

United States Department of the Interior

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In Reply Refer To:

AESO/SE

2-21-99-F-002

September 24, 2001

Memorandum

To: Field Manager, Arizona Strip Field Office, Bureau of Land Management, St. George, Utah

From: Field Supervisor

Subject: Biological Opinion on the Effects of the Kane Ranch Allotment Management Plan on Brady Pincushion Cactus

The U.S. Fish and Wildlife Service has reviewed the biological evaluation (BE) for the Kane Ranch Allotment Management Plan (AMP), in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 *et seq.*). We received your May 25, 2001, request for formal consultation and your biological evaluation (BE) on May 29, 2001. The Bureau of Land Management (BLM) determined that the Kane Ranch AMP may affect, and is likely to adversely affect, the Brady pincushion cactus. No critical habitat has been designated for the species. This document represents our biological opinion that the Kane Ranch AMP is not likely to jeopardize the continued existence of the endangered Brady pincushion cactus (*Pediocactus bradyi*).

This biological opinion is based on information provided in the BE, information provided during informal consultation, and other sources of information. Literature cited in this biological opinion does not represent a complete bibliography of literature available on the cactus, the effects of livestock grazing on the species, or other subjects that may have been considered in this opinion. A complete administrative record of this consultation is on file in the Arizona Ecological Services Field Office.

CONSULTATION HISTORY

Informal consultation on the Kane Ranch AMP began on August 26, 1998, when we received an August 24, 1998, scoping letter from the Forest Service, in conjunction with BLM, with a request for comments. Details of the remainder of the consultation history are summarized in Table 1.

Table 1. Summary of Consultation History.

<i>Date</i>	<i>Event</i>
October 2, 1998	We received a September 25, 1998, invitation from the Forest Service and BLM to attend an October 10, 1998, field trip on the Kane Ranch AMP.
October 10, 1998	We attended a Kane Ranch AMP field trip with the Forest Service and BLM.
October 21, 1998	We issued comments on the August 24, 1998, scoping letter to the Forest Service.
November 4, 1998	We received a summary of the October 10, 1998, field trip from the Forest Service.
February 23, 1999	We received an invitation from the Forest Service to participate in a Kane Ranch Planning Collaborative Group.
March 20, 1999	We attended a Kane Ranch Collaborative Group meeting.
March 29, 1999	We received a request from the Forest Service for a species list for the Kane Ranch AMP.
April 14, 1999	We issued a species list for the Kane Ranch AMP to the Forest Service.
April 17, 1999	We attended a Kane Ranch Collaborative Group meeting.
June 12, 1999	We attended a Kane Ranch Collaborative Group meeting.
June 26, 1999	We attended a Kane Ranch Collaborative Group meeting.
July 16 and 17, 1999	We attended a Kane Ranch Collaborative Group meeting.
October 12, 1999	We received a species table for review from the Forest Service.
October 19, 1999	We received an October 15, 1999, Kane Ranch AMP proposed action from the Forest Service.
November 29, 1999	We issued comments on the Kane Ranch AMP proposed action to the Forest Service.
December 13, 1999	We provided comments on the species table to the Forest Service.
May 24, 2000	We received a May 22, 2000, environmental assessment of the Kane Ranch AMP from the Forest Service and BLM.

June 2, 2000	We issued a letter to the Forest Service acknowledging a request for concurrence with a not likely to adversely affect determination for Brady pincushion cactus for the Kane Ranch AMP.
June 23, 2000	We issued comments on the May 22, 2000, environmental assessment to the Forest Service.
October 17, 2000	We issued a nonconcurrence letter on a not likely to adversely affect determination for Brady pincushion cactus to BLM.
November 8, 2000	We conducted a field trip with BLM to review and discuss existing monitoring of Brady pincushion cactus.
November 29, 2000	We met with BLM to develop a livestock grazing damage monitoring plan for Brady pincushion cactus.
December 20, 2000	We met with BLM to develop a livestock grazing damage monitoring plan for Brady pincushion cactus.
January 26, 2001	We received a draft Brady pincushion cactus biological evaluation from BLM.
January 30, 2001	We received a proposed livestock grazing damage monitoring plan for Brady pincushion cactus from BLM.
February 8, 2001	We “finalized” the proposed livestock grazing damage monitoring plan for Brady pincushion cactus with BLM.
February 28, 2001	We provided comments on the draft Brady pincushion cactus biological evaluation to BLM.
March 5, 2001	We received a second version of a draft Brady pincushion cactus biological evaluation from BLM.
March 28, 2001	We received a decision notice from the Forest Service that they would implement Alternative 6 of the Kane Ranch AMP.
March 29, 2001	We provided comments on the second version of a draft Brady pincushion cactus biological evaluation to BLM.
May 17, 2001	We received a third version of a draft Brady pincushion cactus biological evaluation from BLM.
May 29, 2001	We received a May 25, 2001, request for formal consultation and a biological evaluation on Brady pincushion cactus from BLM.
June 6, 2001	We issued a thirty-day letter to BLM indicating that formal consultation on Brady pincushion cactus for the Kane Ranch AMP was initiated on May 29, 2001.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action would implement the grazing management actions described in the Kane Ranch AMP. Alternative 6 of the Kane Ranch Allotment Management Plan and Environmental Assessment is the selected alternative. The AMP includes a variety of management actions for the Kane Ranch allotments. Overall, the project involves nine allotments on both BLM and Forest Service lands. The nine allotments are Central Summer, Central Winter, Kanab Creek, and Kane, on the North Kaibab Ranger District of the Kaibab National Forest; and Badger Creek, Buffalo Tank, Cram, Lees Ferry, and Soap Creek, on the Arizona Strip District of the BLM. The allotments that contain Brady pincushion cactus are Badger Creek (River Pasture), Cram (North Canyon Point, Rider, and Sand [East Wash] pastures), and Soap Creek (South Soap Pasture), all of which are BLM allotments. The proposed action includes withdrawing the River Pasture of Badger Creek Allotment from the grazing rotation.

A rest-rotation grazing strategy would be used on both the BLM and Forest Service allotments. During the initial phase of plan implementation (the first 3 to 5 years), the overall initial stocking rate would be 800 head of cattle. Depending on the results of monitoring, the numbers could go down or up, potentially as high as 1190 head. Livestock would graze from November 1 to April 30 on the BLM pastures, including those containing Brady pincushion cactus. After April 30 the herd would be divided into two parts. Half the herd (400 head) would be trucked to the Central Winter Allotment to graze from May 1 through June 30, at which time they would be moved to the Central Summer Allotment. After June 1 the remaining 400 animals would be trucked from the BLM allotments to the Central Summer Allotment. The initial season of use for Central Summer would be 400 head from June 1 to June 30, then 800 head from July 1 thru October 15. From October 15 through October 31 the livestock would be herded through the Kane Allotment to the BLM allotments, including those containing Brady pincushion cactus, where they would graze until April 30.

Following the first 3 to 5 years, the season of use on the BLM allotments would be from November 1 through April 30. All (not just half) livestock would be removed from those allotments on April 30. Up to 45 percent utilization would be allowed on the BLM allotments.

A monitoring plan developed by the BLM, the National Park Service, and the Fish and Wildlife Service is attached to this biological opinion as Appendix A. Five damage transects and eight new demography plots (four grazed and four ungrazed) will be established to monitor the livestock grazing damage on Brady pincushion cactus. Monitoring will be conducted according to the protocol in Appendix A for a minimum of ten years. Results of the monitoring will be reported to us annually and will be useful to assess the need, nature, and scope of additional actions to protect cactus from damage.

STATUS OF THE SPECIES

The Brady pincushion cactus was listed as endangered under the ESA on October 26, 1979. Critical habitat has not been designated. A recovery plan was completed for the species in 1985.

Brady pincushion cactus is a small, semiglobose cactus with one (occasionally more) stems up to 6 cm tall and 5 cm in diameter (U.S. Fish and Wildlife Service 1985). Its areoles are elliptic and densely white or yellow-villous. There are usually no central spines, but each areole has 14-15 whitish radial spines, each 6 mm long and spreading nearly pectinate. The straw-yellow flowers are about 2.5 cm in diameter. The green top-shaped fruit turns brown at maturity. During the dry season, the plants largely retract into the soil.

Brady pincushion cactus is a narrow endemic occupying a geographic area of about 17,000 acres on the Colorado Plateau in Coconino County, Arizona. It occurs on benches and terraces in the Navajoan Desert near Marble Canyon of the Colorado River. It occurs on plateaus flanking both sides of the river from below Lees Ferry to the vicinity of Bedrock Canyon, a distance of about 40 kilometers (25 miles). Very local, discrete populations are scattered along the rim on both sides of Marble Canyon and tributary canyons, and they may be found up to three miles from the canyon rim. Populations occur on the Glen Canyon National Recreation Area, BLM lands, private lands, the Navajo Nation, and possibly Grand Canyon National Park. Plants have been located on only 10-20 percent of the potential habitat that has been surveyed. The total estimated population may be as high as 10,000 individuals.

Brady pincushion cactus is restricted to habitat composed of Kaibab limestone chips overlying soil derived from Moenkopi shale and sandstone outcrops. Chert and quartzite pebbles eroded from the Shinarump member of the Chinle Formation are also present at some sites. The rock chips that overlay the soil have clear crystalline coatings and a whiter color that appears distinct from the adjacent brown limestones where few or no Brady pincushion cactus occur. The cactus occurs between 1170-1360 meters (3861-4488 feet) which is the elevation of the Kaibab Formation. The plants grow in gravelly alluvium on the gently sloping benches in exposed situations.

The vegetation where Brady pincushion cactus occurs is generally open and sparse, and characterized by low shrubs, grasses, and annuals. The biotic community is the Great Basin Desert Scrub. Dominant plant species include shadscale (*Atriplex concertifolia*), snakeweed (*Gutierrezia sarothrae*), Mormon tea (*Ephedra viridis*), and desert trumpet (*Eriogonum inflatum*).

The densest populations of the cactus occur along Soap Creek, Badger Creek, the north side of North Canyon and Rider Canyon rims, and the rims of Marble Canyon leading into Soap and Rider Canyons. It can also be found in suitable habitat to about 0.5 to 1.0 mile from canyon rims such as at a small mesa north of Soap Creek. Forty miles of these rims have been inventoried by belt transect and 600 live cacti have been counted (Bureau of Land Management undated).

The Navajo Nation and the National Park Service monitor this cactus adjacent to the action area, in the Jackass Canyon and Lees Ferry areas, respectively. Roth (2000), according to Bureau of Land Management (undated), reported that on the Navajo Nation “the cacti population increased steadily from 1991 to 1993. During the winter of 1993/1994 a film crew severely disturbed the site causing a dramatic drop in the plant numbers, decreasing the number of plants from 114 to 97.” Recovery at the site appears to be slow. After an insect infestation that killed at least seven cacti in 1998 and five in 1999, the total number of plants was only 96 in 1999. During the 2000 monitoring season there were 99 plants in the seven study plots. Two of these plants were considered to be new recruits and two were rediscovered. The overall health of the cacti in the Jackass Canyon plots, as measured by appearance or vigor, rebounded between 1999 and 2000. That followed a period of low vigor during the 1998 and 1999 season which may have been a response to a beetle infestation. At least 85 percent of the cacti were rated in excellent condition. Most of the remaining plants were in good condition, while one was in fair condition. None were in poor condition. Roth concluded that this population of Brady pincushion cactus is extremely vulnerable to human-caused disturbance.

Spence (1993), according to Bureau of Land Management (undated), reported the following on the population at Lees Ferry in Glen Canyon National Recreation Area: “There was no change in the population size...1992 and 1993. Mortality (8 individuals) was balanced with new seedlings (8 individuals). Based on this, projections would show a stable population indefinitely.... Although the population size remained stable, size class frequencies changed from 1992 to 1993. The 1993 population was older and significantly larger...” Spence stated that the major threat to the populations in the Lees Ferry location was off-road vehicle activity. The population appears to be stable.

ENVIRONMENTAL BASELINE

The southwest trending Colorado River forms the eastern and southern boundaries of Brady pincushion cactus habitat in the project area. The northern boundary is the Vermillion Cliffs of the Paria Plateau. The western boundary would parallel a line about 1,000 feet back from the rims of Marble Canyon and all tributary canyons from the Navajo Bridge to Bedrock Canyon (Bureau of Land Management undated).

Four demographic monitoring plots (referred to as Badger Creek, North Canyon East, North Canyon West, and Soap Creek) in Brady pincushion cactus habitat within the action area have been monitored since 1984. In each plot the individuals are tagged, measured for width, and mapped. The cacti are monitored to quantify fruiting and mortality. Demographic monitoring in the 1980s revealed a paucity of small cacti (0 to 15mm) in the plots, whereas larger cacti above 15mm were dominant. In 1985, all of the four demographic monitoring plots were dominated by the 20-31 mm size class of cactus. In 1990, the size structure trend of the cactus population remained stable at Badger Creek and North Canyon (east and west). However, the Soap Creek population shifted toward the largest (oldest) size class (31+ mm). Most very small and juvenile cacti were, in all probability, remaining submerged during the ongoing drought in the Soap Creek plot.

In the mid-1990s, the population structure changed in the Badger Creek plot, where a large recruitment of cacti occurred in the 0-15mm size class resulting in domination by that size class. The Soap Creek and North Canyon (east and west) plots remained dominated by the 15-30mm size class. However, the 0-15mm size class increased in those plots also. Overall, this was a healthier population due to the greater number of young, small cacti. In 1999 and 2000 the Badger Creek plot exhibited a shift to the larger cacti.

The North Canyon plots experienced a severe reduction in the number of Brady pincushion cactus in the late 1980s and early 1990s due largely to rodent herbivory. By 2000, the North Canyon (east and west) plots had recovered to the same numbers of cacti found in the late 1980s before the depredation event of 1989-91.

From 1985 through 1998, the demographic monitoring plots contained an average of 313 cacti each year. Monitoring of the demographic plots since 1984 revealed a total mortality of 314 individuals (Bureau of Land Management undated). At least 81 tagged cacti were lost to rodent herbivory on the North Canyon plot. Human-caused mortality accounted for the loss of a total of 22 cacti. Livestock trampling resulted in the loss of two individuals in the plots. Six tagged cacti were killed by vehicles. Three individuals may have been collected from the plots. Eleven were lost to vandalism.

The cactus has exhibited variable annual seed production in the monitoring plots, which may be influenced by the amount and timing of precipitation. For example, cacti in the Badger North, Soap, and North Canyon plots all exhibited poor fruit production in 1986 when the fall and winter precipitation amounts were 61 and 20 percent of the average, respectively. Similar fruit production occurred in 1990 when fall precipitation was three percent of the average. Precipitation data over the study period indicates that drought conditions predominated during most years. If the timing and amount of precipitation is conducive, and viable seeds are present in the soil, an episodic seedling emergence can occur and change the population structure for the year to smaller and younger size classes (e.g. Badger Creek North and North Canyon [east and west] in 1992-3). During drought years, as in 1988 through 1990, the North Canyon plots experienced high rodent depredation of the cactus.

On March 24, 1994, we issued a biological opinion (2-21-93-F-414) to BLM on the effects of implementation of the Marble Canyon Area of Critical Environmental Concern (ACEC) on the Brady pincushion cactus. The ACEC biological opinion stated that livestock management continues in the ACEC and that potential impacts include trampling which is typically site-specific. It also stated that range improvements such as water sources and mineral supplements are prohibited in the ACEC. Other potential impacts include changes to the species composition of the plant community and effects to the soils through compaction and hoof action. The ACEC biological opinion included a conservation recommendation to initiate formal consultation on the grazing allotments which include Brady pincushion habitat. It stated that several site-specific problems had been identified which should be addressed through an allotment management plan.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of the AMP on the cactus, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline.

The Brady pincushion cactus recovery plan states that anthropogenic threats to the species include illegal collection, off-road vehicle use, mining, and livestock grazing (U.S. Fish and Wildlife Service 1985). It further states that cattle grazing in the area occupied by this plant adversely affects it. Trampling of the plants and habitat, especially during wet seasons of the year when the ground is muddy and the plants are emergent, is a definite threat on portions of the range which are administered by the BLM and on private lands which are grazed. One of the stated tasks of the recovery plan is to ensure that grazing does not impact populations of the species. Natural factors that may exacerbate human-caused effects include its restriction to a unique and very localized soil type, its restriction to flat or gentle slopes in an area which has very dissected topography, its rather low population level with resultant restricted gene pool, its restriction to a small geographic area, root rot, and frost heaving.

On February 9, 1999, the BLM provided us with a memorandum titled "Guidance Criteria for Determinations of Effects of Proposed Grazing Permit Authorizations or Renewals on Threatened or Endangered Species." General representative threats to plants that are identified in the guidance criteria include changes in plant communities, changes in soil characteristics, and trampling. The Guidance Criteria state that a "may affect" determination should be made for a listed plant species if (among other factors) improvement of potential habitat for the species may be precluded or impeded, or if any individual plants may be disturbed by trampling. It also states that formal section 7 consultation is required for situations where, among others factors, trampling of individual plants would likely occur, suitability and sustainability of the habitat to support the plant would likely be altered, potential habitat would be prevented from moving to a suitable condition due to plant composition changes or deterioration of the watershed/soil stability, or plants and/or their habitat would be physically disturbed. We subsequently agreed in a memorandum that the guidance criteria should be followed.

Of the approximately 17,000 acres of Brady pincushion cactus habitat, the North Canyon Point, Rider, and Sand pastures contain a total of 7,440 acres, and the South Soap Pasture contains 8,990 acres (U.S. Fish and Wildlife Service 1985). The River Pasture, which also contains Brady pincushion cactus and approximately 975 acres of its habitat, will not be grazed. Thus, over 95 percent of the known habitat of Brady pincushion cactus is contained in the allotments proposed for grazing.

Livestock grazing in all of the grazed pastures will occur during the wet season of the year from November through May. This season includes the period in which Brady pincushion cactus is emergent and most vulnerable to the effects of trampling from livestock grazing.

Areas in the vicinity of water developments where cattle tend to concentrate are of particular concern (U.S. Fish and Wildlife Service 1985). Cattle typically are drawn to and use cactus habitat when precipitation puts water in sinkholes and reservoirs on or near the rims.

Livestock affect the Brady pincushion cactus directly by trampling individual plants (Bureau of Land Management undated). In 1990, demographic monitoring revealed that two cacti in the monitoring plots were stepped on and both died as a result. Trampling of individuals could be exacerbated if the soil is wet when livestock walk through the habitat during the winter. Trampling at that time would push the cactus into the ground, causing damage or mortality.

On or about the middle of March and in to early April, Brady pincushion cactus bloom. The blossom is vulnerable to being destroyed by hoof action. If the flower is damaged there would likely be no reproduction. About early April, seed pods form on top of the cactus and the seed develops for about a month. During this period, if the pods are stepped on they would be damaged for the year and the seeds would not mature. This reduces the amount of seed in the soil and opportunity for an episodic reproductive event. Livestock trampling may also prevent young cacti from emerging by stepping on and killing them at a young age.

The River Pasture of the Badger Creek Allotment has been only lightly grazed (1 to 4 animals) for 20 years (Bureau of Land Management undated). In the mid-1990s there was a large increase of young cacti that persisted until the 2000 drought when 34 died. Young cacti dominated the demographic monitoring plot in this pasture. This domination by young cacti has not been observed in the plots in the pastures grazed by livestock. There have been large increases in the number of young cacti in the North Canyon plots, although not to the degree observed for the Badger Creek plots. In contrast, the ungrazed Lees Ferry plots have not yet exhibited an increase of young cactus. Thus, cattle grazing may affect recruitment to an extent that is not clear at this time.

There are currently nine cattle watering sites in or within 0.5 mile of habitat of known Brady pincushion cactus populations. When these watering sites were built, the surrounding area was grazed year-round. Cattle made extensive use of the grazing lands within one-quarter to one-half mile of these watering sites. Some changes in vegetative composition are evident in this impact zone. Long term effects of livestock grazing on this plant community need further study (Bureau of Land Management undated). Under the Kane Ranch AMP, there is no proposal to remove existing livestock watering sites and no new watering sites are planned in the Brady pincushion habitat.

Utilization of key forage species by livestock may force rodents to rely more heavily on the cactus as a food source (Bureau of Land Management undated). Little information is available in the literature to substantiate or refute this theory in the case of rare cactus. The BLM compared precipitation data from the Badger Creek rain gauge with Brady pincushion cactus mortality attributed to rodent herbivory in the demographic monitoring plots. They were unable to detect significant trends in the data that would suggest that grazing during drought

years had caused rodents to increase their dependence on Brady pincushion cactus due to the paucity of other available forage. There may be some trend towards increased herbivory in dry years where rodents seek moisture from succulent cacti, but available data do not suggest a simple correlation. It may be that rodent populations peaked during the time when the highest level of herbivory was detected. However, the only population monitoring that has been conducted on rodents in the action area was for the House Rock Valley chisel-toothed kangaroo rat (*Dipodomys microps leucotis*). A likely suspect for rodent herbivory on Brady pincushion cactus is the desert woodrat (*Neotoma lepida*). This species has been captured in the action area within Brady pincushion cactus habitat, relies on succulent plants for moisture, and is one of only a few species capable of digesting the high concentration of oxalic acid found in many cacti. Additional studies are needed to identify those rodent species found within Brady pincushion cactus habitat, determine their preferences for the cactus, and monitor their population numbers.

Livestock grazing may also alter the plant community resulting in effects to the Brady pincushion cactus. Grazing may alter communities if continuous utilization of some perennial species leads to their replacement by non-forage perennials or annuals. On the rims of Marble Canyon and other habitat in the area, there is no documentation of such change or any noticeable large-scale shift of the perennial plant community where the Brady pincushion cactus grows (Bureau of Land Management undated).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area in the foreseeable future. Future Federal actions are subject to the consultation requirements established under section 7, and, therefore, are not considered cumulative to the proposed action. Brady pincushion cactus occurs primarily on Federal land. No cumulative effects are anticipated for the action area (Bureau of Land Management undated).

CONCLUSION

After reviewing the current status of the Brady pincushion cactus, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the proposed Kane Ranch AMP is not likely to jeopardize the continued existence of the species. This conclusion is based on the following:

- The best scientific information available indicates that injury and mortality of Brady pincushion cactus caused by livestock trampling occurs at a level that is low.
- The best scientific information available indicates that any change to Brady pincushion cactus habitat that may be caused by livestock grazing is relatively low .

INCIDENTAL TAKE STATEMENT

Sections 7(b)(4) and 7 (o)(2) of the ESA do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the ESA requires a Federal permit for removal or reduction to possession of threatened or endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy endangered plants on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law. Neither incidental take authorization nor recovery permits are needed for implementation of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that BLM implement fencing, herding, and/or moving of livestock watering sites from Brady pincushion cactus habitat to reduce the effects of livestock grazing to the species.
2. We recommend that all livestock be removed from the BLM allotments by March 31 to reduce the effects of livestock grazing on emerging and reproductive Brady pincushion cactus.
3. We recommend that the BLM conduct research designed to determine the influence of any additional effects (beyond trampling or physical damage) that livestock grazing may have on Brady pincushion cactus. Such effects may include, but are not limited to, placement of livestock watering sites within or near cactus habitat, alteration of the plant community of cactus habitat, and facilitation of rodent herbivory on the cactus.
4. We recommend that, if additional effects are identified, the BLM work with us to develop means of reducing those effects to Brady pincushion cactus.

In order to keep us informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitat, we request notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the draft biological evaluation and draft environmental assessment. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the

Field Manager, Arizona Strip Field Office

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action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded (this provision is not applicable to plants); (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Thank you for your consideration of threatened and endangered species. For further information please contact Bill Austin (928) 226-0714 or Steve Spangle (928) 226-0250 of our Flagstaff Suboffice. Please refer to consultation number 2-21-99-F-002 in future correspondence concerning this project.

/s/ David L. Harlow

Attachment

cc: Regional Director, Fish and Wildlife Service, Albuquerque NM (ARD-ES)

Forest Supervisor, Kaibab National Forest, Williams AZ
District Ranger, North Kaibab Ranger District, Fredonia AZ
John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix AZ

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Literature Cited

Bureau of Land Management. Undated. A biological evaluation on Kane Ranch Allotment Management Plan as it pertains to the Brady pincushion cactus. Arizona Strip Field Office, Bureau of Land Management, St. George, Utah. 35 p.

Roth, D. 2000. Monitoring report - *Pediocactus bradyi* (Jackass Canyon Overlook, Coconino Co. AZ). Navajo Natural Heritage Program. Window Rock, Arizona. Unpublished.

Spence, J. 1993. A monitoring program for the endangered *Pediocactus bradyi* L. Benson, Lees Ferry, Glen Canyon National Recreation Area. Page, Arizona. Unpublished.

U. S. Fish and Wildlife Service. 1985. Brady pincushion cactus recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. iv.+ 68pp.

Appendix A

Monitoring Livestock Grazing Impacts on Brady Pincushion Cactus

Objective of the monitoring: Use distance transects to determine the quantity of Brady pincushion cactus (BPC) that are damaged or killed by livestock trampling in Brady pincushion cactus habitat. Demography plots will be used to determine life histories of individual Brady pincushion cactus under livestock grazing and non-grazing situations.

Transect location: The transects will be established at five locations. Transect 1 is on the north side of North Canyon. It will run east from the east plot until 100 cactus are observed, and west from the west plot until 100 cactus are observed. Transect 2 will run on the north side of Rider Canyon from the point on the canyon rim where Marble Canyon rim meets the Rider Canyon rim. The transect will run west from that point until 200 cactus are observed. Transect 3 will be on the south side of Soap Creek. It will start across the Soap Creek canyon from the airport and run eastward until 200 cactus are observed. Transect 4 will run on the north side of Soap Creek and along the Marble Canyon Rim starting at the first closed road sign and going northeast on the Marble Canyon Rim until 200 cactus have been observed. Transect 5 will be on the Clay May study site, and will be run until the all cactus visible on the small mesa are observed and noted. If the number of cactus are below 200, the difference will be observed near the pullout on Highway 89 about one mile east of the mesa. Subsequent annual transects will be located in the same areas in a random manner in accordance with livestock use areas in Brady pincushion habitat.

Number of individuals to do transect: Two; one observer will count the cactus on the transect and the other will record data and assist with the tape. Note: The same observer should do all transects to insure comparability. If personnel are reduced to one per transect, then using paces in place of tapes is an option. A hand counter may be useful to record the paces.

Method:

1. At each transect the first 200 BPC encountered will be evaluated for any evidence of possible impacts that can be attributed to livestock grazing and trampling. More cactus can be evaluated should resources allow it.
2. Such evaluation will include determining whether the plants have been crushed, ejected, stepped on, trampled, or otherwise injured or killed by livestock.
3. Data collected will include:
 - a. Total number of cactus examined
 - b. Total number of damaged individuals
 - c. Type of damage (stepped on, trampled, ejected, crushed, split) for each individual
 - d. Perpendicular distance each individual was from the transect line (tape or paces)
 - e. Distance traveled along the transect (use tapes or maintain a count of paces)

- f. Map of location of each transect
 - g. Clumps of cactus will have the individual cactus in the clump counted as individuals
4. Data will be collected annually in April for at least ten years. However, the actual date of collection may be adjusted due to variety of factors.
 5. The data will be analyzed using the program Distance to determine the density of damaged cactus.
 6. The study will be done annually, unless some factor (e.g., drought) precludes observing the cactus, after which a report will be produced annually and provided to the U.S. Fish and Wildlife Service.
 7. The Bureau of Land Management (BLM) is responsible for gathering and summarizing the data. The BLM will also coordinate conducting the transects each spring.
 8. The transects are subject to revision when and if unanticipated factors arise indicating such changes need to be made.

Demographic Plots

All demographic plots in place for BPC will continue to be monitored as outlined in the management plans. Eight new demographic plots will be established in non-grazing and grazing situations as described below.

1. Experimental Design

Sample plots should be placed in representative sites with BPC of sufficient density. Site data, such as vegetation, elevation, and soil type, should be recorded.

2. Plot Size and Shape

The plots will be 10x20 m in size and subdivided into eight 25 m square subplots. The plots will be permanently located with angle iron or rebar on the corners. Plots will be located on maps or with the Global Positioning System for relocation purposes. BLM will provide the angle iron.

3. Type of Data to Collect

Each cactus will be tagged, numbered, mapped, and measured for width. Mortality will be noted and the cause indicated if it can be discerned. Fruiting will be recorded for each individual. Recruitment of new cactus will also be noted. Data collection will occur at fruiting or shortly thereafter.

Flowering, pollinators, and ratio of flowers to fruits and seeds per fruit, could be determined if time and resources permit.

Using line intercept(s) of 100 feet or 30 meters per plot, other vegetation will be recorded to obtain data on species composition and density data.

4. Climate

The rain gauges at Lees Ferry, Badger Creek, and Woolley Exclosure could provide data for precipitation events at the north, mid-, and south portions of the Marble Canyon Rim. BLM will be responsible for gathering the precipitation data from non-BLM sources.

5. Statistical Analysis

If replication is adequate in the demographic plots (grazed vs. ungrazed), ANOVA (or some other test that proves best to use) will be conducted to test the differences in performance and/or mortality of cactus between treatments.

6. Location of Plots

Plots for the ungrazed area will be in the River Pasture by Badger Creek on BLM land and possibly in Lees Ferry of the National Park Service. The plots to be located in the grazed area could be at the Clay May site, two north of Soap Creek and one north of Rider Canyon. BLM will be the party responsible for permission and coordination with any other landowners in establishing the plots.

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