PETITION TO LIST THE UNSILVERED FRITILLARY *(Speyeria adiaste)* UNDER THE U.S. ENDANGERED SPECIES ACT

Photo © Jeffrey Pippen

Petition Submitted to the U.S. Secretary of Interior
Acting through the U.S. Fish and Wildlife Service

Petitioner:
WildEarth Guardians
312 Montezuma Ave.
Santa Fe, New Mexico 87501
(505) 988-9126

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WILDEARTH GUARDIANS
A FORCE FOR NATURE

Executive Summary

The Unsilvered Fritillary (*Speyeria adiaste*) is a medium-sized brush-footed butterfly whose historic range was limited to coastal California. This lovely fritillary has vanished from much of that range due to human activities. One of the Unsilvered Fritillary's three subspecies is extinct (*S.a. atossa*), its nominate subspecies has been and is declining (*S.a. adiaste*), and its third subspecies faces multiple threats within its limited range (*S.a. clemencei*). With extinction of one subspecies and decline of another, the full species faces extinction or endangerment across a significant portion of its range. It therefore qualifies for Endangered Species Act (ESA) listing. However, when presented with an opportunity to list the *adiaste* subspecies in 1991, the U.S. Fish and Wildlife Service (FWS) refused to give this subspecies a helping hand. Petitioners renew the request for protection of the *adiaste* subspecies and broaden that request to include the entire species.

The Unsilvered Fritillary faces a multitude of threats within its narrow range, including habitat loss and degradation due to burgeoning human populations, with resultant urban and suburban sprawl, increasing crop agriculture, extensive livestock agriculture, off-road vehicle use and other adverse land uses. Climate change has taken and will take its toll, through altered fire regimes, more severe and frequent droughts, and shifts in native plant distribution. The intersections of these threats further magnify dangers to this species. In short, the ecosystem upon which this lovely butterfly depends is crumbling.

Other *Speyeria* species have already been listed by FWS. One, the Behren's Silverspot Butterfly (*S. zerene behrensii*), existed at only one location at the time it was granted federal protection. Such a situation creates emergency-room conditions where the costs of recovery are even greater than if protection were offered earlier. Moreover, delayed intervention renders the chances of recovery far too slim. It is vital to provide federal protection for the Unsilvered Fritillary before it declines further to ensure that this vibrant part of California's and the nation's natural heritage is not squandered.

WildEarth Guardians therefore petitions FWS to list the Unsilvered Fritillary under the ESA and provide it with critical habitat.

Introduction

The Unsilvered Fritillary (*Speyeria adiaste*) has vanished throughout much of its range in the Central Coast region of California. There are three subspecies of this butterfly, one of which is considered extinct, and another of which was previously petitioned for federal protection by scientists in 1991. The other subspecies faces multiple threats within its limited range. In 1994, the U.S. Fish and Wildlife Service (FWS) rejected the 1991 petition to list the *adiaste* subspecies of Unsilvered Fritillary by arguing that not enough was known about the butterfly's status.[1] FWS wrote:

> Although the unsilvered fritillary butterfly may be declining, existing information is not available to estimate the extent or rate of changes in habitat or population levels. Further surveys are needed to adequately assess its distribution and population status.[2]

In the 16 years since this decision, FWS appears to have not taken any steps to ensure that this subspecies (or the full species) does not go extinct. Indeed, the extinction of the *atossa* subspecies and FWS's acknowledgment that the *adiaste* subspecies "may be declining" should compel FWS to examine the status of the full species for Endangered Species Act (ESA) listing.

The sensitivity of *Speyeria* species to environmental disturbances has long been reported by scientists. Hammond and McCorkle (1983: 218)[3] write,

> The fritillary butterflies of the genus *Speyeria* and their larval food-plants, violets (*Viola*), are among the most sensitive organisms in native ecosystems, and are among the first to be exterminated as a result of widespread human disturbance.

Indeed, as this petition demonstrates, the habitat of the Unsilvered Fritillary is threatened by a number of anthropogenic activities and causes. Without federal intervention, another of the surviving subspecies could go extinct, and the species as a whole will edge closer to extinction.

WildEarth Guardians seeks listing of the Unsilvered Fritillary under the ESA in order to give this rare, fragile creature its best chance of survival. Over 99% of the species listed under the ESA still exist.[4] The ESA is the Unsilvered Fritillary's best hedge against extinction.

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[1]See U.S. Fish and Wildlife Service (FWS). 1994. Notice of petition findings. Published in the Federal Register on November 22, 1994. [Attachment 1]
[2]*Id*.
[3]Hammond, P.C., and D.V. McCorkle. 1983. The decline and extinction of Speyeria populations resulting from human environmental disturbances (Nymphalidae: Argynninae). The Journal of Research on the Lepidoptera 22(4): 217-224. [Attachment 2]
[4]Compare the number of species currently listed under the ESA (1321) with the species that have been delisted due to extinction (9). *See* **http://www.fws.gov/endangered/wildlife.html** [Accessed November 2009].

Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the Unsilvered Fritillary as an Endangered or Threatened species are:

> 424.02(e) "*Endangered species* means a species that is in danger of extinction throughout all or a significant portion of its range."…(k) "species" includes any species or subspecies that interbreeds when mature. *See also* 16 U.S.C § 1532(6).
>
> (m) "*Threatened species* means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." *See also* 16 U.S.C § 1532(20).

ESA Section 4 (16 U.S.C. § 1533(a)(1)) sets forth listing factors under which a species can qualify for ESA protection (see also 50 C.F.R. § 424.11(c)):

A. The present or threatened destruction, modification, or curtailment of habitat or range;
B. Overutilization for commercial, recreational, scientific, or educational purposes;
C. Disease or predation;
D. The inadequacy of existing regulatory mechanisms; and
E. Other natural or manmade factors affecting its continued existence.

All factors set forth in 50 C.F.R. § 424.11(c) and in ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the historic and continued decline of the Unsilvered Fritillary and are causing the species to face extinction or endangerment in the foreseeable future. A taxon needs to meet only one of the listing factors outlined in the ESA to qualify for federal listing.

Classification and Nomenclature

Common Name. *Speyeria adiaste* is known by the common name "unsilvered fritillary." The Members of the *Speyeria* genus are often referred to as "Fritillaries" or "Silverspots" (Brittnacher et al. 1978).[5] Throughout the petition, we refer to *Speyeria adiaste* as the Unsilvered Fritillary or Fritillary.

Taxonomy. The petitioned species is *Speyeria adiaste* Edwards, 1864. Scientists currently consider the taxon as valid (Opler et al. 2004[6], NatureServe 2009a[7]). The taxonomic classification for *Speyeria adiaste* is shown in Table 1.

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[5]Brittnacher, J.G., Sims, S.R., and F.J. Ayala. 1978. Genetic differentiation between species of the genus Speyeria (Lepidotera: Nymphalidae). Evolution 32: 199-210 [Attachment 3]

[6]Opler, P.A., and A.D. Warren. 2004. Butterflies of North America. 2. Scientific Names List for Butterfly Species of North America, north of Mexico. Dated January 20, 2004. [Attachment 4]

Table 1. Taxonomy of *Speyeria adiaste*.

Phylum	Mandibulata
Class	Insecta (insect)
Order	Lepidoptera (butterflies and moths)
Family	Nymphalidae (brush-footed butterflies)
Subfamily	Heliconiinae (long-wings)
Genus	*Speyeria*
Species	*Adiaste*

There are three recognized subspecies of *S. adiaste: S. a. adiaste, S. a. atossa,* and *S. a. clemencei* (NatureServe 2009a, 2009b, 2009c, 2009d). Grey (1989) marveled at the narrow range of the Unsilvered Fritillary as anomalous and remarkable compared to related species.[8] There are 16 species in the *Speyeria* genus: *S. adiaste, S. aphrodite, S. atlantis, S. callippe, S. carolae, S. coronis, S. cybele, S. diana, S. edwardsii, S. egleis, S. hesperis, S. hydaspe, S. idalia, S. mormonia, S. nokomis,* and *S. zerene*.[9]

Description[10]

The Unsilvered Fritillary has a 2-2 3/8 in (5-6.1 cm) wingspan. The upperside of male adults is pale reddish-tan to bright red. Females are larger and paler than males. They have scattered and small dark markings and a bold postmedian line. Undersides are pale yellow to gray. This species also has unsilvered hindwing spots that slightly contrast with background coloring, standing in contrast to most *Speyeria* species' silvered markings.

Trait & Range Distinctions

The petitioned species intersects with the ranges of *S. callippe* (Callippe Fritillary), *S. coronis* (Coronis Fritillary), *S. egleis* (Great Basin Fritillary), *S. hydaspe* (Hydaspe Fritillary), and *S. zerene* (Zerene Fritillary).[11] The Unsilvered Fritillary can be distinguished from the Callippe Fritillary because of the latter's silvered underside spots and evenly spaced upperside markings. The Coronis Fritillary can be distinguished due to its silvered underside spots and its tawny or orange-ish upperside. The Great Basin Fritillary also has silvered underside spots (triangular) and an orange-brown upperside. While the Hydaspe Fritillary's spots may or may not be silvered, it can be distinguished from the Unsilvered Fritillary by its orange-brown upperside with heavy dark markings. Finally, the Zerene Fritillary has tawny to red-brown

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[7]NatureServe. 2009a. Species Account for *Speyeria adiaste* (Unsilvered Fritillary). Downloaded from **www.natureserve.org/explorer** on December 8, 2009. [Attachment 5]
[8]Grey, L.P. 1989. Sundry Argynninae concepts revisited (Nymphalidae). Journal of the Lepidtoperists' Society 43(1): 1-10. [Attachment 6]
[9]See **www.natureserve.org/explorer** and **www.butterfliesandmoths.org** [Accessed December 2009].
[10]Description adapted from Butterflies and Moths of North America (BMNA). 2009. Species Account for *Speyeria adiaste* (Unsilvered Fritillary). Downloaded from **http://www.butterfliesandmoths.org** on December 8, 2009. [Attachment 7]
[11]See **www.butterfliesandmoths.org** [Accessed December 2009].

markings on its upperside that distinguish it from the Unsilvered Fritillary, along with a sharper contrast between its underside spots and background color.[12]

Geographic Distribution: Historic and Current

The Unsilvered Fritillary is known from a limited area in coastal California, in two isolated areas: the first included high areas in the Santa Cruz Mountains in San Mateo, Santa Cruz, and Santa Clara counties (*adiaste* subspecies); and the second area included the Santa Lucia Mountains in Monterey and San Luis Obispo counties (*clemencei* subspecies). The species also formerly occurred in Kern, Los Angeles, and Santa Barbara counties, but that subspecies (*atossa*) is extinct (NatureServe 2009a; 2009b; *see also* BMNA 2009 and Bruyea 2003[13]). It occurs at 300-1,500 m (approx. 984-4,921 ft) in elevation (Brittnacher et al. 1978). See Figures 1 & 2.

Figure 1: Global Range of the Unsilvered Fritillary.
Source: Butterflies & Moths of North America 2009.

[12] *Id*.
[13] Bruyea, G. 2003. Preliminary Insect (Butterfly) Survey at Griffith Park, Los Angeles, California. October 30, 2003. [Attachment 8]

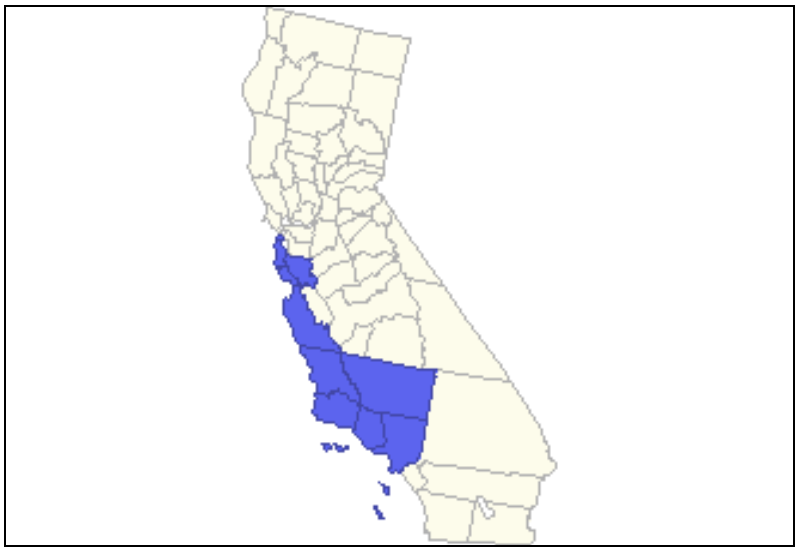

Figure 2: California Range of Unsilvered Fritillary. Highlighted counties denote its range. Source: Butterflies & Moths of North America 2009.

The Unsilvered Fritillary is spottily distributed within this range. Its special circumstances were noted several decades ago: "the scaricity [sic] of populations throughout its range would indicate that rather special conditions are required for its survival."[14]

Habitat Requirements

The Unsilvered Fritillary inhabits openings in conifer and redwood forests, as well as oak woodlands, chaparral, and grassy slopes (Hovanitz 1970; NatureServe 2009a; BMNA 2009). Brittnacher et al. (1978) considered it a xeric *Speyeria* species that occurred in summer-dry locations. *Speyeria* species are known for their dependence on violets, and the Unsilvered Fritillary is no exception (Hovanitz 1970; Hammond and McCorkle 1983; NatureServe 2009a; BMNA 2009). For another *Speyeria*, researchers found that the availability of violet larval food plants (and the size of suitable habitat areas) was an important limiting factor in butterfly population size (Kelly and Debinski 1998).[15]

Life History

Reproduction and Dispersal

This species has one flight period, in June-July, and breeds just once per year. It lays single eggs on fallen leaves and twigs near violets. Preferred larval food plants are violets, including *Viola quercetorum, V. ocellata, and V. penduculata*) (NatureServe 2009a; BMNA 2009).

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[14]Hovanitz, W. 1970. Habitat – *Argynnis adiaste*. Journal of Research on the Lepidoptera 9(3): 168, 192. [Attachment 9].

[15]Kelly, L. and D.M. Debinski. 1998. Relationship of host plant density to size and abundance of the regal fritillary *Speyeria idalia* Drury (Nymphalidae). Journal of the Lepidopterists' Society 52(3): 262-276. [Attachment 10]

Diet

Speyeria species are known for their association with violets (Hovanitz 1970; Brittnacher et al. 1978; Hammond and McCorkle 1983). Caterpillars hibernate without feeding, but feed on violet leaves when they emerge in spring (NatureServe 2009a; BMNA 2009). Adults feed on flower nectar, especially violets. *Id*.

Historic and Current Population Status & Trends

The Unsilvered Fritillary has vanished or is declining in a significant portion of its range. NatureServe (2009a) estimates that the species has undergone "large to substantial decline," on the order of 50-90%. Indeed, FWS admitted in its 1994 rejection of the listing petition for the *adiaste* subspecies that "the unsilvered fritillary butterfly may be declining" (FWS 1994). NatureServe (2009a) states that "all available evidence points to a status of globally imperiled," and Scott (1986)[16] reports that the species has significantly declined.

The southernmost subspecies, *atossa,* is considered extinct (BMNA 2009; NatureServe 2009a, 2009b). It has not been collected since 1959 despite subsequent surveys (Davenport 2004[17]; NatureServe 2009b). The last two known specimens of *S.a. atossa* were both collected on June 5, 1959, one on Mt. Pinos and one near Tehachapi (Davenport 2004). Hammond and McCorkle (1983: 220) describe how populations of *atossa*

> ...were once widely distributed and extremely abundant in the Sierra Madre, Tejon and Tehachapi Mountains of southern California, living on open grasslands where violets such as the Pine Violet (*V. purpurea* Kell.) were abundant...

Scientists report that a combination of human activities and drought reduced their larval foodplant (violets), likely causing their extinction (Orsak 1974[18]; Hammond and McCorkle 1983).

Subspecies *adiaste* is limited in range and has declined (BMNA 2009; NatureServe 2009a, 2009c). Subspecies *clemencei* has the most extensive range (BMNA 2009), but it is considered a narrow endemic under threat (NatureServe 2009d).

Ecology

Given their sensitivity to human disturbances, *Speyeria* species are an important indicator for healthy, functional native ecosystems (Hammond and McCorkle 1983). The extirpations and decline of the Unsilvered Fritillary indicate the severe degradation of its habitat from a range

[16]Scott, J.A. 1986. The Butterflies of North America: A Natural History and Field Guide. Stanford University Press. See p. 328. [Attachment 11]
[17]Davenport, K. 2004. A concise update of the information provided in The Butterflies of California. The Taxonomic Report of the International Lepidoptera Survey 4(7). [Attachment 12]
[18]Orsak, L. J., 1974. Project Atossa -- Preliminary report. Atala 2(2): 5-8.

of human land uses, both rural and urban. These activities are pushing the Fritillary's Central Coast grassland and woodland ecosystems toward collapse.

Identified Threats to the Petitioned Species: Criteria for Listing

The Unsilvered Fritillary likely meets all of the criteria for listing under the ESA:

A. Present and threatened destruction, modification, and curtailment of habitat and range;
B. Overutilization for commercial and recreational purposes;
C. Disease or predation;
D. The inadequacy of existing regulatory mechanisms; and
E. Other natural or manmade factors affecting its continued existence.

The Unsilvered Fritillary's habitat has declined in extent and quality (Factor A) due to expanding human infrastructure and extensive adverse land uses. Its rarity may make it more susceptible to overutilization (Factor B). Disease may have been involved in the extinction of the *atossa* subspecies, and both disease and predation may be compounded by anthropogenic threats (Factor C). This fritillary is not protected under state or federal laws (Factor D). Drought, exotic species, climate change, altered fire regimes, and other dynamics may further threaten this species (Factor E). Moreover, threats to violets within the Unsilvered Fritillary's range should be considered threats to this butterfly itself (Hammond and McCorkle 1983).

I. Present and Threatened Destruction, Modification, or Curtailment of Habitat or Range.

Development, fire suppression, widespread fires, overgrazing, and exotic vegetation, are causing the loss or degradation of this butterfly's habitat (NatureServe 2009a, 2009d). Scientists suspect that the *atossa* subspecies may have gone extinct due to overgrazing and drought, in combination (NatureServe 2009a). While the Unsilvered Fritillary is a poor survivor of fires, this species also depends on fire to protect its habitat from brush and tree encroachment as well as to burn off dead thatch that can crowd out violets (Hammond and McCorkle 1983; NatureServe 2009a; *see also* FWS 1994). FWS should consider how an altered fire regime may be a threat to this species' habitat, particularly given that the *clemencei* subspecies occurs in the fire-prone Santa Lucia range (NatureServe 2009d).

Suburban development has reduced both *Speyeria* and violet populations (Hammond and McCorkle 1983). The California Wildlife Action Plan discusses growth and development as an important stressor on wildlife in the Central Coast region, including *S.a. adiaste* (Bunn et al. 2007).[19] The human population in this region has grown by 13% from 1990-2000, and urban extent has grown by 32% from 1980-1990, and an additional 22% as of 2002. *Id*.

[19]See California Wildlife Action Plan at **http://www.dfg.ca.gov/wildlife/WAP/docs/report/full-report.pdf** [Accessed December 2009][Attachment 13]. Full cite: Bunn, D., Mummert, A., Hoshovsky, M., Gilardi, K., and S. Shanks. 2007. California's Wildlife Action Plan. Prepared by the UC Davis Wildlife Health Center. Published by the California Department of Fish and Game.

Resulting commercial and residential development and other infrastructure has fragmented wildlife habitat in the region. This habitat fragmentation has altered natural fire regimes, interrupted genetic exchange, and facilitated the proliferation of exotic vegetation. *Id*.

Exotic vegetation may have played a role in the extinction of the *atossa* subspecies and could likewise threaten the extant subspecies and the species as a whole. Bruyea (2003) discussed how wildfire suppression likely facilitated the spread of exotic vegetation, which outcompeted native annuals such as violets. This, in combination with other human disturbances may have so severely impacted violets, as to have caused *atossa's* extinction. *Id*. In its listing rule for two subspecies of *Speyeria*, FWS noted:

> The invasion of California's native grassland and coastal prairie by alien plants has adversely affected native flora and fauna… In the absence of control and eradication programs, invasive alien plants may eliminate the remaining native plants, including the host plants…Adequate levels of *Viola* species especially critical for the long term survival of these butterflies… 62 Fed. Reg. 64306 at pp. 64314-64315.

This analysis likewise applies to the Unsilvered Fritillary.

Other stressors in the Central Coast region include agriculture and off-road vehicles (Bunn et al. 2007). Crop and livestock agriculture consumes 11% of the region's area and causes habitat fragmentation, erosion, sedimentation, and habitat degradation from herbicides and pesticides. *Id*. Livestock eat and trample violet food plants and can cause proliferation of noxious weeds that displace violets. While overgrazing has been recognized as a threat to the Unsilvered Fritillary, intensive agriculture crops are also a danger. According to the state's wildlife plan, crops "almost entirely eliminate wildlife habitat values." *Id*. at p. 211. Intensive agriculture is increasing in the region: between 1998-2001, vineyard area increased 36%. *Id*.

II. Overutilization for commercial, recreational, scientific, or educational purposes

Collection is not known to constitute a threat to the Unsilvered Fritillary. However, the rarity of the species makes it more attractive to collectors. In addition, butterfly populations that are small and easily accessible are especially vulnerable to over-collection. FWS should investigate the extent of collection and the potential consequences to the species during the course of a status review.

III. Disease or Predation

Scientists have suggested that disease may explain the extinction of the *atossa* subspecies.[20] (However, as discussed above, drought and overgrazing have also been pointed to as the cause of this taxon's extinction). FWS should further investigate disease as a threat in a status review for the species. Many, if not most, insect populations normally experience large

[20]See **http://essig.berkeley.edu/endins/atossa.htm** [Accessed December 2009]. [Attachment 14]

fluctuations in size.[21] Predation and disease may cause annual changes in butterfly numbers of an order of magnitude or more. The small size of Unsilvered Fritillary populations increases their vulnerability to extirpation due to natural fluctuations that may occur as a result of disease or predation pressures. Adult and larval butterflies are subject to predation by a wide variety of vertebrate and invertebrate wildlife (e.g., birds, herptiles, other insects).

IV. The inadequacy of existing regulatory mechanisms

The Unsilvered Fritillary is not adequately protected by federal or state laws or policies to prevent its endangerment or extinction.

NatureServe Global Status: NatureServe ranks this species as G1G2, rounded to G1 (NatureServe 2009a). These ranks are defined as follows:

> **G1 Critically Imperiled**: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.[22]
>
> **G2 Imperiled**: At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.[23]

NatureServe National Status: The Unsilvered Fritillary has a national ranking of N1N2, which is equivalent to its global rank given that this species is only known from the U.S. (NatureServe 2009a).

While indicating biological imperilment, these rankings does not provide any regulatory or policy mechanisms to protect the Unsilvered Fritillary.

California

NatureServe ranks the California state status of this species as S1 (NatureServe 2009a), which is defined as:

> **Critically Imperiled**—Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.[24]

While indicating biological imperilment, this ranking does not provide any regulatory or policy mechanisms to protect the Unsilvered Fritillary.

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[21]Ehrlich, P.R. 1992. Population biology of checkerspot butterflies and the preservation of global biodiversity. Oikos. 63:6-12 and Schultz, C.B. 1998. Ecology and Conservation of the Fender's Blue Butterfly. PhD. Dissertation, University of Washington. Seattle, WA. 145pp. [Attachment 15]
[22]*See* **http://www.natureserve.org/explorer/ranking.htm#globalstatus** [Accessed November 2009].
[23]*Id*.
[24]*See* **http://www.natureserve.org/explorer/ranking.htm#globalstatus** [Accessed November 2009].

Subspecies Rankings

NatureServe ranks the subpecies *adiaste* as T1, "critically imperiled," which is identical to the definition provided for S1, above. The subspecies *atossa* is ranked as TX, which means it is presumed extinct. The subspecies *clemencei* is ranked as T1T2, similar to the full species' rank of G1G2.[25]

The California Natural Diversity Database includes the *adiaste* subspecies on its species at risk list, but the other two subspecies are not included.[26] Similarly, the California Wildlife Action Plan includes the *adiaste* subspecies as a species of concern in the Central Coast region. While these inclusions in the state's list of at-risk species is important to monitoring the status of this species, it does not provide any regulatory mechanisms to protect the Unsilvered Fritillary. Neither the full species or any of its subspecies are listed under the California Endangered Species Act (CESA).[27] Indeed, insects are not allowed protection under the CESA.[28]

Protected Areas

NatureServe (2009a) indicates that "few to several" locations where this species exists are protected. One location is Big Basin Redwood State Park. *Id*. If any occurrences of the *atossa* subspecies are found, scientists advocate that they be protected. *Id*.

USFWS: As discussed above, in 1991, Scientists Dennis Murphy and Alan Launer petitioned the *adiaste* subspecies for ESA listing. On November 22, 1994, FWS rejected that petition (FWS 1994). However, the *adiaste* subspecies was a Category-2 candidate for ESA protection in FWS's candidate notices of review in 1991 and 1994. FWS dropped it as a candidate when it eliminated the Category-2 list in 1996. 56 Fed. Reg. 58804-58836; 59 Fed. Reg. 58982; 61 Fed. Reg. 7595-7613. All three subspecies were Category-3 candidates in 1984. 49 Fed. Reg. 21664 at p. 21671. Neither the Unsilvered Fritillary nor any of the three subspecies currently have any status under the ESA: they are not listed, proposed, or a candidate for listing.

FWS should consider how the suite of threats identified for four federally listed *Speyeria* might likewise threaten the Unsilvered Fritillary. Behren's Silverspot Butterfly (*S. zerene behrensii*) is listed as an endangered species. 62 Fed. Reg. 64306-64320. Threats identified in its recovery plan are: invasion by exotic species, natural succession, fire suppression, residential development, and collection.[29] A primary action in that plan is to protect the Behren's violet larval food plants. *Id*. The Oregon Silverspot (*S. z. hippolyta*) is listed as a

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[25]See individual accounts for *S.a. adiaste, S.a. atossa, and S.a. clemencei* at **www.natureserve.org/explorer** [Accessed December 2009]. [Attachments 16-18: NatureServe 2009b, 2009c, 2009d]

[26]See **http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPAnimals.pdf** [Accessed December 2009] [Attachment 19].

[27]*Id*.

[28]See California Fish and Game Code § 2050 *et seq*.

[29]See U.S. Fish and Wildlife Service. 2003. Draft recovery plan for Behren's silverspot butterfly (*Speyeria zerene behrensii*). U.S. Fish and Wildlife Service, Portland, Oregon. vii + 55 pp. Online at: **http://ecos.fws.gov/docs/recovery_plan/040120.pdf** [Accessed January 2010].[Attachment 20]

threatened species. 45 Fed. Reg. 44935-44939. Its 2001 recovery plan recognizes exotic species, fire suppression, land development, off-road vehicles, livestock grazing, erosion, roadkill, pesticides, and over-collection as threats.[30] Myrtle's Silverspot Butterfly (*S. z. myrtleae*) is listed as endangered. 57 Fed. Reg. 27848-27859. Threats it faces include: non-native plants, loss of habitat from commercial and residential development, recreation, and livestock grazing.[31] Callippe Silverspot (*S. callippe callippe*) is listed as an endangered species. 62 Fed. Reg. 64306-64320. In its listing rule, FWS described the Callippe as imperiled due to "overcollecting, urban development, alien plant invasion and competition, and excessive livestock grazing." *Id*. at p. 64307.

V. Other natural or manmade factors affecting its continued existence

Climate Change. Climate change is having and will continue to have a multitude of effects on the Fritillary and its habitat, including more severe, longer, and more frequent droughts; increased catastrophic wildfire and alteration of natural fire regimes due to warmer, hotter conditions; and potential shifts in ranges of the Fritillary or the violet species on which it depends. Warming temperatures in the southwest U.S. (which includes the Unsilvered Fritillary's range) are shown in Figure 3.

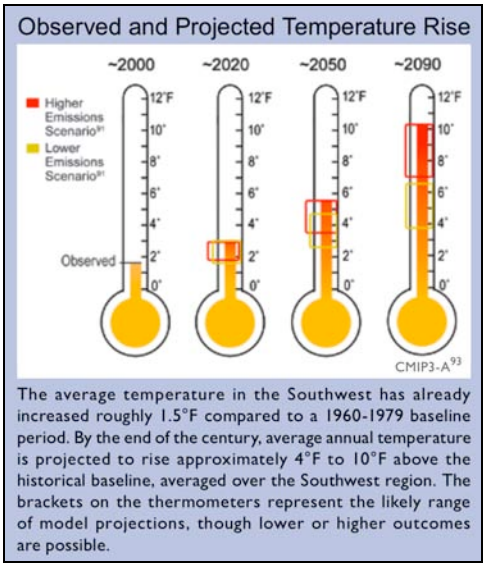

Figure 3: Warming Temperatures in the Southwestern United States.
Source: Karl et al. (2009).[32]

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[30]See U.S. Fish and Wildlife Service. 2001. Oregon silverspot butterfly (*Speyeria zerene hippolyta*) revised recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113 pp. Online at: **http://ecos.fws.gov/docs/recovery_plan/010822.pdf** [Accessed January 2010]. [Attachment 21]

[31]See U.S. Fish and Wildlife Service. 2008. Seven Coast Plants and the Myrtle's Silverspot Butterfly Recovery Plan. Portland, Oregon. 141 pp. Online at: **http://ecos.fws.gov/docs/recovery_plan/980930d.pdf** [Accessed January 2010]. [Attachment 22]

[32]Karl, T.R., Melillo, J. M., and T.C. Peterson (eds). 2009. Global Climate Change Impacts in the United States, Cambridge University Press, 2009. Online at **http://www.globalchange.gov/whats-new/286-new-assessment-climate-impacts-us** [Accessed November 2009]. [Attachment 23]

In the U.S. national report on *Global Climate Change Impacts in the United States*, scientists state,

> Human-induced climate change appears to be well underway in the Southwest. Recent warming is among the most rapid in the nation, significantly more than the global average in some areas (Karl et al. 2009: 129).

Increasing temperatures and other factors are leading to a multitude of intersecting threats to the Fritillary. Karl et al. (2009: 131) further report, "Increasing temperature, drought, wildfire, and invasive species will accelerate transformation of the landscape." All of these dynamics can harm the Fritillary and the violets and habitat on which it depends.

Indeed, these researchers warn of dire consequences to the majority of California's native plants:

> In California, two-thirds of the more than 5,500 native plant species are projected to experience range reductions up to 80 percent before the end of this century under projected warming…*Id*. at p. 132.

These scientists and others also describe significant shifts in native plant community distributions (McMullen and Jabour 2007[33]; Karl et al. 2009), which could adversely affect the Fritillary, given its own narrow distribution. For example, in California's Santa Rosa Mountains, there was a shift in elevation of dominant plant species by approximately 65 m (213 ft) between 1977-2007.

Wildfire. Petitioners discussed under ESA Listing Factor A how an altered fire regime, including more catastrophic wildfires, may threaten the Fritillary. Due to dryer and hotter conditions, total burned area is expected to increase, as is the likelihood of "runaway fires," which are thought to be under control, but re-ignite (Karl et al. 2009). A recent United Nations Environment Programme report on climate change science also notes that an April 2009 wildfire in southern California was the worst wildfire in 30 years and dramatic increases in large-scale wildfires (McMullen and Jabbour 2007). A recent U.S. Forest Service report pulls together science on fire management in the United States. Regarding the intersection of climate and fire regimes, the report states,

> Recent studies show correlations among warming temperatures, earlier springs, and increased numbers of large forest fires in some parts of the Western United States (Westerling et al. 2006), and in Canada (Gillett et al. 2004). Anticipated warming trends as a consequence of greenhouse gas accumulation may lead to further increases in the numbers of large fires and total area burned in some regions…

[33]McMullen, C.P. and Jabbour, J. 2009. Climate Change Science Compendium 2009. United Nations Environment Programme, Nairobi, EarthPrint. Online at **http://www.unep.org/compendium2009/** [Accessed November 2009] [Attachment 24]. See p. 2.

See Keeley et al. 2009 at p. 20.[34]

Drought. Scientists consider drought to be a threat to the Unsilvered Fritillary (NatureServe 2009a, 2009d), and it has been singled out as a primary reason the *atossa* subspecies went extinct (NatureServe 2000a), as well as being a particularly severe problem for the *clemencei* subspecies (Davenport 2004, NatureServe 2009d). Scientists have documented and predict worsening droughts within the range of the Unsilvered Fritillary due to climate change (Figure 4). Keeley and Zedler (2009) point to extreme drought as the likely cause of California's megafires.[35]

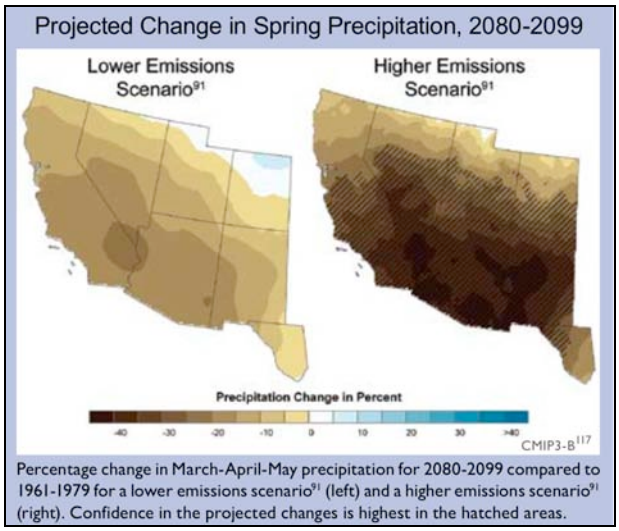

Figure 4: Increased Drought in the Southwestern United States.
Source: Karl et al. (2009).

While drought is a natural climatic event in the Fritillary's range, the danger lies in anthropogenically caused increases in the magnitude and frequency of such events (Karl et al. 2009; *see also* IPCC 2007 [36] and Karl et al. 2008).[37]

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[34]Keeley, J.E., Aplet, G.H., Christensen, N.L., Conard, S.C., Johnson, E.A., Omi, P.N., Peterson, D.L., and T.W. Swetnam. 2009. Ecological foundations for fire management in North American forest and shrubland ecosystems. Gen. Tech. Rep. PNW-GTR-779. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 92 p. [Attachment 25]

[35]Keeley, J.E. and P.H. Zedler. 2009. Large, high-intensity fire events in southern California shrublands: debunking the fine-grain age patch model. Ecological Applications 19(1): 69-94. [Attachment 26]

[36]Intergovernmental Panel on Climate Change. 2007. Climate change 2007: synthesis report. Online at **http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf** [Accessed November 2009] [Attachment 27]. See p. 48.

[37]CCSP, 2008: *Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S.Pacific Islands.* A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Thomas R. Karl, Gerald A. Meehl, Christopher D. Miller, Susan J. Hassol, Anne M. Waple, and William L. Murray (eds.)]. Department of Commerce, NOAA's National Climatic Data Center, Washington, D.C., USA, 164 pp. Online at: **http://www.climatescience.gov/Library/sap/sap3-3/final-report/sap3-3-final-all.pdf** [Accessed November 2009]. [Attachment 28]

Human population growth. Petitioners have described above the consequences of habitat loss and climate change on the Fritillary. A fundamental driver of these threats is human population growth. As mentioned above, there has been a rapid increase in the human population within this butterfly's range. Karl et al. (2009) report staggering increases of 50-249% in the human population within the range of the Fritillary (Figure 5).

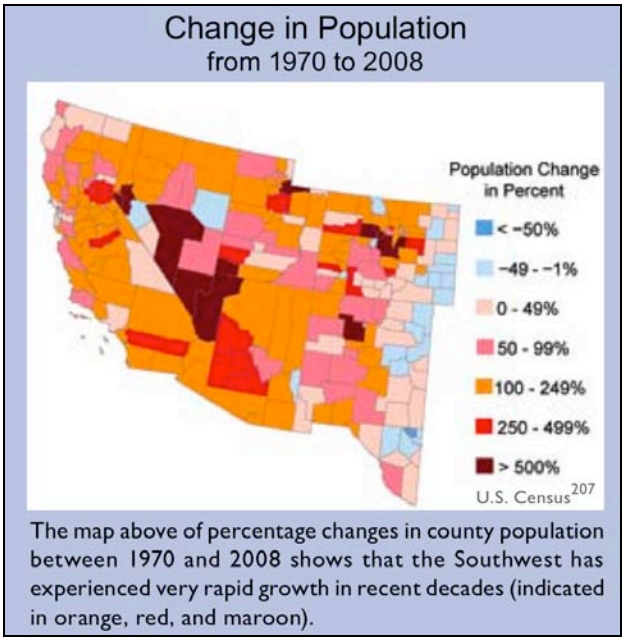

Figure 5: Human Population Increases in the Southwestern United States.
Source: Karl et al. 2009.

FWS should assess how human population increases – which show no sign of abating – will further curtail the extent and suitability of habitat and escalate other human threats to the Fritillary and its habitat.

Biological Vulnerability. FWS has routinely recognized that small population size and restricted range increase the likelihood of extinction.[38] The Unsilvered Fritillary has a small and reduced range. For the Langford's tree snail (*Partula langfordi*), the Service states:

> Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the limited number of known individuals of this species. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to

[38]See, e.g., Service candidate assessment forms for *Doryopteris takeuchii, Huperzia stemmermanniae, Megalagrion nesiotes, Melicope degeneri, Melicope hiiakae, Myrsine mezii, Ostodes strigatus, Partula langfordi, Peperomia subpetiolata, Phyllostegia bracteata*, and *Tryonia circumstriata*. Accessible via FWS website at **http://www.fws.gov/endangered/wildlife.html** [Accessed November 2009].

> cope with environmental change (Lande 1988; Pimm et al. 1988; Center for Conservation Update 1994; Mangel and Tier 1994).[39]

Here, the Service relies on citations not specific to *Partula langfordi* that indicate the threat to survival presented by limited population numbers even without other known threats. The Service similarly notes for a snail called Sisi (*Ostodes strigatus*), "Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of the known populations."[40]

Scientists report that the loss of habitat and populations of another *Speyeria* species, *S. idalia*, has disrupted the gene flow between populations, and the species is consequently more prone to extinction due to genetic and demographic factors (Williams et al. 2003).[41] Because the Unsilvered Fritillary's range was historically limited, has been further reduced by anthropogenic causes, and is vulnerable to weather events such as drought and catastrophic fire, FWS should consider this butterfly's narrow range as itself a threat to the taxon.

Additional Threats. The *Speyeria* genus is known to be susceptible to insecticides (NatureServe 2009a). Given the increase in agriculture within the Fritillary's range, insecticide use is likely to be an escalating threat to this species. In addition to exotic vegetation (under Factor A), non-native thistle seed weevils may also pose a threat to the Unsilvered Fritillary. *Id*.

Cumulative Threats. FWS should consider whether the array of aforementioned threats intersect and act synergistically, therefore increasing the likelihood of extinction or endangerment of the Unsilvered Fritillary in the foreseeable future. For example, livestock grazing, development, crop agriculture, off-road vehicles, and climate change may all result in proliferation of noxious weeds that can displace the Fritillary's violet food plants. Development can lead to fire suppression, which may lead to brush encroachment or catastrophic fires, which may adversely impact the Fritillary's habitat. Both agriculture and proliferation in noxious weeds can prompt increased use of herbicides, which may adversely affect the violets on which the Unsilvered Fritillary depends. More severe droughts can cause catastrophic wildfires and magnify the impact of livestock grazing, to the detriment of the petitioned species. This list is not comprehensive, as there is a multitude of ways in which the single threats this butterfly faces may be compounded.

Summary

The Unsilvered Fritillary merits listing as an Endangered or Threatened species under the Endangered Species Act. The species faces overwhelming threats from loss and degradation

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[39]See 2009 Listing Form for Partula langfordi at: **http://ecos.fws.gov/docs/candforms_pdf/r1/G0AI_I01.pdf** [Accessed November 2009] at p. 5.
[40]See 2009 Listing Form for *Ostodes strigatus* at: **http://ecos.fws.gov/docs/candforms_pdf/r1/G0A5_I01.pdf** [Accessed November 2009] at p. 4.
[41]Williams, B.L, Brawn, J.D., and K.N. Paige. 2003. Landscape scale genetic effects of habitat fragmentation on a high gene flow species: *Speyeria idalia* (Nymphalidae). Molecular Ecology 12: 11-20. [Attachment 29]

of its habitat due to growing human populations within its range and consequent increases in the extent of commercial and residential development, agriculture, and other human land uses. Climate change consequences include increased severity and frequency of drought; and catastrophic wildfires and altered fire regimes. Both direct human land uses and climate change are causing a proliferation of exotic vegetation, which can outcompete the Fritillary's violet host plants. This long list of threats may include factors that intersect and therefore create cumulative obstacles to the Fritillary's persistence. With no state or federal protection, the Unsilvered Fritillary does not enjoy regulatory protections to address the threats it faces.

The Unsilvered Fritillary's range includes a limited area in the Central Coast region of California. Early on, scientists remarked about its narrow range. But its range has narrowed even further, with the extinction of one subspecies. At least one, if not both, of its other two subspecies has substantially declined. The anthropogenic threats it faces are compounded by its historic and currently limited range. This petition is submitted with the hope that federal protection will be granted and will prevent this species' extinction. We believe ESA listing is vital to preserving and recovering this species.

Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the Unsilvered Fritillary (*Speyeria adiaste*) or each of its three subspecies (*S.a. atossa, S.a. adiaste, S.a. clemencei*) as Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the numerous threats this species and its subspecies face, as well as its declining population numbers. The Unsilvered Fritillary is likely threatened by all of the five listing factors: present and threatened destruction, modification and curtailment of habitat and range; overutilization; disease or predation; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

Critical habitat

Given that threats to its habitat are a significant cause of imperilment for the Unsilvered Fritillary, Petitioner requests that critical habitat be designated for this species or its subspecies concurrent with final ESA listing.