

A NEW VARIETY OF *HOLODISCUS DUMOSUS* (ROSACEAE: SPIRAEOIDEAE) FROM COASTAL NORTHWESTERN CALIFORNIA

Roger Raiche

Planet Horticulture Garden Design
6600 Front Street
Forestville, California 95436, U.S.A.
roger@planethorticulture.com

James L. Reveal

L.H. Bailey Hortorium, Department of Plant Biology
412 Mann Building, Cornell University
Ithaca, New York 14853, U.S.A.
jlr326@cornell.edu

ABSTRACT

Holodiscus dumosus var. *cedrorum* is proposed for a localized endemic confined to The Cedars area of Sonoma Co., California. The new variety differs from *H. dumosus* var. *glabrescens* by being a taller shrub with sparser, more open branches, inflorescences composed of numerous secondary branches subtended by bracts, panicles of 70 or more flowers, and achenes with more than 35 glands per side. The new vegetative growth is consistently, and distinctively, a bright ruby red in color. The new variety is a serpentine endemic confined to the outer Coast Ranges of California.

RESUMEN

Se propone *Holodiscus dumosus* var. *cedrorum* para un endemismo confinado al área de The Cedars de Sonoma Co., California. La nueva variedad difiere de *H. dumosus* var. *glabrescens* por ser un arbusto más alto con ramas separadas más abiertas, inflorescencias compuestas de numerosas ramas secundarias subtendidas por brácteas, paniculas de 70 o más flores, y aquenios con más de 35 glándulas en cada lado. El crecimiento vegetativo nuevo es consistentemente, y distintivo, de un color rubí brillante. La nueva variedad es un endemismo de las serpentininas confinado a la Cordillera Costera de California.

The Cedars of northwestern California comprises about 6,000 acres of ultramafic (high magnesium and iron) rock and derived soils located in Sonoma Co. These rocks are commonly referred to as serpentine. Serpentine has a profound effect on vegetation due to an imbalance of magnesium to calcium, and a lack of essential nutrients for plant growth. Geophysical isolation of The Cedars from other serpentine areas, dramatic topographic relief, high winter rainfall and unusually hot summer temperatures, are factors that have fostered an exceptionally high level of endemic taxa on this geologic "island." They are: *Arctostaphylos bakeri* Eastw. ssp. *sublaevis* P.V. Wells, *Calochortus raichei* Farwig & Girard, *Epipactis gigantea* Hook. f. *rubrifolia* P.M. Br., *Erigeron serpentinus* G.L. Nesom, *Eriogonum cedrorum* Reveal & Raiche and *Streptanthus glandulosus* Hook. ssp. *hoffmanii* (Kruckeb.) M.S. Mayer & D.W. Taylor. In addition to the endemic taxa, many others are disjunct or represent a range extreme at The Cedars.

The Cedars *Holodiscus* was first noted by Raiche in 1981 who introduced the plant into the University of California Botanical Garden at Berkeley in 1982 where it has persisted in cultivation ever since. He noted that the plant differed significantly from the common coastal oceanspray, *H. discolor* (Pursh) Maxim, which occurs less than a mile away on non-serpentine substrate. Using the most recently published monograph by Ley (1943), he attempted to ascertain in this complex genus of eight species where this particular expression fit best. He initially sought to fit The Cedars plant into one of the published expressions of *H. discolor* only to conclude that it persistently tended to key out to what Ley termed *H. microphyllus* Rydb. and specifically the var. *glabrescens* (Greenm.) Ley, a plant found in the Sierra Nevada and mountains of central and eastern Oregon eastward to Wyoming, Utah and northwestern Arizona, well away from The Cedars, a mere seven air miles east of the Pacific Ocean in Sonoma Co., California.

By studying the plant over the years, and growing the plant in several different locations, noting that it retained its consistent features, Raiche concluded that the plant was distinct and required formal recognition. Working with Reveal while they jointly examined another local endemic, *Eriogonum cedrorum* (Reveal & Raiche 2009), they began a detailed study of the two species of *Holodiscus* found in the United States and Canada, and concluded that The Cedars oceanspray is a variant of *H. dumosus*, and that the traditional cir-

cumscription of species in the genus failed to take into account a series of important features about branches. The branch type is a crucial determinant of leaf morphology, on which so much of *Holodiscus* taxonomy has been based. Thus it is crucial that comparable leaves are being compared in each taxon. Additional details about the small flowers overlooked by previous workers also proved noteworthy. In particular, details about the complex stamen arrangement, especially filament size, shape and position on the hypanthium have not been consistently noted for most taxa in the genus. In addition, the number of glands on the face of the achenes provides important data to make distinctions within the genus. The long and detailed description which follows attempts to better describe and quantify those features that future workers need to consider in evaluating the remaining species and varieties of this genus.

Holodiscus dumosus (Nutt. ex Hook.) A. Heller var. **cedronus** Raiche & Reveal, var. nov. (Figs. 1–5). Type: UNITED STATES, CALIFORNIA: Sonoma Co.: The Cedars, Central Canyon area NE of Laton (or Layton) Mine, on gravelly, serpentine slopes at 270 m elev., 38°37'16"N, 123°08'00"W, T9N, R12W, sec. 13 SW¼ of the NE¼, 7 Jun 2010, J.L. Reveal & R. Raiche 8999 (holotype: NY, isotype: ARIZ, ASU, BH, BM, BRY, CAS, COLO, GH, IL, MICH, MO, OSC, RENO, RM, RSA, TEX, UC, US, UTC, WTU).

A var. *glabrescens* insigniter elatis et plus apertis cum novis caulis, ramis et petiolis valde et lacte rubineis, et foliis atrovirides superficis differt.

Plants long-lived, deciduous woody shrub, 1–2 (–2.5) m tall forming sparse, open thickets, deeply rooted, spreading slowly underground by rhizomes, resprouting after catastrophic loss of above ground parts, each branch living at least 2–3 decades, possibly longer before senescing, continuously replaced by new branches. **Branches** of two types, primary and secondary. **Primary branches** (Fig. 3) strict, up to 3 m long, unbranched or nearly so, 3–5 mm thick, initially ruby red, aging to reddish tan, glabrous or only sparsely pubescent with the hairs often early deciduous; bark thin, papery, with 5–8 ribs, smooth or finely striate between ribs, outer bark splitting in long vertical fissures but remaining on stem during first season, tan to reddish tan, aging to gray, inner bark deep reddish brown (on tall shrubs, sometimes secondary branches appear on primary branches, but resemble primary branches in size, robust growth and leaf characters). **Secondary branches** (Fig. 4) shorter, repeatedly and divaricately branched with the ultimate branchlets often reduced to peg-like spurs 1–2 cm long, 1–3 mm thick, initially ruby red, becoming opaque gray to reddish tan, initially sparsely pubescent with scattered glands, hairs and glands early deciduous; bark similar to that of the primary cane branches. **Leaves** emerging in early spring (Feb/Mar) and often becoming summer deciduous (Aug) in dry years, otherwise not until fall (Oct), variable according the branch type, shiny and dark green to blackish adaxially when exposed to full sun, often appearing whitish due to stomata abaxially, newly emerging petioles and leaf blades suffused with strong red coloration similar to that of stems and branches, this diminishing with age but still noticeable on mature foliage, becoming a soft golden yellow just prior to leaf drop; blades glabrate or sparsely pubescent with fine hairs and scattered glands adaxially, both deciduous with age, short puberulent with a few glands (not readily visible) abaxially especially on young leaves, primary veins sunken on adaxial surface, these finely pubescent with slightly appressed and persistent hairs abaxially. **Primary stem foliage** (Fig. 3) large, internodes 7–43 mm long, blade typically ovate to deltoid-ovate or roundish, 13–43 mm long (incl. 3–17 mm long petiole), 11–35 mm wide, leaf base often slightly decurrent, otherwise flat to broadly angled relative to central leaf rib, lobes 4–5(–6) per side, shallowly toothed extending past midpoint, sometimes lower lobes incised to near midrib and appearing almost pinnate, often with 1–5 secondary teeth especially on larger leaf blades, each apically rounded or mucronate. **Secondary stem foliage** (Fig. 4) small, 5–25% the size of that found on primary stems, often seemingly in fascicles on short shoots; mostly obovate; blade oval or roundish, 6–21 mm long (including 3–4 mm long petiole), 4–13 mm wide, leaf base minutely decurrent up to half the length of the petiole, teeth usually 3–4 per side and restricted to upper half of margin, secondary teeth lacking, each apically minutely mucronate. **Inflorescences** panicles or compound panicles (Fig. 1) at ends of primary, secondary or tertiary branches (not on peg-like branches), positioned above the foliage, largest and densest on primary stems, decreasing with branch size, often suffused with pink coloration with this persisting after flowering, aromatic (*Myrica*-like) when crushed, diffuse, open; branchlets of compound panicles 7–13(–16), these again often



FIG. 1. *Holodiscus dumosus* var. *cedronis*. Flowering panicles. Fully open flowers \pm 6 mm across, arranged in compound panicles, the secondary panicle branchlets subtended by leaf-like bracts. All young growth, including inflorescence (including sepals) suffused with red or pink coloration.



FIG. 2. *Holodiscum discolor* var. *corymbosum*. Close up of flower showing 5 pistils in center, golden nectary ring on hypanthium, 20 stamens, 5 sepals and 5 petals \pm 0.2 mm longer than sepals. The 20 filaments are inserted at three slightly different positions on the outer rim of the hypanthium, and reflex at different times depending on their respective positions.

branched, each primary lower branchlet subtended by a small leaf-like basal bract 6–7 mm long and 3.5–4 mm wide at lower nodes, these decreasing in size upward and ultimately lacking. **Flowers** (Fig. 2) numerous but extremely variable in number, 70–700, averaging 200 per terminal panicle; calyx 5, persistent, 1.8–2 mm long, 1.4–1.5 mm wide at base, triangular ovate, pubescent and minutely glandular on both surface but more densely so abaxially; sepals hygroscopic, closing inward when wet and reflexed when dry; hypanthium round-pentagonal in outline with the broadest points between the sepals, 1.7–2 mm across, adnate to ovary, pubescent and glandular within, nectary forming a ring between outer and inner rim; **petals** 5, inserted on outside top of outer rim of hypanthium, oval, tapering to a narrow base, 1.8–2.1 mm long, 0.9–1 mm wide, deciduous. **Stamens** 20, arranged in two series with 5 opposite the petals and 15 opposite the sepals; filaments 1.6–1.9 mm long, arising on the inside of outer hypanthium rim, three filaments on sepals flaring at base and of two lengths with central one positioned on inside of outer hypanthium rim and 1.6 mm long, outer two filaments 1.9–2.1 mm long and inserted on top of outer hypanthium rim, these curved outward initially with those opposite petals and central sepal stamen curving outwardly sequentially. **Pistils** with styles 1–1.1 mm long. **Achenes** 5, radial, arranged opposite the petals, laterally flattened, 2–2.1 mm long, densely pilose with long, stiff hairs marginally, otherwise merely pubescent and persistently glandular with (30–)35–45(–50) prominent, sessile or stalked glands per face (Fig. 5).



FIG. 3. *Holodiscus dumosus* var. *cedroris*. Primary branch segment showing large foliage type; typically with truncate base, deep lower lobes; the lower lobes frequently with secondary lobing. Minute glands not apparent on foliage without magnification. Branch color in transition from bright red to drab brown, typical of first year growth.



FIG. 4. *Holodiscus dumosus* var. *cedroris*. Secondary and tertiary branches with ruby red new growth. Foliage smaller than on primary stems, with cuneate bases, fewer, shallower lobes, usually lacking secondary lobing, leaf base sometimes decurrent along petiole for all or part of length (lower center leaf).

Distribution.—Restricted to serpentine substrates at The Cedars 200–620 m elev, Sonoma Co., California (Fig. 6). May–Jul.

Additional collections examined: U.S.A. CALIFORNIA, Sonoma Co.: The Cedars near Big Austin Creek and Layton Mine, 259 m, 20 May 1987, Raiche 70194 (JEPS). The Cedars, in the canyon above Austin Creek near Layton Mine, on serpentine gravelly slopes at 1350 ft elev., 38°37'16"N, 123°07'37"W, T9N.R12W, sec. 13, 28 Jul 2009, Reveal & Raiche 8991 (BH, UC).

Our recognition of *Holodiscus dumosus* as distinct from *H. discolor*, following Hitchcock (1961) and Holmgren (1997), rather than merging the two as proposed by Lis (1993) who then recognized *H. microphyllus* at the species rank rather than including this expression within *H. dumosus*, is based on a broad knowledge of these plants in the field and the original type material. The two species recognized here are not known to hybridize and their distinction in the Pacific Northwest, and especially in Idaho, where their ranges overlap—although the populations never intermix—are consistently and easily recognized. Even in California the ranges of *H. discolor* and *H. dumosus* do not overlap geographically, and even when the two are in close proximity, as is the case of the new variety proposed here, they occur in markedly different ecological settings. Contrary to Lis, a more troublesome distinction is between *H. dumosus* and *H. microphyllus*, and so much so in the Intermountain West that Welsh (2003) joined Hitchcock and Holmgren in not recognizing *H. microphyllus*

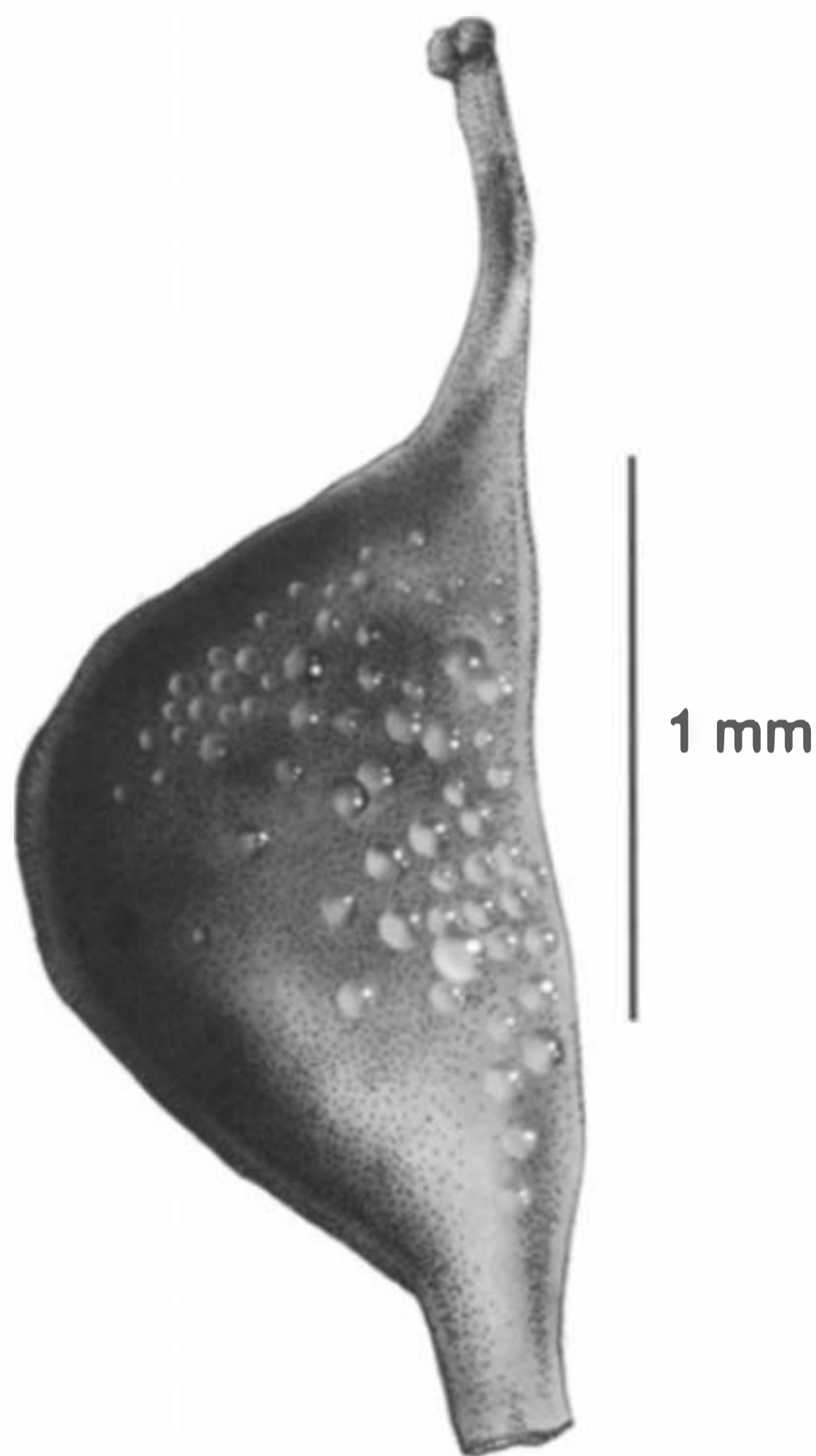


FIG. 5. *Holodiscus dumosus* var. *cedrorus*. An achene showing the variation in size and general distribution of surface glands; hairs on the achenes are not shown. Illustration by Alfonso Doelette.

as distinct from var. *dumosus*. Likewise, contrary to what Lis may well propose in a forthcoming volume of *Flora of North America*, a distinction between his *H. microphyllus* var. *microphyllus* and var. *sericeus* F.A. Ley completely breaks down in portions of southern Nevada and southeastern California, and in Arizona any recognition of two entities based on the length of hairs is impossible as this feature is clearly influenced by exposure and elevation where mixed populations of individuals with differences in hair length are the norm.

Thus, here we recognize two morphological and geographically distinct species, *Holodiscus discolor* and *H. dumosus*, while recognizing that a distinction between var. *dumosus*, var. *glabrescens*, and even var. *cedrorus*, is marred by overlaps in some morphological features although var. *cedrorus* is geographically isolated from both.

Holodiscus dumosus var. *cedrorus* (from the Latin *cedrorus*, of cedars) is restricted to ultramafic substrates (peridotite and serpentinite) that defines The Cedars. The plant is fairly common on the lower canyon slopes in relatively mesic, old-growth *Hesperocyparis sargentii* (Jeps.) Bartel woodland where it may be encountered even in dense shade. This is often the only shrub of open talus slopes and is sometimes found in chaparral, particularly on slopes with a north aspect. In general, the variety is associated with *Quercus dumata* Jeps., *Umbellularia californica* (Hook. & Arn.) Nutt., *Arctostaphylos viscida* Parry ssp. *pulchella* (Howell) P.V. Wells, *A. bakeri* ssp. *sublaevis*, *Rhamnus ilicifolia* Kellogg, *Frangula californica* (Eschsch.) A. Gray ssp. *tomentella* (Benth.) Kartesz & Gandhi, *Iris macrosiphon* Torr., *Carex brevicaulis* Mack., *Silene californica* Durand, *Polygala califor-*

**Distribution of *Holodiscus dumosus* var. *cedrorus* in NW Sonoma Co., CA
at The Cedars and contiguous ultramafic rock areas.**

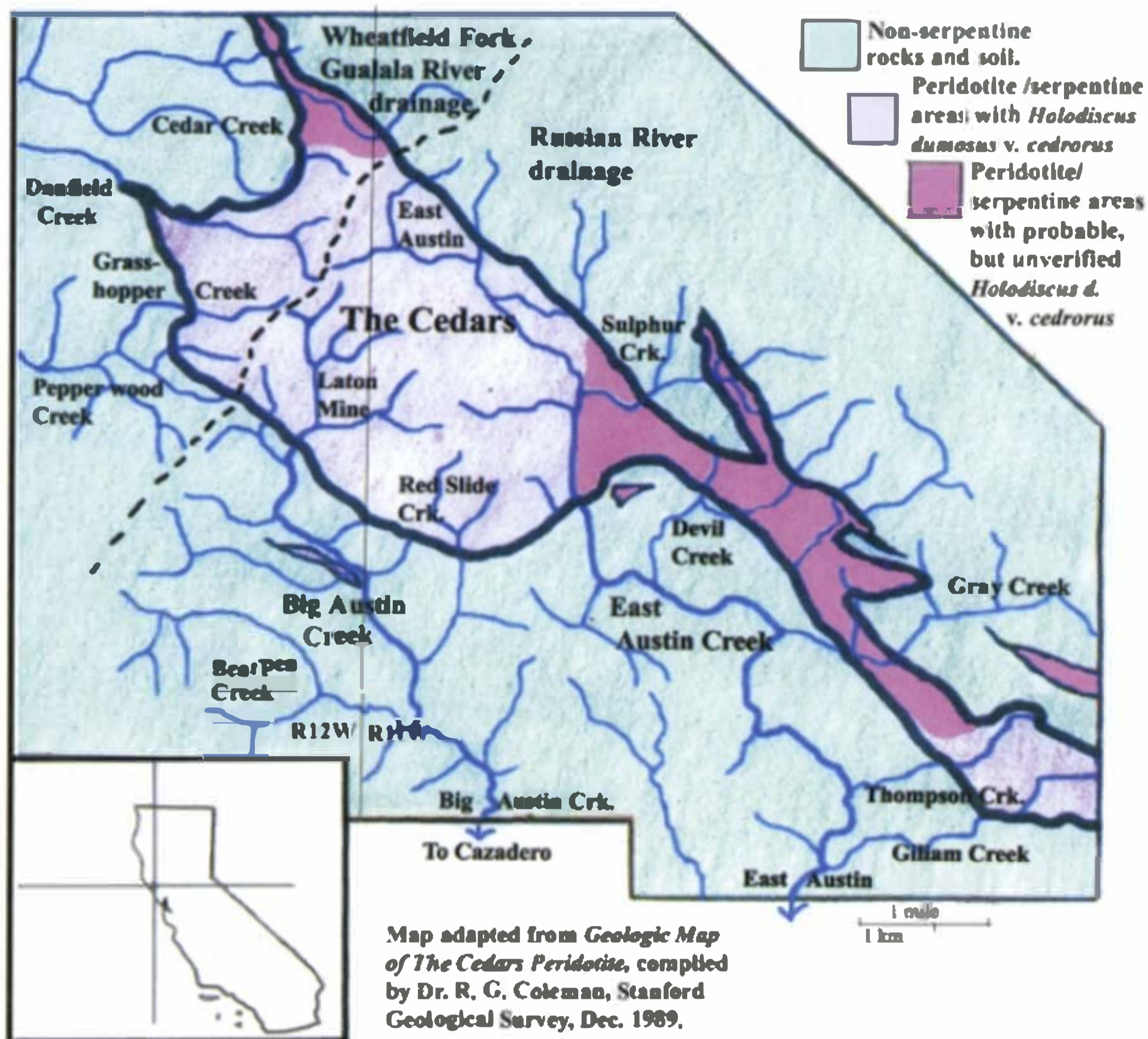


FIG. 6. Map of ultramafic (serpentine) occurrences in the upper drainages of Big and East Austin creeks, and Peppercreek, Grasshopper, Danfield, and Cedar creeks in the Wheatfield Fork of the Gualala River watershed. The occurrence of var. *cedrorus*, where documented, precisely matches the substrate.

nica Nutt. ex Torr. & A. Gray, *Calochortus raichei*, *Erigeron serpentinus*, *Melica torreyana* Scribn., *Monardella viridis* Jeps., etc. On talus slopes the var. *cedrorus* is associated with *Eriogonum cedrorum*, *E. nudum* Douglas ex Benth. var. *auriculatum* (Benth.) J.P. Tracy ex Jeps., *E. luteolum* Greene, *Streptanthus morrisonii* F.W. Hoffm., *Phacelia corymbosa* Jeps., *Cardamine* aff. *californica* (Nutt.) Greene, *Claytonia exigua* Torr. & A. Gray, *Epilobium minutum* Lindl. ex Lehm., and *Allium falcifolium* Hook. & Arn.

The Cedars *Holodiscus* is clearly allied to var. *glabrescens*. As here defined, in western North America *Holodiscus dumosus* is composed of var. *dumosus* (including var. *australis* (A. Heller) Ley) of western Nevada eastward to Wyoming and south to trans-Pecos Texas and Chihuahua, Mexico, and (as the phase with longer hairs on the leaves termed *Holodiscus microphyllus* var. *sericeus* by Ley) south through southern Nevada, northwestern Arizona, southeastern California to northern Baja California, Mexico. From var. *glabrescens*, var. *cedrorus* may be distinguished by its taller and more open habit (being 1 m or more tall vs. plants mostly

less than 1 m tall) with a more open inflorescence consisting of about twice as many flowers as var. *glabrescens*. The differences in substrate (serpentine vs. volcanic for var. *glabrescens*) is significant although a few populations of var. *glabrescens* are known to occur on serpentine. The abundance of foliar hairs and glands is greater in var. *glabrescens*, and the leaf blades of var. *cedrorum* tend to be more consistently roundish. In var. *cedrorum* the number of glands on an achene is generally more than 35 (Fig. 5) on each face whereas in var. *glabrescens* the number of glands is usually less than 35; there are even fewer achene glands in *H. discolor*. Two features are striking. In var. *cedrorum* the bright ruby red coloration of the young stems, branches and petioles is so obvious that this alone makes the variety an attractive addition to the horticultural trade; in var. *glabrescens* the color is at best a dull red. Added to this are the bright, shiny, dark green to nearly blackish upper leaf surfaces of var. *cedrorum* when exposed to bright light; in var. *glabrescens* the upper leaf surfaces tend to be merely light green or even grayish. Finally, the upper leaf surfaces of var. *cedrorum* are far more consistently glabrous than in most populations of *H. dumosus* var. *glabrescens*.

In summary there is no strong, consistent morphological difference between var. *cedrorum* and var. *glabrescens*, but when combined with the prevailing substrate difference and ecological preference (low elevation vs. montane), there is good suite of characters that makes this entity stand apart. Further, the profound geographic isolation of var. *cedrorum* strongly reinforces even these minor differences. In particular, the bright, ruby red of the stems, branches and petioles is the most obvious and readily observable feature. What might be the significance of this feature is unknown.

The Cedars *Holodiscus*, while common at The Cedars, is the rarest and most restricted entity within the genus. A rough estimate of the number of plants at The Cedars is about 5000. The population is exceedingly stable; during surveys over the last decade of the canyons at The Cedars, not a single dead plant was observed. Some seedlings and juvenile plants were noted, but they are rare. More field work is necessary in the northeastern creeks feeding into East Austin Creek to fully document the range and numbers.

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REFERENCES

- HITCHCOCK, C.L. 1961. *Holodiscus*. Univ. Wash. Publ. Biol. 17:115–117.
- HOLMGREN, N.H. 1997. *Holodiscus*. Intermountain flora 3A:74–75.
- LEV, A. 1943. A taxonomic revision of the genus *Holodiscus* (Rosaceae). Bull. Torrey Bot. Club 70:275–288.
- LS, R.A. 1993. *Holodiscus*. In: J.C. Hickman, ed. The Jepson manual: higher plants of California. University of California Press, Berkeley and Los Angeles. P. 953.
- REVEAL, J.L. AND R. RAICHE. 2009. *Eriogonum cedrorum* (Polygonaceae: Eriogonoideae), a new species from northwestern California. J. Bot. Res. Inst. Texas 3:479–483.
- WELSH, S.L. 2003. *Holodiscus*. Utah flora, ed. 3(revised). P. 559.