Taxonomy of Hymenoxys subgenus Picradenia and a Conspectus of the Subgenera of Hymenoxys (Asteraceae: Helenieae: Tetraneurinae)

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TAXONOMY OF *HYMENOXYS* SUBGENUS *PICRADENIA* AND A CONSPECTUS OF THE SUBGENERA OF *HYMENOXYS* (ASTERACEAE: HELENIEAE: TETRANEURINAE)

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Abstract: *Hymenoxys* (Helenieae, Tetraneurinae) is composed of 28 taxa distributed in 8 subgenera: 1) subg. *Hymenoxys,* 2) subg. *Dugaldia,* 3) subg. *Macdougalia,* 4) subg. *Phileozera,* 5) subg. *Picradenia,* 6) subg. *Picradeniella,* 7) subg. *Plummera,* and 8) subg. *Rydbergia.* Eleven taxa comprise *Hymenoxys* subg. *Picradenia.*

Resumen: *Hymenoxys* (Helenieae, Tetraneurinae) contiene 28 taxones en 8 subgéneros: 1) subg. *Hymenoxys,* 2) subg. *Dugaldia,* 3) subg. *Macdougalia,* 4) subg. *Phileozera,* 5) subg. *Picradenia,* 6) subg. *Picradeniella,* 7) subg. *Plummera,* and 8) subg. *Rydbergia.* El subgénero *Hymenoxys* subg. *Picradenia* contiene 11 taxones.

Keywords: Asteraceae, Helenieae, Tetraneurinae, *Hymenoxys,* taxonomy.

Hymenoxys Cass. has been consigned to various tribes and subtribes of Asteraceae, beginning with its placement by Cassini (1828) in tribe Heliantheae (subtribe) Helenieae (which also included *Helenium* L. and *Gaillardia* Foug.). Lessing (1832) and Candolle (1836) placed it in tribe Senecioneae (as Senecionideae) subtribe Helenieae. Bentham (1873) recognized the Helenieae (as Helenioideae) as a tribe, placing *Hymenoxys* (along with *Helenium* and *Gaillardia*) in subtribe Euhelenieae. Hoffmann (1890) followed suit, placing *Hymenoxys* (as *Actinella*) in tribe Helenieae subtribe Heleninae. Rydberg (1915) also placed *Hymenoxys* in tribe Helenieae, but he separated it into subtribe Tetraneurinae (as Tetraneuranae) and placed *Helenium* and *Gaillardia* in the closely allied subtribe Gaillardiinae (as Gaillardianae).

Cronquist (1955), attempting to deal with an obviously polyphyletic Helenieae, returned *Hymenoxys* (with the rest of the Helenieae) to tribe Heliantheae. Stuessy (1977), Turner and Powell (1977), and Robinson (1981) placed *Hymenoxys* (along with *Helenium* and *Gaillardia*) in tribe Heliantheae subtribe Gaillardiinae. Later, as a more narrowly defined, natural Helenieae was being envisioned, Karis and Ryding (1994) returned *Hymenoxys* to tribe Helenieae, placing it with *Helenium, Gaillardia,* and other genera in subtribe Gaillardiinae. Most recently, Baldwin and Wessa (2000), using analyses of nuclear 18S–26S rDNA sequences of the internal transcribed spacer region, classified *Hymenoxys* (sensu Bierner, 1994, and this paper) along with *Amblyolepis* DC., *Baileya* Harv. & A. Gray, *Psilostrophe* DC., and *Tetraneuris* Greene in tribe Helenieae subtribe "Riddelliinae" (an illegitimate name for the subtribe correctly known as Tetraneurinae), reserving subtribe Gaillardiinae for *Gaillardia, Helenium,* and *Balduina* Nutt.

Problems with generic circumscription of *Hymenoxys* generally have revolved around the inclusion or exclusion of taxa referable to *Dugaldia* Cass., *Plummera* A. Gray, and *Tetraneuris*; taxa referable to *Hymenoxys, Macdougalia* A. Heller, *Phileozera* Buckley, *Picradenia* Hook., and *Rydbergia* Greene (as well as *Hymenoxys texana* of subg. *Picradeniella*) have usually, but not always (e.g., Cockerell, 1904; Robinson, 1981), been classified as congeneric (see Bierner, 1994).

For example, Kittie Parker, a long-time worker in this group of composites, was very indecisive about whether to recognize

Tetraneuris as congeneric with or separated from *Hymenoxys,* ultimately taking the latter position (Parker, 1950, 1970, 1980). Stuessy (1977), Turner and Powell (1977), and Karis and Ryding (1994) treated *Tetraneuris* as congeneric with *Hymenoxys*; Cockerell (1904), Robinson (1981), Spring et al. (1994), Bierner (1994), and Bierner and Jansen (1998) recognized *Tetraneuris* as a separate genus, a position accepted by Baldwin and Wessa (2000) and supported by their work.

A close relationship between *Plummera* and *Hymenoxys* has been recognized for some time (e.g., Gray, 1882; Hoffmann, 1890; Blake, 1929). By the 1970s, Turner et al. (1973) and Wagner (1979) were suggesting that *Plummera* be combined with *Hymenoxys.* While I did not initially support that position, I did recognize substantial similarities with regard to their flavonoid chemistry (Bierner, 1978). Later (Bierner, 1994), I found the morphologic, cytologic, micromolecular, and initial DNA evidence (later completed and published—Bierner and Jansen, 1998) so overwhelming that I formally submerged *Plummera* in *Hymenoxys* as a subgenus. This position has been accepted by Wagner et al. (1999) and Baldwin and Wessa (2000).

The relationship between *Dugaldia* and *Hymenoxys* was not so apparent until relatively recently. When I began graduate studies in the late 1960s, *Dugaldia* had been treated for quite some time as congeneric with *Helenium* (e.g., Gray, 1874; Standley, 1940). After completing some early work on flavonoid chemistry, I recognized *Dugaldia* as a distinct genus (Bierner, 1974), and by the time I was publishing my work on the flavonoids of *Plummera* (Bierner, 1978), I was commenting on the similarities (chemical and otherwise) of *Dugaldia* to *Hymenoxys* (Bierner, 1978). Eventually, as with *Plummera,* the morphologic, cytologic, micromolecular, and initial DNA restriction site evidence on *Dugaldia* was so overwhelming that I formally submerged *Dugaldia* in *Hymenoxys* as a subgenus (Bierner, 1994). This position was also accepted by Baldwin and Wessa (2000) and supported by their work.

Over the years, various workers have combined or separated taxa referable to the generic names *Hymenoxys, Macdougalia, Phileozera, Picradenia,* and *Rydbergia.* Cockerell (1904) recognized *Macdougalia* and *Rydbergia* as separate genera, but most recent workers have recognized these taxa (at least the taxa with which they were working) as congeneric (e.g., Stuessy, 1977; Turner and Powell, 1977; Karis and Ryding, 1994; Bierner, 1994; Bierner and Jansen, 1998). An exception is Robinson (1981), who recognized *Macdougalia* as a separate genus but did not comment on his decision.

In agreement with Baldwin and Wessa (2000), I place *Hymenoxys* in Tetraneurinae. I recognize 8 subgenera in *Hymenoxys* for 28 taxa: 1) subg. *Hymenoxys* with 4 species, 2) subg. *Dugaldia* with 3 species, 3) subg. *Macdougalia* with 1 species, 4) subg. *Phileozera* with 2 species, 5) subg. *Picradenia* with 10 species (1 composed of 2 varieties), 6) subg. *Picradeniella* with 1 species, the anomalous *Hymenoxys texana* (see Spring et al., 1994; Strother and Brown, 1988), which is retained in *Hymenoxys* based on DNA restriction site evidence (Bierner and Jansen, 1998), 7) subg. *Plummera* with 1 species composed of 3 varieties, and 8) subg. *Rydbergia* with 3 species. A full taxonomic treatment, including synonymies, descriptions, and distribution maps, for *Hymenoxys* subg. *Picradenia* follows.

Key to the Subgenera of *Hymenoxys*

1. Heads discoid or radiate; annuals of South America ..... *Hymenoxys* subg. *Hymenoxys*
1. Heads radiate; annuals, biennials or perennials of North America.
   2. Annuals.
      3. Delicate plants, (3–)5–10(–15) cm; corollas of the ray florets not extending beyond the

phyllaries; endemic to the Houston, Texas, area ..... *Hymenoxys* subg. *Picradeniella*

3. Robust plants, (15–)20–40(–60) cm; corollas of the ray florets conspicuously extending beyond the phyllaries; widespread in various parts of Mexico, Texas (not Houston), Oklahoma, Kansas, Colorado, New Mexico, Arizona, and California .... *Hymenoxys* subg. *Phileozera*

2. Biennials or perennials.

4. Disc florets functionally staminate .... *Hymenoxys* subg. *Plummera*

4. Disc florets bisexual.

5. Phyllaries in 2 unequal series.

6. Outer phyllaries basally connate ¼–⅔ their lengths; inner phyllaries narrowly obovate to obovate, apices usually mucronate, sometimes acuminate .. .. *Hymenoxys* subg. *Picradenia*

6. Outer phyllaries free; inner phyllaries lanceolate, apices distinctly awn-tipped .... *Hymenoxys* subg. *Macdougalia*

5. Phyllaries in 2–4 subequal series.

7. Phyllaries in 3 subequal series; leaves usually dissected .... *Hymenoxys* subg. *Rydbergia*

7. Phyllaries in 2–4 subequal series; leaves usually entire..... ..... *Hymenoxys* subg. *Dugaldia*

HYMENOXYS Cass., Dict. Sci. Nat. 55: 278. 1828. TYPE SPECIES: *Hymenopappus anthemoides* Juss., Ann. Mus. Natl. Hist. Nat. [Paris] 2: 426. 1803. (= *Hymenoxys anthemoides*)

Hymenoxys subg. **Hymenoxys**

Cephalophora Cav. subg. **Hymenoxys** (Cass.) Lessing, Synopsis Generum Compositarum 240. 1832.

Hymenoxys anthemoides (Juss.) Cass.
Hymenoxys cabrerae K. L. Parker
Hymenoxys robusta (Rusby) K. L. Parker
Hymenoxys tweediei Hook. & Arn. (as *tweedei*)

Hymenoxys subg. **Dugaldia** (Cass.) Bierner, Sida 16: 5. 1994.

Dugaldia Cass., Dict. Sci. Nat. 55: 270. 1828. TYPE SPECIES: *Actinea integrifolia* Kunth, Nov. Gen. Sp. 4: 297. 1818. (= *Hymenoxys integrifolia*)

Oxylepis Benth., Pl. Hartw. 87. 1841. TYPE SPECIES: *Oxylepis lanata* Benth. (= *Hymenoxys integrifolia*)

Hymenoxys hoopesii (A. Gray) Bierner
Hymenoxys integrifolia (Kunth) Bierner
Hymenoxys pinetorum (Standl.) Bierner

Hymenoxys subg. **Macdougalia** (A. Heller) Bierner, stat. nov. BASIONYM: **Macdougalia** A. Heller, Bull. Torrey Bot. Club 25: 629. 1898. TYPE SPECIES: *Actinella bigelovii* A. Gray, Pl. Wright. 2: 96. 1853. (= *Hymenoxys bigelovii*)

Hymenoxys bigelovii (A. Gray) K. L. Parker

Hymenoxys subg. **Phileozera** (Buckley) Cockerell, Bull. Torrey Bot. Club 31: 466. 1904.

Phileozera Buckley, Proc. Acad. Nat. Sci. Philadelphia 1861: 459. 1862. TYPE SPECIES: *Phileozera multiflora* Buckley. (= *Hymenoxys odorata*)

Hymenoxys chrysanthemoides (Kunth) DC.
Hymenoxys odorata DC.

Hymenoxys subg. **Picradenia** (Hook.) Cockerell
See full treatment below.

Hymenoxys subg. **Picradeniella** Cockerell, Bull. Torrey Bot. Club 31: 463. 1904. TYPE SPECIES: *Actinella texana* Coult. & Rose, Bot. Gaz. 16: 27. 1891. (= *Hymenoxys texana*)

Hymenoxys texana (Coult. & Rose) Cockerell

Hymenoxys subg. **Plummera** (A. Gray) Bierner, Sida 16: 6. 1994.

Plummera A. Gray, Proc. Amer. Acad. Arts 17: 215. 1882. TYPE SPECIES: *Plummera floribunda* A. Gray. (= *Hymenoxys ambigens* var. *floribunda*)

Hymenoxys ambigens (S. F. Blake) Bierner var. *ambigens*
Hymenoxys ambigens (S. F. Blake) Bierner var. *floribunda* (A. Gray) W. L. Wagner
Hymenoxys ambigens (S. F. Blake) Bierner var. *neomexicana* W. L. Wagner

Hymenoxys subg. **Rydbergia** (Greene) Bierner, stat. nov. BASIONYM: **Rydbergia** Greene, Pittonia 3: 270. 1898. TYPE SPECIES: *Actinella grandiflora* Torr. & A. Gray, Boston J. Nat. History 5: 109. 1845. (= *Hymenoxys grandiflora*)

Hymenoxys brandegeei (Porter ex A. Gray) K. L. Parker (as *brandegei*)
Hymenoxys grandiflora (Torr. & A. Gray) K. L. Parker
Hymenoxys insignis (A. Gray ex S. Watson) Cockerell

TAXONOMIC TREATMENT

Hymenoxys Cass. subg. **Picradenia** (Hook.) Cockerell, Bull. Torrey Bot. Club 31: 463. 1904.

Picradenia Hook., Fl. Bor. Amer. 1: 317. t. 108. 1833. TYPE SPECIES: *Picradenia richardsonii* Hook. (= *Hymenoxys richardsonii* var. *richardsonii*)

BIENNIALS, MONOCARPIC PERENNIALS, OR POLYCARPIC PERENNIALS. STEMS 1–30, sometimes from branched, woody caudices, branched distally, green throughout to purple-red-tinted proximally and green distally to occasionally purple-red-tinted throughout, 2–15 dm, glabrous or sparsely to densely pubescent, eglandular or sparsely to densely dotted with sessile glands. LEAVES entire or pinnately or bipinnately divided into 3–23 segments, glabrous or sparsely to densely pubescent, dotted with impressed glands; basal leaves in a rosette, bases expanded and clasping the stem. HEADS 1–330 per plant in paniculiform to corymbiform arrays. PEDUNCLES 1–13 cm, expanded apically, glabrous or sparsely to densely pubescent, eglandular or sparsely to densely dotted with sessile glands. INVOLUCRES hemispheric to subhemispheric to campanulate to urceolate, 4–12 mm × 4–18 mm. PHYLLARIES in 2 morphologic series: outer phyllaries 5–18, basally connate ¼–⅔ their lengths, green throughout or yellow to yellow-green proximally and green distally, sometimes purple-red-tinted on the margins, obovate to ovate to lanceolate, 2.9–11 × 0.5–4.5 mm, weakly to strongly keeled, apices acute to acuminate, abaxial faces glabrous or sparsely to densely pubesent, eglandular or sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous or sparsely to moderately to rarely densely pubescent, eglandular or rarely sparsely dotted with sessile and/or impressed glands; inner phyllaries 6–28, free, body yellow and scale-like, yellow to yellow-green to green distally, obovate to narrowly obovate, 2.8–8 × 1–4.5 mm, often surpassing the outer, weakly keeled, apices acuminate to usually mucronate, abaxial faces glabrous or sparsely to moderately pubescent, eglandular or sparsely to moderately dotted with sessile glands, adaxial faces glabrous or sparsely to moderately pubescent, eglandular. RAY FLORETS 6–16, pistillate, fertile; corollas yellow or rarely yellow-orange, 4.2–31 × 2.3–12 mm, lobes 3(–5), abaxial faces glabrous or sparsely pubescent, eglandular or sparsely to densely dotted with sessile glands, adaxial faces glabrous and eglandular. DISC FLORETS bisexual, fertile; corollas differentiated proximally into a yellow-brown tube ¼–⅓ the total length, yellow distally, cylindric to cylindric campanulate, 2.4–5.5 × 0.4–1.2 mm, lobes 5, glabrous or sparsely to densely pubescent, eglandular or sparsely to moderately dotted with sessile glands. RECEPTACLES hemispheric to conic, 1–4 × 1–5.5 mm; paleae none. CYPSELAE obpyramidal to narrowly obpyramidal, 1.6–3.9 × 0.4–1.5 mm, moderately to densely pubescent with straight, forked, antrorse hairs, eglandular or sparsely to moderately dotted with sessile glands; pappus scales 4–8, obovate or ovate to lanceolate, often aristate, 0.8–4 × 0.4–1.5 mm.

CHROMOSOME NUMBER: All taxa of *Hymenoxys* subg. *Picradenia* that have been counted have a chromosome number of $2n = 30$. Counts have not been reported in the literature for *H. lemmonii* or *H. brachyactis*; a count of $2n = 30$ for *H. lemmonii* by John Strother (see *Strother & Ferlatte 828* under representative specimens examined) is reported here.

DISTRIBUTION: *Hymenoxys* subg. *Picradenia* as herein recognized consists of 11 taxa distributed mainly in the southwestern United States from far west Texas, New Mexico, and Colorado west to Arizona, Utah, Nevada, and California. The range of *Hymenoxys cooperi* extends north to southeastern Idaho and southeastern Oregon, and *H. richardsonii* var. *richardsonii* is distributed from central Colorado and Utah north through Wyoming, Montana, and North Dakota into Alberta and Saskatchewan.

KEY TO THE TAXA OF *HYMENOXYS* SUBG. *PICRADENIA*

1. Mature involucres relatively small, 4–8(–9) mm in diameter.
   2. Mid leaves entire or divided into 3 segments; terminal segments of divided mid leaves 2–4 mm wide. . . . . 8. *H. rusbyi*
   2. Mid leaves divided into 3–7 segments; terminal segments of mid leaves 0.8–2.2 mm wide.
      3. Stems distinctly purple-red-tinted proximally, green distally; disc floret corollas and pappus scales relatively short, 2.4–3 and 0.8–2.1 mm, respectively . . . . . 4. *H. jamesii*
      3. Stems green throughout, rarely purple-red-tinted proximally; disc floret corollas and pappus scales relatively long, 3–4.2 and 1.8–3 mm, respectively.
         4. Polycarpic perennials; stems (2–)5–20(–30); involucres campanulate, 7–9 mm in diameter; widely distributed . . . . . 7b. *H. richardsonii* var. *floribunda*
         4. Biennials or monocarpic perennials; stems 1–4(–8); involucres usually urceolate, 5–6 mm in diameter; known only from central New Mexico. . . . . 1. *H. brachyactis*
1. Mature involucres relatively large, (8–)10–18 mm in diameter.
   5. Stems and leaves densely sericeous; mainly on the Kaibab Plateau north of the Grand Canyon in Arizona, rare in western Kane County, Utah. . . . . 9. *H. subintegra*
   5. Stems and leaves sometimes densely pubescent, but not sericeous; only *H. cooperi* and *H. richardsonii* var. *floribunda* also found in the same geographic area.
      6. Outer phyllaries 5(–8); restricted to southern Arizona, particularly in the Huachuca Mountains of Cochise County. . . . . 6. *H. quinquesquamata*
      6. Outer phyllaries 8–15; not found in southern Arizona.
         7. Leaves highly divided, mid leaves divided into 5–11(–21) segments; outer phyllaries basally connate ½–⅔ their lengths. . . . . 10. *H. vaseyi*
         7. Leaves entire or moderately divided, mid leaves entire or divided into 3–5(–7) segments; outer phyllaries basally connate ¼–½ their lengths.
            8. Mid leaves usually divided into 3 segments, sometimes entire; terminal segments of divided mid leaves 2–5.5 mm wide; outer phyllaries weakly keeled, basally connate ¼–⅓ their lengths; ray floret corollas yellow to yellow-orange . . . . . 3. *H. helenioides*
            8. Mid leaves divided into 3–5(–7) segments; terminal segments of mid leaves 0.7–2.3(–2.5) mm wide; outer phyllaries weakly to strongly keeled, basally connate ¼–½ their lengths; ray floret corollas yellow.
               9. Biennials or monocarpic perennials; stems usually 1 (rarely 2 or 3). . . . . 2. *H. cooperi*
               9. Polycarpic perennials; stems 3–10 or more.
                  10. Stems to 5 dm or more; leaves glabrous or sparsely pubescent; outer phyllaries basally connate approximately ½ their lengths. . . . . 5. *H. lemmonii*
                  10. Stems less than 3 dm; leaves sparsely to densely pubescent; outer phyllaries basally connate ¼–½ their lengths. . . . . 7a. *H. richardsonii* var. *richardsonii*

1. HYMENOXYS BRACHYACTIS Wooton & Standl.

Hymenoxys brachyactis Wooton & Standl., Contr. U.S. Natl. Herb. 16: 192. 1913. TYPE: UNITED STATES. New Mexico. Torrance Co.: "near East View," 4 Aug 1906, *E. O. Wooton s.n.* (HOLOTYPE: US-690242!; ISOTYPE: NMC-50365!).

BIENNIALS OR MONOCARPIC PERENNIALS. STEMS 1–4(–8), branched distally, green throughout, 3–6 dm, glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately divided into 3–9 segments, glabrous; basal leaves divided into 5–7(–9) segments; proximal cauline leaves divided into 5–7 segments; mid leaves divided into (3–)5(–7) segments, terminal segments 0.8–1 mm

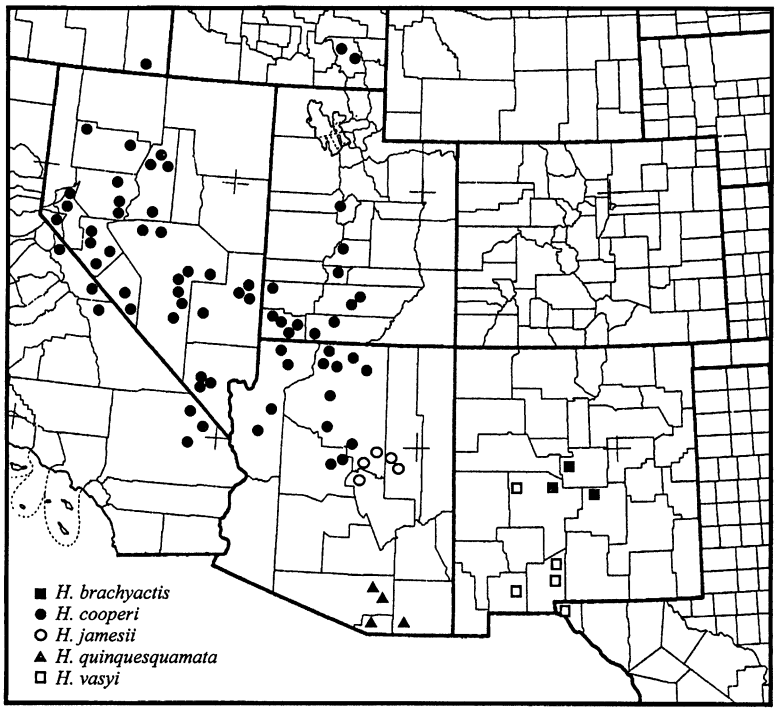

FIG. 1. Distribution of *Hymenoxys brachyactis, H. cooperi, H. jamesii, H. quinquesquamata,* and *H. vaseyi.*

wide; distal leaves simple or divided into 3 segments. HEADS (7–)40–150(–250) per plant in paniculiform to corymbiform arrays. PEDUNCLES 1.2–2 cm, glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. INVOLUCRES usually urceolate, sometimes campanulate, 6–8 × 5–6 mm. PHYLLARIES: outer phyllaries 8(–9), basally connate ½ their lengths, yellow to yellow-green proximally, green distally, lanceolate, 4–6 × 1.5–2 mm, strongly keeled, apices acute to acuminate, abaxial faces glabrous, sparsely to moderately dotted with sessile and/or impressed glands, adaxial faces glabrous, eglandular; inner phyllaries 8(–10), yellow to green distally, obovate, 4.5–5 × 1.5–2 mm, surpassing the outer, apices mucronate, faces glabrous, eglandular. RAY FLORETS 8(–9); corollas yellow, 7–8.5 × 3–4(–4.8) mm, lobes 3(–5), abaxial faces glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 3.1–4.2 × 0.7–1.2 mm, glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. RECEPTACLES conic, 1–2 × 2–2.5 mm. CYPSELAE narrowly obpyramidal, 2.1–2.5 × 0.6–0.8 mm, densely pubescent, eglandular; pappus scales 5(–7), obovate- to lanceolate-aristate, 2.5–3 × 0.7–0.8 mm.

DISTRIBUTION (Fig. 1) AND HABITAT: Endemic to central New Mexico, mainly in the Manzano Mountains of western Torrance County. Also reported from Gallinas Peak in northwestern Lincoln County and Los Piños Mountains in northeastern Socorro County (Bob Sivinski, Forestry Division, Santa Fe, NM, personal communication). Growing at roadsides, in open areas, and at edges of pine forests, 2000–2500 m.

FLOWERING AND FRUITING: July through September.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. New Mexico.** Torrance Co.: Capello Peak area, Manzano Mts, 2440 m, 14 Aug 1945, *Bridges 64* (US); around East View schoolhouse, 16 mi NW of Mountainair, 2100 m, 31 Aug 1946, *Parker & McClintock 6520* (NY, LL); 3.6 mi SW of Manzano on dirt rd to Eastview, 20 Aug 1975, *Bierner 51404* (TEX); ca 4 mi SW of Manzano on dirt rd that goes past Manzano State Park and up to Red Canyon, 1 Aug 1988, *Bierner 88-77* (TEX).

Within subg. *Picradenia, Hymenoxys brachyactis,* a central New Mexico endemic, overlaps in distribution only with *H. richardsonii* var. *floribunda.* I have not, however, observed them growing together locally. *Hymenoxys brachyactis* is readily distinguished from *H. richardsonii* var. *floribunda* by its biennial (or monocarpic perennial) duration, fewer stems, taller stature, more highly divided leaves, and urceolate involucres.

2. HYMENOXYS COOPERI (A. Gray) Cockerell

Actinella cooperi A. Gray, Proc. Amer. Acad. Arts 7: 359. 1868. TYPE: UNITED STATES. California: San Bernardino Co.: Providence Mountains, 5,000 ft. [c. 1524 m], 29 May 1861, *J. G. Cooper s.n.* (HOLOTYPE: GH!; ISOTYPE: US-322987!; probable ISOTYPE: K!).

Actinea cooperi (A. Gray) Kuntze, Revis. Gen. Pl. 1: 303. 1891.

Picradenia cooperi (A. Gray) Greene, Pittonia 3: 272. 1898.

Hymenoxys cooperi (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 494. 1904.

Actinella richardsonii (Hook.) Nutt. var. *canescens* Eaton in S. Watson, Bot. King's Exp. 175. 1871. TYPE: UNITED STATES. Nevada: Pershing Co.: "E. Humboldt Mts—peak," 9,000 ft. [c. 2744 m], Aug 1868, *S. Watson 617* (HOLOTYPE: GH!; ISOTYPES: NY!, US-27456!).

Picradenia canescens (Eaton) Greene, Pittonia 3: 271. 1898.

Hymenoxys canescens (Eaton) Cockerell, Bull. Torrey Bot. Club 31: 484. 1904.

Actinea canescens (Eaton) S. F. Blake, Contr. U.S. Natl. Herb. 25: 596. 1925.

Hymenoxys cooperi (A. Gray) Cockerell var. *canescens* (Eaton) K. L. Parker, Madroño 10: 159. 1950.

Actinella biennis A. Gray, Proc. Amer. Acad. Arts 13: 373. 1878. TYPE: UNITED STATES. Arizona: Mohave Co.: "Mokiak Pass, S.E. of St. George," 28–30 Apr or 1–4 Jun 1877, *E. Palmer 260* (LECTOTYPE here designated: GH!; ISOLECTOTYPES: BRY-230683!, GH!, K!, MO-208215!, MO-208216!, NDG-47152!, NY!, PH!, US-27487!, photograph of 2nd isolectotype at K!).

Actinea biennis (A. Gray) Kuntze, Revis. Gen. Pl. 1: 303. 1891.

Hymenoxys canescens (Eaton) Cockerell subsp. *biennis* (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 482. 1904.

Hymenoxys biennis (A. Gray) H. M. Hall, Univ. Calif. Publ. Bot. 3: 204. 1907.

Hymenoxys canescens (Eaton) Cockerell var. *nevadensis* Cockerell, Bull. Torrey Bot. Club 31: 484. 1904. TYPE: UNITED STATES. Nevada: Clark Co.: "Gravelly soil. Charleston Mts. Nevada," 6–7,000 ft. [c. 1829–2134 m], May–Oct 1898, *C. A. Purpus 6095* (HOLOTYPE: CAS not located; ISOTYPES: UC-89964!, US-348190!).

Hymenoxys cooperi (A. Gray) Cockerell var. *argyrea* Cockerell, Bull. Torrey Bot. Club 31: 496. 1904. TYPE: UNITED STATES. Arizona: Coconino Co.: "Collected about Grand Canon of the Colorado," 7,000 ft. [c. 2134 m], 28 Jun 1898, *D. T. MacDougal 189* (HOLOTYPE: US-334287!; ISOTYPES: GH!, UC-89967!).

Hymenoxys virgata A. Nelson, Amer. J. Bot. 18: 439. 1931. TYPE: UNITED STATES. Arizona: Coconino Co.: "Grand Canyon, Arizona, Bright Angel Trail," 22 Jun 1928, *G. E. Osterhout 6991* (HOLOTYPE: RM-123682!; ISOTYPE: RM-157739!).

BIENNIALS OR MONOCARPIC PERENNIALS. STEMS 1(–3), branched distally, usually distinctly purple-red-tinted proximally and green distally, sometimes purple-red-tinted throughout, (1–)2–8(–10) dm, sparsely to densely pubescent, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately or rarely bipinnately divided into 3–9 segments; basal leaves divided into 3–5(–7) segments, usually densely pubescent; proximal cauline leaves divided into 3–5(–9) segments, usually moderately to densely pubescent; mid leaves divided into 3–5 segments, terminal segments 1–2(–2.5) mm wide, sparsely to densely pubescent; distal leaves simple or divided into 3 segments, sparsely to moderately pubescent. HEADS (1–)7–45(–80) per plant in paniculiform to corymbiform arrays. PEDUNCLES (2–)3.5–8(–13) cm, sparsely to densely pubescent, sparsely to densely dotted with sessile glands. INVOLUCRES subhemispheric to hemispheric, 8–10 × 10–17 mm. PHYLLARIES: outer phyllaries 8–15, basally connate ⅓–½ their lengths, green throughout or yellow-green proximally and green distally, lanceolate, 4.5–8.9 × 1–3.3 mm, moderately to strongly keeled, apices acute to acuminate, abaxial faces sparsely to densely pubescent, sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous proximally, sparsely to moderately pubescent distally, eglandular; inner phyllaries 14–22, yellow-green to green distally, obovate to narrowly obovate, 4.1–6.8 × 1–3 mm, usually slightly surpassing the outer, apices acuminate to mucronate, abaxial faces sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 9–14; corollas yellow, 10.2–17(–21.5) × 4–7.5(–9.2) mm, lobes 3(–4), abaxial faces sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 2.7–4.8 × 0.4–0.8 mm, moderately pubescent, moderately dotted with sessile glands. RECEPTACLES usually conic, sometimes hemispheric, 1.5–3 × 3–5.5 mm. CYPSELAE narrowly obpyramidal, 1.7–3.7 × 0.5–1.2 mm, densely pubescent, eglandular; pappus scales 5–6(–8), usually obovate-aristate, 1.3–3.3 × 0.7–1.5 mm.

DISTRIBUTION (Fig. 1) AND HABITAT: Northwestern Arizona, western Utah, southeastern Idaho, eastern California, Nevada, and southeastern Oregon. Growing at roadsides, in open areas, and at edges of juniper-pine forests, (1000–)1500–2500(–3500) m.

FLOWERING AND FRUITING: May through September, mainly May and June.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Coconino Co.: S end of Oak Creek Cañon, just E of Sedona, 1740 m, 14 Jun 1965, *Strother 338* (TEX); Williams, Aug 1918, *Scott s.n.* (GH); 2 mi E of Hermits Rest in Grand Canyon National Park, 2040 m, 15 Jun 1965, *Strother 347* (TEX); hwy 89, 5.4 mi N of The Gap, 20 May 1988, *Bierner 88-56* (TEX); hwy alt 89, 11.8 mi E of hwy 67 (jct in Jacob Lake), at E edge of Kaibab National Forest, 20 May 1988, *Bierner 88-57* (TEX); 9 mi SE of Jacob Lake, 2100 m, 17 Jun 1947, *Parker & McClintock 6872* (TEX, US); rd to Big Spring, 8.0 mi SW of hwy 67 (jct just S of Jacob Lake), 20 May 1989, *Bierner 89-23* (TEX); hwy alt 89, 13.1 mi SE of hwy 389 (jct in Fredonia), 20 May 1988, *Bierner 88-58* (TEX). Mohave Co.: Hualapai Mts, Hualapai Mt State Park, 2070 m, 5 Sep 1987, *Franklin 5226* (NY); Peach Springs, 1884, *Lemmon 3310* (GH); Mt. Trumbull, jct of Death Valley and Nixon Spring rd, 13 Jun 1983, *Atwood 9441* (NY); Seegmiller Mt, 17.5 mi (air) S of St. George, UT, 1700 m, 23 May 1969, *Holmgren 3300* (NY). **California.** Inyo Co.: Wyman Creek Canyon, 2830 m, 24 Jun 1984, *Morefield 2167* (NY).

Mono Co.: White Mountain Road, SE slope of Sheep Mt, 3490 m, 8 Aug 1963, *Lloyd 3182* (NY); 0.2 km S, 0.6 km W of summit of Wheeler Peak, Sweetwater range, 3475 m, 19 Jul 1977, *Bell & Johnson 674* (NY). San Bernardino Co.: vicinity of Providence Mts, dirt rd 0.6 mi SW of entrance to Mid Hills campground, 14 May 1989, *Bierner 89-17* (TEX); 7.5 mi E of Cima in W New York Mts, 1845 m, 4 Jun 1973, *Henrickson 10521* (LL); ca 4 mi NW of Mt Pass on SE exposure of Clark Mt, 1980 m, *Prigge 1193* (TEX). **Idaho.** Bannock Co.: Fish Creek Pass, E of Lava Hot Springs, 13 Jun 1941, *Christ 12350* (NY); hill 5 mi SW of Pocatello, 1615 m, 24 Jun 1947, *Parker et al. 6940* (LL, MO, NY, US). **Nevada.** Churchill Co.: N side of Buffalo Mt, 4 mi E of hwy 50 on hwy 2 [rd to Eastgate], then 2.1 mi S on dirt rd, 1680 m, 18 May 1986, *Tiehm 10401* (NY, TEX); Clan Alpine Mts, ridge on N side of Mt Augusta, 2745 m, 2 Aug 1982, *Tiehm 7504* (NY); W side of Stillwater Range, 1 mi N of Copper Kettle Basin at an old Iron Mine site, 23 May 1982, *Lavin & Lavin 4089* (TEX). Clark Co.: hwy 157, 15.5 mi w of hwy 95 (rd to Mt Charleston), 15 May 1989, *Bierner 89-19* (TEX); hwy 52 [= hwy 156] at Lee Canyon, 2.6 mi SW of turn-off to Kyle Canyon, 13 Aug 1975, *Bierner 51391* (TEX); Kyle Canyon, Charleston Mts, 29 May 1937, 2100 m, *Clokey 7752* (GH, LL, MO, NY, TEX, US); many other collections from throughout the Charleston and Spring Mts. Douglas Co.: Pine Nut Mts, Bald Mt, ridge NE of the peak, 2745 m, 17 Jul 1982, *Tiehm & Lavin 7362* (MO, NY). Esmeralda Co.: Gold Mt, on summit of main ridge, 5 Jul 1941, *Alexander & Kellogg 2475* (GH, LL); Palmetto Mts, ridge just W of Blue Dick Peak, 2775 m, 27 Jul 1983, *Tiehm & Nachlinger 8230* (NY); White Mts, W rim of Mustang Mt, 0.3 mi NE of Kennedy Point, 3100 m, 5 Jul 1986, *Morefield & McCarty 4050* (NY). Lander Co.: S slope of Kingston Canyon, 1–3 mi below ranger station, 10 Jun 1937, *Henning 198* (GH); rocky canyon, rd to Cortez, 1.5 mi E of hwy 21, 12 Jun 1964, *Spellenberg 359* (NY); Shoshone Mts, E side of Mt Lewis about 1 mi W of Maysville Summit on the Hilltop Rd, 2255 m, 17 Jun 1985, *Tiehm 9701* (NY, TEX); Agusta Mts—Fish Creek Mts, Home Station Wash, less than 1 mi from the Lander-Pershing Co. line, 1525 m, 19 Jun 1979, *Goodrich 12764* (NY). Lincoln Co.: rd from Rose Valley to Deer Lodge Canyon, 1950 m, 10 Jun 1981, *Williams & Tiehm 81-36-1* (NY); near SR 322, Ursine-Pioche rd, 1890 m, 28 Jun 1980, *Williams 80-155-3* (NY); 0.5 mi N of Pioche city limits, near hwy 93, 1830 m, 17 Jun 1982, *Williams & Tiehm 82-159-1* (NY); Andies Mine rd, foothills of NE Timpahute Range, 1920 m, 15 Jun 1969, *Bentley 8953* (NY). Lyon Co.: W side of Rawe Peak, Pine Nut Mts, 2530 m, 24 Jul 1982, *Williams & Larson 82-304-4* (NY); Virginia Range, NW of Silver Springs, 1890 m, 27 May 1977, *Tiehm 3331* (NY). Mineral Co.: 4.1 mi S of city of Mt Montgomery along rd to Tip Top Mine, 12 Jul 1976, *Bierner 52379* (TEX); Pilot Mts, Pilot Peak area at the head of the rd up Telephone Canyon, ESE of Mina, 2775 m, 4 Jul 1988, *Tiehm 11816* (NY, TEX); Wassuk Range, summit of Mt Grant, 3445 m, 26 Aug 1938, *Archer 6766* (GH, NY); Corey Relay Station, USDI, 3085 m, 27 Jun 1974, *Robertson 4200-1* (NY). Nye Co.: SW end of Belted Range, Doe Point, NW Rainier Mesa, 2340 m, 14 Jun 1970, *Beatley & Reveal 11131* (NY, US); Nellis Bombing and Gunnery Range, pass just N of Belted Peak, near N end of Belted Range, 1950 m, 22 May 1976, *Wendt et al. 1543* (TEX); central Kawich Range, base of W slope near Stinking Springs, 2010 m, 6 Jun 1970, *Beatley & Reveal 10980* (NY, US); 10 mi E of Warm Springs on hwy 25-375, 1585 m, 4 Jun 1980, *Neese & White 8855* (NY); E face of N Reveille range, rd to Reveille, 1830 m, 6 May 1971, *Beatley & Reveal 12536* (NY); slopes on benches W of Cherry Creek Pass on E side of Railroad Valley, Quinn Canyon Range, 20 Jun 1945, *Maguire & Holmgren 25,527* (NY, TEX); Ophir Ridge, Toquima Range, 3230 m, 24 Jun 1978, *Williams & Tiehm 78-239-5* (NY); Toiyabe Mts, ridge

just W of W fork of Stewart Creek, 3000 m, 3 Jul 1973, *Cronquist 10,986* (GH, NY, US). Pershing Co.: SE side of Calico Mts, 1310 m, 2 Jun 1979, *Tiehm & Birdsey 4965* (MO, NY). **Oregon.** Malheur Co.: W of McDermitt, 14 Jul 1976, *Packard 76-178* (NY). **Utah.** Garfield Co.: at jct of hwy 12 and rd to Hole-in-the-Rock, ca 5 mi E of Escalante, 8 Jul 1976, *Bierner 52368* (TEX); 5.9 mi W of hwy 12 on rd to Hell's Backbone (jct ca 4 mi S of Boulder), 19 May 1989, *Bierner 89-21* (TEX). Iron Co.: between Hamblin Valley and the Mahogany Mts of Nevada, ca 0.5 mi E of county [state] line, 1830 m, 2 Jun 1983, *Shultz & Shultz 7102* (NY). Juab Co.: N end of Canyon Mts, 12 mi ENE of Lynndyl, 1495 m, 3 Jun 1981, *Neese & Goodrich 10411* (NY). Kane Co.: Sandstone Butte, 8 airmiles WNW of the S end of the Coral Pink Sand Dunes, 2000 m, 15 May 1984, *Atwood 9639* (NY); 12.7 mi SE of the jct of the Cottonwood Wash rd and hwy 54 at Cannonville, 5.5 mi E of the Kodachrome Flat rd and about 3 mi W of the Grosvenor Arch turnoff, 1800 m, 6 Jun 1967, *Reveal et al. 805* (GH, NY, TEX). Piute Co.: Marysvale, 1830 m, 21 May 1894, *Jones s.n.* (NY). Sevier Co.: cañon above Richfield, 1585 m, 5 Jun 1875, *Ward 175* (US). Washington Co.: ca 2 mi N of Rockville, 1295 m, 6 May 1988, *Welsh & Clark 24,006* (NY); Right Fork North Creek, near jct of Trail Canyon, Zion National Park, 1325 m, 9 Jun 1988, *Tuhy 3491* (NY); Pine Valley, 1874, *Parry 111* (MO); roadcut ca 2 mi E of Central, 1695 m, 12 May 1986, *Warrick 1214* (NY).

Hymenoxys cooperi is wide-spread geographically and quite variable morphologically. It is not surprising, therefore, that several morphologic variants have been recognized taxonomically. The name "cooperi" has generally been associated with taller (5–10 dm) puberulent to glabrate plants from southern California and southern Nevada, the name "biennis" with medium height (3–5 dm) puberulent plants from northern Arizona and southern Utah, and the name "canescens" with shorter (1–2 dm) canescent plants from the more northern parts of the range. I have collected *H. cooperi* (sensu lato) in California, Nevada, Arizona, and Utah, and I have examined herbarium specimens from throughout the range, and have found no consistent geographic pattern to the variations in morphology that I would be comfortable using to distinguish these entities at the specific or infraspecific levels. It is perhaps notable, however, that three populations of *H. cooperi,* two from northern Arizona and one from southern Utah, were grouped together and separated from a southern California population and a southern Nevada population in the consensus tree based on DNA restriction site changes in the work of Bierner and Jansen (1998), indicating that there has been some genetic divergence of populations that correlates with geographic distribution.

3. HYMENOXYS HELENIOIDES (Rydb.) Cockerell

Picradenia helenioides Rydb., Bull. Torrey Bot. Club 28: 21. 1901. TYPE: UNITED STATES. Colorado: Costilla Co.: "Sangre de Christo Creek," 2,400–2,700 m, 2 Jul 1900, *P. A. Rydberg & F. K. Vreeland 5495* (HOLOTYPE: NY!; ISOTYPES: NY!, RM-29858!).

Hymenoxys helenioides (Rydb.) Cockerell, Bull. Torrey Bot. Club 31: 481. 1904.

Dugaldia helenioides (Rydb.) A. Nelson, New Man. Centr. Rocky Mts. 562. 1909.

Actinea helenioides (Rydb.) S. F. Blake, J. Wash. Acad. Sci. 21: 335. 1931.

POLYCARPIC PERENNIALS. STEMS 1–5(–10+) from branched, woody caudices, branched distally, green throughout or lightly purple-red-tinted proximally, 2–5 dm, sparsely to moderately pubescent, eglandular or sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately divided into 3 segments, glabrous or sparsely pubescent; basal leaves simple or divided into 3 segments; proximal cauline

leaves simple or divided into 3 segments; mid leaves usually divided into 3 segments, sometimes simple, terminal segments 2–5.5 mm wide; distal leaves usually simple, sometimes divided into 3 segments. HEADS 5–50+ per plant in paniculiform to corymbiform arrays. PEDUNCLES (2.5–)4–7.5 cm, usually moderately to densely pubescent, usually moderately to densely dotted with sessile glands. INVOLUCRES subhemispheric to hemispheric, 9–12 × 12–18 mm. PHYLLARIES: outer phyllaries 10–15, basally connate ¼–⅓ their lengths, green throughout or yellow-green proximally and green distally, lanceolate, 7.5–11 × 2–3 mm, weakly keeled, apices acuminate, abaxial faces sparsely to moderately pubescent, sparsely to moderately dotted with sessile and/or impressed glands, adaxial faces sparsely pubescent proximally, moderately pubescent distally, eglandular; inner phyllaries 13(–17), yellow to green distally, obovate, 5–8 × 2–3 mm, surpassed by or surpassing the outer, apices acuminate to mucronate, abaxial faces sparsely to moderately pubescent, sparsely dotted with sessile glands, adaxial faces glabrous or occasionally sparsely pubescent distally. RAY FLORETS 10–16; corollas yellow to yellow-orange, 17–31 × 5–11 mm, lobes 3, abaxial faces glabrous or sparsely pubescent, eglandular or sparsely dotted with sessile glands. DISC FLORETS: corollas 3.5–5.5 × 0.7–1 mm, glabrous or sparsely pubescent, sparsely dotted with sessile glands. RECEPTACLES hemispheric to conic, 2–3 × 3–4 mm. CYPSELAE narrowly obpyramidal, 2.5–3.5 × 0.8–1 mm, densely pubescent, eglandular; pappus scales 5–7, obovate- to lanceolate-aristate, 2.5–4 × 0.7–0.9 mm.

DISTRIBUTION (Fig. 2) AND HABITAT: North-central and northeastern Arizona, central and eastern Utah, and southwestern and south-central Colorado. Growing at roadsides, in open areas, and at edges of forests, 2200–3000 m.

FLOWERING AND FRUITING: June through August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Apache Co.: Lukachukai Mts, 2210 m, 23 Jun 1939, *Peebles 14401* (ARIZ, US). Coconino Co.: Hart Praire, S of Fern Mt and W of San Francisco Peaks, 2590 m, 8 Aug 1962, *Demaree 46112* (ARIZ). **Colorado.** Costilla Co.: see type specimen. Hinsdale Co.: along upper Cebolla Creek between Lake City and Cathedral, 7 Jul 1940, *Penland 1548* (LL). **Utah.** Carbon Co.: Castle [Valley] Ridge, above Clear Creek, 2930 m, 23 Aug 1946, *Parker et al. 6369* (ARIZ, GH, MO, NY, US). Garfield Co.: rd to Teasdale, 10.9 mi N of Boulder, $2n = 15_{II}$, one cell with two lagging univalents and one lagging bivalent, 8 Jul 1976, *Bierner 52371* (TEX); hwy 12, ca 12 mi N of Boulder, 22 Jun 1992, *Bierner 92-40* (TEX). Grand or San Juan Co.: La Sal Mts, 2 Jun 1914, *Jones s.n.* (NY). Sanpete Co.: Blacks Fork Creek, Muddy Creek drainage, T20S, R4E, Sec 25, S of Ferron Reservoir, Manti-La Sal National Forest, 19 Jul 1981, *Atwood 8049* (NY). Sevier Co.: Wasatch Plateau, E of White Mt, head of Cowboy Creek, Sec 2, T21S, R4E, 2970 m, 2 Aug 1979, *Albee 4687* (NY).

An additional specimen from Colorado, which I have not examined, has been called to my attention by Warren L. Wagner and is shown on the distribution map: Mesa Co.: Colorado Nat'l Monument, *Penland 1783* (US).

Anderson et al. (1996) and Bierner and Jansen (1998) provided evidence that *Hymenoxys helenioides* is a hybrid between *H. hoopesii* and *H. richardsonii* var. *floribunda.* On the few occasions that I have collected *H. helenioides,* both putative parents have been growing close by, and the one chromosome count that I have made included a cell with lagging chromosomes (see *Bierner 52371* above). While I believe that *H. helenioides* is of hybrid origin, I have decided to recognized it as a species, because it is unclear at this time whether all of the plants are F_1 hybrids or if at least

some of them have given rise to breeding populations.

4. HYMENOXYS JAMESII Bierner

Hymenoxys jamesii Bierner, Madroño 40: 43. 1993. TYPE: UNITED STATES. Arizona: Navajo Co.: forest rd 504 (rd to Winslow from Heber), 5.9 mi NW of hwy 260 (jct just W of Heber), 12 Aug 1991, *M. W. Bierner 91-87* (HOLOTYPE: TEX!, ISOTYPES: NY!, US!).

BIENNIALS OR MONOCARPIC PERENNIALS. STEMS 1–4(–20), branched distally, usually distinctly purple-red-tinted proximally and green distally, 3–12 dm, sparsely to densely pubescent, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately or bipinnately divided into 3–9 segments; basal leaves divided into (3–)5–7(–9) segments, usually sparsely pubescent; proximal cauline leaves divided into 3–5(–7) segments, sparsely to moderately pubescent; mid leaves divided into 3–5 segments, terminal segments 0.8–2.2 mm wide, sparsely to densely pubescent; distal leaves simple or divided into 3(–5) segments, sparsely to densely pubescent. HEADS (30–)50–180(–330) per plant in paniculiform to corymbiform arrays. PEDUNCLES 1.3–5 cm, sparsely to densely pubescent, sparsely to densely dotted with sessile glands. INVOLUCRES subhemispheric to campanulate, 4–7 × 4–8 mm. PHYLLARIES: outer phyllaries 8–10, basally connate ⅓ their lengths, green throughout or yellow-green proximally and green distally, ovate to lanceolate, 2.9–5.5 × (0.5–)1–1.9 mm, moderately to strongly keeled, apices acute to acuminate, abaxial faces sparsely to moderately pubescent especially along the margins, sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous or sometimes sparsely pubescent distally, eglandular; inner phyllaries 8–14, yellow-green to green distally, obovate, 2.8–4.2 × 1–2.5 mm, usually slightly surpassing the outer, apices mucronate, abaxial faces glabrous or sparsely to moderately pubescent especially along the margins, sparsely to moderately dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 7–9; corollas yellow, 4.2–8 × 2.3–5 mm, lobes 3, abaxial faces sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 2.4–3 × 0.4–0.8 mm, glabrous or sparsely to densely pubescent, sparsely to moderately dotted with sessile glands. RECEPTACLES hemispheric to usually conic, 1–2 × 1–2.4 mm. CYPSELAE narrowly obpyramidal, 1.6–2.1 × 0.4–0.7 mm, densely pubescent, eglandular; pappus scales 4–5(–8), usually obovate-aristate, sometimes obovate, 0.8–2.1 × 0.5–1 mm.

DISTRIBUTION (Fig. 1) AND HABITAT: Endemic to the Mogollon Plateau of east-central Arizona. Growing at roadsides, in open areas, and at edges of juniper-pine forests, 2000–2400 m.

FLOWERING AND FRUITING: June through September, mainly July and August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Coconino Co.: hwy 87, 7.7 mi SW of the turnoff to Happy Jack, 30 Jul 1988, *Bierner 88-72* (TEX); forest rd 504 (rd to Heber), 2.9 mi S of hwy 99, 11 Aug 1991, *Bierner 91-84* (TEX). Gila Co.: hwy 87, 13.0 mi NW of hwy 260, just S of Pine, 9 Aug 1975, *Bierner 51382* (TEX). Navajo Co. Chevelon Crossing campground, ca 16 mi NW of hwy 260 on forest rd 504 (jct just W of Heber), 11 Aug 1991, *Bierner 91-85* (TEX); forest rd 504, 1.4 mi NW of hwy 260 (jct just W of Heber), 12 Aug 1991, *Bierner 91-88* (TEX).

Hymenoxys jamesii is endemic to the Mogollon Plateau of eastern central Arizona and is completely allopatric to the other taxa of *Hymenoxys* subg. *Picradenia.* It appears to be closely related to *H. cooperi.* It can be readily distinguished from *H. cooperi* by several characteristics including its later flowering time, greater number of heads per plant, and smaller heads, phyllaries, ray co-

rollas, disc corollas, cypselae, and pappus scales.

5. HYMENOXYS LEMMONII (Greene) Cockerell

Picradenia lemmonii Greene, Pittonia 3: 272. 1898, as *lemmoni.* TYPE: UNITED STATES. California. *J. G. Lemmon 148* (HOLOTYPE: NY!).

Hymenoxys lemmonii (Greene) Cockerell, Bull. Torrey Bot. Club 31: 477. 1904.

Actinea lemmonii (Greene) S. F. Blake, Contr. U.S. Natl. Herb. 25: 596. 1925.

Picradenia biennis Greene, Pittonia 3: 272. 1898. TYPE: UNITED STATES. Utah. Iron Co.: Red Creek [Paragonah], 25 or 26 Jun 1877, *E. Palmer 261* (HOLOTYPE: NY!; ISOTYPES: GH!, MO-208277!, MO-208380!, NY-two sheets!; US-782677!).

Hymenoxys lemmonii (Greene) Cockerell subsp. *greenei* Cockerell, Bull. Torrey Bot. Club 31: 479. 1904, stat. et nom. nov. based on *Picradenia biennis* Greene.

Hymenoxys greenei (Cockerell) Rydb., Bull. Torrey Bot. Club 37: 448. 1910.

POLYCARPIC PERENNIALS. STEMS 3–10(–15) from sometimes branched woody caudices, branched distally, green throughout or purple-red-tinted proximally and green distally, 3–5 dm, glabrous or sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately or rarely bipinnately divided into 3–13 segments, glabrous or sparsely pubescent; basal leaves usually divided into (3–)5–9(–13) segments; proximal cauline leaves divided into (3–)5–9(–11) segments; mid leaves divided into (3–)5(–7) segments, terminal segments 1.5–2.3 mm wide; distal leaves simple or divided into 3 segments. HEADS 10–85+ per plant in paniculiform to corymbiform arrays. PEDUNCLES (1–)2–4.5 cm, glabrous or sparsely to moderately or, occasionally, densely pubescent, sparsely to densely dotted with sessile glands. INVOLUCRES subhemispheric to campanulate, 8–11 × 12–15 mm. PHYLLARIES: outer phyllaries 10–12, basally connate ¼–½ their lengths, green throughout or yellow-green proximally and green distally, ovate to lanceolate, 4.5–7 × 1.5–2.5 mm, moderately to strongly keeled, apices acute to acuminate, abaxial faces glabrous or sparsely pubescent, sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous or, sometimes, sparsely pubescent distally, eglandular; inner phyllaries 13–18(–28), yellow-green distally, obovate, 4–6 × 1.8–2.7 mm, slightly surpassed by to surpassing the outer, apices usually mucronate, abaxial faces glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 9–12; corollas yellow, 10–16 × 4–6.5 mm, lobes 3(–4), abaxial faces glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 3.5–4.2 × 0.7–1 mm, sparsely to moderately pubescent, eglandular or sparsely to moderately dotted with sessile glands. RECEPTACLES conic, 2–3 × 3–4 mm. CYPSELAE obpyramidal to narrowly obpyramidal, 2.5–3.5 × 0.7–1 mm, moderately pubescent, eglandular or sparsely to moderately dotted with sessile glands; pappus scales 5(–6), usually obovate-aristate, (1.5–)2.1–2.8 × (0.4–)0.7–0.8 mm.

DISTRIBUTION (Fig. 2) AND HABITAT: Southeastern Utah, Nevada (mainly northern), and northern California. Growing at roadsides, in open areas and meadows, on slopes, and along drainage areas and streams, (800–)1400–2200(–3200) m.

FLOWERING AND FRUITING: June through September, mainly July and August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. California.** Plumas Co.: on rd from Chilcott, Jun 1927, *Eastwood 14898* (LL). Sierra Co.: 1874, *Lemmon 120* (MO, NY). Siskiyou Co.: N side of Mt Shasta, 1525–2745 m, 11–16 Jun

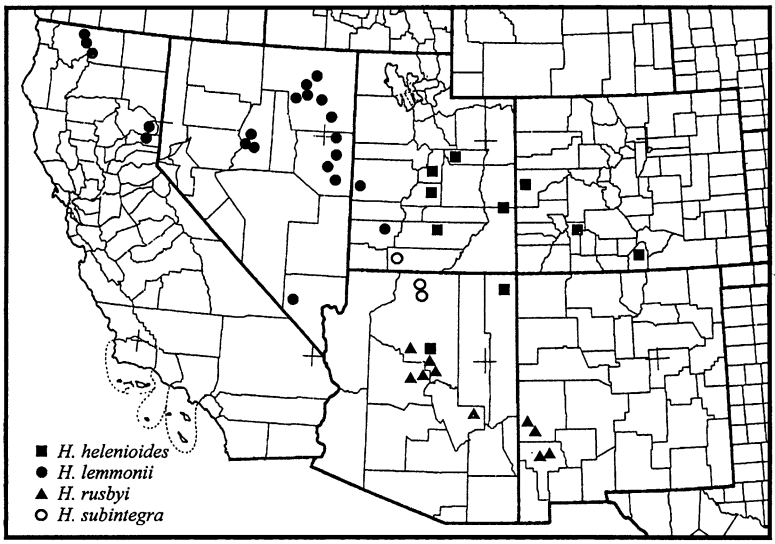

FIG. 2. Distribution of *Hymenoxys helenioides, H. lemmonii, H. rusbyi,* and *H. subintegra.*

1897, *Brown 4131/2* (MO, NY, US); Shasta Valley, 4.6 mi N of Gazelle, 825 m, 5 Jul 1934, *Wolf 5976* (GH, TEX); Yreka, 9 Jun 1905, *Heller s.n.* (NY, US). **Nevada.** Clark Co.: grassy meadow and openings among *Pinus aristata,* Charleston Peak, Charleston (Spring) Mts, 3000–3200 m, 22 Jul 1937, *Clokey 7753* (LL, MO, NY, TEX). Elko Co.: hwy 93, 7.4 mi S of Currie, 11 Jul 1976, *Bierner 52376* (TEX); hwy 93, 1.6 mi S of hwy 11 [hwy 229], 11 Jun 1976, *Bierner 52373* (TEX); dirt rd from Lamoille to hwy 11 [hwy 229], 9.8 mi NE of Lamoille and 7.5 mi sw of hwy 11 [hwy 229], 11 Jul 1976, *Bierner 52372* (TEX); rd from Elko to Lamoille, ca 0.5 mi S of turnoff to Jiggs, 1615 m, $2n = 15$II, 6 Jul 1969, *Strother & Ferlatte 828* (NY, TEX); Humboldt River, Halleck, 24 Jul 1941, *Holmgren 1543* (NY); hwy 40, 2–3 mi SE of Deeth, grassy meadow, 1650–1675 m, 22 Jul 1938, *Pennell & Schaeffer 23435* (NY). Lander Co.: ca 35 mi W of Austin, 24 Jul 1938, *Rethke & Raadshooven 4644* (NY, US); hwy 50, 4.2 mi W of hwy 305 (jct just W of Austin), 27 Jul 1988, *Bierner 88-69* (TEX); 3–18 mi N of Austin along hwy 8A [hwy 305], 27 Jul 1937, *Goodner & Henning 871* (GH). White Pine Co.: Spring Valley, hwy 50, 7 mi E of Major's Place (jct of 50 & 93), 15 Jul 1981, *Neese et al. 10687* (NY); Steptoe Creek, 2 mi N on Success Road, 2075 m, 10 Jul 1974, *Mozingo 74-25* (NY); hwy 93, 19.7 mi N of the center of McGill, 11 Jul 1976, *Bierner 52377* (TEX); Becky Spring[s], E of intersection of hwy 93 and alt 50, 1935 m, 31 Jul 1978, *Williams & Tiehm 78-270-7* (NY). **Utah.** Millard Co.: SW of Dearden Ranch, Burbank 1 mi, 1660 m, 28 Aug 1980, *Welsh et al. 20164* (NY).

Hymenoxys lemmonii, although ranging from southeastern Utah and southern Nevada to northern California, is not particularly variable morphologically. Its distribution overlaps that of *H. cooperi* in some parts of Nevada; I have not observed them growing together locally. *Hymenoxys lemmonii* is distinguished from *H. cooperi* by its later flowering time, polycarpic perennial duration, greater number of stems, and glabrous or only sparsely pubescent leaves.

6. HYMENOXYS QUINQUESQUAMATA Rydb.

Hymenoxys quinquesquamata Rydb., N.

Amer. Fl. 34: 114. 1915. TYPE: UNITED STATES. Arizona. Cochise Co.: "Open flats & ridges—Carr Peak, Huachuca Mts.," 27 Aug 1910, *L. N. Goodding 874* (HOLOTYPE: NY!, photograph of holotype at MO!; probable ISOTYPE: GH!).

Actinea quinquesquamata (Rydb.) S. F. Blake, J. Wash. Acad. Sci. 30: 472. 1940.

Hymenoxys cooperi (A. Gray) Cockerell var. *grayi* Cockerell, Bull. Torrey Bot. Club. 31: 495. 1904. TYPE: UNITED STATES. Arizona: Cochise Co.: "Huachuca Mts.," Jun–Sep 1882, *J. G. Lemmon 2774* (HOLOTYPE: US-27492!; ISOTYPES: BM!, NY!; possible ISOTYPE: GH!).

POLYCARPIC PERENNIALS. STEMS 1(–3), branched distally, green throughout or purple-red-tinted proximally and green distally, 3–10 dm, sparsely to moderately pubescent, sparsely dotted with sessile glands. LEAVES simple or pinnately or, rarely, bipinnately divided into 3–17 segments, glabrous or sparsely pubescent; basal leaves simple or divided into 3–7 segments; proximal cauline leaves divided into 5–17 segments; mid leaves divided into 5–11 segments, terminal segments 0.8–2 mm wide; distal leaves simple or divided into 3 segments. HEADS 5–50+ per plant in paniculiform to corymbiform arrays. PEDUNCLES 2.5–7 cm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. INVOLUCRES campanulate, 8–10 × 9–12 mm. PHYLLARIES: outer phyllaries 5(–8), basally connate ⅓–½ their lengths, yellow-green proximally and green distally, often purple-red-tinted on the margins, obovate to ovate, 6–7 × (2.5–)3.5–4.5 mm, moderately to strongly keeled, apices acuminate, abaxial faces glabrous or sparsely pubescent, moderately to densely dotted with sessile and/or impressed glands, adaxial faces glabrous, eglandular; inner phyllaries 6–8, yellow to green distally, obovate, 6.5–8 × 3–4.5 mm, surpassing the outer, apices mucronate, abaxial faces glabrous, eglandular or sparsely dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 5–8; corollas yellow, 14–18 × 7–12 mm, lobes 3(–4), abaxial faces glabrous, sparsely dotted with sessile glands. DISC FLORETS: corollas 3.5–4.3 × 0.7–1 mm, usually moderately pubescent, sparsely dotted with sessile glands. RECEPTACLES conic, 2.5–3.5 × 2.5–4 mm. CYPSELAE obpyramidal, 2.5–3.9 × 1–1.5 mm, moderately to densely pubescent, eglandular; pappus scales 5–6, obovate to obovate-aristate, 1.2–2.5 × 0.8–1 mm.

DISTRIBUTION (Fig. 1) AND HABITAT: Endemic to southern Arizona mainly in the Huachuca Mountains in Cochise County; also found in the Rincon Mountains and Santa Catalina Mountains in Pima County and the Santa Rita Mountains in Santa Cruz County. Growing in open areas and at the edges of pine-oak forests, 1500–2450 m.

FLOWERING AND FRUITING: June through October, mainly July through September.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Cochise Co.: Huacuca Mts, Carr Canyon, 7.5 mi W of hwy 92 on Carr Canyon Road (jct SE of Sierra Vista), 31 Jul 1988, *Bierner 88-73* (TEX). Pima Co.: Rincon Mts, 1891, *Nealley 208* (US); Santa Catalina Mts, Sabino Cañon, Box Springs, 10 Aug 1906, *Livingston & Thornber s.n.* (ARIZ, US). Santa Cruz Co.: Stone Cabin Cañon, Santa Rita Mts, 1525 m, 6 Jul 1903, *Thornber 279* (ARIZ, MO, NY, US).

Hymenoxys quinquesquamata, which is allopatric to the other taxa of *Hymenoxys* subg. *Picradenia,* has been collected only in southern Arizona. I would not be surprised to find it in northern Sonora, Mexico. As its specific epithet implies, it tends to have 5 outer phyllaries, but I have counted as many as 8. Still, phyllary number alone tends to distinguish it from the other taxa, which generally have 8 or more outer phyllaries. *H. rusbyi* may have as few as 7; its heads are much smaller in diameter.

7. HYMENOXYS RICHARDSONII (Hook.) Cockerell, Bull. Torrey Bot. Club 31: 468. 1904.

POLYCARPIC PERENNIALS. STEMS 1–30+ from highly branched woody caudices, branched distally, usually green throughout, rarely purple-red-tinted proximally and green distally, 0.7–3.4 dm, glabrous or sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately divided into 3–7 segments; basal leaves simple or divided into 3–7 segments, densely long-villous-wooly proximally, glabrous or sparsely to moderately pubescent distally; proximal cauline leaves divided into 3–5 segments, glabrous or sparsely to moderately pubescent; mid leaves divided into 3–5 segments, terminal segments 0.7–2 mm wide, glabrous or sparsely to moderately pubescent; distal leaves simple or divided into 3 segments, glabrous or sparsely pubescent. HEADS 5–300+ per plant in corymbiform arrays. PEDUNCLES 1–5 cm, sparsely to densely pubescent, sparsely to densely dotted with sessile glands. INVOLUCRES campanulate, 7–11 × 7–14 mm. PHYLLARIES: outer phyllaries 8–13, basally connate ½ their lengths, green throughout or yellow-green proximally and green distally, sometimes purple-red-tinted on the margins, obovate to ovate to lanceolate, 3.5–8 × 1–2.5 mm, weakly to strongly keeled, apices acute to acuminate, abaxial faces sparsely to densely pubescent, sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous, eglandular; inner phyllaries 8–18, yellow to green distally, obovate, 3–8 × 1.5–2.5 mm, slightly surpassing the outer, apices mucronate, abaxial faces glabrous or sparsely to moderately pubescent, eglandular or sparsely dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 7–14; corollas yellow, 7–17 × 3–6 mm, lobes 3(–4), abaxial faces sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 3–5 × 0.7–1 mm, glabrous or sparsely to moderately pubescent, eglandular or sparsely to moderately dotted with sessile glands. RECEPTACLES conic, 1.5–3.5 × 1.5–4 mm. CYPSELAE narrowly obpyramidal, 2–3 × 0.6–1 mm, densely pubescent, eglandular or sparsely dotted with sessile glands; pappus scales 4–8, usually obovate- to lanceolate-aristate, 1.8–3.5 × 0.5–1 mm.

INTERMEDIATE SPECIMENS EXAMINED: **UNITED STATES. Colorado.** Lake Co.: hwy 82, at E edge of Twin Lakes, 19 Aug 1975, *Bierner 51399* (TEX). Park Co.: Wilkerson Pass, 2940 m, 9 Jul 1939, *Ehlers 7711* (GH); South Park, 17 Sep 1878, *Jones 746* (GH, NY, US). Summit Co.: Near Breckenridge, 2970 m, Aug 1901, *Mackenzie 60* (NY). **Utah.** Carbon Co.: dirt rd to Castle Valley Ridge, ca 2.3 mi E of Clearcreek, 18 Aug 1975, *Bierner 51396* (TEX); rim of Range Creek, near Willow Springs, 10 mi E of Sunnyside, 2970 m, 12 Jul 1935, *Graham 9621* (GH, MO).

The two varieties of *Hymenoxys richardsonii* are widely distributed (Fig. 3) and quite variable morphologically; hence, both have rather extensive synonymies. In general, var. *richardsonii* can be distinguished from var. *floribunda* by its shorter stature, larger heads, and fewer heads per plant. Where their distributions overlap in Utah and Colorado, intermediates are not uncommon.

Of some note are plants from the summit of Sandia Crest in Bernalillo County, New Mexico. I have collected plants from and examined herbarium specimens from this area. The plants are generally shorter in stature with somewhat larger heads than other plants from northern New Mexico. They may be relict var. *richardsonii* or simply higher elevation variants of var. *floribunda.* I have noted similar high elevation "dwarf" variants in *H. cooperi* and in *Tetraneuris acaulis.*

7a. HYMENOXYS RICHARDSONII (Hook.) Cockerell var. RICHARDSONII

Picradenia richardsonii Hook., Fl. Bor.

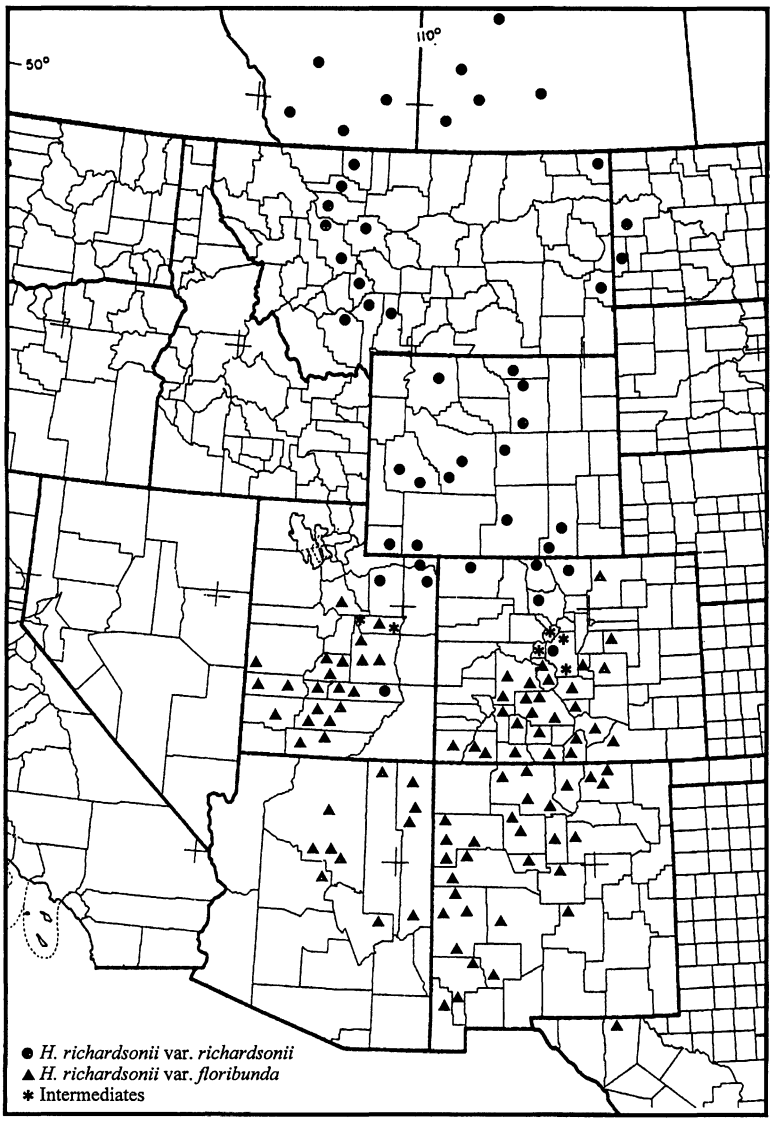

FIG. 3. Distribution of *Hymenoxys richardsonii* var. *richardsonii, H. richardsonii* var. *floribunda,* and intermediates between the two varieties.

Amer. 1: 317. t. 108. 1833. TYPE: CANADA. Saskatchewan. "Carlton House Fort," *D. Richardson s.n.* (HOLOTYPE: K! photograph of holotype at GH!; possible ISOTYPES: BM!, NY!, PH!).

Actinella richardsonii (Hook.) Nutt., Trans. Amer. Philos. Soc. 7: 379. 1841.

Actinea richardsonii (Hook.) Kuntze, Revis. Gen. Pl. 1: 303. 1891.

Hymenoxys richardsonii (Hook.) Cockerell, Bull. Torrey Bot. Club 31: 468. 1904.

Hymenopappus ligulaeflorus A. Nelson, Wyoming Agric. Exp. Sta. Bull. 28: 135. 1896. TYPE: UNITED STATES. Wyoming. Albany or Converse Co.: "Plains near Laramie Peak," 6 Aug 1895, *A. Nel-*

son 1603 (LECTOTYPE here designated RM-5532!; ISOLECTOTYPES: NY!, RM!). This was apparently distributed under two different numbers, *1603* and *1573* (Nelson, 1898). One *1573* collection (GH) carries the date August 4, 1895; another *1573* collection (NDG) carries the date August 6, 1895. No *1573* collections were located at RM. All of the *1603* collections carry the date August 6, 1895, and two of them are located at RM. The original description gives the date as August 5, 1895.

Picradenia ligulaeflora (A. Nelson) A. Nelson, Bull. Torrey Bot. Club 25: 378. 1898.

Hymenoxys richardsonii (Hook.) Cockerell subsp. *ligulaeflora* (A. Nelson) Cockerell, Bull. Torrey Bot. Club 31: 474. 1904.

Hymenoxys ligulaeflora (A. Nelson) Cockerell, Bull. Amer. Mus. Nat. Hist. 22: 422. 1906.

Picradenia pumila Greene, Pittonia 3: 271. 1898. TYPE: UNITED STATES. Wyoming. Albany Co.: Rock Creek, 10 Jul 1896, *E. L. Greene s.n.* (HOLOTYPE: NDG-061629!).

Hymenoxys richardsonii (Hook.) Cockerell subsp. *pumila* (Greene) Cockerell, Bull. Torrey Bot. Club 31: 472. 1904.

Hymenoxys pumila (Greene) Rydb., Bull. Torrey Bot. Club 33: 156. 1906.

Hymenoxys pumila (Greene) Lunell, Amer. Midl. Naturalist 5: 65. 1917, comb. superfl.

Picradenia macrantha A. Nelson, Bot. Gaz. 28: 130. 1899. TYPE: UNITED STATES. Wyoming. Carbon Co.: Ft. Steele, 18 Jun 1898, *A. Nelson 4830* (HOLOTYPE: RM-15395!; ISOTYPES: GH!, NY!, RM!, US-344937!, US-956722!).

Hymenoxys richardsonii (Hook.) Cockerell subsp. *macrantha* (A. Nelson) Cockerell, Bull. Torrey Bot. Club 31: 475. 1904.

Hymenoxys macrantha (A. Nelson) Rydb., Bull. Torrey Bot. Club 33: 156. 1906.

Hymenoxys richardsonii (Hook.) Cockerell var. *macounii* Cockerell, Bull. Torrey Bot. Club 31: 474. 1904, as *macouni.* TYPE: CANADA. Saskatchewan. Wood Mountain, 6 Jun 1895, *J. Macoun 10950* (HOLOTYPE: NDG-061630!; ISOTYPE: MICH!).

Hymenoxys macounii (Cockerell) Rydb., Bull. Torrey Bot. Club 37: 447. 1910.

Hymenoxys richardsonii (Hook.) Cockerell var. *nelsonii* Cockerell, Bull. Torrey Bot. Club 31: 475. 1904, as *nelsoni.* TYPE: UNITED STATES. Wyoming. Albany Co.: "Centennial Hills," 19 Aug 1895, *A. Nelson 1688* (HOLOTYPE: RM-5199!).

STEMS 1–10, 0.7–2.4 dm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. LEAVES: basal leaves simple or divided into 3–7 segments, sparsely to moderately pubescent distally; proximal cauline leaves divided into 3–5 segments, sparsely to moderately pubescent; mid leaves divided into 3–5 segments, sparsely to moderately pubescent; distal leaves simple or divided into 3 segments, sparsely pubescent. HEADS 5–35+ per plant. PEDUNCLES 1–5 cm, moderately to densely pubescent. INVOLUCRES 8–11 × 9–14 mm. PHYLLARIES: outer phyllaries 9–13, lanceolate, 5–8 × 1–2 mm, weakly to moderately keeled, apices acute to acuminate, abaxial faces sparsely to densely pubescent, sparsely to densely dotted with sessile and/or impressed glands; inner phyllaries 9–18, 4–8 × 1.5–2.5 mm, abaxial faces sparsely to moderately pubescent. RAY FLORETS 8–14; corollas 11–17 × 4–6 mm. DISC FLORETS: corollas 3–5 × 0.7–1 mm, eglandular or sparsely dotted with sessile glands. RECEPTACLES 2–3.5 × 3–4 mm. CYPSELAE 2–3 × 0.7–1 mm; pappus scales 5–6(–8), usually lanceolate-aristate, 2–3.5 × 0.5–0.8 mm.

DISTRIBUTION (Fig. 3) AND HABITAT: North-central and northwestern Colorado, eastern Utah, Wyoming, western and east-

ern Montana, western North Dakota, and Canada in Alberta and Saskatchewan. Growing at roadsides, in open areas, and at forest edges, (1000–)1500–2500(–3400) m.

FLOWERING AND FRUITING: May through September, mainly June and July.

REPRESENTATIVE SPECIMENS EXAMINED: **CANADA. Alberta.** Milk River, 1880, *Macoun 27* (GH); W of [Fort] Macleod, 10 Jun 1940, *Moss 710* (GH, NY, US); Medicine Hat, 2 Jun 1894, *Macoun 5077* (GH, MO, NY); Rosedale Camp, 670–760 m, 31 may 1915, *Moodie 923* (GH, MO, NY, US). **Saskatchewan.** Swift Current, 2 milles au nord Collines, 12 Jun 1958, *Boivin et al. 12023* (GH); Matador Field Stn. 35 km SE of Kyle, 9 Jun 1969, *Skoglund 56* (GH); E of Kyle, between Matador and Beechy, 25 May 1964, *Argus 3884* (GH); Moose Jaw, 6 Jul 1938, *Turner 47* (GH, NY, US); Cypress Hills [shown as Northwest Territories on label], Aug 1880, *Macoun s.n.* (GH, MO[2], NY, US). **UNITED STATES. Colorado.** Grand Co.: Near Pinto Creek Bridge, 10 mi W of Kremmling, 2245 m, 29 Jun 1947, *Parker & McClintock 6993* (US). Jackson Co.: Slopes of Independence Mt, ca 8 mi NW of Cowdrey, 2480 m, 17 Jul 1988, *Weber & Hogan 17959* (NY). Larimer Co.: Mt Baldy, 3400 m, *Smith s.n.* (MO). Moffat Co.: Cold Spring Mt, near Wyoming and Utah borders, 2400 m, 23 Jun 1946, *Porter 3919* (GH). Park Co.: 2 mi N of Fairplay, 3100 m, 28 Jul 1967, *Porter & Porter 10503* (GH). **Montana.** Broadwater Co.: ca 10 mi S of Helena on rd to Townsend, 1 Jul 1945, *Hitchcock & Muhlick 11794* (MO, NY). Cascade Co.: Great Falls, 8 Jul 1891, *Williams s.n.* (NY). Fallon Co.: 10 mi S of Baker, 26 Jun 1968, *Stephens & Brooks 23316* (NY). Gallatin Co.: Manhattan, 17 Jul 1895 (NY). Lewis and Clark Co.: Near Helena, 27 Jul 1887, *Williams 351* (US); hwy 287, 1 mi N of Augusta, 8 Jun 1972, *Lackschewitz 3518* (NY). Madison Co.: Jun 1888, *Tweedy 223* (NY). Park Co.: ca 3 mi S of Livingston, 4 Jul 1956, *Booth 56501* (GH). Pondera Co.: Shore of Lake Francis, near Valier, 1 Jul 1952, *Bartlett & Grayson 395* (NY). Sheridan Co.: Westby, 21 Jun 1927, *Larsen 40* (GH, MO). Teton Co.: ca 3 mi N of Bynum, 22 Jul 1968, *Welsh & Moore 7234* (NY). Toole Co.: ca 5 mi N of Shelby, 26 Jul 1981, *Taylor & Taylor 30874* (NY). **North Dakota.** Golden Valley Co.: 1 mi E, 3 mi S of Sentinel Butte (town), 27 Jun 1968, *Stephens & Brooks 23445* (NY). McKenzie Co.: 21 mi S of Watford City, 20 Jun 1970, *Stephens & Brooks 40250* (NY). **Utah.** Daggett Co.: 10 mi E of Linwood, 1920 m, 12 Jun 1962, *Barneby 13166* (NY). Duchesne Co.: 0.5–0.75 mi NE of Hanna, 2120 m, 30 Jun 1983, *Goodrick 18762* (NY). Uintah Co.: along Miner's Draw, in pinyon-juniper zone shortly S of Cliff Ridge & ca 40 km (air) ESE of Vernal, 1850 m, 31 May 1976, *Cronquist 11491* (NY). Wayne Co.: clay draws in desert 28 mi SW of Hanksville, 1550 m, 3 Jun 1961, *Cronquist 9183* (NY). **Wyoming.** Albany Co.: Cooper Lake—clayey draws, 17 Jun 1901, *Goodding 15* (GH, MO, NY, US); Centennial Hills, 16 Jul 1895, *Nelson 1688* (GH). Carbon Co.: Fort Steele, 16 Jun 1900, *Nelson 7254* (GH, MO, NY, US). Freemont Co.: Limestone Mt, 2663 m, 3 Jul 1980, *Dorn 3516* (NY); ca 3 air mi SSW of Big Sand Draw oil and gas field, 1860 m, 3 Jul 1981, *Hartman 13532* (NY). Johnson Co.: ca 10 air mi NE of Kaycee, 1425 m, 5 Jun 1979, *Dueholm 6661* (NY); ca 2 air mi NW of Buffalo, 1550 m, 21 Jul 1979, *Dueholm 8271* (NY). Natrona Co.: 1 mi SE of Badwater on Badwater Creek, 12 Jun, *Weber 1* (TEX). Park Co.: ca 9 mi SE of Meeteetse & ca 2 mi E of hwy 120 along BLM rd, 1860 m, 3 Jul 1983, *Evert 5314* (NY). Sheridan Co.: rolling plains between Sheridan and Buffalo, 1085–1550 m, 15 Jun–15 Jul 1900, *Tweedy 3137* (NY). Sublette Co.: dry, flat plains between Eden and Big Piney, 6 Jul 1922, *Payson & Payson 2587* (GH, MO, NY, US); 5 mi E of the Green river, E of Big Piney, 2135 m, 12 Jul 1967, *Porter & Porter 10460* (GH, NY). Sweetwater Co.: 2 mi S of McKinnon, near Utah State line, 2200 m, 29 Jun 1947, *Parker & McClintock 6982* (GH, NY, US). Uinta

Co.: 5 mi S of Mountainview, 2100 m, 28 Jun 1947, *Parker & McClintock 6976* (NY, US).

7b. HYMENOXYS RICHARDSONII (Hook.) Cockerell var. FLORIBUNDA (A. Gray) K. L. Parker

Actinella richardsonii (Hook.) Nutt. var. *floribunda* A. Gray, Mem. Amer. Acad. Arts (Series 2) 4: 101. 1849. TYPE: UNITED STATES. New Mexico. Santa Fe Co.: "Rocky hills, as well as creek-bottoms, around Santa Fé," Jun–Jul 1847, *A. Fendler 460* (HOLOTYPE: GH! plant in upper right corner; ISOTYPES: BM!, GH-two sheets!, K!, MO-208292!, NY!, PH-two sheets!, US-27459!, photograph of 2nd isotype at K!).

Ptilepida floribunda (A. Gray) A. Heller, Pl. World 1: 22. 1897.

Picradenia floribunda (A. Gray) Greene, Pittonia 3: 272. 1898.

Hymenoxys floribunda (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 485. 1904.

Actinea richardsonii (Hook.) Kuntze var. *floribunda* (A. Gray) Cory, Rhodora 38: 408. 1936.

Hymenoxys richardsonii (Hook.) Cockerell var. *floribunda* (A. Gray) K. L. Parker, Madroño 10: 159. 1950.

Picradenia richardsonii Hook. subsp. *floribunda* (A. Gray) W. A. Weber, Phytologia 79: 66. 1995.

Picradenia earlei Cockerell, Bull. Colorado College Mus. 1: 1. 1903. TYPE: UNITED STATES. Colorado. Montezuma Co.: "Mancos, Pinon belt," 8 Jul 1898, *C. F. Baker, F. S. Earle & S. M. Tracy 409* (HOLOTYPE: RM-13808!; ISOTYPES: BM!, F!, GH!, K! [photograph of K isotype at GH!], MICH!, MO-208278!, MO-208281!, NY!, RM-157734!, US-337289!).

Hymenoxys earlei (Cockerell) Cockerell, Bull. Torrey Bot. Club 31: 492. 1904.

Picradenia floribunda (A. Gray) Greene subsp. *utilis* Cockerell, Bull. Colorado College Mus. 1: 1. 1903. TYPE: UNITED STATES. Colorado. Chaffee Co.: "Near Buena Vista," 1903, *F. R. Marsh s.n.* (HOLOTYPE: not located, plate 20 [Cockerell, 1904]!; ISOTYPE fragments: CAS!, GH!, NY!).

Hymenoxys floribunda (A. Gray) Cockerell var. *utilis* (Cockerell) Cockerell, Bull. Torrey Bot. Club 31: 486. 1904.

Hymenoxys richardsonii (Hook.) Cockerell var. *utahensis* Cockerell, Bull. Torrey Bot. Club 31: 477. 1904. TYPE: UNITED STATES. Utah. Emery Co.: Emery, 16 Jun 1894, *M. E. Jones 5442* (HOLOTYPE: US-234968!; ISOTYPES: MO-208247!, MO-208288!, NY!, UC-159389!; probable ISOTYPE: BM!).

Hymenoxys floribunda (A. Gray) Cockerell var. *arizonica* Cockerell, Bull. Torrey Bot. Club 31: 488. 1904. TYPE: UNITED STATES. Arizona. Coconino Co.: "Collected in the Vicinity of Flagstaff," 4 Jul 1898, *D. T. MacDougal 219* (HOLOTYPE: US-334316!; ISOTYPES: GH!, NY-two sheets!, RM-31781!, UC-134243!, US-956725!).

Hymenoxys floribunda (A. Gray) Cockerell var. *intermedia* Cockerell, Bull. Torrey Bot. Club 31: 492. 1904. TYPE: UNITED STATES. Arizona. Coconino Co.: "Collected about Walnut Canon," 28 Jul 1898, *D. T. MacDougal 359* (HOLOTYPE: US-334454!; ISOTYPES: GH!, NY-two sheets!, US-956724!).

Hymenoxys metcalfei Cockerell, Bull. Torrey Bot. Club 31: 492. 1904. TYPE: UNITED STATES. New Mexico. Grant Co.: "Collected in the Burro Mountains," 20 Jun 1903, *O. B. Metcalfe 179* (cited as *170* in the original description) (HOLOTYPE: US-495288!; ISOTYPES: BM!, GH!, K!, MO-208251!, RM-55900!, UC-130168!, US-735071!, US-1070757!).

Hymenoxys olivacea Cockerell, Bull. Torrey

Bot. Club 31: 497. 1904. TYPE: UNITED STATES. New Mexico. Grant Co.: "Hanover hills," 9 Aug 1895, *A. I. Mulford 807* (HOLOTYPE: NDG-061627!).

STEMS (2–)5–20(–30+), 1.9–3.4 dm, glabrous or sparsely to moderately pubescent, usually moderately dotted with sessile glands. LEAVES: basal leaves simple or divided into 3(–5–7) segments, glabrous or sparsely pubescent distally; proximal cauline leaves divided into 3(–5) segments, usually glabrous, occasionally sparsely pubescent; mid leaves divided into 3(–5) segments, usually glabrous, occasionally sparsely pubescent; distal leaves usually simple, occasionally divided into 3 segments, usually glabrous, occasionally sparsely pubescent. HEADS (30–)80–250(–300+) per plant. PEDUNCLES 1.5–3.5 cm, sparsely to densely pubescent. INVOLUCRES 7–8 × 7–9 mm. PHYLLARIES: outer phyllaries 8–9, sometimes purple-red-tinted on the margins, obovate to ovate to lanceolate, 3.5–6 × 1.5–2.5 mm, strongly keeled, apices acute, abaxial faces sparsely to moderately pubescent, moderately to densely dotted with sessile and/or impressed glands; inner phyllaries 8–12, 3–5 × 1.5–2 mm, abaxial faces glabrous or sparsely pubescent. RAY FLORETS 7–9; corollas 7–11 × 3–6 mm. DISC FLORETS: corollas 3–4 × 0.7–1 mm, eglandular or sparsely to moderately dotted with sessile glands. RECEPTACLES 1.5–2.5 × 1.5–2.5 mm. CYPSELAE 2 × 0.6–0.9 mm; pappus scales (4–)5, usually obovate-aristate, 1.8–2.8 × 0.6–1 mm.

DISTRIBUTION (Fig. 3) AND HABITAT: New Mexico, Arizona, Utah, Colorado, and the Guadalupe Mountains of Culberson County, Texas. Growing at roadsides, in open areas, and at edges of forests, (1600–)1800–2700(–3400) m.

FLOWERING AND FRUITING: May through October, mainly July and August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Apache Co.: Lukachukai Mts, 6 mi E of Lukachukai, 2170 m, 18 Jul 1948, *Gould & Phillips 4860* (NY, US); 4 mi W of Ganado, 2010 m, 19 Jul 1948, *Gould & Phillips 4872* (NY, US); Fort Defiance, Navajo Indian Reservation, 2170 m, 15 Jul 1961, *Demaree 44634* (NY); South Fork Little Colorado River, Apache Forest, 2700 m, 23 Aug 1920, *Eggleston 17103* (GH). Coconino Co.: 2 mi E of Williams, 2100 m, 14 Aug 1946, *Parker et al. 6162* (MO, NY, US); 10 mi S of Grand Canyon Village, 2100 m, 21 Jul 1946, *Parker 6022* (GH, MO, NY, US); rd to Mormon Lake and Flagstaff, just N of Mormon Lake, 34.3 mi N of hwy 87, 9 Aug 1975, *Bierner 51386* (TEX); hwy 89 N of Flagstaff, 1.5 mi S of the southern turnoff to Sunset Crater National Monument, 10 Aug 1975, *Bierner 51387* (TEX). Gila Co.: Carrizo, 1600 m, 12 Jun 1937, *Peebles 13566* (GH, NY). Navajo Co.: S end of Monument Valley, N of Kayenta, 28 May 1961, *Cronquist 9138* (GH, NY). Yavapai Co.: 8 mi E of Camp Verde, 1700 m, 16 Jun 1947, *Parker & McClintock 6857* (MO, NY, US). **Colorado.** Archuleta Co.: W of Pagosa Springs, 19 Jun 1927, *Osterhout s.n.* (MO). Chaffee Co.: Buena Vista, 2475 m, 27 Jul 1892, *Sheldon 433* (NY, US); hwy 285, S of Poncha Springs, 0.5 mi N of the Chaffee-Saguache Co. line, 20 Aug 1975, *Bierner 51401* (TEX). Conejos Co.: hwy 285, 4.3 mi N of the Colorado-New Mexico State line, 20 Aug 1975, *Bierner 51402* (TEX). Costillo Co.: 15 mi S of Fort Garland, 2475 m, *Hitchcock et al. 4151* (GH); slopes around Sangre de Cristo Creek, 7 mi N of Fort Garland, 2540 m, 3 Jul 1947, *Parker & McClintock 7003* (US). Custer Co.: Westcliffe, 12 Aug 1896, *Shear 3800* (NY, US). Elbert Co.: 13 mi NE of Elizabeth, 15 Jun 1937, *Ownbey 1266* (GH, MO, NY). El Paso Co.: plains, Colorado Springs, 1860 m, 19–21 Sep 1895, *Clarke s.n.* (NY). Fremont Co.: in canyons of the Arkansas River, 4 mi E of Texas Creek, 2 Sep 1924, *Bacigalupi 1030* (GH). Gunnison Co.: Gunnison, 2380 m, 17 Jul 1901, *Baker 450* (GH, MO, NY, US); Lower Monarch Pass, 5 Aug 1920, *Nelson 9823* (GH, MO); Powderhorn School, 2.2 mi SE of hwy 149,

17 mi S of hwy 50, 2540 m, 14 Jul 1984, *Neese 15861* (NY). Hinsdale Co.: hillsides adjoining Cebolla Creek Rd, ca 2 mi S of the Gunnison Co. line, just N of Rock Creek, 2700 m, 4 Jul 1962, *Barrell & Spongberg 220-62* (GH). La Plata Co.: 5 mi S of Durango, 2010 m, 26 Aug 1946, *Parker & McClintock 6415* (GH, NY, US); Hesperus, 2630 m, 15 Jul 1896, *Tweedy 531* (US). Las Animas Co.: Trinidad, 1860–2170 m, Aug 1912, *Beckwith 206* (NY). Mineral Co.: Caldwell Creek Trail, 2725 m, 13 Jul 1911, *Murdock 4744* (MO, US). Montezuma Co.: Mancos River Canyon, 6 mi S of Mancos, Mesa Verde National Park, 12 Jun 1963, *Welsh et al. 2173* (NY). Rio Grande Co.: along rd to Rock Creek recreation area (SW of Monte Vista), ca 11 mi W of jct with hwy 15, 26 Jul 1964, *Terrell & Brown 3810* (US). Saguache Co.: Marshall Pass, 3100 m, 20 Aug 1901, *Baker 874* (GH, MO, NY, US); near [S of] jct of 114 and hwy 50, 2790 m, 13 Jul 1963, *Dunn & Willey 14561* (NY); hwy 17 a few mi N of Hooper, 2320 m, 11 Aug 1952, *Barrell 237-52* (US); Cochetopa Park, near jct of rd to Cochetopa Pass & rd to Saguache Park, 2850 m, 1 Jul 1957, *Barrell 26a-57* (US). Teller Co.: Florissant Fossil Beds National Monument, 2590 m, 4 Aug 1973, *Van Royen 10512* (US). Weld Co.: Evans, 1909, *Johnson 577* (MO). **New Mexico.** Bernalillo Co.: Summit of Sandia Crest, 3400 m, 30 Aug 1946, *Parker et al. 6503* (NY, US). Catron Co.: hwy 180, 2 mi S of San Francisco River near Luna, 16 Aug 1974, *Pinkava et al. P12747* (NY, US); near Snow Lake, Gila National Forest, 2480 m, 6 Sep 1974, *Shultz & Shultz 1503* (GH, NY); hwy 60 between Datil and Pie Town, Cibola National Forest, 24 Jul 1983, *Ertter & Strachan 4923* (NY); hwy 60 between Pie Town and Quemado, 20 Aug 1959, *Kruckeburg 4958* (NY). Cibola Co.: Grants, 1 Oct 1884, *Jones 4352* (US); hwy 32, 12 mi S of Fence Lake, 2110 m, 23 Jun 1986, *Walter & Walter 11166* (MO). Colfax Co.: Eagle Nest Lake, 6 Jul 1937, *Schwarz & Talley s.n.* (MO); Raton Mts, 18–19 Aug 1903, *Griffiths 5478* (MO); Cimarron Canyon near Cimerron, 30 Jun 1929, *Mathias 553* (MO). Grant Co.: Black Range, Gallinas Canyon, 2100 m, 25 Jul 1986, *Worthington 14271* (NY); Burro Mts, hwy 90, 4.2 mi E of the Grant-Hidalgo Co. line, 19 Jun 1992, *Bierner 92-28* (TEX). Hidalgo Co.: foothills of Burro Mts, hwy 90, 0.3 mi W of the Grant-Hidalgo Co. line, 13 Aug 1991, *Bierner 91-90* (TEX). Lincoln Co.: Gallinas Pk, 2480 m, 23 Jul 1973, *Spellenberg et al. 3402* (NY, US). McKinley Co.: hwy 32, 11 mi S of Gallup, 21 Jul 1940, *Ferris 10173* (GH, NY); N of Ramah, 25 Jul 1906, *Wooton s.n.* (US); San Mateo Mts, 10 mi E of San Mateo, 2415 m, 25 Aug 1936, *Parker & Parker 2932* (US); 17 mi NW of Gallup, 2010 m, 5 Jul 1947, *Parker & McClintock 7012* (US). Rio Arriba Co.: Chama, 6 Sep 1899, *Baker 697* (GH, MO, NY, US); 4 mi N of Truchas Village on rd to Saw Mill, 2480 m, 28 Aug 1946, *Parker & McClintock 6460* (NY); hwy 84 10 mi S of Cebolla, 27 Jul 1973, *Higgins 7969* (NY); Jicarilla Apache Reservation, near Dulce, 2150–2470 m, 21 Aug 1911, *Standley 8254* (US). Sandoval Co.: hwy 44, 8 mi S of Cuba, 10 Aug 1977, *Higgins 10506* (NY); hwy 4, 12 mi N of San Yasidro, 1 mi S of Jemez Springs, 29 Aug 1974, *Shultz & Shultz 1299* (GH, NY). San Miguel Co.: Near Pecos, 2075 m, 15 Aug 1908, *Standley 4908* (GH, MO, NY, US). Santa Fe Co.: Along Camino de Cruz Blanca, E of St. John's College, in SE part of Santa Fe, 2290 m, 13 Aug 1966, *Bennett 8790* (US). Sierra Co.: Kingston, 2320 m, 7 Jun 1904, *Metcalfe 963* (GH, MO, NY, US). Socorro Co.: hills W of Magdalena, 21 Jul 1904, *Wooton 2551* (GH, US). Taos Co.: hwy 64, 13.1 mi W of the Colfax Co. line, 3 Aug 1988, *Bierner 88-78* (TEX). Torrence Co.: Capillo Pk lookout, 2850 m, 5 Aug 1949, *Dunn 6285* (NY). **Texas.** Culberson Co.: Guadalupe Mts, open rocky ridge below Guadalupe Pk, 3000 m, 28 Jul 1931, *Moore & Styermark 3676* (GH, MO, NY). **Utah.** Beaver Co.: Minersville Reservoir, 12 mi W of Beaver, 5 Aug 1953, *Holmgren & Tillett 9658* (GH, MO, NY, US). Carbon Co.: 2 mi N of Sunnyside, 2170 m, 8 Jul 1935, *Graham 9527* (MO);

Panther Canyon ca 2 mi W of Helper, 2700 m, 20 Jun 1985, *Kass 2101* (NY). Emery Co.: hwy 70, 17.0 mi E of the Savier Co. line, 19 Jul 1983, *Sunberg & Hardison 1999* (NY); jct of hwy 10 and old hwy to Moore, 1935 m, 8 Jun 1979, *White & Moore 87* (NY); hwy 29 along Seely Creek, Wasatch Mts, 2380–2445 m, 6 Jul 1938, *Pennell et al. 22723* (NY). Garfield Co.: hwy 12, 1.4 mi N of Henrieville, 30 May 1975, *Bierner 51268* (TEX); hwy 12, ca 12 mi N of Boulder, 22 Jul 1992, *Bierner 92-38* (TEX); 3 mi N of Panguitch, 2010 m, 18 Jun 1947, *Parker et al. 6894* (US); hwy 89, 3.8 mi S of hwy 12, 8 Jul 1976, *Bierner 52363* (TEX). Iron Co.: 0.5 mi SE of Cedar City, 23 Jun 1942, *Degener 16631* (MO, NY). Kane Co.: rd to Kadachrome Flats and Grosvenor Arch, 10.1 mi SE of hwy 12 (jct in Cannonville), 8 Jul 1976, *Bierner 52367* (TEX); 11 mi N of Glendale, 1795 m, 20 Aug 1946, *Parker et al. 6315* (GH, MO, NY). Millard Co.: Desert Experimental Range, 45 air mi NW of Milford, Halfway Summit, 1930 m, 2 Aug 1983, *Goodrich 19347* (NY). Piute Co.: Dry Fork Canyon, ca 5 mi N of Antimony, 2320 m, 28 Jul 1976, *Welsh et al. 14115* (MO, NY). Sevier Co.: Water Flat, SE of UM Creek, Fish Lake, 2715 m, 17 Aug 1985, *Thorne et al. 4118* (NY); Corral Knoll, ca 10 mi W of Emery, 2630 m, 17 Jul 1980, *Neese & White 9251* (NY); near Salina, 20 Jun 1915, *Marsh s.n.* (US). Utah Co.: Price Canyon Recreation Area, 2600 m, 28 Jun 1977, *Neese & White 3384* (NY). Wayne Co.: 6 mi W of Loa, 2230 m, 19 Jun 1947, *Parker & McClintock 6895* (NY, US); 10 mi E of Bicknell, 1890 m, 7 Jun 1977, *Welsh & White 3052* (NY).

8. HYMENOXYS RUSBYI (A. Gray) Cockerell

Actinella rusbyi A. Gray, Proc. Amer. Acad. Arts 19: 33. 1883. TYPE: UNITED STATES. New Mexico. Catron or Grant Co.: "Grassy slopes Mogollon Mts.," Sep 1881, *H. H. Rusby 2461/2* (HOLOTYPE: GH!; ISOTYPE: MICH!; possible ISOTYPES: MO-208293!, NY-four sheets!).

Actinea rusbyi (A. Gray) Kuntze, Revis. Gen. Pl. 1: 303. 1891.

Picradenia rusbyi (A. Gray) Greene, Pittonia 3: 271. 1898.

Hymenoxys rusbyi (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 496. 1904.

POLYCARPIC PERENNIALS. STEMS 1–5(–15), usually distinctly purple-red-tinted proximally and green distally, 3–15 dm, glabrous or sparsely to moderately pubescent, sparsely to densely dotted with sessile glands. LEAVES simple or pinnately divided into 3 segments, glabrous; basal, proximal cauline, and mid leaves simple or divided into 3 segments, terminal segment of mid leaves 2–4 mm wide; distal leaves simple. HEADS 50–250+ per plant in corymbiform arrays. PEDUNCLES 1–3.2 cm, glabrous or sparsely to moderately pubescent, sparsely to densely dotted with sessile glands. INVOLUCRES campanulate to urceolate, 6–8 × 6–7 mm. PHYLLARIES: outer phyllaries 7–9, basally connate ¼–⅓ their lengths, green throughout, often purple-red-tinted on the margins, lanceolate, 4.5–6 × 1.5–2 mm, strongly keeled, apices usually rounded, abaxial faces glabrous, densely dotted with sessile and/or impressed glands, adaxial faces glabrous, eglandular or sparsely dotted with sessile and/or impressed glands; inner phyllaries 7–11, yellow to green to purple-red distally, obovate, 3.5–4.5 × 1.3–1.9 mm, slightly surpassing the outer, apices mucronate, abaxial faces glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 6–8; corollas yellow, 4.5–8 × 2.5–5 mm, lobes 3, abaxial faces glabrous, sparsely to densely dotted with sessile glands. DISC FLORETS: corollas 2.7–3.2 × 0.6–0.9 mm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. RECEPTACLES hemispheric to conic, 1–2 × 1.5–2 mm. CYPSELAE narrowly obpyramidal, 2–3 × 0.6–1 mm, densely pubescent, eglandular or sparsely dotted with sessile glands; pappus scales usually 5,

obovate to obovate-aristate, 0.9–1.8 × 0.6–0.8 mm.

DISTRIBUTION (Fig. 2) AND HABITAT: Southwestern New Mexico to central Arizona. Growing at roadsides, in open areas, and at edges of forests, 1600–2100 m.

FLOWERING AND FRUITING: July through October, mainly July and August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Coconino Co.: 15 km E of Ash Fork on rd to Williams, 1910 m, 27 Sep 1985, *Bartholomew et al. 2444* (GH, NY); 10.5 mi N of Stoneman Lake exit on I-17, S of Flagstaff, 27 Aug 1970, *Sanderson 180* (TEX); W edge of Stoneman Lake, 26 Aug 1972, *Sanderson 434* (TEX). Gila Co.: 29 mi NE of Globe, 1730 m, 21 Jul 1935, *Kearney & Peebles 12044* (LL, US). Yavapai Co.: ca 30 mi S of Flagstaff on hwy 17, between Flagstaff and Phoenix, Stoneman Lake Rd jct, 1580 m, 19 Oct 1982, *Neese 12511* (NY); Mingus Mt, 7 mi on Prescott rd near camp grounds in Prescott National Forest, 2010 m, 22 Aug 1959, *Demaree 41550* (NY, TEX). **New Mexico.** Catron Co.: along Silver Creek between Mogollon and Mogollon Ranger Station, Gila Forest, 2030–2100 m, 28 Jul 1920, *Eggleston 16810* (NY); Lower [San Francisco] Plaza, Frisco, NW of the Mogollon Mts, 1860 m, 25 Jul 1900, *Wooton s.n.* (US). Grant Co.: hwy 35, 7.3 mi SE of hwy 15 in Gila National Forest, 7 Aug 1975, *Bierner 51369* (TEX); hwy 15, 7.6 mi S of hwy 35 (jct in Gila National Forest N of Piños Altos), 1 Aug 1988, *Bierner 88-75* (TEX).

Hymenoxys rusbyi overlaps in general distribution with *H. cooperi, H. jamesii,* and *H. richardsonii* var. *floribunda*; I have never observed any of these taxa growing together locally. *Hymenoxys rusbyi* is most readily distinguished from the other taxa by its leaves, which are glabrous and simple or divided into only three segments.

9. HYMENOXYS SUBINTEGRA Cockerell

Hymenoxys subintegra Cockerell, Bull. Torrey Bot. Club 31: 480. 1904. TYPE: UNITED STATES. Arizona. Coconino Co.: "Nagle's Ranch," 13 Sep 1894, *M. E. Jones 60540* (HOLOTYPE: US-234966!).

Actinea subintegra (Cockerell) S. F. Blake, J. Wash. Acad. Sci. 19: 278. 1929.

BIENNIALS OR MONOCARPIC PERENNIALS. STEMS 1(–5), green throughout or, occasionally, purple-red-tinted proximally and green distally, 3–6 dm, usually densely sericeous, sparsely to moderately dotted with sessile glands. LEAVES simple or pinnately divided into 3 segments, usually densely sericeous; basal, proximal cauline, and mid leaves simple or divided into 3 segments, terminal segment of mid leaves 1.8–3.5 mm wide; distal leaves simple. HEADS 10–85+ per plant in paniculiform to corymbiform arrays. PEDUNCLES 3–9 cm, usually densely sericeous, sparsely to moderately dotted with sessile glands. INVOLUCRES hemispheric to campanulate, 8–10 × 10–13 mm. PHYLLARIES: outer phyllaries 10–14(–18), basally connate ¼–½ their lengths, usually green throughout or yellow-green proximally and green distally, obovate to ovate to lanceolate, 5–7 × 1.5–2.5 mm, weakly keeled, apices acute to acuminate, abaxial faces usually densely pubescent, sparsely to densely dotted with sessile and/or impressed glands, adaxial faces glabrous proximally and moderately to densely pubescent distally, eglandular; inner phyllaries 13–16(–22), yellow-green distally, obovate, 4–5 × 1.5–2 mm, slightly surpassed by to slightly surpassing the outer, apices mucronate, abaxial faces moderately to densely pubescent, eglandular or sparsely dotted with sessile glands, adaxial faces glabrous or sparsely to moderately pubescent distally. RAY FLORETS 10–16; corollas yellow, 10–15 × 4.5–6.5 mm, lobes 3(–4), abaxial faces glabrous or sparsely pubescent, sparsely to moderately dotted with sessile glands. DISC FLORETS: corollas 3.5–4 × 0.6–0.9 mm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. RECEPTACLES conic, 3–4 ×

3–4 mm. CYPSELAE narrowly obpyramidal, 2.1–3 × 0.8–1 mm, densely pubescent, eglandular; pappus scales 5(–6), usually obovate-aristate, 2.5–3 × 0.7–1 mm.

DISTRIBUTION (Fig. 2) AND HABITAT: Found mainly on the Kaibab Plateau in northern Coconino County, Arizona, but also found in western Kane County, Utah. Growing at roadsides, in open areas, and at edges of forests, 2100–2800 m.

FLOWERING AND FRUITING: June through September, mainly July and August.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. Arizona.** Coconino Co.: hwy 67, 15.4 mi S of hwy alt 89 (jct in Jacob Lake), 29 Jul 1988, *Bierner 88-70* (TEX); hwy alt 89, 3.0 mi NW of hwy 67 (jct in Jacob Lake), 10 Aug 1975, *Bierner 51390* (TEX). **Utah.** Kane Co.: just S of intersection of hwy 89 and 15 [= hwy 9], 17 Jun 1965, *Strother 368* (TEX).

Hymenoxys subintegra is found almost exclusively on the Kaibab Plateau in northern Arizona; it has also been collected in southern Utah. It overlaps in distribution with *H. cooperi,* but *H. subintegra* grows mainly on the top of the plateau while *H. cooperi* is found at slightly lower elevations below the summit of the plateau. Morphologically, *H. subintegra* is readily distinguished from all other taxa of *Hymenoxys* subg. *Picradenia* by its dense, sericeous vestiture.

10. HYMENOXYS VASEYI (A. Gray) Cockerell

Actinella vaseyi A. Gray, Proc. Amer. Acad. Arts 17: 219. 1882. TYPE: UNITED STATES. New Mexico. Doña Ana Co.: "Organ Mts.," Aug 1881, *G. R. Vasey 82* (HOLOTYPE: GH!; ISOTYPES: BM!, NDG-061632!, NY!, PH!, US-27484! US-1415381!).

Actinea vaseyi (A. Gray) Kuntze, Revis. Gen. Pl. 1: 303. 1891.

Picradenia vaseyi (A. Gray) Greene, Pittonia 3: 271. 1898.

Hymenoxys vaseyi (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 493. 1904.

POLYCARPIC PERENNIALS. STEMS 1–10 from branched woody caudices, branched distally, green throughout or sometimes purple-red-tinted proximally and green distally, 2–6 dm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. LEAVES usually pinnately or bipinnately divided into 3–23 segments; basal leaves divided into (3–)9–17(–23) segments, moderately long-villous-wooly proximally, glabrous or sparsely pubescent distally; proximal cauline leaves divided into 5–11(–21) segments, glabrous or sparsely pubescent; mid leaves divided into 5–11(–21) segments, terminal segments 0.8–1.2 mm wide, glabrous or sparsely pubescent; distal leaves simple or divided into 3–5 segments, glabrous or sparsely pubescent. HEADS 10–50+ per plant in paniculiform to corymbiform arrays. PEDUNCLES 1.5–5.5 cm, sparsely to moderately pubescent, sparsely to moderately dotted with sessile glands. INVOLUCRES campanulate, 8–9 × 8–11 mm. PHYLLARIES: outer phyllaries 8–11, basally connate ½–⅔ their lengths, yellow proximally, very distinctly green distally, usually obovate, 4.5–6 × 2–2.5 mm, weakly to moderately keeled, apices acute, abaxial faces sparsely to moderately pubescent, sparsely to moderately dotted with sessile and/or impressed glands, adaxial faces glabrous proximally, sparsely to moderately pubescent distally, eglandular; inner phyllaries 8–12, green distally, obovate, 4.5–6 × 1.8–2 mm, surpassing the outer, apices mucronate, abaxial faces glabrous or sparsely pubescent, eglandular or sparsely dotted with sessile glands, adaxial faces glabrous. RAY FLORETS 8–11; corollas yellow, 9–15 × 4–7 mm, lobes 3, abaxial faces glabrous or sparsely pubescent, sparsely dotted with sessile glands. DISC FLORETS: corollas 3.5–4.2 × 0.6–1 mm, sparsely to moderately pubescent, sparsely dotted with sessile glands.

RECEPTACLES conic, 2–2.5 × 2.5–3.5 mm. CYPSELAE narrowly obpyramidal, 2–2.7 × 0.7–1 mm, densely pubescent, eglandular; pappus scales 5–6, usually obovate-aristate, 1.7–2.7 × 0.5–1 mm.

DISTRIBUTION (Fig. 1) AND HABITAT: Southwestern New Mexico in the Organ and San Andreas Mountains in Doña Ana County, the Florida Mountains in Luna County, and the Gallinas Mountains in Socorro County; far west Texas in the Franklin Mountains in El Paso County. Growing in open areas and at edges of forests, 1600–2100(–2500) m.

FLOWERING AND FRUITING: June through September, mainly July through September.

REPRESENTATIVE SPECIMENS EXAMINED: **UNITED STATES. New Mexico.** Doña Ana Co.: Organ Mts at top of Pine Tree Nature Trail in the Aguirre Spring Recreation Area (ca 3 mi E of Organ on hwy 70/82), 6 Aug 1975, *Bierner 51367* (TEX); canyon 4 mi N of Rope Springs, San Andreas Mts, 30 mi N of Las Cruces, 1825 m, 12 Sep 1936, *Parker & Parker 3839* (GH, MO, NY, US). Luna Co.: Florida Mts, 0.8 mi WNW from top of Gym Pk, 2000 m, 1 Sep 1991, *Worthington 19799* (TEX). Socorro Co.: 19 mi NW of Augustine, Gallinas Mts, 2140 m, 10 Sep 1936, *Parker & Parker 3762* (GH, MO, NY, US). **Texas.** El Paso Co.: Franklin Mts, 0.8 air mi NW of the top of North Franklin Mt, 1825 m, 10 Sep 1978, *Worthington 3455* (TEX).

Hymenoxys vaseyi is allopatric to the other taxa of *Hymenoxys* subg. *Picradenia,* but it does approach *H. richardsonii* var. *floribunda* in southwestern New Mexico. *Hymenoxys vaseyi* can be readily distinguished from *H. richardsonii* var. *floribunda* by its more highly divided leaves, generally fewer heads per plant, and distinctive outer phyllaries, which are connate ½–⅔ their lengths.

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