

**PETITION TO LIST THE  
Clover's Cactus (*Sclerocactus cloverae*)  
UNDER THE ENDANGERED SPECIES ACT**



Clover's cactus. Photo: Robert Sivinski

**Petition Submitted to the U.S. Secretary of the Interior, Acting through  
the U.S. Fish and Wildlife Service**

Petitioner:

WildEarth Guardians  
Address correspondence to: Taylor Jones  
tjones@wildearthguardians.org  
(720) 443-2615

May 29, 2020



**WildEarth  
GUARDIANS**

## INTRODUCTION

WildEarth Guardians (Guardians) respectfully requests that the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (Service) list Clover's cactus (*Sclerocactus cloverae*) as "threatened" or "endangered" under the U.S. Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544). Guardians also requests that the Service designate critical habitat for the species concurrent with listing.

## ENDANGERED SPECIES ACT AND IMPLEMENTING REGULATIONS

The ESA, 16 U.S.C. §§ 1531-1544, was enacted in 1973 "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species." 16 U.S.C. § 1531(b). The protections of the ESA only apply to species that have been listed as endangered or threatened according to the provisions of the statute. The ESA delegates authority to determine whether a species should be listed as endangered or threatened to the Secretary of Interior, who has in turn delegated authority to the Director of the U.S. Fish & Wildlife Service. As defined in the ESA, an "endangered" species is one that is "in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. § 1532(6); *see also* 16 U.S.C. § 533(a)(1). A "threatened species" is one that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." 16 U.S.C. § 1532(20). The Service must evaluate whether a species is threatened or endangered as a result of any of the five listing factors set forth in 16 U.S.C. § 1533(a)(1):

- A. The present or threatened destruction, modification, or curtailment of its habitat or range;
- B. Overutilization for commercial, recreational, scientific, or educational purposes;
- C. Disease or predation;
- D. The inadequacy of existing regulatory mechanisms; or
- E. Other natural or manmade factors affecting its continued existence.

A taxon need only meet one of the listing criteria outlined in the ESA to qualify for federal listing. 50 C.F.R. § 424.11.

The Service is required to make these listing determinations "solely on the basis of the best scientific and commercial data available to [it] after conducting a review of the status of the species and after taking into account" existing efforts to protect the species without reference to the possible economic or other impacts of such a determination. 16 U.S.C. § 1533(b)(1)(A); 50 C.F.R. § 424.11(b). "The obvious purpose of [this requirement] is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise." *Bennett v. Spear*, 520 U.S. 154, 175 (1997). "Reliance upon the best available scientific data, as opposed to requiring absolute scientific certainty, 'is in keeping with congressional intent' that an agency 'take preventive measures' *before* a species is 'conclusively' headed for extinction." *Ctr. for Biological Diversity v. Lohn*, 296 F. Supp. 2d 1223, 1236 (W.D. Wash. 2003) (emphasis in original).

In making a listing determination, the Secretary must give consideration to species which have been "identified as in danger of extinction, or likely to become so within the foreseeable future, by any State agency or by any agency of a foreign nation that is responsible for the conservation of fish or

wildlife or plants.” 16 U.S.C. § 1533(b)(1)(B)(ii); *see also* 50 C.F.R. § 424.11(e) (stating that the fact that a species has been identified by any State agency as being in danger of extinction may constitute evidence that the species is endangered or threatened). Listing may be done at the initiative of the Secretary or in response to a petition. 16 U.S.C. § 1533(b)(3)(A).

After receiving a petition to list a species, the Secretary is required to determine “whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted.” 16 U.S.C. § 1533(b)(3)(A). Such a finding is termed a “90-day finding.” A “positive” 90-day finding leads to a status review and a determination whether the species will be listed, to be completed within twelve months. 16 U.S.C. §1533(b)(3)(B). A “negative” initial finding ends the listing process, and the ESA authorizes judicial review of such a finding. 16 U.S.C. § 1533(b)(3)(C)(ii). The applicable regulations define “substantial information,” for purposes of consideration of petitions, as “that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted.” 50 C.F.R. § 424.14(b)(1).

The regulations further specify four factors to guide the Service’s consideration on whether a particular listing petition provides “substantial” information:

- i. Clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved;
- ii. Contains detailed narrative justification for the recommended measure; describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species;
- iii. Provides information regarding the status of the species over all or significant portion of its range; and
- iv. Is accompanied by appropriate supporting documentation in the form of bibliographic references, reprints of pertinent publications, copies of reports or letters from authorities, and maps.

50 C.F.R. §§ 424.14(b)(2)(i)-(iv).

Both the language of the regulation itself (by setting the “reasonable person” standard for substantial information) and the relevant case law underscore the point that the ESA does not require “conclusive evidence of a high probability of species extinction” in order to support a positive 90-day finding. *Ctr. for Biological Diversity v. Morgenweck*, 351 F. Supp. 2d 1137, 1140 (D. Colo. 2004); *see also Moden v. U.S. Fish & Wildlife Serv.*, 281 F. Supp. 2d 1193, 1203 (D. Or. 2003) (holding that the substantial information standard is defined in “non-stringent terms”). Rather, the courts have held that the ESA contemplates a “lesser standard by which a petitioner must simply show that the substantial information in the Petition demonstrates that listing of the species may be warranted” (emphasis added). *Morgenweck*, 351 F. Supp. 2d at 1141 (quoting 16 U.S.C. § 1533(b)(3)(A)); *see also Ctr. for Biological Diversity v. Kempthorne*, No. C 06-04186 WHA, 2007 WL 163244, at \*3 (N.D. Cal. Jan. 19, 2007) (holding that in issuing negative 90-day findings for two species of salamander, the Service “once again” erroneously applied “a more stringent standard” than that of the reasonable person).

## CLASSIFICATION AND NOMENCLATURE

**Common name.** Common names for *Sclerocactus cloverae* include “Clover’s cactus,” “Brack’s cactus,” “Brack’s hardwall cactus,” “New Mexico fishhook cactus,” and “Brack’s fishhook cactus.” We refer

to the species as “Clover’s cactus” throughout this petition, but leave instances of other common names unchanged in quotations.

**Taxonomy.** The petitioned species is *Sclerocactus cloverae* (Heil & Porter) (alternative spelling: *cloveriae*). The full species taxonomy can be found in Table 1.

**Table 1.** Taxonomy of *Sclerocactus cloverae* (ITIS, 2019).

Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida
Order	Caryophyllales
Family	Cactaceae
Genus	<i>Sclerocactus</i>
Species	<i>cloverae</i>

## SPECIES DESCRIPTION

*Sclerocactus cloverae* is a flowering succulent in the cactus family:

**Stem** usually solitary, occasionally with one or few additional stems sprouting from the base, ovoid or elongate-cylindric, usually with 13 ribs. **Central spines** 4-9, 1.5-4.6 cm long, the lower one hooked or absent, the upper one flattened on the outer (abaxial) face and often ribbon-like. **Lateral spines** 3-8, usually not hooked and a bit shorter than the centrals. **Radial spines** 2-8, somewhat thinner than the laterals. **Flower buds** rounded at the apex. **Flowers** pink-purple, 2.3-4 cm long. **Fruit** green, tan or pink, 7-15 mm long, 5-12 mm wide, opening along an irregular line of dehiscence just below the middle. **Seeds** black or brown, 1.5-3 mm long, 2-4 mm wide. Flowers from mid-April to early June. (Muldavin et al., 2015, p. 1)

There were formerly considered to be two subspecies of *S. cloverae*—*S. c. cloverae* and *S. c. brackii*—distinguished by morphological characteristics. The subspecies were difficult to distinguish: “[p]ositive identification is only possible during the flowering and fruiting period from late April to mid June” (Roth, 2001, p. 1). The subspecies appear indistinguishable at mature morphological stages:

[*S. c. brackii*] differs from *Sclerocactus cloverae* ssp. *cloverae* only in that the reduced spination of juveniles lasts for several years and persists on plants of early reproductive maturity to as large as 10 cm tall and 10 cm across. If plants survive to such a size, they all produce typical adult spination eventually and become indistinguishable from adults of typical *S. c. cloverae*. (Ferguson, 1998)

Recent genetic research (Porter et al., 2018, *entire*) supports the hypothesis that the subspecies division was erroneously based on morphology of young vs. old plants and that there is no genetic differentiation between the nominal subspecies, meaning that the entire population should be considered a full species, *S. cloverae*. The Bureau of Land Management (BLM) is managing the species

as such: “[a]lthough recent genetic research has indicated that Brack’s cactus is not genetically distinct from Clover’s cactus (*Sclerocactus cloverae*), the BLM aims to manage and mitigate threats to the species as a whole” (Beitner, 2019, p. 1). In a 2018 memo, the BLM states that “[w]hile there is not genetic support for a *brackii* subspecies, the distribution and range of Clover’s cactus continue to fit the profile of a rare species that merits special management. The report confirms Clover’s cactus is a rare and endemic species” (BLM 2018, p. 2).

### **Reproduction and seed dispersal.**

Little is known about pollination of *S. cloverae*, but recent observations and inferences from similar species suggest their flowers are pollinated primarily by native ground-nesting bees:

Most of the mature cacti flowered during the period from mid-April to mid- June. Flowering cacti usually set fruit and only a few flowers appear to have been aborted. Most flowering individuals had more than one flower and when some aborted, at least one or a few flowers succeeded in making fruit. No pollination studies have been conducted specifically for *Sclerocactus cloverae*, but some rare *Sclerocactus* species in adjacent Utah have been studied and are likely similar to New Mexico *Sclerocactus* species. The two Utah species, *Sclerocactus wetlandicus* and *Sclerocactus brevispinus*, are usually self-incompatible outcrossers and predominantly pollinated by small, native, ground-nesting bees in the subfamily Halictinae. Bees observed in the flowers of *Sclerocactus cloverae* during this survey belonged to Halictinae in the genera *Agapostemon* and *Lasioglossum*. These bees are indiscriminate collectors of pollen and nectar from *Sclerocactus* flowers and other flowering plant species. (Muldavin et al., 2015, p. 34)

Similar to other cactus species, seed dispersal, “for the most part, appears to be over very short distances” (Muldavin et al, p. 34). “Seed dispersal for this cactus is generally localized around maternal plants, but occasional longer distance dispersal by ants and cyclonic whirlwinds likely occurs” (Muldavin et al, p. 38). Short seed dispersal distance means that “plants are very clumped in their distribution—forming local ‘family’ clusters of low to high density driven by local dispersal of seeds and micro-habitat conditions” (Muldavin et al, p. 22).

### **HABITAT REQUIREMENTS**

“In general, Brack’s hardwall cactus usually occurs on eroding sandy clay soils derived from shales and sandstones in badlands regions of the Nacimiento [Formation]... Brack’s hardwall cactus is usually relegated to open desert scrub habitats on gypseous soils or badlands” (Muldavin et al., 2015, p. 5)

Clover’s cactus inhabits desert scrub and scattered juniper communities (Roth, 2001, p. 1).

Brack’s hardwall cactus occurs within a variety of vegetation communities including sparse grasslands dominated by blue grama (*Bouteloua gracilis*), Galleta (*Pleuraphis jamesii*), Indian ricegrass (*Achnatherum hymenoides*), and needle and thread grass (*Hesperostipa comata*); open to dense shrublands dominated big sagebrush and rabbitbrush (*Ericameria nauseosa*), and woodlands dominated by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*)... It is also associated with sparsely vegetated badland habitats with species that indicate saline

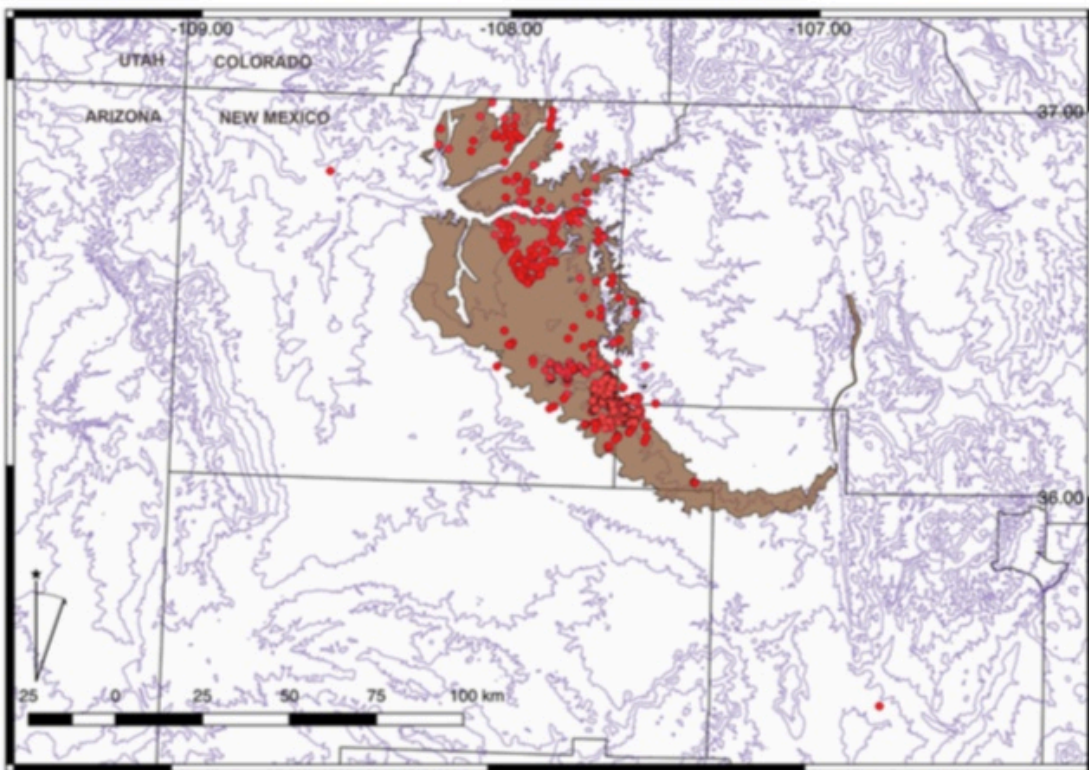
and clayey substrates such as shadscale (*Atriplex confertifolia*), stalked orach (*Atriplex saccaria*), bud sagebrush (*Picrothamnus desertorum*), oblongleaf basin daisy (*Platyschkeubria integifolia*), alkali sacaton (*Sporobolus airoides*), and greasewood (*Sarcobatus vermiculatus*). (Muldavin et al., 2015, p. 5)

## GEOGRAPHIC DISTRIBUTION

This species is endemic to Rio Arriba, Sandoval and San Juan counties in New Mexico, and is found nowhere else in the world (Figure 1).

The current knowledge concerning the distribution of *S. cloverae*, including subspp. *Brackii* and *cloverae*, suggests that it is restricted to a small region of northwestern New Mexico, largely confined to the Nacimiento [Formation] or closely proximate to it. At the global scale this represent a highly endemic species (Porter et al., 2018, p. 7).

**Figure 1.** Documented distribution of Clover’s cactus (red dots) and its relationship to the Nacimiento formation in New Mexico (shown in brown) (Porter et al., 2018, p. 7).



Information specific to the former subspecies *S. c. brackii* indicates that this species is highly restricted:

Subspecies *brackii* occurs on the Nacimiento Formation in Rio Arriba, Sandoval and San Juan Counties, New Mexico. When initially described (Heil and Porter 1994), this subspecies was known from a few San Juan County locations near Bloomfield and Aztec and south to

near Huerfano Mountain. Subsequent field surveys extended the southern range of Brack's hardwall cactus into the extensive badlands of the Nacimiento Formation between Nageezi and Lybrook, including the southwest corner of Rio Arriba County and northwest corner of Sandoval County. The elevation range for this subspecies is 1,680 – 2,200 m (5,510 – 7,220 ft). (Muldavin et al., 2015, p. 5)

The New Mexico Forestry Division recommends listing Clover's cactus as a New Mexico endangered species in its 2019 draft request for rule change proposals:

Although our knowledge of the distribution range of *S. cloverae* ssp. *brackii* has increased significantly since the taxon was originally state listed and the combination of the two subspecies expands the range of the species, the overall range of the combined species and available habitat remains limited to San Juan, Rio Arriba, and Sandoval counties. Combining *S. cloverae* ssp. *cloverae* and *S. cloverae* ssp. *brackii* adds less than 2% to our current knowledge of mapped locations. (NMFD, 2019, p. 3)

A U.S. Fish and Wildlife Service biologist indicated that “[a]t the end of the day, there is a building body of evidence that suggests declines in both species [Clover's cactus and Aztec gilia], some of which may be attributed to energy development and the lack of proper conservation management” (FOIA response 2018 (2), p. 2).

The Mesa Verde cactus, which is similarly restricted in distribution, is listed as “threatened” under the ESA (USFWS, 2011, *entire*).

#### **IDENTIFIED THREATS TO THE PETITIONED SPECIES: CRITERIA FOR LISTING**

The Service must evaluate whether a species is “threatened” or “endangered” as a result of any of the five listing factors set forth in 16 U.S.C. § 1533(a)(1):

- A. The present or threatened destruction, modification, or curtailment of its habitat or range;
- B. Overutilization for commercial, recreational, scientific, or educational purposes;
- C. Disease or predation;
- D. The inadequacy of existing regulatory mechanisms; or
- E. Other natural or manmade factors affecting its continued existence.

Seed plants are experiencing heightened levels of extinction compared to background rates. “Extinction of seed plants is occurring at a faster rate than the normal turnover of species. We found that, on average, 2.3 species have become extinct each year for the past 2.5 centuries” (Humphreys et al., 2019, p. 1,043).

#### **(Factor A) The Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range**

Habitat destruction and fragmentation is rampant in the San Juan region. “An imperiled species typically means an imperiled habitat. Indeed, threats identified for imperiled plant species of the San Juan region, such as livestock overgrazing or poorly planned land and water development, adversely

impact a host of other plants and animals, many of which could eventually be lost” (Povilitis, 2000, p. 11, *internal citations omitted*)

### **Oil and gas development.**

The prevailing and most destructive land use in the habitats of Brack’s hardwall cactus is exploration and development of oil and natural gas... Gas and oil wells and their associated road and pipeline infrastructure are already established or actively developing throughout all Brack’s hardwall cactus habitats, regardless of surface ownership. Direct impacts of gas and oil development are mostly associated with the surface activities of creating well pads and connecting them with broad and extensive networks of pipelines and roads. (Muldavin et al., 2015. p. 37)

The best and most densely occupied cactus habitats are the grasslands and open shrublands of valleys and channel margins... which are also preferred areas for pipeline and road placement. Even though the surface disturbance of energy development may ultimately impact less than 10% of the surface area, the percentage of occupied Brack’s hardwall cactus habitat impacted by this activity will likely be larger because the cactus and well-field development prefer similar locations. Plants not directly impacted by energy exploration and development can suffer indirect impacts when in close proximity to roads and pipelines including impacts of dust, chemicals, air pollution, invasive species, and impacts on pollinators. (Muldavin et al., 2015. p. 38)

### **Off-road vehicle use.**

Porter and Prince (2011) identify off-road vehicle (ORV) traffic as an ongoing threat to Brack’s hardwall cactus because ORVs run over the cacti and indirectly impact habitat by destruction of nurse plants and fragile soil crusts necessary for germination and establishment, damage or destroy annual and perennial plants leading to soil erosion, cause soil compaction, alter drainage patterns, form and distribute dust, and facilitate the proliferation of weeds. The 2015 survey of both Brack’s and Clover’s hardwall cactus did find significant amounts of soil disturbance from bicycle and motorized ORV traffic on most BLM lands north of the San Juan River in the regions around Bloomfield, Aztec and La Plata, especially along ridges. ORV impacts to habitats in that region were not as severe as the disturbance caused by roads and pipelines supporting energy development, but were quite noticeable. South of the San Juan River and through the southern part of the Nacimiento Formation no off-road bicycle traffic was observed and there was very little evidence of motorized ORV use. *Overall, habitat degradation from ORV use is a management concern in habitats north of the river, and changes in ORV use to the south should be monitored.* (Muldavin et al., 2015, p. 39)

### **Livestock grazing.**

Livestock will not eat Brack’s hardwall cactus, but these cacti are occasionally stepped on and long-term livestock grazing can change the structure and function of ecosystems – especially in the arid west. In the Lybrook Focal Zone, 80% of the transect quadrats had evidence of recent use by large grazing animals. Domestic horses were the most prevalent



type of livestock, at 62% of the plots, while cattle were detected at 30% of cactus plots...The regional reconnaissance plots had a lower incidence (56%) of grazing mostly to the south on Navajo Nation lands and BLM, but the plots further north had limited evidence of recent livestock use. Regardless, these are comparable incidence numbers to that reported for *Sclerocactus wrightiae* in Southern Utah where direct trampling by livestock was considered a significant impact factor. *Accordingly, stocking rates and specifics of grazing management programs should address Brack's impacts in the future to help limit impacts on the species.* (Muldavin et al., 2015, p. 39, *internal citations omitted*)

Grazing may have indirect negative impacts on cacti via dehydration due to removal of plants that provide shade. "Other [relatively large] plants in disturbed areas gradually dried out maybe as a result of the increased solar radiation and the reduced soil humidity that are associated [with] overgrazing" (Ureta et al., 2009, p. 1,997). Grazing may also have positive impacts for some cacti species as it removes competing plants (Ureta et al., 2009, p. 1,998) or creates favorable habitat conditions for ruderal plants (Martorell & Peters, 2005, p. 205), though the authors caution that "the response of species to disturbance is idiosyncratic. Not even two species in the same genus behave similarly. Thus, extrapolating our results to other plants may lead to erroneous management planning" (Ureta et al., 2009, p. 1,997).

Therefore, the impacts of grazing on Clover's cactus (excluding trampling) can only be hypothesized without future study. However, the eroding, sandy soils favored by Clover's cactus may be negatively impacted by cattle trampling, given that cattle grazing has been associated with soil loss via erosion (Jones, 2000, p. 158; Jones, 2001, 17-18).

### **(Factor B) Overutilization for Commercial, Recreational, Scientific, or Educational Purposes**

In 2015, illegal collection appeared to be relatively infrequent and "likely to remain a low-level threat for the foreseeable future" (Muldavin et al. 2015, p. 41). However, a "recent surge of illegal cactus collections throughout the United States resulted in the listing of *S. cloverae* by CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) in Appendix I (threatened with extinction). Unauthorized collection of this plant could further exacerbate the existing threats to this species" (NMF, 2019). See Factor D for further discussion of the CITES uplisting.

### **(Factor C) Disease or Predation**

Predation by cactus longhorn beetle and rabbits appeared to be the most frequent cause of natural mortality in 2015 (40%) (Muldavin et al., 2015, p. 41). Rabbit predation may act synergistically with climate change and drought to threaten cactus survival, as "[c]actus predation by rabbits and rodents is more severe during dry periods when other green forage is less available" (Muldavin et al., 2015, p. 42).

Both subspecies of *Sclerocactus cloverae* are preyed upon by the native stem-boring insect, cactus longhorn beetle (*Moneilema* sp.) and between 25% and 35% of the samples had evidence of beetle impact... Cactus longhorn beetles feed on a variety of cacti as adults and

larvae, but mortality of larval host plants is very high in single-stem barrel cacti such as *Sclerocactus*. (Muldavin et al., 2015, pp. 34-35)

### **(Factor D) The Inadequacy of Existing Regulatory Mechanisms**

#### **Federal.**

CITES. During CoP2017, the U.S. proposed the transfer of *Sclerocactus cloverae* from Appendix II to Appendix I.

These species are desirable for the international horticultural market, and are sought after by collectors. According to the proponent the populations are adversely affected by unauthorized and illegal harvest of plants and seeds with the seeds being particularly vulnerable to harvest because they are easy to carry and transport, and not regulated under the CITES Appendix-II listing annotation. There is an active market for seeds of rare cacti, including these species, on the Internet. (VKM 2016, p. 80)

[T]he harvest of seeds for international trade may adversely affect the populations' reproductive potential and perhaps long-term survival of the three species. Appendix-I listing would strengthen the regulation of the three species from over-exploitation for international trade. (VKM, 2016, p. 80)

The species is now listed as Appendix I. Trade in seeds and plants (import and export) is regulated under CITES, but there are no protections from trade within the U.S. or for habitat under this convention.

Bureau of Land Management (BLM). The New Mexico state office of the BLM lists Clover's cactus as "sensitive" (BLM 2019, p. 5). "Although *Sclerocactus cloverae* is a BLM sensitive species, protections afforded to the species through BLM Manual 8640 and the 2017 IM Guidance (IM no. NMF01210-2017-003) are significantly less than they were in 2014, making conservation measures primarily a voluntary opportunity provided to the project proponent. There is no conservation strategy in place for this species on BLM, State, or tribal lands" (NMFD 2019, p. 3).

Regulations regarding sensitive species appear to be focused on avoiding listing under the ESA and the associated mandatory duties under federal law, rather than prioritizing species conservation and recovery, as the ESA does:

[T]he BLM shall designate Bureau sensitive species and implement measures to conserve these species and their habitats, including ESA proposed critical habitat, to promote their conservation and *reduce the likelihood and need for such species to be listed pursuant to the ESA*. (BLM Manual § 6840.2 (2008), *emphasis added*)

These regulations appear less concerned with survival and recovery of species than with avoiding federal listing. "Designating measures" to "promote" conservation is not equivalent to protecting a species.

When BLM engages in the planning process, it shall address Bureau sensitive species and their habitats in land use plans and associated NEPA documents... When appropriate, land use plans shall be sufficiently detailed to identify and resolve significant land use conflicts with Bureau sensitive species without deferring conflict resolution to implementation-level planning. Implementation-level planning should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary. (BLM Manual § 6840.2B (2008))

To “address” sensitive species in land use plans is not the same as to protect them. The rest of this regulation is discretionary and carries no affirmative duty to conserve and recover sensitive species:

On BLM-administered lands, the BLM shall manage Bureau sensitive species and their habitats to minimize or eliminate threats affecting the status of the species or to improve the condition of the species habitat, by:

1. Determining, to the extent practicable, the distribution, abundance, population condition, current threats, and habitat needs for sensitive species, and evaluating the significance of BLM-administered lands and actions undertaken by the BLM in conserving those species.
2. Ensuring that BLM activities affecting Bureau sensitive species are carried out in a way that is consistent with its objectives for managing those species and their habitats at the appropriate spatial scale.
3. Monitoring populations and habitats of Bureau sensitive species to determine whether species management objectives are being met.
4. Working with partners and stakeholders to develop species-specific or ecosystem-based conservation strategies...
5. Prioritizing Bureau sensitive species and their habitats for conservation action based on considerations such as human and financial resource availability, immediacy of threats, and relationship to other BLM priority programs and activities.
6. Using Land and Water Conservation Funds, as well as other land tenure adjustment tools, to acquire habitats for Bureau sensitive species, as appropriate.
7. Considering ecosystem management and the conservation of native biodiversity to reduce the likelihood that any native species will require Bureau sensitive species status.
8. In the absence of conservation strategies, incorporate best management practices, standard operating procedures, conservation measures, and design criteria to mitigate specific threats to Bureau sensitive species during the planning of activities and projects. (BLM Manual § 6840.2C (2008)).

These regulations are much weaker and less enforceable than protections under the ESA. Firstly, the BLM is not required to eliminate threats, only to eliminate *or minimize* them. The BLM must ensure that its activities are consistent with “objectives for managing [sensitive species] and their habitats,” but does not here define those management objectives or require them to be science-based or measurable. The rest of these regulations are discretionary or require only “consideration” or “prioritization” of species rather than enforceable protections as would be required by an ESA listing. BLM sensitive species designation is not an adequate regulatory mechanism to protect species on the brink of extinction.

In addition, BLM management of Clover's cactus has largely been haphazard. First, the BLM does not appear to be consistently following their own survey guidelines when conducting surveys for Clover's cactus. BLM survey guidance states that "[s]urveys are best conducted during the flowering and fruiting season (May 1, or when bud opening starts, through July 31, or when fruits are no longer visible), when individual plants are easier to observe. If additional time is needed to complete surveys, they may extend through the end of the growing season (generally, August 1 through September 30) but will require more intensive surveys because the individual plants are more difficult to observe without flowers or fruit present" (BLM, 2016, p. 8). However, analysis of a FOIA response received from the BLM in Sept. 2016 indicated that of the 140 Biological Survey Reports on documented Clover's cactus habitat conducted between Oct. 2010 and Sept. 2016, only 42 (30 percent) documented at least one survey for Clover's cactus that took place within the flowering and fruiting season. Of the 98 surveys that took place outside the flowering and fruiting season, 24 took place during the growing season. Seventy-four (52 percent) took place outside both the flowering and fruiting season and outside the growing season.

This lax survey technique was brought to the attention of the BLM by a Forestry employee in a 2016 email stating: "Surveys for sensitive plant species were done outside the flowering season. Therefore significantly more individuals may be impacted by this action. Clearance surveys outside the flowering season should not be permitted because they do not allow for a proper analysis of impacts to sensitive plants" (FOIA response 2016, p. 1). The BLM responded by saying that "survey timing is not considered important if habitat impacts have been minimized" (FOIA response 2016, p. 7).

As far back as 2014, a Forestry employee states in an email to BLM that "[s]urvey reports for out-of-season surveys stating that if plants are not found there is no impact to the species, are misleading at best. Surveys need to be done during the appropriate time of year to maximize detection. Otherwise, what is currently happening with the Brack's cactus may happen again with the Aztec gilia, which cannot be transplanted successfully" (FOIA response 2014, p. 7). A BLM employee responded that "[t]he concern [the Forestry employee] expressed in her email regarding completion and timing of inventories and surveys with regard to Aztec gilia, as well as other species is valid. Completion of inventories and considerations for timing of surveys is often critical to completion of defensible NEPA, and conservation of sensitive species to avoid listing by Fish and Wildlife Service (per BLM policy)." (FOIA response 2014, p. 7).

In the same email chain, another BLM employee says:

At some point the USFWS may have this issue show up on their radar and ask hard questions about this species and Aztec gilia found in the same habitat. So yes, much of the responsibility falls on our shoulders for the management of these species. Without an inventory, distribution and status determined for this species (and Aztec gilia found in the same habitat) by a professional botanist we are truly flying blind. We don't have the locations we have found these cacti on a map for the southern portion, and little for the northern portion... we don't have the numbers of plants we have impacted, and we don't have the number of plants we have transplanted (or buried in the topsoil) from these populations, either north or south. What we are doing with the current interim guidance is mitigation, certainly not conservation measures. (FOIA response 2014, p. 10).

Concerns about lax monitoring and haphazard mitigation continue to the present. In a 2018 correspondence, a BLM employee states:

Every project in suitable habitat is a fight to move or minimize. I have very limited success moving projects out of suitable habitat due to lack of support from management and the NRSs on the ground. (FOIA response 2018, p. 83)

In a 2019 correspondence, a BLM employee states:

I'm also concerned about incomplete monitoring/NEPA records. In several instances, clearance surveys were conducted but there was no documentation of transplanting or monitoring. Many NEPA documents were not located or associated with the project names given in reports. In several cases, aerial imagery indicates development occurred, but it's unclear if the cacti on-site were lost or transplanted. (Beitner, 2019, p. 2)

A summary of monitoring data reveals additional concerns:

Monitoring reports did not follow one data standard. When discrepancies were found, consulting firms informed us of their methods. Some monitoring efforts counted individuals, while others counted stems separately. In at least one case, the monitoring methods changed from year to year, skewing the data. (Beitner, 2019, p. 3)

By assessing all biological survey reports, 10,451 *S. cloverae* were found across 234 potential project sites. Of the 87 projects with Clover's cactus, 2,955 cacti were transplanted for 27 projects, and 2,027 cacti across 14 transplant plots have been monitored for at least one year. 674 cacti were avoided and 6,375 cacti were lost to construction. The status of 773 cacti were unknown, due to lack of transplant reports or NEPA records... Clearance surveys found *S. cloverae* at 87 project sites, but transplanting occurred for only 27 projects. Only 52% of those transplants were monitored. 48 projects had Biological Survey Reports (BSR) but no NEPA records related to their project names on ePlanning or IT4RM. Seven of these project sites had visible development from aerial imagery. It is likely that the project names have changed, but there are no records accounting for this change. (Beitner, 2019, p. 4)

This pattern of poor record-keeping and lack of consistent monitoring indicates that the BLM is not adequately conserving this species in the face of intense oil and gas development in the region.

Second, the main mitigation technique used by the BLM is transplantation, but it is poorly implemented and monitored.

The BLM Special Status Species Management Manual instructs managers to avoid actions that could cause a sensitive species to become listed as threatened or endangered under the ESA. This written policy, however, has not prevented the destruction of hundreds or thousands of Brack's hardwall cactus in the recent construction of the Lybrook oil and gas well field. BLM has required transplantation of as few as 25% of these Special Status cacti when they are in the path of development and NM State Land Office has required transplanting 100% Brack's hardwall cactus as mitigation. Data is still limited on the efficacy of transplanting these cacti. (Muldavain et al., 2015, p. 42, *internal citations omitted*)

More recent data indicates that transplantation is largely ineffective:

The majority of abundance and locational information comes from survey reports for biological clearances related to oil & gas development projects. Cactus populations found within project footprints have been avoided only to a very limited degree in the past. In general, cacti found within the footprint of oil & developments were either transplanted or they were destroyed. Transplanting is not considered a viable conservation measure and survival rates have been very low (avg. 24% over 2-5 years, ranging from 0 to 69% in 26 study plots, 2,525 transplanted cacti). Hence the majority of cacti reported in survey reports are not likely extant. (NMF 2019, p. 4)

Chi-square tests were performed on transplant and control survival data. Transplant cacti were found to have a higher mortality for the first four years of monitoring (P-value < 0.000877). Transplant survival one year after transplant was 47.56% versus 56.97% survival among control populations. Mortality increased for both groups as the years since transplant increased... In the one plot that has been monitored for five years, survival was under 15% for both treatments. (Beitner, 2019, p. 4)

Third, there has been at least one incident of an oil and gas company in Clover's habitat failing to follow the Conditions of Approval, as described by a BLM employee:

I stopped into this location today, it appears that they [WPX] decided to keep working despite this unresolved issue with the Brack's cacti on location. They were removing tree and driving around the red pinflags on the pad with their heavy equipment. I informed them that they more than likely destroyed some unflagged cacti. I also informed them that they needed to cease construction activities until this matter is resolved. This is a direct violation of the Conditions of Approval. (FOIA response 2014 (2), p. 1)

Lastly, the state seems eager to remove protections from the cactus. A Forestry employee wrote in 2018:

I am currently under high pressure to delist Brack's before the current Secretary leaves at the end of December... They are basically cutting out the informal review process and only allowing for an official review. Pretty unbelievable, especially considering that a full update of the State Endangered List is on the schedule for this winter anyways, including the listing of Clover's cactus (FOIA response 2018, p. 212)

Brack's cactus interim guidance. From Feb. 24, 2014 until its expiration on Sept. 30, 2015, Brack's cactus management was guided by an interim instruction memorandum. This memorandum was written in response to the discovery of new habitat areas for the species and several large populations of Brack's cactus (BLM, 2014, p. 1).

BLM stated that any project outside the mapped suitable habitat would not require any management under this guidance, as habitat outside the mapped suitable habitat was considered *S. c. cloverae* habitat, rather than Brack's cactus habitat, thus providing no protection to *S. cloverae* outside the mapped habitat area (Figure 2).

2017 Brack's cactus management instruction memorandum. In 2017 the BLM released an instruction memorandum intended to provide guidance “on habitat management of Brack's cactus (*Sclerocactus cloverae* ssp. *brackii*) and Aztec gilia (*Aliciella formosa*), two BLM Sensitive Plant Species, for ground-disturbing projects on BLM-managed lands” (BLM, 2017, p. 1).

“[P]rotections afforded to the species through BLM Manual 8640 and the 2017 IM Guidance (IM no. NMF01210-2017-003) are significantly less than they were in 2014, making conservation measures primarily a voluntary opportunity provided to the project proponent” (NMFD, 2019, p. 3). For example, this memorandum allows surveys during any time of year except in established “Habitat Conservation Areas” (HCAs). Establishment of HCAs is entirely voluntary (BLM, 2017, p. 3-4).

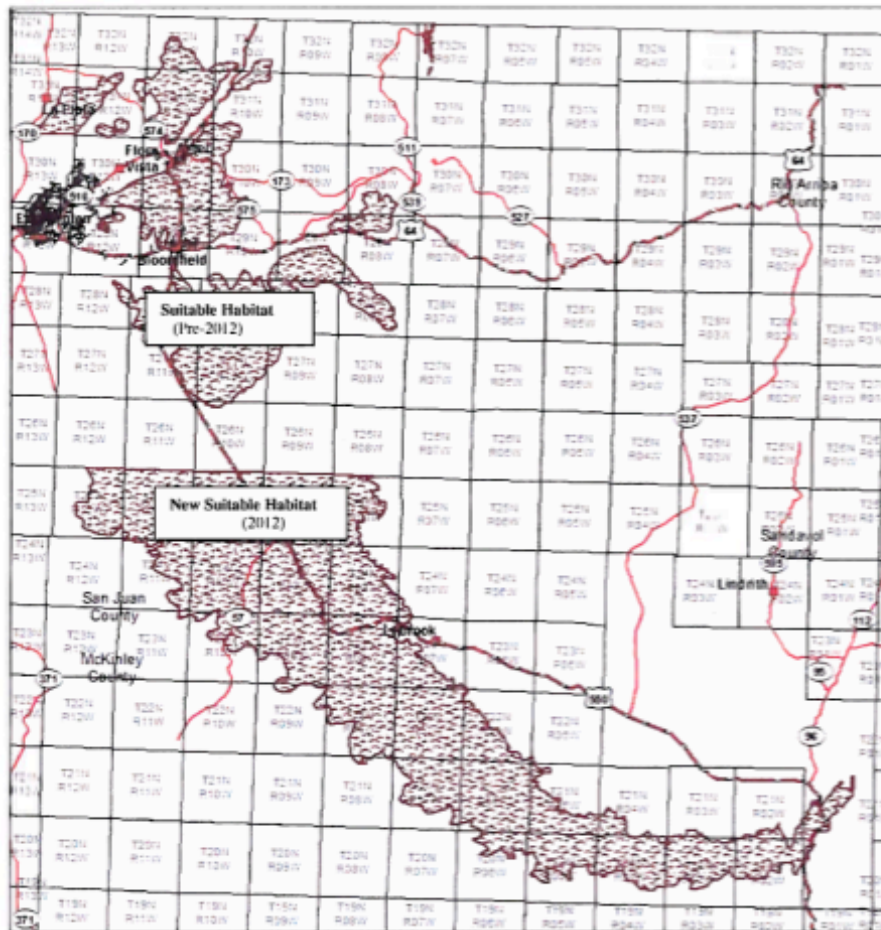
Avoiding impacts to habitat is conditional and not a requirement:

Impacts to SSPH habitat will first be avoided by altering the project design or location *if* there are appropriate and practicable measures to avoid impacts. If impacts cannot be avoided, then impacts will be minimized through project modifications and permit conditions *if* there are appropriate and practicable measures to reduce impacts (BLM 2017, p. 5, *emphasis added*).

**Figure 2.** *S. c. brackii* suitable habitat circa 2012 (BLM, 2014, p. 4)

## Brack's Cactus/Aztec Gilia Habitat

Nacimiento Formation



 Brack's cactus/Aztec gilia habitat

UNITED STATES DEPARTMENT OF INTERIOR

BUREAU OF LAND MANAGEMENT  
FARMINGTON FIELD OFFICE  
FARMINGTON, NEW MEXICO



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### State.

New Mexico. “The State of New Mexico lists Brack’s hardwall cactus as a New Mexico Endangered Plant Species. This state law only prohibits unauthorized collection and transport of species on the state endangered plant list and does not protect them from destruction within their natural habitats” (Muldavain et al., 2015, p. 7, *internal citations omitted*). New Mexico removed the subspecies from the list because it was found to be “not taxonomically different from *S. cloverae* spp. *cloverae* and therefore is considered an invalid subspecies” (NMF 2019, p. 3), but the New Mexico Forestry Division recommends that the full species be listed as endangered.

### Other.



Navajo Nation. “The Navajo Nation (2008) includes Brack’s hardwall cactus in Group 4 of its endangered species list. Group 4 is a candidate list of species or subspecies for which the Navajo Nation Department of Fish and Wildlife does not have sufficient information to support their being listed as endangered, but has reason to consider them and is actively seeking additional information” (Muldavin et al., 2015). “[T]he Navajo Nation does not require botanical consultants to look for Brack’s hardwall cactus prior to constructing roads or energy development projects within the habitats of this rare cactus” (Muldavin et al., 2015, p. 42).

New Mexico Rare Plant Conservation Strategy. Both former subspecies of Clover’s cactus are considered “under conserved” in the New Mexico Rare Plant Conservation Strategy (NMFD, 2017, p. 56). This provides no legal protection.

### **(Factor E) Other Natural or Man-made Factors Affecting its Continued Existence**

**Climate change.** The Southwest is already feeling the impacts of climate change. “The predicted Southwest hot spot of climatic change looks much the same during the next 30 years as at the end of this century. And that future hot spot bears a strong resemblance to the drying and warming of the Southwest during the past decade or so” (Kerr, 2008, p. 909).

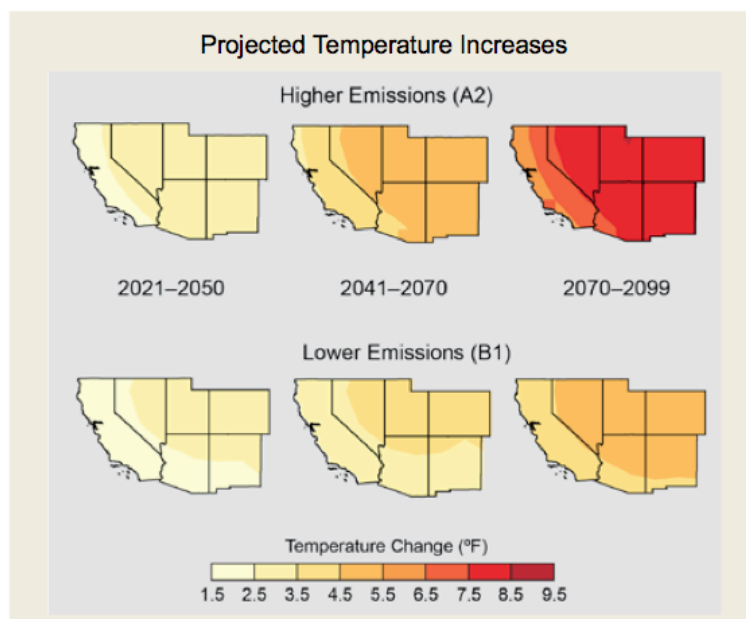
Climate change is well under way in [the southwestern United States and northern Mexico] with clear trends of both warming and drying. This is partially a consequence of a northward shift in the track of winter and spring storms. Temperatures are expected to increase by 2.0 to 3.0 °C [3.6-5.4 °F] by 2050 and 2.2 to 5.5 °C [4.0-9.9 °F] by 2100, and spring precipitation is anticipated to decrease by 20 to 40% by the end of the century, but the contribution of summer monsoon remains uncertain. Monsoons have been delayed by approximately 10 [days] in northern Mexico over the last half century. Multiyear droughts are projected to increase by mid-century, with some persisting for a decade or more. In spite of this drying trend, flooding events are anticipated to increase in response to greater storm intensities falling on a larger proportion of bare soil. (Polley et al., 2013, p. 503, *internal citations omitted*)

The current prognosis for global climate change impacts on the Southwest include fewer frost days; warmer temperatures; greater water demand by plants, animals, and people; and an increased frequency of extreme weather events (heat waves, droughts, and floods). Furthermore, warmer nights and projected declines in snow pack, coupled with earlier spring snow melt, will reduce water supply, lengthen the dry season, create conditions for drought and insect outbreaks, and increase the frequency and intensity of wildfires. Temperatures currently considered unusually high will occur more frequently. These model-based projections align with observations made in the region over the past decade. (Archer & Predick, 2008, p. 23)

Temperature. The Southwest “has heated up markedly in recent decades, and the period since 1950 has been hotter than any comparably long period in at least 600 years” (Garfin et al., 2014, p. 464). The National Climate Assessment predicts that regional annual average will “rise by 2.5 °F to 5.5 °F [1.4-3.0 °C] by 2041-2070 and by 5.5 °F to 9.5 °F [3.0-5.2 °C] by 2070-2099 with continued growth in global emissions (A2 emissions scenario), with the greatest increases in the summer and fall. If global emissions are substantially reduced (as in the B1 emissions scenario), projected temperature

increases are 2.5 °F to 4.5 °F [1.4-2.5 °C] (2041-2070), and 3.5 °F to 5.5 °F [1.9-3.0 °C] (2070-2099)” (Figure 3). Other models project “a notable increase in annual mean temperature of +4.5 °C [8.1 °F] (Notaro et al., 2012, p. 1,370).

**Figure 3.** Maps show projected changes in average, as compared to 1971-1999. Top row shows projections assuming heat-trapping gas emissions continue to rise (A2). Bottom row shows projections assuming substantial reductions in emissions (B1) (Garfin et al., 2014, p. 464).



Precipitation. Climate models predict that “by the second half of the 21st century, the number and duration of extreme dry events increases markedly, with most of the projected dry spells lasting longer than five years and in three cases exceeding 150 months—more than 12 years... Composited over the 11 extreme drought years, the aggregate Southwest precipitation was reduced to 77% of its 1951-1999 average, April 1 snow water equivalent was reduced to 50%, and runoff was reduced to 63%” (Cayan et al., 2010, p. 21,273). Soil moisture is projected to decrease as a result of the precipitation deficit: by the end of the 21st century, “the soil moisture deficits range from 1.7 to more than 2 standard deviations below the mean” (Cayan et al., 2010, p. 21,274).

Water inputs are expected to decline due to reduced precipitation. Water losses are also likely to increase due to elevated evapotranspiration rates at higher temperatures and greater runoff losses associated with increased frequencies of high intensity convective storms. Urban expansion will also increase human demand for water and further reduce water availability for wildland ecosystems. (Archer & Predick, 2008, p. 25)

Projections of precipitation changes are less certain than temperature changes, but precipitation will become more variable and drought more extreme. “Despite a small decrease in mean precipitation (-4%) during 2000-2100 under the A2 scenario, the frequency of extremely dry years is expected to increase substantially. During the 1953-1956 drought annual mean precipitation across the [southwestern United States] was only 25 cm [10 in]. According to the CMIP3 models, by 2070-2099

one in every five years will be characterized by 25 cm [10 inches] of annual precipitation or less, making such extreme drought a regular occurrence” (Notaro et al., 2012, p. 1,370). Projections of weather type frequencies across the U.S. found that “[t]he strongest significant drying trends are found in the Central Southwest and the Southern Rockies” (Prein et al., 2019, p. 1,275). “Our observational-based results support projections of climate models that show a pronounced increase of droughts and aridity in the Southwest during the latter half of the 21st century due to a poleward extension of the subtropical dry zones leading to increasing anticyclonic conditions” (Prein et al., 2019, p. 1,277).

“Rising temperatures will exacerbate droughts, along with their ecological impacts, through enhanced evapotranspirational demand” (Notaro et al., 2012, p. 1,366):

Average summer-fall evaporative demand has been increasing steadily in recent decades of atmospheric warming, and it has been the highest on record since 2000. Recent research documents that summer-fall atmospheric evaporative demand is just as important as winter precipitation in stressing montane plants, and that this available water deficit has impacted Southwestern forests for centuries during periods of warming and/or drought. In fact, climate model projections of winter precipitation and summer-fall evaporative demand suggests that megadrought-type forest drought-stress conditions will exceed those of the megadroughts of the 1200s and 1500s on a regular basis by the 2050s, and that this condition has prevailed over about 30% of the past 13 years in the Southwest. (Brusca et al., 2013, p. 3,313)

This cactus has survived [more than four-year-long] droughts in recent millennia. Future droughts, however, will be coincident with higher temperatures, which may be more lethal. This rare plant has remarkable tolerance to drought, but a climate changing towards drier conditions with higher temperatures could become a serious threat to the survival of this rare cactus. A NatureServe analysis of climate change vulnerability of several plant taxa on BLM lands found *S. cloverae* (*Sclerocactus whipplei* of authors) and nearby *Sclerocactus parviflorus* and *Sclerocactus mesae-verdae* to be only moderately vulnerable to climate change. Subspecies *brackii*, however, often occurs in shaley/mudstone badlands while subspecies *cloverae* is more often associated with sandier soils. Munson et al. (2011) monitored vegetation on various soil types of the Colorado Plateau and found that *Atriplex* species on clayey/silty soils lost more canopy cover over a 20-year period than other shrub communities on sandier soils, indicating deeper soil moisture reserves on sandy substrates during drought than are available to shallow-rooted *Atriplex* on less permeable clay soils. Brack’s hardwall cactus often occurs on clayey/silty soils with *Atriplex confertifolia* and *Atriplex obovata*, which may indicate a greater vulnerability to climate change. Its few populations are already relatively localized. *Further shrinkage of habitat patches into smaller microclimates of suitable soil or exposure may eventually reduce population sizes towards a level of unviability.* (Muldavin et al., 2015, pp. 42-43, *some internal citations omitted*)

The Colorado Plateau ecoregion of New Mexico, where the Clover’s cactus is found, is projected to experience significant impacts from climate change:

Encompassing the far northwestern portion of New Mexico, with the remaining portion extending into the Four Corner states of Arizona, Utah, and Colorado, the ecoregion is

considered ecologically important as a result of its complex geological formations and its more than 300 endemic plant species. Of the 18 conservation areas in the New Mexico portion of the ecoregion, the Carracas Mesa/Navajo Reservoir site (#118) ranked highest in climate exposure (91.7<sup>th</sup> percentile) not only as a result of consistent warmer-drier conditions, but because of the variation experienced in temperature across the two departure periods. Moreover, the site had significant positive trends in both  $T_{min}$  and  $T_{max}$  between 1970-2006...The mean and median climate exposure score for the ecoregion was in the 78<sup>th</sup> percentile. (Enquist & Gori, 2008, p. 20, *internal citations omitted*)

## CONCLUSION AND REQUESTED DESIGNATION

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list Clover's cactus (*Sclerocactus cloverae*) as a "threatened" or "endangered" species under the Endangered Species Act. Listing is warranted, given ongoing and future threats, most notably oil and gas development. Clover's cactus is threatened by at least three of the five listing factors under the ESA: the present or threatened destruction, modification, or curtailment of its habitat or range; inadequate regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

WildEarth Guardians requests that critical habitat be designated for the Clover's cactus in occupied and unoccupied suitable habitat concurrent with final ESA listing. Designating critical habitat for this species will support its recovery and protect areas crucial to long-term survival of Clover's cactus populations.

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