ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Plant Abstract **Element Code:** PDCAC0E040
Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Pediocactus paradinei* B. W. Benson
COMMON NAME: Paradine Plains Cactus; Kaibab Pincushion Cactus; Park Pincushion-Cactus; Bristly Plains Cactus; Kaibab Plains Cactus; Houserock Cactus.
SYNONYMS: *Pilocanthus paradinei* B.W. Benson and Backenberg
FAMILY: Cactaceae

AUTHOR, PLACE OF PUBLICATION: Benson, B.W. 1957. Cactus and Succulent Journal of the Cactus and Succulent Society of America. 29:136-137.

TYPE LOCALITY: Houserock Valley, Coconino County, Arizona.

TYPE SPECIMEN: Boyce Thompson Southwestern Arboretum Herb., No. Bwb 8-1956-1.

TAXONOMIC UNIQUENESS: Seven species of *Pediocactus*, occurring from the Columbia River Basin, Great Basin, Rocky Mountains and Colorado Plateau. Six of these species, including *P. paradinei*, are restricted endemics. There are no recognized varieties of *P. paradinei*.

DESCRIPTION: Small, green, globose tubercled cactus with a solitary stem 3.0-4.0 cm (1.2-1.6 in.) tall (usually half is underground), 6.0-8.0 cm (2.4-3.2 in.) in diameter (may reach a diameter of 8.0 cm (3.2 in.)). Tap root up to 15.0 cm (6.0 in.) long. 4-6 central spines per aereole, spines white to straw colored, hair-like, dense, flexible, bristle-like, 5-7 mm (0.2-0.3 in.) long. Flowers 2.0-2.5 cm (0.8-1.0 in.) diameter to 2.0 cm (0.8 in.) long; petaloids are white or yellowish with pink midribs, about 20.0 mm (0.8 in.) long to 6.0 mm (0.24 in.) broad. Fruit greenish-yellow becoming tan when ripe, 7.5-10.5 mm (0.3-0.42 in.) long, 4.5-6.0 mm (0.18-0.24 in.) diameter. Fruit is smooth and bare except for the veins; sometimes fruit will have minute subapical scales. Seeds are nearly black, 1.5 mm (0.06 in.) long, about 2.0 mm (0.08 in.) broad and 1.0 mm (0.04 in.) thick (Benson, 1982). During the dry seasons, the plants retract into the ground and are flush with the soil surface (USFWS 2015).

AIDS TO IDENTIFICATION: *Coryphantha scheeri* occurs in the same habitat and is easily confused with *P. paradinei*. Spines of *Coryphantha* are stiff and short compared to hair-like spines of *Pediocactus*; this is readily felt by placing a hand over the plants. "Very young plants of *P. paradinei* appear very similar to juvenile plants of *Coryphantha vivipara*, which grows sympatrically with it" (Phillips 1993). *C. vivipara* has stiff and short spines that are parallel to each other along the long axis of the aereole and taper toward the distal end. *P. paradinei* are less robust, not as neatly arranged, may overlap at their tips, and do not taper toward the distal end.

ILLUSTRATIONS:
Line drawing (Benson 1982:761).
Line drawing (USFWS)
Color photo (Hochstätter 1998 *in* http://64.177.111.31/images/others_pictures/fh052_5.jpg)
Color photos (Miller 2000-2001 *in* http://www.cactuscollection.net/)

TOTAL RANGE: East side of the Kaibab Plateau (East Kaibab Monocline) and west edge of House Rock Valley, Coconino County, Arizona.

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

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Globose Succulent Perennial

PHENOLOGY: Flowers mid-April to May. Fruits May to June. Species has low reproductive potential (500 seeds per individual lifetime) (Phiilips 1999).

BIOLOGY: Plants are usually patchily distributed within a general area of appropriate habitat; occurring singly, or more often, in groups within well defined colonies. Those specimens from lower elevations tend to be smaller and not colonial as compared with those from higher on the Kaibab Plateau. Specimens from the upper Kaibab Plateau tend to be more robust and often form clusters with up to 7 stems. This could be due to the higher precipitation and/or colder temperatures in the higher elevations of its range (Heil et al. 1981).

P. paradinei shrinks and swells in response to water availability and retracts below ground during the arid foresummer (late May through early July). With the summer rains, the plants again emerge and generally remain emergent until early November, when they again retract into the ground. Plants usually emerge from winter dormancy as temperatures rise, usually in late March. When retracted, many become flush with the soil surface, or retract as much as 1 cm (0.4 in) below the surface. It should be noted that "when specimens are in this withdrawn state, it becomes almost impossible to find them in their natural state even though their exact locality is known" (Heil et al. 1981).

Reproduction occurs entirely from seed. Tests revealed that the plants are self-sterile and require cross-pollination (Milne 1987). Generally plants begin blooming when approximately 2.0 cm (0.8 in.) in diameter, presumably 10 years old. One to two seed pods (fruits) are produced per plant each year. At maturity the fruit are dry, obovate, rounded at the base, truncate at the top and open by a longitudinal fissure. Seeds are very small with 12-15 seeds per fruit. The largest/oldest plants produce the most flowers, fruit and seeds. The largest plant known has a diameter of approximately 10.0 cm (4.0 in.) and produced about 6 flowers. The life span of *P. paradinei* is expected to be about 40 to 50 years. Approximately half of the plants that flower do not produce fruit. The average number of seeds per fruit is 16, so a fertile span of 20 to 30 years results in an average of 320 seeds per plant (Warren et al. 1992).

This represents a very low reproductive potential. No seed dispersal is known; seeds fall to the base of the parent plant (Laurenzi and Warren, 1988; and Peter Warren--North Kaibab Plant Workshop, June 1992). Many fruit that mature are eaten (Laurenzi and Warren 1988).

Monitoring of two burned sites in 1987-1990 showed approximately 90% survivorship after a cool fire, but approximately 60% survivorship after a hot fire. This species appears more fire tolerant than other cacti species. Even with virtually the entire above ground portion of the plant charred, 20% of the individuals survived to produce flowers and fruit equal to non-burned plants (Warren et al. 1992).

HABITAT: Fairly open, mostly level sites on alluvial fans, valley bottoms and ridge tops. In drainage ways, found in relatively broad valleys with gentle gradients. Plants are preferentially associated with grass (blue grama), often occurring within the grass clump. In valley bottoms with sagebrush, occurs in the grassy openings within open sagebrush stands (not found in pure sagebrush). Open pinyon-juniper woodlands.

ELEVATION: 5,000 - 7,200 ft. (1,525 - 2,196 m)

EXPOSURE: South facing slopes. Level to slope of no more than 10-15%.

SUBSTRATE: Gravelly soils derived from Kaibab limestone; high in calcium carbonate (reduced clay content).

PLANT COMMUNITY: Associated with grass (blue gramma) in Great Basin grassland, desertscrub, pinyon-juniper woodland, and lower ponderosa pine stringers.

POPULATION TRENDS: Collection was documented at the Trail Canyon plot in 1990 with about 20 plants removed; obvious digging and boot tracks. Studies conducted within the last decade indicate significant decline in occurrences (Laurenzi and Spence, 2012). The species had not been found on BLM lands since 2005, based on annual surveys through 2014 (Grank Plant Team, AZ 2012). Information collected on Forest Service lands in 2015 found 504 plants and indicated the population size and extent is larger than previously thought (USFWS 2015). Six individuals have been observed from 2017 to 2020 (iNaturalist, 2022).

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1998)
[CCA (BLM, USFS & USFWS 1998, amended and revised 2015)]
[C USDI, FWS 1996]
[C1 USDI, FWS 1980]
[PTN-T USDI, FWS 1975]

STATE STATUS: Highly Safeguarded (ANPL 2016)

OTHER STATUS:

Forest Service Sensitive (USDA, FS Region 3 2017)
[Forest Service Sensitive (USDA, FS Region 3 1990, 1999, 2007)]
Bureau of Land Management Sensitive (USDI, BLM AZ 2013)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2000, 2005, 2008, 2010)]

MANAGEMENT FACTORS: Collected for the cactus and succulent trade. Loss of habitat to shrub (especially sagebrush) and woodland invasion brought about by fire suppression. Herbivory by jackrabbits. Trampling by livestock and removal of grass cover.

High mortality when exposed to excessively hot fires. Using fire to manage *P. paradinei* habitat requires that the prescribed burn be designed especially for *P. paradinei* management (not to attempt to accomplish other goals, such as shrub control). The fires must be carefully applied (season, temperature of fire) to avoid habitat damage and high cacti mortality. Fire may also result in damge and loss of habitat. Fire suppression activities can result in injury and fatality of individuals, as well as damage to and loss of habitat.

The entire distribution of this species is within an area of approximately 15 miles north-to-south and 2-3 miles east-to-west.

Difficult to survey; the plants retract into the soil in response to moisture and often occurs within grass clumps.

Being found on fairly open, level sites increases the plants' vulnerability to impacts from recreation such as camping, and from road construction.

Rodent herbivory is well documented and believed to be the main impact in the loss of cactus on BLM lands (L. Hughs 2012).

Noxious weeds, pollinator decline, and root rot during very wet years may contribute to population decline.

CONSERVATION MEASURES TAKEN: In 1998 a Candidate Conservation Agreement (CCA) was finalized between the U.S. Fish and Wildlife Service, U.S.D.A. Forest Service, and the U.S. Bureau of Land Management to ensure the long term viability of the Paradine plains cactus and its habitat. The CCA was amended and revived in September 2005.

The Kaibab National Forest established the conservation area as a management area under the revised Land Management Plan (USFS 2014). Grazing activities are timed to avoid impacts to reproduction, the area is closed to cross country travel, and all projects on the district are evaluated during the NEPA process and actions that will occur in the conservation area are

mitigated. Monitoring and research of populations is concurrent and continuing (USFWS 2015).

The Bureau of Land Management has implemented closures to cross-country travel in past *P. paradinei* locations. Monitoring of past locations is concurrent and continuing (USFWS 2015).

The US Fish and Wildlife Service will continue to monitor the status of the cactus, review and comment on any project proposals that may impact populations or individuals, work with cooperators on methods to reduce adverse effects of proposed activities, and pursue funding opportunities to support conservation activities (USFWS 2015).

SUGGESTED PROJECTS: Research needs on various aspects of species biology and potential threats have been identified by the cooperators. In order of priority they are; research on biology and ecology of the species, research on ecosystem characteristics and function, summarization of knowledge to use as baseline data in climate change monitoring and research, conduct controlled studies on the effect of climate change on the species, research on herbivory on plants and seeds, research on the effects of fire on the species and ecosystem, study of the effects of fire on mycorrhizae in soil, research on the effects of fire retardant on *P. paradinei*, examine effects of controlled burns on the species, research effects of grazing, and examine response to spread and establishment of invasice plants.

LAND MANAGEMENT/OWNERSHIP: BLM - Arizona Strip Field Office; USFS - Kaibab National Forest (North Kaibab Ranger District).

SOURCES OF FURTHER INFORMATION

REFERENCES:

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

Ralph Gierisch - St. George, Utah.
Ken Heil - Navajo Community College, Shiprock, New Mexico
Andy Laurenzi - Tucson.
Art Phillips – Private Consultant, Colorado.
Barb Phillips - USFS Zone Botanist, Coconino, Kaibab and Prescott national forests, Flagstaff, Arizona (retired).
Peter Warren - Tucson, Arizona.

ADDITIONAL INFORMATION:

Phillips B.G. et al. (1981) recommended for Threatened status under the Endangered Species Act.

Revised: 1989-10-30 (LJB)
1992-09-14 (BKP)
1997-11-12 (SMS)
1998-04-24 (SMS)
1999-12-20 (DJG)
2020-07-10 (KSL)