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*POGOGYNE FLORIBUNDA* (LAMIACEAE), A NEW SPECIES FROM  
THE GREAT BASIN IN NORTHEASTERN CALIFORNIA

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ABSTRACT

*Pogogyne floribunda* is described as a new endemic species from Lassen and Modoc counties in northeastern California. Its occurrence on the eastern Modoc Plateau of the Great Basin Floristic Province is the first record for the genus outside the California Floristic Province. *Pogogyne zizyphoroides* also is reported from the Great Basin in Lassen County.

Key words: *Pogogyne*, Lamiaceae, Great Basin, Modoc Plateau, vernal pool.

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INTRODUCTION

A distinctive new *Pogogyne* has been discovered in vernal pools and seasonal lakes of the Modoc Plateau in northeastern California at the west edge of the Great Basin Floristic Province (GBFP) circumscribed by Raven (1977). This is the first reported occurrence of the genus *Pogogyne* beyond the California Floristic Province (CFP), in which the genus was previously thought to be endemic (Raven and Axelrod 1978; Zedler 1987). The new *Pogogyne* and species associated with it could be relicts of the past migration of CFP species into the western GBFP.

TAXONOMY

***Pogogyne floribunda* Jokerst, sp. nov.**

Fig. 1

Caulis plerumque multi basii, plerumque minus quam 10 cm alti. Flores densi in spicas elongatas occultans caulis plurimi. Corolla 4-6 mm longa, alba maculis lavendulis in palato, occulta inter calyces et bracteas.

*Type.*—U.S.A. CALIFORNIA: Modoc Co., unnamed seasonal lake 1.5 mi E of Doublehead Lake, 0.46 km W of north-south fence line through center of Section 13 (T45N, R7E, NE ¼ NW ¼ S. 13, 1370 m), 31 July 1990, *Jokerst 3205* (holotype: CAS; isotypes: MO, NY, RSA, UC).

Plant aromatic, sparse-hirsute. Stems typically many from a rebranching base, occasionally solitary, upright, 4-10 (-30) cm tall, densely flowered throughout; lower stem occasionally subterranean. Leaves obovate to spatulate, ciliate, appearing glabrous but sparsely short-pubescent under 10× magnification, glandular-punctate, 6-12 mm long; blade 5-9 mm long, 2-4 mm wide, green aging purple, commonly shed during or after anthesis; petiole 1-3 mm long. Inflorescence an elongate, densely flowered spike; flowers concealing most of stem; spike (1-) 1.5-2.5 cm wide, with 2-4 flowers per whorl; bracts resembling leaves; bractlets 2 per flower, narrowly lanceolate, 2-5 mm long, 1-2.5 mm wide. Corolla 4-6 mm long, two-lipped; upper lip hooded over stamens; lower lip reflexed perpendicular to the tube, short hirsute without, white, with three lavender spots at base of lower lobes. Calyx (with lobes) 4-8 mm long, accrescent; tube 2-4 mm

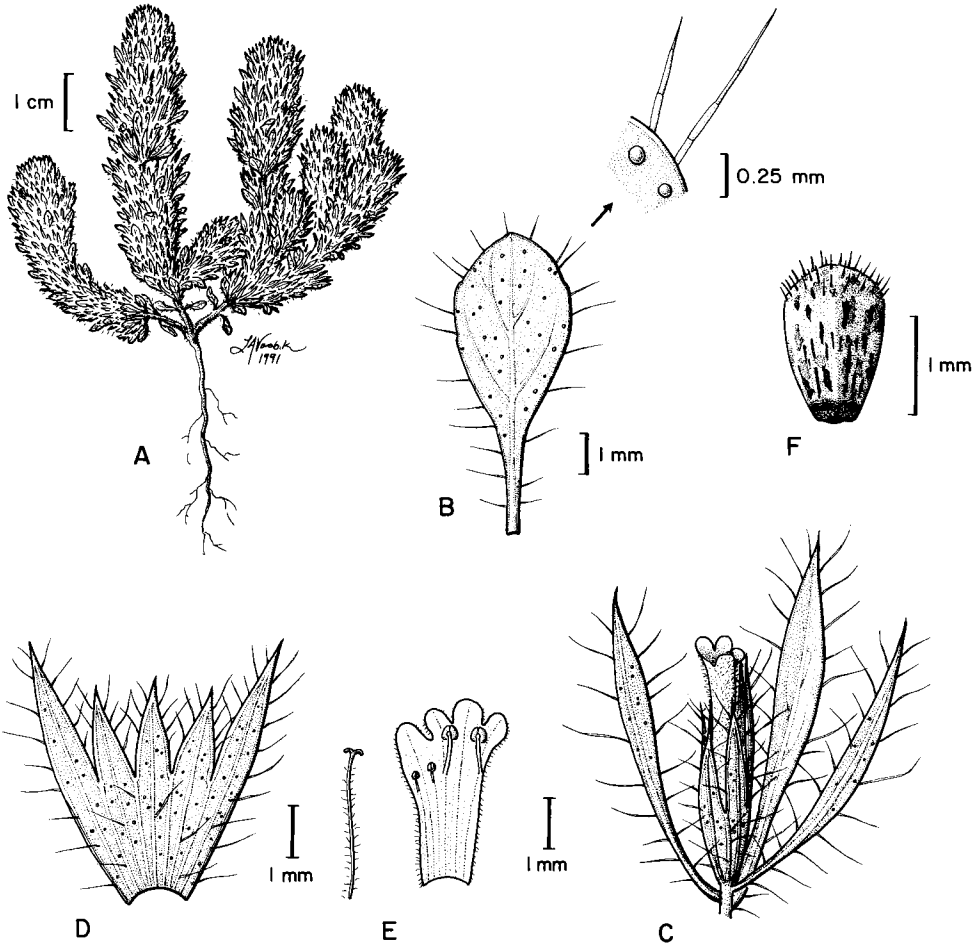


Fig. 1. *Pogogyne floribunda*.—A. Flowering plant.—B. Leaf and close-up view of septate hairs and punctate glands.—C. Flower and subtending bractlets.—D. Inside view of calyx.—E. Inside view of corolla.—F. Nutlet.

in flower, 3–5 mm in fruit; lobes acuminate, 1.5–3 mm in flower, 2–5 mm in fruit, bristly-hirsute, densely so on the inner surface of the ciliate teeth. Stamens 4; lower stamens fertile, 1–2 mm long; upper stamens rudimentary, sterile or fertile, club-shaped, <1 mm long. Style 3–4 mm, sparsely hairy below stigma branches. Nutlet 2–2.5 mm long, rhombic, brown mottled with black, hirsute at apex.

*Paratypes*.—U.S.A. CALIFORNIA: Lassen Co., Halls Flat, ca. 25 miles W of N end of Eagle Lake, 5 Aug 1933, *Whitney 1902* (UC!).—Modoc Co., embayment S end of Clear Lake, 27 Aug 1947, *Grant 8329* (UC!); peat soil E end of Fairchild Swamp N of Alturas, 9 Aug 1947, *Mason 13474* (CAS! UC!); Rim Rock Valley, 25 Aug 1935, *Wheeler 3915* (CAS! UC!); large seasonal lake ca. 2.5 miles S of Doublehead Mountain, T45N, R7E, center of the NE  $\frac{1}{4}$  S. 20, 23 Jun 1987, *Jokerst 2930* (CAS); small seasonal lake ca. 200 m S of lower lobe of Doublehead Lake and dirt road, T45N, R7E, NW corner S. 14, 23 Jun 1987, *Jokerst 2931* (CAS); large seasonal lake ca.  $\frac{2}{3}$  mi SE of Doublehead Lake, T45N, R7E, NE

¼ SE ¼ S. 14, 23 Jun 1987, *Jokerst 2932* (CAS); wide, low-lying ephemeral drainage ca. 1 mi S of the S end of Clear Lake, 2 mi N of Doublehead Mt., T46N, R7E, NE ¼ NE ¼ S. 36, 24 Jun 1987, *Jokerst 2938* (CAS); large seasonal lake ca. 3 mi S of Doublehead Mt., T45N, R7E, NE ¼ SW ¼ S. 28, 11 Aug 1986, *Jokerst 2762* and 13 Jul 1987, *Jokerst 2945* (CAS); vernal pool ca. 3 miles S of Doublehead Mt., T45N, R7E, NW ¼ SW ¼ S. 28, 13 Jul 1987, *Jokerst 2946* (CAS); seasonal lake ca. 1.25 mi SE of Doublehead Lake, T45N, R7E, SE ¼ SE ¼ S. 14.

*Other populations observed by author (no collections).*—U.S.A. CALIFORNIA: Modoc Co., large seasonal lake 0.46 km NW of Lone Pine Lake, T45N, R7E, NW corner S. 23, 23 Jun 1987; large seasonal lake at the center of W edge and at S edge ca. 5.6 km E of Doublehead Mt., T45N, R7E, N edge SE ¼ SE ¼ S. 12, 23 Jun 1987; ephemeral drainage at the edge of a wet meadow S of Mowitz Crk., T46N, R8E, NW ¼ SE ¼ S. 28, 2 Aug 1990; margin of receding perennial lake converted from seasonal lake, N of Highway 139, 6.1 km W of junction with Loveness Rd, T42N, R8E, NW corner S. 3, 2 Aug 1990.

#### DISTRIBUTION, HABITAT, PHENOLOGY, AND RARITY

*Pogogyne floribunda* has thus far been recorded in Lassen and Modoc counties (Fig. 1) of the eastern Modoc Plateau within the GBFP delineated by Raven (1977).

Specimen labels of *P. floribunda* collected before my investigations provide little habitat data. From my observations at Devils Garden, *P. floribunda* occurs in seasonal lakes; wide, intermittently flooded drainages; and basalt-flow vernal pools (Holland 1986). Seasonal lakes and vernal pools supporting *P. floribunda* are inundated or have saturated soil during winter and spring, and are generally dry by June or as early as April. In Devils Garden, seasonal lakes supporting *P. floribunda* pond water only during years of above-average precipitation. *Pogogyne floribunda* also occurs in intermittent drainages where topography prevents surface ponding.

The three types of seasonal wetlands with *P. floribunda* had a distinctive dark, grayish-brown or black, relatively deep Vertisol soil. It is classified as Ravendale clay loam, a fine, montmorillonitic, mesic, Entic Chromoxerert. This self-churning, expansive clay soil remains damp several centimeters below the surface throughout the hot summer (Lukow 1987).

*Pogogyne floribunda* at Devils Garden often occurs with a 30–60% cover of *Artemisia cana* Pursh subsp. *bolanderi* (Gray) Ward. Typical associates from Devils Garden include *Alopecurus howellii* Vasey, *Camissonia tanacetifolia* (T. & G.) Raven, *Deschampsia danthonioides* (Trin.) Benth., *Downingia elegans* (Lindl.) Torr., *Eleocharis macrostachya* Britton, *Eryngium mathiasiae* Sheikh, *Muhlenbergia richardsonis* (Trin.) Rydb., *Navarretia propinqua* Suksd., *Phacelia inundata* J. T. Howell, *Plagiobothrys leptocladus* (E. Greene) Jtn., *P. stipitatus* (E. Greene) Jtn. var. *micranthus* (Piper) Jtn., *Poa nevadensis* Scribn., *Polygonum polygaloides* Meissner subsp. *confertiflorum* (Piper) Hickman, *Psilocarphus brevissimus* Nutt., and *Rumex salicifolius* J. A. Weinm. var. *lacustris* (E. Greene) Hickman.

The presence of *P. floribunda* in the western GBFP documents the previously acknowledged floristic tie with the CFP (Griffin 1966; Young, Evans, Kay, and Budy 1986).

*Pogogyne floribunda* germinates and flowers during June after surface water has dried. Seedlings of *P. floribunda* were not visible on 11 May 1987 at a site where the plants were abundant 6 weeks later. Flowering continues through August. *Pogogyne floribunda* begins flowering soon after emerging from the soil and con-

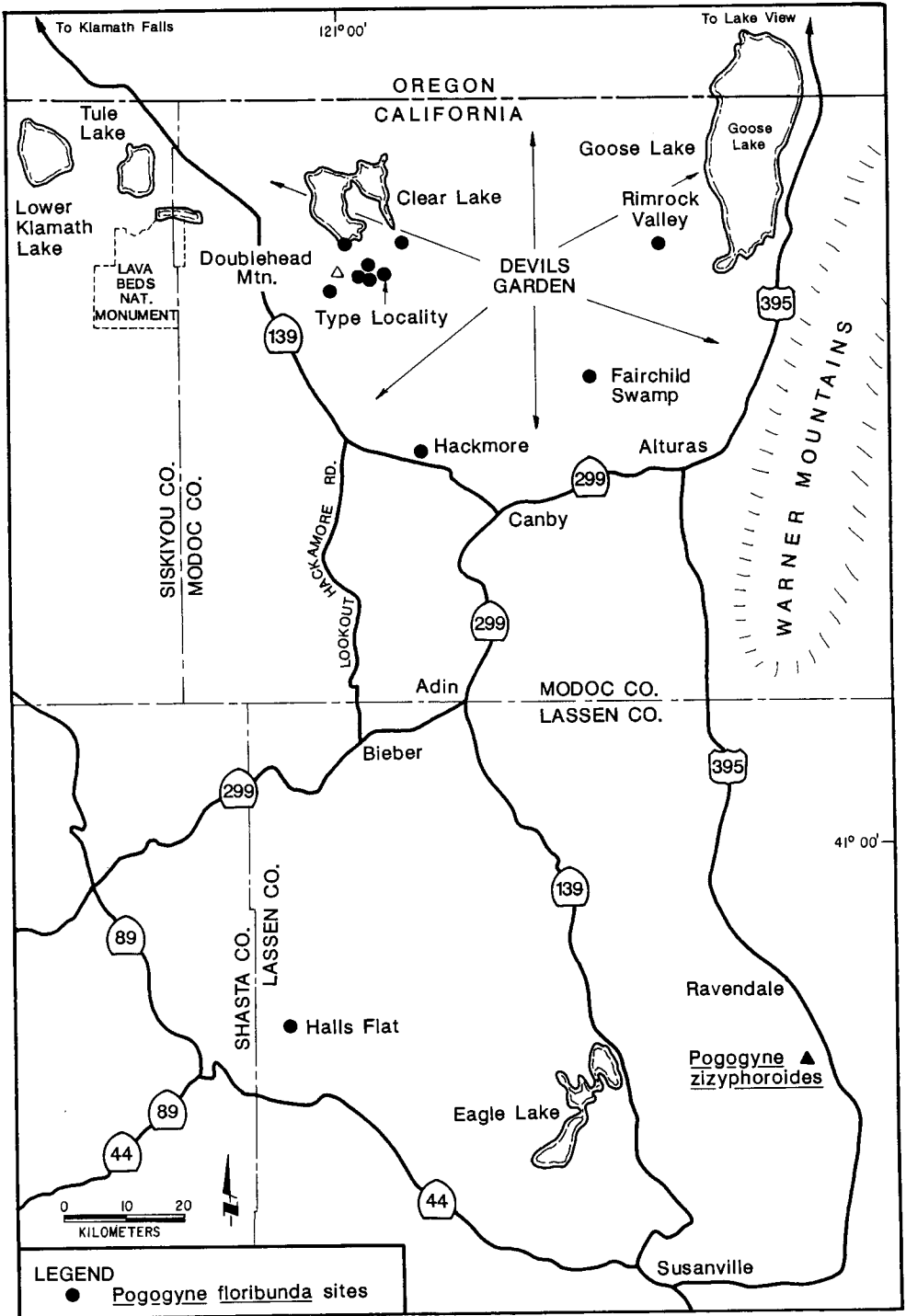


Fig. 2. Geographic range of *Pogogyne floribunda* and locations of known populations.

tinues throughout summer when adequate soil moisture is available. A heavy July rain shower caused plants with maturing fruit to rebranch at the base with new, actively flowering stems. Seed is produced from July to September.

*Pogogyne floribunda* occurs in a habitat that is vulnerable to destruction or alteration. It has a relatively narrow range and is known from only a few populations (Fig. 1), but a thorough survey throughout its range has not been conducted. Reports of 5050 hectares of *Artemisia cana* subsp. *bolanderi* vegetation in a 145,750-hectare portion of the Devils Garden (Salwasser and Shimamoto 1981) indicate undocumented populations likely exist. The species may occur in southeastern Oregon and northwestern Nevada, which are connected to the eastern Modoc Plateau by sagebrush scrub and juniper woodland vegetation with vernal pools and seasonal lakes.

#### DISCUSSION

John Thomas Howell of the California Academy of Sciences was apparently the first to recognize the distinctive nature of *P. floribunda*. His annotation of Louie Cutter Wheeler's collection from Rim Rock Valley in Modoc County (3915 CAS!) labeled as *Pogogyne zizyphoroides* states: "*forma nana et floribunda*." The species is named in recognition of Howell's early observation.

The growth habit and flower color of the new *Pogogyne* are unique in the genus. Plants of *P. floribunda* are typically branched at the base with few to many upright stems, each densely flowered throughout (i.e., flowers conceal the stem). Some unbranched plants generally occur in each population. *Pogogyne floribunda* has white flowers, contrasting with the blue or lavender flowers of other *Pogogyne* species.

Although normally the stems are concealed by flowers, *P. floribunda* specimens collected or observed during late summer may have naked lower stems. This may be due to the following reasons: 1) the lower stem can be buried as Vertisol soils expand and fluff, 2) plants rooted in deep soil cracks flower only along portions of the stem that are above ground level, and 3) calyces and bracts of the lower stem can mature and abscise by late summer while the upper stem is still concealed by flowers.

*Pogogyne floribunda* is assigned to Section *Hedimoides* because the corollas are scarcely exerted from the calyx and are thus inconspicuous, and the upper stamens are rudimentary (Howell 1931a). Specimens key to *P. zizyphoroides* Benth. in Munz (1968) or Peck (1941). Section *Hedimoides* spans the geographic range of the genus *Pogogyne*, with the localized endemics *P. floribunda* and *P. tenuiflora* Gray of Guadalupe Island, Baja California, at the northern and southern range extremes and the widespread *P. zizyphoroides* and *P. serpylloides* (Torr.) Gray in the intervening region.

Munz (1968) acknowledged a distinctive trait of *P. floribunda* when recognizing the summer-flowering form of *P. zizyphoroides* from the Modoc Plateau. Prior records for the genus on the Modoc Plateau are not documented. Neither Howell (1931a, b) nor Jepson (1943) cited collections from the Modoc Plateau. The Modoc Plateau was excluded from the distribution of *Pogogyne zizyphoroides* and other *Pogogyne* species by Jepson (1951), Abrams (1951), Mason (1957), Peck (1941), Hitchcock, Cronquist, Ownbey, and Thompson (1959), and Cronquist, Holmgren, Holmgren, Reveal, and Holmgren (1984). An obscure reference to a Modoc Pla-

teau *Pogogyne* was uncovered in the original description of *Polygonum esotericum* Wheeler (Wheeler 1938), where *P. zizyphoroides* is listed as an associate.

The distribution, morphology, and ecology of *P. floribunda* suggest its closest relationship lies with *P. zizyphoroides*. Historic collections of *P. floribunda* were probably referred to as *P. zizyphoroides* because of their morphological similarity and the latter's presence in cismontane northern California and southern Oregon. Both species have dense-flowered, spicate inflorescences and flowers with the same shape and dimensions. The two species differ, however, in their habit, stature, inflorescence size, flower color, geographic range, phenology, and habitat associations, as described below.

*Pogogyne floribunda* has white flowers in long, continuous spikes that extend the length of the stem. Plants are usually branched at the base and produce few to many flowering spikes that rarely exceed 10 cm in height (30-cm stems have been observed). *Pogogyne zizyphoroides*, in contrast, has purple or pink flowers in an interrupted spike of terminal and axillary flower clusters. Dried flowers of *P. zizyphoroides* can appear colorless but retain a faint lavender hue under magnification. Stems of *P. zizyphoroides* are branched above the base, typically exceed 10 cm, and are not flowered along the lower stem. The stems, leaves, bracts, and calyces of *P. zizyphoroides* are more densely hirsute than those of *P. floribunda*, and the leaves of the former are generally larger and typically persist throughout anthesis, while those of *P. floribunda* often abscise during anthesis.

*Pogogyne floribunda* flowers from June to August. The eastern Modoc Plateau is characterized by a cold desert climate with 25–38 cm of annual precipitation. Winters have freezing temperatures and most precipitation falls as snow. The soil of vernal pools and seasonal lakes with *P. floribunda* is usually submerged under water, snow, or ice during winter, flooded or saturated during spring, and normally dry at the surface by summer.

In contrast, *P. zizyphoroides* flowers from March to May and occurs in portions of California and Oregon with a Mediterranean climate characterized by mild, wet winters with occasional freezing temperatures. Annual precipitation ranges from 6 to 12 cm, most of which falls as rain. Vernal pools and swales supporting this species are continuously or intermittently flooded or have saturated soils from November to April, and are dry by May.

An exceptional *P. zizyphoroides* population is known from the GBFP in Secret Valley, Lassen County (Fig. 1) (*Schoolcraft 1022*, 28 Jun 1983, mudflats with silver sage, T31N, R15E, S. 22, specimen at the U.S. Bureau of Land Management herbarium, Susanville, California) (Fig. 1). The collection clearly represents *P. zizyphoroides*. This most easterly population of *P. zizyphoroides* is disjunct from its main distribution in eastern Shasta County and near Burney and Weed in Siskiyou County by over 46 km.

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