

Argynnis nokomis nitocris (Mogollon Mountains Nokomis Silverspot)



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Taxonomy

- **Class:** INSECTA
- **Order:** LEPIDOPTERA
- **Family:** NYMPHALIDAE
- **Genus:** Argynnis
- **Scientific Name:** *Argynnis nokomis nitocris* W. H. Edwards, 1874
- **Common Name:** Mogollon Mountains Nokomis Silverspot
- **Synonyms:** *Argynnis nitocris* W. H. Edwards, 1874
W. H. Edwards, 1874
- **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:** [T3](#)
- **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

This butterfly lives in high elevation wet marshy meadows that contain its sole host plant Northern Bog Violet (*Viola nephrophylla*) (Scott 1986, Opler and Wright 1999, Glassberg 2001, Lotts and Naberhaus 2021, Cary and Toliver 2024). Northern Bog Violet is the major limiting factor for this butterfly and it is not found even in pristine habitats which do not have Northern Bog Violet (NatureServe 2024). In captivity other *Nokomis* Fritillary subspecies have been able to complete their life cycle when fed other violet species including Common Blue Violet (*Viola papilionacea*) and Confederate Violet (*Viola sororia priceana*) however, there is no evidence of this occurring in the wild and toxicity and deficiency symptoms were observed in the lab on individuals fed other violets ((Mattoon *et al.* 1971, Hammond 1974, NatureServe 2024). Northern Bog Violet requires wet soggy soil or standing water often thriving in marshy meadows with ankle deep water this plant also seems to require a shady microclimate (Baird 1942, Cary and Toliver 2024). This ties the Mogollon Mountains *Nokomis* Fritillary to a very specialized hydrology and microclimate. This butterfly also requires readily available nectar sources in its habitat and has been observed nectaring on both native and introduced Thistles, (*Cirsium*, *Carduus*, and *Onopordon* species), Horsemint (*Agastache*), and Joe Pye Weed (*Eupatorium maculatum*) (Scott 1986, Opler and Wright 1999, NatureServe 2024). Thistles are reported as being the primary nectar source for this butterfly and an important component of this specialized habitat (Scott 1986, Opler and Wright 1999, Lotts and Naberhaus 2021, NatureServe 2024).

This highly specialized habitat is a rarity in the arid southwest and when found these wetland habitats are often small and isolated from each other by large stretches of desert (Cary and Toliver 2024, NatureServe 2024). This increasing isolation has resulted in inbreeding depression and spelled doom for many metapopulations leading to declines across this butterfly range (Ehrlich and Murphy 1987, Saccheri *et al.* 1998, Nonaka *et al.* 2018, NatureServe 2024).

This butterfly is thought to be univoltine with one flight generally occurring from mid July to early September depending on locality and with males generally emerging a week or two before females (Ferris and Fisher 1971, Mattoon *et al.* 1971, Scott and Mattoon 1981, Scott 1986, Opler and Wright 1999, Lotts and Naberhaus 2021, NatureServe 2024). Extreme flight dates for New Mexico are recorded as July 13th to September 29th with the highest numbers in August (Cary and Toliver 2024). During flight adults go to nectar however, rarely stray very far from their wet meadow habitats (Cary and Toliver 2024). Points from GBIF.org for this butterfly range from June 29th to September 26th (GBIF.org

2024). During flight males will patrol all day starting as early as 8:30am around wet meadows and seeps looking for receptive females (Ferris 1969, Scott 1986, Lotts and Naberhaus 2021, NatureServe 2024).

After mating females of the parent species will walk on the ground and lay eggs singly on substrates near Northern Bog Violet females seem to preferential lay eggs on hard substrates such as willow stems, tree trunks, or logs (Scott 1986, Lotts and Naberhaus 2021, NatureServe 2024). It is thought that adult females may be able to use olfactory cues to pick out stands of Northern Bog Violet to lay their eggs in or near (Hammond 1974, NatureServe 2024). Soon after eggs hatch and unfed first instar larvae seek shelter and then hibernate (Scott 1986, Lotts and Naberhaus 2021, Cary and Toliver 2024). In the spring larvae emerge from diapause and begin to feed on the leaves of their host plants without forming nests (Scott 1986, Lotts and Naberhaus 2021, Cary and Toliver 2024).

Larvae of the parent species go through six larval instars before reaching maturity and in the lab a 60% average growth rate between instars has been determined (Scott and Mattoon 1981). In the wild the larvae of this butterfly are rarely observed as they feed nocturnally and leave their host plants during the day (Hammond 1974, NatureServe 2024). Before pupation mature larvae stop feeding and wander around rapidly looking for a place to pupate the pupae of this taxa are suspended by silk (NatureServe 2024).

Some previous studies have reported that this butterfly has a vastly skewed sex ratio favoring males in *A.n. nokomis* and the Mogollon Mountains Nokomis Fritillary where ratios as high as 9:1 male to female have been reported (Ferris and Fisher 1971, NatureServe 2024). However, females are more cryptic and harder to detect and more in depth investigations of some specific colonies of *A.n. nokomis* in Colorado have found a nearly 1:1 sex ratio calling into question the reality of this claim (Arnold 1979, 1989; NatureServe 2024)

Geographic Range:

The accepted range for the Mogollon Mountains Nokomis Fritillary has changed overtime through several taxonomic revisions. It is now known to be limited to along the Mogollon Rim, in Arizona and New Mexico, with occurrences in the Mogollon and White Mountains, as well as on several peaks in the Gila region of New Mexico (Cong *et al.* 2021). Occurrences further north in Colorado, and in the Chuskae Mountains were once thought to be of this taxa. However, Colorado populations now reside under the federally listed subspecies *Argynnis nokomis nokomis* and the population in the Chuskae Mountains is thought to be hybrids of *A. n. nokomis* and *A. n. nokomis* (Cong *et al.* 2021, USFWS 2023). This butterfly exists at higher elevations than other Nokomis Fritillary's (*A. nitocris*), with most records found between 2,285 and 2,895 meters (7,000 to 9,500 feet) (Ferris 1971, Cary and Toliver 2024).

Conservation Considerations:

In the past the taxonomy of this species has been a major roadblock for this butterflies conservation with this subspecies being proposed for listing four separate times in 1984, 1989, 1991, and 1994 however, it was not listed due to uncertainty of what populations would actually be protected by a listing (NatureServe 2024, USFWS 2024). However, recently more robust genetic evidence has solidified the subspecies of this taxa causing the United States Fish and Wildlife Service to list *A.n. nokomis* as federally threatened in the winter of 2024 (USFWS 2023). The Mogollon Mountains Nokomis Fritillary seems like a prime candidate to get the same treatment now that the taxonomy issues are less extreme.

With several colonies being extirpated and many threats, any remaining habitats for this butterfly should be conserved in order to ensure its survival (Lotts and Naberhaus 2021). In many cases these patches of habitat left may not be resilient enough to support a population; the United States Fish and Wildlife Service estimated that a minimum of 12 acres of habitat would be needed for a resilient population (USFWS 2023). In these cases habitat restoration may be required although due to the specific hydrological and microclimatic variables required by this taxa habitat restoration

may be challenging (Arnold 1989, NatureServe 2024). More research on the factors that promote Northern Bog Violet survival would likely be needed for these efforts to be effective. If these efforts do occur targeting them around existing colonies to provide more resiliency and larger population numbers will likely be the most effective strategy. Dispersal data for the Nokomis Fritillary has shown this species traveling up to 1.2km (.75 miles) between disjunct habitats (Arnold 1989). As a result, restoration efforts should likely be targeted within this range in Ellis (1989) they recommended to protect the Nokomis Fritillary that several small colonies near each other in a metapopulation may be the most effective way to conserve this species as individuals could move between colonies however, in the event of landslides, flooding, and fire which could easily extirpate an entire population recolonization would still be a possibility (Ellis 1989). These sites would also need to have nectar resources in order to support adults. Additionally, this butterfly could be reintroduced or introduced into habitats with Northern Bog Violets however, again these habitats may not have the correct hydrology or microclimatic variables required to support a population (Arnold 1989, NatureServe 2024). Additionally, care to make sure subspecies integrity is being maintained is a consideration for any reintroduction (Pyle 1976, NatureServe 2024).

On top of protecting all known habitats from water development and grazing. Management for this butterfly's host plant Northern Bog Violet will likely be required in order to ensure its long term survival as this butterfly is so closely tied to its host plant. Monitoring of trends and in some cases determinations of population sizes may be required in order to determine the health of metapopulations and properly implement conservation actions. Status of Northern Bog Violet and habitat conditions should also be monitored where possible especially in relation to grazing activities. Additionally, more research is needed on this species especially in determination of population size and trends, but also trying to identify any additional colonies, and further analyzing the threats to this species in order to properly deploy conservation measures for the taxa. Determination of healthy metapopulation size will likely also be very important. More research is also needed on the specific subspecies and the threats to them as well as on Northern Bog Violet.

Threats:

This butterfly is somewhat range restricted with an Extent of Occurrence (EOO) of just 23,834km² which nearly qualifies the taxa for listing as vulnerable. However, this butterfly's distribution is also extremely spotty as this taxa relies on large amounts of water in a very arid region this is made worse by the fact that not only does it need a large amount of moisture but it also needs a very specific microclimate for its host plant. This specific microclimate is even harder to find and as a result the colonies of this butterfly are small, isolated, and very vulnerable to degradation by humans (Cary and Toliver 2024). As a result, this butterfly has a very small Area of Occupancy of just 92km² which qualifies this butterfly for listing as endangered. This isolation from one another has also caused a variety of problems for this taxa including inbreeding depression which can quickly extirpate the small isolated colonies which remain (Lynch *et al.* 1995, Saccheri *et al.* 1998, Nieminen *et al.* 2001, Nonaka *et al.* 2018).

This butterfly also seems to be in a metapopulation dynamic where populations frequently extirpate and then are recolonized by nearby larger populations however, due to habitat loss and increasing isolation these colonies are no longer getting recolonized when they go extinct leading to widespread extirpations and extinctions of colonies throughout this butterfly's range. Within the last fifty years this taxa has an Area of Occupancy of just 92km² however, within the last fifty years the southwestern United States and northern Mexico have gotten much hotter and drier and many colonies may have silently extirpated in that time (Cook *et al.* 2009, Cook *et al.* 2015, Forister *et al.* 2021, Williams *et al.* 2022). As the western United States continue to get hotter and drier over the next century these declines are expected to continue unless significant conservation actions are taken (Cook *et al.* 2009; Cook *et al.* 2015; Forister *et al.* 2010, 2021; Williams *et al.* 2022; USFWS 2023). A climate change vulnerability assessment done on *A.n. nokomis* for the Bureau of Land Management in 2015 found that taxa to be highly vulnerable to climate change and these results were corroborated by a separate Fish and Wildlife Service assessment (CNHP 2015, USFWS 2023). It was also found that of all of the subspecies of the Nokomis Fritillary that the Mogollon Mountains Nokomis Fritillary and *A.n. nokomis* may be less adapted to the changing climate than any of the other subspecies due to them having fewer adaptive mutations and less Single amino acid variations they are also experiencing less positive

selection than these other taxa and as a result, are of special concern in the face of climate change (Cong *et al.* 2021).

Besides climate change the main threat to this butterfly is habitat loss and many populations of this taxa have been lost already due to water development by humans including draining of habitat, cattle grazing, and capping of springs (Pyle 1976, Hammond and McCorkle 1983, Stanford and Opler 1993, Lotts and Naberhaus 2021, Bailowitz and Brock 2022). Although some habitat and populations have also been lost due to natural hydrological disturbance (Pyle 1976, NatureServe 2024). On top of causing the extirpation of many populations it has been documented that water development has forced some populations of *A.n. nokomis* further up canyons reducing the amount of available habitat and decreasing their population numbers (Stanford 1993). Additionally, it has been theorized that historically beaver activity largely maintained many of these floodplain habitats that this subspecies requires however, with beavers being largely absent from this area now widespread habitat declines have occurred (Cary and Toliver 2024).

Additional threats to this butterfly include overgrazing of cattle which can have very detrimental effects on this subspecies habitat (Hammond and McCorkle 1983, Arnold 1989, NatureServe 2024). Areas of New Mexico have been documented as extirpating the Mogollon Mountains Nokomis Fritillary due to overgrazing of cattle (Ferris 1971). Studies of another subspecies of Nokomis Fritillary in Nevada found that 88% of the populations of their subspecies had disappeared and that 50% of that 88% was due to cattle grazing (Sanford 2011). Additionally, flooding and fire, while often actually beneficial to this species, host violets if in small amounts can also cause large amounts of short term mortality which may be enough to extirpate colonies (NatureServe 2024). This butterfly has also previously been over collected in some areas which can highly stress these already small and isolated populations (Pyle 1976, New 1991, NatureServe 2024). Other threats to this taxa include invasive weeds which can choke out and kill Northern Bog Violets, elimination of nectar resources, and insecticides (NatureServe 2024). In other *Argynnis* species temperature and humidity have been shown to have a large effect on the timing of individuals development and on mortality of individuals (Mattoon *et al.* 1971, NatureServe 2024). This effect on development timing is especially worrying as only having a single brood and a single host plant puts this butterfly especially at risk for phenological mismatch which could cause the extinction of entire colonies in just one year (Singer and Parmesan 2010, Patterson *et al.* 2019). Butterflies that are univoltine are also thought to have decreased dispersal abilities, which limits the area they can utilize, in turn making them less resilient to stressors (Eskildsen *et al.* 2015).

This subspecies is also very host specific with just a single known host plant. Host specificity is a key indicator of extinction risk in butterflies where more host specific species are much more likely to go extinct as any threats affecting their host plant will result in direct population declines for the butterfly (Kotiaho *et al.* 2005, Palash *et al.* 2022, Forister *et al.* 2023). Extreme temperatures and dry conditions can also cause mortality in all life stages of this butterfly as well as disease, predators, and parasitic organisms (Mattoon *et al.* 1971, NatureServe 2024).

Furthermore Forister *et al.* (2023) used biological, ecological, and climate data to rank the imperilment of western butterfly species for which long-term monitoring data are not available. Using a weighted scheme, the authors found the Nokomis Fritillary to be among the most imperiled butterfly species in the western United States due to a combination of its univoltine life history, its heavy reliance on moisture throughout the entire summer, and its host specificity of having just a single host plant.

Population:

The exact population size and trend are not known for this subspecies; however, this butterfly has been declining due to human disturbance and climate change since European settlement (Hammond and McCorkle 1983). This subspecies has been documented as being driven to extirpation in the southernmost part of its range in southeastern Arizona with at least two populations formerly occurring there one on Mt Lemmon and one in the Huachuca mountains being extirpated by humans with the last known occurrences happening in 1938 (Bailowitz and Brock 2022). Due to the remoteness of the rest of the range we have little other data on declines for this butterfly however, it has not been seen in the northwest of its range in over fifty years (GBIF.org 2024). Which may also indicate that it has extirpated there.

The other subspecies of the Nokomis Fritillary have also experienced declines and we can use these as a potential gauge of decline. We know that subspecies *A.n. coerulescens* is likely now extinct in the United States due to human disturbance (Hammond and McCorkle 1983). *A.n. wenona* is now also considered to be possibly extinct with no one being able to find it since the 1970s despite several searches (Hammond and McCorkle 1983, Selby 2007). *A.n. tularosa* may also be extinct now as the population has not been able to be located (Cong *et al.* 2019).

A.n. nokomis has also undergone severe declines to the point where now only ten populations remain which has resulted in it getting federally listed as threatened by the United States Fish and Wildlife Service (USFWS) (USFWS 2023). This listing by the Fish and Wildlife Service means that we have the most information available on this nearby subspecies and in climate change scenarios run by the USFWS they found that without conservation action and with only a moderate amount of climate change by 2050 of these ten populations four are likely to extirpate by 2050 with another three being in very bad condition, two being in bad condition, and one population being in moderate condition (USFWS 2023). With any other disturbance or a large amount of climate change this could cause that taxon's extinction. A climate change analysis like this hasn't been performed for the Mogollon Mountains Nokomis Fritillary but we expect that it would fair the same with a moderate or large amount of climate change and no conservation.

In their investigations of *A.n. nokomis* the USFWS also found that a minimum amount of habitat for a resilient population of *A.n. nokomis* would be around 12 acres. Finding this much wet alpine meadow habitat with readily available Northern Bog Violet is hard to come by and so most known populations of this butterfly are likely not very resilient to disturbance and many may not be viable in the face of climate change (USFWS 2023).

This subspecies also exists in a metapopulation dynamic which makes it much more prone to extinction (Ehrlich and Murphy 1987, Saccheri *et al.* 1998, Nonaka *et al.* 2018). Additionally, many of these metapopulations are now isolated from each other due to habitat decline and land use changes (USFWS 2023). As a result, the usual cycle of extinction and recolonization has been broken in many places with colonies going extinct and not being able to be recolonized by other individuals. These small isolated colonies are then at extreme risk for extirpation due to inbreeding depression which can lead to more rapid declines in this butterfly's population and therefore more isolation for those who remain (Hedrick 1994, Lynch *et al.* 1995, Saccheri *et al.* 1998, Nieminen *et al.* 2001, Nonaka *et al.* 2018).

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More Information

