Deleted *Hesperolinon serpentinum,* and added *H. sharsmithiae* to 1B.2 of the CNPS Inventory on December 14, 2012

Rare Plant Status Review: *Hesperolinon serpentinum* and *H. sharsmithiae*
Proposed Deletion of *Hesperolinon serpentinum* from 1B.1, G2 / S2.1
Proposed Rank Change of *Hesperolinon tehamense* from 1B.3, G2 / S2 to 1B.3, G3 / S3
Proposed New Addition of *Hesperolinon sharsmithiae* to 1B.2, G2Q / S2

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Background on *Hesperolinon serpentinum* ined.
Hesperolinon serpentinum was added to California Rare Plant Rank 1B.1 of the CNPS Inventory, 5th Edition, in 1994. It was first described in *The Jepson Manual* (*TJM* 1993), but the publication did not designate a type specimen, and was therefore considered *nomen nudum* and an invalid taxon under the International Code of Botanical Nomenclature (O'Donnell 2006, 2010). *Hesperolinon serpentinum* will neither be included in *The Jepson Manual, Second Edition* (*TJM 2*) nor in *Flora of North America* due to its invalid publication.

Hesperolinon serpentinum ined., as originally circumscribed, was found only in Napa and Lake counties, but has subsequently been documented in Alameda and Stanislaus counties (CNDDB 2011). *Hesperolinon serpentinum* ined. closely resembles *Hesperolinon tehamense*, both of which have 3 styles and carpels. *Hesperolinon tehamense* has larger flowers, more pubescence (throughout the plant vs. ±glabrous), and a more deeply notched petal tip than *H. serpentinum* ined. (*The Jepson Manual* 1993). *Hesperolinon tehamense* has been documented in Glenn, Tehama, and Trinity counties, while *H. serpentinum* ined. occurs farther south, from Lake County to Stanislaus County; there is a ~75 km disjunction between the two species, as no records of either plant are known to exist in northern Lake County (CNDDB 2011). After the publication of *TJM* (1993), further field observations led N. McCarten to not recognize *H. serpentinum* as a species. Field observations of *H. tehamense* indicate that many plants from Glenn and Tehama Counties exhibit the character of reduced pubescence. Also, flower size is highly variable in this species (N. McCarten pers. comm. 2011). Viewing *H. serpentinum* from a larger perspective which takes into account geography, morphology, genetics, and ecology, *N. McCarten* (pers. comm. 2012) concluded that *H. serpentinum* is no more than a local variant of *H. tehamense*. Sharsmith (1961) noted that *Hesperolinon* spp. have many local variants, and recognition of them at the subspecies level would be very difficult. Due to the similarities in these two species, *H. serpentinum* ined. should be included within *H. tehamense*; a treatment that documents these changes is expected to be published by N. McCarten (pers. comm. 2011).

CNPS and CNDDB recommend deleting *H. serpentinum* ined. from the CNPS Inventory. Since it is invalid, CNDDB has already added all of the known occurrences of *H. serpentinum* ined. to *H. tehamense*. Several additional records from the

Consortium of California Herbaria (CCH 2012) should also be added, and a few occurrences (CNDDB Element Occurrence numbers 32, 39, 53) should be taken from *H. tehamense* and moved to *H. sharsmithiae*, resulting in a total of 54 occurrences of *H. tehamense* (see attached "Locations_HesperolinonTehamense.xls" spreadsheet and the following background on *Hesperolinon sharsmithiae*).

Background on *Hesperolinon sharsmithiae*

O'Donnell (2006) described a new species in the genus, *Hesperolinon sharsmithiae*, which was validly published in *Madroño*. This new species, however, was not included in *TJM 2*. O'Donnell (2010) argued that *H. sharsmithiae* should be recognized in *TJM 2* and given the same protection that *H. serpentinum* was given in the CNPS Inventory, and that specimens at the Jepson Herbarium which were treated as *H. serpentinum* are evidence of a "new taxon". However, the two are not synonymous, and *H. sharsmithiae* has a narrower circumscription than *H. serpentinum* (O'Donnell 2006; N. McCarten pers. comm. 2011; J. McDill pers. comm. 2007). Treatment author J. McDill (pers. comm. 2007) only had a single topotype specimen of *H. sharsmithiae* available for review, and therefore chose not to include it in *TJM 2*.

Hesperolinon sharsmithiae is morphologically very similar to three other members of the genus: *H. clevelandii, H. bicarpellatum, H. disjunctum,* and *H. tehamense*. Superficially, *H. sharsmithiae* has a strong resemblance to *H. bicarpellatum*, with the main difference being that the former has 3 styles and carpels, while the latter has 2 styles and carpels (O'Donnell 2006). At the southern end of *H. sharsmithiae*'s range, plants resembling *H. bicarpellatum* but with a mix of flower types (2-carpellate and 3-carpellate), sometimes even on the same plant, can be found (Sharsmith 1961, O'Donnell 2010). O'Donnell (2010) hypothesized that this represents the transition zone from *H. sharsmithiae* (occurring to the south) and *H. bicarpellatum* (occurring to the north). Indeed, Springer's (2009) genetic analysis of the entire genus placed 3 of the 5 *H. sharsmithiae* collections used in his analysis on a clade with the southern population of *H. bicarpellatum*, lending support to this hypothesis. However, almost none of the taxa examined proved to be monophyletic. For example, *H. sharsmithiae* was placed in several separate clades that included *H. bicarpellatum, H. clevelandii, H. disjunctum,* and *H. micranthum* (Springer 2009). Members of the genus can be notoriously difficult to identify, and Springer (2009) did not make any voucher collections, calling into question the actual identity of his samples (N. McCarten pers. comm. 2011, J. McDill pers. comm. 2007). Greenhouse experiments debunk the idea of a close relationship between *H. sharsmithiae* and *H. bicarpellatum*. Plants which had a mix of 2 and 3 carpels in the field were grown in a greenhouse and consistently produced 3-carpellate flowers, showing that this character was due to environmental stress and not genetic variation (N. McCarten pers. comm. 2011).

Hesperolinon sharsmithiae is likely a closer relative of *H. tehamense* and, according to N. McCarten (pers. comm. 2012), is probably a local variant of the latter. O'Donnell (2006) lists some of the main differences between the two taxa. *Hesperolinon sharsmithiae* has smaller flower parts (petals, filaments, and styles) than *H. tehamense*,

although there is some overlap. Also, the inflorescence of *H. sharsmithiae* is a dichasial cyme, while *H. tehamense* usually has a monochasial cyme (O'Donnell 2006).

According to N. McCarten (pers. comm. 2011 and 2012), *H. sharsmithiae* is so similar to *H. tehamense* that it should be treated as a minor variant of the latter; insufficient research has been done to treat it as a subspecies of *H. tehamense* at this point. *Hesperolinon* spp. have few morphological features to separate them, and variation within populations and across ecological gradients further confound the recognition of infraspecific variation (N. McCarten pers. comm. 2012, Sharsmith 1961). A complete review of the taxonomy of a species and its close relatives would need to be completed before subspecies could be assigned. O'Donnell's (2006) description of *H. sharsmithiae* was hindered by a lack of understanding of the geographic variation of the entire group, and a lack of a thorough review of specimens, due in part to lack of access (N. McCarten pers. comm. 2012). However, N. McCarten (pers. comm. 2011) noted that *H. sharsmithiae* may someday prove to be a valid subspecies of *H. tehamense*. *Hesperolinon sharsmithiae* plants are indeed smaller, probably due to their occurrence on soils with high heavy metal concentrations. Until more definitive work is performed and published on the group, CNPS and CNDDB tentatively, and somewhat reluctantly recommend recognizing *H. sharsmithiae* as a unique species. The reluctance stems from our feeling that the species level is likely not the correct taxonomic level, and our discomfort with not knowing the full relationship within the group. However, we feel it is important to recognize this entity at some level, since it does seem distinct and is therefore deserving of conservation attention.

Hesperolinon sharsmithiae occurs on serpentine soils in chaparral vegetation (O'Donnell 2006). It has a rather narrow distribution, being limited to the inner north coast ranges of Napa and Lake Counties, and has been documented between 270 and 300 meters in elevation (CCH 2011).

There are currently eight known occurrences of *H. sharsmithiae*. O'Donnell (2010) notes five discrete occurrences in a map, but provides no site or voucher information associated with that map. Three of these occurrences overlap with known occurrences of *H. tehamense* (CNDDB Element Occurrence numbers 32, 39, 53) and will be attributed to *H. sharsmithiae*. There is currently only a single voucher in the CCH (2011) that is identified to *H. sharsmithiae*; two other vouchers of *H. serpentinum* include comments by R. O'Donnell, in which he identifies them as *H. sharsmithiae*.

At least two of the known populations of *H. sharsmithiae* are threatened by development, as they occur on private property that is currently for sale (R. O'Donnell pers. comm. 2011). Threats to other populations are unknown.

Based on the available information, CNPS and CNDDB recommend adding *Hesperolinon sharsmithiae* to California Rare Plant Rank 1B.2. If a revised taxonomic treatment for *H. sharsmithiae* becomes available in the future, CNPS and CNDDB will re-evaluate its status at that time.

Recommended Actions
CNPS: Delete *Hesperolinon serpentinum* from California Rare Plant Rank 1B.1
Add *Hesperolinon sharsmithiae* to California Rare Plant Rank 1B.2
CNDDB: Delete *Hesperolinon serpentinum* from G2 / S2.1
Change *Hesperolinon tehamense* from G2 / S2 to G3 / S3
Add *Hesperolinon sharsmithiae* to G2Q / S2

Please review the draft CNPS Inventory record below, respond Yes or No on the proposal to add *H. sharsmithiae* to the Inventory and CNDDB, and provide any edits/comments. If responding No, please provide supporting information.

Revised CNPS Inventory Record
Hesperolinon tehamense H.K. Sharsm.
Tehama County western flax
Linaceae
Rank 1B.3
Alameda, Glenn, Lake, Napa, Stanislaus, Tehama
Aetna Springs (516B) 3812264, Capell Valley (499B) 3812242, Cedar Mtn. (445D) 3712155, Chiles Valley (516D) 3812253, Crevison Peak (404B) 3712122, Detert Reservoir (517A) 3812265, Elk Creek (580D) 3912255, Felkner Hill (580C) 3912256, Hall Ridge (596C) 3912276, Jericho Valley (532C) 3812274, Log Spring (597D) 3912277, Lower Lake (533A) 3812285, Middletown (533D) 3812275, Mt. George (499C) 3812232, Newville (596D) 3912275, Paskenta (596A) 3912285, Riley Ridge (596B) 3912286, St. Helena (516C) 3812254, Walter Springs (516A) 3812263, Wilcox Range (425D) 3712133, Yountville (500A) 3812243
Chaparral, cismontane woodland / serpentinite; elevation 100 – 1250 meters.
Annual herb. Blooms May – July.
Threatened by vehicles and road maintenance. Some plants from ALA, LAK, NAP, and STA cos. were previously treated as *H. serpentinum* ined.; plants from the inner north coast ranges of LAK and NAP cos. are now treated as *H. sharsmithiae.* Similar to *H. sharsmithiae.* See *University of California Publications in Botany* 32:298 (1961) for original description.

Draft CNPS Inventory Record
Hesperolinon sharsmithiae R. O'Donnell
Sharsmith's western flax
Linaceae
Rank 1B.2
Lake, Napa
Aetna Springs (516B) 3812264, Chiles Valley (516D) 38122E3, Jericho Valley (532C) 38122G4, St. Helena (516C) 3812254
Chaparral / serpentinite; elevation 270 – 300 meters.
Annual herb. Blooms May – July.

Element Code: *H. serpentinum* PDLIN010D0; *H. sharsmithiae* ?; *H. tehamense* PDLIN010C0

Threatened by development. Includes plants previously identified as *H. tehamense* and *H. serpentinum* ined. Similar to *H. bicarpellatum*, *H. clevelandii, H. disjunctum,* and *H. tehamense*. Not in *TJM 2.* See *Madroño* 53(4):404-408 (2006) for original description and *The Four Seasons* 13(4):1-54 (2010) for additional taxonomic information.

Sent to CW, NW, R. O'Donnell, J. McDill on 10/26/2012