

## VASCULAR PLANTS OF THE PAT HILLS DESERT GRASSLAND, SOUTHEAST ARIZONA

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### ABSTRACT

A checklist is provided for the vascular plant flora of the Pat Hills desert grassland located south of Willcox in the Sulphur Springs Valley of Cochise County in southeastern Arizona. A total of 480 taxa of vascular plants in 288 genera and 73 families have been recorded in the study area since March of 2015. *Erigeron decrescens* was documented as a species new to science from the Pat Hills. *Bergia texana* and *Eleocharis atropurpurea* have been reported as additions to the Arizona flora. Also, a new population of *Pediomelum pentaphyllum*, a plant of conservation concern, was located.

The grasslands of the Sulphur Springs Valley of Cochise County in southeastern Arizona represent an example of the extensive North American desert grassland that approaches its northern limit in Arizona, New Mexico, and Texas. Most of this desert grassland extends to the southeast into central Mexico (McClaran & Van Devender 1995). The study area includes the Pat Hills and adjacent grasslands, which are located in the Sulphur Springs Valley between the Willcox Playa to the west and the Chiricahua mountains to the east (Fig. 1). Within the study area are over 15,000 acres (6,000 hectares) of land, most of which is privately owned, that has been used for grazing cattle for at least the past 100 years (Riggs & Roll 1951).

Elevations range from approximately 1,275 to 1,525 meters (4,400 to 5,000 feet). Precipitation generally ranges from approximately 20 to 30 centimeters (8 to 12 inches) per year (James Riggs, Willcox, Arizona, pers., comm., 7 March 2018; PRISM Climate Group, 24 Mar 2018). Southeastern Arizona has a bi-seasonal rainfall pattern with both winter and summer wet periods. The summer rains (May through October) account for approximately 60–70% of the annual rainfall (Martin 1963). Plants respond with two distinct growth and flowering periods, spring (March to May) and summer monsoon (mid-July to October) (Crimmins et al. 2008).

Current vegetation is desert grassland interspersed with a complement of shrubs and forbs, and with halophytic scrub in alkaline areas. There are no active springs, but a number of stock ponds hold water for various periods of the year. There is also the remnant of what is known locally as the Pat Burns Ciénega. This ciénega flowed intermittently at the end of the 19<sup>th</sup> century, but today it is an occasionally wet alkaline floodplain lying immediately to the south of the Pat Hills (Meinzer & Kelton 1913). Ephemeral watercourses from the Chiricahua Mountains both to the north and south of the Pat Hills historically flowed west into the Willcox Playa, and prehistorically into ancient Lake Cochise (Meinzer & Kelton 1913).

Both the Pat Hills and the Pat Burns Cienega are named after Pat Bierne, whose last name was sometimes spelled as Burn. In 1878 Mr. Bierne (Burn) located a cattle ranch at the ciénega that now bears his name (Barnes 1935).

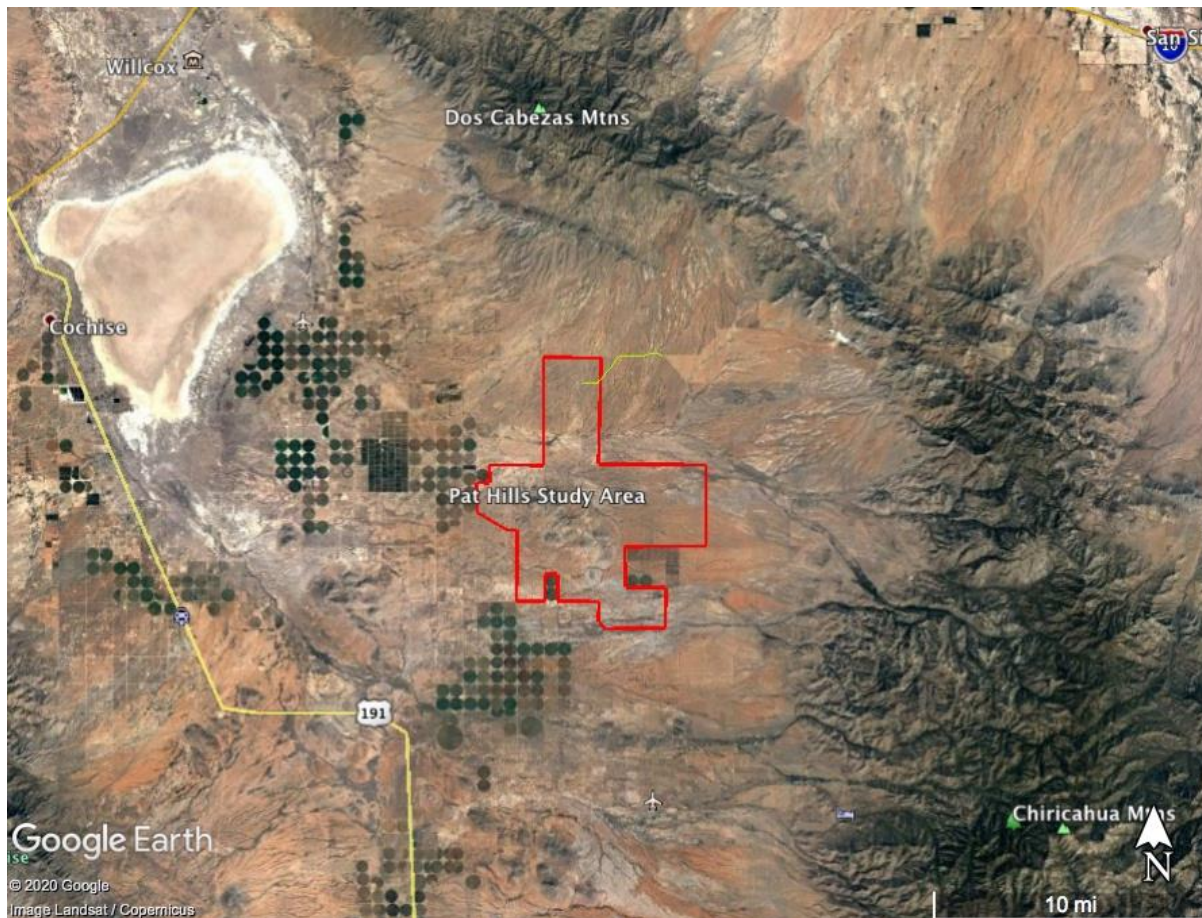


Figure 1. Pat Hills Desert Grassland Study Area, Cochise Co., Arizona.

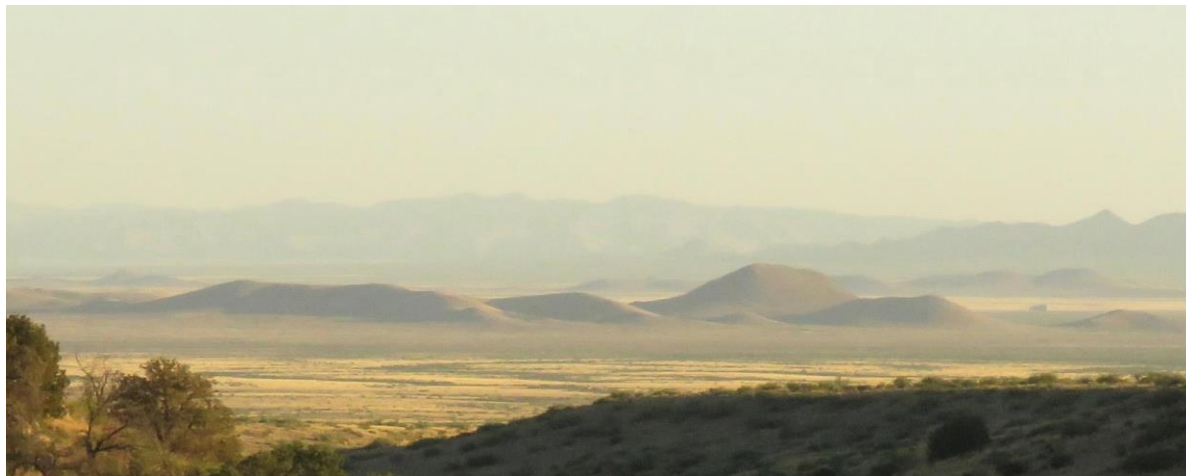


Figure 2. Pat Hills as seen from Dos Cabezas Mtns., looking south. Photo by Michael Witt.

The rocks that make up the Pat Hills were formed by one volcano that was active during two distinct periods of time around the end of the Cretaceous Period (around 65 million years ago). The extrusions of volcanic material apparently occurred in a non-explosive manner. Massive deposits of porphyritic andesite, porphyritic dacite, and quartz diorite-granodiorite (represented in early geologic maps as granite) are common, along with later deposits of rhyolite, quartz monzonite, and other materials. Although the volcano may have once been over 1,600 meters (5,200 feet) high, erosion has

reduced it to the existing range of small hills (Ettinger 1962). There is no exposed limestone within the study area, but there are areas with large amounts of “caliche,” a calcareous evaporite deposit, in the soil (Meinzer & Kelton 1913). The hills are surrounded by deep alluvial fans.

Very few plant collections from the Pat Hills have been found in regional herbaria. This may be due to the private ownership of the land or its relative distance and inaccessibility from established highways. In 1884 Marcus E. Jones made early botanical collections in the nearby areas of Willcox, Dos Cabezas, and Bowie. John J. Thornber made substantial collections from 1905 through 1916 around the communities of Cochise, Willcox, and Light (now non-existent) and from the Dos Cabezas Mountains. Lyle A. McGill made collections in the area from 1970 through 1984. Elizabeth Makings published the Flora of the San Pedro Riparian National Conservation Area in 2006 (Makings 2006). That flora includes a desert grassland component that is similar to that of the Pat Hills area.

This floristic inventory of the Pat Hills and adjacent grassland began in March 2015 and will continue into the future. Preliminary results were presented at the Madrean Conference 2018, held in Tucson (Roll 2018). More complete inventory results are presented here as a list of vascular plants. A total of 480 taxa of vascular plants in 288 genera and 73 families have been recorded by observation or collection. Approximately 6% of the taxa are introduced, with most being grasses. Approximately 13% of the taxa are subshrubs, shrubs, or trees, including a number of trees and shrubs that occur only in the ephemeral watercourses flowing from the Chiricahua Mountains or as introductions around an abandoned residence and stock ponds.

During this inventory, a new species was discovered and has been described (Nesom & Roll 2020). *Erigeron decrescens* Nesom & Roll was first discovered in an occasionally wet depression in a small draw east of the Pat Hills in the spring of 2019 and it subsequently has been found in extensive drainages with *Hilaria mutica*, and at the margins of wet areas outside of the study area. It is a winter annual, germinating with the late fall and winter rains and flowering from late March and into May. This new species grows in association with the annual *Erigeron divergens* and the perennial *Erigeron incomptus*.

Of other taxa recorded in the checklist, two are additions to the known flora of Arizona. *Bergia texana* (Elatinaceae) and *Eleocharis atropurpurea* (Cyperaceae) were collected from the moist soil around a stock pond located at the base of one of the largest hills. This particular stock pond catches runoff readily and holds the water for extended periods of time. The discovery of these taxa in Arizona was not unexpected, since their presence in nearby states and Mexico has been previously documented (Roll 2020).

In addition, a new population of the rare *Pediomelum pentaphyllum* (Fabaceae) was located. A petition to list this plant under the U. S. Endangered Species Act was filed in 2008 (Wild Earth Guardians 2008). That petition is currently under investigation and consideration by the U.S. Fish and Wildlife Service. Other populations of this plant are located in southwestern New Mexico and in southeastern Arizona. Populations of *Leuciva dealbata* (Asteraceae) were discovered in the Pat Hills area and appear to represent a western extension of range of this plant.

More than 160 days were spent collecting in the field during 2015, 2016, 2017, 2018, and 2019. Extensive use has been made of the Southwestern Environmental Information Network (SEINet) database for the purposes of plant identification, label production, and flora preparation in this study. Herbarium vouchers or photographic documentation for all taxa listed below have been made. Observations and collections have been entered into the SEINet database and vouchers have been deposited in the University of Arizona Herbarium, with duplicates in other local herbaria. Full collection or observation data for all specimens are available in SEINet.

Plant taxa are listed alphabetically by family, genus, and species. In some cases, determination to subspecies or variety is shown. Following the name is the author's collection number in parenthesis, representing in most cases a voucher specimen at the University of Arizona Herbarium (ARIZ). Where plant material was not collected and only photographic vouchers were made, the word 'SEINet' is included within the parenthesis. Those photographic vouchers have been entered into SEINet.

The Pat Hills lie at the western edge of an extensive open grassland landscape covering more than 100,000 acres, bounded by the Dos Cabezas Mountains to the north and the Chiricahua Mountains to the east. Efforts are currently underway by the Trust for Public Land, New Mexico Land Conservancy, Arizona Game and Fish Department, Arizona Land and Water Trust, and other agencies to protect this unique landscape and its integral biological diversity. The area is at risk from the encroachment of irrigated agriculture and other forms of potential development. Through the use of conservation easements and other conservation tools, efforts are under way to maintain the integrity of this uninterrupted swath of desert grassland. It is hoped that the present study will provide useful basic information to assist in that important work.

### VASCULAR PLANTS OF THE PAT HILLS DESERT GRASSLAND

#### ACANTHACEAE

- Anisacanthus thurberi* (Torr.) A. Gray  
(2879)  
*Carlowrightia arizonica* A. Gray (170)

#### AIZOACEAE

- Trianthema portulacastrum* L. (715)

#### AMARANTHACEAE

- \**Alternanthera caracasana* Kunth (904)  
*Amaranthus blitoides* S. Wats. (2521)  
*Amaranthus palmeri* S. Wats. (821)  
*Atriplex canescens* (Pursh) Nutt. (175)  
*Atriplex elegans* (Moq.) D. Dietr. (753)  
*Atriplex wrightii* S. Watson (749)  
*Chenopodium berlandieri* Moq. (1435)  
*Chenopodium desiccatum* A. Nels. (853)  
*Chenopodium fremontii* S. Watson (852)  
*Chenopodium incanum* (S. Watson)  
Heller (387)  
*Chenopodium incanum* var.  
*elatum* Crawford (412)  
*Chenopodium leptophyllum* (Moq.)  
Nutt. ex S. Wats. (1245)  
*Chenopodium neomexicanum* Standl.  
(470)  
*Chenopodium watsonii* A. Nels. (1055)  
*Froelichia arizonica* Thornb. ex Standl.  
(695)  
*Gomphrena caespitosa* Torr. (225)  
*Gomphrena nitida* Rothrock (762)

- Guilleminea densa* (Humb. & Bonpl. ex  
Willd.) Moq. (415)  
\**Kochia scoparia* (L.) Schrad. (2274)  
*Krascheninnikovia lanata* (Pursh)  
A.D.J. Meeuse & Smit (461)  
*Monolepis nuttalliana* (J.A. Schultes)  
Greene (1768)  
*Salsola tragus* L. (380)  
*Tidestromia lanuginosa* (Nutt.) Standl.  
(921)

#### AMARYLLIDACEAE

- Allium kunthii* G. Don (769)  
*Zephyranthes longifolia* Hemsl., also  
*Habranthus longifolius* (Hemsl.)  
Flagg, G. Lom. Sm. & Meerow  
(439)

#### APIACEAE

- Cymopterus multinervatus* (Coult. &  
Rose) Tidestrom (1)  
*Daucus pusillus* Michx. (307)  
*Eryngium heterophyllum* Engelm. (1399)  
*Lomatium nevadense* var.  
*parishii* (Coult. & Rose) Jepson  
(2847)  
*Lomatium orientale* Coult. & Rose  
(1863)  
*Spermolepis lateriflora* G.L. Nesom (47)

## APOCYNACEAE

- Asclepias asperula* (Dcne.) Woods.  
(456)  
*Asclepias brachystephana* Engelm. ex  
Torr. (247)  
*Asclepias nummularia* Torr. (1963)  
cf. *Asclepias nyctaginifolia* A.  
Gray (2820)  
*Asclepias subverticillata* (A. Gray) Vail  
(394)  
*Asclepias uncialis* Greene (1860)  
*Funastrum crispum* (Benth.) Schltr.  
(251)  
*Funastrum hartwegii* (Vail) Schltr. (401)  
*Mandevilla brachysiphon* (Torr.)  
Pichon (588)

## ARACEAE

- Lemna minor* L. (1036)

## ARISTOLOCHIACEAE

- Aristolochia watsonii* Woot. & Standl.  
(139)

## ASPARAGACEAE

- Agave palmeri* Engelm. (810)  
*Agave parryi* var. *huachucensis* (Baker)  
Little ex L. Benson (284)  
*Dasyilirion wheeleri* S. Wats. (270)  
*Dichelostemma capitatum* (Benth.)  
Wood (42)  
*Echeandia flavescens* (J.A. & J.H.  
Schultes) Cruden (633)  
*Yucca elata* (Engelm.) Engelm. (335)

## ASTERACEAE

- Acourtia nana* (A. Gray) Reveal & King  
(146)  
*Acourtia wrightii* (A. Gray) Reveal &  
King (158)  
*Almutaster pauciflorus* (Nutt.) A. & D.  
Löve (1251)  
*Ambrosia confertiflora* Dc. (657)  
*Ambrosia monogyra* (Torr. & A. Gray)  
Strother & B.G. Baldwin (1066)  
*Artemisia dracunculus* L. (2257)  
*Artemisia ludoviciana* Nutt. (839)  
*Baccharis pteronioides* DC. (109)  
*Baccharis salicifolia* (Ruiz & Pav.) Pers.  
(1591)  
*Baccharis sarothroides* A. Gray (1185)

- Baccharis wrightii* A. Gray (1257, 1962)  
*Bahia absinthifolia* Benth. (73)  
*Baileya multiradiata* Harvey & A. Gray ex  
A. Gray (129)  
*Berlandiera lyrata* Benth. (928)  
*Bidens leptcephala* Sherff (746)  
*Brickellia californica* (Torr. & A. Gray) A.  
Gray (1148)  
*Brickellia coulteri* A. Gray (540)  
*Brickellia eupatorioides* (L.) Shinnars  
(1174)  
*Brickellia floribunda* A. Gray (1615)  
*Brickellia venosa* (Woot. & Standl.) B.L.  
Robins. (371)  
*Calycoseris wrightii* A. Gray (224)  
*Chaenactis stevioides* Hook. & Arn. (55)  
*Chaetopappa ericoides* (Torr.) G.L.  
Nesom (77)  
*Cirsium neomexicanum* A. Gray (242)  
*Cirsium ochrocentrum* A. Gray (352)  
*Dietaria verna* (Raf.) Morefield (2932)  
*Dyssodia papposa* (Vent.) A.S. Hitchc.  
(1247)  
*Ericameria laricifolia* (A. Gray)  
Shinnars (1547)  
*Ericameria nauseosa* (Pallas ex Pursh)  
G.L. Nesom & Baird (1635)  
*Erigeron arisolius* G.L. Nesom (446)  
*Erigeron canadensis* L., also *Conyza*  
*canadensis* (L.) Cronq. (880)  
*Erigeron decrescens* Nesom & Roll  
(2865)  
*Erigeron divergens* Torr. & A. Gray  
(2866, 2886)  
*Erigeron incomptus* A. Gray (2885)  
*Erigeron tracyi* Greene (1293)  
*Flourensia cernua* DC. (1612)  
*Gaillardia pulchella* Foug. (65)  
*Gamochaeta stagnalis* (I.M. Johnst.)  
Anderb. (2856)  
*Grindelia nuda* var. *aphanactis* (Rydb.)  
G.L. Nesom (911)  
*Gutierrezia sarothrae* (Pursh) Britt. &  
Rusby (389)  
*Hedosyne ambrosiifolia* (Gray) Strother  
(567)  
*Helianthus laciniatus* A. Gray (2814)  
*Helianthus petiolaris* Nutt. (282)  
*Heliomeris longifolia* (Robins. &  
Greenm.) Cockerell (1212)  
*Heterotheca psammophila* B. Wagenkn.

(872)  
*Hymenothrix wislizeni* A. Gray (507)  
*Isocoma tenuisecta* Greene (688)  
 \**Lactuca serriola* L. (301)  
*Laennecia coulteri* (A. Gray) G.L.  
 Nesom (464, 731)  
*Laennecia sophiifolia* (Kunth) G.L.  
 Nesom (619)  
*Leuciva dealbata* (Gray) Rydb. (2594)  
*Logfia filaginoides* (Hook. & Arn.)  
 Morefield (2857)  
*Machaeranthera tagetina* Greene (847)  
*Machaeranthera tanacetifolia* (Kunth)  
 Nees (385)  
*Malacothrix fendleri* A. Gray (117)  
*Parthenium incanum* Kunth (494)  
*Pectis filipes* Harvey & A. Gray (659)  
*Pectis papposa* Harvey & A. Gray  
 (2343)  
*Pectis prostrata* Cav. (919)  
*Pseudognaphalium canescens* (DC.)  
 Anderb. (1026)  
*Pseudognaphalium leucocephalum* (A.  
 Gray) A. Anderb. (873)  
*Pseudognaphalium stramineum* (Kunth)  
 W.A. Weber (1025)  
*Psilactis brevilingulata* Schultz-Bip. ex  
 Hemsl. (407)  
*Psilactis gentryi* (Standl.) D. Morgan  
 (1391)  
*Ratibida columnifera* (Nutt.) Woot. &  
 Standl. (452)  
*Sanvitalia abertii* A. Gray (767)  
*Schkuhria pinnata* (Lam.) Kuntze ex  
 Thell. (2818)  
*Senecio flaccidus* Less. (273)  
 \**Sonchus asper* (L.) Hill (198)  
*Stephanomeria exigua* Nutt. (228.1)  
*Stephanomeria pauciflora* (Torr.) A.  
 Nels. (741)  
*Stephanomeria tenuifolia* (Raf.) Hall  
 (1982)  
*Stylocline sonorensis* Wiggins (2854)  
*Thelesperma megapotamicum* (Spreng.)  
 Kuntze (641)  
*Thymophylla acerosa* (DC.) Strother  
 (1923)  
*Thymophylla pentachaeta* var.  
*belenidium* (DC.) Strother (1913)  
*Thymophylla pentachaeta* var. *pentachaeta*  
 (DC.) Small (184)

*Trixis californica* Kellogg (236)  
*Uropappus lindleyi* (DC.) Nutt. (1835)  
*Verbesina encelioides* (Cav.) Benth. &  
 Hook. f. ex A. Gray (211)  
*Viguiera cordifolia* A. Gray (1002)  
*Xanthisma gracile* (Nutt.) D.R. Morgan &  
 R.L. Hartm. (791)  
*Xanthisma spinulosum* (Pursh) D.R.  
 Morgan & R.L. Hartman (2861)  
*Xanthium strumarium* L. (850)  
*Zinnia acerosa* (DC.) A. Gray (118)  
*Zinnia grandiflora* Nutt. (157)

#### BIGNONIACEAE

*Chilopsis linearis* (Cav.) Sweet (2101)

#### BIXACEAE

*Amoreuxia palmatifida* Moc. & Sessé ex  
 DC. (476)

#### BORAGINACEAE

*Amsinckia tessellata* A. Gray (2870)  
*Cryptantha crassisepala* (Torr. & A.  
 Gray) Greene (50)  
*Cryptantha micrantha* (Torr.) I.M.  
 Johnston, also *Eremocarya*  
*micrantha* (Torr.) Greene (303)  
*Cryptantha nevadensis* A. Nels. &  
 Kennedy (314)  
*Cryptantha pterocarya* var. *cycloptera*  
 (Greene) J.F. Macbr. (130)  
*Eucrypta micrantha* (Torr.) Heller  
 (2582)  
*Lappula occidentalis* var. *cupulata* (A.  
 Gray) Higgins (84)  
*Lappula occidentalis* var. *occidentalis* (S.  
 Wats.) Greene (2588)  
*Nama hispidum* A. Gray (40)  
*Pectocarya platycarpa* (Munz &  
 Johnston) Munz & Johnston (29)  
*Pectocarya recurvata* I.M. Johnston  
 (2576)  
*Phacelia arizonica* A. Gray (43)  
*Phacelia crenulata* Torr. ex S. Wats.  
 (131)  
*Plagiobothrys arizonicus* (A. Gray)  
 Greene ex A. Gray (1794)

#### BRASSICACEAE

*Descurainia pinnata* (Walt.) Britt. (18)



\**Descurainia sophia* (L.) Webb ex Prantl (1726)  
*Draba cuneifolia* Nutt. ex Torr. & A. Gray, also *Tomostima cuneifolia* (Nutt. ex Torr. & A. Gray) Al-Shebbaz, M. Koch & Jordan-Thaden (2843)  
*Hesperidanthus linearifolius* (A. Gray) Rydb. (522)  
*Lepidium lasiocarpum* Nutt. (13)  
*Lepidium oblongum* Small (1805)  
*Lepidium thurberi* Woot. (24)  
*Lepidium virginicum* L. (1868)  
*Physaria gordonii* (A. Gray) O'Kane & Al-Shebbaz (5)  
*Planodes virginicum* (L.) Greene (1804)  
 \**Sisymbrium irio* L. (16)  
*Thysanocarpus curvipes* Hook. (2832)

#### CACTACEAE

*Coryphantha vivipara* (Nutt.) Britt. & Rose (206 SEINet)  
*Cylindropuntia leptocaulis* (DC.) Knuth (1572)  
*Cylindropuntia leptocaulis* x *C. spinosior* (858)  
*Cylindropuntia spinosior* (Engelm.) Knuth (135 SEINet)  
*Echinocereus fendleri* (Engelm.) Sencke ex J.N. Haage (82 SEINet)  
*Echinocereus rigidissimus* (Engelm.) Haage f. (358 SEINet)  
*Ferocactus wislizeni* (Engelm.) Britt. & Rose (653 SEINet)  
*Mammillaria heyderi* Muehlenpfordt (1964 SEINet)  
*Mammillaria wrightii* var. *wilcoxii* (Toumey ex K. Schum.) W.T. Marsh. (652 SEINet)  
*Opuntia engelmannii* Salm-Dyck (142 SEINet)  
*Opuntia macrocentra* Engelm. (356)  
*Opuntia phaeacantha* Engelm. (355)

#### CANNABACEAE

*Celtis reticulata* Torr. (246)

#### CARYOPHYLLACEAE

*Loeflingia squarrosa* Nutt. (2855)  
*Silene antirrhina* L. (2841)

#### CLEOMACEAE

*Polanisia dodecandra* ssp. *trachysperma* (Torr. & A. Gray) Iltis (2801)

#### COMMELINACEAE

*Commelina erecta* L. (687)

#### CONVOLVULACEAE

*Convolvulus equitans* Benth. (345)  
*Evolvulus alsinoides* (L.) L. (479)  
*Evolvulus arizonicus* A. Gray (440)  
*Evolvulus nuttallianus* Roem. & Schult. (143)  
*Evolvulus sericeus* Sw. (136)  
*Ipomoea costellata* Torr. (939)  
*Ipomoea cristulata* Hallier f. (2332)  
*Ipomoea hederacea* Jacq. (779)

#### CUCURBITACEAE

*Apodanthera undulata* A. Gray (475)  
*Cucurbita digitata* A. Gray (871)  
*Cucurbita foetidissima* Kunth (453)  
*Marah gilensis* Greene (2303)

#### CYPERACEAE

*Cyperus acuminatus* Torr. & Hook. ex Torr. (1625, 2415)  
 \**Cyperus difformis* L. (2375)  
*Cyperus esculentus* L. (726)  
*Cyperus flavicomus* Michx. (2307)  
*Cyperus sphaerolepis* Boeckl. (595)  
*Cyperus squarrosus* L. (1255)  
*Eleocharis atropurpurea* (Retz.) J. Presl & C. Presl (2361, 2376)  
*Eleocharis macrostachya* Britton (2864)  
*Eleocharis palustris* (L.) Roemer & J.A. Schultes (558)  
*Eleocharis parishii* Britt. (2878)  
*Fimbristylis annua* (All.) Roemer & J.A. Schultes (2297)

#### ELATINACEAE

*Bergia texana* (Hook.) Seub. ex Walp. (1660, 2371)  
*Elatine rubella* Rydb. (1583)

#### EPHEDRACEAE

*Ephedra trifurca* Torr. ex S. Wats. (21)

## EUPHORBIACEAE

- Acalypha neomexicana* Müll. Arg. (2389)  
*Croton pottsii* Klotzsch) Müll. Arg. (76)  
*Argythamnia neomexicana* Müll. Arg. (154)  
*Euphorbia abramsiana* L.C. Wheeler (2325)  
*Euphorbia albomarginata* (Torr. & A. Gray) (111)  
*Euphorbia davidii* Subils (709)  
*Euphorbia dioica* Hieron. (2453)  
*Euphorbia exstipulata* Engelm. (2345)  
*Euphorbia fendleri* Torr. & A. Gray (147.1)  
*Euphorbia hyssopifolia* L. (740)  
*Euphorbia micromera* Boiss. ex Engelm. (2800)  
*Euphorbia serpyllifolia* Pers. (699)  
*Euphorbia serrula* Engelm. (2353)  
*Euphorbia stictospora* Engelm. (755)  
*Tragia nepetifolia* Cav. (2522)  
*Tragia ramosa* Torr. (101)

## FABACEAE

- Acaciella angustissima* (Mill.) Britton & Rose (159)  
*Acmispon brachycarpus* (Benth.) D.D. Sokoloff (35)  
*Acmispon greenei* (Wooton & Standl.) Brouillet (264)  
*Astragalus allochrous* A. Gray (79)  
*Astragalus arizonicus* A. Gray (72)  
*Astragalus mollissimus* Torr. (8)  
*Astragalus nothoxys* A. Gray (2639)  
*Astragalus nuttallianus* DC. (31)  
*Astragalus thurberi* A. Gray (329)  
 \**Caesalpinia gilliesii* (Hook.) Wallich ex D. Dietr., also *Erythrostemon gilliesii* (Wall. ex Hook.) Klotzsch (229)  
*Calliandra eriophylla* Benth. (133)  
*Calliandra humilis* var. *reticulata* (A. Gray) L. Benson (2500)  
*Chamaecrista nictitans* (L.) Moench (936)  
*Crotalaria pumila* Ortega (879)  
*Dalea albiflora* A. Gray (520)  
*Dalea brachystachya* A. Gray (2516)  
*Dalea formosa* Torr. (90)

- Dalea jamesii* (Torr.) Torr. & A. Gray (141)  
*Dalea lachnostachys* A. Gray (2347)  
*Dalea nana* var. *carnescens* Kearney & Peebles (92)  
*Dalea nana* var. *nana* Torr. ex A. Gray (191)  
*Dalea pogonathera* A. Gray (70)  
*Desmanthus cooleyi* (Eat.) Trel. (372)  
*Desmodium neomexicanum* A. Gray (952)  
*Galactia wrightii* A. Gray (639)  
*Hoffmannseggia drepanocarpa* A. Gray (551)  
*Hoffmannseggia glauca* (Ortega) Eifert (83)  
*Lupinus concinnus* J.G. Agardh (207)  
*Macroptilium gibbosifolium* (Ortega) A. Delgado (585)  
*Marina calycosa* (A. Gray) Barneby (120)  
*Mimosa biuncifera* Benth. (179)  
*Pediomelum pentaphyllum* (L.) J. Grimes (298, 318)  
*Phaseolus acutifolius* var. *latifolius* Freeman (737)  
*Pomaria jamesii* (Torr. & Gray) Walp. (188)  
*Prosopis glandulosa* (Torr.) Cockerell (96)  
*Prosopis velutina* Wooton (417)  
*Psoralidium tenuiflorum* (Pursh) Rydb., also *Pediomelum tenuiflorum* (Pursh) A.N. Egan (2809)  
*Rhynchosia senna* Gillies ex Hook. (148)  
*Senegalia greggii* (A. Gray) Britton & Rose (2181)  
*Senna bauhinioides* (A. Gray) Irwin & Barneby (234)  
*Sophora nuttalliana* B.L. Turner (239)  
*Tephrosia tenella* A. Gray (294, 316)  
*Vachellia constricta* (Benth.) Seigler & Ebinger (361)

## FAGACEAE

- Quercus emoryi* Torr. (1632)  
*Quercus turbinella* Greene (531)

## FOUQUIERIACEAE

- Fouquieria splendens* Engelm. (2563)



## GERANIACEAE

- \**Erodium cicutarium* (L.) L'Hér. ex Ait.  
(10)  
*Erodium texanum* A. Gray (2833)

## JUNCACEAE

- Juncus bufonius* L. (2627)  
*Juncus interior* Wiegand (2955)

## KRAMERIACEAE

- Krameria lanceolata* Torr. (151)

## LAMIACEAE

- Clerodendrum coulteri* (A. Gray)  
Govaerts (150)  
*Salvia subincisa* Benth. (1248)

## LINACEAE

- Linum pratense* (J.B.S. Norton)  
Small (2851)

## LOASACEAE

- Cevallia sinuata* Lag. (128, 331)  
*Mentzelia albicaulis* (Dougl.) Dougl. ex  
Torr. & A. Gray (1938)  
*Mentzelia montana* (A. Davids.) A.  
Davids. (296)  
*Mentzelia multiflora* (Nutt.) A. Gray  
(281)

## LYTHRACEAE

- Ammannia auriculata* Willd. (2826)  
*Ammannia robusta* Heer & Regel (2830)

## MALPIGHIACEAE

- Cottisia gracilis* (A. Gray) W.R. Anderson  
(171, 486)

## MALVACEAE

- Abutilon abutiloides* (Jacq.) Garcke ex  
Britt. & Wilson (535)  
*Abutilon mollicomum* (Willd.) Sweet  
(650)  
*Abutilon parvulum* A. Gray (160)  
*Anoda cristata* (L.) Schlecht. (834)  
*Anoda pentaschista* A. Gray (923)  
*Ayenia filiformis* S. Wats. (181)  
*Hibiscus denudatus* Benth. (127)  
*Malvella lepidota* (A. Gray) Fryxell  
(138)

- Rhynchosida physocalyx* (A. Gray)  
Fryxell (419)

- Sida abutifolia* P. Mill. (132)  
*Sida spinosa* L. (799)  
*Sphaeralcea angustifolia* (Cav.) G. Don  
(85)  
*Sphaeralcea hastulata* A. Gray (99)  
*Sphaeralcea laxa* Woot. & Standl. (177)

## MARSILEACEAE

- Marsilea mollis* B.L. Robins. & Fern.  
(293)

## MARTYNIACEAE

- Proboscidea althaeifolia* (Benth.) Dcne.  
(450)  
*Proboscidea parviflora* (Woot.) Woot. &  
Standl. (713)

## MOLLUGINACEAE

- Glinus radiatus* (Ruiz & Pav.) Rohrb.  
(289)  
\**Mollugo cerviana* (L.) Ser. (2395)  
*Mollugo verticillata* L. (697)

## MONTIACEAE

- Calandrinia ciliata* (Ruiz & Pav.) DC.  
(33)  
*Cistanthe monandra* (Nutt.) Hershkovitz  
(1871)  
*Phemeranthus aurantiacus* (Engelm.)  
Kiger (534)

## MORACEAE

- Morus microphylla* Buckl. (1139)

## NYCTAGINACEAE

- Allionia choisyi* Standl. (2349)  
*Allionia incarnata* var. *villosa* (Standl.)  
B.L. Turner (2824)  
*Boerhavia coccinea* P. Mill. (732)  
*Boerhavia coulteri* (Hook. f.) S. Wats.  
(590)  
*Boerhavia erecta* L. (717)  
*Boerhavia pterocarpa* S. Wats. (2247)  
*Boerhavia triquetra* S. Wats. (2356)  
*Boerhavia wrightii* A. Gray (1336)  
*Mirabilis linearis* var. *decipiens*  
(Standl.) Welsh (2816)  
*Mirabilis linearis* var. *linearis* (Pursh)  
Heimerl (503)

*Mirabilis longiflora* L. (2335)

#### OLEACEAE

*Fraxinus velutina* Torr. (1629)

#### ONAGRACEAE

*Eremothera chamaenerioides* (A. Gray)  
W.L. Wagner & Hoch (2599)

*Gaura coccinea* Nutt. Ex Pursh, also  
*Oenothera suffrutescens* (Ser.)  
W.L. Wagner & Hoch (97)

*Gaura hexandra* Ortega, also *Oenothera*  
*hexandra* (Ortega) W.L. Wagner  
& Hoch (68)

*Oenothera albicaulis* Pursh (46)

*Oenothera flava* (A. Nels.) Garrett  
(1773)

*Oenothera primiveris* A. Gray (30)

#### OROBANCHACEAE

*Castilleja integra* A. Gray (634)

#### PAPAVERACEAE

*Argemone pleiacantha* Greene (205)

*Corydalis aurea* Willd. (87)

*Eschscholzia californica* ssp. *mexicana*  
(Greene) C. Clark (39)

#### PHRYMACEAE

*Erythranthe cordata* (Greene) Nesom  
(2662)

#### PLANTAGINACEAE

*Bacopa rotundifolia* (Michx.) Wettst.  
(1580)

*Nuttallanthus texanus* (Scheele) D.A.  
Sutton (25)

*Penstemon fendleri* Torr. & A. Gray  
(276, 1862)

*Plantago elongata* Pursh (1774)

*Plantago patagonica* Jacq. (37)

*Plantago virginica* L. (2675)

*Veronica peregrina* L. (1967)

#### PLATANACEAE

*Platanus wrightii* S. Wats. (1642)

#### POACEAE

*Aristida adscensionis* L. (758)

*Aristida havardii* Vasey (2264)

*Aristida purpurea* Nutt. (167)

*Aristida ternipes* Cav. (892)

*Bothriochloa barbinodis* (Lag.) Herter  
(379)

\**Bothriochloa ischaemum* (L.) Keng  
(670)

*Bothriochloa springfieldii* (Gould)  
Parodi (1179)

*Bouteloua aristidoides* (Kunth) Griseb.  
(666)

*Bouteloua barbata* var. *barbata* Lag.  
(164, 672)

*Bouteloua barbata* var. *rothrockii*  
(Vasey) Gould (668)

*Bouteloua chondrosioides* (Kunth)  
Benth. ex S. Wats. (1203)

*Bouteloua curtipendula* (Michx.) Torr.  
(970)

*Bouteloua eriopoda* (Torr.) Torr. (1202)

*Bouteloua gracilis* (Kunth) Lag. ex  
Griffiths (1095)

*Bouteloua hirsuta* Lag. (783)

*Bouteloua radicata* (Fourn.) Griffiths  
(1069)

\**Bromus catharticus* Vahl (2951)

*Cenchrus spinifex* Cav. (1348)

\**Cenchrus ciliaris* L., also *Pennisetum*  
*ciliare* (L.) Link (2420)

*Chloris virgata* Sw. (804)

\**Cynodon dactylon* (L.) Pers. (981)

*Dasyochloa pulchella* (Kunth) Willd. ex  
Rydb. (119)

*Digitaria californica* (Benth.) Henr.  
(677)

*Dinebra viscida* (Scribn.) P.M. Peterson &  
N. Snow (807)

*Diplachne fusca* ssp. *uninervia* (J. Presl)  
P. M. Peterson & N. Snow  
(1602)

*Disakisperma dubium* (Kunth) P.M.  
Peterson & N. Snow (734)

\**Echinochloa colona* (L.) Link (1429)

\**Echinochloa crus-galli* (L.) Beauv.  
(569)

*Elymus elymoides* (Raf.) Swezey (1954)

\**Enneapogon cenchroides* (Licht.ex  
Roem. & Schult.) C.E. Hubb.  
(2479)

*Enneapogon desvauxii* Desv. ex Beauv.  
(1153)

\**Eragrostis cilianensis* (All.) Vign. ex  
Janchen (802, 1599)

\**Eragrostis curvula* (Schrad.) Nees  
 (1488)  
*Eragrostis intermedia* A.S. Hitchc.  
 (1188)  
 \**Eragrostis lehmanniana* Nees (221)  
*Eragrostis pectinacea* (Michx.) Nees ex  
 Steud. (1163)  
*Eriochloa acuminata* (J. Presl) Kunth  
 (1159)  
*Heteropogon contortus* (L.) Beauv. ex  
 Roemer & J.A. Schultes (621)  
*Hilaria belangeri* (Steud.) Nash (523)  
*Hilaria mutica* (Buckl.) Benth. (98)  
*Hopia obtusa* (Kunth) Zuloaga &  
 Morrone (508)  
*Hordeum pusillum* Nutt. (2940)  
*Lycurus setosus* (Nutt.) C.G. Reeder, also  
*Muhlenbergia alopecuroides* (Griseb.)  
 P.M. Peterson & Columbus (1235)  
*Muhlenbergia arenacea* (Buckl.) A.S.  
 Hitchc. (2253)  
*Muhlenbergia emersleyi* Vasey (1215)  
*Muhlenbergia fragilis* Swallen (996)  
*Muhlenbergia pauciflora* Buckl. (1226)  
*Muhlenbergia porteri* Scribn. ex Beal  
 (680)  
*Muhlenbergia repens* (J. Presl) A.S.  
 Hitchc. (1481)  
 \**Panicum antidotale* Retz. (2511)  
*Panicum capillare* L. (1089)  
*Panicum hirticaule* J. Presl (2203)  
*Paspalum distichum* L. (2426)  
 \**Schismus arabicus* Nees (2950)  
 \**Schismus barbatus* (Loefl. ex L.)  
 Thellung (226, 1788)  
*Schizachyrium cirratum* (Hack.) Woot. &  
 Standl. (963)  
*Scleropogon brevifolius* Phil. (1151)  
*Setaria leucopila* (Scribn. & Merr.) K.  
 Schum. (721)  
*Setaria macrostachya* Kunth (278)  
 \**Sorghum halepense* (L.) Pers. (549)  
*Sporobolus airoides* (Torr.) Torr. (864)  
*Sporobolus contractus* A.S. Hitchc.  
 (1112)  
*Sporobolus cryptandrus* (Torr.) A. Gray  
 (2255)  
*Sporobolus pyramidatus* (Lam.) C.L.  
 Hitchc. (1607)  
*Sporobolus wrightii* Munro ex Scribn.  
 (1060)

*Tragus berteronianus* J.A. Schultes  
 (1473)  
*Tridens muticus* (Torr.) Nash (1191)  
*Trisetum interruptum* Buckl. (2941)  
*Urochloa arizonica* (Scribn. & Merr.) O.  
 Morrone & F. Zuloaga (806)  
*Vulpia octoflora* (Walt.) Rydb. (1870)

## POLEMONIACEAE

*Eriastrum diffusum* (A. Gray) Mason  
 (58)  
*Gilia mexicana* A. & V. Grant (1915)  
*Gilia flavocincta subsp. australis* (A. & V.  
 Grant) Day & V. Grant (1793)  
*Ipomopsis longiflora* (Torr.) V. Grant  
 (200)  
*Leptosiphon chrysanthus* J.M. Porter & R.  
 Patterson (2859)  
*Linanthus bigelovii* (A. Gray) Greene  
 (2618)

## POLYGALACEAE

*Polygala barbeyana* Chod. (144)  
*Polygala obscura* Benth. (2763)

## POLYGONACEAE

*Eriogonum abertianum* Torr. (81)  
*Eriogonum polycladon* Benth. (825)  
*Eriogonum trichopes* Torr. (213)  
*Eriogonum wrightii* Torr. ex Benth.  
 (849.1)  
*Persicaria bicornis* (Raf.) Nieuwl.  
 (2408, 1950)  
 \**Polygonum argyrocoleon* Steud. ex  
 Kunze (2507)  
 \**Polygonum aviculare* L. (248)  
*Rumex hymenosepalus* Torr. (89)

## PONTEDERIACEAE

*Heteranthera limosa* (Sw.) Willd. (705)

## PORTULACACEAE

*Portulaca oleracea* L. (2260)  
*Portulaca suffrutescens* Engelm. (636)  
*Portulaca umbraticola* Kunth (868)

## POTAMOGETONACEAE

*Potamogeton nodosus* Poir. (1649)  
*Potamogeton foliosus* Raf. (2788)

## PRIMULACEAE

*Androsace occidentalis* Pursh (1681)

## PTERIDACEAE

*Astrolepis sinuata* (Lag. ex Sw.)  
Benham & Windham (685)  
*Bommeria hispida* (Mett. ex Kuhn)  
Underwood (526)  
*Myriopteris rufa* Fée (126, 527)  
*Notholaena grayi* Davenport (683)  
*Pellaea truncata* Goodding (241, 528)

## RANUNCULACEAE

*Anemone tuberosa* Rydb. (2568)  
*Clematis drummondii* Torr. & A. Gray  
(1296)  
*Delphinium wootonii* Rydb. (62)  
*Myosurus cupulatus* S. Wats. (2660)  
*Myosurus minimus* L. (288)

## RHAMNACEAE

*Ziziphus obtusifolia* (Hook. ex Torr. & A.  
Gray) A. Gray (258)

## ROSACEAE

*Fallugia paradoxa* (D. Don) Endl. ex  
Torr. (244)

## RUBIACEAE

*Houstonia rubra* Cav. (454)

## SALICACEAE

*Populus fremontii* S. Wats. (907)  
*Salix exigua* Nutt. (2881)  
*Salix gooddingii* Ball (2593)

## SAPINDACEAE

*Sapindus drummondii* Hook. & Arn.  
(362)

## SAPOTACEAE

*Sideroxylon lanuginosum* Michx. (1244)

## SCROPHULARIACEAE

\**Verbascum virgatum* Stokes (1957)

## SOLANACEAE

*Chamaesaracha coronopus* (Dunal) A.  
Gray (112)  
*Chamaesaracha sordida* (Dunal) A.  
Gray (656)

*Datura wrightii* Regel (277)  
*Lycium andersonii* A. Gray (874)  
*Lycium pallidum* Miers (324)  
*Nicotiana obtusifolia* Mertens & Galeotti  
(103)  
*Physalis acutifolia* (Miers) Sandw. (913)  
*Physalis angulata* L. (2796)  
*Physalis hederifolia* A. Gray (778)  
*Physalis solanacea* (Schltdl.) Axelius  
(2388)  
*Solanum douglasii* Dunal (954)  
*Solanum elaeagnifolium* Cav. (163)  
*Solanum jamesii* Torr. (2810)  
*Solanum rostratum* Dunal (2876)

## TALINACEAE

*Talinum paniculatum* (Jacq.) Gaertn.  
(840)

## ULMACEAE

\**Ulmus pumila* L. (838)

## VERBENACEAE

*Aloysia wrightii* Heller ex Abrams (484)  
*Glandularia latilobata* (L.M. Perry)  
Nesom, comb. et stat. nov. (52)  
*Verbena bracteata* Lag. & Rodr. (249)  
*Verbena gracilis* Desf. (344)  
*Verbena plicata* Greene (606)

## VIOLACEAE

*Hybanthus verticillatus* (Ortega) Baill.  
(140)

## ZYGOPHYLLACEAE

*Kallstroemia californica* (S. Wats.) Vail  
(2329)  
*Kallstroemia grandiflora* Torr. ex A.  
Gray (546)  
*Kallstroemia hirsutissima* Vail ex Small  
(2795)  
*Kallstroemia parviflora* J.B.S. Norton  
(718)  
*Larrea tridentata* (Sessé & Moc. ex  
DC.) Coville (285)  
\**Tribulus terrestris* L. (674)

\* denotes an introduced species

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\* References not cited in the text have been useful in identifications.