Petition to list Dalea tentaculoides (*Gentry indigobush*) as an endangered species

January 2, 2002

Ms. Gayle Norton
Secretary of the Interior
Office of the Secretary
Department of the Interior
18th and "C" Street, N.W.
Washington, D.C. 20240

The Center for Biological Diversity and Noah Greenwald hereby formally petition to list Dalea tentaculoides (*Gentry indigobush*) as endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq. (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.

Petitioners also request that Critical Habitat be designated concurrent with the listing, as required by 16 U.S.C. § 1533(b)(6)(C) and 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553).

Petitioners understand that this petition action sets in motion a specific process placing definite response requirements on the U.S. Fish and Wildlife Service and very specific time constraints upon those responses. See 16 U.S.C. § 1533(b).

Species Description and taxonomy

Dalea tentaculoides (Gentry indigobush and hereafter referred to as Dalea or Dalea tentaculoides) is an erect perennial shrubby herb growing from a woody root crown within the Fabaceae, or the legume family of plants. Dalea was described by Gentry in 1950 and maintained as a valid species by Barneby in 1977. Stems grow up to 50 cm tall, branching from the base and are covered with pustulate tubercles. Compound leaves have 15-27 leaflets oblong to obovate in shape, lacking hairs above but dotted with small punctate glands below. Terminal and lateral inflorescences have bracts shorter than the calyx lobes, both with prominent tentacular glands, hence the specific epithet. Flower petals are violet on this bifloral species; however, the flower heads developing in fall are smaller than those of spring (Gentry 1950). . The species has never been known to exhibit sexual reproduction. Dalea is sympatric with other, somewhat similar looking members of the genus (e.g. Dalea greggii and Dalea versicolor) but, is distinguished by the tentacular glands on the bracts and calyx lobes (Gori et al. 1991). Gori et al. (1992) noted that the taxon is thought to be without close relatives, thus making it even more taxonomically significant for conservation.

Habitat requirements

Dalea occurs in sandy, gravelly soils along floodplain terraces and on slopes close to the floodplains of small creeks in igneous derived alluvium at elevations of 3600-4000 feet. Slope is less than 5 to 10 percent in a level canyon bottom aspect. The plants may be found in the open or within the shade of riparian species such as Platanus wrightii, Juglans major, Quercus spp. and Fraxinus velutina. Most of these sites are subject to periodic flooding as part of the dynamics of the system. Plants do not survive scouring; however, may relocate in a sandbar downstream and establish and expand via asexual reproduction or survive if protected by the scouring velocities from rocks or logs lain across the gravel bar by floodwaters (Gori et al. 1991). This vegetative reproduction mechanism is common in plants subject to frequent system disturbances. Severe scouring resulting from catastrophic flooding or flooding combined with grazing-induced watershed degradation removes and buries plants completely, rendering them lost from the site.

Distribution

Dalea currently occurs at only three localities, including a recently discovered and poorly studied site in Mexico, a site on the west slope of the Baboquivari Mountains on the Tohono O'odham Reservation (Roller 1998), and in Sycamore Canyon. A previously known site in the Coyote Mountains is extirpated probably because of overgrazing (Gori et al. 1992). Numerous other localities in the U.S. have been surveyed, but no plants were found (Gori et al. 1992)(Table 1). In addition, nine general areas in Mexico, extending from the Sierra Cibuta on the west to the Sierra San Luis on the east, were surveyed between 1988-1991 with negative results (Gori et al. 1992), leading the authors to conclude: “our failure to find it at any new locations, combined with the failure of other botanists familiar with it to locate new populations over the last ten years, suggests that the species is quite rare.”

Table 1. Location of negative surveys for *Dalea tentaculoides*.

Mountain Range	**Survey Location**
Coyote Mountains	Mendoza Canyon
Atascosas/Pajaritos Mountains	Upper Peck Canyon
	California Gulch
	Holden Canyon
	Rock Corral Canyon
Baboquivaris Mountains	Thomas Canyon
Catalina Mountains	Sabino Canyon
Patagonia Mountains	Harshaw Creek
	Finley Canyon
	Adams Canyon
	Flux Canyon
	Upper Mowry Wash

Population Status

The population of Dalea in Sycamore Canyon is the only one that has received any monitoring or management. Despite this attention, the population is far from secure, but rather is subject to numerous threats, in particular overgrazing in the larger watershed, sediment erosion and deposition from numerous roads, extensive human traffic and stochastic disturbance from flooding. As a result of these threats, the population has fluctuated dramatically within the last ten years (Falk 1993, Falk and Warren 1994, Gori et al. 1992). Indeed, Gori et al. (1992) concluded:

> "We observed substantial changes in population structure and flowering activity between 1990 and 1991 suggesting that the population is not at an equilibrium condition."

Continued surveys have confirmed this initial conclusion. Gori et al. (1992) estimated there were 1400 "individuals" in Sycamore Canyon. Following severe flooding in 1993, monitoring shows that the population declined severely. A June 10, 1993 survey by Coronado National Forest Botanist Mima Falk found that a substantial portion of a monitoring plot established by Gori et al. (1992) had been washed away and that the population had declined to 15-30 individuals, leading her to conclude:

> "A decrease in the total numbers from 1,400 to 15-30 is quite dramatic. Who knows how much more rainfall would have removed the entire population from the canyon."

In response to information provided by Falk, the USFWS itself concluded:

> "This new information discussed in these two reports [the above referenced report from Mima Falk and Falk and Warren 1994] provides strong evidence to suggest that the potential threat of population extirpation associated with peak water flow events resulting from runoff during average precipitation events is severe. The flow velocity was so great and powerful with these storms that a plot established to monitor site specific

> demographic trends across a portion of the population within Sycamore was largely washed away" (Roller 1998).

Later surveys show that the population recovered somewhat with Bertelsen (1997) documenting a total of 499 plants. This recovery, however, does not negate the threat to populations by catastrophic flooding and other factors with the USFWS concluding:

> "In summary, the species' capacity to recover does not negate the threat of extirpation to this extremely localized endemic, as it relates to extreme flood events within the watershed" (Roller 1998).

Of further concern is that the Sycamore Canyon population has never been observed to produce seed and apparently relies entirely on asexual reproduction. This makes estimates of numbers of individuals as cited above suspect with true population numbers probably much lower. Responding to these concerns, the USFWS concluded:

> "Additionally, as expressed within the original proposed rule, this species which has been well monitored within the Coronado National Forest over the past 7 years, and has not been found to produce any seed. Many of the plants found and counted as individuals are often found with further inspection, to be connected through underground runners and may actually be vegetative sprouts of each other. This finding leads concerned ecologists to hypothesize that the species is existing completely upon asexual reproduction to establish/re-establish itself along the deposited terrace habitats. If this potential is true, the threat of population extirpation with a catastrophic flood event is placed at a much greater magnitude of risk due to the potential absence of a seed bank to re-colonize washed out areas" (Roller 1998).

In summary, a decade of monitoring of the Sycamore Canyon population of *D. tentaculoides* documents that it has undergone population fluctuations near extirpation that clearly indicate long-term stability is poor.

Very little is known about the sites in Mexico and the Tohono O'odham Reservation. The latter site was believed extirpated by overgrazing, but was later rediscovered (TNC personal communication). Further information on population size and trend or current grazing regime is unavailable because of its occurrence on Tohono O'odham Nation lands. Similarly, the site in Mexico was only discovered in 1995 (Van Dervender 1995) and its status in regards to population trend or current threats has never been assessed. Neither site, however, is currently protected from grazing or other threats and as noted above livestock grazing has been a problem at one of the sites.

The present or threatened destruction, modification, or curtailment of its habitat or range.

Livestock grazing. Livestock grazing negatively affects Dalea through direct foraging, or trampling, or by altering hydrologic systems associated with Dalea habitat (Gori et al. 1992). Cattle alter stream hydrology by compacting soils, eroding streambanks and removing riparian vegetation, resulting in increased surface runoff, higher intensity floods, stream downcutting, and

increased scouring and deposition (Arndt 1966, Branson and Owen 1970, Cooperrider and Hendricks 1937, Davis 1977, Gifford and Hawkins 1978, Haynes and Neal 1943, Lusby 1970, Smiens 1975). Although Dalea is adapted to flooding, scouring or excessive deposition can lead to loss of populations (Gori et al. 1992). The effects of livestock grazing on Dalea are confirmed by Gori et al. (1992), who concluded "our surveys of Sycamore and Mendoza Canyon leads us to believe that grazing constitutes a threat to D. tentaculoides."

Severe habitat modification by livestock grazing is believed to have caused the loss of a population of Dalea in Mendoza Canyon in the Coyote Mountains. Gori et al. (1992) note that:

> "Much of Mendoza Canyon was heavily grazed by cattle and dominated by Acacia greggii to an extent we have rarely encountered in southern Arizona. Such heavy cover of invasive shrubs is indicative of a long history of overgrazing."

Similarly, the population of Dalea in the Baboquivaris has in the past been severely reduced by livestock grazing to the point where it was believed extirpated (Gori et al. 1992, Roller 1998). In Sycamore Canyon, Dalea is primarily restricted to a small area between two naturally occurring barriers to cattle movement in the canyon, despite seemingly suitable habitat outside the barriers (Brooks personal communication). Where the plant occurs outside of the naturally-occurring barriers, it is found only in scattered instances and often is found trampled by either cattle or humans.

Livestock are currently excluded from the Gooding Research Natural Area, where most of the Dalea population is found. Trespass cattle from Mexico and the Bear Valley Allotment, however, remain a problem with the USFWS noting in 1998 that "no measures have been implemented to reduce the opportunities for trespass cows to move into Sycamore Canyon within the Research Natural Area" (Roller 1998). This lack of action was observed six years after Gori et al. first observed trespass cows from Mexico and noted "direct evidence of livestock browsing on, and even uprooting, the species in lower Sycamore Canyon."

Continued livestock grazing in the larger Sycomore Creek watershed on the Bear Valley Allotment has also caused indirect destruction and degradation of Dalea habitats within Sycamore Canyon. In a recent evaluation of watershed condition, F. Escobedo of the Forest Service determined that about 20% of the watershed had slopes of less than 15 % (Dalea occurs where the slope ranges from <5-10%) and that these areas all were rated as having unsatisfactory or impaired soil conditions based on the surface horizon and depth, little vegetative ground cover, and encroachment of invasive, woody "increaser" type vegetation (all indicative of overgrazing). The USFWS relied on this information in the biological opinion for the Bear Valley Allotment which considered effects on the Sonoran chub, concluding that:

> "Livestock grazing in the Sycamore Creek watershed has been on-going over many decades, occurs throughout the watershed, and thus has the greatest overall impact on watershed/ecological status. Twenty percent of the watershed has slopes less than 15 percent. Within this portion, soil conditions are impaired or unsatisfactory, with low vegetative ground cover and encroachment of woody tap-rooted vegetation. These conditions on the more gently-sloping areas which are immediately adjacent to the

> channel system of Sycamore Creek can be attributed to cattle grazing… The effects of livestock grazing activities can be additive, exacerbating the naturally fragile and highly sensitive watershed conditions" (USFWS 1999).

Comparison of photopoints from 1985 to 1996, show that many gravel bars and standing dead trees have been lost within the Sycamore Canyon system, and the banks with mature trees and well developed old terraces have been cut away, their soils lost through increased streamflow (Escobedo 1996). Based on this analysis Escobeda (1996) concluded: "Translocation of gravel bars, removal of standing dead trees, steep slopes, common areas with rock outcrops, and shallow soils are all indicative of high volume stream flows that have characterized the stream channel recently. Recent stream flow events have indicated that maintaining all vegetative groundcover within the main stream channel and minimizing flow input into the main stream channel is crucial for maintaining sediment loss and translocation to a minimum."

Schmidt (1994) noted "the problem" of Sycamore Canyon as being the dramatic movement of the channel between the road crossing and where the canyon is confined within bedrock walls. He notes that this sudden and significant change has resulted in a significant loss of the vegetated floodplain and states that sediment is filling many of the downstream pools important to Sonoran chub. The document then speculates the cause of the channel movement, loss of floodplain and sediment filling aquatic habitats as being the road crossing of the creek and the frequent reconstruction of the stockpond.

A February 27, 1998 Forest Service memo from R. LeFevre notes that recent channel changes in Sycamore Canyon have increased the sand and gravel deposits in the gentle gradient sections and increased erosion in the steeper sections. This memo then notes: "While the deposits have been cited as a concern where they apparently filled in historic Sonoran chub habitat, the erosion of banks and terraces within the Goodding Research Natural Area where unique plants have been historically found may be of greater concern." Highlighting this concern, the Species Effect Assessment (1998) completed during review of the Bear Valley Allotment concludes:

> "It is logical and supportable to conclude that livestock grazing has contributed, and the current management continues to contribute, to the overall degradation of the channel and aquatic habitat conditions in Sycamore Creek. The Sycamore watershed is naturally fragil and highly sensitive to disturbance; soils are shallow with a high lithic component, productivity is low, precipitation can be intense, and the valley bottom has little floodplain to dissipate flood energy. All of these factors contribute to the flashiness of the hydrograph. Activities that exacerbate these conditions by decreasing ground cover, or increasing soil instability must be avoided. Certainly other uses in the watershed accelerate erosional processes... 24-mile road network, recreation and vehicle use... However, livestock grazing is chronic, occurs throughout the watershed and thus, assuredly, has the greatest overall impact on watershed condition..."

Referring specifically to Dalea tentaculoides, the species assessment states: "If this species was proposed for listing, the determination would be a jeopardy call."

Finally, the Forest Service's own watershed assessment for the Bear Valley Allotment concludes:

> "Mankind's influence on Sycamore Canyon is mostly related to downcutting of the channel system, sediment movement, and sediment yield to the stream. Human settlement and cattle grazing, and the roads associated with these activities has resulted in erosion rates above that which would be expected under unroaded, unmined and ungrazed conditions. The effects of this additional sediment may be seen in the reaches of the channel where deposits of gravel have filled pools. Downcut channel reaches may also be attributed to mankind's effects on the uplands because peak flows were artificially increased during the past century" (Lefevre 2000).

Roads. There are currently 24.1 miles of roads within the Sycamore Creek watershed, amounting to a road density of .93 miles per square mile (Lefevre 2000). The Forest Service considers these roads to be "a primary source of erosion and sediment" (Lefevre 2000). Of greater concern for Dalea is the potential for roads to increase the intensity and duration of floods, leading to further erosion of terraces occupied by the species. This concern is shared by the USFWS, who concluded in their biological opinion for the Bear Valley Allotment that "the 24-mile road network in the watershed collects and concentrates runoff, which increases rilling and gullying" (USFWS 1999).

Recreation and human migration. Sycamore Canyon is both a popular recreation area and a corridor for cross-border human traffic, including migrant workers and drug smugglers. Heavy foot traffic from both activities can result in trampling of Dalea and compaction of soils altering hydrologic flow patterns. In combination with the negative effects of livestock grazing, such impacts place the only studied population of Dalea in serious danger of extinction.

B. Disease or predation.

The plant is highly palatable as browse to rabbits and as forage to cattle. Gori et al. (1992) notes direct observations of plants being uprooted and grazed. Survey work has shown the majority of the plant's occurrence is restricted between two naturally occurring cattle barriers (one prohibiting further direct grazing from the U.S. side, the other prohibiting cattle movement up the canyon from the seldom-repaired border fence at Mexico. No records of monitoring work note an absence of direct grazing impacts to the habitat despite putative removal of habitat from grazing. In fact, Gori et al. (1991) states that "there is little doubt" that grazing "may be a significant source of [Dalea] mortality."

C. The inadequacy of existing regulatory mechanisms.

Much has been submitted by the USFWS to argue that Dalea is afforded ESA - level protection already through its occurrence in Sycamore Canyon with the federally listed Sonoran chub and its critical habitat. Much has been made by FWS and the FS of its supposed protections afforded by the designation of the area as a Research Natural Area. An evaluation of the protections offered demonstrates that historically and up to the present, Dalea is provided no protection from cattle grazing beyond that of what occurs naturally within the system due to topography, no

protection from habitat modification through the watershed degradation occurring from cattle grazing and maintenance of high road density, and no protection from recreation and other human-related impacts.

Little to no action has been taken by the Forest Service to reduce direct or indirect affects to Dalea. A recent "Bear Valley Allotment Management Plan Analysis" proposed to continue livestock grazing on the allotment with little modification, despite known degradation of a substantial portion of the watershed (20%) (Imler 1999). Such continued grazing is most likely limiting the species to a small area inaccessible to livestock. Lastly, the Forest Service has failed to take action to ensure that livestock will not enter the allotment from Mexico.

The Forest Service has also failed to address the effects of high road densities within the watershed and continued human traffic through Sycamore Canyon. Road densities remain high and despite closure of 5.4 miles of road (Roads 4180-4181), the roads remain in place (Lefevre 2000). The Forest Service does not have an effective recreation plan for the area or effective means to reduce migrant worker or smuggler traffic in the Canyon.

Significantly, if Dalea is still extant in Mexico and the Baboquivaris, these populations are currently receiving no protection and in fact are not even being monitored.

In sum, the severe lack of effective regulation from livestock grazing, roads and human migration and recreation places Dalea at risk of extinction.

D. Other natural or manmade factors affecting its continued existence.

Recent history supports an argument of severe threat from catastrophic flooding. Such flooding probably relates in part to watershed degradation caused by an extensive road network and livestock grazing. It may also relate to cyclical weather patterns like the El Nino winter floods. Regardless of the cause of severe floods, the very rare and disjunct occurrence of Dalea place the species at risk to extinction from stochastic events and make it unlikely that any single population will be rescued following disturbance. The following records provide important information on the species' possible extinction due to a loss of ability to recover from dynamic system events and degradation of habitat and depredation by livestock:

1. June, 1991 report from The Nature Conservancy censused plants within established monitoring plot (153) and mapped site occurrences. This monitoring plot with associated plants later mostly lost in flooding. Grazing noted as the primary threat to the species and as the putative cause of other site extirpations.

2. 1992 status report (TNC) estimating 1400 "individuals"; population noted as not in equilibrium, mortality exceeding recruitment in monitoring plot, plant noted as extremely rare and threatened primarily through direct impacts of grazing and grazing-induced habitat modification.

3. June 10, 1993. M. Falk. Forest Service monitoring data. Following floods. Most plants buried under considerable sand and debris. Monitoring plot location found; most washed away in strong winter storms. Only 15-30 plants found.

4. June 6, 1997. D. Bertelsen. Forest Service monitoring data. 499 plants total including all side canyons and a new location at Black Tank.

5. 29 May, 1999. A. Brooks. Forest Service monitoring data. Following year of El Nino floods, only 194 plants total including Penasco Canyon, not counting Black Tank. Cattle and signs thereof observed in all areas except for the brief area of continually primary occurrence between the narrowed, second constriction and the cattle guard below. Primary threats noted as direct grazing, indirect watershed and habitat degradation, other human impacts from recreation and illegal activities, flashy flood regime in Sycamore and Penasco Canyons.

The evidence clearly supports a proposal of listing Dalea tentaculoides as endangered with critical habitat. Given this, we hearby petition such a designation for Dalea tentaculoides on this January 2, 2002,

Signatures
followed by printed names
and addresses.

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Appendix A (Site Records):

Site Records (The Nature Conservancy 1991, 1992. Forest Service monitoring data 1991, 1992, 1993, 1997, 1999):

Atascosa Mountains

13 May 1938. L.N. Goodding. Sycamore Canyon, AZ. ARIZ 106796.
9 May 1941. R. Darrow. Type Specimen. Sycamore Canyon, between Nogales and Ruby. ARIZ 30239.
14 May 1941. L. Benson 10960. Sycamore Canyon near Ruby, Oro Blanco Mountains, Santa Cruz County, Elevation 5,000 ft. Southwestern oak woodland. ARIZ 02693.
29 May 1977. L.J. Toolin. Sycamore Canyon, Pajarito Mountains, 5 miles east of Ruby. ARIZ 206516.
13 May 1979. J. Kaiser (1275). Sycamore Canyon, several plants close to Penasco Canyon. ARIZ 217036.
16 May 1981. L.J. Toolin. Scattered along bottom of Sycamore Canyon and in its side drainages, from big side canyon entering west about 2/3 miles down from Hank and Yank ruins to 3/4 miles below confluence of Penasco Canyon. Elevation 3,700 - 4, 000 feet, partial shade, shrub with stem to about 48 inches long. ARIZ 233241. Take special note of this description as it documents occurrence only in area where cattle could not possibly gain access as far back as 1981.
June, 1991 report from The Nature Conservancy censused plants within established monitoring plot (153) and mapped site occurrences essentially as noted above in 1981 Toolin. This monitoring plot with associated plants later mostly lost in flooding. Grazing noted as the primary threat to the species and as the putative cause of other site extirpations.
1992 status report (TNC) estimating 1400 "individuals"; population noted as not in equilibrium, mortality exceeding recruitment in monitoring plot, plant noted as extremely rare and threatened primarily through direct impacts of grazing and grazing-induced habitat modification.
June 10, 1993. M. Falk. Forest Service monitoring data. Following floods. Most plants buried under considerable sand and debris. Monitoring plot location found; most washed away in strong winter storms. Only 15-30 plants found. This year's monitoring data (along with that of 1997 and 1999 below) not evaluated in species candidacy removal (1998) or reviewed in the 1999 Federal Register Notice of Review in which the species is still identified as being more common than originally identified and not subject to threats.
June 6, 1997. D. Bertelsen. Forest Service monitoring data. 499 plants total including all side canyons and a new location at Black Tank.
29 May, 1999. A. Brooks. Forest Service monitoring data. 194 plants total including Penasco Canyon, not counting Black Tank. Following year of El Nino floods. Cattle and signs thereof observed in all areas except for the brief area of continually primary occurrence between the narrowed, second

constriction and the cattle guard below. Primary threats noted as direct grazing, indirect watershed and habitat degradation, other human impacts from recreation and illegal activities, flashy flood regime in Sycamore and Penasco Canyons.

Coyote Mountains

6 March 1965. W.E. Niles, J.A. Reese. Among rocks in stream bottom, Mendoza Canyon, Coyote Mountains, Elevation 3,200 feet. 1982, 1992 surveys at this site noted extirpation of species from site and severely modified habitat through overgrazing.

Baboquivari Mountains

3 April 1926. H.F. Loomis, R.H. Peebles (1597) Baboquivari Canyon, ARIZ 98165.
25 April 1927. R.H. Peebles, G.H. Harrison. Baboquivari Canyon. ARIZ 98164.
22 April 1932. G.J. Harrison, T.H. Kearney, C. Hope, G. Smith. Toros Canyon, Baboquivari Mountains. ARIZ 98162.
12 April 1935. L.N. Goodding (3936). Baboquivari Mountains, AZ. ARIZ 03001.
Summer 1937. H.S. Gentry (3386). Baboquivari Mountain. ARIZ 270333.
October 1937. H.S. Gentry (3406). West slope of Baboquivari Mountains; open hill slope, banner violet, rest purple. ARIZ 270316.
October 1937. H.S. Gentry (3407). West slope of Baboquivari Mountains; rocky, volcanic slopes, 3.000 - 4.5000 feet. ARIZ 270317.
25 April 1984. G. Starr (762). Occasional shrub to 0.5 m tall on Kitt Peak Road, elevation about 4.5000 feet, on north facing slopes. ARIZ 248190.
1998 verbal reporting by The Nature Conservancy of a site relocation on the west slope of Baboquivaris. No other information provided.

Mexico

27 May 1995. T.R. Van Devender (95-532), A.L. Reina G., j.J. Sanchez, Cruz del Diablo (Canada Maimodochi), 7.5. km (by air), 13.2. km (by road) northeast of Huasabas on road to El Coyote, Cerro El Lobo. Shady understory in oak woodland in rocky canyon, flowers purple. First record for Mexico.

Sites surveyed with negative results:

TNC (1992) surveyed the following sites with negative results:

1. Atascosas/Pajaritos (Upper Peck Canyon, California Gulch, Holden Canyon, and Rock Corral Canyon).
2. Baboquivaris in Thomas and Sabino Canyons.
3. Coyotes in Mendoza Canyon.

4. Patagonias in Harshaw Creek, Finley and Adams Canyon, Flux Canyon, and upper Mowry Wash.
5. Mexico: Between 1988 and 1991, TNC searched northern Sonora, Mexico in likely habitat with negative results. They searched in nine general areas extending from the Sierra Cibuta on the west to the Sierra San Luis on the east. Following these efforts they note "Although the species is somewhat cryptic and difficult to survey for, our failure to find it at any new locations, combined with the failure of other botanists familiar with it to locate new populations over the last ten years, suggests that the species is quite rare."

Appendix B:

Important conclusions from reports on the status of Dalea:

From Gori et al. (1992):

"There is evidence that grazing adversely affects the Sycamore Canyon population, and we suspect grazing may be responsible for disappearance of the plant in Mendoza Canyon."

"Our surveys of Sycamore and Mendoza Canyon leads us to believe that grazing constitutes a threat to D. tentaculoides. We observed direct evidence of livestock browsing on, and even uprooting, the species in lower Sycamore Canyon where trespass cows from Mexico enter the canyon up to an impassable narrows. Much of Mendoza Canyon was heavily grazed by cattle and dominated by Acacia greggii to an extent we have rarely encountered in southern Arizona. Such heavy cover of invasive shrubs is indicative of a long history of overgrazing. Toolin (1982) also observed that the habitat on the west slope of the Baboquivari Mountains, where this Dalea was once collected but where he was unable to find it in 1981, had been 'exceedingly modified' by overgrazing."

"Although the species is somewhat cryptic and difficult to survey for, our failure to find it at any new locations, combined with the failure of other botanists familiar with it to locate new populations over the last ten years, suggests that the species is quite rare."

"We observed substantial changes in population structure and flowering activity between 1990 and 1991 suggesting that the population is not at an equilibrium condition."

From USFWS (1997):

"Livestock have been excluded from Sycamore Creek south of Sycamore Corals, north of Ruby Road, throughout the Pajarito Wilderness and Gooding Research Natural Area. This, with other modifications to livestock management, have resulted in recent improvements in range conditions. However, ongoing livestock grazing activities on the Bear Valley Allotment continue to contribute to the overall degradation of the channel and aquatic habitat conditions in Sycamore Creek."

"The Sycamore Creek watershed is naturally fragile and highly sensitive to disturbance, the soils are shallow and rocky, productivity is low, precipitation can be intense, and the valley bottom has little floodplain to dissipate flood energy."

"Livestock grazing in the Sycamore Creek watershed has been on-going over many decades, occurs throughout the watershed, and thus has the greatest overall impact on watershed/ecological status. Twenty percent of the watershed has slopes less than 15 percent. Within this portion, soil conditions are impaired or unsatisfactory, with low vegetative ground cover and encroachment of woody tap-rooted vegetation. These conditions on the more gently-sloping areas which are immediately adjacent to the channel system of Sycamore Creek can be

attributed to cattle grazing… The effects of livestock grazing activities can be additive, exacerbating the naturally fragile and highly sensitive watershed conditions."

"trespass cattle from Mexico range into the lower end of Sycamore Canyon. The International Border fence is remote and difficult to maintain."

"Other activities within the watershed that decrease ground cover or increase soil instability accelerate erosional processes. The 24-mile road network in the watershed collects and concentrates runoff, which increases rilling and gullying."

From USDA Forest Service Sycamore Canyon Watershed Assessment, September 29, 2000:

Commenting on a table that shows 16% of watershed soils to be impaired and 8% unsatisfactory, the report states: "Where soils were found to be unsatisfactory, it was because they lacked vegetative ground cover, had altered structure, and had evidence of erosion associated with roads. Both poor ground cover and altered structure are probably a result of cattle grazing at various levels of intensity over the past 100 years. These two factors result in a higher risk of accelerated erosion and poor water infiltration."

"Mankind's influence on Sycamore Canyon is mostly related to downcutting of the channel system, sediment movement, and sediment yield to the stream. Human settlement and cattle grazing, and the roads associated with these activities has resulted in erosion rates above that which would be expected under unroaded, unmined and ungrazed conditions. The effects of this additional sediment may be seen in the reaches of the channel where deposits of gravel have filled pools. Downcut channel reaches may also be attributed to mankind's effects on the uplands because peak flows were artificially increased during the past century."

From a memo to the files by Forest Service botanist Mima Falk of a visit to Sycamore Canyon, June 10, 1993 and more recent 1997 surveys:

"The purpose of the trip was to try and locate the monitoring plot that biologists from the Nature Conservancy had set up in 1990… We did finally locate the terrace where the transect was located. A large portion of the plot had been washed away… I counted approximately 15-30 clumps of Dalea at or near the monitoring site… I did not find any other *D. tentaculoides* in the canyon during this trip. This is a significant reduction in Dalea density from previous monitoring trips. A 1992 status report on *Dalea tentaculoides* estimated the population in Sycamore Canyon to around 1,400 'indivduals'… A decrease in the total numbers from 1,400 to 15-30 is quite dramatic. Who knows how much more rainfall would have removed the entire population from the canyon."

"Site survey done by Dave Bertelsen, for the Coronado, in June 1997. Dave surveyed the entire drainage of Sycamore Canyon and found 499 plants."

"My other concern is: *Dalea tentaculoides* has not been observed to produce seeds. In all the time that we have been monitoring this population, no one has seen the plants produce any seed.

There have been many flowering individuals detected in previous surveys. The plant seems to be surviving in the canyon asexually."

From "Memo to the Files," Patricia S. Roller, U.S. Fish and Wildlife Services, May 12, 1998:

"This new information discussed in these two reports [the above referenced report from Mima Falk and Falk and Warren 1994] provides strong evidence to suggest that the potential threat of population extirpation associated with peak water flow events resulting from runoff during average precipitation events is severe. The flow velocity was so great and powerful with these storms that a plot established to monitor site specific demographic trends across a portion of the population within Sycamore was largely washed away."

"Additionally, as expressed within the original proposed rule, this species which has been well monitored within the Coronado National Forest over the past 7 years, and has not been found to produce any seed. Many of the plants found and counted as individuals are often found with further inspection, to be connected through underground runners and may actually be vegetative sprouts of each other. This finding leads concerned ecologists to hypothesize that the species is existing completely upon asexual reproduction to establish/re-establish itself along the deposited terrace habitats. If this potential is true, the threat of population extirpation with a catastrophic flood event is placed at a much greater magnitude of risk due to the potential absence of a seed bank to re-colonize washed out areas."

"Following the 1993 and 1994 reports, David Bertelsen in June 1997 documented after conducting thorough surveys of Sycamore Canyon that the population appeared to recover to approximately 499 individuals. This 1997 report does suggest, as do other reports prior to the 1993 floods, that the species does exhibit some apparent capacity to recover and re-establish itself along newly deposited terrace habitats."

"In summary, the species' capacity to recover does not negate the threat of extirpation to this extremely localized endemic, as it relates to extreme flood events within the watershed."

"Based on evidence provided to the Service from monitoring population status within Sycamore, and considering the one population extirpation, and the isolated, disjunct nature of its distribution, I would consider *Dalea tentaculoides* to be threatened with the risk of natural events such as flooding from heavy winter rains or hurricanes moving up from the south Pacific."