Interim Core Map Documentation for Oregon silverspot butterfly

Posted to EPA's Geoplatform: July 2025

Interim Core Developed by the U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs.

Species Summary

The Oregon silverspot butterfly (*Speyeria zerene hippolyta*; Entity ID #431) is a threatened terrestrial invertebrate. The larva are obligate to the early blue violet (*Viola adunca*) while the adults feed on a variety of composite flowers. The species occupies three types of early successional, coastally influenced grassland habitat: marine terrace and coastal headland "salt spray" meadows, stabilized dunes, and montane grasslands. There is a designated critical habitat for this species. The critical habitat encompasses only one of the five known populations, and it does not include two experimental populations nor two reintroduction sites. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Oregon silverspot butterfly is based on biological information. There are five extant populations of this species, four of which fall outside of the critical habitat and one of which is represented by the critical habitat. In addition, FWS identified two experimental populations as well as two potential reintroduction sites. The core map represents all five extant populations as well as the two experimental populations and two reintroduction sites. **Figure 1** depicts the interim core map for the Oregon silverspot butterfly. The core map represents approximately 46,054 acres.

Extant populations of the Oregon silverspot butterfly are found at Coastal Mountains Habitat Conservation Area: Mount Hebo, Cascade Head Habitat Conservation Area: Cascade Head, Central Coast Habitat Conservation Area: Bray Point and Rock Creek-Big Creek, and Del Norte Habitat Conservation Area: Lake Earl. Experimental populations are found at Nestucca Bay National Wildlife Refuge and Saddle Mountain State Natural Area. Reintroduction areas are located at Long Beach Peninsula Habitat Conservation Area: Willapa National Wildlife Refuge, and Clatsop Plains Habitat Conservation Area: Clatsop Plains.

Landcover categories within the core map area are included in **Table 1.** Landcover is predominantly evergreen forests, emergent herbaceous wetlands, and open water.

The core map developed for the Oregon silverspot butterfly is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Oregon silverspot butterfly. This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a "limited" (2) best professional judgment classification due to the use of the designated critical habitat plus named locations described in FWS documents to create the core map. The map is based on known locations described by FWS, which includes extant, experimental, and potential reintroduction locations. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

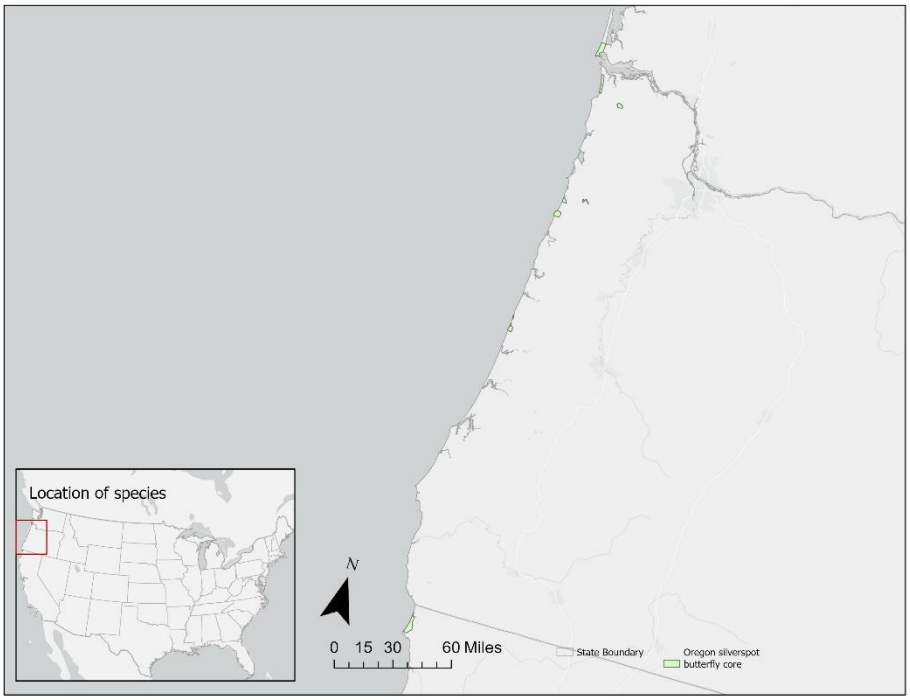

Figure 1. Interim core map for the Oregon silverspot butterfly. The total acreage of the interim core map is approximately 46,054 acres.

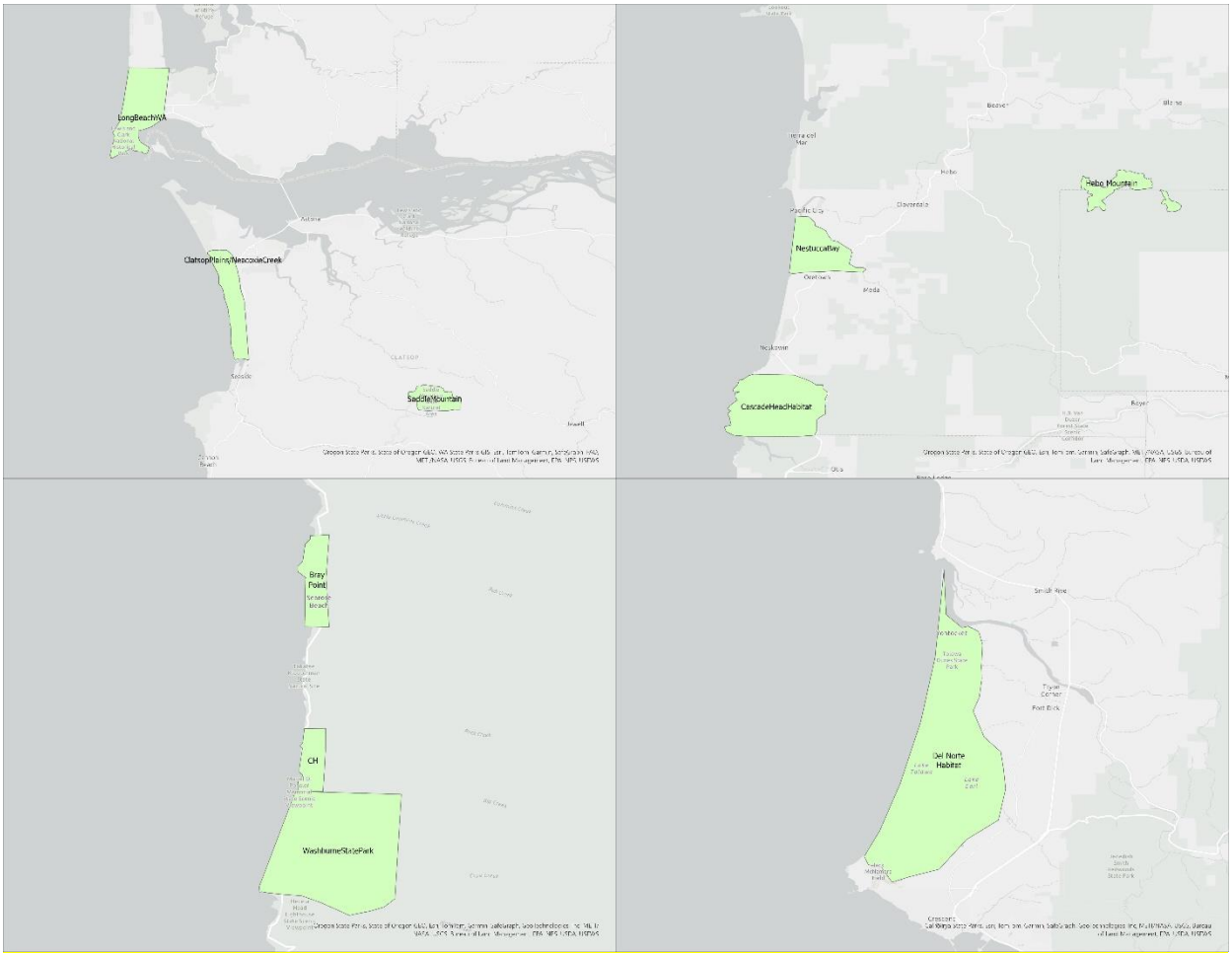

Figure 2. Interim core map for the Oregon silverspot butterfly with site labels. The total acreage of the interim core map is approximately 46,054 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD 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%	35%
Forestry	Evergreen Forest (42)	27%	35%
Forestry	Mixed Forest (43)	8%	35%
Agriculture	Pasture/Hay (81)	1%	1%
Agriculture	Cultivated Crops (82)	0%	1%
Mosquito adulticide, residential	Open space, developed (21)	5%	12%
Mosquito adulticide, residential	Developed, Low intensity (22)	5%	12%
Mosquito adulticide, residential	Developed, Medium intensity (23)	2%	12%
Mosquito adulticide, residential	Developed, High intensity (24)	0%	12%
Invasive species control	Woody Wetlands (90)	8%	52%
Invasive species control	Emergent Herbaceous Wetlands (95)	14%	52%
Invasive species control	Open water (11)	11%	52%
Invasive species control	Grassland/herbaceous (71)	9%	52%
Invasive species control	Scrub/shrub (52)	5%	52%
Invasive species control	Barren land (rock/sand/clay; 31)	5%	52%
	Interim Core Map Acres	~46,054 acres	

Evaluation of Known Location Information

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

- Descriptions of locations provided by FWS in its 2020 Five Year Review;
- Occurrence locations included in iNaturalist;
- Occurrence locations included in the Global Biodiversity Information Facility (GBIF); and
- Occurrence locations included in NatureServe.

EPA evaluated these four sets of data to inform or support the core map. FWS' 2020 Five Year Review and Revised Recovery Plan (2001) contain information about where the species resides. iNaturalist had 71 research grade observations while GBIF's occurrence data had five observations with coordinates that had not been accounted for in iNaturalist but were from 1915-1988. NatureServe occurrence locations lined up with those in iNaturalist and GBIF. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

EPA compiled available information for the Oregon silverspot butterfly from FWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF, and NatureServe). The information compiled for the Oregon silverspot butterfly is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- FWS identified the locations of five extant populations, two experimental populations which together represent all currently living members of this species, as well as two potential reintroduction sites.
- The species critical habitat only encompasses one of the five extant populations described by FWS documentation.
- The FWS range includes a northern area that does not contain a population. The FWS range may encompass Mount Hebo, Cascade Head, Lake Earl, and Rock Creek-Big Creek but does not appear to encompass the Bray Point population. Additionally, range does not include potential reintroduction locations.
- Occurrence data from other sources are generally consistent with the description of the five populations described in FWS documents.

EPA used the compiled information to identify the core map type. EPA compared known location data to the critical habitat and range and found that neither encompassed all populations. Thus, EPA selected biological information to use as the species core map type.

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

Alternative approaches and data not described in this document were not explored in the development of this interim core map.

Appendix 1. Information Compiled for Species

1. **Relevant FWS Documents**
   - 1980 Listing the Oregon Silverspot Butterfly as a Threatened Species with Critical Habitat
   - 2001 Revised Recovery Plan for the Oregon silverspot butterfly
   - 2012 Oregon silverspot butterfly 5-year review
   - 2017 Endangered and Threatened Wildlife and Plants; Establishment of a Nonessential Experimental Population of the Oregon Silverspot Butterfly in Northwestern Oregon
   - 2020 Oregon silverspot butterfly 5-year review

2. **Background information on Species**
   - **Status:** Federally listed as threatened in 1980
   - **Taxonomy**: Terrestrial Invertebrate
   - **Resiliency:**
     - "In 2019, 4 of the 7 populations of Oregon silverspot butterfly had index counts of fewer than 20 individuals, rendering these populations highly susceptible to extirpation which would contribute to the species' overall extinction risk. Isolation of these populations from one another further contributes to their risk of extirpation as opportunities for dispersing individuals to augment small populations or recolonize extirpated populations are reduced." (5-year review 2020, 28)
     - "Extreme weather events, such as the drought of 2014 and 2015, have a profound effect on Oregon silverspot butterfly populations and the frequency of extreme weather events is predicted to increase because of climate change." (5-year review 2020, 29)
   - **Redundancy**
     - "All Oregon silverspot butterfly populations are currently isolated from one another by significant distances and natural genetic exchange is highly unlikely to occur." (5-year review 2020, 12)
   - **Representation**
     - "The Oregon silverspot butterfly is now absent from much of its former range, with the loss of at least 11 historically known populations and approximately half of the northern portion of its historical range, which once extended north to Westport, Washington." (5-year review 2020, 13)
     - There are 5 extant populations and 2 experimental populations (see **Known Locations** below).

   - **Habitat Description**
     - "The Oregon silverspot butterfly occupies three types of early successional, coastally influenced grassland habitat: marine terrace and coastal headland "salt spray" meadows, stabilized dunes, and montane grasslands." (Services 2017, 82 FR 28569)
     - Both the coastal headland "salt spray" meadows and the stabilized sand dunes are strongly influenced by proximity to the ocean, with mild temperatures, high rainfall, and persistent fog. While the montane grassland habitat has colder temperatures, frequent orographic cloud cover, significant snow accumulations, less coastal fog, and no salt spray. (5-year review 2020, 6)
     - "Habitat quality is largely determined by violet densities and the abundance and availability of nectar plants during the flight season. Field studies have demonstrated

that female Oregon silverspot butterflies select areas with high violet densities for egg-laying." (Services 2017, 82 FR 28569)
    - Oregon silverspot butterfly adults are generalists that require nectar from blooming flowers. These habitats include montane/grasslands, marine terraces and headlands, and stabilized dunes, and are typically found in areas that are sheltered from the wind.

- **Relevant Life History Information:**
    - "Central to the life cycle of the Oregon silverspot butterfly is the abundance of the caterpillar host plant, the early blue violet (*Viola adunca*). The female butterfly lays her eggs on the early blue violet, which serves as the nearly exclusive food source for the developing larvae. Field studies have demonstrated that female butterflies select areas with high violet densities for egg-laying." (5-year review 2020, 5)
    - "A single Oregon silverspot butterfly requires 200 to 300 violet leaves to develop from caterpillar to pupa. In the wild, a caterpillar would therefore require a clump of approximately 16 violet plants to complete its development, assuming each violet could provide about 12 to 20 leaves. Based on studies of other butterflies, nectar abundance and quality are also important to adult survival and particularly fecundity." (5-year review 2020, 6)
    - "Studies show females preferentially search for ovipositing sites in areas with vegetation heights of 22 to 25 cm (8.6 to 10 in.). Their habitat must be able to maintain a variety of nectar sources for feeding. Observations suggest that distribution, abundance, and temporal availability of nectar sources may affect the stability of Oregon silverspot butterfly populations." (Revised Recovery Plan 2001, 13)
    - "The Oregon silverspot butterfly has six larval instars and a pupal stage before metamorphosis into the adult. Very little is known about the biology of the caterpillar or pupae. Adult emergence starts in July and extends into September. Many males appear several weeks before most females emerge, as is typical of Speyeria butterflies. Mating usually takes place in relatively sheltered areas." (Revised Recovery Plan 2001, 14)

- **Ecology**
    - "Plants that provide nectar to adult butterflies include, but are not limited to, yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), Pacific aster (*Symphyotrichum chilensis*), Canada goldenrod (*Solidago canadensis*), tansy ragwort (*Senecio jacobaeae*), and edible thistle (*Cirsium edule*)." (5-year review 2020, 6).
    - "Oregon silverspot butterfly caterpillars had limited ability to move long distances in search of their host plant, the early blue violet. Four violets per square meter (m2) (0.37 violets per square foot [ft2]) are needed for 80 percent of fourth instar larvae to find a violet within 8 hours, and 8 violets per m2 (0.74 violets per ft2) are needed for 50 percent of larvae to reach pupation." (5-year review 2020, 17)

- **Essential Physical Biological Features (PBFs) for Designated Critical Habitat**
    - Constituent biological elements essential to the continued existence of the Oregon silverspot butterfly within the Critical Habitat include:
        - Early blue violet (*Viola adunca*), the primary host plant for caterpillars
        - Variety of nectar plants that bloom during the butterfly flight period
        - Grasses and forbs in which the larvae and shelter
        - Trees surrounding occupied meadows which provide shelter for adults" (Service 1980, 45 FR 44938-44939)

- **Relevant Pesticide Use Sites**
  - Direct effects to populations from road kills (collisions with vehicles) and pesticides were noted as threats. (Revised Recovery Plan 2001, 19)

- **Threats**
  - "Butterfly populations can fluctuate dramatically in response to local weather events. Populations are most at risk when unfavorable weather conditions occur in consecutive years." (5-year review 2020, 9)
  - **"**Invasion by exotic species, natural succession, fire suppression, and land development have resulted in loss and modification of the species' habitat. Land use practices have altered disturbance regimes needed to maintain existing habitats and create new habitats for species expansion. Management is needed to maintain sufficient habitat to sustain the species, curtail vegetative succession, and reduce other threats to the species and/or its habitat. Other threats include off-road vehicles, grazing, erosion, roadkill, and pesticides. The Oregon silverspot butterfly is also sought after by butterfly collectors." (Revised Recovery Plan 2001, 6)

- **Relevant Recovery Criteria and Actions (Source: 2001 Revised Recovery Plan)**
  - De-listing criteria include:
    1. At least two viable Oregon silverspot butterfly populations exist in protected habitat in each of the following areas: Coastal Mountains, Cascade Head, and Central Coast in Oregon; and Del Norte County in California; and at least one viable Oregon silverspot butterfly population exists in protected habitat in each of the following areas: Long Beach Peninsula, Washington and Clatsop Plains, Oregon. This includes development of comprehensive management plans.
    2. Habitats are managed long-term to maintain native, early successional grassland communities. Habitat management maintains and enhances early blue violet abundance, provides a minimum of five native nectar species dispersed abundantly throughout the habitat and flowering throughout the entire flight period, and reduces the abundance of invasive non-native plant species.
    3. Managed habitat at each population site supports a minimum viable population of 200 to 500 butterflies for at least 10 years.
  - Actions needed:
    1. Protect habitat
    2. Manage habitat
    3. Monitor populations
    4. Reduce take

3. Description of Species Range

- The current geographic range encompasses the western coast of Oregon and North California.
- **Figure A1-1** depicts the current FWS species range map (last updated on February 2, 2022).
- The range encompasses 243,604 acres.

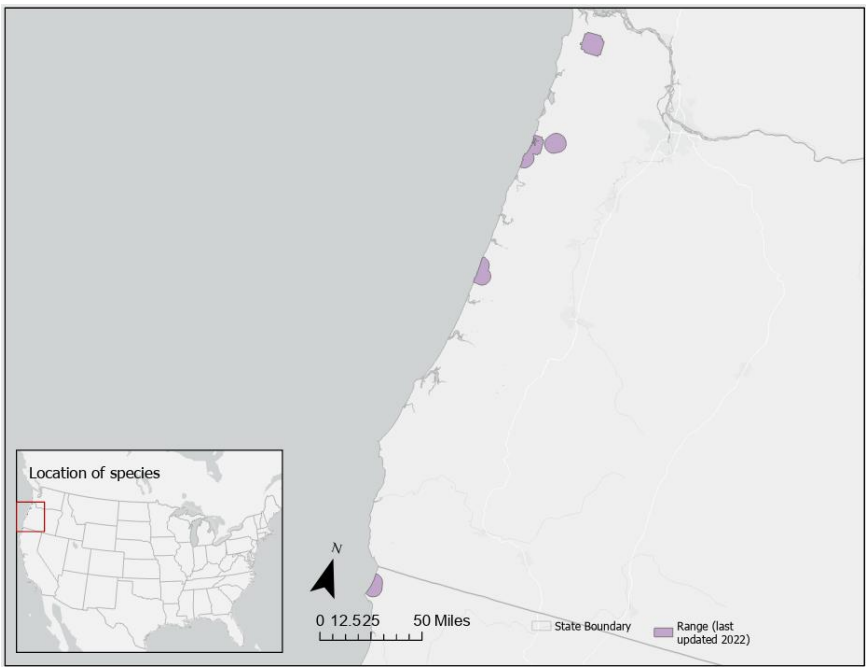

Figure A1-1. Map of the Oregon silverspot butterfly range.

4. **Critical Habitat**
    - The Oregon silverspot butterfly critical habitat was designated in 1980 and contains 368 acres (Service 1980, 45 FR 44935-44939).
    - **Figure A1-2** depicts the current critical habitat.

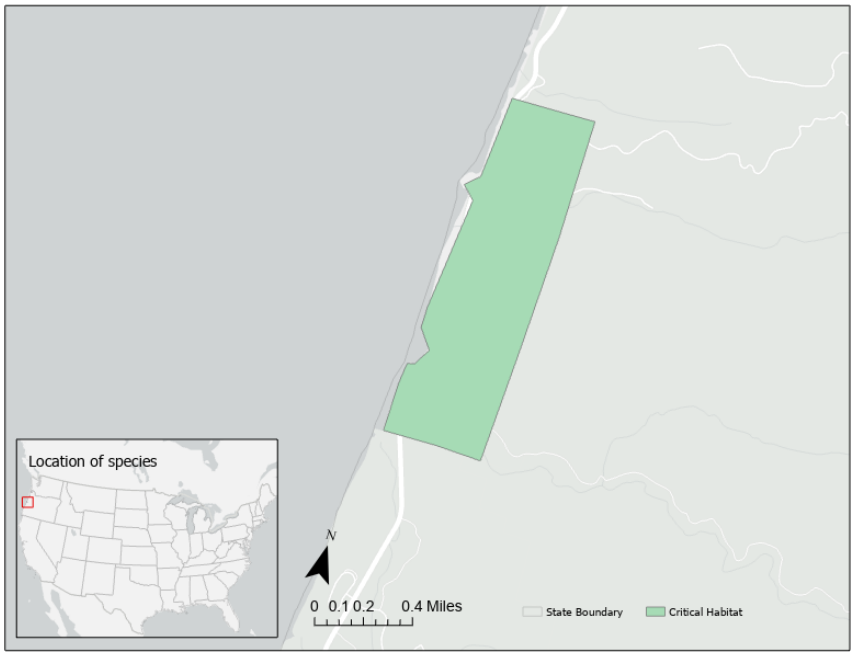

Figure A1-2. Designated critical habitat of the Oregon silverspot butterfly.

5. **Known Locations**
    - There are currently five extant populations and two experimental populations (Figure A1-3 to A1-5).
    - Extant Wild Populations Described in FWS Documents
        - Coastal Mountains Habitat Conservation Area – Mount Hebo
            - "Mount Hebo population is the largest. The Mount Hebo site, a meadow complex of approximately 60 ac (24 ha), differs from most other Oregon silverspot butterfly habitat conservation areas in that it is at an elevation of 3,000 feet [ft] (914 meters [m]) and snow typically covers the meadow areas, often until the early summer months. This may be a factor in preserving the native plant composition of the site compared to the coast sites." (5-year review 2020, 16)
        - Cascade Head Habitat Conservation Area – Cascade Head
            - Owned and managed by The Nature Conservancy (TNC) (5-year review 2020, 17)
        - Central Coast Habitat Conservation Area – Bray Point and Rock Creek-Big Creek
            - The designated critical habitat encompasses the Rock Creek-Big Creek population because at the time of listing, it was thought to be the only viable population. (5-year review 2020, 18)
            - Bray Point is 5 miles south of Rock Creek-Big Creek. (5-year review 2020, 19)
        - Del Norte Habitat Conservation Area – Lake Earl
            - Area extends "from the north side of Lake Earl in Del Norte County northward for about 2.5 mi (4 km) within the coastal dune complex. The northern third of this area, north of Kellogg Road, is entirely within Tolowa Dunes State Park. Butterfly habitat in the southern area, from Kellogg Road south to Lake Earl, occurs on lands in the State's Lake Earl Wildlife Area, the Tolowa Dunes State Park, and some privately owned lots in the Pacific Shores subdivision." (5-year review 2020, 20)
    - Experimental Populations
        - Nestucca Bay National Wildlife Refuge
            - Cannery Hill Unit of the refuge (5-year review 2020, 23)
        - Saddle Mountain State Natural Area
            - "60 ac (24 ha) of meadows on the slopes of Saddle Mountain near its upper peaks at 3,288 ft (1,002 m) above sea-level. Based on plant surveys, the upper meadows contain high-quality butterfly habitat with sufficient densities of violets and native nectar plants." (5-year review 2020, 24)

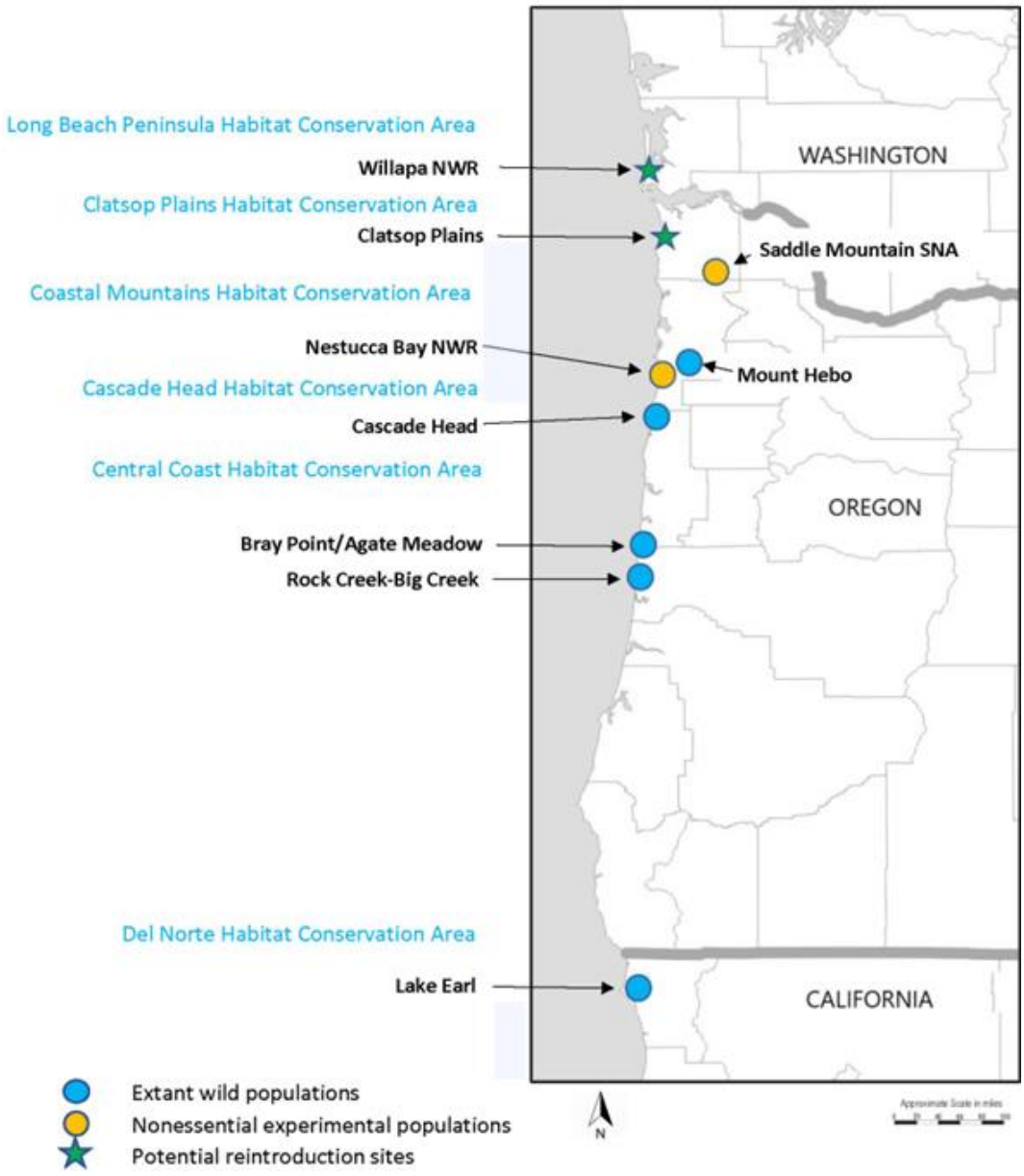

Figure A1-3. Known locations of the Oregon silverspot butterfly. Reproduced from FWS 5-year review (2020).

Habitat Conservation Area	Location	Recovery criteria # pops.	Known # pops	Habitat Acres	Habitat Condition	Pop. Index Count (2019)	Primary Ownership	Current 5-year trend
Long Beach Peninsula, Washington	Southwest Washington	1	0	120	Degraded, restoration in progress	Last observed 1990	Washington Department of Fish and Wildlife, Willapa National Wildlife Refuge, Natural Resource Conservation Service Easement	Likely extirpated
Clatsop Plains, Oregon	Northwest Oregon	1	0	130	Degraded, restoration in progress	Last observed 1998	Private property	Likely extirpated
Saddle Mountain, Oregon	Northwest Oregon	N/A	1	60	Suitable	41*	Oregon Parks and Recreation Department	N/A, new population
Coastal Mountain, Oregon	Mount. Hebo	2	1	65	Suitable	1,171*	Siuslaw National Forest	Increasing with augmentations
Coastal Mountain, Oregon	Fairview Mt.	2	1	4	Too small	0	Siuslaw National Forest	N/A
Cascade Head, Oregon	Oregon Central Coast	2	1	50	Degraded, restoration in progress	12*	The Nature Conservancy, Siuslaw National Forest	Declining
Nestucca Bay NWR, Oregon	Oregon Central Coast	N/A	1	30	6 acres suitable, 25 acres undergoing restoration	17*	U.S. Fish and Wildlife Service	N/A, new population
Central Coast, Oregon	Bray Point, Oregon Central Coast	2	2	6	Degraded, 2-4 acres suitable	2*	Siuslaw National Forest, Private	Declining
Central Coast, Oregon	Rock Creek-Big Creek, Oregon Central Coast	2	2	30	Degraded, restoration in progress	151*	Oregon Parks and Recreation Department, Siuslaw National Forest	Increasing with augmentations
Del Norte (Lake Earl), California	Northwest California	2	1	42[1]	Mix of suitable and degraded, restoration in progress	1	California Department of Fish and Wildlife, California State Parks (few Private)	Declining

*Indicates the populations have been established or augmented with captive-reared individuals that are included in the population index counts if observed.

[1]Habitat area approximate and based primarily on grasslands with early blue violets. Does not include some areas with dispersed nectar plants and few or no violets, and some potential habitat is on private lands and has not been assessed for suitability.

Figure A1-4. Population status of the Oregon silverspot butterfly. Reproduced from FWS 5-year review (2020).

Location	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mt. Hebo	1,334	1,377	3,091	1,489	582	120	461 (597[1])	379 (531[1])	764 (59[1])	1,171 (285[1])
Cascade Head	610 (1017[1])	643 (1089[1])	103	88	87 (89[2])	20 (48[1])	13 (47[1])	9	5	12 (140[2])
Bray Pt./Agate Meadow	140 (1356[1])	204 (560[1])	341 (851[1], 259[2])	133 (672[1])	105 (631[1], 93[2])	3 (477[1])	26 (139[1])	NA	4	2 (171[2])
Rock Creek/Big Creek	426 (665[2])	352	251 (734[1], 259[2])	302 (582[1])	199 (723[1])	158 (301[1])	115 (67[1])	82 (162[1])	45	151 (300[2])
Lake Earl	352	625	491	332	438	264	89	7	4	1
Nestucca Bay NWR								59 (927[2])	21 (105[1])	17 (458[2], 12[3])
Saddle Mt.									27 (545[2])	41 (504[2])
TOTAL	2,862	3,201	4,277	2,344	1,411	565	704	536	870	1,395

Number of captive-reared Oregon silverspot butterflies released as pupae[1], caterpillars [2,] adults[3] per site, by year.

Figure A1-5. Relative abundance of Oregon silverspot butterfly 2010-2019. Reproduced from FWS 5-year review (2020).

- **Occurrences in iNaturalist**
  - Searched on April 18, 2025
  - https://www.inaturalist.org/observations?subview=table&taxon_id=1456665
  - iNaturalist includes 71 research grade observations available from 2016-2024.
  - While these data have a coarse resolution, they appear to align with the current range map and extend beyond the extent of the critical habitat.

- **Occurrences in GBIF**
  - Searched on April 17, 2025
  - There was 1 “human observation” available for this species which had coordinates but is from 1988.
  - There were 4 “preserved specimens” available for this species with coordinates, all of which are from 1915-1931.
  - https://www.gbif.org/occurrence/search?has_coordinate=true&has_geospatial_issue=false&taxon_key=4299418
  - These locations do not match the current range but because all are from 1988 or earlier with coarse resolution.

- **Occurrences in NatureServe**
  - Searched on April 18, 2025
  - https://explorer.natureserve.org/pro/Map/?taxonUniqueId=ELEMENT_GLOBAL.2.114277
  - There are 4 locations mapped from 2003 to 2021.

Appendix 2. GIS Data Review and Method to Develop Core Map (Step 3)

This core map was created based on biological information, including occupied location and descriptions from FWS documentation. EPA used the list of known locations in FWS documents for extant, experimental, and potential reintroduction locations for developing this core map. Each location was refined by on the availability of data describing the location and extent of the individual sites.

1. Dataset References and Software
    - NLCD Land Cover 2021
    - Software used: ArcGIS Pro 3.2
    - FWS Species Range – last updated on November 23, 2020

2. Datasets Used in Core Map Development

All datasets used in core map development are described in EPA's process document.

3. Core Map Development
    - EPA started with known locations found in FWS documentation based on site names and specific details related to locations to refine polygons to the areas where the species is found.
    - Mount Hebo area was refined to only include elevations of 2,600ft or higher due to FWS documentation stating the population occurs at elevations of 3,000ft.
    - Cascade Head was refined by park boundaries.
    - Bray Point was refined by determining the location of Bray point, which is a small point on the Oregon coast and extending out approximately a mile north and south of Bray Point to ensure encompassing species location.
    - Rock Creek-Big Creek locations were refined by including the species critical habitat and Washburne State Park, which includes all known locations in this area per FWS documentation.
    - Del Norte was refined by including described areas of species locations in FWS documentation.
    - Saddle Mountain State Natural Area was refined by only encompassing the natural area. 1
    - Nestucca Bay National Wildlife Refuge was refined by only encompassing the national wildlife refuge and bay area.
    - Willapa National Wildlife Refuge was refined to only include the southern portion of the peninsula.
    - Clatsop Plains Conservation Area was refined based on the species corridor, Neacoxie Creek.

The resulting core map includes Mount Hebo, Cascade Head, Bray Point, Rock Creek-Big Creek, Del Norte, Saddle Mountain State Natural Area, Nestucca Bay National Wildlife Refuge, Willapa National Wildlife Refuge, and Clatsop Plains Conservation Area. These areas are also representative of other occurrence data sources including iNaturalist, GBIF, and NatureServe.