# Recovery Plan for Vandenberg Monkeyflower (*Diplacus vandenbergensis*)

Photo: Kristie Scarazzo VFWO

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## PURPOSE AND DISCLAIMER STATEMENT

This document presents the U.S. Fish and Wildlife Service's (Service) plan for the conservation of Vandenberg monkeyflower. The recovery plan is the second part of the Service's 3-part recovery planning framework and includes the statutorily required elements pursuant to section 4(f) of the Endangered Species Act (Act). This recovery plan is informed by the first part of the framework, a Species Status Assessment (SSA). The SSA report delivers foundational science for informing decisions related to the Act and includes an analysis of the best available scientific and commercial information regarding a species' life history, biology, and current and future conditions that characterizes the species' viability (i.e., ability to sustain populations in the wild over time) and extinction risk. We have also prepared a Recovery Implementation Strategy (RIS), the third part of the framework. The RIS is an easily updateable operational plan that is separate and complimentary to the recovery plan that details the on-the-ground recovery activities needed to complete the recovery actions contained in the recovery plan.

Recovery plans describe the envisioned recovered state for a listed species (when it should no longer meet the Act definitions of a threatened species or endangered species) and include a recovery strategy, recovery criteria, recovery actions, and the estimates of time and cost needed to achieve it. Plans are published by the Service and are often prepared with the assistance of recovery teams, contractors, State agencies, and others. Recovery plans do not necessarily represent the views, official positions, or approval of any individuals or agencies involved in plan formulation, other than the Service. They represent the official position of the Service only after they have been signed by the Regional Director as approved. Recovery plans are guiding and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and completion of recovery actions.

**Recommended Citation:**

U.S. Fish and Wildlife Service. 2024. Recovery Plan for Vandenberg Monkeyflower (*Diplacus vandenbergensis*). U.S. Fish and Wildlife Service, Pacific Southwest Region. Ventura, California.

An electronic copy of this recovery plan is available at:
https://www.fws.gov/endangered/species/recovery-plans.html.

## INTRODUCTION

We listed Vandenberg monkeyflower as endangered in 2014 (79 FR 50844–50854). The species is an herbaceous annual plant, endemic to the Burton Mesa landform in southwestern Santa Barbara County, California. It occurs on sandy soils, in openings within the canopy of Burton Mesa maritime chaparral habitat. The species needs contiguous stands of Burton Mesa maritime chaparral habitat, canopy openings within this habitat type, loose sandy soils derived from the Burton Mesa Dune Sheet, insect pollinators, adequate annual precipitation, appropriately timed first seasonal rains, and suitable temperature regimes.

Recovery Priority Numbers are metrics designed to help us make the most appropriate use of the limited resources available to implement the Act (Service 1983, 48 FR 43098). We assigned a Recovery Priority Number of 8 to the species because it is under a moderate degree of threat with high recovery potential and because it is a species taxonomically. Vandenberg monkeyflower is under a moderate amount of threat overall, although the majority of remaining Burton Mesa maritime chaparral habitat where it occurs is within federal or state-owned lands that are predominantly protected from future development, and these partners are conducting recovery-related actions intended to ameliorate threats and benefit the species. It has high recovery potential because if we acquire adequate funding and cooperative partnerships, we will likely be able to implement monitoring and population augmentation efforts. Further, sufficient resources and partnerships will facilitate our ability to effectively manage fuels and non-native, invasive species, given that these are two of the most important threats.

We use the term “population” in this document to refer to discrete groupings of Vandenberg monkeyflower that are delineated by distance, location, or landscape feature including geography, topography, and other attributes such as land use, and other anthropogenic barriers. We do not know the amount of gene flow that occurs within the populations. Each population is comprised of multiple occurrences, where “occurrence” means a specific location where Vandenberg monkeyflower is or has been known to occur. By convention, we separate occurrences when there is at least 0.4-kilometer (km)/0.25-mile (mi) distance between documented locations. The species is composed of 31 occurrences, with two of these likely extirpated (Figure 1). We delineated the occurrences into three populations: Vandenberg (21 occurrences, with 2 likely extirpated), Burton Mesa (6 occurrences), and La Purísima (4 occurrences). We estimate the current range to be 5,177 hectares (12,791 acres).

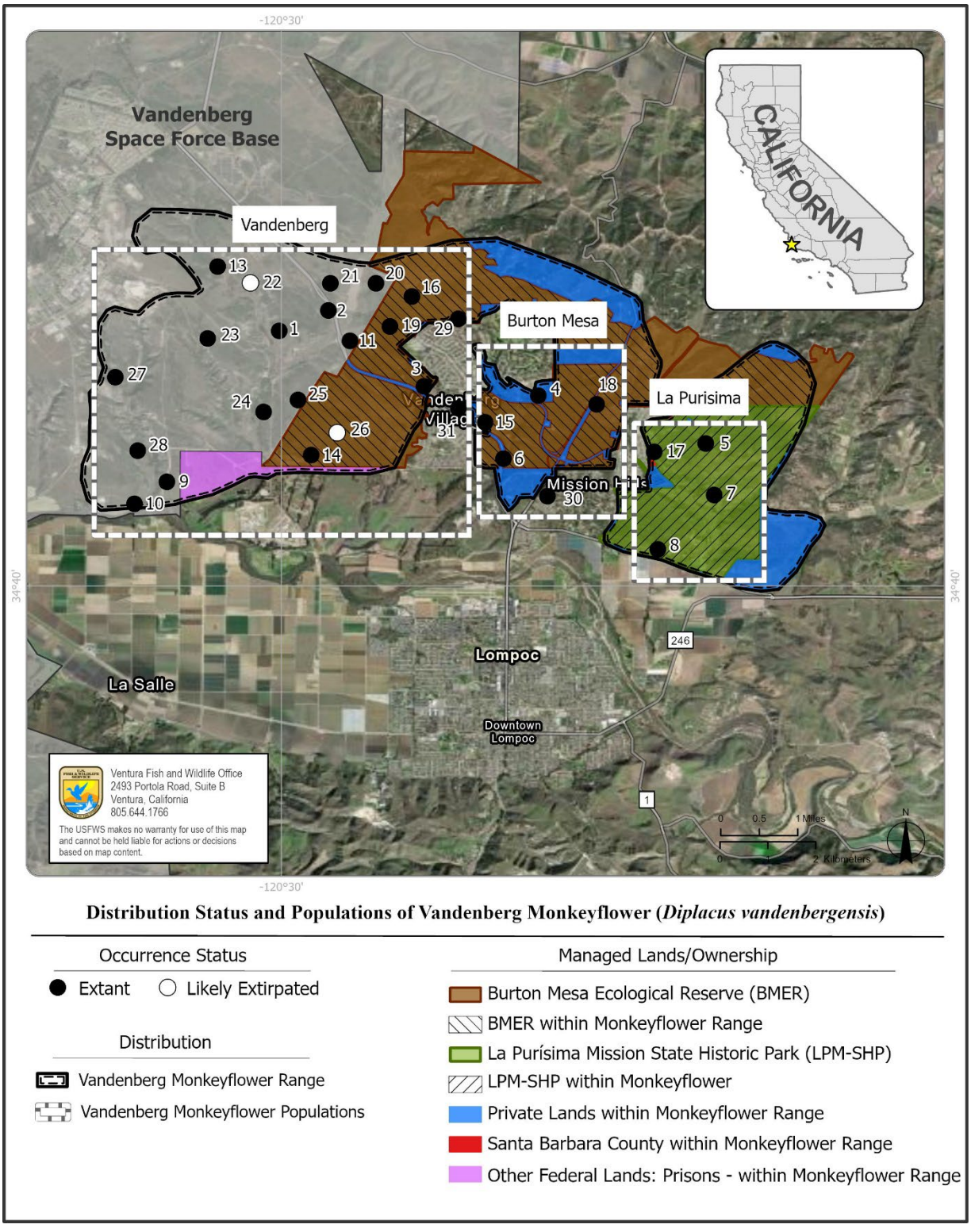


**Figure 1.** Distribution, status, land ownership. and populations of Vandenberg monkeyflower (*Diplacus vandenbergensis*), Santa Barbara County, California (Service 2022).

All known Vandenberg monkeyflower occurrences are located on lands with three different types of ownership: privately owned land, publicly owned land that is not generally publicly accessible, and publicly owned land that is generally publicly accessible (Figure 1). The publicly owned lands with public access include Burton Mesa Ecological Reserve, which is owned by the State Lands Commission (SLC) and managed by the California Department of Fish and Wildlife (CDFW), and La Purísima Mission State Historic Park, which is owned by California State Parks. The Federal lands where the species occurs are generally inaccessible to the public, including Vandenberg Space Force Base (VSFB) and U.S. Penitentiary, Lompoc (Service 2022, entire).

## THREATS

When we listed Vandenberg monkeyflower in 2014, threats to the species included development, utility and pipeline maintenance, invasive species, anthropogenic fire, recreation and other human activities, and climate change (79 FR 50844–50854). We considered the threats identified in the 2014 listing (79 FR 50844–50854) in the 2022 SSA (Service 2022, pgs. 25–31) and found that threats to the species have not changed substantially. All these threats continue to act on the species and many of them do so in synergistic ways that create negative feedback loops, particularly invasive, non-native plants (such as perennial veldt grass [*Ehrharta calycina*]), and fire.

We do not have data to determine the resiliency of the Vandenberg monkeyflower populations. However, threats are likely affecting the populations' ability to withstand stochastic events. Redundancy will always be limited for local, endemic species with only three populations distributed over a small geographic range. Species representation is also naturally low because of its niche specificity and because it has been affected by reduced connectivity and habitat degradation (Service 2022, entire).

## RECOVERY STRATEGY

The Vandenberg monkeyflower recovery strategy is to systematically increase the species' resiliency, redundancy, and representation to achieve self-sustaining populations of this narrow endemic throughout its range. Vandenberg monkeyflower populations must be able to consistently sustain adequate abundance within a sufficient area to be self-sustaining in the wild. Resilient populations of the species require an adequate soil seed bank to not only survive dormancy during unfavorable conditions, but also to sustain the population in years where seed production is low. Annual species are characterized by boom-and-bust years, which is why an adequate soil seed bank is so important for sustaining populations over time.

Recovery of the species requires that a sufficient number of populations are protected, managed, and restored throughout the geographic range to the degree necessary for them to be resilient and fully self-sustaining, meaning the population trends are stable or increasing, and the species threats are effectively mitigated. This can only be achieved through collaborative partnerships with resource agencies and other entities that own lands supporting Vandenberg monkeyflower occurrences including SLC, CDFW, California State Parks, VSFB, and private landowners. Structured monitoring and additional studies need to be conducted to effectively assess viability, population trends, and whether threats have been sufficiently managed. The actual amount of time required for the recovery strategy's success and our abilities to effectively manage and ameliorate climate change effects on the species are unknown. Therefore, we will manage the populations

adaptively as we learn what is most effective and required to achieve recovery.

## RECOVERY CRITERIA

According to the definitions provided in the ESA, an endangered species is a species that is "in danger of extinction throughout all or a significant portion of its range," and a threatened species is one that is "likely to become endangered within the foreseeable future throughout all or a significant portion of its range." When we evaluate whether or not a change in the species status is warranted, such as downlisting or delisting, we consider if the species continues to meet either of these definitions. A recovered species is one that no longer meets the definitions of endangered or threatened because the threats to that species have been ameliorated and its viability has been restored to levels expected to be sustainable into the foreseeable future.

Recovery criteria outline the specific conditions that, when met, indicate that a species may warrant downlisting or delisting. Recovery criteria also serve as the performance measures, or targets, to track the species progress towards achieving recovery. Recovery criteria represent our best assessment at this time of what needs to be achieved for the species to be downlisted from an endangered to threatened species or removed from the list of threatened and endangered species. Because we cannot predict the exact course that recovery may take, and because our understanding of the species vulnerability to threats is likely to change as more information becomes available, it is possible that a status review may indicate that downlisting is warranted even though not all of the recovery criteria have been met. Conversely, it is possible that the recovery criteria could all be met, and a status review may indicate that downlisting is still not warranted because, for example, a new threat has emerged that is not addressed in the current recovery criteria.

### Downlisting and Delisting Criteria

Downlisting criteria describe conditions that, when achieved, suggest a reclassification of Vandenberg monkeyflower from an endangered species to a threatened species may be appropriate. Delisting criteria build from the downlisting criteria. When delisting criteria are met, a removal from the list of threatened and endangered species may be warranted.

*Downlisting Criteria*

Vandenberg monkeyflower may be considered for downlisting when all the following criteria are met:

1. Annual abundance within at least two populations displays stable[1] or increasing trends, based on a minimum of 10 years of data. The two populations include the Vandenberg population, within which there are at least 21 extant occurrences, and one of the other populations (either Burton Mesa or La Purísima), and that population includes at least six extant occurrences.

[1] Stable means that the population supports the required number of occurrences, (or more), and population abundance equals or exceeds the established baseline, (three-year average of reproductive individuals).

2. If either of the two needed populations drops below 75 percent of the established three-year average[2] of reproductive individuals (baseline), in any single year, adequate funding and resources are available and supplemental seeding and/or other management endeavors (such as invasive weed abatement) will be implemented as necessary to augment the population and increase reproductive output until the population(s) rise back above 75 percent.

3. The two necessary populations are effectively managed to ameliorate the species threats, with population trends being the primary evidence that all of its biological needs are being met. Vandenberg monkeyflowers' biological needs are described in the SSA (Service 2022, pg. 20-24).

4. An *ex-situ* recovery seed bank (a collection of Vandenberg monkeyflower seed stored in a facility to preserve the species and serve as a backup in the event of catastrophic loss) is established and maintained over time. The recovery seed bank will adequately represent the genetic diversity from at least the two requisite populations, and seed from all known occurrences within each population should be included. Seed collections should be made over multiple years (no fewer than three different years). The primary recovery seed bank will be stored in an institution approved by the Center for Plant Conservation with the capability to test germination as needed to ensure viability, and a secondary, reserve collection will be stored in a long-term storage facility, such as the National Laboratory for Genetic Resources Preservation.

Downlisting may be warranted when the above recovery criteria are met. While we were unable to determine resiliency for the three known Vandenberg monkeyflower populations in the SSA, we did report the number of occurrences in each and provided limited abundance data (Service 2022, pg. 33-37). The Vandenberg population is the largest population of the three, which is why it is critical for recovery. If it supports 21 occurrences, the two likely extirpated occurrences will be restored, and the population resiliency will increase substantially. Similarly, having a second population that supports six occurrences will also increase the population resiliency because the La Purísima population currently has five occurrences and Burton Mesa only has four, thus the criterion represents a net increase in the number of occurrences in either population. We expect that having two resilient populations, evidenced by stable or increasing trends, along with the required effective management, will prevent further declines in the species and ameliorate the imminent threat of extinction. Having two resilient populations will increase the species inherently low redundancy because increased population resiliency enhances the species overall ability to withstand catastrophic events (Service 2020, pg. 37). Vandenberg monkeyflower also has naturally low representation throughout its limited geographic range (Service 2020, pg. 37). Two resilient populations will largely maintain the known distribution of the species. Ten years for monitoring typically encompasses the full range of wet and dry year variation in coastal California. However, climate change effects that result in catastrophic loss are still likely to make the species become endangered in the foreseeable future, even if the downlisting criteria are met.

[2] Data for three-year average of reproductive individuals at each population will be established through annual monitoring efforts conducted by partnering agencies and other organizations.

*Delisting Criteria*

Once the downlisting criteria are met, Vandenberg monkeyflower may be considered for delisting when all the following criteria are met:

1. Annual abundance within one additional (for three total) population displays stable or increasing trend based on a minimum of 10 years of data. As with the downlisting criteria, the Vandenberg population supports at least 21 extant occurrences, and the other two populations (Burton Mesa and La Purísima) each support at least six occurrences.

2. If either of the three needed populations drops below 75 percent of the established three-year average of reproductive individuals, in any single year, adequate funding and resources are available and supplemental seeding and/or other management endeavors (such as invasive weed abatement) will be implemented as necessary to augment the population and increase reproductive output until the population(s) rise back above 75 percent.

3. The three necessary populations are effectively managed to ameliorate the species threats, with population trends being the primary evidence that all of its biological needs are being met.

4. The established *ex-situ* recovery seed bank continues to be maintained over time, and adequately represents the genetic diversity from all three requisite populations, with seed from all known occurrences within each population included. Germination testing occurs as needed to ensure viability. Additional accessions of Vandenberg monkeyflower seed are made periodically, and collections managers conduct bulking activities if necessary to supply seeds for restoration and other outplanting projects.

Delisting may be warranted when the above recovery criteria are met. Having three resilient populations with the specified number of occurrences in each will further increase the species redundancy and representation. We expect that this increase will ensure that Vandenberg monkeyflower is better equipped and more able to withstand catastrophic events and potential environmental changes, particularly those that are climate related. Further, we anticipate that having three resilient populations, evidenced by stable or increasing trends, distributed across the range with effective management will provide the redundancy and representation to ensure species viability.

## RECOVERY ACTIONS

Recovery actions are prioritized, site-specific interventions that need to be taken to conserve, manage, and enhance the current condition of Vandenberg monkeyflower and its habitat to meet the recovery criteria. Priority 1 actions are defined as those actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future. Priority 2 actions are those that must be taken to prevent a significant decline in population numbers, habitat quality, or some other significant negative impacts short of extinction. Priority 3 actions are all other actions necessary to provide for full recovery of the species. 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 specific operational

tasks and activities required to implement the proposed recovery actions outlined within this plan are presented in the Vandenberg monkeyflower RIS, which is a separate document that can be easily adjusted, therefore maximizing the flexibility of species recovery implementation. Table 2 below crosswalks the identified actions with the criteria, threats, and listing factors.

1. Manage habitat that supports the species to reduce or eliminate threats, including but not limited to seeding for augmentation; supplemental irrigation and shading for temperature reduction to offset future climate change effects; invasive weed removal and abatement; mechanical disturbance; vegetation thinning and removal to open canopy and maintain desired cover; and import, transfer, and redistribution of sand. (Priority 1)
2. Develop and implement a standardized annual monitoring protocol to identify population trajectories and environmental conditions that might be adversely affecting the species. (Priority 1)
3. Secure currently unprotected habitat where the species occurs or could occur from future destruction and development. (Priority 2)
4. Encourage partners to incorporate conservation measures for the species and its habitat into their projects and into all local and regional, strategic planning documents and programs. (Priority 3)
5. Collect seed from all three populations and deposit accessions into permanent conservation seed banks. (Priority 2)
6. Conduct experimental research projects, including those that examine the roles of biotic and abiotic environmental effects, natural soil seed banks, disturbance regimes, invasive weed management techniques, herbivory and seed predation, genetics, effects of fire and controlled burns, and the species' pollination system. (Priority 2)

**Table 1.** Crosswalk of ESA listing factors, threats under those factors, recovery criteria, and recovery action numbers for Vandenberg monkeyflower. Listing factors B and D do not apply to the species at this time.

| Listing Factor | Threat Description | Downlisting/Delisting Criteria | Recovery Actions |
|---|---|---|---|
| ***Factor A*** *The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range* | Development<br>Utility and pipeline maintenance | Downlisting 1, 2, 3<br><br>Delisting 1, 2 | 1, 2, 3, 4 |
| ***Factor C*** *Disease or Predation* | Herbivory<br>Disease<br>Seed predation | Downlisting 1, 2, 3<br><br>Delisting 1, 2 | 1, 2, 5, 6 |
| ***Factor E*** *Other Natural or Manmade Factors Affecting Its Continued Existence* | Non-native, invasive weeds<br>Anthropogenic fire<br>Climate change | Downlisting 2, 3, 4<br><br>Delisting 2 | 1, 2, 3, 4, 5, 6 |

## ESTIMATED TIME AND COST OF RECOVERY ACTIONS

Table 3 below summarizes the estimated time and costs to achieve recovery of Vandenberg monkeyflower based on the recovery actions described in this plan. The costs include financial, volunteer, and in-kind support as well as other conservation endeavors likely to be facilitated by other cooperating agencies. We assume that implementation of habitat management, habitat protection, and experimental research could occur immediately and that we could see persistence of viable, self-sustaining populations in the following 15-20 years (10 years to downlisting and 5-10 additional years to delisting). Thus, after 15-20 years of recovery implementation, we expect consideration of the species for delisting to be plausible.

**Table 2.** Estimated Time and Costs of Vandenberg Monkeyflower Actions

| Recovery Action Number | Recovery Action | Estimated Time to Achieve | Estimated Cost |
|---|---|---|---|
| 1 | Manage habitat that supports the species to reduce or eliminate threats (3 populations) | 20 years | $15,000,000 |
| 2 | Develop and implement a standardized annual monitoring protocol | 10 years | $4,000,000 |
| 3 | Secure currently unprotected habitat where the species occurs or could occur | 20 years | $2,000,000 |
| 4 | Work with project proponents and other partners to incorporate conservation measures for the species and its habitat into their projects and strategic planning documents and programs | 20 years | $100,000 |
| 5 | Collect seed from all three populations and deposit accessions into a permanent conservation seed banks | 20 years | $350,000 |
| 6 | Conduct experimental research projects | 10 years | $450,000 |
| | | **TOTAL ESTIMATED COSTS** | **$21,900,000** |

## LITERATURE CITED

[Service] U.S. Fish and Wildlife Service. 1983. Endangered and Threatened Species Listing and Recovery Priority Guidelines. 48 FR 43098–43105.

[Service] U.S. Fish and Wildlife Service. 2022. Vandenberg Monkeyflower (*Diplacus vandenbergensis*). Species Status Assessment. Version 1. February 2022. Ventura, California.