U.S. Fish & Wildlife Service

Draft Recovery Plan for the Callippe Silverspot Butterfly (*Speyeria callippe callippe*)

Callippe silverspot butterfly (Photo credit: Dave Kelly, USFWS)

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U.S. Fish and Wildlife Service
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Regional Director, Pacific Southwest Region
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Literature citation should read as follows:

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An electronic copy of this draft recovery plan will be made available at:
http://www.fws.gov/endangered/species/recovery-plans.html

Introduction

This document presents the U.S. Fish and Wildlife Service's plan for the conservation and recovery of the callippe silverspot butterfly (*Speyeria callippe callippe*).

The goal of this recovery plan is to provide guidance on how to control or ameliorate impacts from current threats to the callippe silverspot butterfly, such that the taxon no longer requires protections afforded by the Endangered Species Act (Act) and therefore, warrants consideration for delisting. Pursuant to section 4(f) of the Act, a recovery plan must, to the maximum extent practicable, include (1) a description of site-specific management actions as may be necessary to achieve the plan's goals for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would support a determination under section 4(a)(1) that the species should be removed from the List of Endangered and Threatened Species; and (3) estimates of the time and costs required to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal. This recovery plan provides these specific recovery plan elements as well as a description of the overall recovery strategy. In developing the recovery plan elements, we recognize that continued coordination with our partners is needed to ensure long-term protections are afforded to callippe silverspot butterfly and its habitat.

This draft recovery plan is based on the Species Status Assessment (SSA) report for the callippe silverspot butterfly. The SSA report describes the species' life history and biology, including individual, population, and species needs; assesses the current status of the species, including factors influencing species viability; and projects the status of the species in the future under two plausible scenarios. The species' current and future viability is assessed in terms of its resiliency, redundancy, and representation (the three Rs). Resiliency is the ability for populations to sustain themselves in the face of stochastic events, or for populations to recover from years with low reproduction or reduced survival, and is associated with population size, growth rate, and the quality and quantity of habitats. Redundancy is the ability for the species to withstand catastrophic events, for which adaptation is unlikely, and is associated with the number and distribution of populations. Representation is the ability of a species to adapt to changes in the environment and is associated with its diversity, whether ecological, genetic, behavioral, or morphological. The SSA report is summarized below. Those specific activities necessary for implementing this plan's proposed recovery actions are described in the Recovery Implementation Strategy (RIS); the RIS is a separate document from this Recovery Plan and can be modified if monitoring reveals that expected results are not being achieved, thereby maximizing flexibility of recovery implementation. Both the SSA report and the Recovery Implementation Strategy are available at http://ecos.fws.gov and will be updated as necessary.

Summary of Species Status Assessment

The callippe silverspot butterfly is a medium-sized subspecies of butterfly found in hilly grasslands in the San Francisco Bay Area. The subspecies occurs across a disconnected range in San Mateo, Sonoma, and Solano Counties. Populations generally function as metapopulations made up of multiple subpopulations that interact with each other. The SSA report used the term population throughout the document when referring to metapopulations, as does this recovery plan.

General characteristics of callippe silverspot butterfly include: (1) intense melanic suffusion on the dorsal wing surface; (2) solid brown area on the disc of the ventral hindwing cell, free from yellow suffusion; and (3) reddish ground color on the basal portion of the ventral hindwing. However, due to extensive variation and overlap in phenotypic characteristics in the *Speyeria* genus, even experienced observers are sometimes unable to identify the species and/or subspecies without knowledge of the geographic region from which a specimen was collected.

Callippe silverspot butterflies are sedentary (non-migratory), and one or more of the life stages are present within suitable habitat patches year-round. They are univoltine (having one generation per year), and undergo complete metamorphosis from egg to larva, pupa, and adult stages. Adults emerge in late spring and early summer and lay eggs, eggs hatch into larvae and remain in this state until the following spring, and larvae pupate in late spring or early summer. The larvae feed exclusively on California golden violets (*Viola pedunculata*). Adults rely on nectar sources available throughout their flight period (primarily mid-May – mid-July with a few occasionally observed as early as April or as late as early August), and both males and females congregate on hilltops for mating opportunities.

The callippe silverspot butterfly was listed as endangered in 1997, primarily due to loss and degradation of habitat from human activities. Habitat loss and degradation continues to be the primary factor limiting callippe silverspot butterfly populations, including fragmentation, competition with invasive non-native vegetation (especially thatch build-up from non-native grasses), and grassland conversion to coastal scrub or chaparral. Habitat loss and degradation negatively impact host and nectar plants used by the subspecies as well as limit larval movement. Other current threats include high-intensity wildfire and non-targeted pesticide use. Ongoing conservation and management actions or factors positively influencing resiliency include land protection, low-intensity prescribed fires, grazing, and removal of non-native species and encroaching scrub habitat.

As of the 2024 SSA report, the subspecies has one population in moderate condition (San Bruno Mountain, San Mateo County) and three populations in low condition (Sears Point, Sonoma County; Ferrari Ranch, Solano County; and, Cordelia Hills, Solano County). As the population with highest resiliency currently, the San Bruno Mountain population contributes the most to viability of the callippe silverspot butterfly. For redundancy, there are currently four populations spread over three counties. Because of the distribution, it is unlikely that a single catastrophic event could negatively impact all populations. The populations are all genetically unique, and thus all provide genetic variation that may confer adaptive capacity to the subspecies. This genetic variation contributes to representation for the subspecies. Maintaining multiple resilient populations within each of the three counties where the subspecies is currently found is important for its viability.

Recovery Strategy

We envision recovery for callippe silverspot butterflies as four to five self-sustaining populations in high or moderate condition across the subspecies' range. Achieving recovery will require increasing adult abundance at all currently extant populations, reducing the threats of grassland conversion and of thatch buildup from non-native plants, and increasing the density of the species' host plant and nectar resources. A range-wide monitoring and adaptive management

program will be needed to better track population trends and to respond adaptively with management as we gain a better understanding of how to protect populations from threats.

Because the callippe silverspot butterfly's current range consists of populations from three counties in the San Francisco Bay area, the following units are identified for this recovery plan: 1) San Mateo County, 2) Solano County and 3) Sonoma County. By increasing population health within each county, we aim to increase population resiliency and maintain adaptive capacity. At present, the only catastrophic event likely to affect the species is high-intensity wildfire. Since a single wildfire is not likely to affect more than one population, we aim for one to two resilient populations within each county to achieve redundancy and to safeguard against catastrophic losses from wildfire.

Callippe silverspot butterfly populations exhibit boom and bust cycles in response to fluctuations in precipitation. Resiliency, then, is indicated by populations of the species being able to withstand these cycles and maintain long-term stability, as measured by population condition across 20 years that includes at least two precipitation cycles.

Recovery actions are intended to expand the area of protected grassland for the butterfly, and to increase butterfly population sizes using adaptive management and translocations. Recovery actions will also address key uncertainties for the species. We do not currently know what densities of host and nectar resources are needed to maintain resilient populations of the callippe silverspot butterfly, and an important recovery action will be to conduct research that answers these questions. There is also currently no range-wide monitoring program for the species, impeding our ability to detect population declines or compare abundance across populations. Lastly, we do not have a good understanding of the best way to expand populations of the butterfly's host plant or to manage grasslands to reduce thatch, prevent scrub encroachment, and maintain high densities of host and nectar resources. Research currently underway on grazing and on *Viola pedunculata* translocations will allow us to begin to answer these questions and to respond adaptively with management. All recovery actions will require collaboration with the local government, NGO, and university partners who are conducting on-the-ground research and management for the butterfly.

Recovery Criteria

An endangered species is defined in the Act as a species that is in danger of extinction throughout all or a significant portion of its range. 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 species warrants downlisting or delisting, we consider whether the species meets either of these definitions. A recovered species is one that no longer meets the Act's definitions of threatened or endangered. Determining whether a species should be downlisted or delisted requires consideration of the same five categories of threats which were considered when the species was listed, and which are specified in section 4(a)(1) of the Act.

Recovery criteria are conditions that, when met, are likely to indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are mileposts that measure progress toward recovery. These recovery criteria are our best assessment at this time of the conditions that indicate the callippe silverspot butterfly is ready 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 very likely to change as more is learned about the species and its threats, it is possible that a status review may indicate that delisting is warranted although not all recovery criteria are met. Conversely, it is possible that the recovery criteria could be met, and a status review may indicate that delisting is not warranted. For example, a new threat may emerge that is not addressed by the current recovery criteria.

Delisting Criteria

The following criteria indicate that callippe silverspot butterfly may be considered for delisting:

1. There are at least four to five populations of the callippe silverspot butterfly, with at least one population in each of the three counties where the subspecies is currently found (San Mateo, Solano and Sonoma Counties). Whether four or five populations are needed depends on the condition of the populations (see next criterion).

2. Biennial or annual monitoring has shown that at least **one of the five** or **two of the four** populations under **criterion 1** are in high condition, and the remaining populations are in at least moderate condition as defined by the most recent SSA. The moderate conditions must be met in each year of monitoring during a 20-year period that includes at least two normal precipitation cycles, and the high conditions must be met in at least 4/5 of those years, including each of the last four years of the period (or the last two monitoring years for biennial monitoring).

   Justification for criteria 1 and 2

   As of the 2024 SSA report, there is one population of the callippe silverspot butterfly in moderate condition and three populations in low condition across San Mateo, Solano and Sonoma Counties. We believe that recovery of the subspecies depends on having a minimum of four populations, with all of those populations in high or moderate condition. The condition of a population is defined by the SSA as a function of the population's adult abundance, the area of contiguous grassland it occupies, the amount of thatch, and the availability of host and nectar resources. A high or moderate condition indicates that a population is sufficiently abundant to withstand normal environmental fluctuations, and that grassland is of sufficient size and quality, and with sufficient resources, to support the population over time.

   Having resilient populations of the callippe silverspot butterfly across all three counties of its current range is important for redundancy and representation of the subspecies. This distribution of populations makes it unlikely that resilient populations across all counties would be extirpated by a single catastrophic event. However, a wildfire has the potential to greatly reduce the resiliency of any one of the populations. For this reason, our recovery criterion states that there are at least two populations in high condition to insure against losses from high-intensity wildfire if there are only four populations across the subspecies' range. This ensures that there is at least one population remaining in high condition after a wildfire. Alternatively, there may be only one population in high condition if there is an additional population in moderate condition (i.e., five populations total). This population may be established in Alameda or surrounding counties, or in

areas adjacent to the populations in Sonoma and Solano counties.

Under these criteria, the butterfly's population conditions are sustained for 20 years with at least two iterations of a normal precipitation cycle. A normal precipitation cycle is defined as a series of years that encompass average, above-average, and below-average rainfall conditions. Years of above- and below-average precipitation likely correlate with variation in the abundance of host and nectar plants, and in thatch levels. Monitoring that demonstrates populations can maintain high and moderate condition over the precipitation cycles would show that the populations have the resiliency to withstand these fluctuations.

3. Each population under **criterion 1** occurs on habitat that is protected by a legally binding or otherwise demonstrated commitment. The area of protected habitat is greater than or equal to the area of grassland habitat listed in the high condition category of the SSA (486 ha as of the 2024 SSA report) and includes important hill-topping habitat for mating.

   Justification for criterion 3

   Here we sought to address the habitat requirements necessary to support resilient populations. Callippe silverspot butterflies are strong fliers, and as such, require large areas of contiguous habitat containing all their habitat needs. Habitat protected by a long-term, legally binding agreement will ensure subspecies' viability and protection from development into the future.

4. Protected habitat under **criterion 3** is managed to reduce threats to the callippe silverspot butterfly, and to maintain open grassland habitat with sufficient host and nectar resources. This can include the implementation of habitat management or grazing management plans. Long-term management is assured and financially sustainable.

   Justification for criterion 4

   The callippe silverspot butterfly is a habitat and dietary specialist that requires open grassland habitat with sufficient nectar resources and a high density of its host plant, California golden violet. For the long-term persistence of the subspecies, management plans or other mechanisms are needed to ensure that protected habitat meets the subspecies' habitat and resource requirements.

Recovery Actions

The actions identified below are those that, based on the best available science, are necessary to bring about the recovery of the callippe silverspot butterfly and ensure its long-term conservation. Priority 1 actions are defined as actions that must be taken to prevent extinction or to prevent the species from declining irreversibly. Priority 2 actions are defined as actions that must be taken to prevent a significant decline in species' populations, habitat quality, or some other significant negative impact short of extinction. Priority 3 actions are defined as all other actions necessary to provide for the 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 following actions are necessary to meet the recovery criteria:

1. **Manage habitat that supports the butterfly in the long-term to maintain grassland communities with a sufficient density of host plants, appropriate levels of thatch, and diverse native nectar sources available in sufficient quantities throughout the butterfly's flight period (Priority 1).** Management plays a direct role in reducing three of the biggest threats to the callippe silverspot butterfly: grassland conversion to scrub, thatch, and the establishment of non-native plant species that outcompete the butterfly's host plant. Management is also important for improving conditions and increasing abundances of the butterfly's host plant and nectar resources. Management is thus needed to increase population resiliency in all populations and to maintain representation and redundancy of the subspecies throughout its range.

2. **Conduct research to better understand the species' resource needs and to guide conservation efforts (Priority 2).** There are currently gaps in our knowledge about how to recover the callippe silverspot butterfly and what a recovered state looks like for the subspecies. Research is important for filling in these gaps. Research should focus on obtaining more precise estimates of the host and nectar resources needed to support resilient populations. It should also focus on improving management of the butterfly's habitat. A major research question is whether disturbance regimes, such as grazing or prescribed fire, can be implemented and used to increase the butterfly's nectar and host resources, and to reduce the amount of thatch and non-native plant species. Another research question is how to successfully restore the butterfly's host plant through outplanting, seeding, or transplanting. Research should be conducted concurrently with monitoring and management so that management plans are updated as more becomes known about how to manage habitat for the subspecies.

3. **Create and implement a protocol for range-wide surveys and monitoring (Priority 2).** Range-wide monitoring of the callippe silverspot butterfly is important for evaluating the effectiveness of its management, tracking progress towards recovery, and detecting and preventing population declines. Monitoring is also an integral component of adaptive management, and monitoring results should be used to inform and update management plans.

4. **Protect currently unprotected habitat where callippe silverspot butterflies occur, and potential habitat where they can be reintroduced if needed (Priority 3).** Protecting habitat is important for addressing the threat of habitat loss and for maintaining resiliency in populations of the callippe silverspot butterfly that occupy private land. Acquiring or otherwise protecting land for a fifth population will likely be necessary to reach a total of five total populations under recovery criteria one and two.

5. **Augment or establish populations of the callippe silverspot butterfly, as needed (Priority 3).** Population augmentation is an important tool for increasing adult abundance and population resiliency of low condition populations, which as of the 2024 SSA report make up three out of four of the butterfly's populations. In addition, the establishment of an additional population will be needed to reach a total of five total populations under

recovery criteria one and two.

Table 1. Crosswalk table linking listing factors, specific threats to the callippe silverspot butterfly, recovery criteria and recovery actions. At present, the listing factors B, C, and D do not apply for this species.

Listing factor	Threat description	Recovery criteria	Recovery actions
Factor A The present or threatened destruction, modification, or curtailment of its habitat or range	Habitat loss Grassland conversion to scrub	1, 2, 3, 4	1, 2, 3, 4, 5
Factor E Other natural or manmade factors affecting its continued existence	Non-native plants and thatch build-up Loss of host plant and nectar resources High-intensity wildfire	2, 4	1, 2, 3, 5

Estimated Time and Cost of Recovery Actions

We estimate that the cost of recovery of the callippe silverspot butterfly is $22.76 million (Table 2), based on the recovery actions described in this plan. We estimate that these actions could be completed by in thirty years, assuming effective coordination and cooperation among partners and stakeholders.

Table 2. Estimated time and cost of recovery actions for the callippe silverspot butterfly.

Recovery Action Number	Recovery Action	Estimated Time to Achieve	Estimated Cost
1	Manage habitat that supports the butterfly in the long-term to maintain grassland communities with a sufficient density of host plants, appropriate levels of thatch, and diverse native nectar sources available in sufficient quantities and throughout the duration of the flight period.	30	$9,623,000
2	Conduct research necessary to refine recovery criteria and guide conservation efforts.	20	$249,000
3	Create and implement a protocol for range-wide surveys and monitoring	30	$888,000
4	Protect currently unprotected habitat where callippe silverspot butterflies occur, and potential habitat where they can be reintroduced if needed.	30	$10,024,000
5	Augment or establish populations of the callippe silverspot butterfly, as needed.	20	$1,925,000