5-YEAR REVIEW

San Bruno elfin butterfly (*Callophrys mossii bayensis*)

GENERAL INFORMATION:

Species: San Bruno elfin butterfly (*Callophrys mossii bayensis*)
Date listed: June 1, 1976
Federal Register (FR) citation: 41 FR 22041
Classification: Endangered

State Listing:
Not listed. Currently, there are no insects listed as threatened or endangered under the California Endangered Species Act.

BACKGROUND:

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2010. San Bruno elfin butterfly (*Callophrys mossii bayensis*) and mission blue butterfly (*Icaricia icarioides missionensis*) 5-year review: summary and evaluation. Sacramento, California. 39 pp.

We did not recommend a status change in the 2010 status review.

FR Notice citation announcing this status review:

[Service] U.S. Fish and Wildlife Service. 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 66 species in California and Nevada. Federal Register 85:4692–4694.

We did not receive any information from the public regarding San Bruno elfin butterfly.

ASSESSMENT:

Information acquired since the last status review:

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Sacramento Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on January 27, 2020 (Service 2020). We used personal communications with species experts, obtained data from partners, and reviewed information from our own files, much of which was compiled during a recent recovery plan amendment for the species. The recovery plan amendment included quantitative criteria regarding downlisting and delisting the species (Service 2019).

Since the last 5-year review, new species' information has become available, which is described below. Site specific monitoring efforts are discussed in **Distribution and abundance** and summarized in Appendix A.

Host plant monitoring and planting

Inflorescence counts for San Bruno elfin butterfly's host plant (Pacific stonecrop, *Sedum spathulifolium*; hereafter stonecrop*)* have been conducted at Milagra Ridge since 2009 and show high variability in the number of inflorescences (from 41 in 2016 to 2,749 in 2012). However,

environmental correlates of inflorescence counts remain unclear. The importance of stonecrop inflorescences per se has come into question based on observations of larvae on other parts of the plant, especially the leaves, in the Milagra and San Bruno Mountain populations (Ormshaw 2018, pp. 37–41; Harris and Crooker 2019, pp. 9–11). Although there is a positive relationship between the number of San Bruno elfin butterfly larvae and stonecrop inflorescences, the persistence of San Bruno elfin butterflies across years with low inflorescence counts, combined with observations on other parts of the plant, suggests that larvae may get adequate nutrition from stonecrop leaves (Harris and Crooker 2019, pp. 12, 18–19). We note that Coast Ridge Ecology (2019, p. 8) described larval feeding damage in the San Francisco Peninsula Watershed as flowers/buds that are partially or completely eaten, while stalks and leaves are left relatively intact. It is not clear if larval feeding varies across locations or based on flowering stage or larval instar (developmental stage of larvae), or if variation in survey protocols might influence observations and descriptions of feeding damage.

Based on the importance of stonecrop for San Bruno elfin butterfly, and because stonecrop cover was observed to decline in 2016 relative to 2014, planting seedlings was initiated. Immature stonecrop were planted at Milagra Ridge monitoring points in 2016, 2017, and 2019 (Harris and Crooker 2019, p. 21), and continued comparisons between San Bruno elfin abundance and host plant abundance may aid in determining future recovery recommendations.

Land protection

The previous status review included a recommendation to protect San Bruno elfin habitat in perpetuity on properties near Montara Mountain (Service 2010, p. 29). Spatial data from the California Protected Areas Database now shows that most land containing San Bruno elfin butterfly habitat in the Montara Mountain area is protected (Figure 1). Rancho Corral de Tierra became part of the Golden Gate National Recreation Area in 2011 (National Park Service 2011), although habitat for the species extends north of the Golden Gate National Recreation Area property boundary onto private property (Service 2019, p. 5).

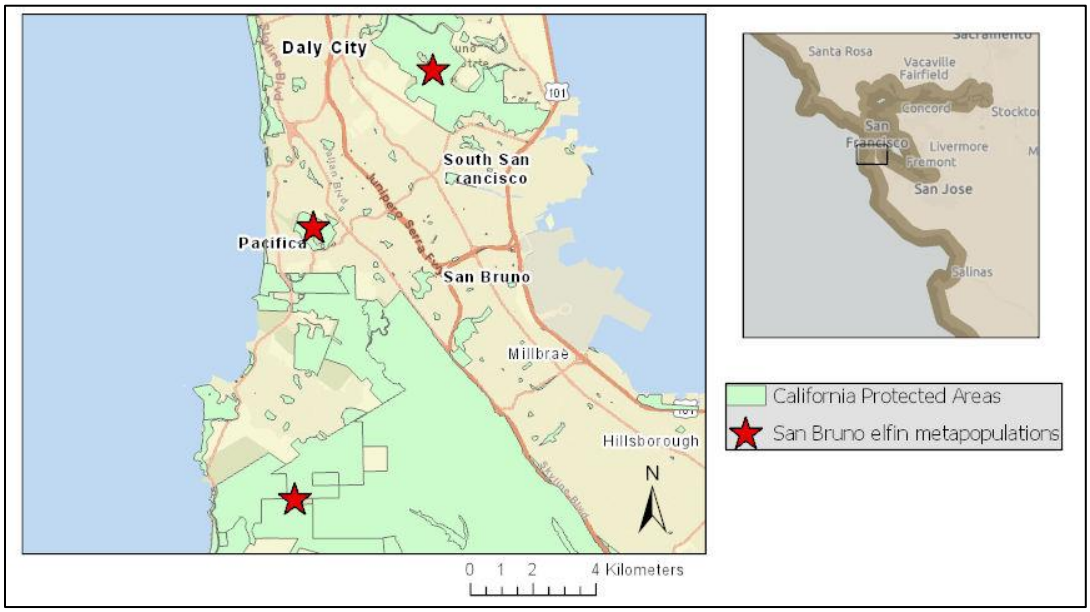

Figure 1. San Bruno elfin butterfly metapopulations and protected lands. Metapopulation locations are approximate to protect sensitive habitat. Protected areas are from the California Protected Areas Database (California Protected Areas Database 2018).

Distribution and abundance:

The current distribution of San Bruno elfin butterfly is the same as described in the recovery plan amendment (Service 2019, p. 3), the previous 5-year review (Service 2010, pp. 6–7), and the final listing rule (Service 1976, p. 22042). The San Bruno elfin butterfly is restricted to San Mateo County. Metapopulations occur on San Bruno Mountain, Milagra Ridge, and the Montara Mountain region. The original recovery plan refers to colonies in the Montara Mountain area at Whiting Ridge and Peak Ridge (Service 1984, p. 3). The Montara Mountain region is now known to include colonies along the Bay Ridge Trail in the San Francisco Peninsula Watershed (Arnold 2007, p. 7) and in Rancho Corral de Tierra (Bennett and Russo 2016, p. 5).

Annual or biennial monitoring surveys occur throughout the range of the San Bruno elfin butterfly. Since the last 5 year review, we received additional monitoring reports from San Mateo County Parks, the Golden Gate National Parks Conservancy (Parks Conservancy), the Golden Gate National Recreation Area, and the San Francisco Public Utilities Commission. The results indicate the species is still present at previously known populations, including San Bruno Mountain, Milagra Ridge, and Montara Mountain.

Monitoring at the various sites highlighted variability in survey protocols across sites and years which makes it difficult to establish trends in abundance. For example, the monitoring protocol at Milagra Ridge calls for approximately weekly censusing (every 7 to 11 days) of open host plant inflorescences for San Bruno elfin butterfly larvae (Harris and Crooker 2019, p. 8), while monitoring at San Bruno Mountain occurred biweekly and included counts of other parts of the host plant (including stems, leaves, and the insides of rosettes) (Ormshaw 2018, p. 39). Also at San Bruno Mountain, larvae in early instar stages were included in counts in 2018, while in previous years it is likely that only later instar larvae were included (Ormshaw 2018, pp. 39–41). It is likely that counting larvae on all parts of the plant (as well as on other plants and substrates) leads to counting the same individuals in different instars over time (Harris and Crooker 2019, p. 12). More observations of San Bruno elfin butterfly larvae "off-transect" than when using protocol methodology in at least some years led the Parks Conservancy to call for cross-partner collaboration to identify and implement a consistent and robust monitoring protocol for San Bruno elfin butterflies and their host plants (Kwan 2017, pp. 12, 24; Harris and Crooker 2019, p. 15).

Additional information on site-specific monitoring, including survey methodology and abundance counts, is included in Appendix A.

Threats:

At the time of listing, the primary threat to the San Bruno elfin butterfly was destruction of habitat through private development (Service 1976, p. 22042). Although no longer considered an imminent threat because most habitat is on publicly protected lands, development is still a threat on habitat that is privately owned. In Service (2010, p. 14), habitat degradation via public infrastructure projects was considered the most serious threat. Additional threats identified in the previous status review include: habitat loss due to succession; poaching; parasitism and predation of larvae; small population size; native and exotic plant invasions; and climate change (Service 2010, pp. 13–24). Additional threats noted in the recovery plan amendment include: pesticide use; and, accidental damage to the habitat during population monitoring (Service 2019, p. 5). Previous monitors and reports noted the importance of minimizing disturbance of host plant habitat (and treading carefully) throughout survey areas since San Bruno elfin larvae have been

detected on other surfaces and plants other than stonecrop (Bennett and Russo 2016, p. 10; Arechiga pers. comm. 2018; Harris and Crooker 2019, p. 23). There is no indication that the status of threats to the species has significantly changed since the recovery plan amendment (Service 2019, pp. 4–5).

Recovery criteria:

The recovery plan amendment included quantitative downlisting and delisting criteria for the San Bruno elfin butterfly (Service 2019, pp. 6–9); this amendment addresses the recommendation in the previous status review to develop measurable recovery criteria for the species (Service 2010, p. 29). Downlisting criteria relate to: habitat management, including maintenance of habitat that includes a diversity of nectar plants and the larval host plant, and to control threats; minimum numbers of colonies in metapopulations at San Bruno Mountain, Milagra Ridge, and the Montara Mountain region, with stable or increasing population trends averaging at least 30 adults in each metapopulation for at least 10 years; and a stable or increasing areal extent of habitat patches over this same time period. Surveys at San Bruno Mountain have documented larval numbers at 8 colonies over 14 years, suggesting a stable or positive trend, but at this time it is difficult to translate larval counts to adult population estimates. Moreover, quantitative data on areal extent of habitat at this site is not available. Therefore, downlisting criteria for the San Bruno elfin butterfly have not been met. Because downlisting criteria have not been met, delisting criteria are not considered here.

Conclusion:

After reviewing the best available scientific information, we conclude that San Bruno elfin butterfly remains an endangered species. Although the species distribution has remained consistent since listing, variability in survey protocols across sites and years makes it difficult to assess population trends, and information about areal extent of habitat is not available. We acknowledge that future results of range-wide monitoring may indicate a potential change in status for the San Bruno elfin butterfly and provide recommendations below that could help facilitate a stronger assessment for our next status review.

RECOMMENDATIONS FOR FUTURE ACTIONS:

The following recommendations incorporate those from the previous 5-year review, recovery plan amendment, various monitoring reports, and communication with species experts:

1. *Develop an action plan relative to the updated recovery criteria and coordinate with partners regarding implementation*. This may involve updating the step-down outline, narrative, and implementation schedule from the Recovery Plan (Service 1984, pp. 46–62, 67–74) to incorporate amended recovery criteria, and may take the form of a Recovery Implementation Strategy. This document would likely integrate recommendations from this status review; the process would likely reveal additional recommendations.

2. *Coordinate among habitat managers and regulatory agencies to establish recommended San Bruno elfin butterfly monitoring protocols.* Concern about damage to host plants and habitat should be considered when determining monitoring activities and frequency.

3. *Investigate biology of San Bruno elfin butterflies to guide population estimates and monitoring protocols.* Studies on oviposition rates and larval survival, or a meta-

analysis/review of data from similar species, could help determine how to estimate adult populations from larvae monitoring. Measuring the size of larvae can help in determining their stage of development, assessing if larvae are occupying different parts of the host plant based on their sizes, and analyzing monitoring trends if surveys detect multiple instars. Research on phenology of the species, and host plant use by larvae, could help guide monitoring recommendations. Investigating correlations and trends between climate, host plant stage, and San Bruno elfin butterfly larvae could aid with understanding the role of climate change as a threat to the species, and/or point to adaptive foraging by San Bruno elfin larvae.

4. *Coordinate with partners to develop a consistent monitoring protocol to document size and trends in host plant cover.* Documenting areal extent of habitat patches is an important step towards being able to assess these data in comparison to recovery criteria. Continue outplantings of stonecrop when appropriate to increase host plant abundance.

5. *Search for larvae at additional documented stonecrop occurrences across the range to determine San Bruno elfin butterfly presence.* Increased understanding of San Bruno elfin butterfly larvae habitat use, including host plant leaves, can guide searches for additional occupied patches.

Field Supervisor, Sacramento Fish and Wildlife Service

Approve MICHAEL FRIS Digitally signed by MICHAEL FRIS Date: 2021.04.13 14:57:44 -07'00' Date _____

LITERATURE CITED:

Arechiga, R. 2016. San Bruno Mountain Habitat Conservation Plan year 2016 activities report for federally listed species and habitat management, Endangered Species Permit PRT-2-9818. Prepared by San Mateo County Parks Department for United States Fish and Wildlife Service. 72 pp.

Arnold, R. 2007. Monitoring report for the endangered San Bruno Elfin and Mission Blue butterflies at the Bay Area Ridge Trail project site in the San Francisco Peninsula Watershed. Prepared for the San Francisco Public Utilities Commission.

Bennett, S., and I. Russo 2016. 2016 San Bruno elfin butterfly survey: Montara Mountain—Rancho Corral de Tierra. Unpublished memo prepared by the Golden Gate National Recreation Area.

Coast Ridge Ecology, LLC. 2019. 2018 monitoring report for the endangered mission blue butterfly and San Bruno elfin butterfly within the San Francisco Peninsula Watershed. Unpublished report prepared for the San Francisco Public Utilities Commission. 97 pp.

Coast Ridge Ecology, LLC. 2020. 2019 monitoring report for the endangered mission blue butterfly and San Bruno elfin butterfly within the San Francisco Peninsula Watershed. Unpublished report prepared for the San Francisco Public Utilities Commission. 97 pp.

Cole, E. 2020. San Bruno Mountain Habitat Conservation Plan year 2019-20 activities report for federally listed species endangered species 10(a)1(B) permit TE215574-6. Submitted to U. S. Fish and Wildlife Service, Sacramento, CA. 247 pp.

County of San Mateo. 2007. San Bruno Mountain Habitat Conservation Plan year 2006 activities report for Endangered Species Permit PRT-2-9818. Submitted to the United States Fish and Wildlife Service. 68 pp.

Correa, S., R. Kwan, and C. Crooker. 2017. 2017 San Bruno elfin butterfly survey, Milagra Ridge. Unpublished report prepared by the Golden Gate National Parks Conservancy. 25 pp.

Harris, M., and C. Crooker 2019. 2019 San Bruno elfin butterfly survey, Milagra Ridge. Unpublished report prepared by the Golden Gate National Parks Conservancy. 31 pp.

Kwan, R. 2017. Final report: 2016 San Bruno elfin butterfly survey, Milagra Ridge. Unpublished report prepared by the Golden Gate National Parks Conservancy. 29 pp.

Lease, A., C. Crooker, and P. Nicholson. 2018. 2018 San Bruno elfin butterfly survey, Milagra Ridge. Unpublished report prepared by the Golden Gate National Parks Conservancy. 25 pp.

National Park Service. 2011. Rancho Corral de Tierra transferred to Golden Gate National Recreation Area. News release available online at http://www.nps/gov/goga/learn/news/rancho-release.htm. Accessed March 10, 2020.

Ormshaw, H. 2018. San Bruno Mountain Habitat Conservation Plan year 2017-18 activities report for federally listed species endangered species 10(a)1(B) permit TE215574-6. Submitted to U. S. Fish and Wildlife Service, Sacramento, CA. 98 pp.

[Service] U.S. Fish and Wildlife Service. 1976. Endangered and Threatened Wildlife and Plants; Determination that six species of butterflies are endangered species. Federal Register: 22041-22044.

[Service] U.S. Fish and Wildlife Service. 1984. Recovery plan for the San Bruno elfin and mission blue butterflies. U.S. Fish and Wildlife Service, Portland, Oregon. 81 pp.

[Service] U.S. Fish and Wildlife Service. 2010. San Bruno elfin butterfly (*Callophrys mossii bayensis*) and mission blue butterfly (*Icaricia icarioides missionensis*) 5-year review: summary and evaluation. Sacramento, California. 39 pp.

[Service] U.S. Fish and Wildlife Service. 2019. Recovery plan amendment; Recovery Plan for San Bruno Elfin Butterfly (*Callophyrs mossii bayensis*) and Mission Blue Butterfly (*Icaricia icariodes missionensis*). Sacramento Field Office, Sacramento, CA.25 pp.

[Service] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 66 Species in California and Nevada. Federal Register 85:4692-4694.

TRA Environmental Sciences. 2008. San Bruno Mountain Habitat Management Plan. Prepared in September 2007 in support of the San Bruno Mountain Habitat Conservation Plan, revised March 2008.

TRA Environmental Sciences. 2009. San Bruno Mountain Habitat Conservation Plan year 2008 activities report for special-status species, Endangered Species Permit PRT-2-9818. Prepared by TRA Environmental Sciences for the County of San Mateo. 33 pp.

TRA Environmental Sciences. 2012. San Bruno Mountain Habitat Conservation Plan year 2012 activities report for special-status species, Endangered Species Permit PRT-2-9818. Prepared by TRA Environmental Sciences for San Mateo County Parks Department. 30 pp.

TRA Environmental Sciences. 2014. San Bruno Mountain Habitat Conservation Plan year 2014 activities report for federally listed species, Endangered Species Permit PRT-2-9818. Prepared by TRA Environmental Sciences for San Mateo County Parks Department. 21 pp.

In litteris **Communication:**

Ormshaw, H. 2020. Compiled survey data for San Bruno elfin butterfly monitoring at San Bruno Mountain fixed survey points. Excel spreadsheet titled "SBM_ElfinLarvaeObservations_1999 to Present" received by Samantha Lantz, Sacramento Fish and Wildlife Office, on February 26, 2020.

Personal Communications:

Arechiga, R. 2018. Natural Resource Manager, San Mateo County Parks and Rec. Phone calls with Samantha Lantz, Sacramento Fish and Wildlife Office. July 23 and August 22, 2018.

APPENDIX A

San Bruno Mountain

Monitoring at San Bruno Mountain continues to occur biennially, focusing on 8 point counts known to include the host plant for the species and monitored since 2001, as described in the Habitat Management Plan for the site (TRA Environmental Sciences 2008, p. VIII-2). Although the monitoring protocol calls for three rounds of surveys, the number of surveys has varied over the years from 0 to 3 at each of the 8 points. Abundances during each round of surveying by transect are shown in Figure A1. Total and peak counts, summed across the 8 points, are shown in Figure A2. Note that in 2018 survey methodology differed from previous years: surveys were performed biweekly instead of weekly in order to capture a greater span of the larval phenology; all parts of the hostplant were searched instead of just the inflorescence; and larvae were also recorded in 1st and 2nd instar stages instead of just 3rd and 4th instars (Ormshaw 2018, pp. 39–40). Monitoring in 2020 mostly followed the 2018 protocol, but started later than in previous years because of county-wide shelter-in-place orders due to Covid-19 (Cole 2020, p. 39).

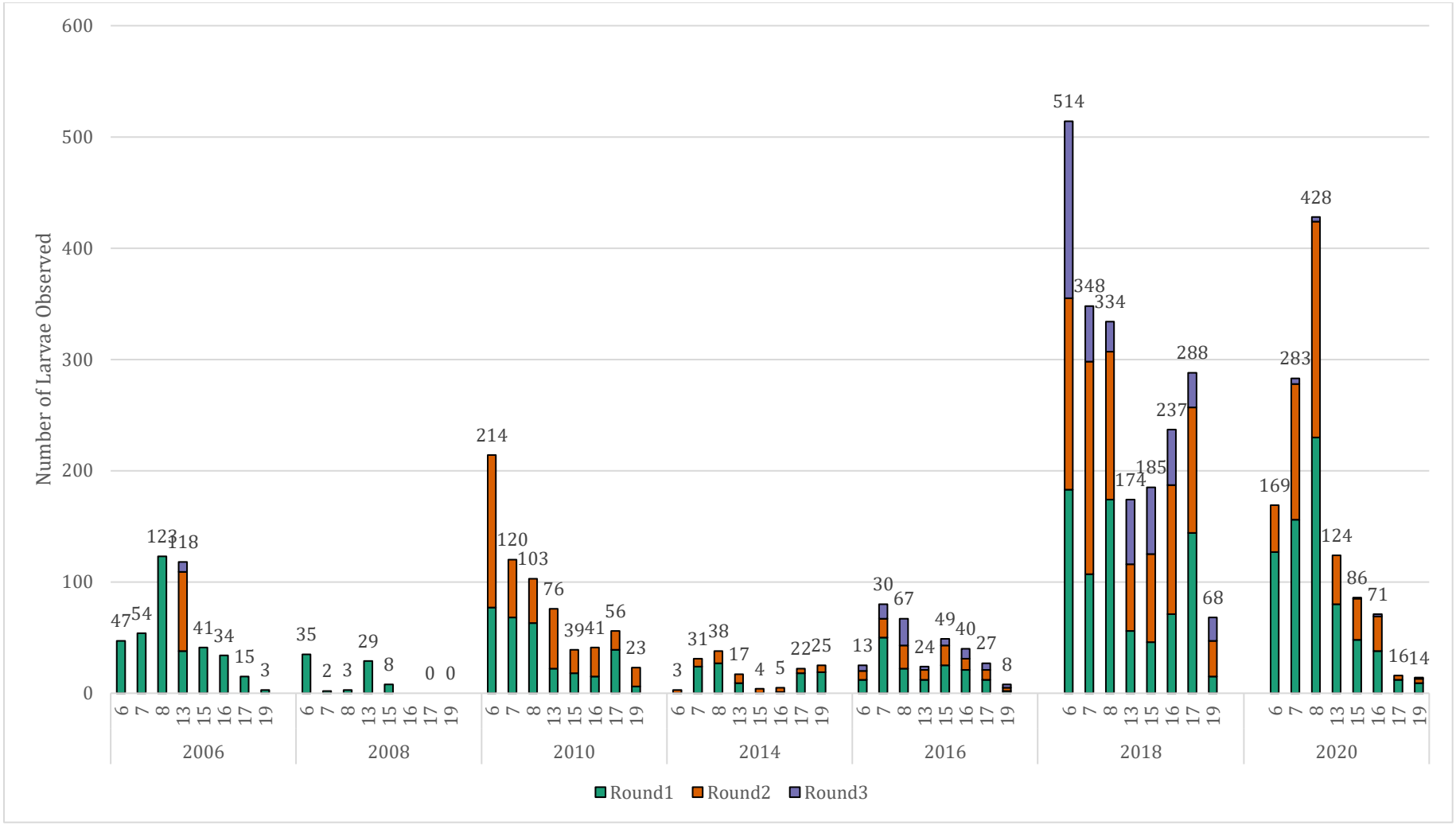

Figure A1. Larval counts during biennial surveys from 2006 to 2020 at San Bruno Mountain at 8 fixed survey points. Data include totals summed across all survey rounds (range 0-3), and the high count for each point across all survey rounds. Note that the large increase in observations beginning in 2018 may be part an artifact of survey methodology, and that surveys started later than normal in 2020. Data from San Bruno Mountain annual reports from 2006, 2008, 2010, 2014, 2016, 2018, and 2020 and compiled survey data (Ormshaw in litt. 2020). Surveys for San Bruno elfin butterfly were not conducted in 2012, as noted in the report.

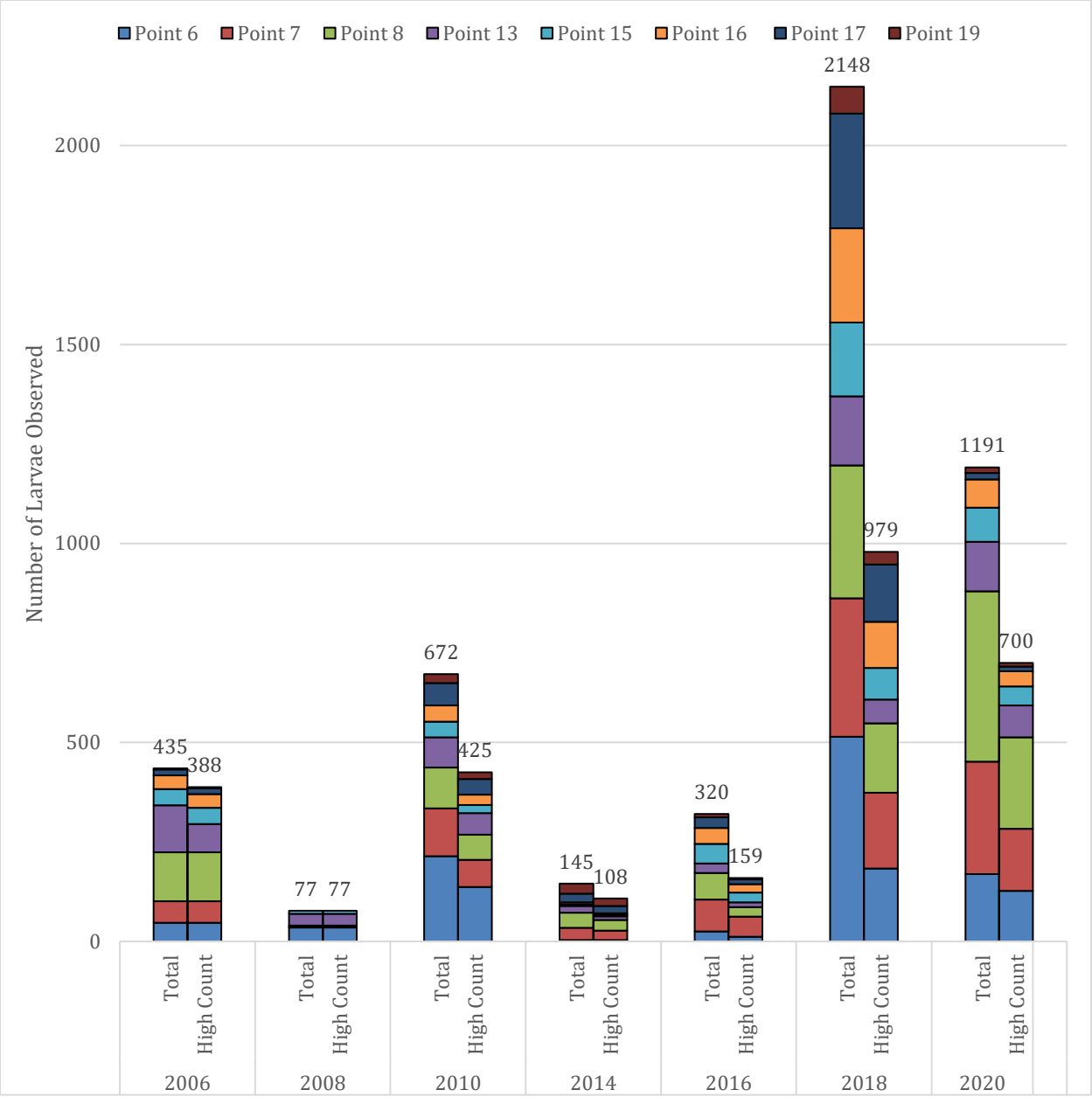

Figure A2. Summed and high larval counts across 8 survey points at San Bruno Mountain from 2006 to 2018. Total counts include counts summed across from 0 to 3 survey rounds. High larval counts are the high count across any of the survey rounds added together at each point. Data from San Bruno Mountain annual reports from 2006, 2008, 2010, 2014, 2016, 2018, and 2020 and compiled survey data (Ormshaw in litt. 2020). Surveys for San Bruno elfin butterfly were not conducted in 2012, as noted in the report.

Milagra Ridge

From 0 to 58 larvae have been observed on-transect between 1999 and 2019 (Figure A3). Although on-transect larval counts at Milagra Ridge fluctuate widely, this could be in part associated with survey methodology. For example, although no larvae were observed on-transect in 2016, 9 larvae were observed "off-transect", and as such, were not counted in surveys according to protocol methodology (Kwan 2017, p. 10). Although survey methodology calls for larval counts on host plant inflorescences, larvae have also been observed on other parts of the host plants, other species (e.g., big quaking grass, *Briza maxima*), and other aspects of habitat (e.g., rocks) (Kwan 2017, p. 10). Actively searching for larvae both on- and off-transect located larvae at all four monitoring points in 2019, and although on-transect surveys led to observations of only six larvae, 117 larvae were observed off-transect (Harris and Crooker 2019, p. 14). Two survey points (5 and 6) were discontinued in approximately 2010 and 2011; however, the 2019 monitoring report mentions that it may be worth revisiting these points and surveying parts of the host plant other than open inflorescences (Harris and Crooker 2019, p. 23).

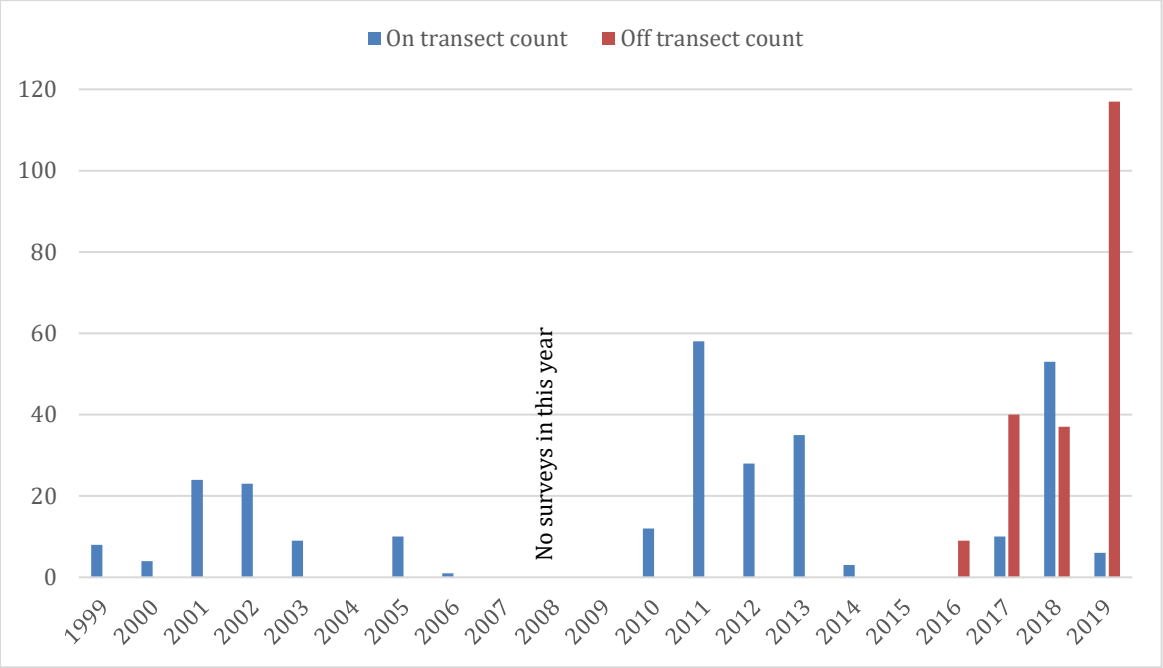

Figure A3. San Bruno elfin butterfly larval counts from 1999 to 2019. No surveys were conducted in 2008, but other years with no on-transect count data indicate a count of 0. Larvae were observed off-transect in 2016, and in 2017, surveys started to include both on- and off-transect counts. Data for on-transect surveys are from Harris and Crooker (2019), and for off-transect surveys are from annual reports from 2016 through 2019.

Montara Mountain

San Bruno elfin butterfly in the Montara Mountain area occur in Rancho Corral de Tierra, managed by the Golden Gate National Recreation Area, and the San Francisco Peninsula Watershed, managed by the San Francisco Public Utilities Commission.

Rancho Corral de Tierra

We received one memo for Rancho Corral de Tierra including survey information from 2012 through 2016. Surveys at this site have occurred opportunistically since 2012, with varying numbers of survey days and surveyors across years. Known habitat at the site is generally steep, in some cases consisting of a nearly vertical wall. Monitoring consisted of larval counts on host plants. Prior to 2016, monitoring was concentrated in two patches; in 2016, the monitoring search area was expanded to include additional habitat likely to support the species (based on host plant presence), but most patches were searched without detection of San Bruno elfin butterfly larvae. Survey counts varied from 5 to 29 larvae between 2012 and 2015; in 2016 only 3 larvae were detected despite the inclusion of additional sites. Despite the low numbers detected in 2016, the report cautions that low numbers may be influenced by phenology of the species, in particular if the survey period missed the peak season (Bennett and Russo 2016, pp. 2–5, 10).

San Francisco Peninsula Watershed

Monitoring of San Bruno elfin butterfly in the San Francisco Peninsula Watershed has occurred annually since 2001 (except for 2002). Surveys at Whiting Ridge Road and Fifield Ridge Road occur for eggs, larvae, and adult San Bruno elfin butterflies at five sites (although one of these sites has not had the host plant detected since at least prior to the previous status review for this species; Arnold 2007, p. 7), and additional occupancy surveys at other known host plant locations were initiated in 2012. No other Lycaneid butterfly species (the family including San Bruno elfin butterfly) are known to use stonecrop as a host plant, so all eggs observed on the host plant are assumed to be San Bruno elfin butterfly eggs (Coast Ridge Ecology 2020, p. 8).

Various biologists and companies have performed surveys at this site, and the company performing surveys changed in 2017 relative to previous years. Although methods remained similar to previous years, there were decreased observations (particularly of adults and eggs) in comparison to previous years, which may be in part due to survey timing and/or weather. Surveys in 2017 were initiated too late for the adult and egg stages, and no larvae were observed (although feeding damage consistent with San Bruno elfin butterfly larvae was noted) (Coast Ridge Ecology 2018, p. 9). Surveys may have been initiated late in the flight season for adults in 2018 (Coast Ridge Ecology 2019, pp. 9–10), and lack of adult/egg observations in 2019 was postulated to relate to weather patterns causing an early emergence in that year (Coast Ridge Ecology 2020, p. 10). At this time, it is unclear if the decrease in San Bruno elfin butterfly observations at the San Francisco Peninsula Watershed across years is a population trend or an artifact of survey methodology.

Watershed-wide host plant surveys found one new host plant location in 2019, but one host plant location surveyed in previous years did not have the host plant in 2019. Three of the 11 patches with the host plant are inaccessible because of dense scrub surrounding rocky “islands,” and were not surveyed in 2019 or in previous years. Occupancy surveys of these patches found San Bruno elfin butterfly life stages at 6 of 8 accessible host plant sites in 2018 and in 3 of 8

accessible sites in 2019 (Coast Ridge Ecology 2019, p. 11; Coast Ridge Ecology 2020, pp. 11–12).