

VASCULAR PLANT TYPES IN THE ARIZONA STATE UNIVERSITY HERBARIUM

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ABSTRACT

Founded in 1896 by Fredrick M. Irish, the vascular plant herbarium at Arizona State University (ASU) acts as a repository for plants particularly from the desert Southwest and Mexico. It now contains over 230,000 specimens, of which 735 have been designated as types including paratypes. Here we present a list that documents 384 major vascular plant type specimens and includes verified holotypes, lectotypes, syntypes and neotypes and their duplicates. Regionally the majority of the specimens are from the United States (186) and Mexico (178), while 13 from South America and 7 from the Old World. Taxonomically, the majority of type specimens belong to the Asteraceae (84), followed by Polygonaceae (56), Cactaceae (34), Scrophulariaceae (27), Fabaceae (16), the Agavaceae (13), and Acanthaceae (10). Historically prominent are 60 isotype specimens collected by C.G. Pringle, a prominent early plant collector in Mexico from 1885 to 1909. Numerous type collections were also made by James R. Reveal, Noel H. Holmgren, Howard S. Gentry and George B. Hinton. For each basionym typified by an ASU specimen, which is accompanied by a copy of the original publication, we here list collector(s) and collection number, locality information (restricted to country and state or equivalent demographic unit), and date of collection.

RESUMEN

Fundado en 1896 por Frederick M. Irish, el herbario de plantas vasculares de la Universidad del Estado de Arizona (ASU) actúa como un repositorio de plantas, principalmente del desierto del Suroeste y México. Actualmente el herbario cuenta con 230000 ejemplares, de los cuales 735 corresponden a ejemplares tipo incluyendo también paratipos. Se presenta una lista que documenta 384 de los más importantes ejemplares tipo de plantas vasculares, incluyendo holotipos, lectotipos, sintipos, y neotipos, y sus duplicados. Regionalmente, la mayoría de los ejemplares son de los Estados Unidos (186) y de México (178); mientras que 13 son de América del Sur y 7 de Viejo Mundo. Taxonómicamente, la mayoría de los ejemplares tipo pertenecen a las familias Asteraceae (84), seguida de Polygonaceae (56), Cactaceae (34), Scrophulariaceae (27), Fabaceae (16), Agavaceae (13), y Acanthaceae (10). Históricamente, los más importantes son 60 isotipos colectados por C.G. Pringle, prominente colector en México entre 1885 y 1909. Se cuenta además con ejemplares tipo de los colectores James R. Reveal, Noel H. Holmgren, Howard S. Gentry y George B. Hinton. Cada basiónimo tipificado por un ejemplar en ASU, incluye una copia de la publicación original. Se listan además, el colector(es), y número de colecta, información de la localidad (restringida al país y estado o unidad demográfica equivalente) y a la fecha de la colecta.

INTRODUCTION

Since the herbarium was founded by Fredrick M. Irish in 1896, the vascular plant herbarium has grown to over 230,000 specimens, centering on floristics of the

desert Southwest and Mexico, but many worldwide collections are represented. Frederick Mortimer Irish received his Bachelor of Science degree at the University of Iowa in 1895 and briefly taught high school in his hometown of Dubuque, Iowa, before accepting the position at Tempe Normal School in 1896 (Thomas 1960). "Cap" Irish served not only as the biology science teacher, but also as football coach, captain of the Military Company, and leader of student activities such as the Cactus Walking Club and the Girl's Hiking Club (Hopkins & Thomas 1960; Trauth-Nare & Pinkava 2000).

"He knew the flowers and could call them by name. As a botanist he was an authority" (Thomas 1960, p. 549). Irish was instrumental in establishing the herbarium. When Irish came to Tempe he brought with him his personal collections. Over the years more than 700 specimens bearing his name have been processed; some duplicates have been eventually deposited at the Desert Botanical Garden (DES). His early collections in the Salt River Valley are a valuable historical record of the diversity of plants in the Phoenix area of the time. Irish was appointed Registrar at the newly named Arizona State Teachers College in 1925 and served in this position till his death in 1941 (Thomas 1960).

James A. McCleary followed Irish as curator and botany professor. His interests were in bryophytes and desert plants and he and his students added approximately 3,000 specimens from 1947-1959 with only minimal financial assistance (McCleary, pers. comm.). By 1960, according to the new curator, Norman H. Russell, professor and departmental chair, more than 15,000 specimens were shelved in the herbarium. It was housed on the third floor of the now Life Science Center A Wing, Arizona State University (Rubinoff 1973). Russell's research interests included study of *Viola* and numerical taxonomy.

Donald J. Pinkava became director of the herbarium and Assistant Professor of Botany in 1964, after receiving a Ph.D. in Botany from Ohio State University, studying the genus *Berlandiera* DC. (Asteraceae). His research has focused on the Asteraceae, floristics of Cuatro Ciénegas, Coahuila, Mexico (resulting in 52 type collections and 5 original descriptions) and most recently on cacti, particularly the Opuntioideae of the Southwest. The ASU Herbarium houses one of the nation's largest collections of Cactaceae, including the best documented vouchered collection for chromosome counts. The Arizona State University Herbarium received official recognition when assigned its acronym, ASU, in 1966 (Anonymous 1966). It was then recognized as one of only 105 resource herbaria in the United States (Anonymous 1974). In 1971 the herbarium was moved to its present site, the third floor of the new C Wing of the Life Science Center (L.S.C.392). During Pinkava's tenure as director, several members of the faculty, curators and especially his graduate students were responsible for the growth of the herbarium.

Throughout the 1960s and 1970s Pinkava received much assistance from

the very knowledgeable curator, Ms. Elinor Lehto, her contributions were immeasurable. Upon her retirement in 1980, Bruce Parfitt served as acting curator, until the position was upgraded to half-time curation and half-time research position, which was filled by Thomas Daniel, who received his Ph.D. from the University of Michigan. As an expert on Neotropical Acanthaceae, his studies resulted in several types. Upon the appointment of Tom Daniel as curator of the herbarium at the California Academy of Sciences, Leslie R. Landrum, who also received his Ph.D. from the University of Michigan, accepted in 1986 the position as curator and research scientist in the Department of Botany. He is an expert on New World Myrtaceae. An herbarium grant from the National Science Foundation created a permanent half-time position for a collections' manager, which rotates from student to student and provides an important learning experience. As curator, Landrum's objectives have been to enlarge the holdings of Southwestern plants, and acquire material from Mexico, South America and the Caribbean, where he and many of his students carry out current studies. Increased interest has also been placed upon the Phoenix Flora project (URL: <http://www.asu.edu/ces/CAPLTER.htm>), part of the Central Arizona-Phoenix Long-Term Ecological Research Project (CAPLTER) awarded to the Center for Environmental Studies, funded by the National Science Foundation. Present staff of the ASU herbarium includes Pinkava, retired Director (Biosystematics of Opuntioideae, Southwest floristics), and Landrum, Curator (Systematics of South American Myrtinae, Southwest floristics).

The ASU herbarium serves as repository of specimens worldwide and particularly from the southwestern United States. Emphasis is on producing a Manual of the Vascular Plants of Arizona, portions of which are being published as they become available in the Journal of the Arizona-Nevada Academy of Science. From 1992 to 2001, treatments of 68 families or portions thereof, were prepared by experts, including ASU staff and students (Mason et al. 1992). These publications make the treatments available for researchers, pending the publication of the completed Flora.

TYPE COLLECTIONS

The ASU vascular plant herbarium houses 735 type specimens including 26 holotypes, 338 isotypes, 3 isolectotypes, 13 isosyntypes, 4 isoneotypes, 233 paratypes, and 118 isoparatypes. The following list documents 384 vascular plant type specimens in the Arizona State University Herbarium (ASU) and includes verified holotypes, lectotypes, syntypes and neotypes and their duplicates. Regionally, the majority of the specimens are from the United States (186) and Mexico (178), while 13 are from South America and 7 from the Old World. Taxonomically the majority of type specimens belong to the Asteraceae (84), followed by Polygonaceae (56), Cactaceae (34 of which 15 are holotypes),

Scrophulariaceae (27), Fabaceae (16), Agavaceae (13), and Acanthaceae (10). Historically prominent are 60 isotypes collected by C.G. Pringle, a prominent early plant collector in Mexico from 1885 to 1909 (Davis 1936). Numerous type collections were also made by James R. Reveal, Noel H. Holmgren, Howard S. Gentry, and George B. Hinton (Ickert-Bond and Pinkava 2000). The list of type specimens is arranged phylogenetically by division and then alphabetically by family, genus, species, and infraspecific categories. For each basionym typified by an ASU specimen accompanied by a copy of the original publication, we here list collector(s) and collection number, locality information (restricted to country and state or equivalent demographic unit), and date of collection.

In the 1960s the irreplaceable type specimens were filed among the general collection and were thus subject to much unnecessary handling. The specimens are now housed in two separate herbarium cabinets. The use of these specimens is limited to only trained taxonomists, who appreciate the value of these specimens in accordance with the recommendations set forth by the International Code of Botanical Nomenclature (Greuter et al. 2000), "Recommendation 7A . . . It is strongly recommended that the material on which the name of a taxon is based, especially the holotype, be deposited in a public herbarium or other public collection with a policy of giving bona fide botanists open access to deposited material, and that it be scrupulously conserved". The types are specially curated in acid-free genus folders (e.g., palm folders) and additionally each specimen is protected by a species folder, all from Herbarium Supply Company, California. Copies of original descriptions are accompanying the type specimens. They are fastened on a herbarium sheet with archival clear-hold press-on mounting corners from Light Impressions, New York. Specimens were checked against the original publication and the type status was verified. Cross-referencing dummy sheets are placed in the main herbarium.

Some specimens that are cited in the protologue are missing from the ASU type collection; they are out on loan or were never received. This type list is the first account of the history of the ASU herbarium and the first list of its type specimens. We plan to update this list in the future with a supplement of all new types since this publication. We feel that the printed version of the type list allows for convenient checking of type specimens. A searchable list of all type specimens including paratypes, isotypes and clonotypes as well as some images of types is planned for the future, and will be made available at a later point through the web page of the ASU herbarium (URL: <http://lsvlla.asu.edu/herbarium/>). The construction of such a web page will take some time and this paper version will serve in the interim.

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POLYPODIOPHYTA

ASPLENIACEAE

- Asplenium montanum* C.L. Willdenow forma *shawangunkense* T. Reeves, Amer. Fern J. 64:105. 1974. USA. New York: 18 Oct 1973, T. Reeves R500 (HOLOTYPE). ASU 67981.

DRYOPTERIDACEAE

- Cystopteris utahensis* M.D. Windham & C.H. Hauffler, Amer. Fern J. 81: 13. 1991. USA. Utah: 2 Jul 1990, M.D. Windham 90-282 with Windham (ISOTYPE). ASU not found.
- Woodsia cochisensis* M.D. Windham, Contr. Univ. Michigan Herb. 19:54. 1993. USA. Arizona: 31 Aug 1985, M.D. Windham 781 with G. Yatskevych (ISOTYPE). ASU not found.
- Woodsia neomexicana* M.D. Windham, Contr. Univ. Michigan Herb. 19:52. 1993. USA. New Mexico: 23 Aug 1990, M.D. Windham 90-365 with Rabe (ISOTYPE). ASU not found.

POLYPODIACEAE

- Goniophlebium pringlei* W.R. Maxon, Proc. U.S. Natl. Mus. 27: 953. 1904. Mexico. Veracruz: 30 Nov 1903, C.G. Pringle 11855 (ISOTYPE). ASU 60335.

PTERIDACEAE

- Astrolepis cochisensis* (L.N. Gooding) D.M. Benham subsp. *arizonica* D.M. Benham, Amer. Fern J. 82:60. 1992. USA. Arizona: 5 Sep 1989, D.M. Benham 1312 (ISOTYPE). ASU 158448.
- Cheilanthes yavapensis* T. Reeves ex M.D. Windham, Contr. Univ. Michigan Herb. 19:33. 1993. USA. Arizona: 18 Nov 1980, M.D. Windham 202 (ISOTYPE). ASU not found.
- Pellaea lyngholmii* M.D. Windham, Contr. Univ. Michigan Herb. 19:40. 1993. USA. Arizona: 23 Sep 1990, M.D. Windham 90-420 with lyngholm (ISOTYPE). ASU not found.
- Pellaea ternifolia* (A.J. Cavanilles) J.H.F. Link subsp. *arizonica* M.D. Windham, Contr. Univ. Michigan Herb. 19:47. 1993. USA. Arizona: 18 Mar 1981, M.D. Windham 246-C (ISOTYPE). ASU 115789.

MAGNOLIOPHYTINA-DICOTS

ACANTHACEAE

- Dyschoriste novogaliciana* T.F. Daniel, Pollbotanica 2:1. 1996. Mexico. Nayarit: 16 Mar 1982, T.F. Daniel 2051 (ISOTYPE). ASU 208318.
- Justicia masiaca* T.F. Daniel, Brittonia 47:408. 1995. Mexico. Sonora: 14 Jan 1983, T.F. Daniel 2456 (ISOTYPE). ASU 220596.
- Mirandea andradenia* T.F. Daniel, Southw. Naturalist 31:170. 1986. Mexico. Tzumalipas: 12 Aug 1984, T.F. Daniel 3693 with M. Baker (ISOTYPE). ASU 142778.
- Mirandea huastecensis* T.F. Daniel, Syst. Bot. 3:428. 1979. Mexico. Nuevo Leon: 10 Jul 1978, T.F. Daniel 252 (ISOTYPE). ASU 110135.
- Mirandea sylvatica* S. Acosta, Phytologia 57:249. 1985. Mexico. Tabasco: 26 Apr 1983, F. Ventura 20168 (ISOTYPE). ASU 147810.
- Tetramerium butterwickianum* T.F. Daniel, Syst. Bot. Monogr. 12:89. 1986. Mexico. Michoacan: 27 Nov 1983, T.F. Daniel 3267 with M. Butterwick (ISOTYPE). ASU 141588.
- Tetramerium emilyanum* T.F. Daniel, Syst. Bot. Monogr. 12:74. 1986. Mexico. Michoacan: 26 Nov 1983, T.F. Daniel 3258 with M. Butterwick (ISOTYPE). ASU 141733.
- Tetramerium mcvaughii* T.F. Daniel, Syst. Bot. Monogr. 12:92. 1986. Mexico. Michoacan: 26 Nov 1983, T.F. Daniel 3247 with M. Butterwick (ISOTYPE). ASU 141590.
- Tetramerium rzedowskii* T.F. Daniel, Syst. Bot. Monogr. 12:104. 1986. Mexico. Michoacan: 24 Mar 1982, T.F. Daniel 2145 (ISOTYPE). ASU 141586.
- Tetramerium sagasteguanum* T.F. Daniel, Syst. Bot. Monogr. 12:110. 1986. Peru. Cajamarca: 30 Aug 1985, T.F. Daniel 4319 with M. Butterwick (ISOTYPE). ASU 142681.

APIACEAE

- Angelica callii* M.L. Mathias & L.C. Constance, Madroño 24:78. 1977. USA. California: 18 Oct 1965, T. & V. Call 2459 (ISOTYPE). ASU 108729.
- Lomatium junceum* R. Barneby & N.H. Holmgren, Brittonia 31:96. 1979. USA. Utah:

- 27 May 1978, N.H. Holmgren et al. 8778 (isotype), ASU 113743.
- Prionosciadium megacarpum** J.M. Coulter & J.N. Rose, Contr. U.S. Natl. Herb. 3:308. 1895. Mexico: Oaxaca: 10 Oct 1894, C.G. Pringle 4688 (isotype), ASU 50595.
- Sanicula moranii** P. Vargas, L.C. Constance & B.G. Baldwin, Brittonia 50:122. 1998. Mexico: Baja California: 19 May 1973, R. Moran 20929 (isotype), ASU 170073.
- AQUIFOLIACEAE**
- Ilex pringlei** P.C. Standley, Contr. U.S. Natl. Herb. 23:675. 1923. Mexico, Puebla: 25 Apr 1904, C.G. Pringle 10003 (isotype), ASU 50602.
- ASCLEPIADACEAE**
- Asclepias welshii** N.H. Holmgren & P.K. Holmgren, Brittonia 31:110. 1979. USA, Utah: 20 Jun 1978, N.H. Holmgren 9009 with P. Holmgren (isotype), ASU 113750.
- Marsdenia tressensis** S.A. Caceres & G.N. Morillo, Bonplandia (Corrientes) 7:34. 1993. Argentina.: 21 Oct 1988, S.A. Caceres 426 (isotype), ASU 191309.
- ASTERACEAE**
- Achaetogeron versicolor** J.M. Greenman, Proc. Amer. Acad. Arts 41:255. 1905. Mexico, Hidalgo: 7 Aug 1904, C.G. Pringle 8849 (isotype), ASU 50584.
- Acourtia fragrans** J. Rzedowski, Bol. Soc. Bot. Mexico 45:102. 1983. Mexico, Puebla: 6 Jan 1981, J. Rzedowski 37174 (isotype), ASU 184636.
- Acourtia hintoniorum** B.L. Turner, Phytologia 75:404. 1993. Mexico, Nuevo Leon: 13 Nov 1993, G.B. Hinton 23934 et al. (isotype), ASU 202296.
- Acourtia huajuapana** B.L. Turner var. **actinomorpha** J. Rzedowski, Bol. Soc. Bot. Mex. 45:104. 1983. Mexico, Guerrero: 23 Dec 1980, J. Rzedowski 37160 (isotype), ASU 184565.
- Alomia stenolepis** S.F. Blake, J. Wash. Acad. Sci. 27:375. 1937. Mexico, Sonora: 7 Mar 1935, H.S. Gentry 1434 (isotype), ASU 89075.
- Barroetia subuligera** A. Gray var. **latisquama** J.M. Greenman, Proc. Amer. Acad. Arts 40:35. 1904. Mexico, Jalisco: 27 Oct 1903, C.G. Pringle 8773 (isotype), ASU 17584.
- Bidens rosea** Schz. Bip. var. **aequisquamosa** M.L. Fernald, Proc. Amer. Acad. Arts 43:68. 1907. Mexico, Michoacan: 1 Nov 1905, C.G. Pringle 70709 (isotype), ASU 50605.
- Carminatia alvarezii** J. Rzedowski & G. Calderon, Anales Esc. Nac. Ci. Biol. 31:9. 1987. Mexico, Oaxaca: 25 Oct 1980, J. Rzedowski 37075 (isotype), ASU 147806.
- Carminatia anomala** B.L. Turner, Pl. Syst. Evol. 160:173. 1988. Mexico, Puebla: 6 Oct 1984, Sundberg 3032 with M. Levin (isotype), ASU 141518.
- Chrysactinia lehtoae** D. Keil, Madroño 23:374. 1976. Mexico, Sinaloa: 25 Nov 1975, E. Lehto (1955) with T.H. Nash and J.L. Landye (holotype), ASU 80003.
- Chrysanthellum keilii** B.L. Turner, Phytologia 64:437. 1988. Mexico, Michoacan: 29 Aug 1981, D. Keil 15222 with M.L. Lane (isotypes), ASU 123621, 176521.
- Chrysothamnus nauseosus** (P.S. Pallas) Britt. subsp. **iridis** L.C. Anderson, Great Basin Naturalist: 41:311. 1981. USA, Utah: 29 Sep 1979, S.L. Welsh 19258 (isotype), ASU 108397.
- Cirsium clokeyi** S.F. Blake, Proc. Biol. Soc. Wash. 51:8. 1938. USA, Nevada: 6 Aug 1937, L.W. Clokey 7456 (isotype), ASU 66713.
- Cymophora pringlei** B.L. Robinson, Proc. Amer. Acad. Arts 43:39. 1907. Mexico, Guerrero: 22 Sep 1905, C.G. Pringle 10068 (isotype), ASU 18329.
- Erigeron acomanus** R. Spellenberg & P. Knight, Madroño 36:115. 1989. USA, New Mexico: 14 Jul 1983, P. Knight 2689 (isotype), ASU 176290.
- Erigeron arisolius** G.L. Nesom, Phytologia 69:243. 1990. USA, Arizona: 28 Aug 1981, G.L. Nesom 4521 (isotype), ASU 174639.
- Erigeron basaeachensis** G.L. Nesom, Phytologia 66:426. 1989. Mexico, Chihuahua: 18 Aug 1984, G.L. Nesom 5089 with P. Lewis (isotype), ASU 160286.
- Erigeron bistiensis** G.L. Nesom & B. Hevron, Madroño 42:12. 1995. USA, New Mexico: 3 Jun 1993, B. Hevron 1975 with J. Mez (isotype), ASU 191569.
- Erigeron byei** S. Sundberg & G.L. Nesom, Phytologia 69:278. 1990. Mexico, Chihuahua: 19 May 1985, R. Scott 471 with T. Ayers, M. Levin & A. Whittemore (isotype), ASU 202297.

- Erigeron chiangii** G.L. Nesom var. **lamprocaulis** G.L. Nesom, *Phytologia* 73:119. 1992. Mexico. Coahuila: 3 Jun 1992, G. Nesom 7408 with M. Mayfield (isotype). ASU 190098.
- Erigeron coroniglandifer** G.L. Nesom, *Phytologia* 66:432. 1989. Mexico. Chihuahua: 28 Aug 1983, G.L. Nesom 4964 (isotype). ASU 160287.
- Erigeron cuatrocienegensis** G.L. Nesom, *Madroño* 28:143. 1981. Mexico. Coahuila: 12 Jun 1968, D.J. Pinkava P5511 with E. Lehto, D.J. Keil (holotype). ASU 80536.
- Erigeron eruptens** G.L. Nesom, *Phytologia* 66:438. 1989. Mexico. Chihuahua: 27 Apr 1985, R. Spellenberg 8070 et al. (isotype). ASU 143251.
- Erigeron rybius** G.L. Nesom, *Syst. Bot.* 7:457. 1982. USA. New Mexico: 30 Aug 1981, G.L. Nesom 4535 (isotype). ASU 124943.
- Erigeron sceptrifer** G.L. Nesom, *Phytologia* 69:248. 1990. Mexico. Chihuahua: 23 Aug 1981, G.L. Nesom 4477 (isotype). ASU 174638.
- Erigeron scopulinus** G.L. Nesom & V.D. Roth, *J. Arizona-Nevada Acad. Sci.* 16:39. 1981. USA. Arizona: 9 Jun 1976, V.D. Roth s.n. (isotype). ASU 140787.
- Eupatorium saltillense** B.L. Robinson, *Proc. Amer. Acad. Arts* 43:31. 1907. Mexico. Coahuila: 5 Oct 1905, C.G. Pringle 10080 (isotype). ASU 18777.
- Flaveria mcdougallii** M.E. Theroux, D.J. Pinkava & D. Keil, *Madroño* 24:13. 1977. USA. Arizona: 27 Jan 1976, M.E. Theroux 7675 (isotype). ASU 84121.
- Gaillardia powellii** B.L. Turner, *Southw. Naturalist* 17:183. 1972. Mexico. Coahuila: 11 Apr 1970, B.L. Turner 6023 (isotype). ASU 130037.
- Grindelia fraxino-pratensis** J.L. Reveal & J. Beatley, *Bull. Torrey Bot. Club* 98:334. 1971. USA. Nevada: 21 Aug 1968, J.L. Reveal 7887 with N.H. Holmgren (isotype). ASU 50079.
- Grindelia hintoniorum** G.L. Nesom, *Phytologia* 68:328. 1990. Mexico. Nuevo Leon: 15 May 1984, G.B. Hinton 18666 et al. (isotype). ASU 147845.
- Gutierrezia ionensis** C.L. Lunell, *Amer. Midl. Naturalist* 2:194. 1912. Neotypified by M.A. Lane, *Syst. Bot.* 10:25. 1985. USA. Oregon: 27 Aug 1983, M.A. Lane 3054 (isoneotype). ASU 130892.
- Halimium exaltatum** J.N. Rose & P.C. Standley, *Contr. U.S. Natl. Herb.* 23:833. 1923. Mexico. Michoacan: 27 Oct 1907, C.G. Pringle 10409 (isotype). ASU 16235.
- Haplopappus enormidens** R. Moran, *Phytologia* 34:371. 1976. Mexico. Baja California: 19 Jul 1975, R. Moran 22602 (isotype). ASU 85778.
- Haplopappus juarezensis** R. Moran, *Trans. San Diego Soc. Naturalist Hist.* 15:154. 1969. Mexico. Baja California: 17 Sep 1966, R. Moran 73556 (isotype). ASU 200010.
- Haplopappus rosaricus** R. Moran, *Trans. San Diego Soc. Naturalist Hist.* 15:159. 1969. Mexico. Baja California: 2 Jul 1967, R. Moran 74020 (isotype). ASU 200013.
- Haplopappus thiniicola** J. Rzedowski & E. Ezcurra, *Ci. Interamer.* 26:16. 1986. Mexico. Sonora: 17 Dec 1984, E. Ezcurra 84007 (isotype). ASU 150461.
- Heterotheca fulcrata** (E.L. Greene) Shinnars var. **arizonica** J.S. Semple, *Brittonia* 39:380. 1987. U.S.A. Arizona: 13 Sep 1985, J.S. Semple & S. Heard 7923 (isotype). ASU on loan.
- Heterotheca marginata** J.S. Semple, *U. Waterloo Biol. Ser.* 38:83. 1996. U.S.A. Arizona: 16 Oct 1993, J.S. Semple 70384 (isotype). ASU on loan.
- Heterotheca mucronata** V.L. Harms in B.L. Turner var. **harmisiana** J.S. Semple, *U. Waterloo Biol. Ser.* 38:60. 1996. Mexico. Zacatecas: 18 Jun 1976, D.J. Pinkava P13486 et al. (holotype). ASU on loan.
- Heterotheca zionensis** J.C. Semple, *Brittonia* 39:384. 1987. U.S.A. Utah: 15 Sep 1985, J.C. Semple 7859 & S. Heard (isotype). ASU 160244.
- Hydropectis stevensii** R. McVaugh, *Contr. Univ. Michigan Herb.* 9:416. 1972. Mexico. Jalisco: 11 Aug 1958, R. McVaugh 17078 (isotype). ASU 127635.
- Hymenoxys turneri** K. Parker, *Phytologia* 20:192. 1970. USA. Texas: 21 Apr 1965, B.L. Turner 5154 (isotype). ASU 174640.
- Isocoma menziesii** (W.J. Hooker & G.A.W. Arnett) G.L. Nesom var. **diabolica** G.L. Nesom, *Phytologia* 70:96. 1991. USA. California: 5 Oct 1985, D. Keil 19042 (isotype). ASU 146650.
- Isocoma tomentosa** G.L. Nesom, *Phytologia* 70:109. 1991. Mexico. Chihuahua: 14 Oct 1986, G.L. Nesom 5478 with W.L. Vorbik (isotype). ASU 184811.

- Laphamia cochisensis** W.E. Niles, Mem. New York Bot. Gard. 21:47. 1970. USA. Arizona: 10 May 1964, W.E. Niles 377 (isotype). ASU 75480.
- Machaeranthera ammophila** J.L. Reveal, Bull. Torrey Bot. Club 97:172. 1970. USA. Nevada: 21 Aug 1968, J.L. Reveal 1882 with N.H. Holmgren (isotype). ASU 96211.
- Machaeranthera asteroides** (J. Torrey) E.L. Greene var. **glandulosa** B.L. Turner, Phytologia 60:77. 1986. USA. Arizona: 19 Sep 1975, E. Lehto 118904 et al. (isotype). ASU 78593.
- Machaeranthera canescens** (F.T. Pursh) A. Gray var. **nebraskana** B.L. Turner, Phytologia 60:77. 1986. USA. Nevada: 27 Aug 1968, S. Stephens 28307 (isotype). ASU 83768.
- Microspermum debile** G. Bentham var. **arsenelii** J. Rzedowski, Bol. Soc. Bot. Mexico 31:81. 1970. Mexico. Michoacan: 18 Nov 1967, J. Rzedowski 25195 (isotype). ASU 44931.
- Parthenium lozaniatum** H.H. Bartlett, Proc. Amer. Acad. Arts 44:636. 1909. Mexico. Nuevo Leon: 1 May 1906, C.G. Pringle 10247 (isotype). ASU 50587.
- Pectis exilis** D. Keil, Phytologia 67:349. 1989. Mexico. Jalisco: 6 Oct 1903, C.G. Pringle 8760 (isotype). ASU 26006.
- Pectis holochaeta** (S.F. Blake) D. Keil var. **cana** D. Keil, Phytologia 67:354. 1989. Mexico. Michoacan: 7 Sep 1981, D. Keil 75389 with M. Luckow (isotype). ASU 161217.
- Pectis papposa** W.H. Harvey & A. Gray var. **grandis** D. Keil, Brittonia 26:32. 1974. USA. Texas: 15 Aug 1971, D. Keil 87768 with L.A. McGill (isotype). ASU 51797.
- Pectis purpurea** T.S. Brandegee var. **sonorae** D. Keil, Brittonia 26:35. 1974. Mexico. Sonora: 07 Sep 1977, D. Keil 88644 & J.M. Canne (isotype). ASU 51802.
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