Gierisch Mallow (*Sphaeralcea gierischii*) Recovery Plan

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The document is available on-line at the ECOS Gierisch Mallow Species Profile.

TABLE OF CONTENTS

INTRODUCTION

This recovery plan describes criteria for determining when Gierisch mallow (*Sphaeralcea gierischii*) should be considered for reclassification from endangered to threatened status and to recovered status, lists site-specific actions that will be necessary to meet those criteria, and estimates the time required and costs to carry out those measures needed for recovery. Additionally, information on the species' biology and status is included, along with a brief discussion of factors limiting its populations. A Species Status Assessment (SSA) report, which provides a more detailed accounting of the species' status, biology, and threats, and a Recovery Implementation Strategy (RIS), which describes the activities to implement the recovery actions, are available online at the ECOS Gierisch Mallow Species Profile. The SSA report and the RIS will be updated as necessary.

SPECIES BIOLOGY

The following is a summary of what we know about the biology of the species. For more detailed information see the SSA report (USFWS 2024).

Gierisch mallow is a perennial plant in the mallow family of the genus *Sphaeralcea*, commonly referred to as globemallows. The following description is from Atwood and Welsh (2002): Gierisch mallow produces few to many stems from a woody caudex (short, thickened, stem that is usually subterranean or at ground level). The stems are 43 to 103 centimeters (cm; 17 to 41 inches [in]) tall and are often dark red-purple. The foliage is bright green and glabrous (smooth) or nearly glabrous. The leaf blades are 1.2 to 4 cm (0.47 to 1.57 in) long, 1 to 5 cm (0.4 to 1.9 in) wide, and usually longer than wide. The leaves are usually flat and egg-shaped; the leaf base is cordate (heart-shaped) to truncate (with a flat base), with three to five lobes. The inflorescence (flowering stalk) is compound, with more than one flower per node. The calyx (outer whorl of the flower that encloses the petals) is 5 to 10 millimeters (mm; 0.2 to 0.4 [in]), long, green, and uniformly glabrous, and the orange petals are 15 to 25 mm (0.6 to 0.98 in) long (Atwood and Welsh, pp.161-163).

Gierisch mallow plants are concentrated on gypsum rock outcrops of the Harrisburg Member of the Kaibab Formation (Atwood and Welsh 2002, p. 161). The Kaibab Formation comprises a continuous layer of exposed limestone rock in the Grand Canyon region (Clark 2021, p. 1) and forms the resistant cap rock at both the north and south rims of the Grand Canyon. The Harrisburg Member is the most recent (topmost) exposed geologic layer of the Kaibab Formation; its soils contain high levels of gypsum (gypsiferous soils) (Clark 2021, p. 10). Gierisch mallow also occurs in between gypsum outcrops in other geologic formations, such as the Moenkopi (Rink, G., Far Out Botany, pers. comm., June 1, 2023).

A variety of small- to medium-sized solitary bees pollinate Gierisch mallow in the spring (McBride 2022, p. 14). These pollinators depend on floral resources and nesting substrate within Gierisch mallow habitat and the surrounding Mojave desert scrub plant community, within approximately 700 meters (m; 0.4 mile [mi]) of Gierisch mallow plants (McBride 2022, p. 19).

We have no information regarding the historical range of Gierisch mallow, because it is a relatively newly described species with few previous studies. Because of its association with a specific habitat type, we assume that Gierisch mallow has historically been an endemic plant with a narrow, limited range.

To delineate current Gierisch mallow populations, we used NatureServe's guidelines and grouped mapped plant concentrations on gypsum outcrops separated by one kilometer (km) from other concentrations (NatureServe 2004, n.p.; USFWS 2024, p. 9). This is greater than the expected flight distance of Gierisch mallow bee pollinators, 700 m (0.4 mi) (McBride 2022, p. 19); thus, genetic exchange between these concentrations is likely uncommon. Our methodology resulted in three populations of Gierisch mallow: North, Central, and South. We further delineated the distribution into subpopulations that are concentrations of plants surveyed as a unit in the past or gypsum outcrops with records of Gierisch mallow but no population estimates (unsurveyed subpopulations). This results in 24 subpopulations within the three populations: two subpopulations in the North population, 20 in the Central population, and two in the South population. In addition to the subpopulations, Gierisch mallow plants also occur between gypsum outcrops, likely sparsely, though we have little information about the distribution or abundance of these plants.

The North population occurs in both Arizona and Utah on lands managed by the Bureau of Land Management (BLM) and the Arizona State Land Department (ASLD) (Figure 1). The Central and South populations are in Arizona on BLM lands, located south of the Black Knolls to the edge of Black Rock Gulch near Mokaac Mountain (Figure 1). A complete description of these populations and subpopulations is in our SSA Report (USFWS 2024, pp. 9–16).

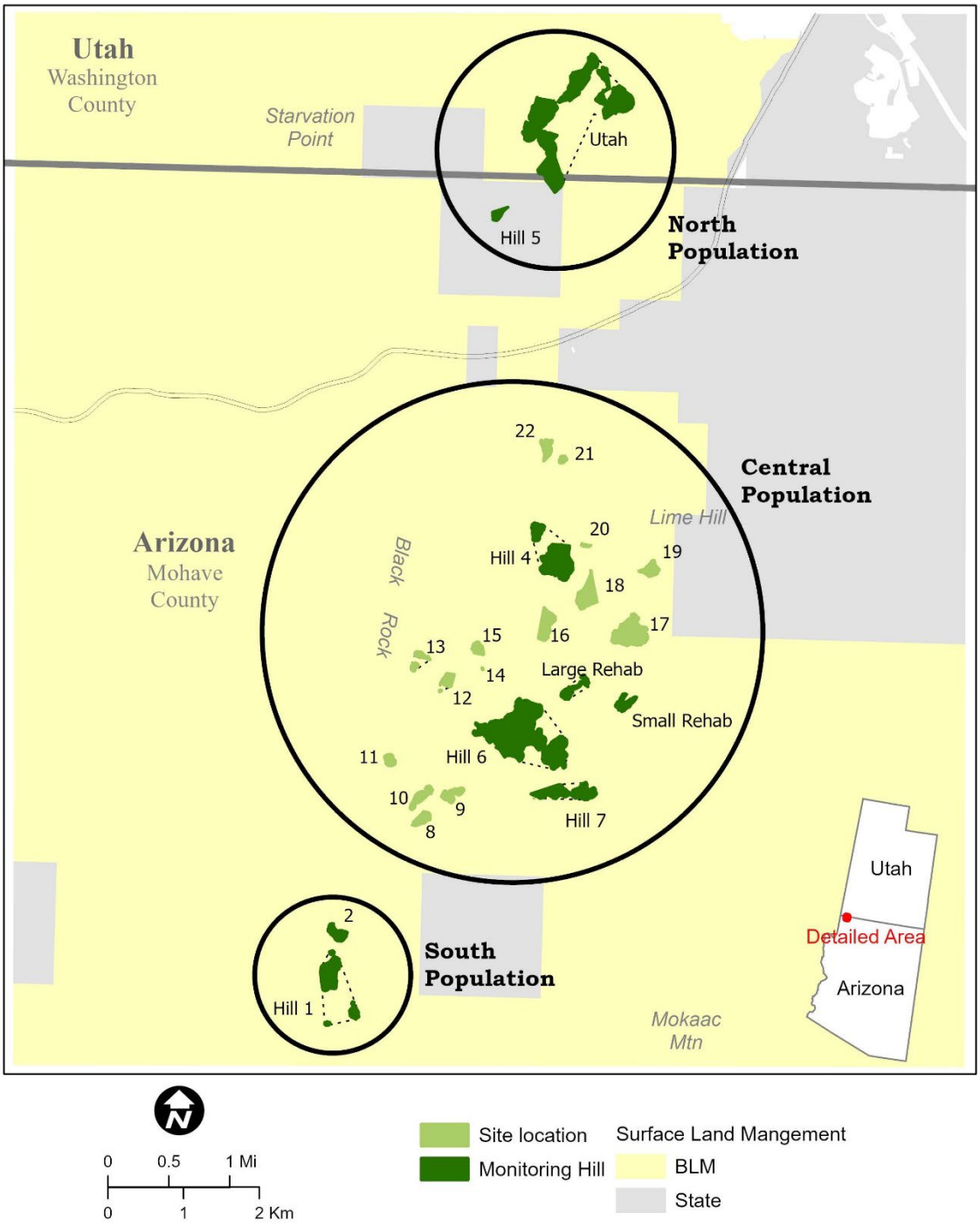

Figure 1. Gierisch mallow range in Arizona and Utah. Light and dark green polygons are Gierisch mallow concentrations on individual gypsum outcrops. Subpopulations are numbered or named. Dark green polygons are the locations that have some survey or monitoring data. Black circles indicate Gierisch mallow populations.

THREATS

At the time of listing, we identified destruction and modification of habitat as a major threat to Gierisch mallow, and we continue to identify it as the major threat to the species. Gypsum mining has altered the habitat and likely substantially reduced the abundance of at least one Gierisch mallow subpopulation. Additionally, a recent mine expansion and explorations indicate that mining in the range of Gierisch mallow will likely continue. Recreational use, including off-highway vehicle (OHV) use, continues to be a potential substantial threat to the North Population. Because of the growing human population in the St. George, Utah, area the threat of recreational use will increase and may expand to other Gierisch mallow populations. At the time of listing, we did not consider livestock grazing a major contributor to destruction and modification of habitat because we assumed that livestock did not commonly access Gierisch mallow habitat due to its steep terrain. However, recent observations indicate that livestock occurrence in Gierisch mallow habitat is common in some areas. Because of this and the active grazing allotments across the species' range, we now consider grazing a potential threat to Gierisch mallow.

Destruction and modification of habitat can be exacerbated by other factors. Climate change will alter Gierisch mallow habitat, and plants may not readily adapt to the changing conditions. Climate change could stress plants and make them less resilient to other threats, increase grazing pressure on Gierisch mallow habitat when availability of other species decreases (during more frequent droughts), and create favorable conditions for nonnative, invasive species and altered fire regimes. We do not know how effects of climate change and climate change interactions with other potential threats affect Gierisch mallow.

Nonnative invasive plant species are species that have invaded and become naturalized into new habitats. They are ubiquitous in many landscapes, and they alter plant communities by competing with native plants for resources, such as nutrients, water, light, and space (Gioria and Osborne, 2014 pp. 3–4) and by affecting pollinator populations (Bartomeus *et al*. 2008, p. 765). Nonnative, invasive cheatgrass (*Bromus tectorum*) and red brome (*B. rubens*) are prevalent in high densities throughout the Mojave Desert in northwest Arizona and southwest Utah, including throughout all four grazing allotments containing Gierisch mallow (Roaque, J., BLM, pers. comm., February 15, 2012; Douglas, R.L., BLM, pers. comm. February 16, 2012). McBride (2022, p. 16) found cheatgrass and red brome and other nonnative, invasive species in and around Gierisch mallow habitat, with red brome being the most common. Other nonnative invasive species that occur in Utah or may invade in the future may invade Gierisch mallow habitat (UDAF 2022, n.p.). Though we do not know the effects nonnative invasive plant species are having or may have on Gierisch mallow trends, their occurrence in Gierisch mallow habitat and their potential to affect native plants in general warrants evaluation of their effects to Gierisch mallow.

The potential threats to Gierisch mallow and its habitat discussed in the sections above also may negatively affect pollinators. The effects of nonnative, invasive plant species and livestock grazing on the vegetation community can alter the quantity and quality of nectar and pollen available to pollinators (Drossart *et al.* 2017, p. 2; Levine *et al.* 2003, p. 777), which can alter pollinator visitation rates to native species, potentially increasing or decreasing the number of visits (Traveset and Richardson 2006, pp. 211–212; Bartomeus *et al.* 2008, p. 765). We do not have information about changes in the community of pollinators important to Gierisch mallow reproduction.

Gierisch mallow's restricted range makes a substantial portion of the range vulnerable to similar threats. As a species with small population sizes and limited distribution, Gierisch mallow is at greater risk of extinction due to effects of catastrophic and stochastic events and limited genetic diversity. Additionally, endemic plant species and species with small populations typically have lower genetic diversity than more widespread species (Ellstrand and Elam 1993, p. 220, 225; Lammi *et al.* 1999, p. 1075), which could restrict its ability to adapt to changing conditions.

Gierisch mallow plants in Arizona receive some protection as a "highly safeguarded" plant under the Arizona Native Plant Act (State of Arizona 2016, 3-901); however, this designation does not protect Gierisch mallow habitat. Utah state law does do provide any protections to Gierisch mallow. The protection of listed plants under the ESA is limited to actions under Federal jurisdiction or actions in violation of State law. Section 9 of the ESA does not provide the same prohibitions for take of plants as it does for wildlife. Future Federal actions on BLM land are subject to section 7 consultation, which can incorporate conservation measures for Gierisch mallow and its habitat, including critical habitat. However, the provisions in the Mining Law of 1872 limit the BLM's discretion in permitting gypsum mining. The BLM and the ASLD require reclamation after mining operation on land they manage.

RECOVERY STRATEGY

The USFWS uses the conservation biology principles of resiliency, redundancy, and representation (collectively known as the "3Rs") as a lens to evaluate the viability of a species (Shaffer and Stein 2000, pp. 307, 309–210; Wolf *et al.* 2015, entire). Resiliency, measured by population size and growth rates, describes the ability of populations to withstand stochastic events (arising from random factors). Redundancy, measured by the number of populations, their resiliency, and their distribution; describes the ability of a species to withstand catastrophic events. Representation, evaluated by the extent and variability of habitat characteristics across the geographical range, describes the ability of a species to adapt to changing environmental conditions.

Our recovery strategy focuses on: 1) maintaining or increasing the resiliency of populations via minimum subpopulation and population sizes; 2) maintaining or increasing redundancy for the

species via minimum numbers and spatial arrangements of subpopulations; 3) maintaining representation for the species via a North, Central, and South population; and 4) ensuring that threats from mining, recreational activities, livestock grazing, and nonnative invasive plants do not impede our ability to maintain or increase levels of the 3Rs as described in the recovery criteria below.

RECOVERY CRITERIA

"The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range" (16 USC §1532 (6)). "The term 'threatened species' means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC §1532 (20)). When we evaluate whether a species warrants downlisting (reclassification from endangered to a threatened status) or delisting (removal from the list of threatened and endangered species), we consider whether the species meets either of these statutory definitions. A recovered species is one that no longer meets the ESA definitions of threatened or endangered due to amelioration of threats.

Determining whether a species should be downlisted or delisted requires consideration of the same five factors that were considered when the species was listed, specified in section 4(a)(1) of the ESA and at 50 C.F.R. 402.02. Recovery criteria are conditions that, when met, indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are mileposts that measure progress toward recovery. Because the appropriateness of delisting is assessed by evaluating the five factors identified in the ESA, the recovery criteria below pertain to these factors. These recovery criteria are our best assessment at this time of what the species needs to be downlisted from endangered to threatened and to be delisted. Because we cannot envision the exact course that recovery may take, and because our understanding of the vulnerability of a species to threats is likely to change as we learn more about the species and the threats, it is possible that a status review may indicate that downlisting or delisting is warranted even if not all recovery criteria are met (50 CFR 424.11). Conversely, it is possible that a status review may indicate that downlisting or delisting is not warranted even if the recovery criteria are met. For example, a new threat may emerge that is not addressed by the current recovery criteria.

The downlisting criteria for Gierisch mallow consist of a combination of conditions that, when met, indicate the plant may warrant reclassification from endangered to a threatened status. These criteria are described in detail in the "Downlisting Criteria" section below. Full recovery of Gierisch mallow to the point that protections of the ESA are no longer necessary (delisting) involves similar criteria as that of downlisting, sustained for a longer period, and is described in detail in the "Delisting Criteria" section below. We describe our justifications for the recovery criteria in the section following the criteria.

SUMMARY OF THREATS, CRITERIA, AND ACTIONS,

Table 1. A summary of how the delisting criteria, recovery actions, and recovery activities address potential threats to Gierisch mallow.

Listing Factor	Threat	Delisting Criteria	Recovery Actions
A	Mineral extraction	1, 2, 3	2; 4; 5; 6
	Livestock grazing	1, 2, 4	1; 3; 4; 5; 6
	Recreational use	1, 2, 4	1; 3; 4; 5; 6
B	Seed collection		1; 5; 6
C	Livestock herbivory	1, 2, 4	1; 3; 4; 5; 6
D	Inadequacy of existing regulatory mechanisms	1, 2, 3, 4	4; 5; 6
E	Small population size and restricted range	1, 2	1; 2; 4; 5; 6
	Climate change	1, 2, 4	1; 3; 4; 5; 6
	Nonnative, invasive species	1, 2, 4	1; 3; 4; 5, 6
	Changes to pollinator community	1, 2, 4	1; 3; 4; 5, 6

Downlisting Criteria

1. At least 17 subpopulations are extant with at least 100 mature plants each. The total number of mature plants in all the subpopulations is at least 25,000. The 17 subpopulations are geographically distributed such that at least one is in the North population, at least three in the Central population, and at least two in the South population.

2. The Utah subpopulation has at least 5,000 mature plants, one subpopulation in the Central population has at least 5,000 and two have at least 1,275 each, and two subpopulations in the South population have at least 100 each. Subpopulations on restored habitat contributing to this criterion have the specified minimum number of plants at least 20 years after restoration or must contain twice as many plants as specified.

3. Mineral extraction plans and the best available information from restoration of disturbed habitat indicates that downlisting criterion #1 and #2 will continue to be fulfilled in the foreseeable future.

Delisting Criteria

1. At least 17 subpopulations are extant and have at least 100 mature plants. The total number of plants in all the subpopulations is at least 25,000. The 17 subpopulations are geographically distributed such that at least one is in the North population, at least three in the Central population, and at least two in the South population.

2. The Utah subpopulation has at least 5,000 mature plants, one subpopulation in the Central population has at least 5,000 and two have at least 1,275 each, and two subpopulations in the South population have at least 100 each. Monitoring data indicate that these subpopulations have had a stable or increasing trend ($\lambda>1$) over a 10-year period. Subpopulations on restored habitat contributing to this criterion must have maintained a minimum average of the specified number of mature plants over a 10-year period at least 20 years after restoration.

3. Mineral extraction plans and the best available information from restoration of disturbed habitat indicates that delisting criterion #1 and #2 will continue to be fulfilled in the foreseeable future.

4. The best available data indicate that the effects of other potential threats (*e.g.*, livestock grazing, nonnative invasive species, climate change) to Gierisch mallow are not increasing to the level at which they would impede fulfillment of delisting criteria #1 and #2 in the foreseeable future.

Justification for Recovery Criteria

We explain the concepts and rationale used in the Recovery Criteria in the context of Gierisch mallow viability (resiliency, redundancy, and representation) and amelioration of threats.

Number of extant subpopulations: We currently have records of 24 subpopulations. Mining has substantially altered the habitat of one of those subpopulations (Hill 5), likely reducing the abundance (USFWS 2024, p. 14). The 17 extant populations with at least 100 plants required to fulfill downlisting criterion #1 and delisting criterion #1 represent about 70 percent of the documented subpopulations. Currently, sixteen subpopulations contain or likely contain at least 100 plants: the eight surveyed subpopulations and at least eight of the unsurveyed subpopulations (Miller 2024, p. 1; USFWS 2024, p. 12). We do not know if the remaining eight subpopulations contain at least 100 plants.

Number of individuals per subpopulation: The number of individuals per subpopulation contributes to its resiliency, with higher numbers of individuals making subpopulations more likely to withstand disturbances such as random fluctuations in germination rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic

activities (Wolf *et al.* 2015, p. 205). A greater number of individuals in a subsite increases the chance that a portion of the subsite will survive after a stochastic event. In addition, the number of plants contributes to the genetic health of populations and subpopulations.

We do not know the necessary abundance or minimum viable population size for Gierisch mallow subpopulations to be resilient. In general, more individuals increase the resiliency of a species. However, rare plant species often naturally occur in small populations. We estimate, based on life history characteristics, a minimum viable population size of at least 1,275 plants for Gierisch mallow (USFWS 2024, p. 34). Most of the Gierisch mallow subpopulations are part of the Central population which contains far more than 1,275 plants. We expect genetic exchange (*i.e.*, pollination) to occur between these subpopulations to maintain genetic diversity within the subpopulations. Resiliency is also important for the subpopulations comprising the populations. With the lack of current and past abundance information on most of the subpopulations, we prioritize Gierisch mallow subpopulations with at least 100 individuals.

It is especially important to maintain the current subpopulations with the highest abundances because they are likely the most resilient subpopulations. Four of the eight subpopulations for which we have abundance data contain more than 1,275 plants. Downlisting criterion #1 and delisting criterion #1 ensure that the Utah subpopulation and one of the Central subpopulations maintain at least 5,000 plants (almost four times our estimated minimum viable population size) and that two of the subpopulations in the Central population maintain at least 1,275 plants (our estimated minimum viable population size).

Total abundance of plants: Downlisting criterion #1 and delisting criterion #1 require a total of 25,000 plants across all subpopulations. We estimate that 23,300 Gierisch mallow plants occur in the eight surveyed subpopulations. To total 25,000 plants rangewide, the 15 unsurveyed subpopulations would need to contain 1,700 plants, an average of 113 plants per subpopulation. We think that Gierisch mallow likely already occurs at this abundance. Because we do not have information supporting that the species ever occurred in substantially greater numbers, we do not think increasing the number of plants is necessary to recover the species. Future threats, particularly that of mining, could cause substantial decreases in abundance. We include these criteria to ensure we retain sufficient resiliency and redundancy for Gierisch mallow to persist.

Abundance trend: We will document subpopulation trends through monitoring and abundance counts. We expect annual fluctuations in total plant numbers and recruitment and mortality rates, because Gierisch mallow plants only live for a few years, and reproduction and recruitment likely vary widely with annual weather conditions. Delisting criterion #2 accounts for annual fluctuations by requiring a stable or increasing trend, where recruitment equals mortality ($\lambda = 1$) or exceeds mortality ($\lambda > 1$), over at least a ten-year period. Some years may exhibit mortality greater than recruitment ($\lambda < 1$).

Other *Sphaeralcea* species thrive in disturbed habitats (James *et al.* 1998, p. 299; Ott *et al.* 2013, p. 182; Gucker and Shaw 2018a, p. 6; 2018b, p. 7), and we have observed Gierisch mallow successfully growing in disturbed areas. This presents challenges for maintaining a stable or increasing abundance trend, as Gierisch mallow may decrease in abundance as habitat recovers from disturbance.

Ten-year timeframe: We chose a ten-year timeframe in downlisting criterion #2 and delisting criterion #2 to evaluate Gierisch mallow subpopulation trends, because this timeframe is long enough to encompass a drought/non-drought cycle during which Gierisch mallow numbers may fluctuate and therefore provides an adequate representation of the trend occurring at a subsite over time. Based on data from 2000 to 2020 in the Southwest United States, a ten-year interval captures at least one multiple-year period of extreme to exceptional drought (Mankin *et al.* 2021, p. 6). With climate change occurring, drought conditions will likely occur more frequently in the future (Alder 2014, n.p.). If such a scenario results in substantially reduced recruitment, the resulting decreasing population trend at the subpopulation would not fulfill the criterion. Based on future projections of increased drought in the Southwest, it is unlikely that climate conditions over any particular ten-year period will be favorable enough to recruitment that we would overestimate the trends in the number of individuals at a subpopulation.

Delisting criterion #2 and downlisting criteria #2 require a ten-year timeframe for subpopulations on restored sites at least 20 years after restoration. Gierisch mallow readily grows in disturbed areas and can exhibit abundance peaks before stabilizing after the restored vegetative community becomes more established. For example, Gierisch mallow abundance increased at Small Rehab and Large Rehab and then peaked about 20 years after restoration, before declining in number and becoming more stable (BLM 2024, n.p.).

Distribution of subsites: As a narrow endemic, Gierisch mallow has an intrinsically narrow distribution and, thus, likely low genetic variation. Maintaining the three populations will preserve existing genetic variation. Additionally, maintaining three populations will minimize the chance that multiple Gierisch mallow subpopulations are simultaneously affected by catastrophic events (*e.g.*, high severity fire) or local disturbance (*e.g.*, heavy OHV use). Downlisting criterion #1 and delisting criterion #1 require three populations, with at least one subpopulation in the North population, at least three in the Central population, and at least two in the South population. This distribution reflects the current distribution of Gierisch mallow. We have no information that Gierisch mallow subpopulations were more widely or abundantly distributed, with the exception of some loss at Hill 5 in the North population.

Even with the decline in abundance at Hill 5, we think the North population can have sufficient resiliency. The Utah subpopulation in the North population (Utah) contains the second highest abundance of plants of all the subpopulations, and the subpopulation is spatially arranged into

areas that could function as subpopulations (Figure 1). These features of the Utah subpopulation contribute to the resiliency of the Utah population in the absence of a second subpopulation.

Effects of threats: We identified mineral extraction as the primary threat at the time of listing. We will continue to evaluate available information to assess effects of the threat on Gierisch mallow viability. We have identified other potential threats to Gierisch mallow but do not have good information regarding their effects to Gierisch mallow viability. Additional data will provide better information for understanding these effects.

RECOVERY ACTIONS

We know little about the abundance and distribution of Gierisch mallow outside of the eight subpopulations that the BLM monitors. Collecting information about the remaining 16 subpopulations and distribution between subpopulations will inform our understanding of Gierisch mallow recovery needs. Additionally, we have a limited understanding of Gierisch mallow abundance trends and the species' responses to potential threats (*e.g.*, livestock grazing, nonnative invasive species). We need to expand on the BLM's existing monitoring plan to include more subpopulations and ensure that the data collected are sufficient to determine statistically significant abundance trends. We identified mineral extraction as a primary threat at the time of listing; habitat restoration and Gierisch mallow reestablishment on previously mined sites demonstrated some success in the past. These efforts should continue and be improved upon in the future, as needed. When we better understand additional potential threats to the species, we can then identify and implement recovery activities to minimize the effects of those threats.

To fully recover this species, we intend to strengthen our partnerships in this region with the BLM offices and ASLD. We also will need to work closely with Western Mining and Minerals, Inc. and Georgia-Pacific, who own the two gypsum mines that include Gierisch mallow habitat. We will refine our recovery activities under the recovery actions as we implement recovery and learn more about Gierisch mallow's distribution, abundance trends, and responses to threats.

To ensure Gierisch mallow viability, our recovery actions focus on: 1) documenting plant abundance at all subpopulations and occurrence of plants between subpopulations; 2) monitoring plant abundance over time to understand trends; 2) continuing to restore Gierisch mallow habitat in mined areas, monitor Gierisch mallow reestablishment in mined areas, and improve restoration techniques; 3) increasing our understanding of non-mining threats; and 4) implementing measures, as needed, to minimize effects from threats.

We will accomplish recovery of Gierisch mallow through implementation of site-specific recovery actions (Table 1). In general, implementation of the recovery actions will involve participation from BLM, nongovernmental organizations, academia, and other conversation partners. Recovery actions are accompanied by estimates of the time and cost required for

implementation and are classified by priority number (48 FR 43098). Priority 1 actions must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future. Priority 2 actions must be taken to prevent a significant decline in population size or habitat quality, or some other significant negative impact. Priority 3 actions are all other actions that are necessary for the species' full recovery. The assignment of priorities does not imply that some recovery actions are of low importance, but instead implies that lower priority items may be deferred while higher priority items are being implemented.

The separate RIS for Gierisch mallow provides detailed, site-specific activities needed to implement the actions identified here. We intend to update the RIS as necessary based on new information, including the findings of future 5-year status reviews. The RIS provides greater site-specificity than the recovery actions listed in this recovery plan. For example, we will implement measures to reduce threats at subsites as we identify those subsites from long-term monitoring data. We will only revise the recovery actions in this recovery plan if there are changes needed based upon the findings of future 5-year status reviews or other information.

As stated in the Disclaimer, recovery plans are advisory documents, not regulatory documents. A recovery plan does not commit any entity to implement the recommended strategies or actions contained within it for a particular species, but rather provides guidance for ameliorating threats and implementing proactive conservation measures, as well as providing context for implementation of other sections of the ESA, such as section 7(a)(2) consultations on Federal agency activities or development of Habitat Conservation Plans. Funding and personnel limitations are common challenges for the conservation of listed species; however, these actions are needed to recover the species. We encourage agencies and organizations to seek funding to implement this plan.

Table 1. Recovery actions with estimated cost and priority number.

Recovery Action	Site/ Location	Estimated Cost	Delisting Criteria Impacted	Priority
1. Conduct research to increase our understanding of Gierisch mallow's distribution and trends.	Throughout species' range	$185,000	1;2;3;4	1
2. Continue efforts to restore degraded Gierisch mallow habitat and re-establish Gierisch mallow in mined areas, monitor results, and improve techniques.	Subpopulations with mining activities	$210,000	1;3;4	1
3. Conduct research to increase our understanding of Gierisch mallow's biology and response to potential non-mining threats.	Throughout the species' range	$100,000	1;2	1
4. Implement measures to reduce the effects of threats to Gierisch mallow.	Throughout species' range	$50,000 + costs that are part of existing programs.	3;4	1
5. Maintain genetic diversity *ex situ*.	Botanical gardens, labs, or nurseries	$15,000	1;2	2
6. Coordinate all recovery activities, evaluate success, and revise RIS as appropriate	Throughout species' range	Costs are a part of existing programs.	3;4	3
Total Estimated Cost:		$560,000		

Estimated Time and Cost of Recovery

We expect the status of Gierisch mallow to improve such that we can achieve recovery (delisting) in approximately 30 years (*i.e.*, 2054). We base this on the estimated time we expect Gierisch mallow to reestablish and stabilize on a restored site, based on existing restoration sites. If meeting recovery criteria does not depend on establishing Gierisch mallow at a new restoration site, we may achieve recovery in 15 years. We base this on the existing data we have and anticipated future data collection sufficient to evaluate trends to support delisting and downlisting criteria. Time to recovery is based on the expectation of full funding, implementation as provided for in this recovery plan, and full cooperation of partners.

We estimate $560,000 for the total cost of recovery. This is the estimated cost of completing the recovery actions such that the recovery criteria have been met and includes those costs borne by all participating partners. The actions identified in Table 1 are those that, based on the best available science, the USFWS thinks are necessary to achieve recovery of Gierisch mallow. Time and cost for recovery may increase if data indicate decreasing trends at subsites, prompting the need for additional recovery actions to identify and mitigate threats.

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APPENDIX A. SUBSTANTIVE COMMENTS ADDRESSED ON THE GIERISCH MALLOW DRAFT RECOVERY PLAN.

Comment 1: Gierisch mallow is also found on gypsiferous Miocene and Quaternary deposits.

Response: The USFWS has revised the recovery plan to state that Gierisch mallow also occurs on "other geological formations that contain gypsum." This is inclusive of the specified deposits and is sufficient detail for the recovery plan.

Comment 2: The draft recovery plan states that 700m is the "expected" flight distance of Gierisch mallow bee pollinators; this misrepresents the 700m "assumed" flight distance stated in the source cited and questions the reliability of that assumption.

Response: The cited source summarizes typical bee flight distances "expected" based on their body sizes and states that maximum foraging distances can be higher. We changed the recovery plan wording to "estimated" to better represent the flight distance we use to delineate populations. These are estimates based on the best available science.

Comment 3: The draft recovery plan did not include several Gierisch mallow records to the south in the map of populations.

Response: The USFWS has updated the recovery plan with additional text to acknowledge those records and explain that we did not include them in our population delineation because of the limited information from that area. In the RIS, USFWS specifically references the need to obtain more information about the abundance and distribution of plants in that area as an activity under recovery action #1.

Comment 4: Commenter recommends commission of an independent economic impact analysis to assess the potential costs of implementing the recovery plan.

USFWS is not required to conduct economic analyses on recovery plans because recovery plans are guidance and planning documents only. They do not create a legal obligation beyond any existing legal requirements. Recovery plans list recovery criteria that are our best assessment of what the species needs to be downlisted from endangered to threatened and to be delisted. Because we cannot envision the exact course that recovery may take and because our understanding of the vulnerability of a species to threats is likely to change as we learn more about the species and the threats, it is possible that a status review may indicate that downlisting or delisting is warranted even if not all recovery criteria are met. Conversely, it is possible that a status review may indicate that downlisting or delisting is not warranted even if the recovery criteria are met.

Comment 5: Commenter recommends a formal process for ongoing communication and collaboration with local officials and stakeholders throughout the recovery planning process.

Response: The official process for recovery planning begins with development of the draft recovery plan. We coordinate with stakeholders and interested parties on the plan through a public comment period. Implementing the recovery plan requires coordination with stakeholders. USFWS does not have a formal process for coordinating with stakeholders during implementation because the recovery implementation process varies by species and can change with new information. We have updated the draft recovery plan with "coordinate with other regional stakeholders" in the paragraph where we had specifically stated USFWS would coordinate with the entities that have management jurisdiction over Gierisch mallow habitat and entities with leases to conduct activities in Gierisch mallow habitat. USFWS will reach out to those regional stakeholders and offer a meeting to answer questions about the recovery plan and recovery implementation and discuss future communication and coordination.

Comment 6: Multiple comments request recommendations on developing a plan for managing livestock grazing in areas where Gierisch mallow is found, including assessments of grazing impacts, management strategies, and monitoring. One comment specifically asks for concrete strategies for managing the livestock grazing.

Response: While livestock grazing can negatively affect individual plants, USFWS does not know what effects livestock grazing is having on Gierisch mallow at a population level. Recovery action #1 includes monitoring to understand Gierisch mallow abundance trends that would inform the species' response to current potential threats, like livestock grazing. Recovery action #3 includes activities in the RIS to increase our understanding specifically of the effects of livestock grazing on Gierisch mallow. Recovery action #4 states that we will implement measures to reduce effects of non-mining threats to Gierisch mallow. USFWS cannot identify specific measures that would need to be implemented to address the effects of livestock grazing on Gierisch mallow until there is a better understanding of the effects. Recovery actions #1, #3, and #4, once implemented, will add additional information that will inform which measures will be necessary to recover Gierisch mallow.

Comment 7: The recovery plan does not address the effects of pesticide spraying for grasshopper control on Gierisch mallow's pollinators.

Response: USFWS has no information supporting that impaired pollinator communities are affecting Gierisch mallow. Future monitoring will give us a better understanding of the abundance trends of pollinators at Gierisch mallow subpopulations and inform what additional research is needed to understand the threats to the species.

Comment 8: Commenter suggests adding a downlisting criterion related to livestock grazing that states that livestock grazing, including trespass livestock grazing, does not occur in any subpopulations and that livestock grazing permits adjacent to Gierisch mallow critical habitat have been permanently retired or closed.

Response: Because USFWS does not know the effect that livestock grazing is having on Gierisch mallow at a population or subpopulation level, it would not be prudent to have a recovery criterion based on removing livestock grazing from Gierisch mallow subpopulations and critical habitat. Future monitoring will improve our understanding of the abundance trends at Gierisch mallow subpopulations and inform what additional research is needed to better understand the threats to the species and which conservation measures would reduce the effects of those threats.

Comment 9: Commenter requests that USFWS conduct its own analysis of the BLM-managed allotments that overlap with suitable habitat for the Gierisch mallow to determine which of those allotments have been reauthorized for livestock grazing via the grazing rider or Categorical Exclusion or outdated Environmental Assessment, determine which allotments have had Rangeland Health Assessments, Land Health Analysis, Evaluations, or other analysis, and consider this information while making future decisions regarding the management of these species.

Response: Recovery action #3 includes activities in the RIS to increase the understanding of the effects of livestock grazing on Gierisch mallow. This activity would investigate how prevalent grazing on Gierisch mallow is, temporally and spatially. The recovery plan contains the following sentence in the description of the recovery activity to investigate grazing effects: "In addition to the effects livestock are currently having on Gierisch mallow, available historical data may provide insight on the persistence of effects from past grazing practices." These activities can include analyses of rangeland habitat condition on public lands.

Comment 10: Commenter noted a discrepancy between the stated number of subpopulations that the BLM monitors in the draft recovery plan and the RIS.

We have clarified the text within the recovery plan to state that the BLM has collected abundance data for eight subpopulations. The BLM continues to monitor seven subpopulations.

Comment 11: Commenter recommends that USFWS have responsibility for monitoring the currently unmonitored subpopulations to prevent potential discrepancy in data quality or criteria and to ensure that all subpopulations are assessed under the same standard.

Response: The recovery plan lists the actions believed necessary to meet recovery criteria. USFWS identified developing a standardized monitoring plan and protocol as a recovery activity to support recovery action #1. The USFWS will work with partners and researchers to develop a monitoring plan and protocol sufficient to consistently assess trends at the subpopulations while considering the biology of the species.

Comment 12: The Service must adopt more specific, enforceable language in its own monitoring plan and take decisive action.

Response: The monitoring plan developed will outline how USFWS intends to monitor the species to improve the information available about the status of the species. Recovery plans are guidance documents and do not contain binding regulatory language. The information collected in accordance with the monitoring plan will be used to inform activities necessary to recover the species.

Comment 13: Commenter requests that all information used as part of the decision-making process for this project be posted online in a publicly available manner, preferably on a website that allows open access for all members of the public during all public review and involvement periods for this project.

Response: USFWS used scientific information recorded within the SSA report to inform all parts of the recovery plan and RIS. The SSA report is publicly available at: https://ecos.fws.gov/ServCat/Reference/Profile/164078. As our understanding of the species and its needs change, the SSA report will be updated to reflect these changes.