FIELD GUIDE

Methods for Assessment of Species Richness and Occupancy Across Space, Time, Taxonomic Groups, and Ecoregions

Field Guide and Natural History of Butterflies on the Western Edge of the Great Basin

SERDP Project RC-2202

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This field guide and natural history was written to share information on the ecology and identification of the species of butterflies that the data suggest regularly breed or occur on Department of Defense lands and ecologically similar areas on the western edge of the Great Basin. Although existing field guides provide some of the same details, this guide focuses on the regional context. For example, it is described how to differentiate among species with similar appearance that co-occur in the western Great Basin. If the biology of a given species varies considerably among ecosystems, it's presented the most relevant information for the region.

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Cover photograph by Erica Fleishman. Photographs in the body of the guide are by David Pavlik if not otherwise credited. The photographers credited herein retain all rights to their images unless different licenses are noted.

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Introduction

We wrote this field guide and natural history to share information on the ecology and identification of the species of butterflies that our data suggest regularly breed or occur on Department of Defense lands and ecologically similar areas on the western edge of the Great Basin. Although existing field guides provide some of the same details, we focus on the regional context. For example, we describe how to differentiate among species with similar appearance that co-occur in the western Great Basin. If the biology of a given species varies considerably among ecosystems, we present the most relevant information for our region.

The Great Basin (taupe) and approximate area covered by this guide (red). Image produced by the Great Basin Landscape Conservation Cooperative.

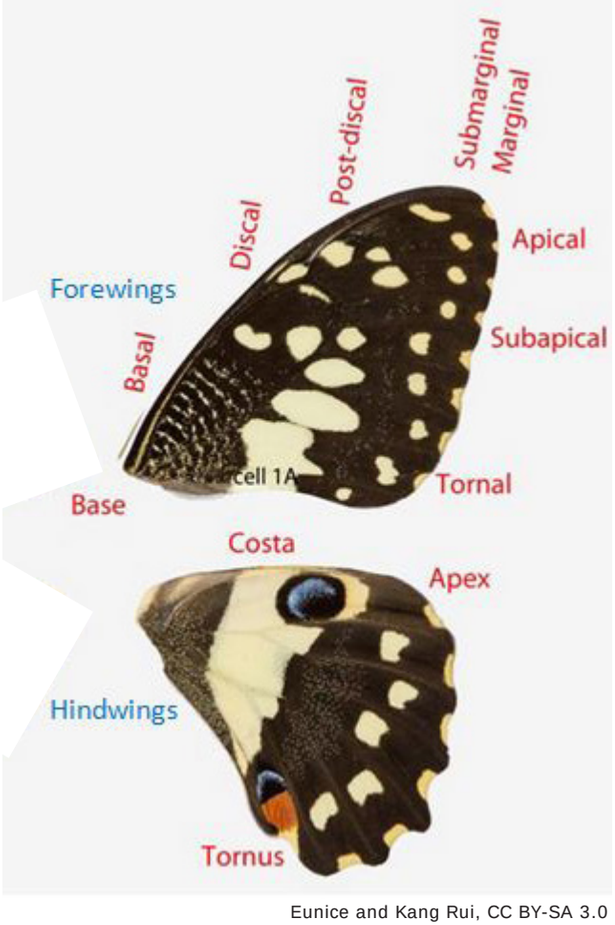
Inferences on distribution and abundance are based on our research in 1996 and 1997 and from 2012 through 2017 on the east slope of the Sierra Nevada in Alpine and Mono Counties, California, from approximately Walker south to Virginia Lakes, and in the Wassuk Range (Mineral County, Nevada) and Sweetwater Mountains (Douglas and Lyon Counties, Nevada). In other parts of these mountain ranges and other parts of the Great Basin, and in other time periods, occurrences and abundances of butterflies may differ.

Among the dominant land–cover types in the western Great Basin are woodlands dominated by single–leaf pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*, *J. occidentalis*), shrubsteppe dominated by sagebrush (*Artemisia* spp.), and riparian woodlands dominated by deciduous trees (e.g., aspen [*Populus tremuloides*], chokecherry [*Prunus virginiana*]) and shrubs (e.g., willow [*Salix* spp.], Woods' rose [*Rosa woodsii*]). Jeffrey pine (*Pinus jeffreyi*), lodgepole pine (*Pinus contorta*), and red fir (*Abies magnifica*) also are dominant trees in some parts of the east slope of the Sierra Nevada and Wassuk Range.

Natural variability is infinite, and exceptions to many of our characterizations are inevitable. For example, some number of adult butterflies of a given species will occur in unexpected locations, feed on plants that may not have been documented previously as food sources, or have atypical or aberrant morphology. We do not cite all records of each species from outside its typical range. Future work undoubtedly will document resident butterflies, migrants, and vagrants in addition to the species described herein. We encourage readers to explore other sources of information on butterfly ecology and identification. Perhaps the most useful among these is *The Butterflies of North America* (Scott 1986). *Kaufman Field Guide to Butterflies of North America* (Brock and Kaufman 2003) and *A Swift Guide to Butterflies of North America* (Glassberg 2012) also may be helpful for field identifications.

We present the species accounts in current taxonomic order and use the names in Austin (1998). We do not include common names because there is no recognized taxonomic authority for the common names of butterflies (by contrast, the *Birds of North and Middle America Checklist* is the taxonomic authority for birds in those regions). As a result, common names of most species tend to vary considerably among field guides, and use of common names can hamper communication about the taxa. Although scientific names may change over time as taxonomic revisions are published, these changes generally are well-documented in the literature.

In our descriptions of appearance, we use a number of terms that may be unfamiliar or are specific to lepidoptera. The following figure may be a useful reference.



Eunice and Kang Rui, CC BY-SA 3.0

Dorsal refers to the upper side and **ventral** to the lower side of the body.

We hope you will enjoy these accounts as much as we enjoyed compiling them. We look forward to continued learning and exploration on our nation's public lands.

Thorybes mexicana (Family Hesperiidae, Subfamily Pyrginae)

Natural history

- *Thorybes mexicana* occur from the Cascade Mountains in Oregon south through the Sierra Nevada in California and east to the Sweetwater Mountains. Although they also occur in the mountains of Utah and Colorado and south through the highlands of Panama, they otherwise are absent from the Great Basin (Scott 1986).
- *Thorybes mexicana* complete their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as a larva.
- *Thorybes mexicana* have one generation per year in the Great Basin.

Abundance

- *Thorybes mexicana* were uncommon to common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.

Habitat associations and behavior

- *Thorybes mexicana* mainly occur in open areas (Scott 1986).
- Known larval hostplants are herbaceous Fabaceae, including *Vicia* and *Trifolium*.
- Adults of both sexes take nectar.
- Males visit mud.
- Males perch near the ground on hilltops.

Identification

- *Thorybes mexicana* are small Hesperiines (skippers). The dorsal wings are dark brown, with white spots on the forewings. The ventral wings are two-toned. The outer half is paler than the inner half, and is finely striated. The ventral forewings have white spots that are paler than those on the dorsum.
- *Thorybes mexicana* may seem similar to *Pyrgus scriptura*, but the wings of *Pyrgus scriptura* have wide white margins.
- *Thorybes mexicana* can be confused with *Erynnis persius*, but the dorsal wings of *Erynnis persius* do not have white spots.
- *Pholisora catullus* are smaller than *Thorybes mexicana*, and their ventral wings are plainer.

Mt. Grant, Wassuk Range, Mineral County, Nevada (Erica Fleishman)

Erynnis persius (Family Hesperiidae, Subfamily Pyrginae)

Natural history

- *Erynnis persius* occur from central Alaska south through Oregon, Idaho, and western Montana. They have a patchy distribution further south and east in the mountains of Arizona and Colorado, and in California's Central Valley. They also occur from Wisconsin east to Maryland, north to southern Maine, and further south in the Appalachian Mountains to Tennessee and North Carolina.
- *Erynnis persius* complete their entire life cycle in the Great Basin, and largely are restricted to the mountains.
- Diapause is as a larva.
- *Erynnis persius* have one generation per year in the western Great Basin.
- The taxonomy of *Erynnis persius* is uncertain at the species and subspecies levels.

Abundance

- Abundance of *Erynnis persius* in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range was low. We have not recorded the species in the Sweetwater Mountains.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Erynnis persius* generally occur at intermediate elevations in open areas and woodlands, including those near streams.
- Larval hostplants are herbaceous Fabaceae (*Lupinus*, *Astragalus*) and Ranunculaceae (*Aquilegia*).
- Adults of both sexes take nectar.
- Males visit mud.
- Males patrol canyons and seek mates on hilltops.

Identification

- *Erynnis persius* are medium-sized Hesperiines. The dorsal wings of *Erynnis persius* are brown-black and the forewings have numerous low-contrast, glassy (hyaline) spots. The dorsal hindwing and ventral wings have fewer marks. The forewings of males have many raised white hairs. Females are paler than males, and have a greater number of marks on the dorsum.
- *Erynnis persius* can be distinguished from other dark skippers in the western Great Basin by the absence of white spots on their dorsal wings.
- The wings of *Pyrgus scriptura* have wide, white margins.
- The dorsal wings of *Thorybes mexicana* have white spots.
- *Pholisora catullus* are smaller than *Erynnis persius*, and their ventral wings are plainer.

Pyrgus communis (Family Hesperiidae, Subfamily Pyrginae)

Natural history

- *Pyrgus communis* occur throughout the conterminous United States with the exception of New England, north to the southern Prairie Provinces, and south to Argentina (Scott 1986).
- The species spends its entire life cycle in the valleys and mountains of the Great Basin.
- *Pyrgus communis* have multiple generations per year in the Great Basin.
- Diapause is as a larva.
- The taxonomic status of *Pyrgus communis* and *Pyrgus albescens* is uncertain. On the basis of molecular data, Fordyce et al. (2008) suggested that they should be included within one species, but noted substantial and consistent morphological differences with few intermediate forms. The molecular differences may be obscured by recent contact between previously isolated populations.

Abundance

- Abundance of *Pyrgus communis* was relatively low in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains. In the Wassuk Range, the species was fairly common.
- Annual variation in abundance is moderate.

Habitat associations and behavior

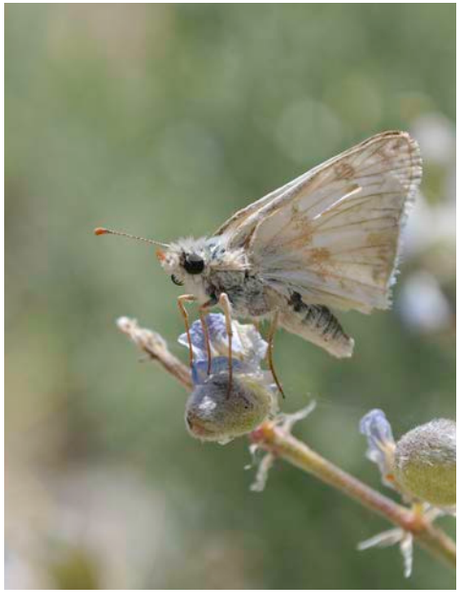
- *Pyrgus communis* inhabit open areas, including roadsides, creek beds, and disturbed areas. They also occur in open woodlands at moderate elevations.
- In the western Great Basin, larval hostplants are herbaceous Malvaceae, including *Sphaeralcea.*
- Adults of both sexes take nectar.
- Males visit mud.
- Males perch and patrol in canyons.

Identification

- *Pyrgus communis* are small Hesperiines. The dorsal wings are blue-black with white checkering. Some individuals, primarily females, have dark dorsal wings, whereas the dorsum of some males is largely white. The ventral wings are pale yellow and checkered with white.
- The dorsal and ventral wings of *Heliopetes ericetorum* are whiter than those of *Pyrgus communis*, and *Heliopetes ericetorum* usually are larger than *Pyrgus communis*.

Heliopetes ericetorum (Family Hesperiidae, Subfamily Pyrginae)

Natural history



- *Heliopetes ericetorum* occur from eastern Washington south through the Great Basin and Rocky Mountains. They also occur from the Klamath Mountains south through central and coastal California into Baja California, and in the highlands of Mexico south to Guerrero.
- The species likely does not overwinter in the western Great Basin, although it may breed there.
- *Heliopetes ericetorum* inhabit both valleys and mountain ranges.
- Diapause is as a larva.
- The species has multiple generations per year in the western Great Basin.

Abundance

- *Heliopetes ericetorum* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater and Wassuk Ranges.
- Annual variation in abundance is high.

Habitat associations and behavior

- *Heliopetes ericetorum* inhabit open woodlands, sagebrush shrubsteppe, and agricultural areas.
- Larvae hostplants are herbaceous Malvaceae, including *Sphaeralcea*.
- Adults feed on nectar.
- Male use of mud is moderate.
- Males patrol throughout canyons.

Identification

- *Heliopetes ericetorum* are large Hesperiines. The dorsal wings of males are mostly white, with blackish chevrons along the margins. Females have blackish wing bases, and more-extensive marginal and postmarginal blackish marks than do males. The ventral wings of both sexes largely are white. The tip of the ventral forewing and the margin and base of the ventral hindwing have faint, orange-brown marks. The wing margins are checkered.
- *Heliopetes ericetorum* can be distinguished from other pale skippers in the western Great Basin by their large size and white ventral wings.
- The ventral wings of *Pyrgus communis* are whitish, but have extensive, darker checkering.

Pholisora catullus (Family Hesperiidae, Subfamily Pyrginae)

Natural history

- *Pholisora catullus* occur throughout the United States with the exception of peninsular Florida, lower elevations in the Great Basin and southwestern deserts, Washington and Oregon west of the Cascade Mountains, and California outside the Central Valley and Sierra Nevada (Scott 1986).
- The species is resident in the Great Basin, and largely restricted to the mountains.
- *Pholisora catullus* have two or more generations per year in the Great Basin.
- Diapause is as a larva.

Abundance

- *Pholisora catullus* were rare in the areas we sampled on the east slope of the Sierra Nevada. We did not detect them in the Sweetwater Mountains or Wassuk Range.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Pholisora catullus* inhabit open areas, often including disturbed areas (Scott 1986). They also occur in open woodlands at moderate elevations.
- In the western Great Basin, larval hostplants are herbaceous Chenopodiaceae, including *Chenopodium*.
- Adult *Pholisora catullus* feed on nectar.
- Males sometimes visit mud.
- Males patrol in canyons.

Identification

- *Pholisora catullus* are small Hesperiines. The wings are dark brown with small white spots on the dorsal forewing and occasionally on the dorsal hindwing. The fringes are paler brown than the rest of the wings.
- *Pyrgus scriptura* have wide, white wing margins.
- The dorsum of *Erynnis persius* does not have white spots, and *Erynnis persius* generally are larger than *Pholisora catullu*s.
- *Thorybes mexicana* are larger than *Pholisora catullus*, and their ventral hindwings have large, white dorsal spots and striations.

Hesperia uncas (Family Hesperiidae, Subfamily Hesperiinae)

Natural history

Alan Schmierer, public domain (CC0 1.0)

- *Hesperia uncas* occur in the southern prairies of Canada, south through much of the Great Plains into northern Texas, and west through the Great Basin. Small, disjunct populations occur in the mountains of Arizona and northern Mexico.
- *Hesperia uncas* spend their entire life cycle in the Great Basin. Different subspecies largely are restricted to either valleys or mountain ranges.
- Diapause is as a larva.
- *Hesperia uncas* have one generation per year in the western Great Basin.

Abundance

- High-elevation forms of *Hesperia uncas* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We have not recorded the species from our study areas in the Sweetwater Mountains.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Hesperia uncas* inhabit alkali grasslands in valley and open uplands dominated by sagebrush.
- Larval hostplants are Poaceae, including *Bouteloua* and *Stipa*.
- Adults of both sexes feed on nectar.
- Use of mud is rare.
- Males of high-elevation forms perch in uplands and on hilltops.

Identification

- *Hesperia uncas* are medium-sized Hesperiines. The dorsal wings are orange, with brown margins and bases and whitish spots near the tip of the forewing. The ventral forewing is similar to the dorsal forewing but duller. The ventral hindwing is olive-orange with a curved, whitish submarginal band and a basal white spot.

Veins on the ventral hindwing are white to at least some extent, and usually are more prominent on low-elevation forms than high-elevation forms. Low-elevation forms also are paler than high-elevation forms..

- *Hesperia uncas* are similar to and can be difficult to differentiate from other *Hesperia* in the western Great Basin. The white veins, when clearly present, are the most distinguishing character.

Hesperia juba (Family Hesperiidae, Subfamily Hesperiinae)

Natural history

- *Hesperia juba* occur from central British Colombia south through the Rocky Mountains, Great Basin, and most of Washington, Oregon, and California.
- *Hesperia juba* spend their entire life cycle in the Great Basin, where they inhabit both valleys and mountain ranges.
- Diapause is as a larva.
- *Hesperia juba* have two generations per year.

Abundance

- *Hesperia juba* were common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Hesperia juba* inhabit sagebrush shrubsteppe, open woodlands, and riparian areas across a fairly extensive elevational gradient.
- Larval hostplants are Poaceae, including *Deschampsia*, *Stipa*, *Bromus*, and *Poa*.
- Adults feed on nectar
- Males visit mud.
- Males perch in canyons.

Identification

- *Hesperia juba* are medium-sized Hesperiines and often larger than other *Hesperia* in the region. The forewings are fairly long and pointed. The dorsal wings are orange, with jagged brown margins and brown spots. Males have a black stigma on the dorsal forewing. The ventral hindwing is orange-green and has a U-shaped band of white spots enclosing a smaller white spot. Veins on the ventral hindwing are white to at least some extent, and usually are more prominent on low-elevation forms than high-elevation forms. The dorsal forewing is similar to the ventral forewing. Low-elevation forms are paler than high-elevation forms.
- *Hesperia juba* may be difficult to differentiate from *Hesperia uncas*.
- Worn individuals of *Hesperia juba* and *Hesperia comma* may be difficult to differentiate.

Hesperia comma (Family Hesperiidae, Subfamily Hesperiinae)

- *Hesperia comma* occur from eastern Alaska south through the Cascade Range, Sierra Nevada, Great Basin, and Rocky Mountains. They also occur in coastal California and the prairies of Canada.
- *Hesperia juba* spend their entire life cycle in valleys and mountains of the Great Basin.
- Diapause is as an egg.
- *Hesperia comma* have one generation per year in the western Great Basin.

Abundance

- *Hesperia comma* were common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. Their presence in the Sweetwater Mountains was more variable in time, but the species was abundant when present.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Hesperia comma* inhabit meadows, open woodlands, and sagebrush shrubsteppe across an extensive elevational gradient.
- Larvae feed on Poaceae, including *Festuca*, *Poa*, and *Stipa*.
- Adults feed on nectar.
- Males visit mud.
- Males perch on hilltops and in canyons.

Identification

- *Hesperia comma* are medium-sized Hesperiines. The dorsal wings are orange, with brown margins and spots. The ventral hindwing has a U-shaped band of white spots that enclose a smaller white spot; these spots may not have sharp edges. The ventral and dorsal forewings are similar. The ventral hindwings are yellow to green.
- *Hesperia comma* often are smaller than *Hesperia uncas* and *Hesperia juba*, but size is not diagnostic.
- The ventral hindwings of *Hesperia comma* generally appear yellowish, whereas those of *Hesperia juba* appear brownish, but the color of both species varies, and worn individuals may be difficult to differentiate.
- *Hesperia comma* generally begin to fly toward the end of the flight period of the first generation of *Hesperia juba*, and their flight season often tapers to a close before that of the second generation of *Hesperia juba*.

Polites sabuleti (Family Hesperiidae, Subfamily Hesperiinae)

Natural history

- *Polites sabuleti* occur from southern British Columbia south through Baja California and east through the mountains of Wyoming, Colorado, and New Mexico (Scott 1986).
- *Polites sabuleti* spend their entire life cycle in the Great Basin. Different subspecies largely are restricted to either valleys or mountain ranges.Valley forms typically are paler than those in the mountains.
- Diapause is as a pupa.
- *Polites sabuleti* most likely have one generation per year in the western Great Basin. The species may have two generations in some valleys (Newcomer 1966, Scott 1986).

Abundance

- *Polites sabuleti* were moderately common in some open meadows on the east side of the Sierra Nevada. They were less common in the areas we sampled in the Wassuk Range and Sweetwater Mountains.
- Annual variation in abundance is low to moderate.

Habitat associations and behavior

- *Polites sabuleti* generally inhabit wet meadows and alkali grasslands in valleys, and wet meadows at low to moderate elevations in mountains.
- Larvae feed on Poaceae, including *Distichlis*, *Cynodon*, *Poa*, *Agrostis*, and *Festuca*.
- Adults feed on nectar.
- Use of mud is rare.
- Males perch in grassy areas.

Identification

- *Polites sabuleti* are small Hesperiines. Most of the individuals in the mountains have deep orange dorsal wings with black marks along the margins of the forewing and the margins, edges, and base of the hindwing. The ventral wings are pale orange-brown with yellow veins. The hindwing has a jagged, yellow-white band. Most of the individuals in the mountains are somewhat paler, with narrower black margins.
- *Polites sabuleti* are unlikely to be confused with other species. *Hesperia* are larger, with white rather than yellowish spots.

Polites sonora (Family Hesperiidae, Subfamily Hesperiinae)

Natural history

- *Polites sonora* occur from the Cascade Range south through the California Coast Ranges and Sierra Nevada. They are absent from most of the Great Basin, but occur in the mountains of central Utah and in the Rocky Mountains from Montana south to Colorado (Scott 1986).
- *Polites sonora* spend their entire life cycle in the Great Basin, and largely are restricted to mountain ranges.
- Diapause is as a larva.
- *Polites sonora* have one generation per year in the western Great Basin.

Abundance

- *Polites sonora* were uncommon to common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual variation in abundance is low to moderate.

Habitat associations and behavior

- *Polites sonora* inhabit wet meadows and small meadows along riparian areas.
- Larval hostplants are Poaceae. In some parts of its range, the species reportedly feeds on *Panicum*, *Digitaria*, and *Poa*.
- Adults feed on nectar.
- Use of mud is rare.
- Males perch in meadows.

Identification

- *Polites sonora* are small Hesperiines. The dorsal wings are deep orange with wide black or brown margins and dark veins. The ventral wings are brownish orange or brownish green. The ventral hindwing has a postmedial band of spots of similar size and a larger yellow spot closer to the base.
- The ventral wings of *Polites sabuleti* usually are paler than those of *Polites sonora*, and the spots on the ventral hindwing are less evenly sized.
- *Hesperia* tend to be larger than *Polites*, and the spots on their ventral hindwings are white rather than yellowish.
- *Ochlodes sylvanoide*s generally are more orange and have less-distinctive spots.

Ochlodes sylvanoides (Family Hesperiidae, Subfamily Hesperiinae)

Natural history

- *Ochlodes sylvanoides* occur from coastal and southern British Columbia south through California (except in the Central Valley and southeastern deserts), the Great Basin, and most of the Rocky Mountains.
- The species is resident in the Great Basin, and largely restricted to mountain ranges.
- Diapause is as a larva.
- *Ochlodes sylvanoides* have one generation per year.

Abundance

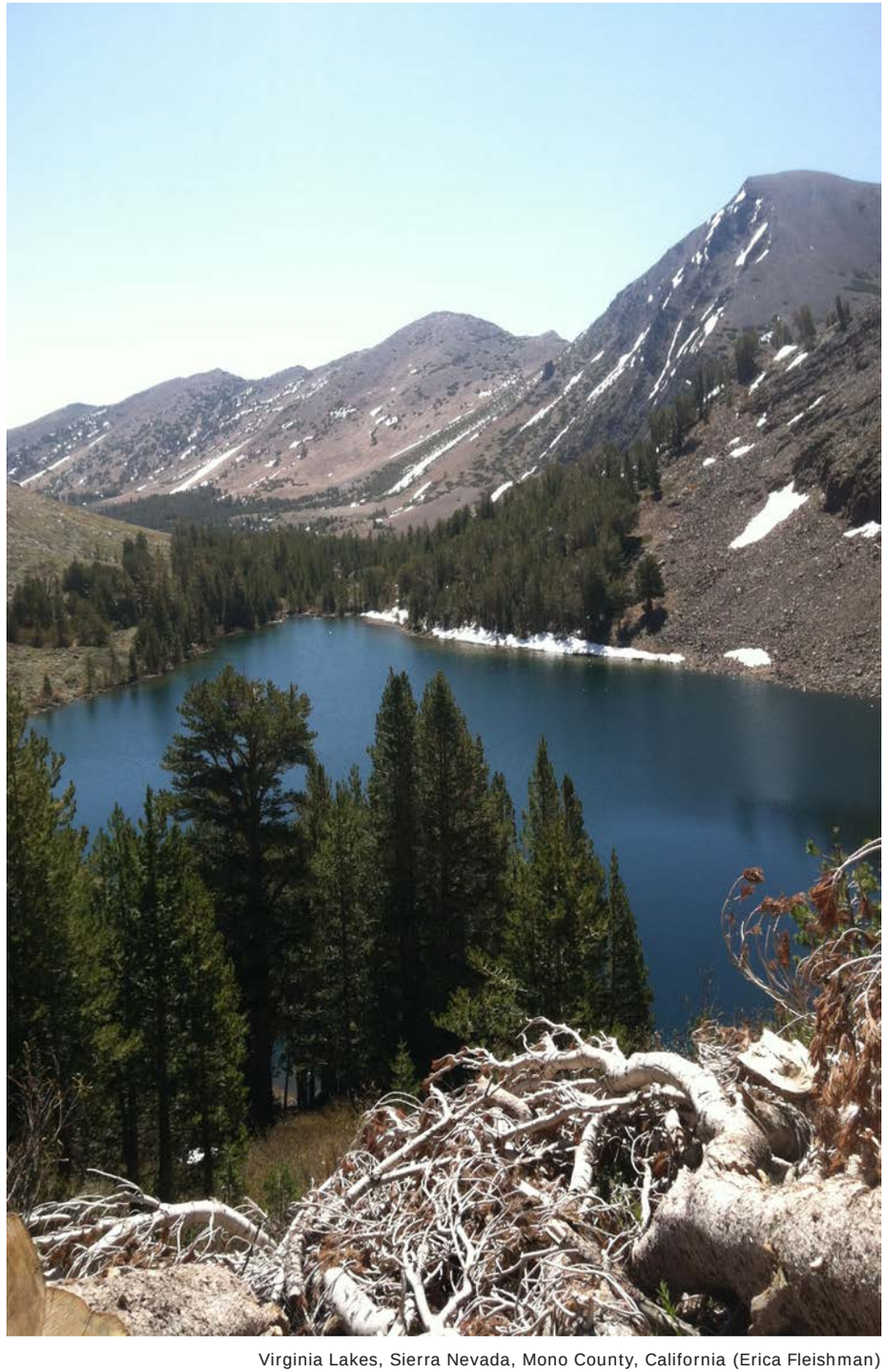
- *Ochlodes sylvanoides* were uncommon to rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Ochlodes sylvanoides* occur in diverse but relatively open areas, from woodlands to riparian zones to shrublands, usually at low to moderate elevations.
- Larvae feed on Poaceae, including *Phaliaris*, *Elymus*, and *Agropyron*.
- Adults feed on nectar, and males visit mud.
- Males perch in canyons.

Identification

- *Ochlodes sylvanoides* are fairly small Hesperiines. The dorsal wings are deep orange with a dark border and large, blocky dark spots on the forewing. The border is wider on females than on males. Females also tend to have more spots, especially on the hindwing. The ventral wings are bright, pale yellow-orange or orange with indistinct white-orange spots.
- Most *Polites* are smaller than most *Ochlodes sylvanoides*, and the spots on the ventral hindwings of *Polites* typically are more distinct.
- *Hesperia* generally are larger than *Ochlodes sylvanoides*, and the spots on their ventral hindwings are large and white.



Virginia Lakes, Sierra Nevada, Mono County, California (Erica Fleishman)

Papilio indra (Family Papilionidae, Subfamily Papilioninae)

Natural history

- *Papilio indra* occur from central Washington south through the Sierra Nevada and southern California into Baja California, the Great Basin, and beyond the east slope of the Rocky Mountains. The species also occurs in the northern Coast Range of California.
- *Papilio indra* spend their entire life cycle in the Great Basin, and largely are restricted to the mountains.
- Diapause is as a pupa.
- *Papilio indra* have one or two generations per year, depending on location (Emmel 1974). In the western Great Basin, the species has one generation.

Habitat associations and behavior

- *Papilio indra* are associated with steep, rocky slopes in arid, montane areas, often from about 1920–2200 m (Emmel 1974).
- Larval hostplants are Apiaceae, including *Pteryxia petraea* (Umbelliferae) in the central Great Basin (Emmel 1974). The species is known to feed on *Lomatium* and *Cymopterus* elsewhere in its range. Hostplants have not been recorded in the western Great Basin.
- Adults take nectar from flowers. In the central Great Basin, they often are observed on thistles in the genus *Cirsium* (Emmel 1974).
- Males commonly visit mud or wet sand (Emmel 1974).
- Males patrol and perch, often near hilltops.

Abundance

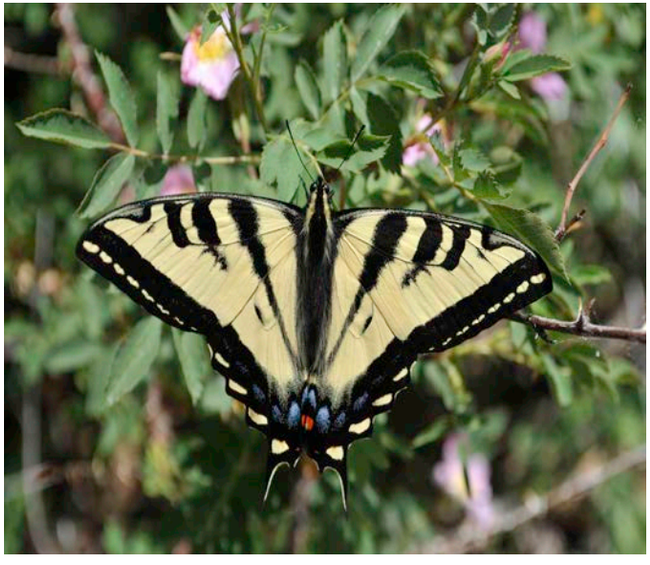
- *Papilio indra* have moderate annual variation in abundance.
- *Papilio indra* were rare in the areas we sampled in the Sweetwater Mountains. We have not detected the species in the areas we sampled on the east slope of the Sierra Nevada or in the Wassuk Range.
- Annual variation in abundance is moderate.

Identification

- Adult *Papilio indra* generally are smaller than other Papilionids (swallowtails) in the western Great Basin. The dorsal wings are black with a single pale-yellow band and spots along the margin. The dorsal hindwing has diffuse blue patches beyond the yellow band and a single, orange spot with a black center. The ventral wings are similar to the dorsal wings. The hindwing tails are small and may be difficult to discern. The abdomen is solid black, sometimes with a single yellow dash near the posterior.
- *Papilio indra* are best distinguished from other primarily black-winged *Papilio* by the paleness of the yellow on their wings, the presence of one or no yellow abdominal mark rather than a longitudinal line or series of spots, and the relatively short length of their tails.

Papilio rutulus (Family Papilionidae, Subfamily Papilioninae)

Natural history



- *Papilio rutulus* occur from southern British Columbia south to northern Mexico border and east to western Nebraska. They are absent from most of the low-elevation desert in southern California and Arizona (Scott 1986).
- *Papilio rutulus* spend their entire life cycle in the Great Basin. They largely occur in the mountains, but occur at lower elevations in developed areas.
- Diapause is as a pupa.
- *Papilio rutulus* generally have one generation per year in the western Great Basin.
- Some systematists consider *Papilio rutulus* to be a subspecies of *Papilio glaucus*, although the two taxa generally have different larval hostplants (Scott 1986).
- *Papilio rutulus* occasionally may hybridize with *Papilio eurymedon*.

Abundance

- *Papilio rutulus* were common in riparian areas on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

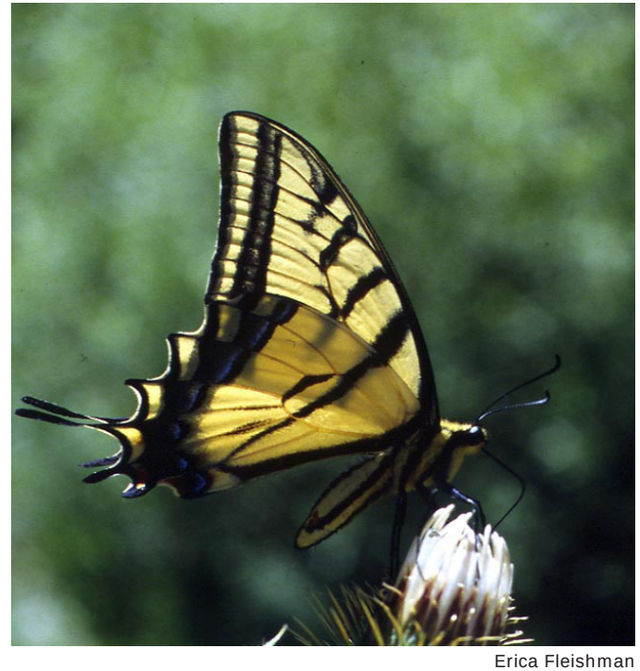
- In the western Great Basin, *Papilio rutulus* may occur in almost any wet area where their hostplants are present, including canyons and developed areas.
- Known larval hostplants in the western Great Basin include multiple genera in the Salicaceae (*Populus*, *Salix*). Larvae also may feed on Rosaceae (*Prunus*) and Betulaceae (*Betula*) (Scott 1986).
- Adults of both sexes take nectar.
- Males visit mud.
- Males patrol along canyon bottoms.

Identification

- *Papilio rutulus* are fairly large Papilionids. Each hindwing has one tail. The dorsal and ventral wings are lemon yellow with a black basal line and a wider, black submarginal band across both the forewings and hindwings. The forewing has additional blackish lines. The submarginal band of the hindwing has an extensive bluish wash and orange spots in the corners.
- The morphology of *Papilio rutulus* is very similar to that of *Papilio multicaudatus*, but *Papilio rutulus* generally are smaller, have wider stripes, and have one tail rather than two. The second, inner tail of *Papilio multicaudatus* can be difficult to see unless the individual is in hand. Where the species co-occur, capture is necessary for credible identification.
- The dorsal wings of *Papilio eurymedon* are whitish yellow rather than lemon yellow.
- *Papilio indra* have black dorsal wings, much less yellow, and shorter tails.

Papilio multicaudata (Family Papilionidae, Subfamily Papilioninae)

Natural history



Erica Fleishman

- *Papilio multicaudata* occur from southern British Columbia, east to western North Dakota, and south through Guatemala. They are absent from coastal Oregon and Washington and rare in the Mojave Desert (Scott 1986).
- *Papilio multicaudata* spend their entire life cycle in the Great Basin, and largely are restricted to the mountains.
- To prevent dislodging, larvae weave a silk mat on the surface of leaves (Pronin 1955).
- Diapause is as a pupa.
- *Papilio multicaudata* have one (especially at relatively high elevations) or two generations per year in the western Great Basin.

Abundance

- *Papilio multicaudata* were relatively rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual variation in abundance is low.

Habitat associations and behavior

- *Papilio multicaudata* generally occur in canyons with extensive riparian vegetation, including their larval hostplants.
- The species largely is restricted to montane areas.
- Larvae feed on *Prunus*, *Fraxinus*, and *Ptelea*. Known larval hostplants in the western Great Basin include chokecherry (*Prunus virginina*, *Prunus* sp.) (Pronin 1955, Brower 1958).
- Adults feed on nectar.
- Males feed on mud.
- Males patrol canyon bottoms and riparian areas, and sometimes seek mates on hilltops.

Identification

- *Papilio multicaudata* is the largest resident species of butterfly in Nevada, and generally is larger than other species of *Papilio*. The dorsal and ventral wings are lemon yellow. The forewings and hindwings have a black basal line and a wider, black submarginal band. The forewing has additional black lines. The submarginal band of the hindwing has an extensive bluish wash and orange spots in the corners.
- The species is distinguished from other *Papilio* in the western Great Basin by the presence of two tails on each hindwing and narrower black stripes. Worn individuals with damaged or missing tails may not be possible to identify with certainty.
- *Papilio multicaudata* often are larger than *Papilio rutulus*, but size alone is not diagnostic.
- *Papilio multicaudata* are quite similar to *Papilio rutulus* and can only be distinguished definitively by the number of tails. The smaller, inner tails can be difficult to see unless the individual is in hand.

Papilio eurymedon (Family Papilionidae, Subfamily Papilioninae)

Natural history

Jim Conrad, public domain

- *Papilio eurymedon* occur from southern British Columbia south through California, with the exception of the Central Valley and southeastern deserts. They also occur in the Rocky Mountains and the mountains of central Utah and northeastern Nevada.
- *Papilio eurymedon* spend their entire life cycle in the Great Basin and largely are restricted to montane areas.
- Diapause is as a pupa.
- *Papilio eurymedon* have one generation per year in the western Great Basin.
- *Papilio eurymedon* occasionally may hybridize with *Papilio rutulus*.

Abundance

- *Papilio eurymedon* were uncommon to common the areas we sampled on the east slope of the Sierra Nevada. We did not record the species in the Wassuk Range or Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Papilio eurymedon* generally are associated with riparian areas. Elsewhere, they also may occur in forest gaps and open areas in canyons and sagebrush shrubsteppe.
- Known larval hostplants in the western Great Basin are Rhamnaceae (*Ceanothus*, *Rhamnus*) (Brower 1958). Larvae also may feed on tree and shrub Rosaceae (*Prunus*, *Amelanchier*) and Betulaceae.
- Adults take nectar.
- Males visit mud.
- Males patrol on hilltops.

Identification

- *Papilio rutulus* are large Papilionids. Each hindwing has one tail. The dorsal and ventral wings are pale white to yellow with thick, black stripes and borders. The border of the dorsal hindwing has blue, cream, and orange spots. The ventral wings are similar, with black veins. Some individuals at relatively high elevations have heavier black stripes than those at relatively low elevations.
- The dorsal wings of other *Papilio* in the western Great Basin are lemon yellow rather than white or pale yellow (*Papilio rutulus*, *Papilio multicaudata*) or black with a single yellow or white-yellow stripe (*Papilio indra*).
- When faded, *Papilio eurymedon* and *Papilio rutulus* may be difficult to differentiate in flight.

Neophasia menapia (Family Pieridae, Subfamily Pierinae)

Natural history

National Park Service

- *Neophasia menapia* occur from southern British Columbia south through Oregon, the Great Basin, and the Rocky Mountains. They also occur in most of the mountain ranges in California.
- *Neophasia menapia* spend their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as an egg.
- *Neophasia menapia* have one generation per year.
- *Neophasia menapia* is one of the last species to emerge as adults in the western Great Basin in a given season. They often are not present until late July or August.

Abundance

- *Neophasia menapia* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains, although the time period of our sampling may have led us underestimate the species' abundance. We have not recorded the species in the Wassuk Range.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Neophasia menapia* occur in coniferous woodlands with pines or firs.
- Larval hostplants in the western Great Basin are pines (*Pinus*). Larvae also may feed on Douglas-fir (*Pseudotsuga*) and firs (*Abies*).
- Adults feed on nectar.
- Use of mud is rare.
- Males patrol, often far above the ground.

Identification

- *Neophasia menapia* are medium-sized Pierids (the family of butterflies that includes whites and sulfurs). The dorsal wings of both sexes are white, with prominent black marks on the tip and leading edge of the forewing. The dorsal hindwings of males are unmarked, whereas those of females have wide black veins and black marks around the margin. The ventral wings of both sexes are similar to the dorsal wings, but males have fine, black veins on the hindwing and females have a thin, pink or red-orange margin at the top of the hindwing.
- In flight, *Neophasia menapia* are distinctive. They are the only white butterflies in the western Great Basin that fly slowly and in a fluttery manner rather than rapidly, and they often are observed near the top of pine trees.
- George T. Austin characterized the appearance of *Neophasia menapia* in flight as small pieces of toilet paper floating in the breeze.

Pontia beckerii (Family Pieridae, Subfamily Pierinae)

Natural history

- *Pontia beckerii* occur from southern British Columbia south through the Great Basin and Rocky Mountains, and in the mountains of southern California and northern Baja California (Scott 1986).
- *Pontia beckerii* spend their entire life cycle in the Great Basin, where they occur in both valleys and mountain ranges.
- Diapause is as a pupa.
- *Pontia beckerii* have two to four generations per year in the western Great Basin.
- Some systematists consider *Pontia beckerii* to be conspecific with *Pontia chloridice*, a Eurasian species.

Abundance

- *Pontia beckerii* were abundant in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Pontia beckerii* occur in dry, open areas dominated by shrubs. In the western Great Basin, they generally occur at low to moderate elevations.
- Known larval hostplants in the western Great Basin include herbaceous and shrubby Brassicaceae (*Sisymbrium*, *Stanleya*).
- Adults take nectar. Use of mud is low.
- Males patrol in canyons and over diverse terrain.

Identification

- Many *Pontia beckerii* are somewhat larger than other white Pierids in the western Great Basin. The dorsal wings are white with a square, black spot, which often has a pale center, and large black spots along the margin of the forewing. Females may have black spots on the dorsal hindwing. The ground color of the ventral wings is white. The ventral forewing has yellow-green marks near the tip and a square, black spot similar to that on the dorsal wing. The ventral hindwing has wide, yellow-green marks along the veins and a white postmedian band.
- White Pierids are difficult to identify in flight. When observed at close range, *Pontia beckerii* are unlikely to be confused with other species..

Pontia sisymbrii (Family Pieridae, Subfamily Pierinae)

Natural history

- *Pontia sisymbrii* occur from southern Nunavat and Yukon Territory south to the border between the United States and Mexico and east to Wyoming (Scott 1986).
- *Pontia sisymbrii* spend their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as a pupa.
- *Pontia sisymbrii* have one generation per year in the western Great Basin.
- *Pontia sisymbrii* fly relatively early in the season.

Abundance

- *Pontia sisymbrii* were rare in the areas we sampled in the Wassuk Range. We did not detect the species in the areas we sampled on the east slope of the Sierra Nevada or in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Pontia sisymbrii* occur in diverse land-cover types, from woodlands to open ridgelines, but generally in dry areas.
- Larval hostplants are herbaceous Brassicaceae. In the western Great Basin, the species is known to use *Arabis*.
- Adults of both sexes take nectar.
- Males visit mud.
- Males patrol in canyons and on hilltops.

Identification

- *Pontia sisymbrii* are similar in size, or slightly smaller, than several other white Pierids in the western Great Basin. The dorsal wings are white. The dorsal forewing has black spots along its margin and a postmedian black spot. The ventral forewing has gray-green spots near the tip and a small, black postmedian spot. The veins of the ventral hindwing are dark green-black.
- *Pontia occidentalis* and *Pontia protodice* generally are larger than *Pontia sisymbrii*, and the veins on their ventral hindwings are paler and less distinct.
- *Pontia beckerii* have thicker, greenish veins and a strong black spot on the forewings.

Pontia protodice (Family Pieridae, Subfamily Pierinae)

Natural history

Jerry Oldenettle (CC BY-NC-SA)

- *Pontia protodice* breed from southern California east to the mid Atlantic and south through Mexico and Cuba. Migrants occur throughout the rest of the conterminous United States and southern Canada (Scott 1986).
- *Pontia protodice* are present in the Great Basin each year, but probably do not survive all of the winters. Instead, they regularly immigrate north to the Great Basin from their breeding range.
- Diapause is as a pupa (Shapiro 1976).
- *Pontia protodice* have multiple generations per year—six or more in some areas—throughout their breeding range (Shapiro 1976). They have three generations per year in the western Great Basin.

Abundance

- *Pontia protodice* were rare to common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We have not recorded the species in the Sweetwater Mountains.
- Annual fluctuations in abundance and distribution are high.

Habitat associations and behavior

- *Pontia protodice* generally occur in dry, open areas below 2000 m, including roadsides and dry washes (Shapiro 1976), but can occur at elevations to about 3000 m.
- Larvae feed on native and non-native Brassicaceae. In the Great Basin, known larval hostplants include *Lepidium*, *Descurania*, *Physaria*, *Sisymbrium altissimum*, and, rarely, *Brassica nigra* (Shapiro 1986, Fleishman et al. 1997).
- Adults take nectar. Males rarely visit mud.
- Males patrol in canyons and on hilltops.

Identification

- *Pontia protodice* are fairly large relative to other Pierids in the western Great Basin. The ground color of both sexes is white. Males have a brown or black spot toward the middle of the upper edge of the forewings, additional spots around the outer top edge of the forewings, and usually another spot toward the middle of the lower forewing. The venter of males is either unmarked or has faded, light-brown shading around the veins. The dorsal wings of females usually have stronger marks than those of males, and the ventral wings have darker brown or yellow-brown along the veins.
- *Pontia protodice* and *Pontia occidentalis* are quite similar, and rarely can be distinguished without a butterfly in the hand or a specimen. *Pontia occidentalis* usually are slightly larger and have heavier marks and a darker abdomen than *Pontia protodice*. The marks on the forewings of *Pontia occidentalis* are grayish rather than brownish, and tend to be connected, and the marks on the ventral hindwings are tinged with green rather than brown.
- *Pontia sisymbrii* generally are smaller than *Pontia occidentalis* and *Pontia protodice*, and the veins on their ventral hindwings are darker and more distinct.
- *Pontia beckerii* have thick, greenish veins and a strong black spot on their forewings.

Pontia occidentalis (Family Pieridae, Subfamily Pierinae)

Natural history

- *Pontia occidentalis* occur from Alaska south through the Sierra Nevada, Great Basin, and Rocky Mountains. They also occur from the Prairie Provinces east across Canada to western Ontario (Scott 1986).
- *Pontia occidentalis* are resident in the Great Basin, and largely restricted to montane areas.
- Diapause is as a pupa (Shapiro 1976).
- *Pontia occidentalis* have one or generations per year in the western Great Basin. The number of generations varies as a function of latitude, generally increasing from north to south. In central Washington, however, Kingsolver (1995) recorded four or five generations per summer.
- In areas in which the species has multiple generations, early generations tend to have considerably more melanin than later generations (Kingsolver 1995).

Abundance

- *Pontia occidentalis* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- Most *Pontia occidentalis* occur in dry, open areas above 2000 m. They often occur at higher elevations in the southern part of their range (Shapiro 1976). *Pontia occidentalis* also inhabit disturbed areas or agricultural fields at lower elevations (Scott 1986).
- Larvae feed on herbaceous Brassicaceae, including *Lepidium*, *Descurania*, and *Sisymbrium*.
- Adults take nectar. Males rarely visit mud.
- Males patrol in canyons and often on hilltops (Shapiro 1976).

Identification

- *Pontia occidentalis* are fairly large relative to other Pierids in the western Great Basin. The ground color of both sexes is white. Males have a gray or black spot toward the middle of the upper edge of the forewings, additional spots around the outer top edge of the forewings that usually are connected, and another spot toward the middle of the lower forewing. The venter of males has faded, yellow-green shading around the veins. The dorsal wings of females usually have stronger marks than those of males, and the the coloring along the veins of theur ventral wings is darker.
- *Pontia occidentalis* and *Pontia protidice* are quite similar, and rarely can be distinguished without a butterfly in the hand or a specimen. *Pontia protodice* usually are slightly smaller and have lighter marks and a lighter abdomen than *Pontia occidentalis*. The marks on the forewings of *Pontia protodice* are brownish rather than grayish and rarely are connected, and the marks on the ventral hindwings are tinged with brown rather than green.
- *Pontia sisymbrii* generally are smaller than *Pontia occidentalis* and *Pontia protodice*, and the veins on their ventral hindwings are darker and more distinct.
- *Pontia beckerii* have thick, greenish veins and a strong black spot on their forewings.

Pieris rapae (Family Pieridae, Subfamily Pierinae)

Natural history

- *Pieris rapae* were introduced to North America from Europe in the mid 1800s (Scott 1986). They are considered to be agricultural pests, especially on cabbage and other cultivated Brassicas.
- *Pieris rapae* occur from southern Canada south through the conterminous United States to southern Mexico.
- *Pieris rapae* spend their entire life cycle in the Great Basin, and occur in both mountain ranges and valleys.
- Diapause is as a pupa.
- *Pieris rapae* have multiple generations per year in the western Great Basin. Individuals that fly relatively early and late in the season tend to be darker than those that fly during the middle of the season.

Abundance

- *Pieris rapae* were rare in the areas we sampled in on the east slope of the Sierra Nevaa and in the Wassuk Range and Sweetwater Mountains, but can be abundant in agricultural areas in nearby valleys.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Pieris rapae* generally occur in agricultural areas and disturbed areas near residential or other types of development. They also may occur in riparian canyons.
- Known larval hostplants in the western Great Basin are herbaceous *Brassicaceae*, especially *Rorippa*.
- Adults of both sexes take nectar.
- Males rarely visit mud.
- Males patrol throughout canyons.

Identification

- *Pieris rapae* are medium-sized relative to other Pierids in the western Great Basin. Their wings are whitish, with blue-black tips on the dorsal forewings. The dorsal forewing of males and females have one and two submarginal black spots, respectively. The ventral hindwing is yellowish, with indistinct veins.
- *Pieris rapae* are distinct in the western Great Basin.

Celastrina ladon at mud (Erica Fleishman)

Euchloe ausonides (Family Pieridae, Subfamily Pierinae)

Natural history

- *Euchloe ausonides* occur from central Alaska south through the Sierra Nevada, east to northern Arizona and New Mexico, and across the Prairie Provinces to northern Minnesota. With the exception of northern and central California, they are absent from the Pacific coast.
- *Euchloe ausonides* spend their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as a pupa.
- *Euchloe ausonides* have one generation per year in the western Great Basin.

Abundance

- *Euchloe ausonides* can be abundant locally, but generally were not abundant in the areas we sampled. The species was somewhat more common on the east slope of the Sierra Nevada than in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Euchloe ausonides* occur in open areas at moderate to high elevations, often in mesic meadows and mesic openings in woodlands.
- Known larval hostplants in the western Great Basin include herbaceous Brassicaceae (*Sisymbrium* and *Descurainia*).
- Adults rarely take nectar or visit mud.
- Males patrol along canyon bottoms and in uplands.

Identification

- *Euchloe ausonides* are medium-sized Pierids, and often are larger than *Anthocharis*. The dorsum is white or off-white, and sufficiently transparent that the ventral pattern, especially that on the hindwing, can be seen on the dorsum. The tip of the dorsal forewing has thick, black veins, and the discal cell of the dorsal forewing has a black spot. The veins of the ventral hindwing are yellow, and the wing has a thick, yellow-green marbled pattern.

- *Euchloe ausonides* are similar to *Euchloe hyantis* and *Anthocharis lanceolata*, especially in flight.
- *Euchloe ausonides* usually are slightly larger than *Euchloe hyantis*, but this is not diagnostic. *Euchloe hyantis* do not have a black spot in the discal cell of the dorsal forewing.
- The ventral hindwing of *Anthocharis lanceolata* has a brown rather than a yellow-green pattern.

Anthocharis sara (Family Pieridae, Subfamily Pierinae)

Natural history

- *Anthocharis sara* occur from northern British Columbia south to northern Baja California and east to New Mexico and Colorado.
- *Anthocharis sara* spend their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as a pupa.
- *Anthocharis sara* generally have one generation per year in the western Great Basin. In warmer parts of their range, they may have a second generation.

Abundance

- *Anthocharis sara* usually are uncommon in the western Great Basin.
- Annual fluctuations in abundance are low to moderate.
- *Anthocharis sara* were less common in the areas we sampled in the Sweetwater Mountains than on the east slope of the Sierra Nevada and in the Wassuk Range.

Habitat associations and behavior

- In the western Great Basin, *Anthocharis sara* typically occur at intermediate elevations in woodlands.
- Known larval hostplants in the western Great Basin are Brassicaceae, including *Arabis*.
- Use of nectar is relatively limited. The species generally does not visit mud.
- Males patrol canyon bottoms and uplands.

Identification

- *Anthocharis sara* often are smaller than other species of largely white butterflies in the western Great Basin. The wings are whitish, with yellow-green marbling on the ventral hindwing. The orange tips on the dorsal forewing are distinctive and diagnostic.
- *Anthocharis lanceolata* are similar, but their wings do not have orange tips. The pattern on the ventral hindwing of *Anthocharis lanceolata* largely is brown, and noticeably less marbled than that of *Anthocharis sara*.

Anthocharis lanceolata (Family Pieridae, Subfamily Pierinae)

Natural history

- *Anthocharis lanceolata* occur from montane southern Oregon south through the northern coast ranges of California, the Sierra Nevada, Carson Range, other nearby mountain ranges in Nevada, and into the mountains of northern Baja California.
- *Anthocharis lanceolata* spend their entire life cycle in the Great Basin, and largely are restricted to montane areas.
- Diapause is as a pupa.
- *Anthocharis lanceolata* have one generation per year in the western Great Basin.

Abundance

- *Anthocharis lanceolata* are uncommon in the western Great Basin. We consistently recorded one or a few individuals in a relatively small area of one canyon on the east slope of the Sierra Nevada.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Anthocharis lanceolata* generally occur in relatively steep, rocky canyons, especially on fairly warm aspects, and along washes.
- Known larval hostplants in the western Great Basin are Brassicaceae (*Arabis)*.
- Use of nectar is relatively limited. The species generally does not visit mud.
- Males patrol canyon bottoms (Scott 1986).

Identification

- *Anthocharis lanceolata* often are smaller than other species of largely white butterflies in the western Great Basin. The wings are whitish, with fine, brown striations on the ventral hindwing. The dorsal forewings have a black spot in the discal cell and black marks toward the tip.
- Females generally are larger than males.
- In flight, *Anthocharis lanceolata* may be difficult to distinguish from *Euchloe*.
- *Anthocharis sara* are similar, but their dorsal forewings wings have orange tips. The pattern on the ventral hindwing of *Anthocharis sara* is yellow-green rather than brown, and noticeably more marbled than that of *Anthocharis lanceolata*.

Colias philodice (Family Pieridae, Subfamily Coliadinae)

Natural history

Aaron Carlson (CC BY-SA 2.0)

- *Colias philodice* occur across most of Alaska, southern and western Canada and most of the conterminous United States south to Guatemala; they are absent from southern Florida and most of California.
- *Colias philodice* spend their entire life cycle in the mountains and valleys of the Great Basin.
- Diapause is as a larva.
- *Colias philodidce* generally have multiple generations per year except at relatively high elevations.
- Selection pressure on the wing color of females is opposing. Fitness increases along an increasing elevational gradient as wings become darker, but males appear to prefer relatively light wings at all elevations (Ellers and Boggs 2003).
- In some geographic areas, *Colias philodice* and *Colias eurytheme* hybridize.

Abundance

- *Colias philodice* were rare to uncommon the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains and Wassuk Range.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Colias philodice* may occur in almost any open area, including fields, meadows, and agricultural areas along an extensive elevational gradient. Most of the locations in which the species occurs are at least moderately wet. *Colias philodice* may be common in alfalfa fields.
- Known larval hostplants are herbaceous Fabaceae, including agricultural species (*Trifolium*, *Medicago*).
- Some populations of *Colias philodice* have ceased feeding on native legumes as larvae, and shifted to feeding on alfalfa (*Medicago sativa*). These populations may become agricultural pests (Tabashnik 1983).
- Adults of both sexes take nectar.
- Males sometimes visit mud.
- Males patrol in canyons.

Identification

- *Colias philodice* are medium-sized Pierids. The dorsal wings of males and most females are yellow, whereas the ventral veins are greenish-yellow. Some females (form *alba*) have white wings. The margin of the dorsal forewing is narrow and brownish, often with pale spots. The ventral hindwing has a silvery spot with two red rings; often a second, smaller spot; and a row of submarginal brownish spots.
- *Colias eurytheme* are quite similar to *Colias philodice* but usually are orange on the dorsum. The brownish border on the dorsal forewing usually is narrower on *Colias philodice* than *Colias eurytheme*, but the species cannot be differentiated on the basis of this feature. Alba females of the two species rarely can be distinguished.
- *Colias alexandra* generally are larger than *Colias philodice*, but size is not diagnostic. The spot on the ventral hindwing of *Colias alexandra* is not ringed, and the ventral hindwings of *Colias alexandra* rarely have submarginal spots.
- Hybrids with *Colias eurytheme* may be difficult to identify to species.

Colias eurytheme (Family Pieridae, Subfamily Coliadinae)

Natural history

Phil Myers (CC BY-NC-SA 3.0)

- *Colias eurytheme* occur from southern Canada, where their range is expanding; across the conterminous United States; and south into Mexico. Deforestation may have facilitated the species' expansion into areas of New England and Canada in which it was not historically present (Scott 1986).
- *Colias eurytheme* spend their entire life cycle in the Great Basin. They occur in both mountains and valleys.
- Diapause is as a larva.
- *Colias eurytheme* generally have multiple generations per year in the western Great Basin.
- In some geographic areas, *Colias eurytheme* hybridize with *Colias philodice*.

Abundance

- *Colias eurytheme* were common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range, and uncommon in the areas we sampled in the Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- In the western Great Basin, *Colias eurytheme* occur in most open areas, including sagebrush shrubsteppe, meadows, and agricultural areas.
- Known larval hostplants are herbaceous Fabaceae, including agricultural species (*Astragalus*, *Medicago*). Larvae also feed on *Lupinus* and *Trifolium*.
- *Colias eurytheme* expanded into agricultural areas as humans cleared forests and planted alfalfa. The species can be a pest on alfalfa and clover.
- Adults of both sexes take nectar.
- Males sometimes visit mud.
- Males patrol along canyon bottoms.

Identification

- *Colias eurytheme* are medium-sized Pierids. The dorsal and ventral wings of most individuals are orange and yellowish, respectively, but white females (form *alba*) also are common. The ventral hindwing has a silvery spot that is bordered by a double red ring, and a row of brownish submarginal dots. The dorsal forewing usually has a broad, brownish margin.
- Early season individuals are smaller, and generally darker, than those that fly later in the season.
- In the western Great Basin, some *Colias eurytheme* are not noticeably orange on the dorsum, but *Colias* with an orange dorsum almost certainly are *Colias eurytheme*.
- *Colias eurytheme* are quite similar to *Colias philodice,* but usually are yellow on the dorsum and greenish-yellow on the venter. The brownish border on the dorsal forewing usually is wider on *Colias eurytheme* than *Colias philodice*, but the species cannot be differentiated on the basis of this feature. Alba females of the two species rarely can be distinguished.
- *Colias alexandra* generally are larger than *Colias eurytheme*, but size is not diagnostic. The spot on the ventral hindwing of *Colias alexandra* is not ringed, and the ventral hindwings of *Colias alexandra* rarely have submarginal spots.
- Hybrids with *Colias philodice* may be difficult to identify to species.

Colias alexandra (Family Pieridae, Subfamily Coliadinae)

Frank Fogarty

- *Colias alexandra* occur in eastern Alaska, south along the Cascade–Sierra Nevada axis to central California, east to Edmonton and the Rocky Mountains, and south through central Arizona and New Mexico (Scott 1986).
- *Colias alexandra* spend their entire life cycle in the Great Basin. They occur in both mountains and valleys.
- Diapause is as a larva.
- *Colias alexandra* generally have one or two generations per year in the western Great Basin.

Abundance

- *Colias alexandra* were moderately common in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains and Wassuk Range.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Colias alexandra* occur in sagebrush shrubsteppe, open woodlands, and grassy areas. They occur from about 1800 m to timberline (Hayes 1981).
- Known larval hostplants are herbaceous Fabaceae, including *Astragalus*.
- Adults of both sexes take nectar.
- Males sometimes visit mud.
- Males patrol in canyons and uplands.

Identification

- *Colias alexandra* are medium- to large-sized Pierids. They generally are larger than other *Colias* in the region. The wings are yellow, with a grayish cast on the ventral hindwing. The ventral hindwing also has a single, unrimmed silver spot and yellowish fringes.
- Individuals that fly relatively early and late in the season tend to be greener than those that fly during the middle of the season.

- *Colias alexandra* generally are larger than *Colias philodice* and *Colias eurytheme*, but size is not diagnostic.
- *Colias philodice* and *Colias eurytheme* both have rims around the spots on their ventral hindwings, and often have brownish medial spots. Unlike *Colias eurytheme*, *Colias alexandra* rarely occur in agricultural areas. *Colias alexandra* generally occur in drier areas than *Colias philodice*.
- *Colias alexandra* may hybridize with *Colias philodice* or *Colias eurytheme*.

Nathalis iole (Family Pieridae, Subfamily Coliadinae)

Natural history

- *Nathalis iole* breed from southern California, east to southern Georgia and Florida, and south through Baja California and most of Mexico. The often disperse much further north.
- *Nathalis iole* are not resident in the Great Basin. Individuals observed during summer are believed to be emigrants from the south. *Nathalis iole* occur in both mountains and valleys.
- *Nathalis iole* do not have a diapause, which likely places a northern limit on the species' breeding range (Douglas and Grula 1978).
- *Nathalis iole* have multiple generations per year in their breeding range.
- Wing color is affected by photoperiod during development. Individuals that develop with short day lengths tend to be darker as adults than individuals that develop during periods in which day lengths are long (Douglas and Grula 1978).

Abundance

- *Nathalis iole* were rare and not detected every year in the the areas we sampled in the Wassuk Range. We did not detect the species in the areas we sampled on the east slope of the Sierra Nevada or in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate, which in part reflects variation in the extent of annual dispersal.

Habitat associations and behavior

- In the western Great Basin, *Nathalis iole* occur in many open areas, including disturbed areas with extensive growth of non-native or native weedy species.
- Known larval hostplants are Compositaceae, including Asteraceae.
- Adults rarely take nectar.
- Males rarely visit mud.
- Males patrol along areas with low slopes.

Identification

- *Nathalis iole* is the smallest species of Pierid in the United States, and substantially smaller than any other white or yellow butterfly in the western Great Basin.
- The dorsal wings are yellow with extensive dark mark along the forewing tips, trailing edge, and margins of both wings. These dark marks tend to be more extensive on females. The ventral wings are yellow with an orange wash on the leading edge of the forewing and black submarginal spots.
- The small size of *Nathalis iole* is distinctive.
- No other Coliadine (the subfamily of sulfurs and yellows) in the western Great Basin has such extensive marks on the dorsal wings, and other Coliadines do not have black spots on the dorsal forewings.

Lycaena arota (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- The range of *Lycaena arota* is discontinuous. The species occurs in many montane areas of the western United States: in the southern Rocky Mountains north to southern Wyoming; in many of the mountain ranges in Utah, Nevada, and Arizona; and throughout the Sierra Nevada, California Coast Ranges, and Cascade Range in California and Oregon.
- *Lycaena arota* spend their entire life cycle in the Great Basin, and generally are restricted to montane areas.
- Diapause is as an egg.
- *Lycaena arota* have one generation per year. Females rarely mate more than once (Scott 1974).
- *Lycaena arota* are quite sedentary. Many adults do not move more than 100 m from the location where they eclosed (Scott 1974).

Abundance

- *Lycaena arota* were fairly common in the areas we sampled in the Wassuk Range, and generally less common on the east slope of the Sierra Nevada and in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Lycaena arota* generally occur in open woodlands or in open patches in woodlands.
- Known larval hostplants are Grossulariaceae, including *Ribes leptanthum* (Scott 1974) and other *Ribes*.
- Adults of both sexes take nectar. Nectar sources include but are not limited to *Solidago* and *Eriogonum* (Scott 1974).
- Males rarely visit mud.
- Males perch in canyons and uplands.

- Unlike most *Lycaena*, *Lycaena arota* mate during the morning (Scott 1974). Males perch on shrubs or trees (1-2 m above ground), darting out to chase other males and to search for females (Scott 1974).
- During the afternoon, males take nectar or perch within shrubs (Scott 1974).

Identification

- *Lycaena arota* are medium- to large-sized Lycaenines (the taxonomic tribe of coppers). Both sexes have tails. The dorsal wings of males are dull copper, sometimes with purple. The dorsal wings of females are orange with bold, brown spots, dark borders on the forewing, and brown shading at the wing bases. The ventral wings are gray to orange, and the cells have heavy and wavy black spots. The ventral wings also have white submarginal bands and one or two dark spots at the base of the tail. The latter spots are encircled by orange, and the orange extends onto the tail.
- No other Lycaenines in the western Great Basin have tails or a similar ventral pattern.

Lycaena cuprea (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- The range of *Lycaena cuprea* is discontinuous. The species occurs through most of the Rocky Mountains, from southern British Columbia and Alberta south, in the Sierra Nevada and Cascade Range, in Idaho, and in northern Nevada and Utah.
- *Lycaena cuprea* spend their entire life cycle in the Great Basin, and generally are restricted to montane areas.
- Diapause is as a larva.
- *Lycaena cuprea* have one generation per year.

Abundance

- *Lycaena cuprea* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Lycaena cuprea* occurs in open areas at moderate to high elevation, including meadows, alpine zones, talus slopes, and low sagebrush shrubsteppe.
- Known larval hostplants are herbaceous Polygonaceae, including *Rumex* and *Oxyria*.
- Adults of both sexes take nectar.
- Males are not known to take mud in the western Great Basin.
- Males perch and patrol in open areas.

Identification

- *Lycaena cuprea* are medium-sized Lycaenines. The dorsal wings of males are bright, reddish copper with small black spots and a thick black margin. The dorsal wings of females are paler red, with larger, dark spots and a thick brown border. The ventral forewing is orange with extensive black spots. The ventral hindwing is pale brown or grey, often with a pinkish wash, with extensive black spots and a red-orange submarginal line that may be broken.
- *Lycaena rubidus* and *Lycaena cuprea* may have similar dorsal wings, but those of *Lycaena rubidus* usually have a thinner dark border, and the dark spots are more faded. *Lycaena rubidus* have almost no pattern on the ventral hindwing.

Lycaena editha (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Lycaena editha* occur from southern Alberta to northern Colorado, west to the Cascade Range in Oregon, and south through the Sierra Nevada in California. The species also occurs in the mountain ranges of central and northern Nevada.
- *Lycaena editha* spend their entire life cycle in the Great Basin, and generally are restricted to montane areas.
- Diapause is as an egg.
- *Lycaena editha* have one generation per year.
- *Lycaena editha* is closely related to *Lycaena xanthoides*, and the two are considered conspecific by some systematists. The ranges of the two subspecies of *Lycaena xanthoides* are geographically disjunct, but the range of *Lycaena editha* lies between them. However, the morphology and habitat associations of *Lycaena editha* and *Lycaena xanthoides* differ, and the two putative taxa rarely co-occur.

Abundance

- *Lycaena editha* was uncommon to common in the areas we sampled on the east slope of the Sierra Nevada, and relatively rare in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Lycaena editha* primarily occur in open areas, including woodland openings and meadows, at moderately high elevations.
- Known larval hostplants are Polygonaceae, including *Rumex* and *Polygonum*; and possibly Rosaceae, including *Horkelia* and *Potentilla*.
- Adults of both sexes take nectar.
- Males rarely visit mud.
- Males perch in canyon bottoms, often in riparian areas.

Identification

- *Lycaena editha* are medium-sized Lycaenines. The dorsal wings of males are dark gray with faint, blurred dark spots. The dorsal wings of females are gray-brown, with dark spots that are more prominent than those of males. The dorsal hindwings of both sexes have an orange marginal band, which contrasts more strongly with the ground color of females than that of males. The ventral wings are pale tan or gray with small black spots on the forewing and larger brown spots on the hindwing. The ventral hindwing also has a submarginal orange line that is often faint or incomplete, and small black spots and chevrons.
- No other Lycaenines in the western Great Basin have a similar ventral pattern.

Lycaena rubida (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Lycaena rubida* occur from southern Alberta south to northern New Mexico, east to western Nebraska, and west to the Sierra Nevada.
- *Lycaena rubida* spend their entire life cycle in the Great Basin. They occur in both mountains and valleys.
- Diapause is as an egg.
- *Lycaena rubida* have one generation per year.
- *Lycaena rubida* may be associated with ants (Funk 1975). In some cases, ants may track oviposition in progress (Funk 1975).

Abundance

- *Lycaena rubida* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We have not recorded the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Lycaena rubida* generally occur in riparian areas and relatively mesic meadows.
- Known larval hostplants are herbaceous Polygonaceae (*Rumex*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch in canyons.

Identification

- *Lycaena arota* are medium-sized Lycaenines. The dorsal wings of males are bright orange or red-orange, sometimes with low-contrast black spots. The dorsal wings of females are a duller brownish gold with black spots. The dorsal wings of both sexes have a jagged orange marginal band that often is more pronounced on the hindwing. The ventral wings are gray or tan with black spots. The spots on the ventral hindwing are smaller than those on the ventral forewing, and may be quite reduced.

- *Lycaena rubida* might be confused with *Lycaena cuprea*. *Lycaena cuprea* are more intensely colored and have a more conspicuous pattern on the hindwings.
- Female *Lycaena rubida* also might be confused with *Lycaena heteronea*, but the former can be distinguished by orange on their dorsal wings.

Lycaena heteronea (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Lycaena heteronea* sometimes are referenced as blue coppers.
- The range of *Lycaena heteronea* extends from southern British Columbia south through the Rocky Mountains, Great Basin, and Sierra Nevada and west to the Cascade Range and the northern Coast Range. A disjunct population of a distinct subspecies (*Lycaena heteronea clara*) occurs in southern California.
- *Lycaena heteronea* spend their entire life cycle in the Great Basin, and generally are restricted to montane areas.
- Diapause is as an egg.
- *Lycaena heteronea* have one generation per year.

Abundance

- *Lycaena heteronea* were uncommon in the areas we sampled on the east slope of the Sierra Nevada. They were more common, but variable, in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate to high.

Habitat associations and behavior

- In the western Great Basin, *Lycaena heteronea* occur in fairly dry and open areas, including meadows and sagebrush shrubsteppe, at low to intermediate elevations in the mountains.
- Known larval hostplants are Polygonaceae (*Eriogonum*).
- Adults of both sexes take nectar.
- Males rarely visit mud.
- Males patrol uplands.

Identification

- *Lycaena arota* are medium-sized Lycaenines. The dorsal wings of males are bright blue. The dorsal wings of females are brown with dark spots and brown shading near the margins. The ventral wings of both sexes are pale. The ventral forewing has small, sharply contrasting black spots. The ventral hindwing rarely has marks but may have a few small, blurry black spots.
- The blue dorsum of male *Lycaena heteronea* can lead them to be confused with some Polyommatines (blues; also in the family Lycaenidae). However, the ventral wings of Polyommatines in the western Great Basin generally are darker, and the patterns on those wings are more extensive.
- Female *Lycaena heteronea* can be confused with female *Lycaena rubida*, but the latter can be distinguished by orange on their dorsal wings.

Lycaena helloides (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

Erica Fleishman

- *Lycaena helloides* occur from Alaska south to California and Nevada, east to Colorado, and across the northern Great Plains and prairie provinces to the Great Lakes region.
- *Lycaena helloides* spend their entire life cycle in the Great Basin, and occur in both mountains and valleys.
- Diapause is as an egg.
- *Lycaena helloides* have multiple generations per year in the western Great Basin.

Abundance

- *Lycaena helloides* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Lycaena helloides* generally occur in relatively wet meadows and riparian areas at fairly low elevations.
- Known larval hostplants are Polygonaceae (*Rumex*).
- Adults of both sexes take nectar.
- Males rarely visit mud.
- Males perch and patrol in canyons.

Identification

- *Lycaena heteronea* are medium-sized Lycaenines. The dorsal wings of males are dull copper-brown with a purple sheen and black spots. The dorsal hindwing has a band of submarginal orange crescents that often are fused. The dorsal wings of females usually are paler than those of males, with larger spots and a reduced or incomplete orange submarginal band. The ventral wings are brighter orange. The ventral forewing has black spots similar to those on the dorsal forewing, whereas the ventral hindwing has fewer, smaller black spots. The ventral hindwing also has a wavy submarginal orange band.

- *Lycaena cuprea* have larger black spots on the hindwings than *Lycaena helloides*, and are a redder orange.
- The dorsum of *Lycaena editha* is browner than that of *Lycaena helloides*, and the brown spots on the ventral wings of *Lycaena editha* are distinctive.
- The ventral wings of *Lycaena rubida* are much paler than those of *Lycaena helloides*.
- The dorsum of *Lycaena nivalis* is similar to that of *Lycaena helloides*, and *Lycaena helloides* are most likely to be confused with *Lycaena nivalis*. However, the ventral wings of *Lycaena helloides* are orange rather than yellow, and generally are brighter.

Lycaena nivalis (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Lycaena nivalis* occur from southern British Columbia south through the Cascade Range and Sierra Nevada, the Great Basin, and the Rocky Mountains.
- *Lycaena nivalis* spend their entire life cycle in the Great Basin, and generally are restricted to montane areas.
- Diapause is as an egg.
- *Lycaena nivalis* have one generation per year.

Abundance

- *Lycaena nivalis* were rare to uncommon in the areas we sampled on the east slope of the Sierra Nevada, and rare in the Wassuk Range. We have not recorded the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Lycaena nivalis* generally occur in wet meadows and open riparian areas.
- Known larval hostplants are *Polygonum*.
- Adults of both sexes take nectar. Nectar sources include but are not limited to *Solidago* and *Eriogonum* (Scott 1974).
- Males rarely visit mud.
- Males perch in canyons.

Identification

- *Lycaena nivalis* are small- to medium-sized Lycaenines. The dorsal wings of males and females are tan and brownish orange, respectively. There are blurry black spots on the dorsal wings, which usually are denser on the forewings than the hindwings. The dorsal hindwing also has a marginal orange band. The ventral wings are pale yellow or cream-colored, with a pink or purple tint beyond the discal area, which makes the wing look two-toned. The ventral forewing has sharp, black spots, whereas the ventral hindwing has a few if any marks.
- *Lycaena nivalis* are most likely to be confused with *Lycaena helloides*. However, the ventral wings of *Lycaena helloides* are orange rather than yellow, do not have a pink or purple tint, and generally are brighter.

Satyrium behrii (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Satyrium behrii* occur in the Cascade Range and Sierra Nevada, east through the Great Basin and southern Rocky Mountains, and north to Wyoming and Idaho (Scott 1986).
- *Satyrium behrii* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an egg.
- *Satyrium behrii* have one generation per year.

Abundance

- *Satyrium behrii* were uncommon to common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Satyrium behrii* generally occur in arid shrubsteppe and open coniferous woodlands.
- Known larval hostplants are Rosaceae, including *Purshia tridentata*.
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch and patrol in canyons and uplands, and sometimes seek mates by perching on hilltops.

Identification

- *Satyrium behrii* are medium- to large-sized Theclinae (the taxonomic tribe of hairstreaks). They have no tail. The dorsal wings are a pale golden brown with broad brown margins and leading edges. The ventral wings are gray or brown with white-bordered black spots; the spots on the hindwings are are larger and more extensive than those on the forewings. The inner edge of the ventral hindwing has a red spot.
- *Satyrium behrii* are unlikely to be confused with other species in the western Great Basin.

Satyrium fuliginosum (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Satyrium fuliginosum* occur in southwestern Canada and the northwestern United States south to central California and northwestern Colorado.
- *Satyrium fuliginosum* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an egg.
- *Satyrium fuliginosum* have one generation per year.

Abundance

- *Satyrium fuliginosum* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Satyrium fuliginosum* generally occur in open areas in sagebrush shrubsteppe, woodlands, and riparian areas.
- Known larval hostplants are Fabaceae (*Lupinus*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch near the ground, on ridgelines, and on hilltops.

Identification

- *Satyrium fuliginosum* are medium-sized Theclines. They have no tail. The dorsal wings are dark grey or dark brown. The ventral wings are brown with blurry, white-ringed black spots. These spots sometimes are larger on the forewing than on the hindwing.
- The ventral pattern of *Satyrium fuliginosum* may be confused with that of *Icaricia icarioides*, but the dorsal wings of the latter are blue rather than grey.

Satyrium californicum (Family Lycaenidae, Subfamily Lycaeninae)

Judy Gallagher (CC BY 2.0)

Natural history

- *Satyrium californicum* occur from southern British Columbia south through the mountains of southern California and east through the Great Basin to the mountains of Wyoming and Colorado (Scott 1986).
- *Satyrium californicum* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an egg.
- *Satyrium californicum* have one generation per year.

Abundance

- *Satyrium californicum* were uncommon to moderately common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the western Great Basin, *Satyrium californicum* generally occur in sagebrush shrubsteppe and dry, open coniferous woodlands.
- Known larval hostplants are Rosaceae, including *Prunus* and *Cercocarpus*.
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch in canyons and on hilltops.

Identification

- *Satyrium californicum* are tailed Theclines. The dorsal wings are brown with orange marginal marks on the hindwings and a dark brown border. The ventral wings are brown or brown-gray with postmedian rows of small, black spots. The ventral hindwing has a row of orange submarginal spots.
- *Satyrium behrii* do not have tails or a full row of orange submarginal spots on the ventral hindwing.
- *Satyrium sylvinum* have paler ventral wings with much smaller black spots, and less orange.

Satyrium sylvinum (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Satyrium sylvinum* occur from southern British Columbia south through California (except the Central Valley), the Great Basin, and the Rocky Mountains. A disjunct population occurs in the mountains of eastern Arizona (Scott 1986).
- *Satyrium sylvinum* spend their entire life cycle in the Great Basin, and occur in both mountains and valleys.
- Diapause is as an egg.
- *Satyrium sylvinum* have one generation per year.

Abundance

- *Satyrium sylvinum* generally were uncommon, but can be locally more common, in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains and Wassuk Range.
- Annual fluctuations in abundance are low to moderate.

Habitat associations and behavior

- *Satyrium sylvinum* occur in riparian areas, especially in canyons, where their larval hostplants occur. They rarely are detected far from their hostplants.
- Known larval hostplants are Salicaceae (*Salix*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch in canyons.

Identification

- The dorsal wings of *Satyrium sylvinum* are brown, often with some orange. The dorsal hindwing and sometimes the dorsal forewing have a submarginal patch of orange. The ventral wings are pale gray or brown with black postmedial and submarginal spots. The thecla spot is orange and black, and the inner margin of the wing near the base has a blue patch.
- *Satyrium californicum* have darker wings with larger black spots, and more orange.
- The strong association of *Satyrium sylvinum* with willows also can be a cue in their identification.

Satyrium saepium (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Satyrium saepium* occur from southern British Columbia south through the mountains of California, and in the Rocky Mountains. In the Great Basin east of the Sierra Nevada, the species has a disjunct distribution in the mountains of Nevada and Utah.
- *Satyrium saepium* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an egg.
- *Satyrium saepium* have one generation per year.

Abundance

- *Satyrium saepium* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains. We have not detected the species in the Wassuk Range.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the Sierra Nevada, *Satyrium saepium* occur in chaparral or patches of shrubs within coniferous woodlands (Scott 1986). Elsewhere in the western Great Basin, *Satyrium saepium* occur in dry, montane shrublands.
- Known larval hostplants are Rhamnaceae (*Ceanothus*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch on the ground or on hilltops.

Identification

- *Satyrium saepium* are tailed Theclines. The dorsal wings are red-brown with dark margins. The ventral wings are brown, with a black postmedial line and an adjacent white line. A line of black chevrons occurs closer to the margin of the ventral wings. The thecla spot is orange and black, with an adjacent blue spot.
- *Satyrium saepium* are unlikely to be confused with other species. *Satyrium californicum* also have a tail, but their ventral wings have considerably more orange.

Callophrys lemberti (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Callophyrs lemberti* occur from the Cascade Range in southern Oregon and California south through the Sierra Nevada and east to mountain ranges in western Nevada.
- *Callophyrs lemberti* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Callophyrs lemberti* have one generation per year.

Abundance

- *Callophyrs lemberti* were rare to uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Callophyrs lemberti* generally occur at high elevations, sometimes above treeline, in rocky, shrub-dominated areas. We have recorded a few individuals near rocky slopes at intermediate elevations.
- Known larval hostplants are Polygonaceae (*Eriogonum*).
- Adults of both sexes take nectar.
- Males rarely use mud.
- Males perch in canyons and sometimes on hillsides.

Identification

- *Callophyrys lemberti* are small Theclines. The dorsal wings of males are gray. The dorsal wings of females sometimes are brownish. The ventral wings are green with white fringe. Some individuals have a white postmedian line, which may be broken, on the ventral hindwing (Tilden 1963).
- The taxonomy of *Callophyrs* is uncertain, and many putative species are similar. However, *Callophrys lemberti* is the only green hairstreak currently known to occur in our montane study areas. *Callophrys comstocki* may co-occur with *Callophrys lemberti* in the western Great Basin, but generally have a much stronger white line on the ventral hindwing. *Callophrys affinis* are similar in appearance to *Callophrys comstocki*, but are not known to occur in the far western Great Basin.

Loranthomitoura spinetorum (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Loranthomitoura spinetorum* occur from southern British Columbia south through the Rocky Mountains, Great Basin, California, and the mountains of the southwestern United States and northern Mexico. It is absent from most of the Central Valley in California and the low-elevation deserts in the southwestern United States.
- *Loranthomitoura spinetorum* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Loranthomitoura spinetorum* have one generation per year.

Abundance

- *Loranthomitoura spinetorum* were rare to uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Loranthomitoura spinetorum* occur in coniferous woodlands.
- Known larval hostplants are Viscaceae: dwarf mistletoes (*Arceuthobium*) that parasitize diverse conifers including *Pinus jeffreyi*, *P. monophylla*, *P. contorta*, and *Abies concolor*.
- Adults of both sexes, but especially females, take nectar.
- Males rarely use mud.
- Males perch on hilltops, in uplands, and on conifers.

Identification

- *Loranthomitoura spinetorum* are larger than most other Theclines in the western Great Basin. The dorsal wings of males are deep blue with wide, black borders. On the dorsal wings of females, the blue is restricted to the base. The ventral wings of males and females are reddish-brown with a bold, black-edged, W-shaped white postmedian line on the hindwing. The ventral hindwing also has a row of black marginal spots. The hindwings have tails.
- No other hairstreak in the western Great Basin has blue dorsal wings.

Mitoura siva (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Mitoura siva* occur from southern British Colombia south through most of California except the Central Valley, and in northern Mexico. They occur east to western Texas and Nebraska and are absent from the low-elevation deserts of the southwestern United States.
- *Mitoura siva* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Mitoura siva* have one generation per year.

Abundance

- *Mitoura siva* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Mitoura siva* occur in woodlands with juniper. They often occur in relatively arid, low-elevation montane areas.
- Known larval hostplants are Cupressaceae, including *Juniperus osteosperma* and possibly *J. occidentalis* (Johnson 1978).
- Adults of both sexes take nectar.
- Males sometimes use mud.
- Males perch in canyons and uplands.

Identification

- *Mitoura siva* are medium-sized Theclines. The dorsal wings of males are gray-brown. The dorsal hindwing has orange marks near the margin. The dorsal wings of females are rust-orange with wide brown margins and wing bases. The base of the ventral hindwings may be green. The ventral forewing and hindwing have a white postmedian line and a dark inner border. The ventral hindwing also has several dark postmedian spots and blurred, gray-purple marks along the margin.

- The taxonomic status of *Mitoura siva* and *Mitoura gryneus* long was unclear. *Mitoura siv*a sometimes has been considered a subspecies of *Mitoura gryneus*.

Incisalia augustinus (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Incisalia augustinus* occur from eastern Alaska south to northern Baja California with the exception of the Central Valley in California. *Incisalia augustinus* also occur throughout the Rocky Mountains, higher-elevation mountain ranges of the Great Basin, the Sierra Nevada, and the mountains of Arizona, New Mexico, and northwest Mexico. Their distribution includes the Prairie Provinces and Great Lakes region to the Atlantic coast, and south through the mid Atlantic and Appalachian highlands.
- *Incisalia augustinus* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Incisalia augustinus* have one generation per year.

Abundance

- *Incisalia augustinus* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We have not detected the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Incisalia augustinus* generally occur in open areas in montane woodlands and shrublands.
- Known larval hostplants are Rhamnaceae (*Ceanothus*).
- Adults of both sexes take nectar.
- Males sometimes use mud.
- Males perch in uplands and sometimes on the ground.

Identification

- *Incisalia augustinus* are relatively small Theclines. The dorsal wings of males are brown with some red toward the interior (close to the thorax) of the hindwing. The dorsal wings of females are red-brown. The ventral wings are red-brown. The forewing has dark submarginal spots and a dark postmedial line. The interior of the hindwing is darker than the exterior, and sometimes has dark spots.

Incisalia eryphon (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Incisalia eryphon* occur from northern British Columbia and Alberta south through the Coast Ranges and Sierra Nevada in California, the Great Basin, the Rocky Mountains, and the mountains of Arizona and New Mexico. They also occur across the Prairie Provinces through southern Ontario and Quebec and in the northern Great Lakes region.
- *Incisalia eryphon* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Incisalia eryphon* have one generation per year.

Abundance

- *Incisalia eryphon* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains, but common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Incisalia eryphon* generally occur above 1800 m in coniferous woodlands, especially in association with *Pinus*, and in gaps and wet meadows within woodlands.
- Known larval hostplants are Pinaceae (*Pinus*).
- Adults of both sexes take nectar.
- Males rarely use mud.
- Males perch in canyons and uplands.

Identification

- *Incisalia eryphon* are relatively large Theclines. The dorsal wings of males are dark brown to purple-brown, whereas those of females are orange-brown. The wing margins are checkered. The margin of the dorsal forewing has bold, dark chevrons. The ventral wings are brown, with a dark line and, in many cases, a thin white border on the forewing. The base of the ventral hindwing is mottled with black-brown and gray marks. The margin of the ventral hindwing has large, deeply forkedm black-brown chevrons.
- *Incisalia eryphon* are unlikely to be confused with any other species in the western Great Basin.

Strymon melinus (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Strymon melinus* occur from southern Canada through the conterminous United States and south to Venezuela (Scott 1986).
- *Strymon melinus* spend their entire life cycle in the Great Basin, and occur in both mountains and valleys.
- Diapause is as a pupa.
- *Strymon melinus* have multiple generations per year in the Great Basin.

Abundance

- *Strymon melinus* were rare in the areas we sampled in the Wassuk Range and Sweetwater Mountains. We have not detected the species on the east slope of the Sierra Nevada.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Strymon melinus* occur in open areas in diverse land cover, often in disturbed areas.
- In the Great Basin, known larval hostplants include *Lupinus*, *Medicago*, *Melilotis*, *Sphaeralcea*, and *Eriogonum*.
- Adults of both sexes take nectar.
- Males rarely use mud.
- Males perch in canyons and uplands and on hilltops. Males may defend hilltops from conspecifics and other species of insects (Alcock and O'Neill 1987).

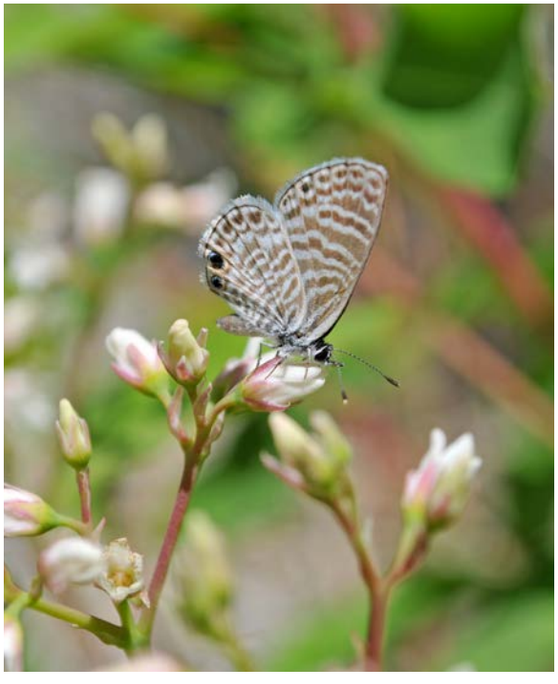
Identification

- *Strymon melinus* are large, tailed Theclines. The dorsal wings are dark gray with an orange thecla spot. The ventral wings are paler gray with bands of orange and black dashes, both bordered distally by white; an orange thecla spot, and several other orange spots.
- *Strymon melinus* are unlikely to be confused with other species in the western Great Basin. The wing color and orange marks are distinctive.

Wolf Creek, Sierra Nevada, Mono County, California (Erica Fleishman)

Leptotes marina (Family Lycaenidae, Subfamily Lycaeninae)

Natural history



- *Leptotes marina* breed from southern California east to southern Texas and south through Central America. Adult migrants occur as far north as southern Idaho and the Great Lakes region.
- *Leptotes marina* detected in the Great Basin generally are believed to be migrants from the south. They may breed in the Great Basin, but likely cannot overwinter in the region. They occur in both mountains and valleys in the Great Basin.
- *Leptotes marina* are not known to have a diapause.
- *Leptotes marina* have multiple generations per year in their breeding range.

Abundance

- *Leptotes marina* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance in the Great Basin are high, likely reflecting variation in the extent of dispersal from the south and local colonization.

Habitat associations and behavior

- *Leptotes marina* occur in diverse open areas that are dominated by either native or non-native grasses and forbs. In the Great Basin, they often are associated with washes, waterways, agricultural fields, and disturbed areas.
- Known larval hostplants in the western Great Basin are herbaceous Fabaceae (*Medicago* and possibly *Melilotis*).
- Adults of both sexes take nectar.
- Males use mud.
- Males patrol in canyons.

Identification

- *Leptotes marina* are small Polyommatines (the taxonomic tribe of blue butterflies). The dorsal wings of males are purple with some brown. The dorsal wings of females generally are dominated by brown rather than purple, especially along the wing margins. The ventral wings are off-white with brown rows or spots. The bottom edge of the ventral hindwing has several black and iridescent blue spots.
- In the western Great Basin, *Leptotes marina* are most likely to be confused with *Hemiargus isola*. *Leptotes marina* are lighter, have purple rather blue dorsal wings, and have a distinctive ventral pattern.

Brephidium exile (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Brephidium exile* occur from California and Oregon east to the central United States and south to South America.
- Most adult *Brephidium exile* detected in the mountains and valleys of the Great Basin likely are migrants from populations to the south. Especially at high elevations, the species may not overwinter in the Great Basin.
- Diapause is as a pupa.
- *Brephidium exile* have multiple generations per year. In the Great Basin, they likely have two or more generations.
- *Brephidium exile* is the smallest butterfly species in the United States and Canada.

Abundance

- We recorded low abundances of *Brephidium exile* in the Wassuk Range and in one canyon on the east slope of the Sierra Nevada. We have not detected the species in the Sweetwater Mountains.
- Annual fluctuations in distribution and abundance in the Great Basin can be high, which may reflect variation in abundance within or dispersal from populations to the south.

Habitat associations and behavior

- *Brephidium exile* generally occur at relatively low elevations, such as the base of mountain ranges, valleys, and playas, and often in areas with alkaline soils.
- Known larval hostplants are Chenopodaceae, including native (*Atriplex*) and non-native (*Salsola*, *Halogetum*) taxa.
- Adults of both sexes take nectar.
- Males rarely use mud.
- Males patrol throughout their habitat (Scott 1986).

Identification

- *Brephidium exile* are noticeably smaller than other Polyommatines, although females are somewhat larger than males. The dorsal wings are coppery brown with dull blue at the bases of both wings. The ventral wings are coppery brown with grayish-white bases and white fringe. The ventral hindwing has a line of three or four black spots along the base, and four or five irridescent blue-black spots along the margin.
- *Brephidium exile* are unlikely to be confused with any other species in the western Great Basin.

Everes amyntula (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Everes amyntula* occur from northern Alaska south through most of the western United States. They are absent from the Central Valley of California and the deserts in eastern California and western Arizona. They also occur across the Prairie Provinces of Canada and in Ontario. A small, disjunct population occurs in eastern Quebec.
- *Everes amyntula* spend their entire life cycle in the mountains and valleys of the Great Basin.
- Diapause is as a larva.
- *Everes amyntula* have one or two generation per year in the western Great Basin.

Abundance

- *Everes amyntula* were rare to uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Everes amyntula* generally occur along washes, in riparian areas, and in uplands dominated by sagebrush.
- Known larval hostplants are herbaceous Fabaceae (*Astragalus*).
- Use of nectar is limited.
- Males and females use mud.
- Males perch in canyons and patrol in canyons and uplands.

Identification

- *Everes amyntula* are medium-sized, tailed Polyommatines. The dorsal wings of males are bright blue with a narrow black border. The dorsal wings of females are brownish black. The ventral wings are grayish white with faded gray marks along the margin and scattered black spots. Most individuals have an orange and irridescent blue spot above the tail.

- *Everes amyntula* are the only tailed blues in the western Great Basin, but the tail is absent on some individuals, especially worn individuals. Nevertheless, the ventral pattern is distinctive.
- *Everes amyntula* sometimes are confused with *Celastrina ladon*, especially when worn. *Celastrina ladon* have chevrons along the margins on the ventral wings and do not have orange spots.

Celastrina ladon (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Celastrina ladon* occur through most of the United States and Canada. They are absent from the high Arctic, southern Florida, portions of the low-elevation deserts in California and southern Nevada, and most of Oklahoma and Texas. *Celastrina ladon* also occur on other continents (Scott 1986).
- *Celastrina ladon* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Celastrina ladon* have one or two generations per year in the western Great Basin.

Abundance

- *Celastrina ladon* were abundant in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. They appeared to be less common in the Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Celastrina ladon* occur in diverse land-cover types in the western Great Basin. They are most common in riparian areas within woodlands.
- The larvae of *Celastrina ladon* can feed on plants in numerous families. In the western Great Basin, they often may feed on Rosaceae, including *Petrophytum* and *Peraphyllum*.
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol in canyons and uplands.

Identification

- *Celastrina ladon* are medium-sized Polyommatines. The dorsal wings are pale blue; the dorsal forewing of females has a black margin. The ventral wings are pale gray with black and dark gray dots throughout the disc, and dark gray chevrons, with a dot in the middle of each, along the margin.
- *Celastrina ladon* sometimes are confused with *Everes amyntula*, especially when worn. *Everes amyntula* are tailed, do not have chevrons along the margins of their ventral wings, and have an orange spot above the tail.
- In contrast to several (but not all) other species of Polyommatines in the western Great Basin, *Celastrina ladon* have no metallic or colorful spots on their ventral hindwings.
- The ventral patterns of *Celastrina ladon* and *Satyrium sylvinum* also may seem similar, but *Satyrium sylvinum* almost always are associated with willows, and have an orange spot and no chevrons.

***Euphilotes* spp.** (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- At least three species of *Euphilotes*, *battoides*, *enoptes*, and *ancilla*, occur and may co-occur in the western Great Basin. The ecology of these species is fairly similar. Although they can be identified under a dissecting microscope on the basis of genital morphology, they rarely can be distinguished on the basis of wing morphology. Therefore, they are addressed here as one group.
- *Euphilotes battoides* occur from southern British Columbia south to central California and east to Idaho, Colorado, and New Mexico. *Euphilotes enoptes* occur from southern Washington south to northern Baja California, and east to western Nevada and Arizona. *Euphilotes ancilla* occur in the Canadian Prairie Provinces and across most of the western United States east to western Nebraska and South Dakota.
- *Euphilotes* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa (Pratt 1994).
- *Euphilotes* have one generation per year.

Abundance

- *Euphilotes* were common in the areas we sampled in the Wassuk Range and uncommon on the east slope of the Sierra Nevada and in the Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Euphilotes* often occur in riparian areas and on dry hillslopes, almost always in association with their larval hostplants, from which they also take nectar.
- Known larval hostplants are Polygonaceae (*Eriogonum*).
- Adults of both sexes take nectar.
- Males and females often use mud.
- Males patrol near larval hostplants.

Identification

- *Euphilotes* are small Polyommatines. The dorsal wings of male *Euphilotes* are blue or purple-blue with black margins. The margin of the hindwing sometimes is bordered with orange along the lower edge. The dorsal wings of female *Euphilotes* are brown with an orange margin on the hindwing and, in some cases, the lower forewing. The wings have a white-and-black checkered fringe. The ventral wings are whitish or pale gray with black spots. The ventral hindwing has a submarginal orange band, and black dots along the margin.
- *Euphilotes* can be distinguished from other blues by the orange band on the ventral hindwing and by the absence of iridescent blue on the hindwings. *Lycaeides melissa* have an orange band and iridescent blue on both ventral wings, whereas *Icaricia lupini* and *Icaricia acmon* have orange and iridescent blue on the ventral hindwings.

Glaucopsyche piasus (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Glaucopsyche piasus* occur from southern British Columbia and Alberta south through the Great Basin, Sierra Nevada, and Rocky Mountains. They also occur in the Black Hills of South Dakota, the northern California coast, and in southern California.
- *Glaucopsyche piasus* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a pupa.
- *Glaucopsyche piasus* have one generation per year.

Abundance

- *Glaucopsyche piasus* were relatively rare in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains, and relatively common in the Wassuk Range.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Glaucopsyche piasus* generally occur at moderate elevations in fairly open areas, many of which are dominated by sagebrush.
- Known larval hostplants are Fabaceae (*Lupinus*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol canyons and uplands.

Identification

- *Glaucopsyche piasus* are relatively large Polyommatines. The dorsal wings of males are blue or violet-blue with a wide, brown border. The dorsal wings of females are similar but with much wider borders. The ventral wings are darker than those of many other blues in the western Great Basin, and often appear brown. The ventral wings have black dots and a postmedial row of white arrowheads, some of which are bordered by orange toward the margin.
- The ventral pattern of *Glaucopsyche piasus* is distinct, and the species is unlikely to be confused with others in the western Great Basin.

Mount Grant, Wassuk Range, Mineral County, Nevada (Erica Fleishman)

Glaucopsyche lygdamus (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Glaucopsyche lygdamus* occur from Alaska south to northern Baja California and east through the Rocky Mountains. They also occur throughout most of subarctic Canada, the Great Lakes region, the Appalachian highlands, and western Arkansas and southern Missouri. Several disjunct populations are scattered throughout the central United States.
- *Glaucopsyche lygdamus* spend their entire life cycle in the Great Basin, and occur in both mountains and valleys.
- Diapause is as a larva.
- *Glaucopsyche lygdamus* have one generation per year.
- The larvae of *Glaucopsyche lygdamus*, like those of many other lycaenids, are tended by ants (Billick et al. 2005).

Abundance

- *Glaucopsyche lygdamus* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range, and rare in the Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Glaucopsyche lygdamus* occur in diverse land-cover types, but usually in open or wooded areas that are fairly dry.
- Known larval hostplants are herbaceous Fabaceae (*Lupinus*, *Astragalus*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol canyons and uplands.

Identification

- *Glaucopsyche lygdamus* are medium-sized Polyommatines. The dorsum of males is silver-blue with a narrow, black margin. The dorsum of females is darker blue than that of males, and has a wider margin. The ventral wings of both sexes are gray. The ventral forewing and hindwing have a single postmedian row of round, black dots ringed with white, and several other scattered dots in the discal area.
- The ventral pattern and lack of orange on either the dorsal or ventral wings make *Glaucopsyche lygdamus* difficult to confuse with other species. The ventral wings of *Icaricia icarioides* generally appear more brown than gray, and the dots on the ventral hindwing are not as sharp. The ventral wings of *Lycaena heteronea* generally appear more yellow, and the ventral hindwings rarely have spots; if spots are present, they are not as sharp.

Lycaeides melissa (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Lycaeides melissa* occur from the central Prairie Provinces west to the Cascade Range and Sierra Nevada, south through the Great Basin to the mountains of Arizona and New Mexico, and east to the central Great Plains. They also occur through the southern Great Lakes region and east into New York. Disjunct populations occur in California, Texas, and northern Mexico.
- *Lycaeides melissa* spend their entire life cycle in the Great Basin, and occur in both valleys and mountains.
- Diapause is as an egg.
- In the Great Basin, *Lycaeides melissa* have three generations per year.

Abundance

- *Lycaeides melissa* were fairly rare in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains, but common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Lycaeides melissa* occur in relatively open and dry areas, in sagebrush shrubsteppe, in riparian areas, and in agricultural fields.
- Known larval hostplants are herbaceous Fabaceae (*Astragalus*, *Melilotis*, possibly *Lupinus*). Throughout the western United States and Canada, *Lycaeides melissa* also have adapted to use non-native *Medicago sativa* (alfalfa) as a larval hostplant (Forister et al. 2012).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol in canyons and uplands.

Identification

- *Lycaeides melissa* are small to medium-sized Polyommatines. The dorsal wings of males are bright blue with a narrow black border. The dorsal wings of females are brownish with orange margins; the margins often are more pronounced on the hindwings. The ventral wings of both sexes are light gray or tan with bold black spots and orange margins. The margins often are fused into a band, and are bordered to the outside with iridescent blue spots.
- Other species of blues have orange on the ventral hindwing, but no other species in the region also has orange on the forewing.

Plebejus saepiolus (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Plebejus saepiolus* occur from eastern Alaska, south through the mountains of California, the Great Basin, and the Rocky Mountains. They also occur east across Canada to New England and the Maritime Provinces (Scott 1986).
- *Plebejus saepiolus* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Plebejus saepiolus* have one generation per year in the Great Basin.

Abundance

- *Plebejus saepiolus* were common in wet meadows on the east slope of the Sierra Nevada and in the areas we sampled in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the Great Basin, *Plebejus saepiolus* generally occur in open, wet meadows and riparian areas.
- Known larval hostplants are Fabaceae (*Trifolium*).
- Adults of both sexes take nectar.
- Males use mud.
- Males patrol canyons and uplands.

Identification

- *Plebejus saepiolus* are small Polyommatines. The dorsum of males is blue with dark margins and, sometimes, faint black spots. The dorsum of females is brown, sometimes with a bit of blue, and sometimes with orange dots near the margin, especially on the hindwings. Both sexes have a small, comma-shaped black mark or bar on the dorsal forewing. The ventral wings of males are gray with black spots. The ventral wings of females are similar to those of males, but browner. The ventral wings of both sexes usually have small black marginal and submarginal dots, often with orange on the outside of the submarginal dots.

- A number of features allow *Plebejus saepiolus* to be differentiated from other species of blues in the western Great Basin. The orange on the ventral hindwing does not form a bar, and there is no iridescent blue on the wing. *Celastrina ladon* have lighter marks and chevron-shaped marks near the margin. *Glaucopsyche lygdamus* usually are larger, with fewer spots that also are ringed with white. *Icaricia icarioides* have no orange, and the dots on their ventral hindwing are less distinct.

Icaricia icarioides (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Icaricia icarioides* occur throughout most of the United States from western South Dakota and Colorado west to California, with the exception of most of the Central Valley of California and the low-elevation deserts of the southwest. The species also occurs in southern British Columbia and Alberta and northern Baja California.
- *Icaricia icarioides* spend their entire life cycle in the Great Basin, and occur in both mountains and valleys.
- Diapause is as a larva.
- *Icaricia icarioides* have one generation per year in the western Great Basin.

Abundance

- *Icaricia icarioides* were common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. They were uncommon in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Icaricia icarioides* occur in diverse open, wooded, and riparian land cover types in which *Lupinus* is present.
- Known larval hostplants in the western Great Basin are Fabaceae (*Lupinus argenteus*, *L. arbustus*, *L. caudatus*, *L. melonanthus*, and possibly *L. holosericeus*).
- Although larvae feed on multiple, sympatric species of *Lupinus*, a given population may not feed on more than one species, even when multiple species are present (Downey and Fuller 1961).
- Adults of both sexes take nectar.
- Males regularly use mud, and females also visit mud.
- Males patrol in canyons and uplands.

Identification

- *Icaricia icarioides* are relatively large Polyommatines. The dorsum of males is silver-blue with a thin, dark margin and uncheckered fringes. The dorsum of females is brown, sometimes with blue wing bases. The ventral wings of both sexes are silver to brown-gray; females usually are browner than males. The ventral forewings are spotted with black, whereas the ventral hindwings have either white spots or smal black spots with wide white borders. The ventral wings have no orange or iridescent spots.
- In the western Great Basin, *Icaricia icarioides* are most likely to be confused with *Satyrium fuliginosum*. However, the dorsal wings of *Satyrium fuliginosum* are dark grey or dark brown, and *Satyrium fuliginosum* do not have a large black spot in the middle of the ventral forewing.

Icaricia shasta (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Icaricia shasta* occur from the Cascade Range in Oregon south through the Sierra Nevada, in many of the mountain ranges in the Great Basin, in the central Rocky Mountains, and in the upper Great Plains from southern Saskatchewan through the western Dakotas.
- *Icaricia shasta* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an egg. Some populations are biennial, in which case the second-year animals overwinter as larvae.
- *Icaricia shasta* have one generation per year.

Abundance

- *Icaricia shasta* were uncommon to rare in the areas we sampled on the east slope of the Sierra Nevada, in the Wassuk Range, and in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Icaricia shasta* occur from 360 to 4000 m across their range, typically in open, sunny shrublands or in alpine environments with sparse, low vegetation. They often occur in areas dominated by *Artemisia tridentata* (Emmel and Shields 1978).
- Larval hostplants are *Fabaceae*, generally prostrate or low, mat-forming growth forms. In the the western Great Basin, larval hostplants include *Astragalus purshii*, *A. whitneyi*, *Lupinus arbustus*, *L. breweri*, *L. lycalli*, and *Oxytropis perryi*. Other species of *Astragalus* and *Trifolium* are known to serve as larval hostplants elsewhere in the Great Basin, and use of *Astragalus* probably is more extensive than documented (Emmel and Shields 1978).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males patrol in uplands.

Identification

- *Icaricia shasta* are small Polyommatines. The dorsal wings of males are blue with a dark margin that becomes dark spots along the hindwing and a distinct black spot in the discal cell. The dorsal wings of females usually are more brown than blue, have wider dark margins than do males, and have some orange near the margin of the hindwing. The ventral forewings of both sexes have black postmedial and gray submarginal spots. The ventral hindwings are gray or brownish gray with brown postmedial spots and black marginal spots. The black spots are bordered with dark, iridescent caps, some orange, and white arrowheads.
- *Icaricia shasta* are fairly distinct. No other species of blue in the western Great Basin has the combination of dorsal and ventral marks, including a black spot in the discal cell on the dorsal forewing and brown postmedial spots on the ventral hindwing.

Icaricia lupini (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Icaricia lupini* occur from the mountains of central Washington and Oregon south through the Cascade Range, Coast Ranges, and Sierra Nevada. They also occur in the mountains of Nevada.
- *Icaricia lupini* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Icaricia lupini* have one or more generations per year.

Abundance

- *Icaricia lupini* were moderately common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Icaricia lupini* are widespread and generally occur in proximity to their larval hostplants, whether in sagebrush shrubsteppe or riparian areas.
- Known larval hostplants are Polygonaceae (*Eriogonum*, including but likely not limited to *E. umbellatum* [Goodpasture 1974]).
- Adults of both sexes take nectar.
- Use of mud by males and females is moderate and occasional, respectively.
- Males patrol canyons and uplands.

Identification

- *Icaricia lupini* are small Polyommatines. The dorsal wings of males are purple-blue with a wide, dark margin. The dorsal wings of females can be blue, but often are browner than those of males. Both sexes have a wide orange band along the margin of the dorsal hindwing. The ventral wings of both sexes are grayish with variable black spots. The margin of the ventral hindwing has a row of orange spots that often form a band and have iridescent caps.

- In the field, *Icaricia lupini* and the comparatively rare (in the western Great Basin) *Icaricia acmon* are virtually indistinguishable. The species can be differentiated by dissection of their genitalia.
- *Euphilotes* spp. may appear similar, but have no iridescence on their ventral hindwings.
- *Lycaeides melissa* have orange bands on both ventral wings.

Agriades podarce (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Agriades podarce* occur from the Klamath Range and southern Oregon south to the southern Sierra Nevada.
- *Agriades podarce* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva or pupa (Scott 1986).
- *Agriades podarce* generally have one generation per year.

Abundance

- *Agriades podarce* were relatively common in the areas we sampled in its habitat on the east slope of the Sierra Nevada. The species does not occur east of the Carson Range, and therefore is absent from the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Agriades podarce* generally occur in meadows and open woodlands at relatively high elevations.
- Known larval hostplants are Primulaceae (*Dodecatheon*, potentially including *Dodecatheon alpinum*).
- Adults of both sexes take nectar.
- Males rarely use mud.
- Males patrol within the species' habitat (Scott 1986).

Identification

- *Agriades podarce* are medium-sized Polyommatines. The dorsal wings of males are blue-gray, whereas those of females are brown. The ventral wings of both sexes are gray-brown with white-encircled black spots. The submargin of the ventral hindwing may have some orange, and the submarginal spots on that wing may appear to be arrowhead-shaped.
- With the exception of strays, *Agriades podarce* are absent from the Great Basin east of the Carson Range, which may simplify identification of other taxa in the western Great Basin.

- *Agriades podarce* initially may seem similar to *Glaucopsyche piasus*, but the ventral wings of the latter generally are darker, have much sharper arrowhead-shaped marks, and black dots with considerably less surrounding white.

Hemiargus isola (Family Lycaenidae, Subfamily Lycaeninae)

Natural history

- *Hemiargus isola* breed from southern California east through central Texas and south to Costa Rica. Migrants occur throughout California and the Great Basin, Great Plains, and Great Lakes region.
- *Hemiargus isola* are immigrants to the valleys and mountains of the Great Basin from their breeding range to the south, and do not overwinter in the Great Basin.
- Within the species' breeding range, diapause is as a larva or pupa.
- *Hemiargus isola* have many generations per year in their breeding range.
- The larvae of *Hemiargus isola* interact facultatively with several species of ants. The ants feed on secretory glands of the larvae and protect the larvae from some natural enemies. *Hemiargus isola* that co-occur with ants have a lower incidence of predation (Wagner and Kurina 1997) and parastism (Weeks 2003) than those that do not co-occur with ants.

Abundance

- *Hemiargus isola* were rare in the areas we sampled in the Wassuk Range. We have not detected the species on the east slope of the Sierra Nevada or in the Sweetwater Mountains.
- Annual fluctuations in abundance are low within the breeding range.

Habitat associations and behavior

- Within their breeding range, *Hemiargus isola* occur in open land-cover types with abundant forbs, including washes and agricultural fields. In the Great Basin, they also occur in open land-cover types.
- Known larval hostplants are Leguminosae, including agricultural species.
- Adults of both sexes take nectar.
- Males sometimes use mud.
- Males patrol near larval hostplants.

Identification

- *Hemiargus isola* are small Polyommatines. The dorsal wings of males and females are lilac-blue and brown, respectively. The ventral wings are brown-gray. The ventral forewing has a postmedian row of black spots circled with white. Most of the other marks on the ventral wings are pale and faded. There are one or two large, black tornus spots. There is no orange on the ventral wings.
- In the western Great Basin, *Hemiargus isola* are most likely to be confused with *Leptotes marina*. The ventral wings of *Lepotes marina* are much browner than those of *Hemiargus isol*a, and the spots at or near the tornus are iridescent.

Apodemia mormo (Family Lycaenidae, Subfamily Riodininae)

Natural history

- *Apodemia mormo* occur from southern Canada and Washington south to Baja California and other parts of Mexico, and east to the Dakotas and western Texas. There are disjunct populations in Montana.
- *Apodemia mormo* spend their entire life cycle in the Great Basin. They are not restricted to the mountains, but they are not common at low elevations.
- Diapause is as a larva.
- *Apodemia mormo* have one generation per year.

Abundance

- *Apodemia mormo* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- The species can be locally common. Annual fluctuations in abundance are moderate to high.

Habitat associations and behavior

- In the western Great Basin, *Apodemia mormo* usually occur in montane areas dominated by sagebrush and in open woodlands with an extensive shrub understory.
- Known larval hostplants are Polygonaceae (*Eriogonum*).
- Adults of both sexes take nectar, including that of *Eriogonum*, *Chrysothamnus*, and *Ericameria*.
- Males rarely use mud.
- Males patrol and perch in canyons and on hilltops.

Identification

- *Apodemia mormo* is a relatively small butterfly and the only Riodinid (metalmark) that occurs in the western Great Basin. The wings are dark brown to black, and checkered with large, black-bordered white spots. These spots are larger on the ventral than the dorsal wings. The basal portions of the forewings have a large orange patch. The fringes of the wings are checkered black and white.
- In the western Great Basin, *Apodemia mormo* are distinctive.

Spring snow in Wolf Creek, Sierra Nevada, Mono County, California (Erica Fleishman)

Speyeria cybele (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Erica Fleishman

- *Speyeria cybele* occur from southern British Columbia east to southern Quebec and New England, and south to Georgia and Arkansas. They also occur in the Cascade Range, Sierra Nevada, and Rocky Mountains (Scott 1986).
- *Speyeria cybele* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an unfed first instar larva.
- *Speyeria cybele* have one generation per year.

Abundance

- *Speyeria cybele* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Speyeria cybele* occur in montane wet meadows, including those along streams.
- Known larval hostplants are Violaceae (*Viola*), probably including *Viola nephrophylla*.
- Adults of both sexes take nectar. Use of mud is rare.
- Males patrol throughout their habitat.

Identification

- *Speyeria cybele* are fairly large relative to other fritillaries (members of the taxonomic tribe Argynnini) in the western Great Basin. The dorsal wings of males are bright orange with wavy black lines, black submarginal spots, and black marginal crescents. The basal two-thirds of the dorsal wings of females are black-brown, whereas the outer third is pale yellow. In the western Great Basin, the ventral wings are pale yellow-orange with a brown-red disc. The disc of the ventral hindwing also has large, irregularly placed silver-white spots and a submarginal row of small silver-white triangles capped with red-brown triangles.

- In the western Great Basin, *Speyeria cybele* are most likely to be confused with *Speyeria nokomis*, which have generally similar morphology and sexual dimorphism, and multiple observations of both species may be necessary to become familiar with the differences. The ventral disk of *Speyeria cybele* is red-brown, whereas that of *Speyeria nokomis* is greenish. *Speyeria nokomi*s usually are somewhat larger than *Speyeria cybele*. Male *Speyeria nokomis* are a brighter red-orange, and the dorsum of females appears black rather than black-brown.
- *Speyeria mormonia* also occur in wet meadows, but are noticeably smaller and paler.

Speyeria nokomis (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Erica Fleishman

- *Speyeria nokomis* occur in mountain ranges and alkali seeps from the central Sierra Nevada east to the Rocky Mountains and south to Durango, Mexico.
- *Speyeria nokomis* spend their entire life cycle in the Great Basin, and occur in both valleys and mountains.
- Diapause is as an unfed first-instar larva.
- *Speyeria nokomis* have one generation per year.
- Females often begin to fly one to several weeks later than males. Within a mountain range or other large area, there may be considerably asynchrony in emergence and flight, which may be related to solar insolation.

Abundance

- *Speyeria nokomis* generally are rare, although can be locally common in patches of habitat, on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Speyeria nokomis* inhabitat wet meadows associated with seeps, springs, and riparian areas. Although they can fly long distances (at least 4500 m; Fleishman et al. 2002), they rarely are detected in areas in which their larval hostplants and adult nectar sources are absent.
- Known larval hostplants are Violaceae (*Viola*), including *Viola nephrophylla*.
- Adults of both sexes take nectar, especially from native and non-native thistles (*Cirsium* and *Carduus*).
- Use of mud is limited.
- Males patrol throughout habitat.

Identification

- *Speyeria nokomis* are the largest fritillaries in the western Great Basin, and are approximately the size of *Danaus plexippus* or some small Papilionids (swallowtails). The dorsal wings of males are bright red-orange with wavy black lines, black submarginal spots, and black marginal crescents. The basal two-thirds of the dorsal wings of females are black, whereas the outer third is pale yellow. In the western Great Basin, the ventral wings of males are a fairly uniform orange, although the basal area of the ventral forewing usually is darker. The disc of the ventral hindwing has large, irregularly placed silver-white spots that are bordered with black and a submarginal row of small silver-white triangles capped with black triangles. The ventral forewing of females is yellow with a dark-red basal area. The ventral hindwing of females is yellow with a greenish disk and silver-white spots.
- In the western Great Basin, *Speyeria nokomis* are most likely to be confused with *Speyeria cybele*, which have generally similar morphology and sexual dimorphism. Multiple observations of both species may be necessary to become familiar with the differences, although one's first observation of *Speyeria nokomis* can be striking. The ventral disk of *Speyeria nokomis* is greenish on females (as opposed to red-brown on *Speyeria cybele)*, and less distinct on male *Speyeria nokomis* than male *Speyeria cybele*. The dorsal wings of male *Speyeria nokomis* are a brighter red-orange than those of *Speyeria cybele*, and the dorsum of females appears black rather than black-brown.

Speyeria zerene (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Frank Fogarty

- *Speyeria zerene* occur from the coast of southeast Alaska and British Columbia south through the California Coast Ranges and Sierra Nevada, Great Basin, and Rocky Mountains. There is a disjunct population in southern Nevada (Scott 1986).
- *Speyeria zerene* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an unfed first instar larva.
- *Speyeria zerene* have one generation per year.

Abundance

- *Speyeria zerene* were common in the areas we sampled on the east slope of the Sierra Nevada, and uncommon in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Speyeria zerene* are widespread and occur in sagebrush shrubsteppe, open coniferous woodlands, meadows, and riparian areas.
- Known larval hostplants are are Violaceae (*Viola*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol canyons and uplands.

Identification

- *Speyeria zerene* are medium-sized fritillaries. The dorsal wings are orange with wavy black lines, black submarginal spots, and black marginal crescents. The ventral wings are pale yellow or orange with a light purple to brown disc. The spots may be silver or unsilvered.

- In the western Great Basin, *Speyeria zerene* are most likely to be confused with, and can be difficult to differentiate from, *Speyeria egleis*. The borders surrounding the silver spots on *Speyeria egleis* often look muddier than those on *Speyeria zerene*, and the disk of *Speyeria egleis* rarely is purple.
- *Speyeria callippe* have a much greener disc.
- *Speyeria cybele* and *Speyeria nokomis* are considerably darker and brighter, and generally are larger.

Speyeria callippe (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Frank Fogarty

- *Speyeria callippe* occur from southern British Columbia east to southern Manitoba and south through the Sierra Nevada, California Coast Ranges, Great Basin, and Rocky Mountains (Scott 1986).
- S*peyeria callippe* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an unfed first instar larva.
- S*peyeria callippe* have one generation per year.

Abundance

- *Speyeria callippe* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Speyeria callippe* occur in relatively dry coniferous woodlands, sagebrush shrubsteppe, and riparian areas.
- Known larval hostplants are are Violaceae (*Viola*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males perch on hilltops and patrol hilltops and uplands.

Identification

- S*peyeria callippe* are medium-sized fritillaries. The dorsal wings are pale orange with wavy black lines, black submarginal spots, and black marginal crescents. The ventral wings are pale yellow or orange with a greenish disc and silvered spots.
- The green disc of *Speyeria callippe* makes them fairly easy to differentiate from other species of *Speyeria*. Worn individuals of *Speyeria callippe* and *Speyeria zerene* may be difficult to identify, but *Speyeria callippe* usually retain at least a trace of green.

Speyeria egleis (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Frank Fogarty

- *Speyeria egleis* occur from eastern Washington east to western Montana and Wyoming and south to the mountains of Colorado, Utah, Nevada, and northern California (Scott 1986).
- S*peyeria egleis* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an unfed first instar larva.
- S*peyeria egleis* have one generation per year.

Abundance

- *Speyeria egleis* were rare in the areas we sampled on the east slope of the Sierra Nevada. We have not detected the species in the Wassuk Range or Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Speyeria egleis* occur in relatively open areas and at the edges of woodlands at moderate to high elevations.
- Known larval hostplants are are Violaceae (*Viola*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males perch on hilltops and patrol in canyons.

Identification

- S*peyeria egleis* are small to medium-sized fritillaries. The dorsal wings are orange with wavy black lines, black submarginal spots, and black marginal crescents. The ventral wings are orange to tan with a red to brown disc and silvered or unsilvered spots. The veins and borders around the spots on the ventral hindwings may appear muddy.
- In the western Great Basin, *Speyeria egleis* may be confused with *Speyeria mormonia*, especially when small. In most of our study areas, *Speyeria mormonia* are smaller than *Speyeria egleis*, and their ventral wings are paler yellow.

Speyeria mormonia (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Speyeria mormonia* occur from southern Alaska south through the Sierra Nevada, high-elevation mountain ranges in the Great Basin, and Rocky Mountains. There is a disjunct population in the mountains of southeast Arizona (Scott 1986).
- S*peyeria mormonia* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as an unfed first instar larva.
- S*peyeria mormonia* have one generation per year.

Abundance

- *Speyeria mormonia* were locally common in the areas we sampled on the east slope of the Sierra Nevada. We have not detected the species in the Wassuk Range or Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Speyeria mormonia* occur in meadows, especially mesic meadows, and in open, subalpine areas (Scott 1986).
- Known larval hostplants are are Violaceae (*Viola*).
- Adults of both sexes take nectar.
- Males and older females use mud, dung, and carrion (Boggs and Ross 1993).
- Males patrol throughout their habitat.

Identification

- S*peyeria mormonia* are the smallest fritillaries in the western Great Basin. The dorsal wings are pale orange with wavy black lines, black submarginal spots, and black marginal crescents. The ventral wings are pale yellow, sometimes with a redder disc, and silvered spots.
- *Speyeria mormonia* often are difficult to distinguish from small *Speyeria egleis*. *Speyeria mormonia* generally have silvered spots, narrower borders surrounding the spots, and a yellower disc than *Speyeria egleis*. *Speyeria mormonia* rarely occur on hilltops.

Pickel Meadows, Sierra Nevada, Mono County, California (Erica Fleishman)

Chlosyne palla (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Chlosyne palla* occur from the Coast Ranges and Sierra Nevada north through the Cascade Mountains into southern British Columbia and east to the Rocky Mountains. The species is absent from most of the Great Basin except for the east slope of the Sierra Nevada and the mountains of central Utah (Scott 1986).
- *Chlosyne palla* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Chlosyne palla* have one generation per year.

Abundance

- *Chlosyne palla* were rare in the areas we sampled on the east slope of the Sierra Nevada. We did not detect the species in the Wassuk Range or Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Chlosyne palla* generally occur in open shrubsteppe at relatively high elevations and in open woodlands with extensive shrub understory.
- Known larval hostplants in the western Great Basin are Asteraceae (including *Aster* and *Chrysothamnus*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males perch, sometimes on hilltops, and patrol along canyon bottoms and washes.

Identification

- *Chlosyne palla* are small to medium-sized Melitaeids (the taxonomic tribe of checkerspots). The dorsal wings are checkered orange and brown. The basal area of the dorsal wings is relatively dark. The ventral forewing is mostly orange with diffuse dark marks and with whitish cells near the tip. The ventral hindwing has two rows of yellow or cream-colored spots and additional spots clustered near the wing base
- *Chlosyne palla* may be confused with *Chlosyne acastus*, *Phyciodes pulchellus*, or *Phyciodes mylitta*. The appearance of *Chlosyne palla* generally is brighter than that of *Chlosyne acastus*, with more black on the dorsal wings and more yellow on the ventral wings, and usually occur at higher elevations.
- *Phyciodes* usually are smaller than *Chlosyne*, and the ventral cells are orange and brown rather than yellow and cream-colored.

Chlosyne acastus (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Chlosyne acastus* occur from the east slope of the Sierra Nevada east to western Nebraska, north to Alberta, and south to northern Arizona and New Mexico (Scott 1986).
- *Chlosyne acastus* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Chlosyne acastus* usually have one generation per year.

Abundance

- *Chlosyne acastus* were abundant in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We did not detect the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Chlosyne acastus* generally occur in sagebrush shrubsteppe and open coniferous woodland with an understory of shrubs. They often are detected in washes and canyon bottoms.
- Known larval hostplants in the western Great Basin are Asteraceae (likely including *Chrysothamnus*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch in canyon bottoms and patrol along canyon bottoms and washes.

Identification

- *Chlosyne acastus* are small to medium-sized Melitaeids, and their morphology is diverse. The dorsal wings are checkered orange and brown. The basal area of the dorsal wings is relatively dark. The tip of the ventral forewing has diffuse black spots and white cells. The ventral hindwing has two rows of pearly white spots.

- *Chlosyne acastus* may be confused with *Chlosyne palla* on the east slope of the Sierra Nevada, or with *Phyciodes pulchellus* or *Phyciodes mylitta*. The appearance of *Chlosyne acastus* generally is less bright than that of *Chlosyne palla*, with less black on the dorsal wings and less yellow on the ventral hindwings.
- *Phyciodes* usually are smaller than *Chlosyne*, and the ventral cells are orange and brown rather than yellow and cream-colored.

Phyciodes pulchellus (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Phyciodes pulchellus* occur from eastern Alaska south through the Coast Ranges and Sierra Nevada and the mountains of Arizona and New Mexico, and east to western Kansas (Scott 1986).
- *Phyciodes pulchellus* spend their entire life cycle in the Great Basin, and occur in both valleys and mountains.
- Diapause is as a larva.
- *Phyciodes pulchellus* have one or two generations per year in the western Great Basin.
- In some of the literature, the species also may be referenced as *Phyciodes campestris* or *Phyciodes pratensis*.

Abundance

- *Phyciodes pulchellus* were common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- *Phyciodes pulchellus* occur in open areas across an extensive elevational gradient (Scott 1986), and often in riparian areas or wet meadows.
- Known larval hostplants are Asteraceae (*Aster*).
- Adults of both sexes take nectar.
- Use of mud by males is moderate.
- Males patrol along canyons.

Identification

- *Phyciodes pulchellus* are small Melitaeids. The orange and heavily patterned dorsal wings are rounded and have no indentations. The antennae are dark. In the Sierra Nevada, the ventral wings are orange with thin, orange-brown lines and small spots. East of the Sierra Nevada, the pattern on the ventral wings has more contrast, and includes yellow and cream-colored spots.
- *Phyciodes pulchellus* may be confused with *Phycioides mylitta*. The forewings of *Phyciodes mylitta* are indented. *Phyciodes mylitta* generally are lighter than *Phyciodes pulchellus*, and have orange rather than dark antennae.

Phyciodes mylitta (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Phyciodes mylitta* occur from southern British Columbia south through southern California, the Great Basin, New Mexico, Arizona, and western Mexico (Scott 1986).
- *Phyciodes mylitta* spend their entire life cycle in valleys and mountains of the Great Basin.
- Diapause is as a larva.
- *Phyciodes mylitta* have multiple generations per year in the western Great Basin.

Abundance

- *Phyciodes mylitta* were locally uncommon to common in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Phyciodes mylitta* occur in diverse areas in which their larval hostplants are present, including montane canyons and disturbed areas.
- Known larval hostplants in the western Great Basin are Asteraceae (*Cirsium*). Larvae also may feed on Scrophulariaceae (*Mimulus guttatus*).
- Adults of both sexes take nectar.
- Use of mud by males is limited.
- Males perch and patrol in canyons.

Identification

- *Phyciodes mylitta* are small Melitaeids. The forewings are slightly indented. The dorsal wings are orange with pale, black lines that are heaviest along the wing base and margin. The submargin of the dorsal hindwing has black spots. The ventral forewing is similar to the dorsal wings. The ventral hindwing is mottled with orange, white, and brown rows of spots, with a row of black submarginal spots.
- *Phyciodes mylitta* may be confused with *Phycioides pulchellus*. The forewings of *Phyciodes mylitta* are indented, and all wings are less rounded than those of *Phyciodes pulchellus*. *Phyciodes pulchellus* generally are darker than *Phyciodes mylitta*, and have dark rather than orange antennae.

Euphydryas chalcedona (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Bill Bouton (CC BY-SA 3.0)

- *Euphydryas chalcedona* occur from coastal southern British Columbia south to northern Baja California. They also occur throughout most of Idaho and western Montana and in northeastern Nevada, the Sierra Nevada, and the mountains of southern California and western Arizona.
- *Euphydryas chalcedona* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a fourth-instar larva (Murphy and Ehrlich 1983).
- *Euphydryas chalcedona* have one generation per year (Long et al. 2014).
- Some *Euphydryas chalcedona*, especially dark morphs such as those that occur in the Sierra Nevada, sequester iridoid glycosides from their larval hostplants that make them unpalatable to avian predators (Bowers 1981, Long et al. 2014).

Abundance

- *Euphydryas chalcedona* were rare in the areas we sampled on the east slope of the Sierra Nevada. We did not detect the species in the Wassuk Range or Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the western Great Basin, *Euphydryas chalcedona* generally occur in fairly dry canyons and uplands with abundant nectar sources.
- Larval hostplants are Scrophulariaceae (likely including *Castilleja* and *Penstemon*).
- Adults of both sexes take nectar.
- Use of mud is rare.
- Unlike some of their congeners, males do not perch on hilltops.

Identification

- *Euphydryas chalcedona* are large Melitaeids. The dorsal wings are black with extensive orange and yellow or cream-colored spots. The ventral wings are orange with rows of cream or white spots. The abdomen has pale dots.
- The size and dark color of *Euphydryas chalcedona* make them unlikely to be confused with other *Euphydryas* on the east slope of the Sierra Nevada.
- *Euphydryas editha* do not have abdominal dots, although *Euphydryas anicia* usually do.

Euphydryas anicia (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Euphydryas anicia* occur from eastern Alaska south through the Rocky Mountains and Great Basin, extending as far west as the eastern Sierra Nevada, as far east as Colorado and western South Dakota, and south into the mountains of southern Arizona and New Mexico.
- *Euphydryas anicia* spend their entire life cycle in the valleys and mountains of the Great Basin.
- Diapause is as a fourth-instar larva (Murphy and Ehrlich 1983).
- *Euphydryas anicia* have one generation per year (Murphy and Ehrlich 1983).
- The morphology of *Euphydryas anicia* is highly variable. Some systematists classify *Euphydryas anicia* as a subspecies of *Euphydryas chalcedona*.

Abundance

- *Euphydryas anicia* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains. They were common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Euphydryas anicia* generally occur in fairly open and dry sagebrush shrubsteppe and woodlands, along washes, and in riparian areas. They generally are more common at low and intermediate elevations than at high elevations, but occur along an extensive elevational gradient.
- Larval hostplants are Scrophulariaceae (*Castilleja*, and possibly *Collinsia* and *Penstemon*).
- Adults of both sexes take nectar.
- Use of mud is limited.
- Males perch and patrol in washes and canyons, and sometimes perch on hilltops.

Identification

- *Euphydryas anicia* are medium-sized Melitaeids. The dorsal wings are checkered with black, orange, and yellow or cream. The ventral wings are orange with rows of cream or white spots. The abdomen usually has pale dots.
- *Euphydryas anicia* are most likely to be confused with *Euphydryas editha*. The former usually are larger than the latter, but size alone is not diagnostic.
- *Euphydryas editha* do not have abdominal dots. Some *Euphydryas anicia* do not have dots, but the presence of the dots can rule out *Euphydyras editha*.
- Male *Euphydryas editha* perch on hilltops to a much greater extent than male *Euphydryas anicia*.

Euphydryas editha (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Euphydryas editha* occur from southern British Columbia and Alberta south through the Great Basin and Rocky Mountains. They also occur through most of California except the Central Valley and southeastern deserts.
- *Euphydryas editha* spend their entire life cycle in the Great Basin, and largely are restricted to the mountains.
- Diapause is as a fourth-instar larva (Murphy and Ehrlich 1983).
- *Euphydryas editha* have one generation per year (Murphy and Ehrlich 1983).

Abundance

- *Euphydryas editha* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the Great Basin, *Euphydryas editha* generally occur at intermediate to high elevations with extensive sagebrush. They also occur in meadows at lower elevations.
- Larval hostplants are Scrophulariaceae (*Castilleja*).
- Adults of both sexes take nectar.
- Use of mud is limited.
- Males perch in canyons and on hilltops.

Identification

- *Euphydryas editha* are small to medium-sized Melitaeids. The dorsal wings are checkered with black, orange, and cream or yellow. The ventral wings are orange with rows of cream or white spots.
- *Euphydryas editha* are most likely to be confused with *Euphydryas anicia*. The former usually are smaller than the latter, but size alone is not diagnostic.

- *Euphydryas editha* do not have abdominal dots. Some *Euphydryas anicia* do not have dots, but the presence of the dots can rule out *Euphydyras editha*.
- The postmedial band of the ventral hindwing of both *Euphydryas editha* and *Euphydryas anicia* has large white cells. In many cases, *Euphydryas editha* have a band of red cells below the white cells, closer to the wing margin, whereas *Euphydryas anicia* have a second band of white cells.
- Male *Euphydryas editha* perch on hilltops to a much greater extent than male *Euphydryas anicia*.

Polygonia zephyrus (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Polygonia zephyrus* occur from southern British Columbia and Alberta south to the Mexico border. They are absent from most of the desert in the southwestern United States and the Central Valley of California (Scott 1986).
- *Polygonia zephyrus* spend their entire life cycle in the Great Basin, and largely are restricted to the mountains.
- Diapause is as an adult.
- *Polygonia zephyrus* have two generations per year in the Great Basin. The generation that overwinters reproduces in spring. Their offspring emerge in summer and reproduce, yielding a new generation that overwinters.
- Some systematists classify *Polygonia zephyrus* as conspecific with or a subspecies of *Polygonia gracilis*.

Abundance

- *Polygonia zephyrus* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the Great Basin, *Polygonia zephyrus* generally occur in woodland openings, often in riparian areas.
- Larval hostplants are Grossulariaceae (*Ribes*).
- Adults use of nectar is limited, although use may increase prior to diapause in late summer. Adults also may feed on sap.
- Use of mud by males is moderate.
- Males perch in canyons.

Identification

- *Polygonia zephyrus* are medium-sized Nymphalids (members of the family Nymphalidae, in the tribe Nymphalini). Their wing margins are ragged and the trailing edges of the forewings are concave. The dorsal wing are orange with scattered black spots. The margins of the dorsal wings are brown, with pale yellowish submarginal marks. The ventral wings are striated grayish and are two-toned. The lower half of the ventral wings is darker than the upper half. There is a pale, comma-shaped mark on the ventral hindwing.
- *Nymphalis milberti* and *Nymphalis californica* have similar wing patterns, but the trailing edges of their forewings are straight, and they do not have a pale, comma-shaped mark on the ventral hindwing.

Nymphalis californica (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Nymphalis californica* breed from southern British Columbia south through the Coast Ranges and Sierra Nevada, Great Basin, Rocky Mountains, and the mountains of Arizona and New Mexico. Migrants occur in the Central Valley of California, southern Nevada, and across the northern Great Plains and Great Lakes regions.
- At least some *Nymphalis californica* spend their entire life cycle in the valleys and mountains of the Great Basin. Some individuals may be immigrants.
- Diapause is as an adult.
- *Nymphalis californica* probably have two generations per year in the Great Basin. The generation that overwinters reproduces in spring. Their offspring emerge in summer and reproduce, yielding a new generation that overwinters.
- *Nymphalis californica* are irruptive. When population sizes are high, immigration may be subtantial (Powell 1972).

Abundance

- *Nymphalis californica* were rare in the areas we sampled on the east slope of the Sierra Nevada and in the Wassuk Range. We have not detected the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Nymphalis californica* generally occur in open woodlands, sometimes in riparian areas.
- Larval hostplants are Rhamnaceae (*Ceanothus*).
- Adults use of nectar is limited. Adults also feed on sap.
- Males and females visit mud.
- Males perch in canyons.

Identification

- *Nymphalis californica* are medium-sized Nymphalids. The dorsal wings are bright orange with several large, irregular black spots and a wide, dark margin. The dorsal forewing has several white spots. The margins of the wings are ragged and the trailing edge of the forewing is straight. The ventral wings look like bark. The basal hindwings are darker than the distal hindwings and several thin, black lines cross both wings.
- The dorsal wings of *Nymphalis milberti* are similar to those of *Nymphalis californica*, but the basal area of their wings is much darker, and they do not have white spots at the tip of their forewings. The distal area of the ventral wings of *Nymphalis milberti* generally is paler than the same area on *Nymphalis californica*.
- The wing patterns of *Polygonia zephyrus* are similar to those of *Nymphalis milberti*, but their forewings have distinctive, concave trailing edges and the margins of both wings are more jagged.

Nymphalis antiopa (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Nymphalis antiopa* occur throughout the United States and Canada except north of treeline in Canada, in Baja California, and in the deserts of the southwestern United States. Individuals in lowland subtropical regions, including the Gulf Coast, primarily may be migrants. The species also occurs in Colombia and Venezuela.
- *Nymphalis antiopa* spend their entire life cycle in the Great Basin, and occur in both valleys and mountains.
- Diapause is as an adult.
- *Nymphalis antiopa* have two generations per year in the Great Basin. The generation that overwinters reproduces in spring. Their offspring emerge in summer and reproduce, yielding a new generation that overwinters.

Abundance

- *Nymphalis antiopa* were uncommon in the areas we sampled on the east slope of the Sierra Nevada and in the Sweetwater Mountains. They were common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Nymphalis antiopa* occur in diverse land-cover types, including areas with considerable human development, but usually near water and willows.
- Larval hostplants are Salicaceae (*Salix*, *Populus*).
- Adults use of nectar is limited. Adults also may feed on sap.
- Use of mud is low.
- Males perch in canyons and along streams.

Identification

- *Nymphalis antiopa* are large Nymphalids. All wings have white or pale yellow margins. The dorsal wings are dark brown with a row of blue submarginal spots bordered in black. The wing margins often are quite ragged. The ventral wings are dark brown or black and mottled with fine lines of dark gray and dark blue.
- *Nymphalis antiopa* are unlikely to be confused with any other species.

Desert Creek, Sweetwater Mountains, Lyon County, Nevada (Erica Fleishman)

Nymphalis milberti (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Jerry Friedman (CC BY-SA 3.0)

- *Nymphalis californica* breed from southern British Columbia south through the Coast Ranges and Sierra Nevada, Great Basin, Rocky Mountains, and the mountains of Arizona and New Mexico. Migrants occur in the Central Valley of California, southern Nevada, and across the northern Great Plains and Great Lakes regions.
- At least some *Nymphalis californica* spend their entire life cycle in the valleys and mountains of the Great Basin. Some individuals may be immigrants.
- Diapause is as an adult.
- *Nymphalis californica* probably have two generations per year in the Great Basin. The generation that overwinters reproduces in spring. Their offspring emerge in summer and reproduce, yielding a new generation that overwinters.
- *Nymphalis californica* are irruptive. When population sizes are high, immigration may be subtantial (Powell 1972).

Abundance

- *Nymphalis californica* are rare in our study areas on the east slope of the Sierra Nevada and in the Wassuk Range. We have not detected the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Nymphalis californica* generally occur in open woodlands, sometimes in riparian areas.
- Larval hostplants are Rhamnaceae (*Ceanothus*).
- Adults use of nectar is limited. Adults also feed on sap.
- Males and females visit mud.
- Males perch in canyons.

Identification

- *Nymphalis californica* are medium-sized Nymphalids. The dorsal wings are bright orange with several large, irregular black spots and a wide, dark margin. The dorsal forewing has several white spots. The margins of the wings are ragged and the trailing edge of the forewing is straight. The ventral wings look like bark. The basal hindwings are darker than the distal hindwings and several thin, black lines cross both wings.
- The dorsal wings of *Nymphalis milberti* are similar to those of *Nymphalis californica*, but the basal area of their wings is much darker, and they do not have white spots at the tip of their forewings. The distal area of the ventral wings of *Nymphalis milberti* generally is paler than the same area on *Nymphalis californica*.
- The wing patterns of *Polygonia zephyrus* are similar to those of *Nymphalis milberti*, but their forewings have distinctive, concave trailing edges and the margins of both wings are more jagged.

Vanessa cardui (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Frank Fogarty

- *Vanessa cardui* are resident from southern California east to southern Texas and south to Venezuela. They regularly occur as migrants in the Great Basin and sometimes occur as far north as Alaska and the Yukon Territories. They also occur in Eurasia and Africa (Scott 1986).
- The geographic range of *Vanessa cardui* is greater than that of any other species of butterfly.
- *Vanessa cardui* are migratory, and in some years the migrations are tremendous. Spring migrations are directional to the north. Southward migrations in autumn are not as pronounced.
- *Vanessa cardui* likely do not overwinter in the Great Basin. They occur in both valleys and mountains.
- Diapause is as an adult within the breeding range.
- *Vanessa cardui* produce one or more generations in the Great Basin during summer.

Abundance

- Depending on the year, *Vanessa cardui* are uncommon to common on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Vanessa cardui* occur in numerous land-cover types, especially in open areas in which their larval hostplants are abundant.
- Larval hostplants are diverse, but in the Great Basin likely are dominated by Asteraceae, especially *Cirsium*.
- Adults of both sexes take nectar.
- Use of mud by males is low.
- Males perch on hilltops, and perch and sometimes patrol in canyons.

Identification

- *Vanessa cardui* are medium-sized Nymphalids. The dorsal wings are orange with large, irregular black spots, black forewing tips, and checkered fringes. The ventral forewing is pinkish with black, brown, and white spots concentrated near the anterior. The ventral hindwing is gray-brown with intricate, irregular white lines and small blue spots.
- *Vanessa cardui* are quite similar to *Vanessa annabella*, and generally cannot be distinguished in flight. The subapical bar on the dorsal forewing is white on *Vanessa cardui*, but yellow on *Vanessa annabella*.

Vanessa annabella (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Alan Vernon, CC BY 2.0

- *Vanessa annabella* occur from southern British Columbia south to California, east to the Great Plains, and south through western Mexico.
- *Vanessa annabella* likely do not overwinter in the Great Basin. They occur in both valleys and mountains.
- Diapause is as an adult within the breeding range.
- *Vanessa annabella* produce one or more generations in the Great Basin during summer.

Abundance

- *Vanessa annabella* are uncommon in our study areas on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Vanessa annabella* occur in numerous land-cover types, especially in open areas and woodlands.
- Larval hostplants are Malvaceae (including *Sphaeralcea*) and Urticaceae (*Urtica*).
- Adults of both sexes take nectar.
- Use of mud by males is low.
- Males perch in canyons.

Identification

- *Vanessa annabella* are medium-sized Nymphalids. The dorsal wings are orange with large, irregular black spots, black forewing tips, and checkered fringes. The ventral forewing is pinkish with black, brown, and white spots concentrated near the anterior, and a yellow subapical bar. The ventral hindwing is gray-brown with intricate, irregular white lines and small blue spots.
- *Vanessa annabella* are quite similar to *Vanessa cardui*, and generally cannot be distinguished in flight. The subapical bar on the dorsal forewing is yellow on *Vanessa annabella*, but white on *Vanessa cardui*.

Vanessa atalanta (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

Frank Fogarty

- *Vanessa atalanta* occur from central Canada south through the conterminous United States to Guatemala and the Greater Antilles. They also occur in Africa and Eurasia, and were introduced to several Pacific islands (Scott 1986).
- *Vanessa atalanta* are migratory in some years. They likely do not overwinter in the Great Basin, where they occur in both valleys and mountains.
- Diapause is as an adult.
- *Vanessa atalanta* have two or more generations per year in the Great Basin.

Abundance

- *Vanessa atalanta* were rare in our study areas in the Wassuk Range and Sweetwater Mountains. We have not yet detected the species in our study areas on the east slope of the Sierra Nevada.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

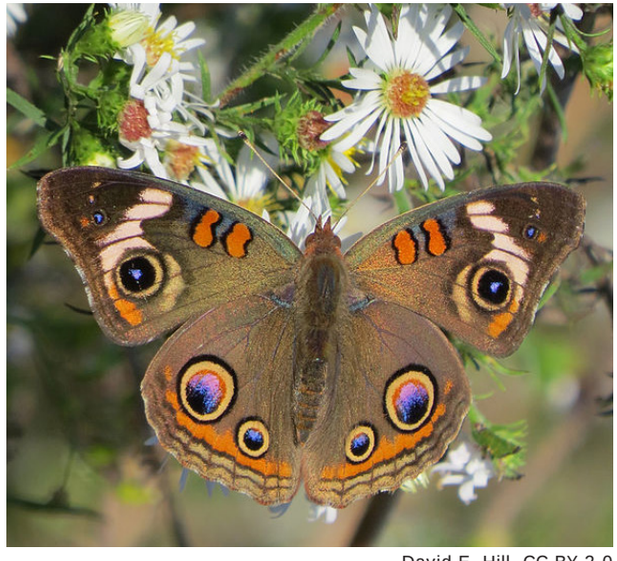
- *Vanessa atalanta* occur in numerous land-cover types. In the Great Basin, they often occur in shady woodlands, especially in riparian areas.
- Known larval hostplants are herbaceous Urticaceae (*Urtica*).
- Use of nectar by adults of both sexes is moderate.
- Use of mud by males is low.
- Males perch in canyons.

Identification

- *Vanessa atalanta* are medium-sized Nymphalids. The margin of the forewing is indented. The dorsal wings are black with white spots near the forewing tip, a diagonal red-orange band across the center of the forewing, and a broad red-orange margin on the hindwing. The ventral wings are mottled with black, brown, and gray.
- *Vanessa atalanta* are unlikely to be confused with any other species in the western Great Basin.

Junonia coenia (Family Nymphalidae, Subfamily Nymphalinae)

Natural history



David E. Hill, CC BY 2.0

- *Junoia coenia* breed from southeast Arizona, east through the Gulf states and Florida, and north along the Atlantic coast to North Carolina. Their breeding range extends to southern Mexico and includes coastal California. Migrant adults occur throughout the conterminous United States with the exception of the northern Rocky Mountains and Washington.
- *Junoia coenia* probably do not overwinter in the Great Basin. Migrants occur in the valleys and mountains.
- In the Great Basin, *Junonia coenia* do not enter diapause. In at least some parts of their breeding range, diapause is as a larva or adult (Scott 1986).
- *Junoia coenia* have multiple generations per year in their breeding range.

Abundance

- *Junoia coenia* were rare in our study areas on the east slope of the Sierra Nevada and in the Sweetwater Mountains. We have not detected the species in the Wassuk Range.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- *Junoia coenia* are widespread and generally occur in proximity to their larval hostplants, whether in sagebrush shrubsteppe or riparian areas.
- Larve feed on plants that contain iridoid glycosides, which serves as a defense against predators (Lampert et al. 2014).
- Known larval hostplants are herbaceous Plantaginaceae, Scrophulariaceae, (*Mimulus*),Verbenaceae, and Cornaceae.
- Adults of both sexes take nectar.
- Use of mud by males is low.
- Males perch in canyon bottoms.
- Males may not mate at temperatures below 32˚C or in low light (McDonald and Nijhout 1996).

Identification

- *Junoia coenia* are medium-sized Nymphalids. The margins of both wings are scalloped. Morphology, especially wing color, is variable. In general, the dorsal wings are brown with a pair of orange bars, often bordered in black, in the forewing cell. The dorsal forewing has a large, dark eyespot embedded within a wide, irregularly shaped cream band. The dorsal forewing also has a second, smaller eyespot at the edge of the cream-colored band. The dorsal hindwing has an orange submarginal band and two eyespots; the anterior spot is much larger. All eyespots are rimmed in pale yellow and have dark, iridescent centers. The ventral wings are similar to the dorsal wings but paler and less well-marked, with greatly reduced eyespots on the ventral hindwings.
- *Junoia coenia* are unlikely to be confused with any other species in the western Great Basin.

Limenitis weidemeyerii (Family Nymphalidae, Subfamily Nymphalinae)

Natural history

- *Limenitis weidemeyerii* occur throughout the Great Basin and Rocky Mountains, north to the Canadian border, and south through the mountains of Arizona and New Mexico.
- *Limenitis weidemeyerii* spend their entire life cycle in the valleys and mountains of the Great Basin.
- Diapause is as a larva.
- *Limenitis weidemeyerii* have one generation per year in the Great Basin.

Abundance

- *Limenitis weidemeyerii* were rare in our study areas on the east slope of the Sierra Nevada and in the Sweetwater Mountains, and common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- In the Great Basin, *Limenitis weidemeyerii* primarily occur in riparian canyons. They also occur in drier areas in association with *Amelanchier*, an alternative larval hostplant. Individuals occasionally are seen far from apparent habitat.
- Known larval hostplants are Salicaceae (*Salix*, *Populus tremuloides*) and Rosaceae (*Amelanchier*).
- Use of nectar is relatively low. Adults also feed on sap.
- Use of mud by females is moderate to high.
- Males perch and patrol in canyons.

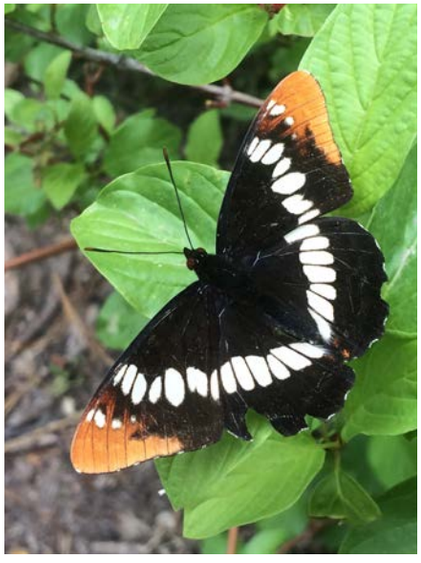
Identification

- *Limenitis weidemeyerii* are fairly large members of the Nymphalidae. The dorsal wings are black with a wide, white band across each. The ventral wings have similar white bands and a complex grid of gray, red or orange, and white spots. The margins of the ventral wings have rows of white crescents that are separated by black lines.

- *Limenitis lorquini*, which can co-occur with *Limenitis weidemeyerii* in the western Great Basin, have orange-tipped dorsal forewings; *Limenitis weidemeyerii* have no red or orange. The lines separating the white crescents on the ventral wings of *Limenitis lorquini* are red rather than black. *Limenitis lorquini* also have more red on the ventral wings than do *Limenitis weidemeyerii*.
- Many adult *Limenitis* in the western Great Basin have faint orange on the dorsal forewing tips (less than on *Limenitis lorquini*) and reddish lines between the marginal crescents on the ventral wings. These individuals, form *fridayi*, are believed to be the result of hybridization between *Limenitis weidemeyerii* and *Limenitis lorquini* (Boyd et al. 1999).

Limenitis lorquini (Family Nymphalidae, Subfamily Nymphalinae)

Natural history



- *Limenitis lorquini* occur from coastal British Columbia south and east to the northern Great Basin. They also occur throughout California except the Central Valley.
- *Limenitis lorquini* spend their entire life cycle in the valleys and mountains of the Great Basin.
- Diapause is as a larva.
- *Limenitis lorquini* have two generations per year in the Great Basin.

Abundance

- *Limenitis lorquini* were uncommon in our study areas on the east slope of the Sierra Nevada and uncommon to rare in the Sweetwater Mountains and Wassuk Range.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the Great Basin, *Limenitis lorquini* primarily occur in riparian canyons.
- Known larval hostplants are Salicaceae (*Salix*, *Populus*), Rosaceae (*Prunus*, *Holodiscus*), and Rhamnaceae (likely *Ceanothus*).
- Use of nectar is relatively low.
- Use of mud by females is moderate.
- Males perch and patrol in canyon and valley bottoms.

Identification

- *Limenitis lorquini* are fairly large members of the Nymphalidae. The dorsal wings are black with a wide, white band across each. The tips of the dorsal forewings are orange. The ventral wings have similar white bands and a complex grid of gray, red or orange, and white spots. The margins of the ventral wings have rows of white crescents that are separated by red or orange lines.
- *Limenitis weidemeyerii*, which can co-occur with *Limenitis lorquini* in the western Great Basin, have white-tipped rather than orange-tipped dorsal forewings. The lines separating the white crescents on the ventral wings of *Limenitis weidemeyerii* are black rather than red. *Limenitis weidemeyerii* also have less red on the ventral wings than do *Limenitis lorquini*.
- Many adult *Limenitis* in the western Great Basin have faint orange on the dorsal forewing tips (less than on *Limenitis lorquini*) and reddish lines between the marginal crescents on the ventral wings. These individuals, form *fridayi*, are believed to be the result of hybridization between *Limenitis weidemeyerii* and *Limenitis lorquini* (Boyd et al. 1999).

Speyeria zerene in Silver Creek, Sierra Nevada, Mono County, California (Erica Fleishman)

Coenonympha tullia (Family Nymphalidae, Subfamily Satyrinae)

Natural history

- *Coenonympha tullia* occur from Alaska south through California (with the exception of the Central Valley), and east through the Great Basin to the Rocky Mountains. Additionally, they occur across the Prairie Provinces of Canada, south to South Dakota, and east through New York and central Quebec. *Coenonympha tullia* also occur outside of the United States and Canada.
- *Coenonympha tullia* spend their entire life cycle in the valleys and mountains of the Great Basin.
- Diapause is as a larva.
- *Coenonympha tullia* have two generations per year in the valleys of the Great Basin, and one or two generations per year in the mountains. The number of generations per year may be plastic (Wiernasz 1988).
- Some systematists split *Coenonympha tullia* into as many as six species; in the Great Basin, the taxon sometimes is classified as *Coenonympha ampelos*.

Abundance

- *Coenonympha tullia* were rare to uncommon in our study areas on the east slope of the Sierra Nevada and in the Sweetwater Mountains. They were common in the Wassuk Range.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Coenonympha tullia* generally occur in grassy areas, often those that are somewhat mesic.
- Larval hostplants are *Poaceae*, likely including but not limited to *Stipa* and *Poa*.
- Adults of both sexes take nectar.
- Use of mud is rare.
- Males patrol canyons and uplands.

Identification

- *Coenonympha tullia* are small-bodied satyrs. The numerous subspecies of *Coenonympha tullia* vary morphologically, but are distinct from other species in their ranges. In the western Great Basin, the species' wings range from pale brown or orange-brown to yellowish-white. There may be a small eyespot near the tip of the ventral forewing. The ventral hindwing is gray-green with a wavy white median line.
- *Coenonympha tullia* are unlikely to be confused with any other species.

Cercyonis sthenele (Family Nymphalidae, Subfamily Satyrinae)

Natural history

Frank Fogarty

- *Cercyonis sthenele* occur from southern British Columbia south along the Cascade Range and Sierra Nevada; east to western Colorado, Montana, and Wyoming; and south to northern Arizona and Baja California and northwestern New Mexico.
- *Cercyonis sthenele* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Cercyonis sthenele* have one generation per year.

Abundance

- *Cercyonis sthenele* were common in our study areas on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Cercyonis sthenele* occur in sagebrush shrubsteppe and open pinyon and juniper woodlands. Their habitat includes relatively dry areas in which few other species of butterflies occur.
- Larval hostplants are Poaceae.
- Adults of both sexes take nectar.
- Use of mud is rare.
- Males patrol canyons and uplands.

Identification

- *Cercyonis sthenele* are medium-sized satyrs. The wings of both sexes are brown. The dorsal forewings of males have two small eyespots, and the anterior spot is larger. The dorsal forewings of females has two large eyespots of about the same size. Both sexes have two eyespots on the ventral forewing that are equidistant from the wing margin. The basal area of the ventral hindwing of both sexes is darker than the marginal area, and the areas are separated by an irregular dark line.

- *Cercyonis sthenele* and *Cercyonis oetus* are quite similar, and rarely can be differentiated in flight. *Cercyonis sthenele* generally are larger than *Cercyonis oetus*, and often inhabit lower elevations, but there is considerable overlap in size and distribution.
- The most effective way to separate *Cercyonis sthenele* and *Cerconis oetus* is by the relative position of the eyepots on their ventral forewings. Those on *Cercyonis sthenele* are equidistant from the wing margin, whereas the posterior eyespot on *Cercyonis oetus* is closer to the wing margin (Emmel 1969). The forewings of *Cercyonis sthenele* are more rounded than those of *Cercyonis oetus*.

Cercyonis oetus (Family Nymphalidae, Subfamily Satyrinae)

Natural history

- *Cercyonis oetus* occur from the central Sierra Nevada north along the spine of the Sierra Nevada and Cascade Range into southern British Columbia, east to the Black Hills and Rocky Mountains, and south into the mountains of northern Arizona and New Mexico
- *Cercyonis oetus* spend their entire life cycle in the Great Basin. They mostly inhabit montane areas (Emmel 1969), but isolated and relatively pallid populations occur in the Reese River and Big Smoky Valleys (Lander and Nye Counties, Nevada, respectively).
- Diapause is as a larva.
- *Cercyonis oetus* have one generation per year.

Abundance

- *Cercyonis oetus* were common in our study areas on the east slope of the Sierra Nevada and in the Wassuk Range. They were uncommon in our study areas in the Sweetwater Mountains.
- Annual fluctuations in abundance are moderate.

Habitat associations and behavior

- *Cercyonis oetus* occur in most land cover types in the western Great Basin, often in fairly dry areas. It is one of few species that is common in coniferous woodlands at intermediate elevations..
- Larval hostplants are Poaceae (*Poa*, *Bouteloua*). Pallid forms in the valleys likely feed on *Distichlis spicata*.
- Adults of both sexes take nectar.
- Use of mud is rare.
- Males patrol canyons and uplands.

Identification

- *Cercyonis oetus* are small to medium-sized satyrs. The wings of both sexes are brown, with checkered fringes. The dorsal forewings of males have one eyespots, whereas the dorsal forewings of females have two eyespots, and the anterior spot is larger. Both sexes have two eyespots on the ventral forewing. The anterior spot is larger and further from the wing margin than the posterior spot.
- *Cercyonis oetus* and *Cercyonis sthenele* are quite similar, and rarely can be differentiated in flight. *Cercyonis oetus* generally are smaller and darker than *Cercyonis sthenele*, and often inhabit higher elevations, but there is considerable overlap in size and distribution.
- The most effective way to separate *Cercyonis oetus* and *Cerconis sthenele* is by the relative position of the eyepots on their ventral forewings. Those on *Cercyonis sthenele* are equidistant from the wing margin, whereas the posterior eyespot on *Cercyonis oetus* is closer to the wing margin (Emmel 1969). The forewings of *Cercyonis oetus* are more pointed than those of *Cercyonis sthenele*.

Neominois ridingsii (Family Nymphalidae, Subfamily Satyrinae)

Natural history

- *Neominois ridingsii* occur from southern Alberta and Saskatchewan south through the Sierra Nevada, Great Basin, and Rocky Mountains.
- *Neominois ridingsii* spend their entire life cycle in the Great Basin, and generally are restricted to the mountains.
- Diapause is as a larva.
- *Neominois ridingsii* have one generation per year.

Abundance

- *Neominois ridingsii* were fairly common in our study areas in the Wassuk Range, and rare on the east slope of the Sierra Nevada. We have not detected the species in the Sweetwater Mountains.
- Annual fluctuations in abundance are low.

Habitat associations and behavior

- In the Great Basin, *Neominois ridingsii* occur in open areas, especially within sagebrush shrubsteppe at intermediate to high elevations.
- Known larval hostplants are Poaceae, likely including but not limited to *Bouteloua*.
- Use of nectar is limited.
- *Neominois ridingsii* rarely use mud.
- Males perch on hilltops and in uplands, often on bare ground or rocks.

Identification

- *Neominois ridingsii* are medium-sized satyrs. The dorsal wings are mottled with various shades of brown or gray. The basal area of the wings is relatively dark, whereas the outer area has light, horizontal bands or patches and two large eyespots. The ventral wings are similar, but often paler.
- *Neominoid ridingsii* are unlikely to be confused with any other species in the western Great Basin.

Wassuk Range, Mineral County, Nevada (Erica Fleishman)

Danaus plexippus (Family Nymphalidae, Subfamily Danainae)

Natural history

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- *Danaus plexippus* breed from British Columbia east to central Quebec and the Maritime Provinces, and south through the conterminous United States and other countries in southern North America into South America and the Caribbean. Populations in Hawaii and other continents may have resulted from introductions. Most of the population in the United States and Canada is migratory. Populations that breed east of the Rocky Mountains primarily overwinter in a small area in the highlands of Mexico, whereas populations that breed west of the Rocky Mountains overwinter in coastal and southern California. A small, nonmigratory population in south Florida is augmented by migratory individuals in winter. Where individuals observed in the Great Basin overwinter is not known with certainty.
- *Danaus plexippus* generally are not thought to overwinter in the Great Basin.
- During summer, *Danaus plexippus* are present in the valleys and mountains oft he Great Basin.
- Diapause is as an adult.
- *Danaus plexippus* have many generations during their spring and autumn migrations and during summer. In most cases, the same individual flies south, but multiple generations complete the northward migration.
- *Danaus plexippus* is the only species of butterfly that undertakes a true latitudinal migration each year.

Abundance

- *Danaus plexippus* are rare to common in our study areas on the east slope of the Sierra Nevada and in the Wassuk Range and Sweetwater Mountains.
- Annual fluctuations in abundance are high.

Habitat associations and behavior

- In the Great Basin, *Danaus plexippus* often occur in mesic meadows in which their larval hostplants and adult nectar sources are present.
- Known larval hostplants are herbaceous Asclepiadaceae (*Asclepias*).
- Adults of both sexes take nectar.
- Use of mud is limited.
- Males patrol canyons and uplands. Migratory individuals may be observed over virtually any land-cover type.

Identification

- *Danaus plexippus* are large members of the Nymphalidae. The dorsal wings are bright orange with black veins and black margins dotted with white. The forewing is pointed and has a black tip with white and orange spots. The ventral wings are similar but paler orange.
- *Danaus plexippus* are distinctive in the western Great Basin, where other members of their genus and mimics, such as *Limenitis archippus*, are rare.
- *Limenitis archippus* are similar to *Danaus plexippus* but have a distinctive black line on the ventral hindwing that cuts across most of the wing cells. Moreover, we have not recorded *Limenitus archippus* in the areas we sampled in the western Great Basin.

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