

Interim Core Map Documentation for Sacramento Mountains Checkerspot Butterfly

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Core Map Developer: Draft interim core map developed by Center for Biological Diversity (CBD) Documentation and analysis supplemented by the U.S. Environmental Protection Agency (EPA)¹

Species Summary

The Sacramento Mountain checkerspot butterfly (*Euphydryas anicia cloudcrofti*; Entity ID #1260) is an endangered terrestrial insect (Lepidoptera). This species is restricted to an isolated mountain range (primarily on Forest Service land) in south-central New Mexico at elevations between 2,380 and 2,750 m (7,800 and 9,000 ft) and depends on the New Mexico beardtongue plant (*Penstemon neomexicanus*) for their larvae. This species is univoltine, meaning there is one generation per year. The flight season last from mid-June to the end of August. There is a designated critical habitat for this species. The recovery vision for the Sacramento Mountain checkerspot butterfly is to maintain and protect the known populations that occur on U.S. Forest Service (USFS) lands, re-establish several extirpated occurrences of the species, and enhance captive reared populations through biobanking, assisted reproduction, and other emerging technologies. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Sacramento Mountain checkerspot butterfly is based on critical habitat. The critical habitat is refined and does not include unoccupied areas. All current known occurrences of this species fall within the critical habitat. EPA did not find evidence that any key areas for this species exist outside of the designated critical habitat. The locations of all the extirpated populations of this species also fall within the critical habitat. **Figure 1** depicts the interim core map for the Sacramento Mountain checkerspot butterfly (green areas on map). The core map represents approximately 1,637 acres.

The butterfly is currently found in only two meadows on the Lincoln National Forest in south-central New Mexico. This is out of the ten meadow units within the range considered to be suitable habitat. The Sacramento Mountains checkerspot butterfly appears to have a stronger affinity for the highest elevation areas in its range, gentle or angled slopes, and south-eastern aspect orientations. Suitable habitat is usually cool and wet, supporting diverse and robust plant life, and includes the butterfly's preferred host plant: New Mexico beardtongue. Landcover categories within the core map area are included in **Table 1**. Landcover within the core map is predominantly medium intensity developed.

The core map developed for the Sacramento Mountain checkerspot butterfly is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Sacramento Mountain checkerspot butterfly. This core map incorporates information developed by FWS which was made available to the public; however, the core map has not been formally reviewed by FWS. This

¹ CBD sent EPA a draft core map for this species before EPA released its mapping process document and example documentation. EPA used CBD's map as the basis for this core map and modified it based on re-evaluation of the available information. EPA supplemented the documentation and supporting analysis for consistency with recent documentation for other maps.

interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a “limited” best professional judgment classification because it consists of the species’ critical habitat without additions or subtractions. However, the core map does not include all areas of the species’ range based on review of FWS documents. There is confidence in the core map because the species’ critical habitat is highly refined, represents areas important for this species’ conservation, and contains all the known occurrences for this species that have been found within the last 25 years. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

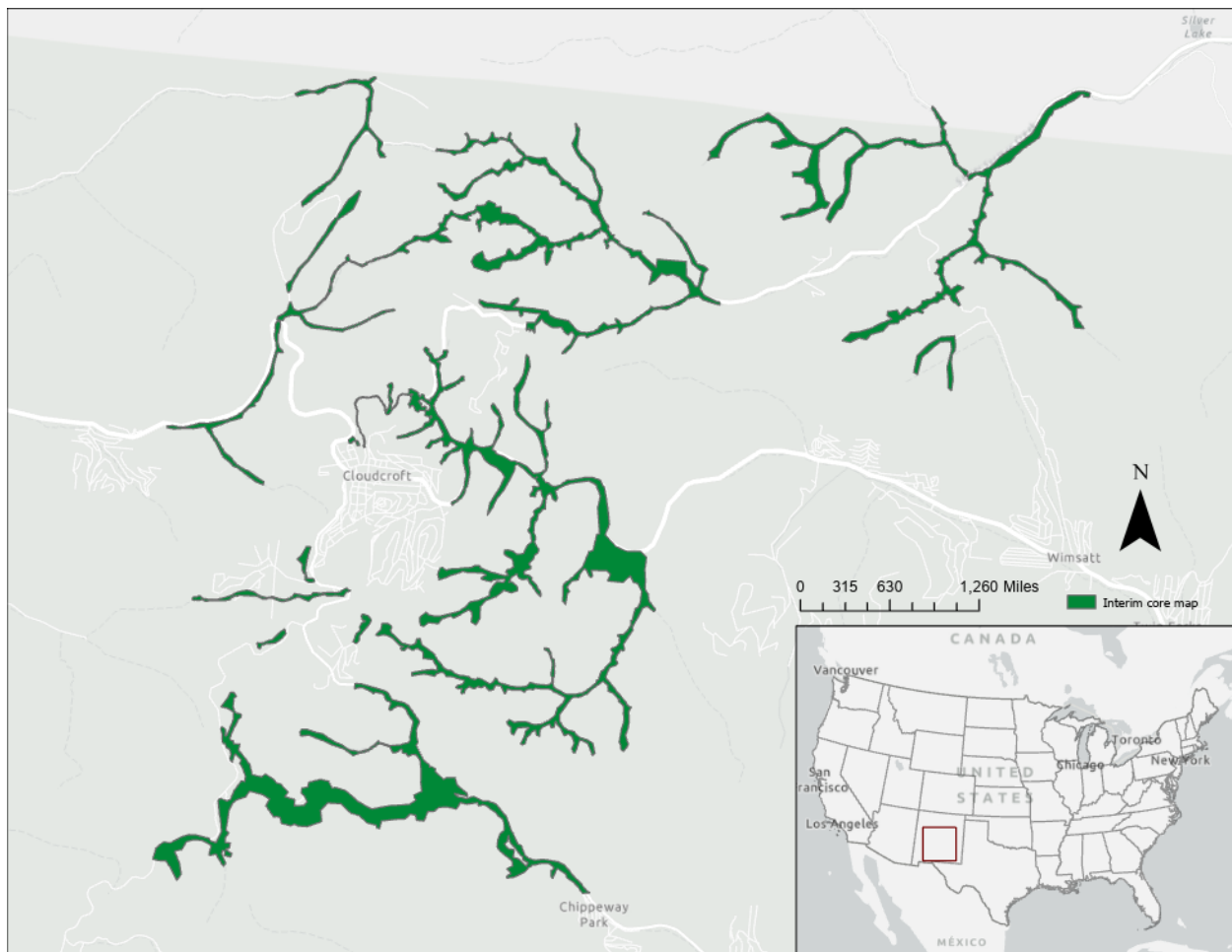


Figure 1. Interim core map for the Sacramento Mountain checkerspot butterfly. The total acreage of the core map is approximately 1,637 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD² Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Forestry	Deciduous Forest (41)	0%	0%
Forestry	Evergreen Forest (42)	0%	0%
Forestry	Mixed Forest (43)	0%	0%
Agriculture	Pasture/Hay (81)	0%	0%
Agriculture	Cultivated Crops (82)	0%	0%
Mosquito adulticide, residential	Open space, developed (21)	0%	76%
Mosquito adulticide, residential	Developed, Low intensity (22)	0%	76%
Mosquito adulticide, residential	Developed, Medium intensity (23)	74%	76%
Mosquito adulticide, residential	Developed, High intensity (24)	1%	76%
Invasive species control	Woody Wetlands (90)	0%	24%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%	24%
Invasive species control	Open water (11)	15%	24%
Invasive species control	Grassland/herbaceous (71)	0%	24%
Invasive species control	Scrub/shrub (52)	0%	24%
Invasive species control	Barren land (rock/sand/clay; 31)	9%	24%
Total Acres	Interim Core Map Acres	1637	

Evaluation of Known Location Information

There are three datasets with known location information for this species:

- Descriptions of locations provided by FWS,
- Occurrence locations in iNaturalist;
- Occurrence locations in the Global Biodiversity Information Facility (GBIF); and
- Occurrence locations in NatureServe.

EPA evaluated these four sets of data and used three before selecting the type of and developing the core map. Both FWS' 2022 Species Status Assessment (SSA) and the Recovery Outline (2023) detailed known locations of this species. FWS described occurrences of the butterfly in ten meadows in the Sacramento Mountains. Currently, there are two extant populations, which have locations that are consistent with the critical habitat. iNaturalist had five research grade observations which were consistent with the critical habitat. GBIF contained 26 occurrences. Of those occurrences the six with coordinates (between the years 2020 and 1999) are consistent with the critical habitat. NatureServe did not have any data on the species. **Appendix 1** includes more information on the available known location information.

² Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

Approach Used to Create Core Map

CBD and EPA compiled available information for the Sacramento Mountain checkerspot butterfly from FWS as well as observational information available from various publicly available sources (discussed in previous section). The information compiled for the Sacramento Mountain checkerspot butterfly is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Current existing populations occur in locations consistent with the critical habitat;
- The species' critical habitat is highly refined.

CBD and EPA used the compiled information to identify the core map type, including the species range, critical habitat, and known location information. CBD and EPA compared known location data to the range and critical habitat and found that the FWS known locations of currently existing (extant) populations are consistent with the location of the designated critical habitat. The species range is narrow, 82 square kilometers (32 square miles). However, the suitable habitat within this area is only approximately two square miles. Based on this information, EPA and CBD used the designated critical habitat as the core map.

CBD and EPA used the designated critical habitat provided by FWS for the Sacramento Mountain checkerspot butterfly. CBD downloaded the critical habitat from FWS's ECOS (<https://ecos.fws.gov/ecp/>).

Discussion of Approaches and Data that were Considered but not Included in Core Map

Alternative approaches and data were not considered in the development of this interim core map.

Appendix 1. Information Compiled for Species During Step 1

1. Recent FWS Documents/Links

- [Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Sacramento mountains Checkerspot Butterfly](#)– (11/27/2023)
- [Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Sacramento mountains Checkerspot Butterfly](#) – (08/10/2023)
- [Recovery Outline for Sacramento Mountains Checkerspot Butterfly](#) – (02/28/2023)
- [Current Condition Assessment Report for the Sacramento Mountain Checkerspot Butterfly](#) – (07/01/2022)

2. Background information

- **Status:** Federally listed as endangered in 2023
- **Resiliency, redundancy, and representation (the 3Rs) (Source: Recovery Outline 2023, 9-10)**
 - **Resiliency** – Low
Habitat needs = host plants, nectar sources, and habitat connectivity at the individual and population levels.
Demographic factors = density of adult butterflies and larval density.
 - **Redundancy** – Low
“We define redundancy for the Sacramento Mountains checkerspot butterfly as having populations or metapopulations spread across the range. Two extant Sacramento Mountains checkerspot butterfly populations are located in adjacent meadows of ten documented historical metapopulations within the single representation area. Several individuals have reported witnessing large numbers of Sacramento Mountains checkerspot butterflies in past years. Therefore, redundancy of the butterfly is low and has declined over time.”
 - **Representation** – Low
“We define representation for the Sacramento Mountains checkerspot butterfly as having ecological and genetic diversity. There is no current genetic information available for the SMCB. The recent range contraction suggests that most of the original representation present within the species has declined. There are currently two representation areas for the butterfly that contains the entire range of the species, including the ten meadows discussed previously. The USFS has been able to locate the species in only two meadows during recent years. There is probably no connectivity between these populations. The occupied meadows are among dense spruce-fir forests, so there are barriers that limit the dispersal of individuals among the populations. Host plant and nectar sources have declined in both meadows. This effectively restricts the transfer of genetic material, limiting genetic diversity. In addition to dense forest barriers between population and host and nectar source plant declines, the fire regime for the Sacramento Mountains has been altered which has likely led to decreases in habitat connectivity between populations. Therefore, overall representation is low and has declined in recent years.”
- **Habitat, Life History, and Ecology (Source: Recovery Outline 2023, 5)**
 - **Habitat:** “The SMCB inhabits high-altitude meadows in the upper-montane and subalpine zone at elevations between 2,380 and 2,750 m (7,800 and 9,000 ft). The

Sacramento Mountains checkerspot butterfly appears to have a stronger affinity for the highest elevation areas in its range, gentle or angled slopes, and south-eastern aspect orientations. The adult butterfly is often found in meadows and have an association with the larval food plants, NM beardtongue and adult nectar sources such as orange sneezeweed (*Helenium hoopesii* Gray). Trees usually occur along the periphery of meadows, including various spruce (*Picea* spp.), fir (*Pseudotsuga* spp. and *Abies* spp.), and pine (*Pinus* spp.).”

- **Relevant Life History Information (Source: Recovery Outline 2023, 6 & Current Condition Assessment 2022, 3):**

“Like most butterflies, the SMCB has an extremely high mortality rate between the egg and adult phases. As many as 98 percent of individuals perish in the wild, even under ideal circumstances”

“The Sacramento Mountains checkerspot butterfly has an extremely low dispersal rate.”

“The Sacramento Mountains checkerspot butterfly is univoltine, meaning there is one generation per year. The butterfly’s life cycle is synchronized with the development of host and nectar plants. The flight season lasts from mid-June to the end of August. The exact timing of adult flights can vary dramatically from one year to the next, depending on local weather conditions. The adult butterflies stagger their emergence from pupation, with numbers peaking around the second week of the flight season. Each life stage has different microhabitat, resources, and seasonal specializations different from the other life stages.”

- **Taxonomy**

- FWS Category: Terrestrial Insect, Lepidoptera

- **Essential Physical Biological Features for Designated Critical Habitat (Source: Recovery Outline 2023 & Current Condition Assessment 2022):**

- High-altitude meadows in the upper-montane and subalpine zone at elevations between 2,380 and 2,750 m (7,800 and 9,000 ft);
- Gentle or angled slopes, and south-eastern aspect orientations;
- Host plant; the New Mexico beardtongue (*Penstemon neomexicanus*), is the primary food source for larvae;
- Host plant; orange sneezeweed (*Helenium (Hymenoxys) hoopesii*), is the preferred adult nectar source.

- **Relevant Pesticide Use Sites in FWS Documents (Current Condition Assessment 2022, 18)**

- Pesticide threats to the species listed in FWS documents: between 2005 and 2006 there was an outbreak of looper moth species, *Nepytia janetae*. Officials decided to treat the affected areas to control the looper outbreak through use of insecticide, *Bacillus thuringiensis* var. *kurstaki* (Btk). When consumed by moths and butterfly larvae, it is deadly to all individuals which contact the bacterium. To minimize risk to the butterfly, the Forest Service chose to apply Btk during months outside of the active period for the Sacramento Mountains checkerspot, when larvae were in diapause.

- **Relevant Recovery Criteria and Actions (Source: *Recovery Outline 2023*)**
 - **Current Conservation Efforts to Date:** USFS has erected fenced enclosures to protect butterfly habitat areas from grazing and is collaborating with the Institute of Applied Ecology to permanently fence additional meadow areas to protect the butterfly and its habitat. Working to develop a habitat restoration plan for meadow units within the Sacramento Mountains checkerspot butterfly historical range, growing larval and adult host plants for habitat restoration and to support captive rearing efforts, and conducting host and pollinator plant seed collections to maintain these restoration and breeding needs into the future.
 - **Interim Action Plan:** reverse the decline of the species, maintain and protect the known populations, expand the range and location of extant populations, and enhance captive reared populations. Address habitat loss, fragmentation, and identify areas for restoration. USFWS is in the process of preparing a recovery plan and recovery implementation strategy for the Sacramento Mountains checkerspot butterfly.

3. Description of the species range

- The current geographic range is restricted to a narrow territory atop the Sacramento Mountain range in south-central New Mexico (*Recovery Outline 2023*, 5)
- **Figure A1-1** depicts the current FWS species range (last updated August 28, 2024).
- The species range is approximately 20,375 acres.

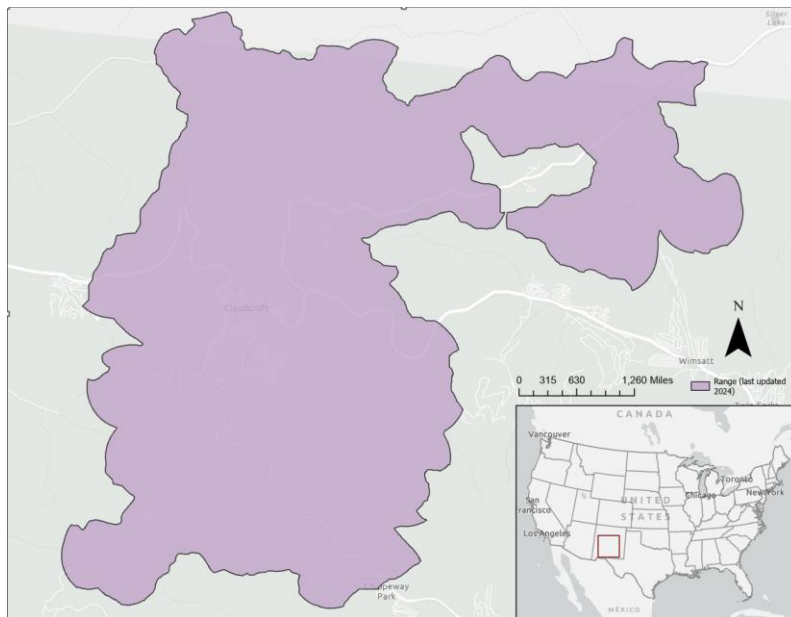


Figure A1-1. FWS Range of the Sacramento Mountains checkerspot butterfly.

4. Critical Habitat (Source: *Recovery Outline 2023*)

- The USFS survey shows that the Sacramento Mountain checkerspot butterfly exists within a range of 82 square kilometers (32 square miles). However, the suitable habitat within this area is only approximately two square miles (USFS 2020). The Sacramento Mountains checkerspot butterfly's current condition is within ten meadow units based on survey sites identified by USFS.
- The species' critical habitat is approximately 1,637 acres.

- **Figure A1-2** depicts the current critical habitat.

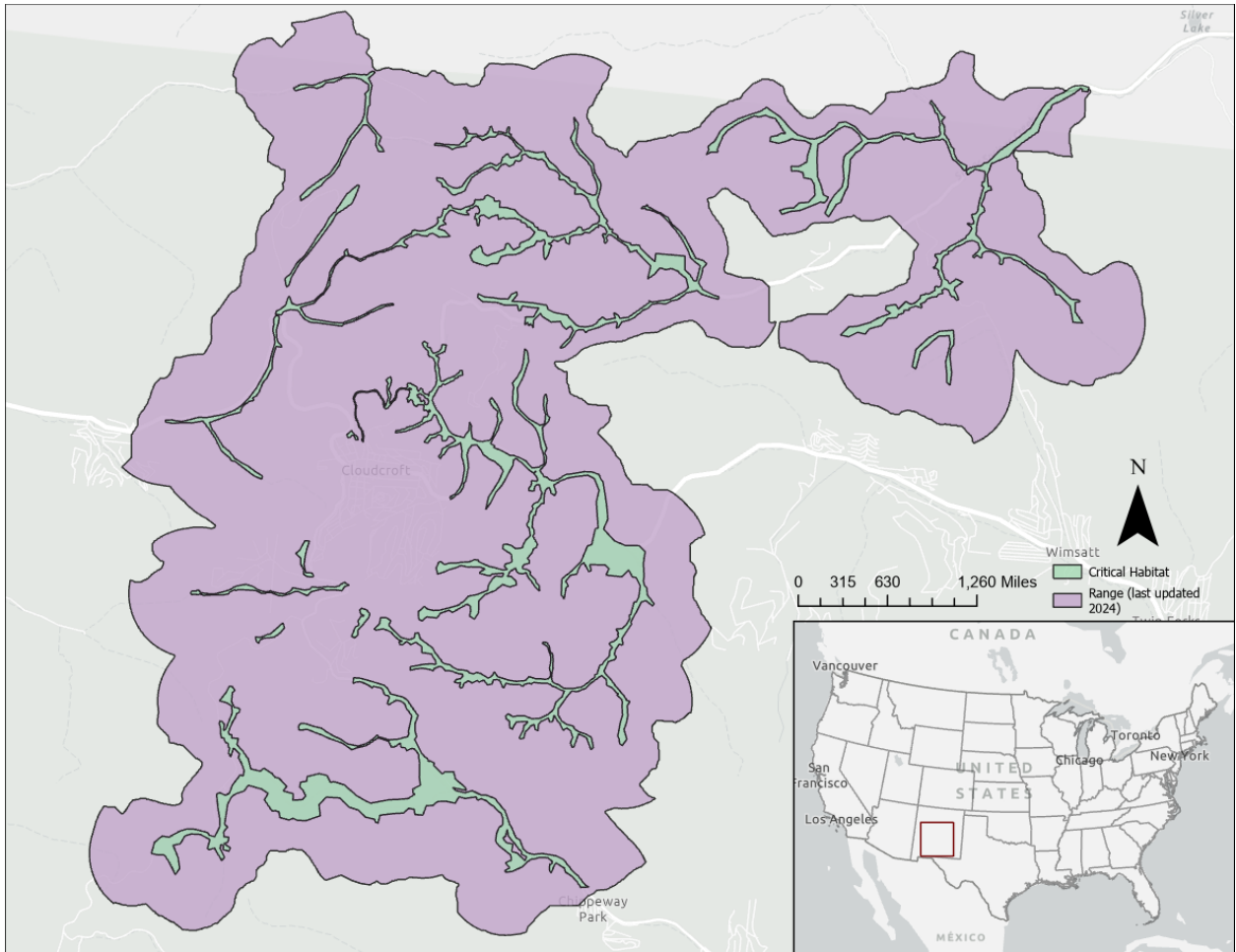


Figure A1-2. FWS critical habitat of the Sacramento Mountain checkerspot butterfly. The range is also included for reference.

5. Known Locations

- **Known Locations Described in FWS Recovery Documents**
 - There are currently 10 meadow unit known occurrences of the Sacramento Mountain checkerspot butterfly.
 - Of these, two meadow unit occurrences are currently known to be extant.
 - Eight historically known occurrences are likely extirpated.
 - **Figure A1-3** depicts the known location data in FWS' most recent 2023 Recovery Outline.
 - **Figure A1-4** depicts the known location data from FWS's 2023 Recovery Outline, including extant and extirpated populations.
 - When considering the locations of the current extant populations (**Figure A1-3**), they are consistent with the location of the Critical habitat (**Figure A1-2**).

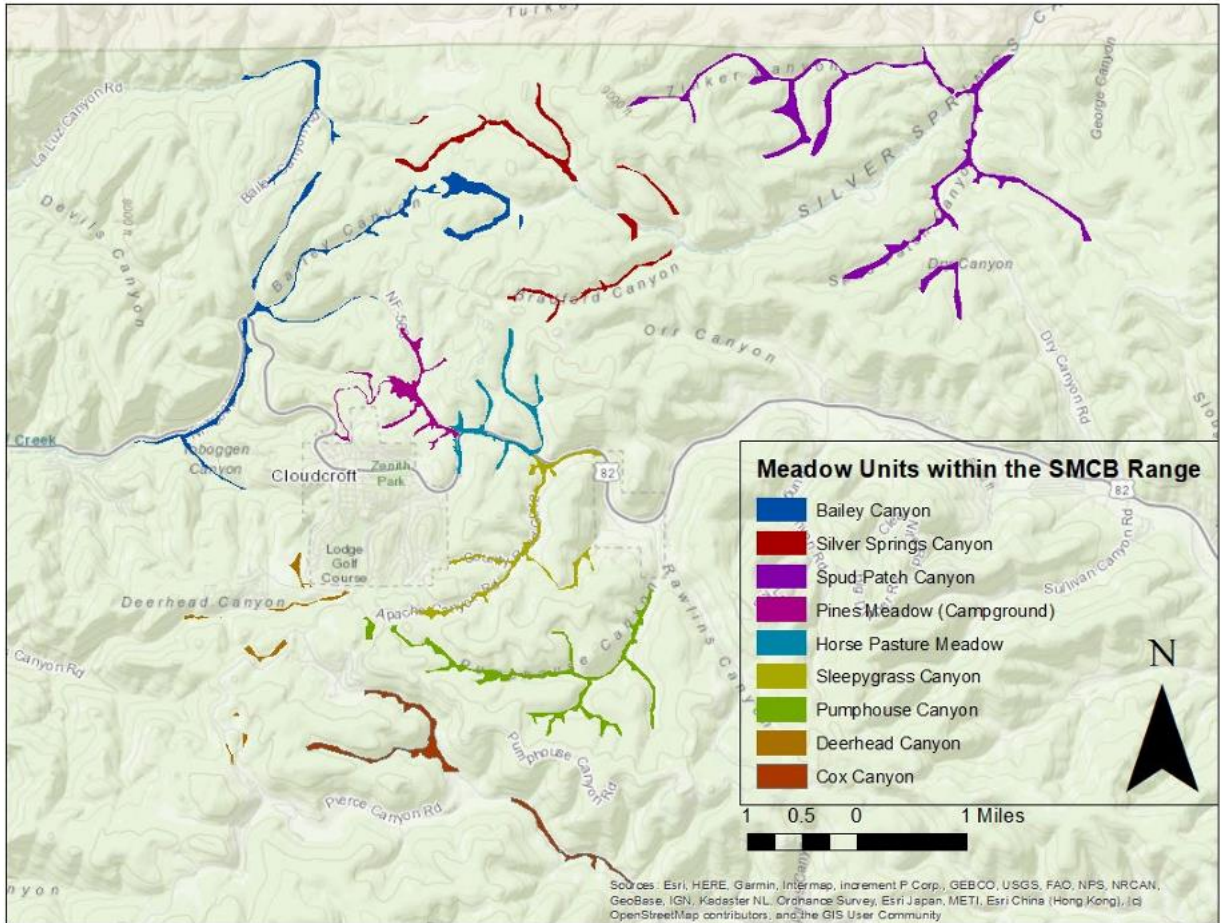


Figure A1-3. Known locations of the Sacramento Mountain checkerspot butterfly. Reproduced from FWS Recovery Outline (2023).

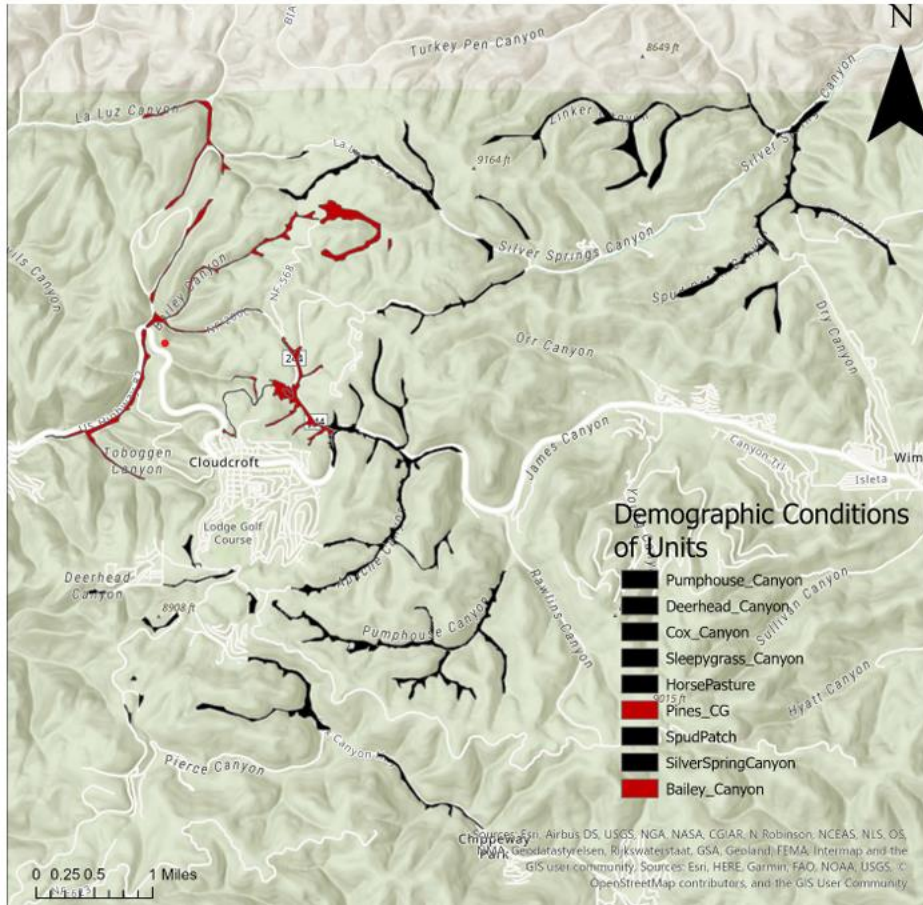


Figure A1-4. Known locations of the Sacramento Mountain checkerspot butterfly. Black indicates units in which the butterfly is extirpated; red indicates units in which it occurs at this time. Reproduced from FWS Recovery Outline (2023).

- **Occurrences in iNaturalist**
 - Searched on February 20, 2025
 - https://www.inaturalist.org/observations?subview=map&taxon_id=235985
 - There are five research grade observations available from 2019-2024.
 - **Figure A1-5** depicts the locations of these observations.
 - These observations are consistent with the critical habitat.

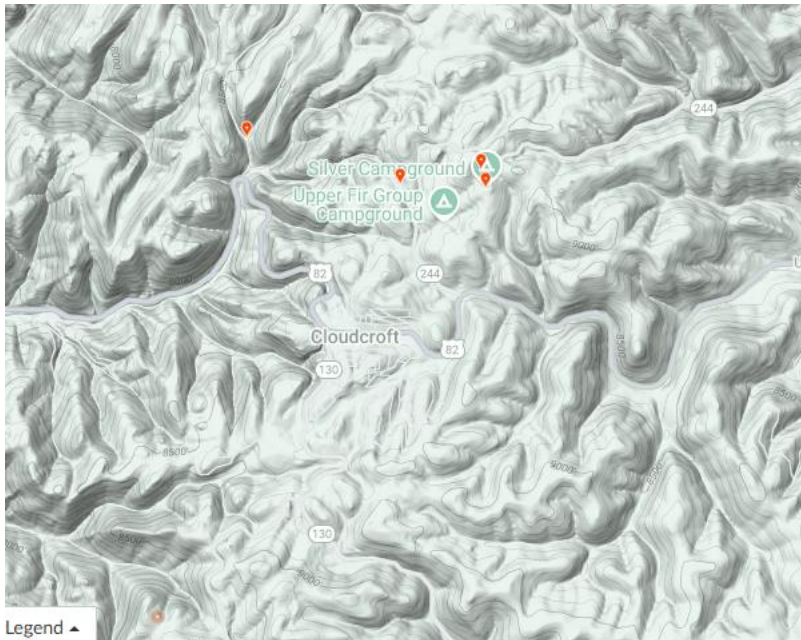


Figure A1-5. Screenshot from iNaturalist observations for Sacramento Mountain checkerspot butterfly.

Occurrences in NatureServe

- NatureServe was searched on February 20, 2025
- https://explorer.natureserve.org/pro/Map?taxonUniqueid=ELEMENT_GLOBAL.2.11583
- NatureServe has no documented location occurrences for the Sacramento Mountain checkerspot butterfly.

Occurrences in GBIF

- GBIF was searched on February 20, 2025
- There were 26 “human observations” available for this species.
- Most observations were included in either iNaturalist or NatureServe but also included observations taken from The Lepidopterists’ Society Season Summary. These observations are consistent with the critical habitat.
- https://www.gbif.org/occurrence/search?basis_of_record=HUMAN_OBSERVATION&taxon_key=4299287&advanced=1

Collectively, the occurrence data from iNaturalist, GBIF, and NatureServe do not support expanding the core map beyond the designated critical habitat.