

NOTEWORTHY COLLECTION

Authors: Neubauer, Dylan M., and Lyons, Dean

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NOTEWORTHY COLLECTION

CALIFORNIA

ASTRAGALUS AGNICIDUS Barneby (FABACEAE).—Santa Cruz Co., central Santa Cruz Mountains, Ben Lomond Mountain, Bonny Doon, elev. ca. 480 m [location obscured]. 1000+ plants, forming a dense monoculture in the understory of burned mixed hardwood/conifer forest (area burned in 2020 CZU Lightning-Complex Fire), in granitic-gravelly soil; associated species include *Sequoia sempervirens* (D.Don) Endl., *Notholithocarpus densiflorus* (Hook. & Arn.) Manos, C.H.Cannon, & S.Oh var. *densiflorus*, *Quercus chrysolepis* Liebm., *Quercus parvula* Greene var. *shrevei* (C.H.Mull.) Nixon, and *Ceanothus thyrsiflorus* Eschsch. var. *thyrsiflorus*. Dylan M. Neubauer & Tim Forsell 1997 (UCSC, OBI, SBBG), 27 March 2022; <https://www.inaturalist.org/observations/109511560>, Dean Lyons (“between-thelyons”), March 2022; subsequent observations: <https://www.inaturalist.org>; seeds seed-banked at the UCSC Arboretum.

Dean Lyons encountered this novel occurrence in March 2022 on one of his favorite trails. The charred redwoods made for a striking contrast to the profusion of thriving plants (Fig. 1A). Due to its exuberance and isolated nature, he assumed it to be an invasive weed, but after he posted photos to iNaturalist (iNaturalist 2022), experts Ken Hickman and Aaron Liston suggested it might represent a widely disjunct population of *Astragalus agnicidus*. Dylan Neubauer then posted a photo of the diagnostic hairy fruit, and Aaron Liston confirmed the identification.

Previous knowledge. *Astragalus agnicidus* was State-listed as endangered in April 1982 and has a California Rare Plant Rank of 1B.1 (California Native Plant Society, Rare Plant Program 2022). It was previously known from 68 occurrences (19 USGS 7.5' quads) in southern Humboldt Co. and western Mendocino Co. (California Department of Fish and Wildlife 2022). It occurs in disturbed areas, openings, and along roads in moist coastal forests, where it is adapted to infrequent fires.

The dramatic story of the initial documentation of a single population of *Astragalus agnicidus*, its apparent extirpation, and subsequent rediscovery has been well-documented (Barneby 1957; Berg and Bittman 1988; Pickart et al. 1992). It was first vouchered in 1931 by sheep-rancher Henry Tosten, who found large numbers of an unknown plant growing on his property in southern Humboldt Co., in an area that had been disturbed by logging. Suspecting it was toxic to livestock, and perhaps a weed, a local agricultural advisor recommended eradication (Pickart et al. 1992). Botanist J. P. Tracy

of Eureka believed it was native, and Fabaceae specialist Rupert Barneby concurred after examining specimens and visiting the site in 1954 (Barneby 1957). Barneby published the description of the novel species in 1957 using the specific epithet *agnicidus*, meaning “lamb-killer.”

Due to those early eradication efforts, by 1987 *Astragalus agnicidus* was presumed extinct, not having been observed since Barneby’s visit. That year, a small group of botanists attempted to rediscover it at the type locality and were successful, locating 100+ individuals (Berg and Bittman 1988). The small population was protected under an agreement with The Nature Conservancy, and research was initiated to better understand the habitat requirements and life-history of this very rare species (Pickart et al. 1992).

These studies (summarized in Bencie 1997) revealed that *Astragalus agnicidus* is a short-lived (5–10 years), early-successional perennial. It is a prolific seeder; its seeds can persist in the soil seed bank for decades until proper conditions arise. The hard, impermeable seeds require both scarification (physical) and stratification (physiological) to germinate, and plants require light to thrive—conditions that can occur following fire or other disturbances. Bencie (1997) determined that plants have a mixed-mating system, which ensures that at least some outcrossing will occur via insect-pollination (mostly bees).

Timber Harvest Plans (THPs) began to include sensitive plant surveys in the late 1990s (Golec et al. 2007), and this practice spurred the documentation of many new occurrences on industrial, mostly private timberlands (Davis 1999; Decker et al. 2002; California Department of Fish and Wildlife 2022). Under optimal conditions, thousands of individuals can be stimulated to germinate following the disturbance of a timber harvest, replenishing the seed bank before succession/canopy closure takes place.

A 2013 population genetics study (Meinke et al. 2013) detected two forms of *Astragalus agnicidus* that differ both genetically and in several morphological characters: the widespread white-flowered form and a single population of a pink-flowered form from southern Mendocino Co. Santa Cruz Co. plants appear to be intermediate in morphology between these two variants (Fig. 1B).

Significance. The new occurrence constitutes a range extension of ca. 250 km south of the nearest known occurrence in southwestern Mendocino Co. (California Department of Fish and Wildlife 2022), though the two sites historically have received comparable annual precipitation and support similar vegetation. The large number of plants that germi-



FIG. 1. *Astragalus agnicidus*, Ben Lomond Mountain, Bonny Doon, Santa Cruz Co., California. A. Forming a dense monoculture in the understory of burned mixed hardwood/conifer forest. B. Inflorescence with mature calyces and corollas tinged pink. Photos by Dylan M. Neubauer.

nated here following the 2020 CZU Lightning-Complex Fire indicates the presence of a robust seed bank, implying previous, likely fire-induced germination events. Pre-2020, the last major fire here occurred ca. 1923 (K. Bareis, personal communication), therefore the seed bank may have lain dormant for ca. 100 years, longer than the ca. 70-year dormancy documented by Renner et al. (2011).

The earliest botanical collection recorded from this part of Ben Lomond Mountain dates from 1899, and collecting efforts increased from the mid-1930s through the 1950s (CCH2 Portal 2022). However, most specimens appear to have been obtained from roadsides so collectors may have missed *Astragalus agnicidus*. THP botanical surveys may also have missed it, as they are conducted pre-harvest. Is this occurrence unique in the Santa Cruz Mountains? Clearly, further explorations are in order, as well as genetic work to determine the relationships of this population to its northern relatives.

This collection highlights the value of community science platforms like iNaturalist and Calflora. With their advent, it is more likely that additional occurrences of transient, often rare species such as

this one will be documented, especially following wildfires.

—DYLAN M. NEUBAUER, Santa Cruz, CA; dneubauer1111@gmail.com; DEAN LYONS, Oakland, CA; betweenhelyons@gmail.com.

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LITERATURE CITED

- BARNEBY, R. C. 1957. *Astragalus agnicidus*, a new locoweed from Humboldt County, California. *Madroño* 14:37–40.
- BENCIE, R. 1997. Genetic variation and inbreeding depression in the rare California endemic *Astragalus agnicidus* (Leguminosae). Unpublished M.A. Thesis, Humboldt State University, Arcata, CA.
- BERG, K. AND R. BITTMAN. 1988. Rediscovery of the Humboldt milk-vetch. *Fremontia* 16:13–14.
- CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE. 2022. California Natural Diversity Database (CNDDB)

- (Government Version, 30 October 2022). Website <https://map.dfg.ca.gov> [accessed 22 November 2022].
- CALIFORNIA NATIVE PLANT SOCIETY, RARE PLANT PROGRAM. 2022. Rare Plant Inventory (online edition, v9-01 1.5). Website <https://www.rareplants.cnps.org> [accessed 22 November 2022].
- CCH2 PORTAL. 2022. Consortium of California Herbaria CCH2 Portal. Website <https://cch2.org/portal/index.php> [accessed 22 November 2022].
- DAVIS, L. H. 1999. Noteworthy Collections: *Astragalus agnicidus*. *Madroño* 46:215.
- DECKER, W., B. BAXTER, AND G. MCBRIDE. 2002. A new location for the Humboldt milk-vetch (*Astragalus agnicidus*). California Forestry Note, Number 116. State of California, The Resources Agency, California Department of Forestry & Fire Protection, Sacramento, CA.
- GOLEC, C., T. LABANCA, AND G. LEPPIG. 2007. Pp. 169–184 in R. B. Standiford, G. A. Giusti, Y. Valachovic, W. J. Zielinski, and M. J. Furniss (eds.), Proceedings of the redwood region forest science symposium: what does the future hold? General Technical Report PSW-GTR-194. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. Website <https://www.fs.usda.gov/research/treesearch/28257> [accessed 26 November 2022].
- iNATURALIST. 2022. iNaturalist. California Academy of Sciences and National Geographic Society. Website <https://www.inaturalist.org> [accessed 22 November 2022].
- MEINKE, R., S. MEYERS, K. AMSBERRY, C. WILSON, M. GROBERG, R. WOOLVERTON, AND J. BROWN. 2013. Assessing the population genetics, taxonomy, reproductive ecology, and life history traits of Humboldt milk-vetch (*Astragalus agnicidus*) in relation to conservation and management. Prepared for California Department of Fish and Wildlife under Contract No. P0982024 by Oregon Department of Agriculture Native Plant Conservation Program. Website <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=72375> [accessed 23 November 2022].
- PICKART, A., A. E. HISS, AND A. W. ENBERG. 1992. Return from extinction: recovery of the Humboldt milk-vetch. Pp. 255–261 in H. M. Kerner (ed.), Proceedings of the symposium on biodiversity of northwestern California. Wildland Resources Center Report No. 29, University of California, Berkeley, CA.
- RENNER, M. A., D. BIGGER, G. LEPPIG, AND E. S. GOLDSWORTHY. 2011. Implications of certain timberland management effects on *Astragalus agnicidus* (Fabaceae), a state-endangered species. Pp. 275–281 in J. W. Willoughby, V. Ashworth, C. Coslett, and L. Worlow (eds.), Strategies & solutions: California Native Plant Society 2009 Conservation Conference proceedings. California Native Plant Society, Sacramento, CA.