

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA



Fourteenth meeting of the Conference of the Parties
The Hague (Netherlands), 3-15 June 2007

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Deletion of *Agave arizonica* from Appendix I.

B. Proponent

United States of America

C. Supporting statement

1. Taxonomy

1.1 Class: Dicotyledoneae

1.2 Order: Liliales

1.3 Family: Agavaceae

1.4 Genus, species or subspecies, including author and year: *Agave arizonica* Gentry & J.H. Weber 1970.

1.5 Scientific synonyms: *Agave x arizonica*, *Agave chrysantha* x *A. toumeyana* var. *bella*

1.6 Common names: English: Arizona agave
French:
Spanish:

1.7 Code numbers: ---

2. Overview

Agave arizonica, endemic to Arizona, has been listed in CITES Appendix I since 1987. According to CITES trade data, international trade does not appear to be a factor affecting the status of the taxon. We are proposing to delete this taxon from the CITES Appendices. Although we recognize that normally Appendix-I species are transferred to Appendix II before being completely removed from the Appendices, we believe that continued regulation of this taxon is not warranted given that: the taxon is a first-generation (F1) hybrid between *Agave toumeyana* ssp. *bella* and *A. chrysantha* that is unlikely to maintain a separate genetic identity due to intrinsic biological limitations; and, that neither parental species is included in the CITES Appendices, such that according to Resolution Conf 11.11 (Rev. CoP13) the taxon would not be subject to the provisions of the Convention. We also recognize that this taxon may represent an evolutionarily transitional entity and, as such, we believe that, should demand for this taxon arise, several factors would ameliorate potential threats to the wild

specimens, including: the virtual inaccessibility of wild specimens, the inability of seeds to breed true, and the present availability of cultivated parental stock.

3. Species characteristics

3.1 Distribution

Agave arizonica is endemic to the mountainous regions of central Arizona. Because of the remoteness of its habitat and rare occurrence, individuals are difficult to find (Arizona Fish and Game 2003; Mima Falk, Plant Ecologist, U.S. Fish and Wildlife Service, Arizona Ecological Services, Tucson, Arizona, pers. comm. 2006). It is restricted to four counties (Gila, Maricopa, Pinal, and Yavapai) where its putative parental species [*Agave toumeyana* ssp. *bella* (Toumey's agave) and *A. chrysantha* (golden-flowered agave)] co-occur. *Agave arizonica* are found mainly on federal land in the New River Mountains and the Sierra Ancha Mountains (all in the Tonto National Forest; Arizona Rare Plant Committee 1998; DeLamater 1984; DeLamater and Hodgson 1986; Pinkava and Baker 1985; Träbold 2001). Plants in the Humboldt Mountains occur primarily on private land (Wendy Hodgson, Herbarium Director and Senior Research Botanist, Desert Botanic Garden, Phoenix, Arizona, pers. comm. 2006; Falk 2006).

3.2 Habitat

Agave arizonica grows on the open, rocky slopes of Arizona's Sonoran Desert, amongst scrub, chaparral, or juniper-grassland vegetation (Arizona Rare Plant Committee 1998). Plants are found in shallow, gravely soils and only in sympatric association with its putative parental species. The terrain is rugged, with strongly sloping to very steep slopes and rock outcrops at elevations of 1100 to 1750 meters (m) [3600 to 5800 feet (ft)]. Some plants have also been found in drainage areas (Hodgson and DeLamater 1988; Falk 2006).

3.3 Biological characteristics

Agave arizonica is a naturally occurring interspecific F1 hybrid, resulting from sporadic hybridization between *Agave toumeyana* ssp. *bella* and *A. chrysantha*, where their populations overlap (DeLamater 1984; DeLamater and Hodgson 1986; Pinkava and Baker 1985). This taxon exists primarily as clones, often with large distances between individuals (Arizona Fish and Game 2003).

Similar to other members of the Agavaceae family, *Agave arizonica* is monocarpic, flowering once and dying. This hybrid is believed to mature between 22 to 35 years of age (Arizona Fish and Game 2003). The rarity of the taxon combined with the relative inaccessibility of its habitat has meant that flowering individuals are rarely seen *in situ* (W. Hodgson, pers. comm. 2006; Träbold 2001). This taxon is pollinated by generalists. Bumblebees are the most frequent visitors to inflorescences. Hummingbirds and bats are also possible pollinators (Hodgson and DeLamater 1988; Träbold 2001).

Agave arizonica is not known to have sexually reproduced in the wild (W. Hodgson, pers. comm. to M. Falk, 2003). Although capable of self-fertilization, *ex situ* breeding studies showed self-fertilization leads to poor seed set, indicating that the plant is a predominately obligate outcrosser (Hodgson and DeLamater 1988). Given the often large distances between individual plants and that it lacks a specialized pollinator, *Agave arizonica* is unlikely to be a successful outcrosser (DeLamater 1984; Hodgson and DeLamater 1988). Reproduction in the wild is primarily vegetative (asexual). Clones are produced sparingly via buds that develop in leaf axils (Hodgson and DeLamater 1988; Arizona Rare Plant Committee 1998). Individual plants may vary in size from 2 to 5 or more rosettes (Rice 2002; W. Hodgson, pers. comm. 2006; Falk 2006).

Genetic studies conducted by the Desert Botanical Garden (Phoenix, Arizona) show that this taxon is a hybrid of recent origin. Several intrinsic biological factors impede this taxon's ability to maintain a separate genetic identity, including: reduced sexual reproductive capacity (low pollen viability); small numbers of individuals occurring within close proximity; unlikelihood that neighboring plants will bloom in the same year; overlap of flowering period with parental

species, with which this hybrid is capable of reproducing; and lack of an effective reproductive isolating mechanism to promote genetic stability (Falk 2006; W. Hodgson, pers. comm. to M. Falk, 2003; W. Hodgson, pers. comm. 2006).

3.4 Morphological characteristics

An acaulescent succulent, *Agave arizonica* grows as a basal rosette (leaves emanate from a central point, with no visible stem). The plant may reach 25 centimeters (cm) [14 inches (in)] high and 40 cm (16 in) in width. Leaves are dark green with toothed leaf margins that are often tinged red-brown (Hodgson and DeLamater 1988). Leaves may grow to 31 cm (12 in) in length and 3 cm (1 in) in width. Because this hybrid exhibits characteristics intermediate to those of its parents, inflorescences are vital to identification (DeLamater and Hodgson 1986; Träbold 2001). Yellow, urn-shaped flowers are perfect, borne upon lateral branches on a slender flowering stalk and may reach 4 m (13 ft) in height. Flowering generally occurs from May to July. The plant is rarely seen in flower due to its rarity of occurrence and remoteness of habitat (M. Falk, pers. comm. 2006; W. Hodgson, pers. comm. 2006; Arizona Rare Plant Committee 1998). Seed set is moderate compared to its putative parents (Hodgson and DeLamater 1988). Fruits are dehiscent capsules, splitting into three sections when dry (Arizona Fish and Game 2003).

3.5 Role of the species in its ecosystem

An F1 hybrid between two other species, this taxon does not constitute a species of hybrid origin at this time, but may represent an evolutionarily transitional entity (DeLamater and Hodgson 1986; Träbold 2001). *Agave arizonica* does not maintain a specialized pollinator relationship (DeLamater 1984; Hodgson and DeLamater 1988). Cattle and wildlife graze on the sugar-rich flowers.

4. Status and trends

4.1 Habitat trends

Agave arizonica grows only where its parental species co-occur (DeLamater and Hodgson 1986; Falk 2006; Pinkava and Baker 1985). As such, it is restricted to four counties (Gila, Maricopa, Pinal, and Yavapai) where populations of the putative parents overlap (Arizona Rare Plant Committee 1998; DeLamater 1984; DeLamater and Hodgson 1986; Pinkava and Baker 1985; Träbold 2001).

Most plants occur on federal land in the New River Mountains and the Sierra Ancha Mountains (all in the Tonto National Forest). A few plants have been found on private land in the Humboldt Mountains (W. Hodgson, pers. comm. 2006; Falk 2006). Aside from grazing, there are no direct threats to this habitat at this time (M. Falk, pers. comm. 2006; Rice 2002; see Section 5).

4.2 Population size

Agave arizonica does not exist in populations, but as randomly scattered individual plants with no definable population density (DeLamater 1984; Hodgson and DeLamater 1988). It is estimated that there are approximately 64 plants in the wild (Arizona Fish and Game 2003; DeLamater 1984; Pinkava and Baker 1985; Rice 2002; Träbold 2001). Plants occur only sporadically and often with large distances between individuals (Falk 2006). The largest number of plants occurs in the New River Mountains (mostly on federal land) and the Humboldt Mountains (mostly on private land; Hodgson and DeLamater 1988; W. Hodgson, pers. comm. 2006). Only two plants are known in the Sierra Ancha Mountains (Arizona Fish and Game 2003; Träbold 2001).

4.3 Population structure

This taxon matures over a 22 to 35 year period, flowering once and dying (Arizona Fish and Game 2003). *Agave arizonica* is not known to have ever sexually reproduced in the wild (W. Hodgson, pers. comm. to M. Falk, 2003). Reproducing primarily vegetatively, it exists as clumps of basal rosettes linked by underground rhizomes (Falk 2006; Träbold 2001). Plants vary

in size from 2 to 5 rosettes or more; one individual with as many as 26 rosettes has been documented (Hodgson and DeLamater 1988; W. Hodgson, pers. comm. 2006). These clumps are often referred to in the literature as clones, although technically the clumps consist of a mother plant (the original F1 hybrid) and several genetically identical offsets (clones; Träbold 2001).

4.4 Population trends

In 1984, when *Agave arizonica* was listed as endangered under the Endangered Species Act (ESA), the taxon had reportedly decreased from 19 historically known populations to 13 (Arizona Ecological Services 2006; Limerick and Olwell 1984). However, as the taxon's hybrid status became clear, researchers targeted their surveys in areas where the putative parents overlap and additional *Agave arizonica* plants were located. Since 1992, the total known occurrences has remained at 64.

In 1996, this taxon was ranked by the Natural Heritage Program as critically imperilled, based on its small number of occurrences (fewer than 100 individuals in the wild; NatureServe 2006). However, the rarity of this taxon may now be attributed to the low probability of occurrence from sporadic and infrequent instances of hybridization between its putative parents, where those species co-occur (DeLamater and Hodgson 1986; Pinkava and Baker 1985). The taxon reproduces primarily vegetatively and does not exist as populations, but as randomly scattered individual plants with no definable population density (DeLamater 1984; Hodgson and DeLamater 1988). *Agave arizonica* has never been found outside patches of its putative parents (Falk 2006).

4.5 Geographic trends

In the mid-1980s, researchers conducted surveys in areas where the two parental species co-occur, resulting in the discovery of several more plants outside of previously known locations (DeLamater 1984; DeLamater and Hodgson 1986; Hodgson and DeLamater 1988; Pinkava and Baker 1985). However, no new occurrences have been recorded since 1992 and *Agave arizonica* has never been found occurring separately from its putative parents (Falk 2006; Träbold 2001).

5. Threats

In 1996, the taxon appeared threatened from collection and grazing (NatureServe 2006). However, we believe that these threats are low.

Horticultural trade was once considered a threat to this taxon, because it could be used both in native landscaping (using plants adapted to the local environment, thus requiring less fertilizer and maintenance) and xeriscaping (using plants adapted to drought conditions, thus requiring less water). However, there is currently no information to suggest that this taxon is being collected or traded domestically (Rice, pers. comm. 2006). There has been no international trade in plants or seeds of this taxon since 1987 (see Sections 6.2 and 6.5).

Wildlife and cattle grazing is a potential threat to this taxon, as animals are attracted to its sugar-rich inflorescences (Hodgson and DeLamater 1988; Rice et al. 2002; M. Falk, pers. comm. 2006). However, the CITES listing does not ameliorate the potential threat from grazing (M. Falk, pers. comm. 2006).

6. Utilization and trade

6.1 National utilization

Because of its rarity, it was once considered threatened by horticultural trade for use in native landscaping and xeriscaping (NatureServe 2006). However, there appears to be no current demand for this taxon as an ornamental (Rice, pers. comm. 2006).

6.2 Legal trade

Since this taxon's listing in CITES Appendix I in 1987, exports were recorded only in 1987. A total of 48 live specimens, all reported as artificially propagated, were exported to Austria, Canada, France, Germany, and Great Britain in 1987 (UNEP-WCMC Database).

6.3 Parts and derivatives in trade

None known.

6.4 Illegal trade

There is no information to suggest illegal trade is occurring.

6.5 Actual or potential trade impacts

Although *Agave arizonica* is currently unlikely to maintain a separate genetic identity (see Section 3.3), we recognize that these hybrids may represent an evolutionarily transitional entity and, as such, wild-collection of the few known plants could prove devastating. We believe that, should demand for this taxon arise, there are several factors that would ameliorate potential threats to the wild specimens. This taxon does not lend itself to wild-collection. The remoteness of its habitat and rare occurrence make it difficult to find (Arizona Fish and Game 2003; M. Falk, pers. comm. 2006). Moreover, the unpredictability of flowering makes it difficult to collect seeds from wild plants. Furthermore, seeds do not breed true (i.e. some offspring produced from seeds obtained through controlled crosses resemble Arizona agave, while others do not; M. Falk, pers. comm. 2006; Falk 2006; Hodgson and DeLamater 1988). This taxon has been cultivated, both from seeds and tissue culture (Rice 2002; W. Hodgson, pers. comm. 2006). Thus, cultivated parental stock or specimens would be available (see Section 8.1). Finally, *Agave arizonica* as well as its parental species remain protected by the Arizona Native Plant Law (see Section 8.3.2).

7. Legal instruments

7.1 National

Although it remains protected in Arizona (Arizona Fish and Game 2003), and therefore is subject to protection under the U.S. Lacey Act (U.S. Fish and Wildlife 1998; see Section 8.3.2), *Agave arizonica* was deleted under the U.S. ESA due to the fact that it is not a stable, self-sustaining taxon in the wild.

7.2 International

Agave arizonica has been listed in Appendix I of CITES since 1987. Neither of its putative parental species are listed under CITES.

8. Species management

8.1 Management measures

Upon listing under the ESA, the U.S. Fish and Wildlife Service, which is responsible for managing endangered species in the United States, implemented a full array of management measures, to include restricting access near known occurrences on public land and developing allotment management plans that restrict placement of water developments for cattle within a certain radius of known *Agave arizonica* during flowering season (Arizona Fish and Game 2003; Rice 2002). A cooperative agreement between the Desert Botanical Garden and U.S. Forest Service Tonto National Forest was signed in 1990 that provided the basis for cooperation by which the ecological and genetic research has been achieved. This taxon is a fully sponsored taxon in the Center for Plant Conservation's (CPC) National Endangered Plants Collection (NEPC), with the Desert Botanical Garden serving as its primary custodian. The CPC National Collection, comprising more than 600 imperilled U.S. plants, consists of rare plant material and

seeds that are collected and maintained by participating botanical institutions and are used by scientists to study and restore rare plants in their region (Center for Plant Conservation 2006). See 8.4, below.

8.2 Population monitoring

Agave arizonica has been the subject of intensive ecological and genetic surveys since it was first described in 1970 (Gentry and Weber 1970; for a list, see Rice 2002). Nonetheless, this taxon is not known to have sexually reproduced in the wild (W. Hodgson, pers. comm. to M. Falk, 2003). Because inflorescences are vital to identification of this hybrid, it is possible that this hybrid is under-identified in the wild due to the hybrid's monocarpic nature (flowering once and dying; Tråbold 2001).

8.3 Control measures

8.3.1 International

International trade does not appear to be affecting the status of *Agave arizonica*. There have been no applications for export of wild-collected specimens of this taxon since 1987. In addition, there is no evidence that trade in wild-collected specimens is likely to occur as a result of deleting this taxon from the CITES Appendices.

8.3.2 Domestic

Agave arizonica and its putative parents are protected by Arizona's Native Plant Law (ARS Chapter 7, Section 3-901). Under this law, *Agave arizonica* is protected as a highly safeguarded taxon, which prohibits collection, except by permit for scientific or educational purposes (Arizona Fish and Game 2003; Arizona Department of Agriculture 2006). The putative parents of *Agave arizonica* are protected as salvage-restricted species (Arizona Department of Agriculture 2006). Salvage-restricted species require a collection permit (whether collected on public or private property) as well as a special tag, which is illegal to remove prior to replanting (Jim McGinnis, Office of Special Investigations, Arizona Department of Agriculture, Tucson, Arizona, pers. comm. 2006).

The U.S. Lacey Act (P.L. 97-79, 95 Stat. 1073, 16 U.S.C. 3371-3378, as amended in 1981), also provides protection for this taxon and its putative parents. Under this Act, for any taxon listed under CITES or protected by State law, it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate commerce of any plant taken, possessed or sold in violation of any law, treaty, or regulation of the United States, any Indian tribal law or any law or regulation of any State (U.S. Fish and Wildlife 1998).

8.4 Artificial propagation

Cultivation research on *Agave arizonica* has been conducted by the Desert Botanic Garden as part of the Center for Plant Conservation's (CPC) National Endangered Plants Collection (NEPC; see Section 8.1). One aim of the CPC-NEPC is to produce seeds in cultivation so wild populations will not be impacted by collection (Kathy Rice, Curator of Seeds and Rare Plants, Desert Botanical Garden, Phoenix, Arizona, pers. comm. 2006). Through this program, *Agave arizonica* has been cultivated from seed and tissue culture (Center for Plant Conservation 2006; Rice 2002; W. Hodgson, pers. comm. 2006; see Section 3.3). DBG further determined that seed from controlled crosses of the parental species, *Agave chrysantha* and *A. toumeyana* var. *bella*, produce *Agave arizonica* plants (Falk 2006). The parental species are not considered rare and exhibit high seed set (Hodgson and DeLamater 1988). Thus, we believe this taxon could be artificially propagated from cultivated parental stock (see Section 8.3.2).

8.5 Habitat conservation

There are no specific habitat protections for this hybrid or its parents. *Agave arizonica* occurs only sporadically over a four-county area where populations of its putative parental species overlap. The habitat is relatively inaccessible, although it may be subject to cattle and wildlife grazing.

8.6 Safeguards

Agave arizonica is considered to be an F1 hybrid that is unlikely to maintain a separate genetic identity due to intrinsic biological limitations (see section 3.3). However, this taxon remains a fully sponsored part of the CPC program (see section 8.1). Denver Botanic Garden is likely to continue maintaining its collection and research into this entity (W. Hodgson, pers. comm. 2006).

9. Information on similar species

There are more than 240 members of this genus, at least 136 of which are native to continental North America (Gentry 1982). *Agave parviflora*, native to Mexico and the United States, is listed in CITES Appendix I. *Agave victoria-reginae*, native to Mexico, is listed in CITES Appendix II. Other rare agaves in Arizona include *A. delamateri*, *A. phillipsiana*, believed to be feral remnants of pre-Columbian cultivars and listed as species of concern by the U.S. Forest Service (W. Hodgson, pers. comm. 2006).

10. Consultations

The Scientific Authority of the United States of America solicited public comments via two public notices (U.S. *Federal Register* Vol. 71, Nos. 13 and 215, 2006). Consultation letters were sent to appropriate State and Federal agencies in the State of Arizona where this taxon occurs. Experts at the Desert Botanical Garden, who conducted much of the ecological and genetic research on this taxon, were also consulted.

11. Additional remarks

Summary of factors prompting this proposal to delete the *Agave arizonica* from the CITES Appendices: The taxon is an F1 hybrid that is not self-sustaining in the wild (Section 3.3.); the taxon is not currently in trade nor are its putative parents listed under CITES (Section 6.1); the taxon does not lend itself to wild-collection (Section 6.5); and, existing research on artificial propagation of this taxon would ameliorate potential threats to the wild specimens should demand for this taxon arise (Section 8.4).

12. References

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