

Argynnis nokomis nokomis (Nokomis Silverspot)



Steve Cary, 2021

Taxonomy

- **Class:** INSECTA
- **Order:** LEPIDOPTERA
- **Family:** NYMPHALIDAE
- **Genus:** Argynnis
- **Scientific Name:** *Argynnis nokomis nokomis*
Edwards, 1862
- **Common Name:** Nokomis Silverspot
- **Synonyms:** *Speyeria nokomis* ssp. *nokomis*
(Edwards, 1862)
- **Taxonomic Name Source:** Pelham, J. P. 2008. A catalogue of the butterflies of the United States and Canada with a complete bibliography of the descriptive and systematic literature. *The Journal of Research on the Lepidoptera*. Volume 40. 658 pp. Revised 14 February, 2012.

Agency Status

- **NMDGF:**
- **Federal Status:**
- **BLM Sensitive:**
- **USFS:**
- **IUCN Red List:** [Not Evaluated](#)
- **Nature Serve Global:** [T1](#)
- **NHNM State:** S1
- **NM Endemic:** NO

Description

The sexual dimorphism of this large butterfly, Nokomis, is amazing. Males resemble other *Argynnis* (*Speyeria*) species in size and maculation, although the dorsal ground color may be redder and the ventral ground color yellower. Females, in contrast, are blue-black dorsally, with whitish in the wide postmedian area. Below, females have a brown discal region and a pale greenish submargin. Eyes are brown. Range and Habitat. Also called Great Basin Silverspot, this butterfly occurs discontinuously in the Great Basin and surrounding uplands, south into northern Mexico. It inhabits wet meadows with the larval host. This habitat is scarce in the semi-arid west and southwest; colonies often are small, disjunct and vulnerable to degradation by human activities. Beaver activity once kept riverside habitats in good shape for Nokomis, but they have been eliminated from most of their former habitats. In New Mexico, the few remaining colonies of *Argynnis nokomis* are in the marshiest valleys in our wettest mountains (counties: Ca,Ci,Gr,Mo,Ot,SJ,SM,Ta), from 7000 to 9500? elevation. Life History. The only known host is kidney-leaf violet (*Viola*

nephrophylla; Violaceae), which thrives in emergent aquatic (up to ankle-deep) marsh habitats. Larvae hatch in autumn, overwinter, and begin feeding in spring. Flight. *Argynnis nokomis* has one late summer brood; New Mexico adults fly from July 13 to September 29, principally August. They go to nectar but rarely stray far from their wet-meadow homes. Comments. This beautiful, hard-to-find insect has long been prized by collectors, some of whom keep colony locations secret. Sapello Canyon (SM) was the type locality of *Argynnis nokomis nigrocaerulea* W. Cockerell and T. Cockerell 1900 and aberration “*rufescens*” (Cockerell 1909). These were later synonymized with the nominate subspecies, to which northern New Mexico colonies are assigned based on recent DNA analyses. Western New Mexico colonies (Ca,Ci,Gr) belong to Mogollon Rim subspecies *Argynnis nokomis nitocris* (W. H. Edwards 1874). Validity and identity of Nokomis colonies in the Sacramento Mountains (Ot), now probably extirpated, has long been a topic of heated debate among the personal, private, passionate, even the published world of Nokomis lovers. Arizona collector Kilian Roeber may have made the only collections of actual specimens from there, ever. Unfortunately, all that seems to remain of those specimens is a single photograph, which suggests it may belong with the Mexican subspecies, *Argynnis nokomis coerulescens* (W. Holland 1900). Richard Holland found specimens in the Carnegie Museum that were labeled from the Sacramentos (Holland 2010) and he named it ssp. *tularosa*, but DNA analysis showed the type was from the Sangre de Cristos, as predicted by Scott & Fisher (2014). One cannot do DNA analysis on a photo, so unless Nokomis is rediscovered in the Sacramentos, that may be the final word on what, if anything, once was there.

Description courtesy of Steven J. Cary, [Butterflies of New Mexico](#), 2024

Habitat and Ecology

The Nokomis Silverspot requires moist habitat with a variety of herbaceous and woody vegetation which can be used for cover and nectar (USFWS 2024). Habitats also require either *Viola nephrophylla* or *Viola sororia affinis*, which are the only larval host plants (Scott 1986, Cary and Toliver 2024, USFWS 2024). These host plants often require a shady microclimate, growing under shrubs especially willows (*Salix* spp.). They also require wet soggy soil or standing water, sometimes thriving in ankle deep water (Baird 1942, Cary and Toliver 2024, USFWS 2024). As a result, the Nokomis Silverspot occurs in areas with permanent water such as spring-fed meadows, seeps, marshes, or streamside meadows (Scott 1986, Opler and Wright 1999, Glassberg 2001, Selby 2007, Wiley 2020, Lotts and Naberhaus 2021, USFWS 2023, Cary and Toliver 2024). The permanent water which sustains these ecosystems is generally supported by incredibly valuable snow runoff from surrounding mountains (USFWS 2023). Interspersion of willows, shrubs, and other trees in the meadows or thick vegetation surrounding the meadows can provide important protection for violets and butterflies (USFWS 2023). In the arid western United States these habitats are increasingly isolated due to agriculture, and other changes in water use (Hammond and McCorkle 1983, Scott 1986, Selby 2007, USFWS 2023).

The Nokomis Silverspot is univoltine with one late summer flight (Mattoon *et al.* 1971, Scott 1986, Selby 2007, USFWS 2023). Males generally emerge at the end of July or beginning of August and females generally emerge in the first week of August, with both continuing until mid September (Scott 1977, Scott and Mattoon 1981, Selby 2007, Cary and Toliver 2024, USFWS 2024). Adult butterflies will fly when temperatures are between 10 and 37°C (50-100°F) though, 18 to 29°C (65-85°F) seems to be ideal for the species (Ellis 2020, Fisher 2020, USFWS 2023). Above 29°C flight times become very limited before individuals need to seek shade (USFWS 2023). Nokomis Silverspot males fly all day when conditions are right but seem to be most active in the late morning from around 10am to noon (USFWS 2023). During flight adults nectar on a variety of plants mostly in the family Asteraceae, especially native and introduced thistles (Scott 1986, Ellis 1989, Selby 2007, USFWS 2023).

Eggs are laid on violets or in grasses or bushes near host violets, typically in September. Willow stems, trunks, and twigs are also used as oviposition sites (Arnold 1989, Selby 2007, Ellis 2018, USFWS 2023, 2024). A single female can lay upwards of 600 eggs. They are usually laid singly although small clusters have been observed (Arnold 1989, USFWS 2023). The eggs hatch in 10-18 days and larvae drink or absorb water before entering diapause until the

following May (Mattoon 1981, Selby 2007, Stout 2020, USFWS 2023). Overwintering mortality is very high in this species (Mattoon *et al.* 1971, USFWS 2023). In mid-May the surviving larvae emerge and can travel up to one foot, though sometimes as far as three feet to reach their host violets (USFWS 2023). The larvae then feed and grow into their sixth and final instar by mid-July, before entering pupation (Scott and Mattoon 1981, Selby 2007, USFWS 2023). Pupation takes around 17 days before adult butterflies emerge (Selby 2007, USFWS 2023). Adults of this species have been recorded to live for around 45 days (USFWS 2023).

Geographic Range:

The range of the Nokomis Silverspot stretches from northern New Mexico north through south-central Colorado and west to east-central Utah (Cong *et al.* 2019, USFWS 2023). The US Fish and Wildlife Service (USFWS) currently recognizes 21 extant colonies of this butterfly, which are grouped into ten sub-populations across southwestern Colorado, eastern Utah, and northern New Mexico (Cong *et al.* 2019; USFWS 2023, 2024). Of these ten populations two are located in New Mexico, six are in Colorado and two are in Utah (USFWS 2023). Currently, known populations of this butterfly occur between 1,585 and 2,530 m (5,200 and 8,300 feet) in elevation (USFWS 2023). In New Mexico historically it has been found between 2,134 and 2,896 m (7,000 and 9,500 feet) in elevation (Cary and Toliver 2024). Remaining populations are extremely localized and isolated, as this butterfly has experienced widespread declines.

Historically this distribution has been heavily debated, as the sub-species relationships of the parent species, *Argynnis nokomis*, are not well understood. Though there is still some uncertainty, a genetic analysis performed in 2019 informed the current accepted boundaries (Cong *et al.* 2019, USFWS 2023): *A. nokomis* in the Chuskae mountains of northwestern New Mexico are currently considered a hybrid between the Nokomis Silverspot and the Mogollon Mountains subspecies (*A. n. nitocris*); *A. nokomis* in the Uinta mountains of northeastern Utah are considered hybrids between the Nokomis Silverspot and the California subspecies *A. n. apacheana*; populations in the Great Basin and southwestern Utah are considered hybrids between all three of these subspecies, though they become genetically closer to pure subspecies as you get closer to the respective type localities of each subspecies (Cong *et al.* 2019, USFWS 2023). None of these hybrid populations were included by the US Fish and Wildlife Service in the federal listing of the species under the Endangered Species Act. Therefore, they are also not currently considered part of the Nokomis Silverspots range in this assessment.

In addition, historically there has been debate about the condition and identity of *A. nokomis* populations in the Sacramento Mountains of southern New Mexico (Cary and Toliver 2024). Previously these were considered part of the Mexican subspecies *A. n. coerulescens* though, some experts argued that they may have been the Nokomis Silverspot which would represent a significant range expansion for this threatened insect (Cary and Toliver 2024). As a side note, in 2010, Richard Holland found several specimens at the Carnegie Museum that were recorded as having been collected in the Sacramento Mountains (Cong *et al.* 2019, Cary and Toliver 2024). From these specimens, R. Holland described subspecies *A. n. tularosa*, but later DNA analysis showed these specimens were actually from the Sangre de Cristo Mountains (Scott and Fisher 2014, Cong *et al.* 2019, Cary and Toliver 2024). This population is now considered to be extinct as several surveys there have not turned up any butterflies. All that remains of the Sacramento Mountains population is a single photograph from which the subspecies cannot be determined (Cary and Toliver 2024). If this population is ever to be rediscovered there is a chance that it may be the Nokomis Silverspot and efforts should be made to see if this population can be located.

Conservation Considerations:

This butterfly is listed as Threatened on the Navajo Endangered Species List (NFWA 1997) and as a sensitive species by the United States Forest Service (USFS 2013). In February of 2024, it was listed as federally Endangered under the

United States Endangered Species Act (USFWS 2024). This was the result of decades of effort, with the butterfly first being petitioned and proposed for listing in 1978. At the time, it was determined that more information was needed, as there was too much taxonomic confusion and the sub-species relationships were not well understood (USFWS 2023). In 1984 the butterfly was placed on the category 2 list, which indicated a taxa that may be fit for listing but which requires more information (USFWS 2023). The butterfly was reviewed for federal listing in 1989, 1991, and 1994 and each time was kept as a category 2 species, indicating more information was needed (USFWS 2023). In 1996, the US Fish and Wildlife Service got rid of all category 2 species, instead categorizing them as Federal Species of Concern, a designation with no legal protections (USFWS 2023). In 2013, the butterfly was petitioned again by WildEarth Guardians, and in 2023 it was finally listed (USFWS 2023).

Conservation actions for this butterfly are incredibly important. In the absence of conservation actions, modelled scenarios suggest about half of the remaining sub-populations will likely become extirpated (USFWS 2023). In order to be resilient, this butterfly needs near year round water to sustain Bog Violet as well as occasional, though not excessive, disturbance (USFWS 2023). This butterfly is often considered to be a beaver adapted species, with beavers creating and maintaining appropriate disturbed meadow wetlands. It is possible the distribution of the butterfly followed the distribution of beavers historically (USFWS 2023, Cary and Toliver 2024). As a result, beaver dam analogs or beaver reintroductions may be a crucial conservation action for this butterfly.

Protection of remaining habitats from further loss, fragmentation, or hydrological alteration will be critical to the survival of this butterfly (USFWS 2023). Limiting livestock grazing, fire, and pesticide application are also critically needed conservation actions (USFWS 2023). Genetic isolation also poses a major threat, so genetic rescue or captive rearing and release may be needed in order to maintain genetic diversity and avoid inbreeding depression (USFWS 2023).

Lastly, additional information is needed on the size and location of additional colonies. More colonies may exist in the range, especially in New Mexico. In New Mexico, research is also needed to figure out the current and historic status of the Sacramento Mountains subpopulation (USFWS 2023). Additional research is also needed on the impact of beaver dam analogs and beaver reintroductions. Research on the effectiveness of other conservation actions is also needed. Further refinement of the taxonomy of this butterfly, especially as it relates to the hybrid populations in New Mexico and Utah, will also be important for the butterflies recovery going forward.

Threats:

In 2024 the United States Fish and Wildlife Service listed this butterfly as threatened stating that “the best available scientific information indicates that it is likely in danger of extinction in the foreseeable future.” (USFWS 2024). This determination was made due to an overwhelming amount of threats facing this butterfly, though perhaps the biggest of these threats is climate change (USFWS 2024). This butterfly relies on riparian areas which require near year round moisture. These habitats are increasingly difficult to find in the southwestern United States, which saw its driest 22-year period from 2000 to 2021 since at least 800 CE (the time period used in previous climatic reconstructions) (Williams *et al.* 2022). Further, droughts are projected to become more prolonged, severe, and common in the region under future climate change scenarios (USGCRP 2018).

Not only do droughts result in decreased habitat and resource availability for this butterfly, but they may also be increasing overwintering mortality (Matoon *et al.* 1971, USFWS 2023). Studies of successful diapause sites show that the larvae need a very specific moisture level, and they will die if they are too wet or too dry (Selby 2007, USFWS 2023). Thus, if conditions become drier, larval mortality may increase over the winter. Furthermore, it is thought that snowpack may play an important role in insulating larvae from the coldest temperatures of the winter months. Without

this snow blanket, more larvae may freeze to death in the winter months. In addition, less snowpack serves to threaten the water supply for the springs and streams that this butterfly relies on (USFWS 2023). Already average annual water flows in the Colorado River Basin have declined by 20% over the last century (Eilperin 2020, USFWS 2023).

Climate change in the southwest is not only predicting drier conditions but also hotter conditions, with more extended periods with temperatures greater than 32°C (90°F) (USFWS 2023). Studies of the Nokomis Silverspot indicate that the butterfly can fly in temperatures up to 37°C (100°F) though it seems to prefer temperatures from 18 to 29°C (65-85°F). When temperatures go above this range, butterfly activity is limited with individuals taking only short flights before seeking shade (USFWS 2023). As a result, as temperatures are more consistently over 29°C (85°F) butterflies are likely to spend more time shading themselves and less time foraging for resources and mating, possibly resulting in reduced reproduction rates and smaller populations (USFWS 2023).

Additionally, other minor effects of climate change may include floods or periods of heavy flows, which may limit habitat and butterfly numbers or even extirpate colonies (USFWS 2023). Another is phenological mismatch, with advanced timing of spring due to increased temperatures (USFWS 2023). The timing of peak snow runoff in Colorado has already shifted 1-4 weeks earlier in the last thirty years and temperatures in the same time have increased by more than 16°C (3.5°F) (Lukas *et al.* 2014, USFWS 2023).

The Nokomis Silverspot is not only losing habitat due to climate change, but also due to hydrological alterations and development (USFWS 2023). These harmful hydrological alterations include diversions of water for agricultural and domestic use, erosion, stream channeling, as well as dredging and filling wetlands, removal of beavers or beaver dams, and the creation and operation of dams (USFWS 2023). Furthermore hydrological alterations caused by livestock grazing, mining, and stream capping are also very harmful for this butterfly (USFWS 2023). Many of the remaining colonies of this butterfly seem to have lost habitat as a result of at least one of these actions and will continue to do so if these projects continue to be implemented (USFWS 2023).

Habitat loss from the construction of a golf course and housing development is also known to have extirpated at least two historical colonies in Colorado, and at least one colony in New Mexico (Scott and Fisher 2014, USFWS 2023). Agriculture conversion is also a major development issue for the species as several meadows where this butterfly occurs have been converted to grow hay or become croplands (USFWS 2023).

Known populations of the butterfly are fragmented due to the irregular occurrence of suitable habitat throughout this species range, as well as by habitat loss and fragmentation due to climate change, hydrological alteration, and development (USFWS 2023). Current estimates indicate that the Nokomis Silverspot likely cannot disperse further than 8 to 16 km (5-10 miles) (USFWS 2023). Currently the two closest remaining populations are around 40 km (25 miles) from each other, making genetic exchange impossible (USFWS 2023). Additionally, a recent genetic study found genetic isolation between the known populations of this butterfly and suggested that genetic drift is likely to be a major issue going forward (Cong *et al.* 2019, USFWS 2023).

This puts the Nokomis Silverspot at extreme risk of inbreeding depression going forward. Inbreeding depression results when slightly deleterious alleles accumulate in a small population, reducing the likelihood of population persistence (Hedrick 1994, Lynch *et al.* 1995). The accumulation of deleterious alleles and reduction in heterozygosity have been shown to reduce survival rates at several important life stages in butterflies, including those that have an effect on population stability and persistence, even after just one generation of mating between full-siblings (Saccheri *et al.* 1998, Nieminen *et al.* 2001). Nieminen *et al.* (2001) also suggests that inbreeding depression may pose an even

greater problem in populations currently experiencing rapid habitat fragmentation but with minimal inbreeding in the past. A reduction in fitness resulting from the loss of genetic diversity significantly increases the risk of extinction when populations are subject to environmental stress. Saccheri *et al.* (1998) found that microclimatic conditions combined with inbreeding caused the extinction of a checkerspot population in Finland, while Singer and Ehrlich (1979) found a combination of drought, fragmented habitat, and low dispersal rates contributed to the extinction of several checkerspot populations in California (Darvill *et al.* 2006).

Historically it seems that this butterfly also existed in a metapopulation dynamic across its range however, due to habitat loss and fragmentation currently only half of the known populations still exist in such a dynamic (USFWS 2023). In a metapopulation dynamic the butterfly can exist on much smaller patches of habitat which is important as climate change, and habitat loss have resulted in many small habitat patches (USFWS 2023). However, a single colony population would likely need a very large area in order to support a resilient population (USFWS 2023). It is currently unknown whether a single colony can remain viable without at least occasional genetic exchange from other sub-populations, which is no longer an option for the remaining isolated colonies (USFWS 2023).

This species may also be at increased threat because it is univoltine (USFWS 2023, Cary and Toliver 2024). Butterflies that are univoltine are thought to have decreased dispersal abilities, which limits the area they can utilize, in turn making them less resilient to stressors (Mattoon *et al.* 1971, Eskildsen *et al.* 2015, Forister *et al.* 2023). Grazing and wildlife may also be a threat, although if well managed they may both benefit the butterfly (Arnold 1989, Ellis 1989, USFWS 2023). For example, if vegetation gets too dense, it may choke out the violets this butterfly requires. Therefore, regular disturbance is incredibly important (USFWS 2023). However, if excessive, disturbance may severely reduce the viability of the butterfly by exterminating host plants, nectar plants, and willows, or by directly killing larvae or eggs (Hammond and McCorkle 1983, Ellis 1999, USFWS 2023).

Invasive species may be another threat. Siberian Elm (*Ulmus pumila*) is prevalent throughout the range and has already invaded the habitat of several of the remaining sub-populations (USFWS 2023). The extirpated Unaweep Seep colony had significant invasion by Himalayan Blackberry (*Rubus armeniacus*), and Tree of Heaven (*Ailanthus altissima*), which may have contributed to its extirpation (USFWS 2023). Several other invasives such as Russian Olive (*Eleagnus angustifolia*), Tamarisk (*Tamarix* spp.), and Leafy Spurge (*Euphorbia esula*) likely already exist in extant colonies of this butterfly. They may currently be an issue or could become one though, little data is available on the subject (USFWS 2023).

Pesticide use, especially that of insecticides and herbicides, could also potentially be a major threat to this subspecies as their use can result in mortality of butterflies, larvae, or host plants, as has been observed in many other butterflies (Malcolm 2018, Olaya-Arenas and Kaplan 2019, Halsch *et al.* 2022, USFWS 2023). Many remaining colonies of this butterfly are in close proximity to agricultural areas and are likely being hit by pesticide drift; however, more research is needed on this subject in order to determine the extent and harm of this (USFWS 2023).

Another minor threat is predation. Although specific studies on predation and parasitism of this butterfly have not been completed it is thought that many animals will predate on or parasitize the Nokomis Silverspot (Scott 1986). Climate change is increasing the length of the growing season; this results in a longer period of exposure to parasites and predators for this butterfly which may result in increased mortality (Lukas *et al.* 2014, USFWS 2023).

Population:

The US Fish and Wildlife Service (USFWS) currently recognizes 21 extant colonies of this butterfly, which are grouped into ten sub-populations across southwestern Colorado, eastern Utah, and northern New Mexico (Cong *et al.* 2019; USFWS 2023, 2024). Of these ten sub-populations, two are located in New Mexico, six are in Colorado, and two are in Utah (USFWS 2023). The isolation distance for this butterfly is considered to be about 16 to 32 km (10-20 miles) (USFWS 2023). Currently the distance between the two closest sub-populations, the two sub-populations in New Mexico, is 40 km (25 miles) (USFWS 2023). Thus all sub-populations are considered isolated and no gene flow is expected between them. In addition, with the exception of one sub-population in New Mexico (near Taos), all extant sub-populations are small and highly threatened by inbreeding depression and low genetic diversity. Therefore, they are likely not viable long-term. The population size of this butterfly is not well understood, though population declines are inferred as the butterfly is known to have been extirpated from several historic localities. At least six colonies are known to have extirpated in the last forty years (USFWS 2023). In New Mexico, a colony in the Sacramento Mountains, which may have belonged to this sub-species, has not been located despite extensive surveys from 1998 through 2000 (Holland 2010, Cary *et al.* 2010, USFWS 2023, Cary and Toliver 2024). There was also a population in Beulah, New Mexico, which was extirpated by a combination of housing developments and the construction of an upstream dam (Scott and Fisher 2014, USFWS 2023). In Colorado, the Unaweep Seep colony was extirpated due a shift in vegetation, likely as a result of cattle grazing which adversely impacted the sole known host plant, the Northern Bog Violet (*Viola nephrophylla*) (Arnold 1989, Ellis 1999, USFWS 2023). Another population near Ouray Colorado was determined to be extirpated in 2022, though the reasons why are currently unknown (USFWS 2023). Two more colonies were extirpated near La Plata, Colorado, after a golf club and several homes were built on the sites (USFWS 2023). Of the two extant New Mexico sub-populations, one is the San Miguel/Mora sub-population, which consists of two small colonies. One of these colonies has not been seen since 2010 and as a result, the status is unknown. The other was recently discovered in 2021, but is only half an acre in size (USFWS 2023). The other New Mexico sub-population is the Taos sub-population, which currently consists of four colonies (USFWS 2023). This is one of the largest sub-populations of *Nokomis* Silverspot, with one colony being 519 acres in size. However, the other three colonies are two acres or less in size (USFWS 2023).

A climate resilience model was run on the extant sub-populations and three were found to currently have very low resiliency, three had low resiliency, two having moderate resiliency, and two having high resiliency; none had very high resiliency (USFWS 2023, 2024). To factor in the impact of conservation actions, four additional future (out to 2050) prediction models were run. In one modeled scenario, the species undergoes moderate climate change and receives conservation measures. Under this scenario, it was predicted that eight populations would have moderate resiliency and two would have high resiliency. In scenario two, the species receives conservation measures but undergoes higher levels of climate change. As a result, one population ends up with low resiliency, seven with moderate resiliency, and two with high resiliency. In scenarios three and four, the species undergoes climate change but receives no conservation measures. Under both scenarios it was predicted that one population would be in moderate condition, two would have low resiliency, three would have very low resiliency, and four populations would be extirpated. Thus without conservation measures over half of the remaining populations are not viable long term, due to climate change (USFWS 2023).

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More Information

