

## Oeneis polixenes brucei (Rocky Mountain Polixenes Arctic)

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Steve Cary,

### Taxonomy

- **Class:** INSECTA
- **Order:** LEPIDOPTERA
- **Family:** NYMPHALIDAE
- **Genus:** Oeneis
- **Scientific Name:** *Oeneis polixenes brucei* (W. H. Edwards, 1891)
- **Common Name:** Rocky Mountain Polixenes Arctic
- **Synonyms:** *Chionobas brucei* W. H. Edwards, 1891 W. H. Edwards, 1891
- **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

Polixenes Arctic has a dark band across the median area, not unlike *Chryxus Arctic*. Unlike *Chryxus*, it has translucent wings and a greyer ground color. **Comments.** Rocky Mountain subspecies *Oeneis polixenes brucei* (W. H. Edwards 1891) occurs in our area. *Oeneis polixenes* was found on Santa Fe Baldy (SF) in July 1935 by Drs. Whitmer and Klots.

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

### Habitat and Ecology

This butterfly lives in wet tundra at extreme high elevations in the southern Rocky mountains (Lotts and Naberhaus 2021). The larval host plant of this butterfly are grasses (*Poaceae*) and sedges (*Cyperaceae*) with known host plants

including Drummond Sedge (*Carex rupestris drummondiana*), Colorado Fescue (*Festuca brachyphylla coloradensis*), and Alpine Oatgrass (*Helictotrichon mortonianum*) (Cary and Toliver 2024). This butterfly has also been observed ovipositing on Shortleaved Sedge (*Carex misandra*) (Scott 1986). Scott (1986) also reports oviposition on *Festuca mibra* however, we could not determine this to be a valid taxonomic name (Scott 1986).

This butterfly is biennial but with even and odd year groups which means that a flight occurs each summer with records stretching from late June to late July (Cary and Toliver 2024). Larvae overwinter their first winter in earlier instars, probably the 1st instar but maybe 2nd and their second winter as mature larvae in either the 4th or 5th instar (Scott 1979, 1986, 1992; Lotts and Naberhaus 2021). During flight males patrol along ridges above treeline, sometimes perching at grassy swales to seek females (Scott 1986, Lotts and Naberhaus 2021, Montana Natural Heritage Program 2024). After mating females lay eggs on pebbles, rocks, litter, or dead plant material near their host plants (Scott 1986).

## Geographic Range:

The Rocky Mountain Polixenes Arctic is the southernmost subspecies of the more polar Polixenes Arctic, which is found across Alaska and northern Canada (Cary and Toliver 2024). This subspecies occurs in the southern Rocky Mountains, with three known disjunct populations; one in New Mexico, one in Wyoming, and one in Colorado. As a cold adapted subspecies, in their more southern distribution they only occupy very high alpine tundra. They are found only above 3,880 meters (12,400 feet) in New Mexico, but can occur at slightly lower elevations further north, with records as low as 3,355 m (ft) in Wyoming (Ferris and Brown 1981, Cary and Toliver 2024, Montana Natural Heritage Program 2024). Prior to 1950, this butterfly was also reported from Carbon County, Montana, but no observations have been made recently and the population is now considered extirpated (Kohler 1980, Stanford and Opler 1993).

## Conservation Considerations:

This subspecies underwent a NatureServe conservation assessment in 1998 and was found to be globally vulnerable to extinction (NatureServe 2024). However, this assessment is now very out of date and in the 25 years since its completion the western United States has gotten much hotter and drier threatening this wet and cold adapted butterfly (Williams *et al.* 2022). This trend of drying and warming is expected to continue over the next century which makes the future for this butterfly look very grim especially in the southern ends of its range such as in New Mexico (Cook *et al.* 2009, Cook *et al.* 2015, Williams *et al.* 2022). As a result, conservation actions are likely required in order to save this butterfly. Firstly more research is needed on this butterfly including determination of specific host plants, systematic searches for new colonies and to document extirpations, and surveying to identify population sizes and trends. Furthermore monitoring of habitats for succession which may be driving this and its host plant up peaks and into extinction should also be done. Armed with this information more in depth conservation measures can be accurately recommended.

## Threats:

As an extreme high elevation endemic at the far south of its parents range the main threat to this butterfly is likely climate change. It has been documented that many butterfly species respond to climate change by moving to higher elevations or higher latitudes; however, this butterfly already lives at the altitude extreme of its habitat and likely already exist at the altitudinal limit of their physiological and ecological requirements and/or those of their larval host plants (Gradish 2014). In the south of its range in New Mexico the butterfly is recorded as living above 3880 meters (12,400 feet) and has only been found on the highest peaks in New Mexico at the northern end of its range it may be a little less heat stress and as a result, exists as low as 3355m (10,942 feet) and above still limiting this butterfly to just high elevation tundra (Cary and Toliver 2024, Montana Natural Heritage Program 2024). With moving to higher elevations

not being an option for this taxa and it being barred from moving farther north by large stretches of desert, a moderate amount of climate change threatens to push this taxa into thin air (Thomas 2005, Habel *et al.* 2010, Holland 2010, Todisco *et al.* 2010, Gradish 2014). As the western United States is expected to continue to get hotter and drier over the next century things are looking dire for this mountaintop resident (Cook *et al.* 2009, Forister *et al.* 2010, Cook *et al.* 2015, Williams *et al.* 2022). Climate change also threatens this subspecies with phenological mismatch with both host and nectar sources which could result in steady declines in population numbers or in the event of an extreme phenological mismatch the extirpation of entire populations (Singer and Parmesan 2010, Patterson *et al.* 2019).

This subspecies could also be highly affected by fire either by it or the lack of it. With such small population numbers in such small areas one fire controlled or wild could wipe out a large percentage of what's left of this subspecies and potentially cause its extinction (Cary *et al.* 2004). However, at the same time with no fire these tundra grasslands may grow senescent or be succeeded which will also drive the taxa towards potential extinction (Cary *et al.* 2004). Because the population is so small and it's so restricted drought, and severe weather also pose large challenges to the taxa; hailstorms and late snows during the flight period could kill off a large number of individuals plummeting the genetic diversity of the population (Cary *et al.* 2004).

Another major threat to this butterfly is inbreeding depression which is magnified by the likely metapopulation dynamics of this taxa and its rarity. This can affect the butterfly in two ways first off in a metapopulation dynamic these mountain top colonies may frequently go extinct and are recolonized by other populations however, as climate change has pushed this butterfly and its host plants to higher elevations or over the edge into oblivion there is less opportunity for recolonization of these sites extirpated by environmental stochasticity. On top of this by all accounts this butterfly is rare and localized and it has only been observed twice since 2014 which may indicate a small population size lessening the amount of genetic material available (SCAN 2020, Lotts and Naberhaus 2021, GBIF.org 2024). Now this butterfly is found in three metapopulations each separated from each other by very large distances. There is one colony in northern New Mexico, one in central Colorado, and one in northern Wyoming the isolation of these colonies from each other is worrisome (Scott 1986, Lotts and Naberhaus 2021, GBIF.org 2024). This butterfly, also being univoltine, likely has somewhat limited dispersal capabilities which can further stress this butterfly (Lotts and Naberhaus 2021). Metapopulations are also at additional risk of inbreeding depression as in these small isolated populations deleterious alleles can begin to allele along with a reduction in heterozygosity which has 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).

Loss of the larval host plants due to development or replacement by invasive species is also a potential threat to this butterfly (Cary *et al.* 2004). In other places many arctic species have been driven out of habitats due to non native grasses (Cary *et al.* 2004, NatureServe 2024). Furthermore this butterfly completes its life cycle in two years rather than just a single year this provides more opportunity for things to go wrong for the larvae due to environmental stochasticity, or predation which they must survive for two years in order to become adults.

## Population:

The population size and trend are not known for this subspecies. Determination of population size and monitoring of population trends is necessary to ensure the population is stable. Especially as several widespread, relatively common species of butterfly are in decline across the American west (Forister *et al.* 2021).

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## More Information

