PETITION TO LIST THE ACUNA CACTUS (*Echinomastus erectocentrus* var. *acunensis*) AS AN ENDANGERED SPECIES

Center for Biological Diversity

Petition Presented To:

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The Center for Biological Diversity hereby formally petitions to list the Acuna cactus (*Echinomastus erectocentrus* var. *acunensis*) as endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seg. (hereafter referred to as "ESA). This petition is filed under 5 U.S.C. 553(e) and 50 CFR 424.14 (1990), which grants interested parties the right to petition for issue of a rule from the Assistant Secretary of the Interior.

The petitioner also requests that Critical Habitat be designated concurrent with the listing, pursuant to 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553).

The petitioners understand that this petition action sets in motion a specific process placing definite response requirements on the United States Fish and Wildlife Service and very specific time constraints upon those responses.

Petitioner:

The Center for Biological Diversity is a 7,500 member non-profit organization dedicated to protecting endangered species and wild places of western North America and the Pacific through science, policy, education, and environmental law.

Executive Summary

Acuna cactus is a highly imperiled plant with a small geographic range, specific substrate requirements, declining population numbers and increasing threats. It was first proposed for listing as threatened in 1975 as part of a review of imperiled plants requiring listing by the Smithsonian Institute. The Smithsonian Review was called for within the Endangered Species Act itself and resulted in recommendation of over 3,000 plants for listing, a majority of which have to this day never been listed. Acuna cactus was made a candidate species (C1) in 1980 and remains so to the present. The U.S. Fish and Wildlife Service prepared a notification to interested parties of consideration for listing in 1995, but failed to follow through with listing. This failure was despite the fact that listing of acuna cactus was required by a settlement agreement with Fund for Animals. Thus, the U.S. Fish and Wildlife Service failed to list a species for 27 years that was clearly imperiled. Within those 27 years, population declines have been documented in several populations.

In the 1995 notification to interested parties and landowners that the plant was being considered for listing, the U.S. Fish and Wildlife Service noted the threats to acuna cactus as being illegal collection, mining, recreation, road maintenance, land development, and grazing along with natural factors, such as moth larvae and Opuntia borer insect predation. None of these threats have been lessened or removed.

Only two disjunct populations centers have ever been known for the plant: one in south-central Arizona with occurrences on private, State and Federal lands; and another in southern Arizona extending slightly into Mexico with occurrences primarily on Federal lands. The south-central Arizona population center includes two known sites in the hills between Florence and Kearney, north and south of the Gila River. The southern population center includes sites at Organ Pipe National Monument, in the Little Ajo, the Sand Tank and the Saucedas Mountains, in addition to the Sonoita Hills of Sonora, Mexico (Arizona Rare Plant Field Guide 2001).

The south-central Arizona population center is near extirpation due to longterm collection, severe livestock grazing and recent development of small homesites. Populations on private lands in Arizona are known to have been lost by recent mining activities. In Mexico, sites are highly impacted and lack laws or policies to protect them. One known site on Organ Pipe National Monument has been monitored over time with documented population declines and high mortality rates since 1977 and this is the only site being afforded protective management and study. No other sites, either on federal or private lands, have had protective measures implemented on the ground, nor are they being monitored. Three sites have had little to no survey work done and are only known to contain a few individuals at this time. Two of these, on lands administered by the Bureau of Land Management, were located as a result of survey work for desert tortoises and lizards and have not been re-evaluated for acuna cactus occurrence. The third is on a combination of private and State lands with development impacts ongoing.

With so little of the species confirmed range and habitat remaining viable, we conclude that the continued existence of acuna cactus is jeopardized and the plant needs the protection of the Endangered Species Act to preclude further population declines, habitat loss or contraction of its historic range.

Taxonomy

Family:
Cactaceae
Scientific Name:
Echinomastus erectocentrus var. *acunensis*
Valid Synonyms:
Echinomastus acunensis
Echinomastus var. *erectocentrus*
Neolloydia erectocentra var. *acunensis*

The acuna cactus was first collected in 1948 on rocky hillsides by the Superintendent of Organ Pipe National Monument. It was described as a species of *Echinomastus* in 1950 by W. T. Marshall and published in 1953. Benson (1969) revised the taxonomy of the cactus family and assigned acuna cactus to the genus *Neolloydia* as a subspecies of *erectocentra*. Earle (1980) raised the variety to the species level (*N. erectocentra*). However in the same year, H. Bravo (1980) transferred it back to *Echinomastus* and left it as a variety of *erectocentrus* where it has since remained.

Acuna cactus is a member of a small and very complex genus. The relationships between members of this genus are poorly understood. In a 1994 status report prepared for the Bureau of Land Management, Heil and Melton state that acuna cactus "is irreplaceable in the terms of the contribution of information that this species can provide to the phylogenetic and biogeographic history of *Echinomastus*..." because so little is understood regarding this complex genus. It is the only member of the genus *Echinomastus* that occurs in the vicinity of Ajo and Florence, Arizona. The other variety of *E. erectrocentrus* (var. *erectrocentrus*) occurring within Arizona is found on a variety of soil substrates in the Tucson/Benson area and has also been subject to collection and development.

Common names for this taxon include: acuna cactus, acuna pineapple cactus and red pineapple cactus.

Description

Technical

Stems solitary, ovoid or somewhat cylindricoid, 10-22.5 cm long to 10 cm diam ribs mostly 15-21, the indentations between tubercles sharp and narrow. Spines dense, obscuring surface of stem, central spines dark-tipped, reddish, pink, 2-4 per areole, the upper turned upward. Radial spines 11-15 per areole, appressed, the lateral spines often pectinate, straight, the longer up to 2.5 cm. Flowers 3.8-5 cm diam, 4-5 cm long, sepaloids with purplish-green midribs, to 7.5 mm broad and up to 30 mm long. Stigmas mostly 10, 1.5 mm long, stout; ovary in anthesis broadly obconical; fruit green drying to tannish with several membraneous, minutely and sharply denticulate scales. Seeds minutely and regularly papillate except near hilum, crescentic-ellipsoid, broader than long, 1.5 mm long, 2 mm broad, and 1mm thick (Benson 1982).

Non-technical

Stems of acuna cactus are solitary, ovoid to somewhat cylindrical up to 22.5 cm (8.9 in) and about 10.0 cm (3.9 in) in diameter. Spines originate at the tips of grooved tubercles and densely obscure the surface of the stem (Figure 1). The central spines number 2-4 per cluster, are 2.5-3.5 (1.0-1.4 in) long and project upward. The radial spines number 11-15 per cluster and are up to 2.5 (1.0 in) long. Flowers are coral pink to pale purple and up to 5.0 cm (2.0 in) in diameter.

Acuna cactus is similar in appearance to fishhook cactus (*Mammillaria microcarpa*) and hedgehog cactus (*Echinocereus*).

Phenology

Acuna cactus flowers from mid-March to early April. Robert Johnson, in his 1992 report on the pollination and reproductive ecology of acuna cactus, notes that the flowering is correlated with plant size and flower number correlated with plant volume. His research has shown that the flowers are self-incompatible and are pollinated primarily by solitary, polyectic bee species. A 1993 report for the Center for Plant Conservation by the Desert Botanical Garden noted only an 18.75% germination rate for their collected seed, noting that a high percentage seemed non-viable. The Desert Botanical Garden has seed representing the Organ Pipe National Monument site and a site near Florence.

Habitat

The acuna cactus is a narrow endemic inhabiting two small areas of the Sonoran Desert Section of the Basin and Range Province (Hunt 1974). This region receives low precipitation, often around 5 to 15 inches annually, low humidity, high insolation, and large fluctuations in daily and annual temperatures.

Johnson (1989) found that the local distribution of acuna cactus is associated with specific soil conditions. Acuna cactus occurs on granitic and andesitic hills and flats at 200-800 m (1,300 - 2,600 ft) elevation (Heil and Melton 1994). Soils are shallow, very gravelly and cobbly, moderately coarse to moderately fine-textured, gently sloping to very steep such as on hills and mountains. Hendricks as cited in Heil and Melton (1994) reported these soils to be within the Lithic Cabothids-Rock Outcrop Lithic Hapargids Association.

Acuna cactus usually occurs on open, rocky sites within the Palo-Verde Cactus Association of the Arizona Upland Subdivision of the Sonoran Desert scrub. Associated species of sites occupied by acuna cactus include creosote-bush *(Larrea tridentata*), bursage (*Franseria dumosa*), wild buckwheat (*Eriogínum fasiculatum*), ocotillo (*Fouquieria splendens*), white-thorn acacia (*Acacia constricta*), fairyduster (*Calliandra eriophylla*), and jojoba (*Simmondsia chinensis*).

Figure 1. Appearance of acuna cactus and its general distribution.

Ecology

Acuna cactus seed appears to germinate primarily during and following the summer monsoons, although some individuals do establish in winter and spring (Johnson 1992). Analysis of data collected over the first three years of a long-term study found that seedling establishment, growth, and flower production were positively associated with rainfall while mortality of juvenile plants was negatively associated with rainfall (Johnson et al. 1993).

The best sources of ecological information about this taxon are Johnson (1989, 1991) and Johnson et al. (1993). Johnson (1989) reported on the flowering phenology, pollination ecology and local distribution patterns within Organ Pipe National Monument. He found that acuna cactus is self-incompatible and thus requires insect vectors for fertilization. He reported that a significant number of fruits and seeds were eaten by larvae of a pyralid moth. He also found that soil texture and chemistry are associated with local plant distribution patterns.

Germination studies and seed banking have been conducted by the Desert Botanical Garden (DBG) for the Center for Plant Conservationžs National Collection (Kozak and Ecker 1992). As of 1992, DBG was maintaining 3000 field collected seed from Organ Pipe National Monument and slightly over 2300 seed from the Florence population. Reportedly they failed to see seeds germinate in 1991 and forwarded seed to Arizona State University for viability testing. In 1993, DBG utilized a different technique and saw an average of 18-19% of collected seed germinate (Kozak 1993).

Geographic Distribution

Only two disjunct populations centers have ever been known for the plant: one center in south-central Arizona with occurrences on private, State and Federal lands; and one in southern Arizona extending slightly into Mexico with occurrences primarily on Federal lands (Figure 1). The south-central Arizona population center includes two known sites in the hills between Florence and Kearney, north and south of the Gila River. The southern population center includes sites at Organ Pipe National Monument, in the Little Ajo, the Sand Tank and the Sauceda mountains, in addition to the Sonoita Hills of Sonora, Mexico (Arizona Rare Plant Field Guide 2001).

Of sites in the south-central Arizona population center, the site near Florence is near extirpation due to longterm collection, severe grazing of habitat and recent development of small homesites. This site occurs on both private and State lands. The other site within this population center historically occurred on Bureau of Land Management lands that were included in part of the Ray Mine Land Exchange. The Environmental Impact Statement for the exchange, however, reported that acuna cactus does not occur in the area, but failed to indicate they had surveyed for the species. Given that impacts are proposed for other rare plants, if the acuna cactus does still occur in the area it likely will be impacted as well, particularly since the agency is unaware of its presence. The plant's location there is within a desert tortoise plot area (Anderson pers. comm. 2002).

Populations on private lands in Arizona have been lost by recent mining activities. In Mexico, sites are highly impacted and without enforcement of conservation laws or policies to protect them. One known site on Organ Pipe National Monument has been monitored over time with documented population declines and high mortality rates since 1977 and this is the only site being afforded protective management and study. No other sites, either on federal or private lands, have had protective measures implemented on the ground, nor are they being monitored. Three sites have had little to no survey work done and are only known to contain a few individuals at this time. Two of these, on lands administered by the Bureau of Land Management, were located as a result of survey work for desert tortoises (south-central population center in hills north of Gila River) and lizards (southern population center site in the Sand Tank mountains known from one plant) and have not been re-evaluated for acuna cactus occurrence (Anderson pers. comm. 2002). The third one noted above near Florence is on a combination of private and State lands with development impacts ongoing.

Sympatry with rare and endemic taxa

Acuna cactus ranges with or near other federally endangered and threatened species, including but not limited to: the cactus ferruginous pygmy owl (*Glaucidium basilianum cactorum*); Sonoran pronghorn (*Antilocapra americana sonoriensis*); lesser long-nosed bat (*Leptonycteris curasoae*); Nicholžs turkžs head cactus (*Echinocactus horixonthalonious* var. *nicholii*); and Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*). Protection for these species, however, has not prevented continued decline of acuna cactus or provided substantial protections to the species.

Population Status & Threats

There are reportedly seven confirmed populations or occurrences of acuna cactus, including six in Arizona and one in Mexico. For clarification purposes, the Arizona populations are grouped as below:

South-central Arizona population center:
- site near Florence
- site near Mineral Mountain

Southern Arizona population center:
- site in Sand Tank Mountains
- site in Sauceda Mountains
- site in Organ Pipe National Monument
- site in Little Ajo Mountains)

According to Rutman (pers. comm 1999), the Mexican population is affected by a number of man-made threats, including expansion of Puerto Penasco, construction of roads, utility lines, trails and parking lots, and recreational sports, such as off-road use and target practice. NAFTA is expected to be a driving factor behind some of the continued development in this region.

According to Rutman (1995) the population occurring in the vicinity of Ajo, Arizona is near extirpatation in part because much of its habitat has been converted into a mining pit. It is unknown if scattered individuals within the Little Ajo Mountains continue to exist on BLM lands or if they have also been lost to mining in the area.

The population of acuna cactus near Florence, Arizona was noted as in decline (Rutman, 1995) presumably due to overcollecting and ranchette development. It has been described as depleted and unrecoverable due to grazing and development impacts. The area is presently undergoing continued impacts with further private development and road maintenance.

Heil and Melton (1994) referred to this population as having limited habitat available and a low density of plants. The highest density and greatest abundance of acuna cactus occurs within Organ Pipe National Monument. This population is well-studied as it has been the focus of a nine-year demographic study by Johnson and early work by Buskirk (1981) and Phillips and Buskirk (1983). Threats to this population include illegal collecting and mammal predation. Probably in part because of these threats, there has been almost a 50% drop in the population (Rutman pers. comm. 2002). Another possible threat is the well-publicized increase in illegal trafficking of people and drugs at the park, which may pose a direct threat to the plants and may increase fires destroying plants and irreparably altering habitat.

The populations in the Sand Tank, Sauceda and Mineral Mountain are on lands administered by the Bureau of Land Management. Management plans have not been revised to protect the acuna cactus in the Saucedas and are non-existent for the Sand Tank and Mineral Mountain sites. These sites are subject to livestock and recreational impacts and are available for lease for mining purposes. Field reports state that the population in the Saucedas was in poor health with numerous dead stems (Rutman, undated). The Sauceda site is facing increasing burro use due to an expanding herd that the Bureau of Land Management is not managing as it is a trespass herd from adjacent Tribal land. Rutman (pers. comm. 2002) states that it is routine to see burros at this site now. This site is part of a designated Area of Environmental Concern, so the lack of management and monitoring at the site demonstrates the ineffectiveness of such designations absent protections of the Endangered Species Act.

Given the existing threats and decreases in population size, it seems clear that even at sites with protective management in place such as Organ Pipe National Monument, acuna cactus' very existence is in question without benefit of federal protection.

U.S. Fish and Wildlife Service documents received under FOIA in 1999, reveal that listing the acuna cactus has been under serious consideration since 1995; however, the agency has taken no action to further protect the plant. In the 1995 notification to interested parties and landowners that the plant was being considered for listing, the U.S. Fish and Wildlife Service noted the threats to acuna cactus as being illegal collection, mining, recreation, road maintenance, land development, and grazing, along with biological factors, such as predation from mammals, moth larvae and the Opuntia borer insect. None of these threats have been lessened or removed. Habitat loss has also been documented from mining and development.

Historical Declines and Current Instability

Rutman (1996) reported that the Ajo and the Florence populations are extirpated or otherwise inviable due to habitat loss and overcollection. In combination with the lack of protections in Mexico and the tremendous growth and development in the border region, approximately one-half to two-thirds of the known acuna cactus range is therefore extirpated, depleted, or otherwise degraded or threatened.

Buskirk (1981) monitored the acuna cactus population at Organ Pipe National Monument between 1977 and 1981. Together, Buskirk and Phillips (1990) reported population declines of 31% between 1977 and 1981. This decline was

39% among taller plants. An independent study by Phillips (1981) also found the same results with about 37% declines. In 1992 and 1993, additional monitoring was conducted with results of overall size classes reflecting an approximately 25% decline. In the smallest size class, mortality occurred in approximately 50% of plants during that one year (USDI-NPS 1993). No one knows if such declines are within the natural range of variation for this species, but they are cause for concern. Recent declines have reduced the only known site receiving protective management.

Similarly, population monitoring was conducted in the Sauceda Mountains on Bureau of Land Management lands in the mid- to late 1980s. As with the Organ Pipe National Monument monitoring, the results indicated extremely high mortality rates at approximately 50% of plants counted in 1987 (Anonymous field report). Monitoring is not conducted at this site by the Bureau of Land Management, so current field data is unavailable; however, the habitat is undergoing effects of an unmanaged and expanding burro herd and other threats.

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Development along the border, within Mexico and Arizona, is expected to continue. The North American Free Trade Agreement is likely to facilitate further growth in the region. Desert habitat in general is being impacted through effects of illegal trafficking in people and drugs at sites near the border. This illegal trafficking brings about significant changes through the additions of trails and roads, fires resulting from warming and cooking fires, the loss of woody vegetation to fuel those fires, and massive littering of areas. While these impacts are documented from the Organ Pipe National Monument site, it is possible that now or in the near future, similar impacts will occur at the Sauceda and Sand Tank populations.

Mining is expected to continue at the Ajo site and elsewhere in the region. No sites, even the Bureau of Land Management administered Sauceda Mountains population within a designated Area of Environmental Concern, have been withdrawn from mining entry. Mining remains a clear threat to the plant's continued existence at all sites excepting the one at Organ Pipe National Monument.

Livestock graze much of the geographic range of acuna cactus in both countries, with the exception of Organ Pipe National Monument. Grazing affects plants incidentally by trampling, and affects habitat by removing native vegetation, and proliferating non-native species where ground disturbances are greatest. A trespass herd of burros has been noted in the Sauceda Mountain site for years; however, no actions have been implemented to remove the animals despite their common occurrence in the plant's habitat and their evident herd expansion. In the hills near Florence, both cattle and horse grazing continues.

Additionally, changes in the vegetation community resulting from grazing alters fuels for wildfire and increased human ignitions have greatly changed the timing, frequency, and intensity of natural fire regimes in the southern Arizona desert ecosystems.

Overutilization for commercial, recreational, scientific, or educational purposes.

The extent of illegal cactus collection varies

by site. Heil and Melton (1994) surveyed the occurrence of acuna cactus on Bureau of Land Management lands in 1994 and reported no sign of current overcollection; however, it does not appear that population comparisons over time and re-location of known individuals was possible due to a lack of previous field work, so noting overcollection as not being problemmatic is unsupported in the status report. Rutman (1995) documented that the Florence population is highly collected due to its easy access and familiarity to collectors. Some reports of collection have come from Organ Pipe National Monument (Rutman pers.comm.). Law enforcement and other protections that would be afforded to this species under the Endangered Species Act could prevent this from happening in other areas. Designation of critical habitat with the resulting publication of locations for the plant would not be beneficial and would likely, in fact, result in even greater impacts to sites.

Disease or Predation

Rodents are believed to prey on acua cacti, especially during dry years when the plants can provide a source of water. Pyralid moth larvae are known to eat acuna cactus fruits and seeds. Johnson (1993) reports that a common source of mortality for adult plants is the larvae of the opuntia borer beetle in the family Cerambycidae.

Inadequacy of Existing Regulatory Mechanisms

This species was recommended for Federal listing first in 1975 by the Smithsonian Institute and later in a report prepared for the Fish and Wildlife Service in 1982 (Phillips et. al. 1983). It was first made a candidate in 1980. In 1995, the Fish and Wildlife Service notified interested parties and landowners of the agency's consideration to propose acuna cactus for Federal listing. Information regarding the status of the plant was sought at this time. Each year, the agency is required to evaluate the status of its candidate species, and acuna cactus was maintained as a candidate with a listing date agreed to within the framework of the Fund for Animals litigation settlement. That listing framework was later abandoned and the agency agreed to a new one that failed to include acuna cactus, thus leaving the plant in a continuing candidate limbo.

Other protections to date include the Arizona Native Plant Law and the Convention on International Trade in Endangered Species (CITES), both of which are difficult to enforce with enforcement taking effect only after the plant has been removed from its habitat.

Although some individuals of acuna cactus occur near ephemeral drainage systems, there is no indication that their adjacent habitat would be considered in an evaluation relevant to Section 404 of the Clean Water Act.

In the case of the acuna cactus, occurrence on federally administered lands has been only partially beneficial. Organ Pipe National Monument has taken numerous proactive conservation steps to protect plants (USDI-NPS 1995). Such steps have included road closures and map modifications and funding for longterm ecological studies. Despite these protective measures, the monument population has continued to decline.

The Bureau of Land Management has taken no meaningful action to address grazing and recreation issues or withdraw lands with acuna cactus from entry for mining. The population in the Saucedas is within a

designated Area of Critical Environmental Concern; however, this has not resulted in population monitoring, management, protection from burros or withdrawal of mining entry for the site. It is not clear as to whether or not the Bureau of Land Management has ever evaluated the effects of its oversight on the plant within this area or at the other two administered populations. Thus, it is evident that the Federal Land Policy and Management Act has provided no benefit through land use planning for acuna cactus.

Without the protection of the Endangered Species Act, the population at Organ Pipe National Monument will likely one day be the only secure refuge for the subspecies in the longterm and yet, each day brings increasing threats to even this site through illegal trafficking. Clearly the existing mechanisms and federal regulations are not sufficient to prevent further losses or possible extinction of this native plant.

Other Natural or Man-Made Factors

The ecosystem within which acuna cactus occurs, both in Mexico and the U.S., has been fundamentally altered and may be in a state of dysfucntion. This has resulted predominantly from the proliferation of exotic (non-native) annual grasses combined with the effects of human activities (Turner et al. 1995). These factors have combined to alter the frequency, and seasonality of natural fire regimes. Although many cacti can tolerate fires, fire is known to proliferate buffelgrass and cheatgrass which then compete with native plants for water and nutrients. Moreover, cactus tolerance of fire in all seasons, frequencies and intensities is unknown. Despite protective management and active enforcement, the increase in illegal trafficking has resulted in increased fires beginning as warming and cooking fires for smugglers and others seeking entry into the United States.

Conclusions

Acuna cactus is a narrowly distributed endemic subspecies with small, declining populations and is in danger of extinction through direct impacts and by habitat destruction and alteration throughout its range. Threats include mining, private development of scattered homesites, road building and maintenance, livestock grazing and unmanaged burros, collection by cactophiles, predation by mammals and insects, recreational activities, illegal trafficking, wildland fires, and changes in the ecosystem at-large.

Declines in populations overtime have been noted for all sites studied; the majority of the plant's populations are small, scattered, and many may no longer be viable due to impacts overtime absent protections. It is not acceptable that acuna cactus remain an unprotected candidate subject to preventable threats on even Federal lands. The demise of this extremely rare cactus is inevitable if actions are not taken immediately.

Critical Habitat

Petitioners request and strongly recommend the designation of critical habitat for acuna cactus coincident with its listing. We recommend that critical habitat include all known locations and sufficient habitat for recovery. To protect the species from collection, we recommend the U.S. Fish and Wildlife Service not publish exact locations, but rather the generalized area of critical habitat, including recovery habitat.

Respectfully submitted**,**

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Appendix A- Personal Communications

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