Botrychium minganense

Element Code: PPOPH010R0
Changed to CRPR 4.2 on 2022-02-15

Rare Plant Status Review: Botrychium minganense
Proposed Change from California Rare Plant Rank 2B.2, G5 / S3 to 4.2, G5 / S4
R. Douglas Stone (CNPS), Aaron E. Sims (CNPS), and Katie Ferguson (CNDDB)
21 December 2022
Changes to original in blue font

This species review is being expedited through a challenge cost share agreement between the California Native Plant Society and the USDA Forest Service, Pacific Southwest Region. Aside from being advanced as part of this agreement, the process, content, and information provided herein is not altered, modified, or developed differently in any way or form compared to other status reviews developed by CNPS.

Background and Taxonomy
Botrychium minganense Vict. is a short-lived, perennial fern in the Ophioglossaceae. It has been included in the CNPS Rare Plant Inventory since 1994, when it was added to California Rare Plant Rank (CRPR) 2 (CNPS 2022). It is also listed as a Sensitive species in USDA Forest Service Region 5 (USFS 2013) and as a “Survey and Manage” species (Oregon and California) under the Northwest Forest Plan (USFS and BLM 2014). As a result of additional collections and observations made in recent years, B. minganense is now understood to be more common and widespread in California than previously believed. It thus warrants downranking from CRPR 2B.2 (rare in California, more common elsewhere) to 4.2 (uncommon but not rare in California).

The species was first described from Quebec (Marie-Victorin 1927). Recent molecular work indicates that B. minganense is an allotetraploid that arose through hybridization between B. neolunaria (Stensvold and Farrar 2017) and the undescribed B. “farrarii” (Dauphin et al. 2018).

Distribution, Abundance, and Ecology
Botrychium minganense is a near-endemic of North America and widely distributed in northern and western regions (Wagner and Wagner 1993, Farrar 2011, NatureServe 2022). It is reportedly one of the most commonly encountered moonwort species in the western states (Hauk et al. 2012; D. Farrar 2022, pers. comm.). Outside of North America, it is known only from Iceland (Stensvold 2007). In California, there are currently 161 known occurrences (CNDDB 2022), in scattered locations mostly along the higher Cascade-Sierran axis with one locality in the Warner Mountains and four occurrences in the Klamath Ranges (Scott Mtns., Trinity Mtns.). Fourteen occurrences (9%) are historical (not revisited within the last 20 years), and 147 (91%) are recent. Of the Californian occurrences, 110 (68%) are on National Forest lands. One occurrence in the Tahoe Basin is possibly extirpated (CNDDB 2022). Five occurrences are in federally designated Wilderness areas. Non-Forest sites are on commercial timberland owned by Sierra Pacific Industries (40 occurrences), the Coon Hollow Wildlife Area managed by CDFW (1), or in National Parks (8). Ninety-two (57%) of the Californian occurrences have been assigned a site quality ranking, and 59 of these were ranked as Good or Excellent (CNDDB 2022). In addition to the occurrences currently tracked by the CNDDB (2022), there are 19 unprocessed field survey forms, including localities on the following USGS 7.5′ quadrangles (K.

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Green 2022, pers. comm.): Haypress Valley (3912055), Independence Lake (3912043), Liberty Hill (3812031), Tahoe City (3912022), Ycatapom Peak (4112217).

Census data are available for 148 occurrences and indicate a range in population size from 1–437 plants, averaging 34 plants per occurrence and only 15 occurrences having 100 or more plants (CNDDB 2022). Thirty-one occurrences have been monitored over a period of years, but the data are insufficient for estimating population trends. Obtaining accurate population counts for this and other moonwort species is difficult, for several reasons. First, the plants are small and inconspicuous and thus often overlooked (Stensvold 2007). Second, moonwort species have been shown to have a much higher density of below-ground structures (i.e., spores, gametophytes, and juvenile sporophytes) than what is represented by the above-ground population, and the plants commonly remain dormant below-ground, especially in dry years (Johnson-Groh et al. 2002, Lesica and Ahlenslager 1996). Third, survey records in many cases have noted that the species identification was uncertain or that the population count was for all Botrychium plants observed (without any attempt to obtain an accurate count of each co-occurring species) (CNDDB 2022).

Threats
Botrychium minganense generally occurs in montane coniferous forest and may be threatened by timber harvest and related activities (CNDDB 2022). However, because of its narrow requirement for wet habitats (streamsides, springs and seeps, meadows, fens), such impacts tend to be avoided under existing Forest Service management guidelines. Populations on private timberlands may receive similar protection under State Forest Practice Rules. Other frequently noted threats include livestock grazing and trampling, hydrologic changes, road and utility line maintenance, recreational activities and foot traffic, off-road vehicles, wildfire and fuel reduction projects, non-native plants, and disturbance associated with riparian or meadow enhancement (CNDDB 2022). Additional threats noted during Forum Review include very small population sizes, reduced water availability and habitat due to drought, and use of wetland waters for firefighting. The effects of fire on this species are not well understood and need further research. Nearly half (23) the known populations of this species on the Lassen NF were within the 2021 Dixie Fire footprint. Sixteen of the 23 affected populations were revisited in 2022, and plants were located at only three locations (Sanger 2023 Forum pers. comm.). Of the B. minganese populations on Sierra Pacific lands, two of three within the Dixie Fire footprint have been observed alive post-fire, and two of four populations within the Caldor Fire footprint have been observed post-fire (Hayes and Henwood 2023 Forum pers. comms.).

Summary

Based on the information presented here, we recommend changing Botrychium minganense from CRPR 2B.2 to 4.2 in the CNPS Inventory. Despite the 161 occurrences currently known in California, the number of plants per occurrence is evidently small, the habitat is fragile, and there are many population threats. If knowledge on the distribution, abundance, or threats to B. minganense changes in future, we will re-evaluate its status at that time.

Recommended Actions

CNPS: Change Botrychium minganense from CRPR 2B.2 to 4.2

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Draft CNPS Inventory Record (Changes to the original record are in green text)

Botrychium minganense Vict.

Mingan moonwort

Ophioglossaceae

USDA Plants Symbol: BOMI

Synonym(s)/Other Name(s): CRPR 2B.2 4.2

Counties: Amador (AMA), Butte (BUT), Calaveras (CAL), El Dorado (ELD), Fresno (FRE), Lassen (LAS), Madera (MAD), Modoc (MOD), Mono (MNO), Nevada (NEV), Placer (PLA), Plumas (PLU), Shasta (SHA), Sierra (SIE), Siskiyou (SIS), Tehama (TEH), Trinity (TRI), Tulare (TUL), Tuolumne (TUO)

States: Alaska (AK), Arizona (AZ), California (CA), Colorado (CO), Idaho (ID), Maine (ME), Michigan (MI), Minnesota (MN), Montana (MT), Nevada (NV), New Hampshire (NH), North Dakota (ND), Oregon (OR), South Dakota (SD), Utah (UT), Vermont (VT)*, Washington (WA), Wisconsin (WI), Wyoming (WY)

Quad name (code): Antelope Mtn. (4012058), Barkley Mtn. (4012126), Bear River Reservoir (3812052), Belden (4012113), Blairsdan (3912075), Boards Crossing (3812032), Bunker Hill (3912014), Butte Meadows (4012115), Calaveras Dome (3812042), Canyondam (4012121), Caples Lake (3812061), Cascade (3912162), Cherry Lake North (3811918), Convict Lake (3711857), Crocker Mtn. (3912084), Diamond Mtn. (4012036), Duncan Peak (3912025), Dunderberg Peak (3811913), Emerald Bay (3812081), Emigrant Lake (3811926), Fredonyer Pass (4012037), Grays Peak (4012146), Grizzly Valley (3912085), Hatchet Mtn. Pass (4012177), Haypress Valley (3912055), Hobart Mills (3912042), Hull Creek (3812011), Humboldt Peak (4012124), Humbug Valley (4012123), Independence Lake (3912043), Jonesville (4012114), Kaiser Peak (3711932), Kimshew Point (3912184), Kyburz (3812073), La Porte (3912068), Lassen Peak (4012145), Leek Spring Hill (3812063), Liberty Hill (3812031), Little Shuteye Peak (3711944), Lodgepole (3611856), Loon Lake (3812083), Lyonsville (4012136), Martis Peak (3912031), Meeks Bay (3912011), Miller Mtn. (4012167), Mineral (4012135), Moses Mtn. (3611836), Mt. Harkness (4012143), Mt. Silliman (3611866), Mumbo Basin (4112225), Norden (3912033), North Palisade (3711815), Onion Valley (3912078), Peddler Hill (3812053), Pegleg Mtn. (4012048), Red Cinder (4012142), Riverton (3812074), Robbs Peak (3812084), Roop Mountain (4012047), Sattley (3912054), Seven Lakes Basin (4112224), Shields Creek (4112043), Silver City (3611846), Skunk Ridge (4112117), Soapstone Hill (3912173), South Lake Tahoe (3811988), Sphinx Lakes (3611865), Swain Mountain (4012141), Tahoe City (3912022), Tamarack (3812041), Tangle Blue Lake (4112226), Templeton Mtn. (3611832), Tioga Pass (3711983), Tragedy Spring (3812062), Triple Divide Peak (3611855), Viola (4012156), West Haight Mtn. (4112251), Westwood East (4012038), Westwood West (4012131), Ycatapom Peak (4112217)

General Habitat: Bogs and fens, Lower montane coniferous forest, Meadows and seeps (edges), Upper montane coniferous forest, Subalpine coniferous forest

Microhabitat Details: Frequently co-occurs with B. ascendens, B. crenulatum or B. montanum

Microhabitat: Mesic

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Elevation: 1455–2180 1190 - 3290 meters

Life form: perennial rhizomatous herb

Blooms: Jul-Sep


- Threats: Threatened by logging and related activities, livestock grazing and trampling, hydrologic changes, water diversions, habitat loss, road and utility line maintenance, recreational activities and foot traffic, off-road vehicles, wildfire and fuel reduction projects, non-native plants, disturbance associated with riparian or meadow enhancement. Possibly threatened by alteration of fire regimes and extirpation due to small population size.

- Taxonomy: Evidently an allotetraploid species \( n = 90 \) from a cross between *B. neolunaria* and *B. “farrarii”* ined. (both diploids with \( n = 45 \)). Similar to *B. crenulatum* which is more delicate, has fewer pinna pairs and a diploid chromosome number \( (n = 45) \).

- Other: Does plant occur in NEV Co.? Occurrences in central and southern Sierra Nevada are mostly above 8000 ft (2500 m).

Selected References:

- Original Description: *Proceedings and Transactions of the Royal Society of Canada*, sér. 3, 21: 331 (1927)

**Literature Cited**


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Persons Contacted

Green, Kaitlyn. 2022. Rare Plant Data Coordinator, California Native Plant Society. Email correspondence regarding unprocessed CNDDB field-survey forms for Botrychium minganense. Personal communication 16 December 2022.

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