barbata – six-weeks grama, *navajita, navajita annual.* Uncommon in washes of semidesert grassland, native; 276 ASU.

Bouteloua barbata* var. *rothrockii (Vasey) Gould – Rothrock grama, *navajita liebrero.* Uncommon in semidesert grassland, native; 257 DES.

Bouteloua curtipendula (Michx.) Torr. – sideoats grama, *banderilla, grama, navajita banderilla.* Uncommon above 1,000 meters, native; 269 DES.

Bouteloua eriopoda (Torr.) Torr. – black grama*; navajita negra.* Uncommon in semidesert grassland, native; 621.

Bouteloua hirsuta Lag. – hairy grama, *navajita velluda, navajitas.* Uncommon in semidesert grassland, native; 613.

Bouteloua parryi (Fourn.*)* Griffiths – Parry grama. Uncommon in semidesert grassland, native; 628.

Bouteloua repens (Kunth) Scribn. & Merr. – slender grama. Uncommon in semidesert grassland, native; 264 DES.

Bromus rubens L. – foxtail brome, foxtail chess, red brome; *bromo rojo.* Common, especially in semidesert grassland as a winter annual, introduced; 135.

Chloris virgata Sw. – feather fingergrass, feather windmill grass, showy chloris, *cebadilla, cola de zorra, zacate lagunero, zacate mota.* Rare in project area, semidesert grassland, native. Not collected; plant was long-dead and very weathered.

Cynodon dactylon (L.) Pers. – bermudagrass, devilgrass, *grama-seda, manienie, bermuda, pasto de bermuda, zacate inglés.* Uncommon in bottoms of large washes, introduced; 291.

Dasyochloa pulchella (Kunth) Willd. ex Rydb. – fluffgrass, low woollygrass, *zacate borreguero.* Uncommon in semidesert grassland, native; 571.

Digitaria californica (Benth.*)* Henr. – Arizona cottontop, California cottontop, *zacate punta blanca.* Uncommon in semidesert grassland, native; 267.

Dinebra panicea* subsp. *brachiata (Steud.) P.M. Peterson & N. Snow – red sprangletop, Mississippi sprangletop, mucronate sprangleltop. Common spring and winter annual, native; 645.

Disakisperma dubium (Kunth) P.M. Peterson & N. Snow – green sprangletop, *zacate gigante.* Uncommon in semidesert grassland, native; 619 SEINet.

Elymus elymoides* subsp. *elymoides – squirreltail. Uncommon throughout the project, native; 205.

Enneapogon cenchroides (Licht. ex Roem. & Schult.) C.E. Hubb. – soft feather pappusgrass. Uncommon in semidesert grassland, introduced; 622.

Enneapogon desvauxii Desv. ex Beauv. – feather pappusgrass, spike pappusgrass, *zacate ladera, zacate lobero.* Uncommon in semidesert grassland, native; 644.

Eragrostis cilianensis (All.) Vign. ex Janchen – candy grass, lovegrass, stinkgrass, *amor seco, zacate apestoso, zacate de aguas.* Uncommon in semidesert grassland, introduced; 583.

Eragrostis curvula (Schrad.) Nees – weeping lovegrass, *amor seco curvado, zacate de amor llorón.* Common in semidesert grassland, introduced; 183.

Eragrostis intermedia A.S. Hitchc. – plains lovegrass, *zacate llanero, zacate volador.* Rare in project area, semidesert grassland, native; 711.

Eragrostis lehmanniana Nees – Lehmann lovegrass, *zacate de amor lehman.* Abundant in semidesert grassland, introduced; 436.

Eragrostis pectinacea* var. *miserrima (Fourn.) J. Reeder – desert lovegrass. Uncommon in major wash bottoms of semidesert grassland, native; 289 DES.

Heteropogon contortus (L.*)* Beauv. ex Roemer & J.A. Schultes – tanglehead, *zacate aceitillo, zacate colorado.* Uncommon in washes, mostly in semidesert grassland, native; 265.

Hilaria belangeri (Steud.) Nash – curly mesquite, *galleta, zacate chino.* Uncommon, mostly on south face of mountains where Sonoran Desert scrub gives way to semidesert grassland, native; 266.

The Plant List

Hordeum murinum L. – bulbous barley, mouse barley. Uncommon in semidesert grassland, introduced; 432.

Hordeum vulgare L. – common barley, *cebada.* Rare, one plant collected on eastern edge of project, introduced; 755.

Lycurus setosus (Nutt.) C.G. Reeder – wolftail, *cola de zorra, zacate lobero.* Rare, one plant collected on east side of project, native; 713.

Melinis repens (Willd.) Zizka – Natal grass, rose Natal grass, *espiga colorada, zacate natal, zacate Rosado.* Uncommon in major washes of semidesert grassland, introduced; 629.

Muhlenbergia emersleyi Vasey – bull muhly, *cola de ratón, cola de zorra, zacate de toro.* Uncommon above 1,200 meters, native; 674.

Muhlenbergia microsperma (DC.) Trin. – little-seed muhly, *liendrilla chica.* Uncommon above 1,200 meters, native; 773.

Muhlenbergia porteri Scribn. ex Beal – bush muhly, *zacate aparejo.* Common in semidesert grassland, native; 288.

Muhlenbergia rigens (Benth.) A.S. Hitchc. – deer grass, deer muhly, deergrass, *zacate de venado.* Rare to uncommon in major washes of semidesert grassland, native; 100.

Muhlenbergia rigida (Kunth) Trin. – Metcalf muhly, purple muhly. Rare, one plant collected, native; 642.

Muhlenbergia tenuifolia (Kunth) Trin. – mesa muhly, Slender Muhly, slimflower muhly, *liendrilla.* Uncommon above 1,200 meters, native; 270.

Panicum hirticaule J. Presl – Mexican panicgrass, roughstalk witchgrass, woodland panic. Uncommon, native; 258.

Pennisetum ciliare (L.) Link – buffelgrass, *zacate buffel.* Rare to uncommon throughout the project, introduced; 686 DES.

Pennisetum setaceum (Forsk.) Chiov. – fountain grass, *plumitas.* Rare to uncommon in semidesert grassland, introduced; 553.

Poa bigelovii Vasey & Scribn. – Bigelow bluegrass. Uncommon throughout the project, native; 137.

Schismus arabicus Nees – Arabian grass, Arabian schismus, camel grass. Locally common in low-lying areas with little slope, introduced; 418.

Schismus barbatus (Loefl. ex L.) Mediterranean grass. Probably locally uncommon in low-lying areas with ephemeral flows, introduced; 141.

Setaria grisebachii Fourn. – Grisebach bristlegrass, *cola de zorra.* Uncommon in semidesert grassland, native; 691.

Setaria leucopila (Scribn. & Merr.) K. Schum. – streambed bristlegrass, yellow bristlegrass, yellow foxtail, *zacate tempranero.* Uncommon grass, mostly in washes of semidesert grassland, native; 606.

Setaria macrostachya Kunth – plains bristlegrass, *zacate tempranero.* Rare to uncommon in washes of semidesert grassland, native; 618.

Sporobolus contractus A.S. Hitchc. – spike dropseed, *zacate alcalino espigado, zacatón de arena.* Locally common in sandy wash bottoms of semidesert, native; 689.

Sporobolus cryptandrus (Torr.) A. Gray – sand dropseed, *zacate de arena, zacate encubierto.* Locally uncommon in major wash bottoms, native; 625.

Sporobolus wrightii Munro ex Scribn. – giant sacaton, *zacatón,* Rare in semidesert grassland, native; 554.

Tridens muticus (Torr.) Nash – slim tridens, *tridente.* Locally uncommon in Sonoran Desert scrub, native; 572.

Urochloa arizonica (Scribn. & Merr.) O. Morrone & F. Zuloaga – Arizona panicgrass, Arizona signalgrass. Locally common in washes of semidesert grassland, native; 309.

Vulpia octoflora (Walt.) Rydb. – eight-flower six-weeks grass, pullout grass, sixweeks fescue. Uncommon throughout the project, native; 114.

POLEMONIACEAE

Eriastrum diffusum (A. Gray) Mason – miniature woollystar, miniature woolstar. Uncommon throughout the project, native; 180.

Gilia stellata Heller – star gilia. Uncommon throughout the project, native; 144.

Ipomopsis multiflora (Nutt.) V. Grant – many flower gilia, many flowered ipomopsis. Rare to uncommon in semidesert grassland, native; 663.

Leptosiphon aureus (Nutt.) J.M. Porter & L.A. Johnson – golden desert trumpets, golden linanthus. Uncommon in eastern portion of the Tortolitas, native; 757.

Phlox tenuifolia E. Nels. – Santa Catalina phlox. Uncommon in semidesert grassland, native; 225.

POLYGONACEAE

Centrostegia thurberi A. Gray ex Benth. – red triangles, spring flower. Rare in eastern portion of the Tortolitas, native; 786.

Chorizanthe brevicornu Torr. – brittle spineflower, sagebrush chorizanthe. Uncommon in Sonoran Desert scrub, native; 450.

Eriogonum abertianum Torr. – Abert buckwheat, skeleton weed. Common in semidesert grassland, native; 179.

Eriogonum fasciculatum Benth. – California buckwheat, Eastern Mojave buckwheat, flat-top buckwheat, Mojave buckwheat, yellow buckwheat, *gordo lobo, maderista, valeriana.* Rare, a single plant found on the south-facing hills of the project, this plant is native to Arizona, but it may be introduced here, native; 779.

Eriogonum polycladon Benth. – skeleton weed, sorrel buckwheat. Uncommon in major wash bottoms, native; 284.

Eriogonum thurberi Torr. – skeleton weed, Thurber's buckwheat. Rare to uncommon in semidesert grassland, native; 748.

The Plant List

Eriogonum wrightii Torr. ex Benth. – bastardsage, shrubby buckwheat, Wright's buckwheat. Uncommon in semidesert grassland, native; 286.

Rumex hymenosepalus Torr. – canaigre, dock, wild rhubarb, *caña agria, hierba colorada, raiz del indio.* Locally uncommon in sandy alluvial areas of semidesert grassland, native; 124.

PORTULACACEAE

Portulaca suffrutescens Engelm. – shrubby purslane. Rare to uncommon in major washes of semidesert grassland, native; 601.

Portulaca umbraticola Kunth – wing-pod purslane. Rare in project area, semidesert grassland, native; 597.

PTERIDACEAE

Astrolepis sinuata (Lag. ex Sw.) Benham & Windham – wavy cloakfern. Uncommon in the protection of rocks on steep slope, native; 434.

Cheilanthes lindheimeri Hook. – fairy swords, Lindheimer lipfern, *hierba de la peña.* Uncommon in steep rocky washes and slopes, native; 372.

Cheilanthes wrightii Hook. – Wright's lipfern. Uncommon in the protection of rocks on steep slope, native; 392 DES.

Cheilanthes yavapensis Reeves ex Windham – graceful lipfern, *helecho.* Uncommon on rocky slopes in semidesert grassland, native; 373.

Notholaena standleyi Maxon – Standley cloak fern, star cloak fern. Uncommon on rocky slopes throughout, native; 394.

Pellaea truncata Goodding – cliff brake, spiny cliffbrake, *helecho.* Uncommon on rocky slopes of semidesert grassland, native; 435.

RANUNCULACEAE

Anemone tuberosa Rydb. – desert anemone, desert windflower, tuber anemone. Uncommon in semidesert grassland, native; 115.

Clematis drummondii Torr. & A. Gray – clematis, Drummond clematis, old man's beard, virgin's bower, *barba chivato, barba de viejo, chilillo.* Uncommon in major washes, native; 700.

Delphinium scaposum Greene – barestem larkspur, desert larkspur, tall mountain larkspur, *espuelita cimarrona.* Uncommon in semidesert grassland, native; 175.

RHAMNACEAE

Ceanothus greggii A. Gray – desert ceanothus. Uncommon in semidesert grassland, native; 112.

Condalia warnockii M.C. Johnston – Warnock condalia, Warnock's snakewood. Uncommon in semidesert grassland, native; 491.

Ziziphus obtusifolia (Hook. ex Torr. & A. Gray) A. Gray – graythorn, gumdrop tree, lotebush, *abrojo, barchata, ciruela de monte, huichilame, jewedbad, jótoro.* Uncommon, mostly in semidesert grassland, native; 538.

RUBIACEAE

Galium stellatum Kellogg – desert bedstraw, starry bedstraw. Uncommon on steep rocky slopes throughout, native; 448.

SALICACEAE

Populus fremontii S. Wats. – Fremont cottonwood, *álamo.* Rare, only a few in major washes, these plants appear to be dying, probably due to long-term drought, native; 515.

Salix exigua Nutt. – coyote willow, desert willow, Hinds' willow, narrowleaf willow, sandbar willow, *sauce.* Rare, only found in Wild Burro Canyon, native; 310.

Salix gooddingii Ball – Goodding willow, *sauce, sauz.* Rare to uncommon, only in major washes, native; 428.

SANTALACEAE

Phoradendron californicum Nutt. – desert mistletoe, mesquite mistletoe, *chile de espino, guhoja.* Common throughout the project, native; 393.

Phoradendron capitellatum Torr. ex Trel. – downy mistletoe, wooly mistletoe. Common on junipers in semidesert grassland, native; 442.

Phoradendron serotinum subsp. tomentosum (DC.) Kuijt – Cory's mistletoe, *injerto, liga, seca palo, silmo, toji.* Uncommon on oaks in semidesert grassland, native; 376.

SAPINDACEAE

Dodonaea viscosa (L.) Jacq. – Florida hopbush, hopbush, hopseed bush, *alamillo, jarilla, saucillo, tarachico, tarachique.* Uncommon in semidesert grassland in southeastern Tortolitas, native; 152.

Sapindus saponaria L. – western soapberry, wingleaf soapberry, *abolillo, amole, amolillo, boliche, chirrión, guayul, jaboncillo, mata muchacho, palo blanco.* Possibly extirpated by drought, two small plants died within a year of specimen collection, native; 255.

SELAGINELLACEAE

Selaginella arizonica Maxon – Arizona clubmoss, Arizona spikemoss, *siempreviva.* Common on steep slopes throughout, native; 102.

SIMMONDSIACEAE

Simmondsia chinensis (Link) Schneid. – coffee berry, goat nut, wild hazel, *jojoba,* Uncommon in southeastern Tortolitas, native; 155.

SOLANACEAE

Datura discolor Bernh. – desert datura, desert thornapple, *toloache.* Common in large washes with low slopes in Sonoran Desert scrub, native; 273.

Datura wrightii Regel – angel's trumpet, devil's weed, Jimson weed, pricklyburr, sacred datura, sacred thornapple, *belladona, tecuyaui, toloache grande.* Rare in the project, native; 802 SEINet.

Lycium berlandieri Dunal – Berlandier wolfberry. Uncommon throughout, native; 578.

Lycium exsertum A. Gray – Arizona desert-thorn, boxthorn, littleleaf wolfberry, *frutilla.* Uncommon in semidesert grassland, native; 110.

The Plant List

Lycium pallidum Miers – boxthorn, pale desert-thorn, pale wolfberry, rabbit-thorn, *frutilla.* Rare to uncommon in eastern Tortolitas, native; 533.

Nicotiana obtusifolia Mertens & Galeotti – coyote tobacco, desert tobacco, tobacco plant, *pata de coyote, tabaco de coyote, tabaco papanta, tabaquillo de coyote.* Common in washes of Sonoran Desert scrub, native; 474.

Physalis crassifolia Benth. – desert ground cherry, thickleaf groundcherry, yellow nightshade groundcherry, *tomate de culebra, tomatillo del desierto.* Uncommon in semidesert grassland, mostly in washes, native; 690.

Solanum douglasii Dunal – green-spot nightshade. Uncommon in protected places in semidesert grassland, native; 699.

Solanum elaeagnifolium Cav. – bull nettle, silverleaf nightshade, tomato weed, white horsenettle, white nightshade, *buena mujer, pera, tomatito de buena mujer, trompillo.* Rare in project area, uncommon east of the Tortolita Mountains, native; 623.

URTICACEAE

Parietaria hespera Hinton – rillita pellitory. Locally common on shady side of large rock faces in late winter, native; 390.

VERBENACEAE

Aloysia wrightii Heller ex Abrams – bee brush, lemon verbena, mintbush lippia, Wright aloysia, Wright lippia, Wright's beebrush, *altamisa, oreganillo, vara dulce.* Uncommon in eastern portion of the Tortolitas, native; 287.

Glandularia gooddingii (Briq.) Solbrig – desert verbena, desert vervain, Goodding verbena, southwestern mock vervain; native. 807 SEINet.

Verbena neomexicana (A. Gray) Small – hillside vervain, New Mexico verbena. Uncommon in eastern portion of the Tortolitas, native; 662.

ZYGOPHYLLACEAE

Kallstroemia californica (S. Wats.) Vail – California caltrop, little summer poppy, *mal de ojo.* Uncommon along low-slope areas in major washes, native; 530.

Kallstroemia grandiflora Torr. ex A. Gray – Arizona poppy, orange caltrop, summer poppy, *baiborín, baiburín, mal de ojo, vaivurín.* Uncommon along low-slope areas in major washes, native; 558.

Kallstroemia parviflora J.B.S. Norton – warty caltrop. Uncommon along low-slope areas in major washes, native; 604.

Larrea tridentata (Sessé & Moc. ex DC.) Coville – Creosote, creosote bush, *gobernadora, guamis, hediondilla, segai.* Uncommon in Sonoran Desert scrub, native; 160.

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Another Milestone for the Sky Islands

by Tom Van Devender, GreaterGood.org

Jesús Sánchez at the Herbario Universidad de Sonora (UNISON) has long led the interest in the flora of the Sierra de Mazatán. This is the southwestern-most Sky Island, 80 km from Hermosillo on the edge of the Plains of Sonora subdivision of the Sonoran Desert. It is a unique flat-topped granite mountain with oak woodland on top and foothills thornscrub on the lower north slopes. The northernmost cycads in the world, *Dioon sonorense,* are there as are the endemic *Diospyros reinae* and *Perityle reinana*. Howard Gentry collected the *Dioon* in May 1957 long before it was recognized as a separate species. A new species of *Bursera* is in the process of description. The range is a candidate CONANP protected natural area as the Sierra Huérfana. In 2014 **GreaterGood.org** funded an Expedition to inventory the area. All of the observations are in the MABA-MDE-USON databases, and were provided as documentation for the CONANP proposal. (See the annotated checklist at: **www.phytoneuron.net/2017Phytoneuron/35PhytoN-MazatanFlora.pdf**).

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Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey, **websoilsurvey.sc.egov.usda.gov**

TreeFlow, a project of regional integrated sciences and assessment (RISA) programs, Climate assessment for the Southwest (CLIMAS) at the University of Arizona, and Western Water Assessment (WWA) at the University of Colorado, **www.treeflow.info**

WestMap, a project of University of Arizona, the Western Regional Climate Center/Desert Research Institute, and the PRISM Climate Group at Oregon State University, National Oceanic and Atmospheric Administration, **www.cefa.dri.edu/Westmap**

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