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Clare B. Hardham

Jim A. Bartel  
*U.S. Fish and Wildlife Service*

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*MONARDELLA STEBBINSII* (LAMIACEAE), A NEW SERPENTINE  
ENDEMIC SPECIES FROM THE NORTHERN SIERRA NEVADA,  
PLUMAS COUNTY, CALIFORNIA

CLARE B. HARDHAM

4485 Creston Road  
Paso Robles, California 93446-9804

AND

JIM A. BARTEL<sup>1</sup>

Office of Endangered Species  
U.S. Fish and Wildlife Service  
2800 Cottage Way  
Sacramento, California 95825-1846

ABSTRACT

*Monardella stebbinsii* (Lamiaceae), a new species from the northern Sierra Nevada of Plumas County, California, is described and illustrated. Characterized by ovate leaves, multiple verticillasters per inflorescence, a matlike habit, reddish papery bracts, and purplish-red leaves with a soft white pubescence, the species is not closely related to any other species of the genus. The new species is apparently restricted to the central portion of a serpentine outcrop located north and east of the confluence of the North Fork of the Feather River and its East Branch.

Key words: *Monardella*, Lamiaceae, Sierra Nevada, taxonomy, plant ecology, serpentine endemism, endangered species.

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INTRODUCTION

In 1968, G. Ledyard Stebbins, for whom the plant is named, and the first author discovered a new *Monardella* along the North Fork of the Feather River, Plumas County, California. Later that year, Stebbins and Carl Epling located a second population on the south side of Serpentine Canyon, which borders the East Branch of the North Fork of the Feather River. Subsequent fieldwork by the second author and other botanists revealed additional populations on the north side of Serpentine Canyon and on the west slope of Red Mountain. Although additional populations likely exist in intervening areas of suitable habitat, the new species appears to be restricted to the central portion of a northwest-southeast trending, ultramafic geologic body consisting largely of serpentinite ("serpentine").

TAXONOMY

*Monardella stebbinsii* Hardham & Bartel, sp. nov.

Fig. 1

Herba perennis humilis, caulibus basi lignosis, plantis rhizomatosis et latis; foliis sine hydathodis, ovatis 15-20 mm longis; planta cinerea pubescentibus pilis simplicibus multicellularibus, saepe purpureo rubris maculatis prope apicem; petiolis 2 mm longis; inflorescentia typica glomerulata, etiam interdum verticillastrata; bracteis infimis plerumque in 2 jugis, plus minusve foliaceis; bracteis mediis in 3 jugis, rubescentibus chartaceis; bracteis intimis acicularibus; pedicellis 1-2 mm longis; calcybus

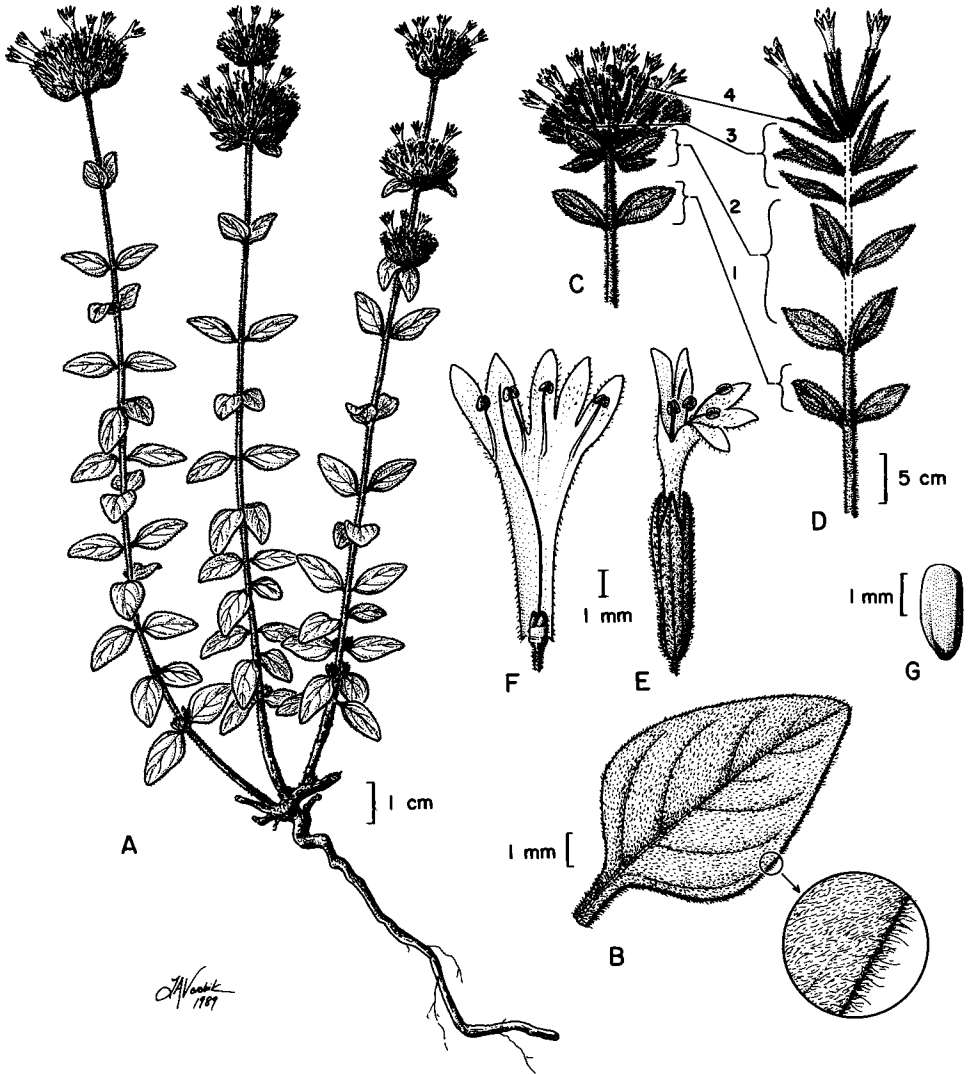


Fig. 1 *Monardella stebbinsii*.—A. Flowering plant.—B. Leaf showing vestiture.—C. Inflorescence.—D. Expanded drawing showing series of bracts: 1) pair of leaves below inflorescence, 2) “leafy” bracts, 3) “cymule” bracts subtended by “cyme” bracts, 4) “bracteoles.”—E. Flower with calyx.—F. Inside view of flower.—G. Seed.

8–9 mm longis, plerumque 13-venosis, dentibus circa 2 mm longis; floribus pallide roseis; chromosomatum numerus gameticus, plerumque  $n = 21$ .

Low-growing, perennial herb, woody at base, 15–40 cm tall, forming extensive matlike clumps from rhizomes; frequently ashy-colored due to soft, white pubescence of unbranched multi-cellular hairs. *Leaves* entire, ovate to occasionally ovate-elliptical, acute, 12–22(–28) mm long, 5–12(–14) mm wide, without hydathodes, often ashy to lead-gray to plum in color, often blotched purplish-red especially on the adaxial surface near apex; petioles 2–4 mm long. *Stems* erect,

often branching at upper nodes forming a panicle, 1(–4) inflorescence per branch. *Inflorescence* a terminal verticillaster (head), 8–20 mm high, 8–20(–25) mm wide, with 0–3 more or less remote, often smaller heads in distinct whorls below; verticillaster bracts in three sets, outer set usually composed of two pairs of either leaflike or reddish and papery bracts, middle set of three pairs of reddish papery bracts (one pair of cyme bracts per inflorescence and one pair of cymule bracts for each dichasium and supporting stem), inner set essentially absent or acicular and membranous; pedicels 1–2 mm long; calyx 8–9 mm long, teeth about 2 mm long, veins usually 13; corolla 6–12(–14) mm long, pale pink; nutlets 2–3 mm long, brown. *Chromosome number*  $n = 21$ , but hypo- and hyperdiploid ( $\bar{x} = 21$ ) numbers not uncommon.

*Type*.—U.S.A., California: Plumas Co.; “North Fork of the Feather River, 1.9 km N of Queen Lily Campground” along Caribou Road, 820–1500 m, 15 Jul 1968, *Clare B. Hardham 15680* (holotype CAS; isotypes RSA, UC).

*Paratypes*.—U.S.A. CALIFORNIA: Plumas Co.; North Fork of the Feather River, 6.3 km N of jct. with State Route 70 along Caribou Road (type locality), 1 Sept. 1989, *Bartel 1332* (CAS, RSA, UC); type locality, 3 Aug. 1989, *Bartel 1326* (RSA); type locality, 7 Aug. 1987, *Bartel 1248* (CAS, RSA, UC); type locality, 1 Aug. 1968, *Stebbins 6827* (CAS); East Branch of the North Fork of the Feather River, 1.6 km E of Rich Bar, 1050 m, 2 Aug. 1968, *Stebbins and Epling 6840* (CAS); S side of Serpentine Canyon, 3.2 km E of Rich Bar, 800 m, 3 Aug. 1989, *Bartel 1330* (RSA); N side of Serpentine Canyon, 4.3 km E of confluence of the North Fork of the Feather River along State Route 70, 850 m, 3 Aug. 1989, *Bartel 1331* (RSA); N side of Serpentine Canyon, 7 Aug. 1987, *Bartel 1252* (RSA); W slope of Red Mountain, 1900 m, 1 Sept. 1989, *Bartel 1336* (CAS, RSA, UC).

#### MORPHOLOGY AND AFFINITIES

The inflorescence in *Monardella*, as in *Monarda* (Scora 1966), is a verticillaster; a false whorl composed of a condensed pair of essentially sessile, determinate cymes (dichasia). Unlike *Monarda*, the inflorescence is subtended by two pairs of leaflike bracts, which make up the outer set of bracts (Hardham 1966*b*). Though the first pair of bracts also may be petiolate, and attached a centimeter or two below the verticillaster, the outer set of bracts or “leafy bracts” in *M. stebbinsii* typically are purplish-red and membranous (except for the leafy green tip), and closely subtend the verticillaster. However, the leafy bracts are highly variable and can be green and leaflike in *M. stebbinsii*, as in some other species with colored bracts (e.g., *M. linoides* Gray and *M. glauca* Greene). Three pairs of highly modified membranous bracts (one pair of “cyme bracts” per inflorescence and one pair of “cymule bracts” for each dichasium and supporting stem) compose the middle set of bracts. These bracts are wide-ovate, reddish, and papery in *M. stebbinsii*. In *M. stebbinsii*, like other species with colored bracts, the cyme bracts are merely smaller versions of the second pair of leafy bracts. A pair of “bracteoles” immediately subtend each dichasium and form the inner set of bracts in the inflorescence. Even when present, these acicular, translucent-membranous bracts are difficult to see. Moreover, the bracteoles are often essentially absent, especially when the leafy bracts are somewhat papery and red. As a result, the bracts of *M. stebbinsii* appear to be intermediate between the presumed primitive (leafy bracts green and leaflike) and derived condition (leafy bracts somewhat papery and colored, and the middle and inner set of bracts much reduced to absent).

The entire, ovate, and relatively small, thick leaves of *M. stebbinsii* often have



Fig. 2. Photograph of large *Monardella stebbinsii* from type locality showing matlike habit.

a curious ashy to lead-gray to plum color due to a combination of soft white pubescence and purplish-red pigments that masks the green. Both leaf surfaces may be reddish, especially the adaxial surface near the apex.

The affinities of *M. stebbinsii* may lie with other narrowly endemic species (e.g., *M. cinerea* Abrams, *M. australis* Abrams). These endemics have reddish papery bracts and are often diploid and pubescent. Regardless, the presence of ovate leaves and multiple verticillasters per inflorescence combined with the matlike habit (Fig. 2), reddish papery bracts, ploidy, and leaf vestiture and coloration of the species clearly indicate that *M. stebbinsii* is not closely related to any known species. *Monardella stebbinsii* would be placed in sect. *Odoratissimae* in Epling's (1925) treatment of the genus, a section that is largely distributed in the Sierra Nevada, Cascade Mountains, and mountain ranges of the Great Basin. The value of assigning the species to an existing section is of dubious value, however, given the lack of any close allies to *M. stebbinsii*.

Chromosome counts varied between plants. Aneuploid chromosome numbers seem to be common in many species of *Monardella* (Hardham 1966a, 1966b,

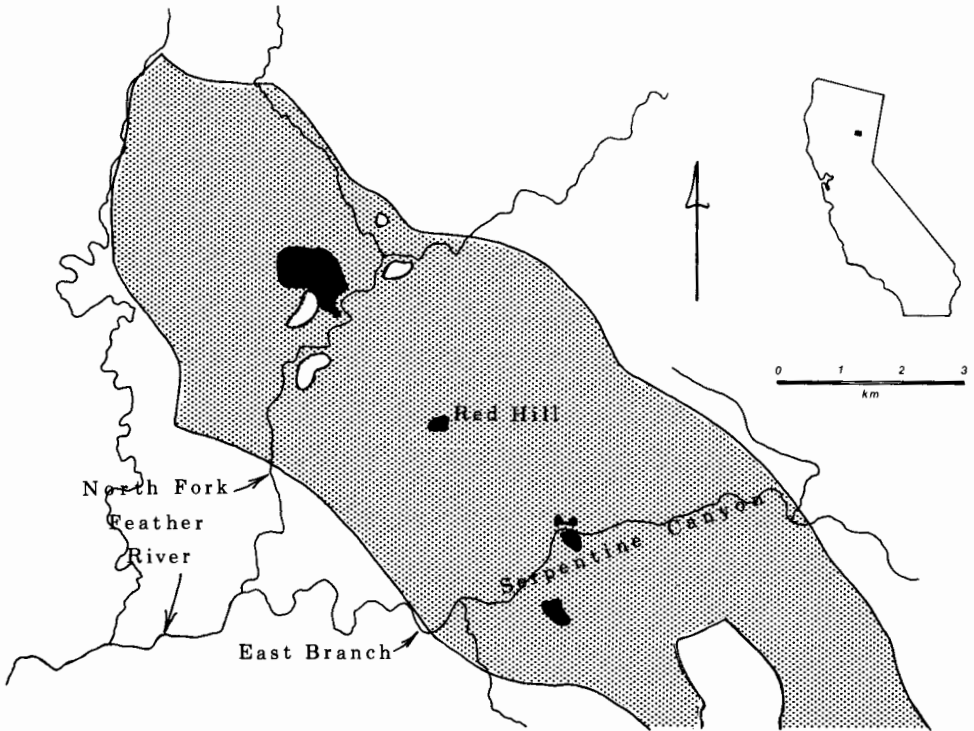


Fig. 3. Map depicting serpentine substrate (stippled area) according to Oliver et al. (1980a, 1980b), and known populations of *Monardella stebbinsii* (black areas).

unpubl. data). El-Gazzar and Watson (1970) suggested that the base number of  $\bar{x} = 7$  for that group of Lamiales in which they included *Monardella*. However, as a result of numerous counts by the first author and work by Raven et al. (1965), the base number for the genus appears to be 21.

#### DISTRIBUTION, ECOLOGY, AND PHENOLOGY

*Monardella stebbinsii* apparently is narrowly restricted to the central portion of a northwest-southeast trending, ultramafic geologic body consisting largely of serpentinite ("serpentine"). This area of serpentine, which is north and east of the confluence of the North Fork of the Feather River and its East Branch (Fig. 3), is the northernmost ultramafic body in the Sierra Nevada (Kruckeberg 1984). The species occurs mostly as widely scattered individuals on steep, loose slopes of generally reddish serpentine talus and boulders, between 820 and 1900 m.

At the type locality, *M. stebbinsii* grows widely scattered on the steep slopes above the river within a large open area bordered by the mixed coniferous forest that occupies much of the serpentine body. Species associated with the new species at lower elevations include: *Antirrhium vexillo-calyculatum* Kellogg subsp. *intermedium* D. Thompson, *Calocedrus decurrens* (Torr.) Florin, *Eriogonum nudum* Dougl. ex Benth., *Chrysothamnus nauseosus* (Pall.) Britton subsp. *albicaulis* (Nutt.) Hall & Clem., *Cheilanthes siliquosa* Maxon, *Eriophyllum lanatum* (Pursh) Forbes, *Mimulus mephiticus* Greene, *Monardella reflexa* Howell, *Pinus jeffreyi* Grev. &

Balf., *Quercus durata* Jeps., *Q. chrysolepis* Liebm., *Sedum albomarginatum* R. T. Clausen, *Senecio eurycephalus* T. & G. var. *lewisrosei* (J. T. Howell) T. M. Barkl., and *Streptanthus tortuosus* Kell. *Lewisia cantelowii* J. T. Howell grows on moister sites adjacent to the low elevation sites harboring *M. stebbinsii*. The population on the south side of Serpentine Canyon near Rich Bar occurs in a clearing within an open forest of *Pseudotsuga menziesii* (Mirb.) Franco, *Calocedrus decurrens*, and *Quercus garryana* Dougl. var. *breweri* (Engelm. in Wats.) Jeps. and grows abundantly on steep scree and serpentine ledges in association with *Sedum albomarginatum* and *Chrysothamnus nauseosus* subsp. *albicaulis*. Only a few isolated individuals of *M. stebbinsii* apparently occur on the north side of Serpentine Canyon amid chaparral. Species associated with *M. stebbinsii* on Red Mountain and at higher elevations at the type locality include: *Calocedrus decurrens*, *Eriogonum nudum*, *Ceanothus cuneatus* (Hook.) Nutt., *Cercocarpus montanus* Raf., *Chrysothamnus nauseosus* subsp. *albicaulis*, *Cheilanthes siliquosa*, *Monardella odoratissima* Benth. var. *folletti* Jepson, *Pinus jeffreyi*, *Quercus chrysolepis*, *Sedum albomarginatum*, and *Senecio eurycephalus* var. *lewisrosei*.

The talus slopes harboring *M. stebbinsii* support only a sparse vegetation, unlike the serpentine sites occupied by chaparral or mixed evergreen forest. Although serpentine generally reduces and attenuates the vegetation ("serpentine syndrome") (Jenny 1980), the sparsely vegetated to barren serpentine found at the type locality and largely at the other population localities reflects the severity of this habitat (Kruckeberg 1984). Nonetheless, the new species obviously tolerates these extreme conditions (i.e., semistable loose talus slopes, skeletal serpentine soils with little available moisture), which effect the sparse vegetation. Although we cannot explain the absence of *M. stebbinsii* from adjacent, more-vegetated, serpentine habitats, tolerance to a narrowly defined habitat enable *M. stebbinsii* to occupy sites essentially devoid of competitors.

*Monardella stebbinsii* typically flowers from July to early September. At higher elevations (1900 m), individual plants likely flower, to some degree, throughout September. This flowering period, which is largely later than that of other monardellas growing on and off serpentine in the area, is remarkable given the hot and dry conditions prevalent at that time. The few competing plants and the pubescence of the species are two factors that may contribute to the apparent drought tolerance of *M. stebbinsii*.

As with other monardellas (Hardham 1966a, 1966b; Shevock et al. 1989), an examination of some individuals of *M. stebbinsii* and two sympatric taxa (*M. reflexa*, *M. odoratissima* var. *follettii*) suggests that some introgression has occurred in the general area. For example, *M. reflexa*, which typically is glabrous in the general area, produces marginally pubescent and somewhat purplish leaves near the type locality of *M. stebbinsii*. Populations of *M. odoratissima* var. *follettii* growing on Red Hill and to the west near Yellow Creek often have dark purple leaves on the upper portion of the stem. Compared to the *M. stebbinsii* growing elsewhere, the plants occurring south of Serpentine Canyon have more elliptical, slightly less pubescent leaves that lack any plum coloration. However, similar individuals can be found within the central portion of the large population at the type locality, which is devoid of sympatric species. Despite the apparent hybridization occurring between *M. stebbinsii* and these other monardellas, we do not

believe these minor morphological variations weaken the distinctiveness of *M. stebbinsii* due to the several morphological characters unique to the new species.

#### ACKNOWLEDGMENTS

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#### FOOTNOTE

<sup>1</sup> To whom requests for reprints should be sent.