

**Added to California Rare Plant Rank 1B.1 of the CNPS Inventory on
March 18, 2014**

**Rare Plant Status Review: *Limnanthes douglasii* subsp. *ornduffii*
Proposed Addition to California Rare Plant Rank 1B.1, G4T1 / S1**

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Background

Limnanthes douglasii subsp. *ornduffii* is a winter annual herb in the Limnanthaceae that was recently described by Buxton (2013) as an endemic to San Mateo County, California. Because of the very recent description of this plant, it was not included in recent major floras, such as *The Jepson Manual* (Ornduff 1993), *The Jepson Manual Second Edition* (Ornduff and Morin 2012), and the *Flora of North America* (Morin 2010). However, Morin (2010) and Ornduff and Morin (2012) did mention that it may be an unusual population of *Limnanthes douglasii*. Buxton and Ornduff (1998) first reported the occurrence of this plant from an agricultural field near Moss Beach, California. The plant that they had discovered was very unique because the flowers are tetramerous (with parts in fours). All other members of the genus have pentamerous (with parts in fives) flowers, except for *Limnanthes macounii*, an endemic to Vancouver Island in British Columbia, Canada, which also has tetramerous flowers. Originally, the plants from Moss Beach were thought to be a disjunct population of *L. macounii* that may have arrived via long-distance dispersal. Because *L. macounii* is autogamous, successful establishment would only have required a single nutlet (Buxton and Ornduff 1998).

Several experiments and studies have since attempted to explain the origin and identity of the plants from Moss Beach. To test the hypothesis that the Moss Beach plants belonged to *L. macounii*, R. Ornduff conducted a common garden experiment with both the Canadian plants and the plants from Moss Beach, and determined that they were definitely morphologically different (Buxton 2013). Ceska and Ceska (1999) also conducted a common garden experiment in Victoria, BC, and noted that the California plants were bigger, had more deeply divided leaves, and that they died in a minor frost, while the Canadian plants survived the frost. To address the phylogenetic position of the plants from Moss Beach, Meyers et al. (2010) performed a phylogenetic study of the genus using data from the ITS region and chloroplasts. They concluded that both the Moss Beach plants and *L. macounii* belonged to a poorly-resolved, polyphyletic *Limnanthes douglasii*, and recommended that the Moss Beach plant only be recognized as an unusual morphological variant of *L. douglasii*. They inferred that the poor resolution could have resulted from either 1) recent and rapid speciation, which did not allow enough time for many mutations to accumulate, or 2) the current taxonomy being a poor reflection of evolutionary history, with too many minor variants being described as distinct taxa.

Despite the poor resolution reported by Meyers et al. (2010), Buxton (2013) formally described the Moss Beach plants as *Limnanthes douglasii* subsp. *ornduffii* based on their obvious morphological separation from other subsp. of *L. douglasii*, and the

complete lack of intergradation or intermediate populations. Morin (2010) had treated *Limnanthes macounii* in a similar fashion, recognizing it as valid due to its unique morphology and geographic isolation, despite molecular data suggesting that it may belong in *L. douglasii* (Plotkin 1998). Buxton (2013) outlined the major morphological differences separating *L. douglasii* subsp. *ornduffii* from *L. macounii*, the most notable of them being the larger overall size, bipinnate (versus pinnate) leaves, longer leaves, larger flower parts, lack of frost hardiness, and larger nutlets of *L. douglasii* subsp. *ornduffii*. Buxton (2013) did not detail all of the morphological differences between subsp. *ornduffii* and the other subsp. of *L. douglasii*, except for the tetramerism of subsp. *ornduffii*. *Limnanthes douglasii* subsp. *ornduffii* flowers from November to May (Buxton 2013).

Limnanthes douglasii subsp. *ornduffii* only grows in a single agricultural field, as well as associated drainage ditches and ruts. It is only found in the low-lying portions of the field that are seasonally saturated to the surface. The moist conditions at the site are maintained by seeps and small streams in the hills just east of the population (Buxton 2013). Buxton (2013) proposed that *Limnanthes douglasii* subsp. *ornduffii* is probably a relict taxon that may have once been more common in the region, but has only been able to persist at the agricultural field. Historically, the area where it occurs was likely a marine terrace with various types of wetlands, but has since undergone major land use changes from cattle grazing, agricultural development and urban development, including the Half Moon Bay airport. Also, changes in the vegetation communities of the region have resulted from invasion by non-native species (Buxton 2013). *Limnanthes douglasii* subsp. *ornduffii* occurs between about 10 and 20 meters in elevation (Consortium of California Herbaria 2013).

There are only two known occurrences of *L. douglasii* subsp. *ornduffii*, and one of them is likely extirpated. The extant occurrence is in an agricultural field just east of the Half Moon Bay Airport. In 1998 the population provided a nearly complete cover on about 18 acres (Buxton 2013). Since then, the population has only declined by about 10% of its original size, possibly due to competition from invasive non-native plants, untimely plowing, or simply natural variation in population size due to weather patterns (Meyers et al. 2010; Buxton 2013). The field has been planted in artichokes, fava beans, and brassicaceous plants for at least 15 years and is left fallow in the winter, when *L. douglasii* subsp. *ornduffii* completes its life cycle (Buxton 2013). Before it was used for vegetable production, the field had probably been used for grazing (Buxton 2013). The field is currently owned by the Peninsula Open Space Trust (POST) and is leased to Cabrillo Farms. An additional occurrence, west of the Half Moon Bay Airport and 2.4 km from the fallow field, was found in 2008. Only three plants were seen, and Buxton (2013) did not find any plants when she returned to the site in 2009, 2010, and 2011. This second occurrence was found in a field that appeared to have been cultivated in the past.

New populations of *L. douglasii* subsp. *ornduffii* are unlikely to be found, as many local and broad-scale searches have already been conducted over several decades. In 1977, PhD students from the University of California at Berkeley and Davis searched for

new populations of *Limnanthes macounii* on the California Coast, but found none. Meyers et al. (2010) looked for tetramerous plants in California and Oregon over four field seasons, but also found none. Searches in areas of similar habitat within San Mateo and Santa Cruz Counties by E. Buxton, D. Taylor, and Boutell et al. (2009) did not result in any more populations being found, except for the occurrence of three plants near the Half Moon Bay Airport (Buxton 2013).

Limnanthes douglasii subsp. *ornduffii* presents a very unique management scenario, given that it is only known from a habitat that is intensively managed by humans. To date, no studies on the management of this plant have been conducted. However, given that the current management of the agricultural field has allowed subsp. *ornduffii* to persist since its initial discovery in 1998, and presumably for a much longer period prior to its discovery, CNPS and CNDDDB recommend that the current management regime be continued. We also recommend regular monitoring of the population of *L. douglasii* subsp. *ornduffii* to track its viability, and to gain insights into the effects that management practices have on it.

Based on the available information, CNPS and CNDDDB recommend adding *Limnanthes douglasii* subsp. *ornduffii* to California Rare Plant Rank (CRPR) 1B.1. If more information on this plant's taxonomy becomes available in the future, CNPS and CNDDDB will re-evaluate it at that time.

Recommended Actions

CNPS: Add *Limnanthes douglasii* subsp. *ornduffii* to CRPR 1B.1

CNDDDB: Add *Limnanthes douglasii* subsp. *ornduffii* to G4T1 / S1

New CNPS Inventory Record

Limnanthes douglasii R. Br. subsp. *ornduffii* E.G. Buxton

Ornduff's meadowfoam

Limnanthaceae

CRPR 1B.1

San Mateo

Montara Mountain (448C) 3712254

Meadows and seeps / agricultural fields; elevation 10-20 meters.

Annual herb. Blooms November to May.

Restricted to a single agricultural field in SMT Co. Tetramerous flowers place it with *L. macounii* from Canada, but molecular data place it within *L. douglasii*. See *Madroño* 45(2):184 (1998) for first record of occurrence in CA, *Systematic Botany* 35(3):552-558 (2010) for molecular phylogeny, and *Madroño* 60(3):229-235 (2013) for original description.

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