ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC060K1
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Echinocereus triglochidiatus* var. *arizonicus*
COMMON NAME: Arizona hedgehog cactus
SYNONYMS: *Echinocereus arizonicus* ssp. *arizonicus* (Rose ex Orcutt), *Echinocereus arizonicus* Rose ex Orcutt 1926, *E. coccineus* var. *arizonicus* (Rose ex Orcutt) Ferguson, *E. triglochidiatus* var. *neomexicanus* auct. non (Standl.) W.T. Marsh, *E. polyacanthus* var. *neomexicanus* auct. non (Standl.) L. Benson
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: *Echinocereus triglochidiatus* var. *arizonicus* (Rose ex Orcutt) L.D. Benson, The cacti of Arizona (ed. 3) 21: 129. 1969. *Echinocereus arizonicus* Rose ext Orcutt, Cactography 3. 1926.

TYPE LOCALITY: Zion (boundary) monument between Pinal and Gila counties, Arizona, USA, at 4,700 feet.

TYPE SPECIMEN: HT: US. C.R. Orcutt s.n., July 1922. LT: NY.

TAXONOMIC UNIQUENESS: Taxonomy within section *Triglochidiatus* of *Echinocereus* has undergone recent changes. Until recently, Benson's (1982) treatment was the mostly widely recognized of *Echinocereus*, with all red-flowered populations within the United States grouped under *E. triglochidiatus*. Taxonomic, cytological, and floral investigations have led specialist to separate *E. triglochidiatus* into *E. arizonicus*, *E. coccineus*, *E. santaritensis*, *E. triglochidiatus*, and *E. yavapaiensis* (Hoffman 1992, Blum et al. 1998, Zimmerman and Parfitt 2003, Baker 2006). Blume et al. (1998) recognized three taxa within *E. arizonicus (*subspecies *arizonicus*, *nigrihorridispinus*, and *matudae*), which Baker (2006) confirmed. *E. arizonicus.* ssp. *arizonicus* refers to this species, with *E. arizonicus* being most widely accepted, as taxonomic boundaries within the species remain controversial.

This species is listed endangered under the Endangered Species Act as *E. triglochidiatus* var. *arizonicus*, and is tracked by the Arizona HDMS system as such.

DESCRIPTION: Large succulent perennial plant, with dark green cylindroid stems occurring singly or most often in clusters of 4-20 stems, occasionally exceeding 50. Large, robust stems are 10-41 cm (3.9-16 in.) tall, by 5-10 cm (2-4 in.) in diameter, stems are longer than similar varieties. Each stem has 8-13 slightly undulate tuberculate ribs; ribbing strong. Areoles 10-15 mm (0.4-0.6 in) apart, with 9-18 spines per areole. Radial spines 7-14 per

aerole, appressed, yellowish to brownish becoming gray, 5-25 mm (0.2-1.0 in) long. Central spines 1-4 per areole, spreading outward, brownish yellow to reddish black, becoming gray, terete, 15-50 mm (0.6-2.0 in) Flowers with inner tepals bright orange-red to dark red distally, proximally paler, with pink to brick red or purple anthers and a green stigma, and are broad, about 5 cm (2 in) in diameter and 7.4 cm (3 in) in length. Flowers burst through the stem sides, leaving a scar on the stem above the spine. Flowers occur on the upper third of stem ribs (Reichenbacher 1994). The fruit is green, brownish tinged with white pulp, 2.5 cm (1 in) in diameter, globose, and spiny. Seeds are black, 2 mm in diameter.

AIDS TO IDENTIFICATION: **Hallmark of *Echinocereus*:** flowers burst through sides of stem, leaving scar on stem right above spine. Brilliant red flowers (no bluish or lavender hues), track it to section *triglochidiatus*. *E. t. arizonicus* is distinguished from other hedgehog cacti in Highland area below 6,000 ft (2000 m) by flowers on upper third of stem ribs.

The typical plant of var. *arizonicus* is visually very different from var. *melanacanthus*. In var. *melanacanthus*, stems are much smaller (in height and width) and each cluster has many (up to 500) stems. In contrast, var. *arizonicus* has just a few stems per cluster. The species *E. fasciculatus*, typically exhibits well in excess of 11 ribs, and the flowers are magenta in color.

Variety *arizonicus* also intergrades with var. *neomexicanus* (common in southeastern Arizona), which will form clusters of up to 45 stems. Ribbing of var. *neomexicanus* is weaker than var. *arizonicus*. Central spines on var. *neomexicanus* are thinner (0.5-1.0 mm) than central spines of var. *arizonicus* (1.5 mm) (Benson 1982). Largest central spine of var. *arizonicus* is deflexed with minute striations and is 2.5-4.0 cm (1.0-1.5 in.) long; central spines of var. *neomexicanus* are smooth, not deflexed, and are 4.5-7.0 cm (1.8-2.8 in.) long (Benson 1982).

ILLUSTRATIONS: B&W photo of plant in flower (Benson, 1982: Fig. 654, p. 617).
Line drawing (USFWS).
Color photo and line drawing (USFWS, *in* Kelly and McGinnis 1994)
Color photos of plant and habitat (Sue Rutman/FWS, *in* Falk & Jenkins et al. 2001)
Line drawing (Falk & Jenkins et al. 2001)
Color photos of plant and habitats (Steven R. Viert, 1996: pls. 1-8)
Color photo (Jane Villa-Lobos, *in* USDA NRCS PLANTS)

TOTAL RANGE: Central Arizona, from Pinal and Gila counties. This includes the Pinal, Dripping Springs, Superstition and Mescal mountains. It also can be found in the highlands between Globe and Superior. Falk & Jenkins et al. (2001), reports range as "Superstition Mountains, Top of the World, Tonto NF."

RANGE WITHIN ARIZONA: See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Budding occurs from April to May, anthesis from late-April to mid-May, and fruiting from May to July; germination occurs in mid-summer. Weather can hasten, prolong, or inhibit flowering by a couple of weeks. According to Parfitt (1992), flowering occurred in April and early May. By June, fruits were nearly ripe with mature seeds. Normal sexual reproduction by seeds is the means of reproduction. Flowering models indicate that the probability of flowering and the predicted numbers of flowers increased significantly with the number of stems per plant (Thomas et al. 2019). Thus, larger individuals are likely to contribute more to fecundity than smaller individuals.

BIOLOGY: Pollen dissemination agents are bees and hummingbirds. Seed dissemination agents are unknown. Variations in annual seed production, viability and longevity are also unknown. Approximately 100 seeds are produced per fruit (Phillips 1985). There does not appear to be any special germination or cultivation requirements. Germination of seeds in cultivation observed at 17% (Boyce-Thompson Arboretum) and 90% (S. Brack).

Limiting factors include specialized soil type, Mediterranean-type climate, frost and perhaps fire. Predators include borers and leaf-foot bugs (Coreidae), which attack the stems, and rodents which eat the fruits (Crosswhite 1976; Phillips et al. 1979).

Mean probability of survivorship and mean life expectancy increases with size, with only 15-20 percent of individuals expected to reach a size of 20 stems. Common causes of morality include desiccation, insect damage, and herbivory (Drezner 2004, Miller et al. 2009, Shryock et al. 2017)

HABITAT: Rugged steep-walled canyons, boulder-pile ridges and slopes. Cactus scattered on open slopes, in narrow cracks between boulders and in understory of shrubs. This plant does well within extensive rock cover. It is commonly found among shrubby vegetation within the Arizona desert grassland.

ELEVATION: Commonly found from 3,300 – 5,200 ft. (1007-1740 m), but ranges up to 6,360 ft. (1940 m).

EXPOSURE: On slopes from almost vertical to nearly level.

SUBSTRATE: Normally found on Orthoclase-rich granite of late Cretaceous age; other parent materials in the area include volcanic tuft, mid-Tertiary age dacite and perhaps rhyolite. Schultze granite, light in color. Devils Chasm has dacite substrate, Gila/Pinal County line (Queen Creek) has much lighter granite. S. Bingham's locations on limestone would be separate species (Rutman 1994). Ph ranges from 5 to 6, or slightly acidic.

PLANT COMMUNITY: Found in the transition zone of the Mogollon Rim where elements of interior chaparral, Madrean evergreen woodland, and upland Sonoran Desert communities meet. Often with the following associated species: *Agave chrysantha* (century plant), *Arctostaphylos pungens* (point-leaf manzanita), *Berberis haematocarpa* (red holly grape), *Ceanothus greggii* (desert ceanothus), *Cercocarpus montanus* (mountain mahogany), *Dasylirion wheeleri* (desertspoon), *Garrya wrightii* (silktassel), *Juniperus deppeana* (alligator-bark juniper), *J. erythrocarpa* (=*J. coahuilensis*, redberry juniper), *Mimosa biuncifera* (catclaw mimosa), *Muhlenbergia emersleyi* (bullgrass), *Nolina microcarpa* (beargrass), *Opuntia spinosior* (cane cholla), *Pinus edulis* (pinyon pine), *P. monophylla* (singleleaf pinyon), *Quercus turbinella* (desert scrub oak), *Quercus emoryi* (Emory oak), *Rhus trilobata* (squawbush), *R. ovata* (sumac), *Rhamnus crocea* (hollyleaf buckthorn), and *Yucca baccata* (banana yucca).

POPULATION TRENDS: Decreases in population are expected to continue due to loss of suitable habitat (Thomas et al. 2019).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
LE (USDI, FWS 1985)
[LE USDI, FWS 1980]
[LE USDI, FWS 1979 (without Critical Habitat)]
[PE USDI, FWS 1976]
[PT-E USDI, FWS 1975]

STATE STATUS:
Highly Safeguarded (ARS, ANPL 2016)
[Highly Safeguarded (ARS, ANPL 1993, 1999)]

OTHER STATUS:
Bureau of Land Management Sensitive (USDI, BLM AZ 2017)
Not Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 1990, 1999]
CITES Appendix 1

MANAGEMENT FACTORS: The limited geographic distribution of this plant increases its vulnerability to threats from mining, mineral exploration, off-road vehicle use, illegal collecting, and road and utility construction. Projects completed under Section 7 consultation have resulted in the direct impact or loss of more than 3,000 individual cacti and approximately 561 acres of occupied, suitable, and(or) potential habitat (Thomas et al. 2019). This taxon occurs within the footprint of current and proposed future mining activity and is the vicinity of a major state highway undergoing widening. Other threats include potential land exchanges at the “Top of the World” vicinity, along with recreational activity, especially

in the Oak Flat campground vicinity, which receives seasonally heavy recreation use, including camping, hiking, hunting, and off-road vehicle use (trail bikes). This area has been identified for increased recreational development.

A lack of survey or monitoring protocol for the taxon, the rugged terrain the cactus grows in, and the presence of similar cactus on the range periphery make full census of the Arizona hedgehog cactus difficult (Thomas et al 2019).

CONSERVATION MEASURES TAKEN: Federally listed as endangered since 1979. Draft recovery plans have been developed, but a recovery plan has not been finalized (Thomas et al. 2019). Most populations occur on Forest Service lands. Various consulting surveys and monitoring efforts undertaken. WestLand has conducted biyearly monitoring since 2010. Cedar Creek has conducted yearly monitoring yearly since 2007, and established eight permanent plots for long term monitoring.

SUGGESTED PROJECTS: Finalization of a recovery plan. Long term annual demographic census required to determine population dynamics, due to episodic recruitment and mortality events characteristic of desert species (Drezner and Lazarus 2008, Miriti et al. 2007). Standardized, long-term, annual collection of flowering and fruiting effort and establishment of plots that allow consistent detection of all individuals, including seedlings are needed to accurately capture demographic trends.

Additional research and consensus on taxonomic classification is needed. A vetted identification guide between *E. triglochidiatus* var. *arizonicus* and *E. santaritensis* is needed for accurate reporting of population boundaries and numbers.

LAND MANAGEMENT/OWNERSHIP: USFS - Tonto National Forest (most plants, including plants within the Superstition Wildness Area); Private. Possibly State Land Department.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Revised Statutes, Chapter 7. 1993. Arizona Native Plant Law. Appendix A.

Arizona Revised Statutes, Chapter 7. 1999. Arizona Native Plant Law. Appendix A.

Baker, M.A. 2006.Anew florally dimorphic hexaploid, *Echinocereus yavapaiensis* sp. *nov.* (section Triglochidiatus, Cactaceae) from central Arizona. Plant Systematics and Evolution 258:63–83.

Baker, M.A. 2006. Circumscription of *Echinocereus arizonicus* subsp. *arizonicus* Phenetic analysis of morphological characters in section Triglochidiatus (Cactaceae), Part II. Madrono, 53(4), pp 388-399.

Benson, L. 1969. The cacti of Arizona. 3rd edition. University of Arizona Press, Tucson. pp. 21, 124, 127, 129.

Benson, L. 1982. The cacti of the United States and Canada. University of Arizona Press, Tucson. pp. 604, 606-607, 617, 940.

Blum, W., M. Lange, W. Rischer, and J. Rutow. 1998. Echinocereus. Fa. Proost N. V., Turnhout, Belgium.

Crosswhite, F. 1976. Threatened and endangered species habitat study area notes on *Echinocereus triglochidiatus* var. *arizonicus*. Prepared for the U.S. Forest Service.

Drezner, T.D. 2004. Saguaro recruitment over their American range – a separation on comparison of summer rainfall and temperature. Journal of Arid Environments. 56: 509-524.

Drezner, T.D., and Lazarus, B.L. 2008. The population dynamics of columnar and other cacti – A review. Geography Compass 2: 1-29.

Earle, W.H. 1980. Cacti of the southwest. Rancho Arroyo Distributor, Tempe, Arizona. p. 72.

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.

Ferguson, D.J. 1989. Revision of the U.S. members of the *Echinocereus triglochidiatus* group. Cactus and Succulent Journal of the Cactus and Succulent Society of America. 61: 217-224.

Hoffman, M. T. 1992. Functional dioecy in *Echinocereus coccineus* (Cactaceae): breeding system, sex ratios, and geographic range of floral dimorphism. American Journal of Botany 79:1382–1388.

Integrated Taxonomic Information System (ITIS). Retrieved 9/12/2003 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. 570-571.

Kelly, K. and J. McGinnis. 1994. Highly safeguarded protected native plants of Arizona. Arizona Department of Agriculture, Native Plant Protection Program.

Lehr, J.H. 1978. A catalogue of the flora of Arizona. Desert Botanical Garden, Phoenix, Arizona. p. 102.

Miller, T.E., Louda, S.M., Rose, K.A., and Eckberg, J.O. 2009. Impacts of insect herbivory on cactus population dymanics – experimental demography across and environmental gradient. Ecological Monographs 79: 155-172.

Miriti, M.N., Rodriguez-Buritica, S., Wright, S.J, and Howe, H.F. 2007. Episodic death across species of desert shrubs. Ecology 88:32-36.

Missouri Botanical Garden – TROPICOS, Nomenclatural Data Base. *Echinocereus triglochidiatus* var. *arizonicus* (Rose ex Orcutt) Benson. http://mobot.mobot.org/cgi-bin/search_vast. Accessed: 12 Sep 2003.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.8. Arlington, Virginia. Available: http://www.natureserve.org/explorer. (Accessed: September 12, 2003).

Parfitt, B.D. and C.M. Christy. 1991. *Echinocereus arizonicus* field work associated with chromosome study. Attachment to letter to S. Rutman, U.S. Fish and Wildlife Service, Ecological Services. Phoenix, Arizona.

Phillips, B.G. 1985. Endangered species information system record. U.S. Fish and Wildlife Service. Phoenix, Arizona.

Phillips, A.M. III, B.G. Phillips, L.T. Green III, J. Mazzoni, and E.M. Peterson. 1979. Status report *Echinocereus triglochidiatus* Engelm. var *arizonicus* (Rose ex Orcutt) L. Benson. U.S. Fish and Wildlife Service, Office of Endangered Species. Albuquerque, New Mexico.

Reichenbacher, F. 1994. Bureau of Land Management, Safford District, Rare Plant Workshop. November 14-16. Tucson, Arizona.

Rutman, S. 1994. Bureau of Land Management, Safford District, Rare Plant Workshop. November 14-16. Tucson, Arizona.

Shryock, D.F., Esque, T.C., and Hughes, L. 2014. Population viability of *Pediocactus bradyi* (Cactaceae) in a changing climate. American Jouranl of Botany. 1010: 1944-1953.

Thomas, K.A., Shryock, D.F. and Esque, T.C., 2019. Arizona hedgehog cactus (Echinocereus triglochidiatus var. arizonicus)—A systematic data assessment in support of recovery (No. 2019-1004). US Geological Survey.

U.S. National Herbarium Type Specimen Register (US). Department of Systematic Biology – Botany, Smithsonian Institution. Accessed: 9/12/2003 from http://rathbun.si.edu/botany/types/fullRecords.cfm?myFamily=.

USDA, Apache-Sitgreaves National Forest. 2000. List of Endangered, Threatened, Proposed, and Sensitive Species. p. 3.

USDA, Forest Service Region 3. 1990. Regional Forester's Sensitive Species List.

USDA, Forest Service Region 3. 2013. 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, Bureau of Land Management Arizona. 2017. Bureau Sensitive Species List.

USDI, Fish and Wildlife Service. 1975. Threatened or Endangered Fauna or Flora: Review of Status of Vascular Plants and Determination of "Critical Habitat": Notice of Review. Federal Register 40(127):27827.

USDI, Fish and Wildlife Service. 1976. Endangered and Threatened Wildlife and Plants: Proposed Endangered Status for some 1700 U.S. Vascular Plant Taxa; Proposed Rule. Federal Register 41(117):24536.

USDI, Fish and Wildlife Service. 1979. Determination that *Echinocereus triglochidiatus* var. *arizonicus* is an Endangered Species: Final Rule. Federal Register 44(208):61556.

USDI, Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants: Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review; Proposed Rule. Federal Register 45(242):82482.

USDI, Fish and Wildlife Service. 1985. Final Rule. Determination that *Echinocereus triglochidiatus* var. *arizonicus* is an endangered species. Federal Register 44(208):61556-61558.

USDI, Fish and Wildlife Service, Arizona E.S. office. Web abstract – Arizona Hedgehog Cactus (*Echinocereus triglochidiatus* var. *arizonicus*). Assessed: 9/12/2003 from http://arizonaes.fws.gov/.

Viert, S.R. 1996. A conservation assessment and plan for the Arizona hedgehog cactus (*Echinocereus triglochidiatus* var *arizonicus*). Report prepared for the USDA, Tonto National Forest. Phoenix, AZ. 51pp.

Zimmerman, A.D. 1989. Letter to Reneé Galeano-Popp, U.S. Forest Service, Region 3, Botanist. U.S. Forest Service files, Albuquerque, New Mexico.

Zimmerman, A. D., and B. D. Parfitt. 2003. *Echinocereus*. Pp. 157–174 in Flora of North America Editorial Committee (eds), Flora of North America, north of Mexico, Vol. 4. Oxford University Press, New York, NY.

MAJOR KNOWLEDGEABLE INDIVIDUALS:

Frank Crosswhite - Boyce Thompson Arboretum, Superior, Arizona.
Bill Feldman - Boyce Thompson Arboretum, Superior, Arizona.
David Ferguson - Albuquerque, New Mexico.
Reggie Fletcher - USFS Regional Ecologist, Albuquerque, New Mexico.
Bruce Parfitt - Missouri Botanical Garden, St. Louis, Missouri.
Allan Zimmerman - Phoenix, Arizona.

ADDITIONAL INFORMATION:

Reichenbacher emphasizes that new Arizona Flora is not based on in-depth surveys. New version will not be ideal but will help.

Ferguson (Cactus and Succulent Journal) gave name *arizonicus* to all red flowered hedgehogs in southeastern Arizona but Parfitt believes new species exists in Globe-Superior area, and another closely related, in southeastern Arizona. Heavily collected at Top of the World sites.

Revised: 1990-11-21 (SR)
1992-09-15 (BKP)
1994-08-18 (DBI)
1994-12-08 (DBI)
1997-11-05 (SMS)
2003-10-02 (SMS)
2020-10-02 (KSL)

To the user of this abstract: you may use the entire abstract or any part of it. We do request, however, that if you make use of this abstract in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.