

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Plant Abstract

Element Code: PMAGA01100
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Agave phillipsiana*
COMMON NAME: Grand Canyon Century Plant, Phillips Agave
SYNONYMS:
FAMILY: Asparagaceae

AUTHOR, PLACE OF PUBLICATION: Hodgson, Wendy C. 2001. Novon 11(4): 410-413.

TYPE LOCALITY: Arizona: Coconino County, Grand Canyon National Park, Clear Creek Canyon, ca. 7 miles upstream from camping area, 1140 meters, 36°07.381'N, 12°00.568'W.

TYPE SPECIMEN: Desert Botanical Garden: DES 44332 (holotype). Wendy C. Hodgson, 11861. September 13, 1999.

TAXONOMIC UNIQUENESS: NatureServe Explorer reports there are 30 species of Agave in the United States; 10 of these are found only in Arizona. There are another 14 subspecies or varieties; 4 of these are restricted to the Arizona as well. There is also one hybrid Agave which is only found in the State. *A. phillipsiana* is one of the 10 species found only in Arizona.

DESCRIPTION: Plants acaulescent, freely suckering; rosettes solitary to cespitose, 7.5–10 × 7.5–10 dm, open. Leaves erect, 76–78 × 10–11 cm; blade glaucous-green to dark green, lightly cross-zoned, lanceolate, rigid, adaxially concave toward apex, abaxially convex at base; margins straight or undulate, armed, teeth single, well defined, brittle, 4–7 mm, 1–2.5 cm apart, interstitial teeth (2–)3–7, mostly along distal 2/3 of margins; apex not conspicuously incurved, spine brownish gray, slender, 2.5–4 cm. Scape 2.7–5.5 m. Inflorescences narrowly paniculate, not bulbiferous, open; bracts persistent, triangular, 1–2+ cm; lateral branches 9–16, ascending to nearly perpendicular, comprising distal 1/3–1/2 of inflorescence, longer than 10 cm. Flowers 32–45 per cluster, erect, 7.4–8.6 cm; perianth greenish cream, tube campanulate, 15.5–20 × 15–23 mm, limb lobes persistent and often leathery during and after anthesis, spreading, unequal, 15–22 mm, apex often flushed with maroon; stamens long-exserted; filaments inserted subequally below rim of perianth tube, erect, yellow, 4.8–6.4 cm, apex flushed with maroon; anthers yellow, 17–25 mm; ovary 3.3–4.6 cm, neck slightly constricted, 4–8 mm. Capsules not seen. Seeds unknown. (Flora of North America.)

AIDS TO IDENTIFICATION: According to the author (Hodgson 2001), *Agave phillipsiana* is distinguished by its open rosette, large glaucous leaves, narrowed paniculate inflorescence, and large flowers. The following key to identify *A. phillipsiana* is taken from Flora of North America, volume 26:

- Inflorescences paniculate; flowers in clusters, borne on peduncles terminating in lateral branches longer than 10 cm (subg. *Agave*).
- Leaf blade linear-lanceolate, oblanceolate, lanceolate to ovate, or spatulate, less than 10 times longer than wide; limb lobes not drying reflexed on perianth tubes; capsules variable; Florida, Texas, sw United States.
- Rosettes usually shorter than 16 dm (up to 20 dm in *A. sisalana* and *A. shawii*); leaves typically shorter than 160 cm.
- Leaf margins armed with well-defined teeth longer than 2 mm.
- Limb lobes (6–)9–27 mm; plants forming single rosettes, or new plants budding from rhizomes and forming clones; mature rosettes up to 15 dm; scape (1.7–)2–7(–7.2) m; sw United States.
- Leaf blade linear-lanceolate, lanceolate, oblanceolate, or obovate, variously colored, apical spine usually longer than 2 cm; inflorescences not bulbiferous, or producing bulbils only when damaged; Arizona, California, New Mexico, Texas.
- Leaves of rosettes usually open; leaf blade linear-lanceolate to lanceolate or oblanceolate; inflorescences open, usually with 6–26 (–32) lateral branches.
- Perianth tube not shallow, 6–20 mm, frequently equaling or exceeding limb lobes (6–22 mm); filaments inserted near perianth tube base to ca. mid tube (inserted at 2 levels in *A. palmeri*, mid-tube and near rim, inserted near rim in *A. phillipsiana*); limb lobes erect to erect-ascending, unequal, persistent and often leathery during and after anthesis; flowers 3.5–8.6 cm.
- Perianth greenish cream to cream to pale yellow or light green, apex of limb lobes and filaments flushed with maroon; leaf margins armed with teeth 3–7 mm, 0.2–2.5 cm apart, interstitial teeth (2–)3–12 on distal 2/3 of margins; Arizona, sw New Mexico.
- Leaves ascending to spreading, blade variously colored, margins armed, interstitial teeth (2–)3–7 on distal 2/3 of margins, apex not conspicuously incurved; filaments inserted at 2 levels or subequally on perianth tube; Arizona, New Mexico.
- Flowers 7.4–8.6 cm; limb lobes 15–22 mm; filaments inserted subequally below rim of tube; scape 2.7–5.5 m; leaf margins armed with brittle teeth, 1–2.5 cm apart; rosettes solitary or cespitose; plants freely suckering; north-central Arizona...*Agave phillipsiana*

The following comparison of three Agave species is extracted from Hodgson (2001):

Characteristic	<i>A. palmeri</i>	<i>A. delamateri</i>	<i>A. phillipsiana</i>
habit	usually solitary	strongly cloning	strongly cloning
leaf length (cm)	35-95	50-74	76-78
leaf orientation	spreading, flaring at tip	erect, ascending, incurved at tip	ascending to spreading, flaring at tip
leaf color	light glaucous green to dark green with purplish tinge	bluish gray glaucous with purplish tinge	glaucous green to dark green
interstitial teeth	4-6 on upper 2/3 of leaf	6-12 on upper 2/3 of leaf	3-7 on upper 2/3 of leaf
flower stalk height (m)	(1.75)4-7	4.5-6	2.7-5.5
inflorescence shape	open, broadly paniculate	open, broadly paniculate	open, narrowly paniculate
flower length (mm)	46-64	47-70	68-86
ovary length (mm)	18-36	21-29	29-46
floral tube lngth, wdth	10-18 x 10-16	11-19 x 11-16	15.5-20 x 15-23
outer/inner tepal length	12-18, 6.5-14	14-18, 9-15	20-21.5, 15-19
filament insertion	at 2 levels	equally	subequally
distribution	SE AZ, NM, Sonora	central AZ	N-central AZ

ILLUSTRATIONS:

Photos: <http://swbiodiversity.org/seinet/taxa/index.php?taxon=18905>.

Line drawing: Phillips (2001), p. 411.

TOTAL RANGE: A rare species endemic to Arizona; originally known from only four sites within the Grand Canyon NP, Coconino County. In the past almost two decades, however, additional collections have expanded its known range.

Arizona Heritage Data Management System records show there are five occurrences now from the Grand Canyon. One is along Clear Creek north of the 83rd Mile Rapids and another is about six miles to the west. The other three are about 25 miles to the northwest in the vicinity of 135 Mile Rapids near Tapeats Creek and Deer Creek.

In Yavapai County, there are 19 occurrences. All but two of these are situated in the extreme northeast corner of the county, northwest of Sedona and generally along the Verde River and its tributaries. The other two are some 40 miles to the southwest, west of the Bradshaw Mountains along the Hassayampa River. There is a single occurrence in Gila County between Walnut and Oak Creeks, west of the Sierra Ancha Mountains. The southern-most recorded occurrence is from Graham County between the Santa Teresa and Pinaleno Mountains.

RANGE WITHIN ARIZONA: See "Total Range."

SPECIES BIOLOGY AND POPULATION TRENDS

GROWTH FORM: Succulent perennial.

PHENOLOGY: Flowers in September.

BIOLOGY: No fruits have ever been found on old inflorescences. Reproduction may be only by vegetative means.

HABITAT: Terraces along permanent waterways between the elevations indicated. Three of four original sites are near pre-Columbian agricultural features or habitation sites (Hodgson 2001). Sandy, gravelly, rocky soils (granitic grus, limestone, or basalt) in desert scrub and grasslands on slopes, hillsides, and ridgelines (Baker 2014).

ELEVATION: 2300 – 3740 feet (700 – 1140 m) according to Hodgson (2001). Baker's surveys (2014) extend the upper range to 4920 feet (1500 m).

EXPOSURE: Not specified.

SUBSTRATE: Sandy, gravelly, rocky soils (granitic grus, limestone, or basalt), was reported by Baker 2014.

PLANT COMMUNITY: Desert, Grassland/herbaceous, Shrubland/chaparral (NatureServe 2019). Baker (2014) also includes open pinon pine grassland and juniper grassland.

POPULATION HISTORY AND TRENDS: Unknown. In the nearly twenty years since the species was first described, its known distribution has been expanded quite significantly as botanists have discovered the plant in many new areas. Given that *A. phillipsiana* seems to be an agricultural cultivar introduced by prehistoric people, this is not too surprising. But although there are about 25 occurrences scattered down nearly three-quarters of the state, the number of individuals is quite low. Baker (2014) reports that individuals per site number from one to a few, and there may be fewer than 100 total individuals known for the species. *A. phillipsiana* is a long lived perennial that produces clonal offshoots so that the plant itself can live indefinitely until it is killed from disease, or some natural (predation, wildfire) or human-caused action. The plant does not seem to produce seeds. The species is currently ranked as imperiled by NatureServe (2019), but Baker (2014), writing about the populations in the Prescott National Forest in Yavapai County, states that plants are subject to herbivory by javelina, probably fire damage in any area where the vegetation is relatively dense, and because it does not propagate by seeds, he predicts that the few plants with the Forest will eventually be extirpated by herbivory or attrition. In the 2014 Sensitive Plant List compiled by the Arizona Rare Plant Advisory Group, *Agave phillipsiana* was one of only eleven plants included in the "Very High Concern" category.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None.
STATE STATUS: Highly Safeguarded (ARS ANPL, 2016)
OTHER STATUS: Sensitive (US Forest Service, R3, 2013)

MANAGEMENT FACTORS: According to Baker (2014), agaves, in general, are a favorite food for javelina. He also suggests that fire might be another threat in areas where vegetation is relatively dense. He again calls attention to the fact that this species of agave appears to reproduce solely by clonal offshoots, and not through seed production, so that once a clonal plant is destroyed by herbivory, or wildfire, or any other cause, there is no seedbank from which the species can regenerate. Hodgson (2001) notes that the very low population numbers are a threat, and also identified the possibility of rodent predation and flash floods.

PROTECTIVE MEASURES TAKEN: *Agave phillipsiana* is listed as Highly Safeguarded under Arizona State statutes and Sensitive by the USDA Forest Service. As a sensitive species, it will receive some consideration in Forest Service management plans. Those specimens living within the USNPS Grand Canyon National Park will receive some additional protection from that location.

SUGGESTED PROJECTS: In Baker's 2014 report on viability of plant species for the USDA Prescott National Forest, he included several recommended conservation strategies for *Agave phillipsiana*. These recommendations can be extended range-wide for the species:

1. Survey for new individuals. Since the low population number has been indicated as an overall threat, the addition of new populations and/or individual plants would be a positive development. Note that this species has been associated with ancient cultural features.
2. Propagation from offshoots. Propagation from offshoots would be simple and ramets could be planted at various easily monitored sites. Since individuals often produce a large number of offshoots, there would probably be little damage to the longevity of the plant if a limited number of offshoots were taken for purposes of propagation. Clones could be established in test plots and public gardens in order to insure the genetic survival of the species. Although transplanting rare species is not generally recommended, this species may be an exception owing to its suspected history as a cultivated plant.
3. Javelina deterrents. Monitoring known populations/plants can indicate whether there is indeed a problem and its level of severity. Fencing to preclude javelina access is one potential solution since there are very limited number of plants. However the style of fence would have to be determined. The Arizona Game and Fish Department recommended fence is electric so this may not be a practical solution on forest lands. Anti-javelina pellets are also available and could be tried for effect (<https://www.shake-away.com/Javelinas.php?page=Javelinas>).
4. Fire Management. In the unlikely event that monitoring indicates that fire causes damage, it may be useful to remove some of the vegetation in the vicinity of the individual plants.

Since these agaves generally occur in areas of sparse vegetation, efforts should be minimal.

5. Monitoring should be scheduled every 5-10 years. Initial baseline data should include locations and number of individuals and offshoots; stage of maturation (presence or absence of flowering stalks); presence or absence of seeds (presently unknown); evidence of herbivory, disease, die-off caused by drought or fire; evidence of off-road vehicle travel or other human disturbances.

Between October 2-8, 2018, Lisa Kearsley and Wendy Hodgson conducted an agave survey of Clear Creek. This work was sponsored by the Grand Canyon Association Field Institute.

LAND MANAGEMENT/OWNERSHIP: USDI National Park Service (Grand Canyon National Park); USDA Forest Service (Prescott, Coconino and Tonto National Forests); Arizona State Land Department (State Trust Land); and possibly some USDI Bureau of Land Management and private land holdings.

SOURCES OF FURTHER INFORMATION

REFERENCES:

- Arizona Administrative Code, Title 3, Chapter 3. 2016. Appendix A: Highly Safeguarded Native Plants, p. 44.
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http://www.aznps.com/documents/AZRPAG_Final_June2014.pdf
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- Flora of North America, eFloras.org, (accessed August 6, 2018),
http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242101316.
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- NatureServe. 2019. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: July 12, 2019).
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- USDA Forest Service. 2013. Region 3 Regional Forester's Sensitive Species: Plants.

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ADDITIONAL INFORMATION: The plant was first discovered by Stewart Aitchison in 1976. At the time of publication, it was known from only four sites within Grand Canyon National Park (Hodgson 2001). It is named in honor of the botanist Arthur Phillips III.

Agave phillipsiana is an ancient, relict cultivar that was intentionally introduced north of the Mexican border and farmed by pre-Columbian people for food and/or fiber. Other agaves occurring in isolated populations probably resulting from similar human intervention are *A. murpheyi*, *A. delamateri* (central Arizona) and *A. decipiens* (Florida).

There is no evidence that *A. phillipsiana* evolved from a hybridization event involving other extant members of Gentry's (1982) informal group Ditepalae (Hodgson 2001).

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