

ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract

Element Code: PDLAM0M0N0

Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Hedeoma diffusa*

COMMON NAME: Flagstaff Pennyroyal

SYNONYMS: *Hedeoma diffusum*, *Hedeoma blepharodontum*, *H. blepharodonta*

FAMILY: Lamiaceae

AUTHOR, PLACE OF PUBLICATION: E.L. Greene, Pittonia 3: 338. 1898.

TYPE LOCALITY: United States of America, Arizona, Coconino County, near Flagstaff (collection stated near Prescott). 1883.

TYPE SPECIMEN: HT: GH 1155. H.H. Rusby 786, 1883. IT: GH 1156; NY 544, H.H. Rusby, 7 June 1883; US 48512. **See Additional Information for remarks from Holotype collection.

TAXONOMIC UNIQUENESS: *Hedeoma* largely confined to Texas-Arizona region, occurring also in South America. *H. diffusa* is 1 of 17 in the genus *Hedeoma* (USDA 2002), and 1 of 7 species found in Arizona (Kearney and Peebles et al. 1951). It is closely related to *H. nanum*.

DESCRIPTION: Herbaceous perennial that forms dense, circular, prostrate mats, 15-23 cm (6-10 in.) in diameter, with numerous shoots branching prolifically at base and generally unbranched distally. Stems puberulent above with retroscly curling or spreading hairs, pubescent with spreading hairs below. The small oval leaves are emarginate, opposite, 2-5 mm wide and 3.5-7.0 mm long. Flowers in 1 - 3 flowered clusters in axis. Calyx about 6 mm long, tubular, slightly sac-like below; teeth triangular, in two sets. Corolla of 5 united petals, 2 lipped, approximately 1.27 cm (0.5 in.) long, blue; fertile stamens 2. Nutlets 4, sticky when wet. $2n=36$.

AIDS TO IDENTIFICATION: *Hedeoma diffusa* is similar to *H. nanum* and *H. oblongifolium*. *H. diffusa* smells like turpentine and lacks apical teeth on the leaves. *H. nanum* has small flowers and its foliage has no fragrance. *H. oblongifolium* has an upright habit and the foliage smells like turpentine. (Falk, Jenkins et al. 2001).

ILLUSTRATIONS: Line drawing (USFWS).

Color photos (Mark Licher, in ASU Vascular Herbarium photo collection, <http://seinet.asu.edu/image/Library/ViewPhotos.jsp?id=61390>).

Line drawing (M.S., in Falk, Jenkins et al. 2001)

Color photo of plant (USFS, in Falk, Jenkins et al. 2001)

Color photo of plant in habitat (Sue Rutman, *in* Falk, Jenkins et al. 2001)

TOTAL RANGE: North-central Arizona.

RANGE WITHIN ARIZONA: San Francisco Plateau of the Colorado Plateau Province; Flagstaff and southward in Coconino and Yavapai counties, including the rims of Oak Creek and Sycamore canyons.

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Perennial forb/herb.

PHENOLOGY: Flowers late May, and by mid-August the plants have reached peak anthesis. "Flowering continues throughout most of September and possibly longer in favorable years. However, late fall flowers have a tendency to abort. Each flower remains open for approximately 3 days and fruits develop 2-3 weeks following anthesis. In August and September the plants develop small rosettes of 'overwintering' leaves and shoots" (Irving 1980).

BIOLOGY: Restricted to small and scattered limestone and sandstone outcrops of relatively undisturbed habitats. As with all species of *Hedeoma*, *H. diffusa* is sensitive to competition. Seed production is good and seeds up to five years of age have a high percentage of germination. Seed dispersal is primarily by water and wind. Principal limitation to distribution of *H. diffusa* appears to be discontinuity and scarcity of suitable habitat.

HABITAT: Rock pavement, cliff, limestone and sandstone break habitats in the Ponderosa pine vegetation type. Canopy coverage ranges from 0-86%. The plant prefers open spots with weathered limestone solution pockets filled with 4-6 inches of soil, but also grows in vertical cracks and around the edges of boulders.

ELEVATION: 4,500 - 7,140 ft. (1373 - 2178 m).

EXPOSURE: 0-10% slope

SUBSTRATE: Kaibab limestone with dolomitic member (higher porosity) containing no chert or fossils. Shallow soil of the rock crevices and weathered pockets of exposed limestone and small outcrops; also found on sandstone outcrops and boulders.

PLANT COMMUNITY: Petran Montane Conifer Forest. Associated species include: *Aquilegia desertorum* (desert columbine), *Bouteloua gracilis* (blue grama), *Festuca arizonica* (Arizona fescue), *Geranium caespitosum* (purple cluster crane's-bill), *Hedeotis pygmaea*, *Juniperus deppeana* (alligator juniper), *Pinus ponderosa* (ponderosa pine), and *Quercus gambelii* (gambel oak).

POPULATION TRENDS: Some populations declining due to urban invasion of habitat; stable within wilderness areas. According to The Center for Plant Conservation (CPC accessed 2003), there are 60 locations in the vicinity of Flagstaff, Arizona, northern Arizona, and locations along the rims overlooking Oak Creek Canyon. Per NatureServe (2003), “Recently has been reported from more than 100 sites in northern Arizona with a total of more than 10,000 individuals.”

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
 [3C USDI, FWS 1993]
 [3C USDI, FWS 1990]
 [3C USDI, FWS 1985]
 [C1 USDI, FWS 1980]

STATE STATUS: Salvage Restricted (ARS, ANPL 1999)
 [Salvage Restricted (ARS, ANPL 1993)]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
 [Forest Service Sensitive (USDA, FS Region 3 1990)]
 Not on NESL List (NNDFW, NESL 2001)
 [NNDFW, Navajo Endangered Species List, 1994]

MANAGEMENT FACTORS: Urban expansion threatens these plants. Prescribed burning may be necessary to maintain populations by removing overstory and clearing litter. Silviculture activities, exotic weeds (particularly Dalmation toadflax), excessive livestock grazing, and throw-down camping activities can be detrimental to existing populations. In the Lake Mary area, *Clematis hirsutissiana* var. *arizonica* and *Hedeoma* are present but occupy different habitats, therefore requiring different management techniques (Phillips 1993b).

CONSERVATION MEASURES TAKEN: U.S. Forest Service has developed a management plan for Peaks, Mormon Lake, and Sedona Ranger Districts. Monitoring plots were established in 1985, and re-read in 1990 and 1996. Prescribed fire study was conducted from 1989 - 1995 (Phillips 1993a and 1997).

SUGGESTED PROJECTS: Protect limestone outcrops; continue field surveys for additional sites. Investigate the basic biology and ecology of this plant including substrate analysis, canopy coverage, associated species, and growth habit trends with season and age. More research is needed on the impact of burns and potential interactions with exotic Dalmation toadflax.

LAND MANAGEMENT/OWNERSHIP: USFS - Coconino, Kaibab and Prescott National Forests (including the Red Rock-Secret Mountain Wilderness and the Sycamore Canyon Wilderness); Private. Possibly found on public lands of Northern Arizona University and private lands in the city of Flagstaff and inholdings in the National Forests.

SOURCES OF FURTHER INFORMATION

REFERENCES:

- Arizona Natural Heritage Program. 1981. *Hedeoma diffusum* (Flagstaff Pennyroyal). Unpublished contract report for U.S. Forest Service.
- Baker, M.A. and T. Wright. 1993. A botanical survey of the Apache Creek, Juniper Mesa, Sycamore Canyon and Woodchute wilderness areas of the Prescott National Forest, Arizona. Unpublished report for the USFS Prescott National Forest, Arizona.
- Boucher, P. 1984. Management Plan for *Hedeoma diffusum* Greene. Unpublished report for Coconino National Forest. Flagstaff, Arizona.
- Center for Plant Conservation (CDC). CDC National Collection Plant Profile, *Hedeoma diffusum*. http://ridgwaydb.mobot.org/cpcweb/CPC_ViewProfile.asp?CPCNum=2153. Accessed: 10/14/2003.
- Epling, C. and W.S. Stewart. 1939. A revision of *Hedeoma* with a review of allied genera. Report Spec. Nov. Regni Veh. 115:1-49.
- Falk, M., P. Jenkins, et al; Arizona Rare Plant Committee. 2001. Arizona Rare Plant Guide. Published by a collaboration of agencies and organizations. Pages unnumbered.
- Fletcher, R. 1980. *Hedeoma diffusum*. Unpublished provisional status report for the U.S. Forest Service.
- Giurgevich, B. 1981. Unpublished draft of *Hedeoma diffusum* summary. Smithsonian Institution. Washington D.C.
- Harvard University Herbaria. 2001. Index of Botanical Specimens. Accessed: 10/14/2003. <http://brimsa.huh.harvard.edu/cms-wb/specimens.jsp>.
- Irving, R.S. 1980. The systematics of *Hedeoma* (Labiatae). Sida 8:218-295.
- Irving, R.S. 1980. *Hedeoma diffusum*. Unpublished status report for U.S. Fish and Wildlife Service.
- Integrated Taxonomic Information System (ITIS). Retrieved 10/14/2003 from ITIS, <http://www.itis.usda.gov>.
- Kearney, T.H., R.H. Peebles with collaborators. 1951. Arizona flora. Second edition with supplement by J.T. Howell, E. McClintock and collaborators. 1960. University of California Press, Berkeley. Pp. 745.
- Missouri Botanical Garden – TROPICOS, Nomenclatural Data Base. *Hedeoma diffusum* Greene. http://mobot.mobot.org/cgi-bin/search_vast. Accessed: 14 Oct 2003.
- NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. Arlington, Virginia. Available: <http://www.natureserve.org/explorer>. (Accessed: October 14, 2003).
- Phillips, B.G. 1984. Field survey for *Hedeoma diffusum* Greene. Unpublished report for Coconino National Forest. Flagstaff, Arizona.

- Phillips, B.G. 1988. Field searches of sensitive plant species along proposed route of Fourth Street extension. Unpublished report for SWCA, Inc. Flagstaff, Arizona.
- Phillips, B.G. 1989. Monitoring and survey for *Hedeoma diffusum* Greene on the Coconino National Forest. Unpublished report for Coconino National Forest, Flagstaff, Arizona.
- Phillips, B.G. 1993b. Pers comm. from South Kaibab Special Status Plant Workshop, conducted at the Williams Ranger District Office, 27 October, 1993.
- Phillips, B.G. 1997. Pers comm.
- Phillips, B.G., H. Green, S. Dudley and R. Galeano-Popp. 1993a. Prescribed fire research on Flagstaff Pennyroyal (*Hedeoma diffusum* Greene). In Sivinski, K. and K. Lightfoot (eds.) 1993. Southwestern rare and endangered plants. Proceedings of the southwestern rare and endangered plant conference. Misc. Publication No. 2. NM Forestry and Resources Conservation Division, Santa Fe, New Mexico.
- The New York Botanical Garden. NYBG Specimens Detailed Results. Accessed: 10/14/2003. http://scisun.nybg.org:8890/searchdb/owa/wwwcatalogrenz.detail_list?this_id=4391315.
- U.S. National Herbarium Type Specimen Register (US). Department of Systematic Biology – Botany, Smithsonian Institution. Accessed: 10/14/2003 from <http://rathbun.si.edu/botany/types/fullRecords.cfm?myFamily=>.
- USDA, Forest Service Region 3. 1990. Regional Forester's Sensitive Species List.
- USDA, Forest Service Region 3. 1999. Regional Forester's Sensitive Species List.
- USDA, NRCS. 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- USDI, Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species. Federal Register 45(242):82508.
- USDI, Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review. Federal Register 50(188):00023.
- USDI, Fish and Wildlife Service. 1990. Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review. Federal Register 55(35):6203.
- USDI, Fish and Wildlife Service. 1993. Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review. Federal Register 58(188):51164.
- USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species; Notice of Review. Proposed Rule. Federal Register 61(40):7596-7613.

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ADDITIONAL INFORMATION:

*“On sheet with *H. nanum* (Torrey) Briquet collection by C. Wright 1520. Rusby collection annotated as Isotype by Stewart and Epling, 1937, and as Type by R.S. Irving, 1968, but see Sida 8: 262. 1980.” (Harvard University Herbaria 2001).

The U.S. Fish and Wildlife Service withdrew the proposed rule to list the species as threatened in the Federal Register of June 29, 1983, as a result of US Forest Service commitment and its Management Plan.

Species name spelled “*diffusum*” in some floras.

Revised:	1992-11-24 (JSP)
	1993-03-24 (SSS)
	1993-11-09 (DBI)
	1995-04-25 (DBI)
	1997-04-08 (BGP)
	2003-10-22 (SMS)

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