

**2023**

**Inventory of**

**Butterflies of Boulder County**

**Open Spaces**



**By Janet Chu**

**with Venice Kelly**

Photo on Cover by Stephen Jones

A Cabbage White (*Pieris rapae*) male on a Blue Flax (*Linum perenne*), one of the most common butterflies in Boulder County and the United States. It was introduced from Europe in the 19<sup>th</sup> century and has spread across the continent. Its host plants include cabbage (*Brassica oleracea*) and others from families *Brassicaceae* and *Cruciferae*.

Page Arrangement by Deborah Baumgold

Grant for Publishing by Linda Hardesty

11/16/2023

**Janet Chu**

350 Ponca Place, Boulder, Colorado 80303

[2chuhouse2@gmail.com](mailto:2chuhouse2@gmail.com)

Ph. 303-494-1108

**Venice Kelly**

P.O. Box 828, Nederland, CO 80466

## Contents

<b>Introduction .....</b>	<b>4</b>
<b>Acknowledgements .....</b>	<b>4</b>
<b>I. Methodology .....</b>	<b>5</b>
<b>II. Trends.....</b>	<b>6</b>
<b>A. Butterflies/Research Hour for all Species in All County Open Spaces</b>	
<b>B. Sherwood Transect and Caribou Open Space Trend</b>	
<b>III. Narration for the accompanying data.....</b>	<b>7</b>
<b>A. Anne U. White Trail</b>	
<b>B. South County Grassland.....</b>	<b>8</b>
<b>C. Heil Valley Ranch</b>	
<b>1. Heil North – North Pointe, Red Gulch</b>	
<b>2. Geer Watershed – Plumely Crossing, Wapiti Trail.....</b>	<b>9</b>
<b>D. Walker Ranch, Meyer’s Homestead Trail.....</b>	<b>10</b>
<b>E. Reynold’s Ranch, North Bog</b>	
<b>F. Caribou Ranch.....</b>	<b>11</b>
<b>G. Sherwood Transect and Caribou Open Space Report .....</b>	<b>12</b>
<b>by Venice Kelly</b>	
<b>IV. Conclusion.....</b>	<b>15</b>
<b>V. References .....</b>	<b>16</b>
<b>VI. Data Tables .....</b>	<b>16</b>
<b>A. South County Grassland .....</b>	<b>17</b>
<b>B. Anne U. White Trail.....</b>	<b>18</b>
<b>C. Heil Valley Ranch (North) – North Pointe, Red Gulch.....</b>	<b>21</b>
<b>D. Heil Valley Ranch – Geer Watershed, Plumely Crossing, Wapiti Trail .....</b>	<b>24</b>
<b>E. Walker Ranch – Homestead Trail .....</b>	<b>31</b>
<b>F. Reynold’s Ranch – North Bog .....</b>	<b>35</b>
<b>G. Sherwood Road and Caribou Ranch .....</b>	<b>38</b>
<b>Appendix. Global Change on Diversity of Lepidoptera .....</b>	<b>45</b>

## **Introduction**

This Butterfly inventory was begun in 2003 by a small group of Naturalist Volunteers, namely Donn and Cathy Cook and this author. We were curious about the species that were found in Boulder County. There had been only one summer's research in the Boulder City Open Spaces produced by Steve Armstead for his master's degree. Historically, collating of specimens had occurred with placement of collections in Colorado State University, the University of Colorado, and the Denver Museum of Nature and Science. Since 2007 data was kept for certain Boulder County Open Spaces, resulting in annual reports for these areas: Anne U. White Trail, South County Grassland, Heil Ranch (North Heil and Geer Meadow), Walker Ranch, Reynold's Ranch (North Bog), and Caribou Ranch (Sherwood Transect). The Butterfly Research Team spent 143 hours in the field making observations; and the volunteers contributed 274 hours for Boulder County Parks and Open Space in 2023.

## **Acknowledgements**

We have had a long-standing close relationship with Boulder County employees, especially Susan Spaulding, Senior Wildlife Biologist, and two Resident Park Rangers, Kevin Grady at Heil Valley Ranch and Sarah Andrews at Caribou Ranch. We appreciate their professional interaction, sharing of knowledge and timely updates. Their friendship has been invaluable. The Special Research Permits given by Boulder County have allowed us to go deep into the Open Spaces.

Our mentor Paul A. Opler of the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, passed away in 2023 and is deeply missed. Paul was always ready to encourage us and answer questions. He encouraged our growth and participation in the High-Country Lepidopterists and the national Lepidopterist Society. Mike Fisher, author and lepidopterist, and Christian Nunes, Boulder City Naturalist, continue to be our mentors, especially by verifying identification and adding to our knowledge. Daniel Ziskin, of the National Center for Atmospheric Research, designed the computer program that determines the trends of butterfly populations.

## **I. Methodology**

Venice Kelly incorporated the transect method as she continued to observe on Sherwood Road near Caribou Ranch. On the other sites the researchers meandered, free to venture off trail toward flower patches. That said, the trails were nearly the same year after year. One exception in 2023 was stopping for longer periods of time at the Plumely Crossing streamlet.

Active researchers were John Barr, Cathy Comstock, Cathy Cook, Chris Freidman, Linda Hardesty, Sue Hirschfeld, Richard Holmes, Venice Kelly, Joe Krieg, and this author. Amy Chu, Ann Cooper, Dan Fosco, Pam Piombino, Wynne Whyman, Jean Morgan, Sue Olmstead, Jeff McLachlan, and Connie Redak joined us when time allowed.

The spring counts were late beginning in 2023 because of extended cold temperatures and considerably greater rainfall. Higher amounts of moisture resulted in the grasses becoming tall and compact. In the South County Grassland, the researchers had difficulty making their way through the tall grasses and found themselves following cow paths. Summer temperatures were high and rainfall in August was low. Summer field days became less frequent because of the extreme heat.

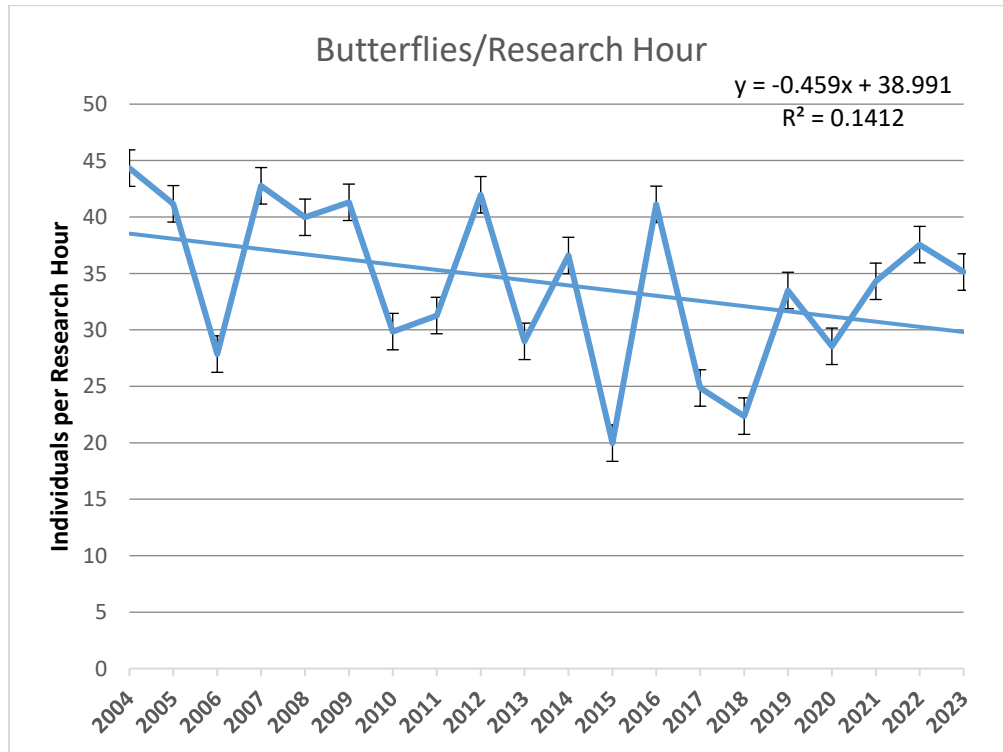
Typically, in each Open Space area the summer heat had dried the streams and ground moisture, driving butterflies to congregate on remaining wet ground and moist mud. We assigned the name Plumely Crossing to the junction of the service road and the stream from Plumely Canyon, because it became an unusually active observation site.

The unit I/RH, Individuals per Research Hour, was devised to allow comparisons of populations of butterfly individuals from one date to another, one location to another, and one season to another. This became necessary because a meander method was used often, not the scientifically preferred transect method.

## II. Trends

If we consider all of the Individual Butterflies per Research Hour (I/RH) in seven of the Open Space areas during 2004-2023, we find there is a continuing downward trend as shown in the graph below.

### A. Graph of individual butterflies per research hour in seven of the Boulder County Open Spaces from 2004-2023.

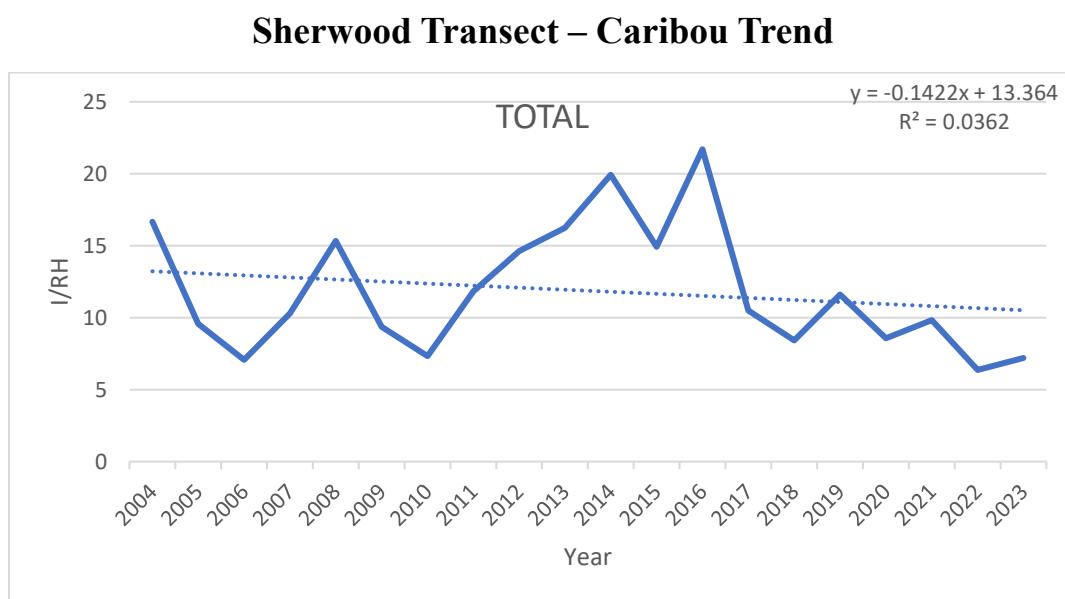


Trend of Butterflies per Research Hour

This count of all-county all-species butterfly populations, as measured by Individual/Research Hour (I/RH), obviously has large interannual variation. Seasonal effects such as moisture, temperature and natural disasters (e.g., fire or flood) impact both the butterfly populations and the data collection protocols. Despite this variability, a clear trend emerges. The  $R^2$  is 14%, as shown in the chart indicating that interannual variability is still predominant, as shown in the chart, relative to the trend. If we focus on the over-all trend, we can describe butterfly abundance county-wide. The population is declining by approximately 1.3% per year, or about 5 individual sightings per hour each decade. For example, a researcher in 2004 may have seen about 40 butterflies in an hour of observation. In 2024, two decades later, a researcher may expect to see 30 butterflies in an hour.

One would expect Sherwood Transect – Caribou Open Space would be high in elevation enough to be above the pollution from cars, motor exhaust, and most foot and dog traffic to show a more neutral trendline. However, there has been herbicide sprayed nearby, and the effects of climate change are occurring here. Five of the six past years have lower results of I/RH, and this pulls the trend line into the negative. The R<sup>2</sup> is 3% indicating that interannual variability is still the main factor in the trend. If a researcher in 2004 may have seen about 13 butterflies in an hour of observation, in 2024, two decades later, a researcher may expect to see about eleven individual butterflies during an hour of counting.

**B. Graph of individual butterflies per research hour on the Sherwood Transect, Caribou Ranch**



The trend of the individual butterflies per research hour is clearly downward.

**III. Narration for the accompanying data**

In 2023 American Ladies (*Vanessa virginiensis*) were unusually common. On the other hand, after an irruption of Pygmy Blues (*Brephidium exile*) in 2022, only one tattered individual was found at Walden Pond by John Barr in 2023. Walden Pond is not in our study area but this discovery must be mentioned because it occurred in a Boulder County Open Space. Seven Pygmies were sighted in Geer Watershed in August 2022, and dozens more in each of a dozen county agricultural areas.

## **A. Anne U. White Trail**

The Research team visited the Anne U. White Trail only twice in 2023. Cathy Cook taught a class for Boulder County Nature Association (BCNA) on Butterflies and Photography. The trail was visited by Cathy and Jan, once to check the trail for teaching possibilities and the second time with the participants. Weidemeyer's Admirals (*Limenitis weidemeyerii*) were sighted on both June 29 and July 9 at the willow-filled small meadow site. This is the location where the Admirals have been found for several years. These butterflies typically fly to leaf tips and are easy to view and photograph on their willow host plants.

Pallid Crescents (*Phyciodes pallida*) were found, as they are annually, near the right angle turn as the trail crosses the Fourmile Stream. Three *Papilio* species, Tiger Swallowtails (*P. rutulus*), Pale Swallowtails (*P. eurymedon*), and Two-tailed Swallowtails (*P. multicaudata*) were present, especially around the flower-filled parking lot. Taxiles Skippers (*Lon taxiles*) landed on trailside leaf tips and Dun Skippers (*Euphyes vestris*) flew on the trail ahead of the researchers. The uncommon Silver-spotted Skippers (*Epargyreus clarus*) were present on both field days. This trail has become heavily traveled and deeply overgrown, making the butterfly search for sunny openings.

## **B. South County Grassland**

The research team visited the South County Grassland only twice in 2023. Grasses were three and a half feet tall and compact because of record-breaking spring rains. We followed cow paths to access the Rock Creek streamlet headwaters from the two-track road leading from Coalton Trail to Rock Creek. The stream bed had very few damp spots in August, and only near the farm trough was there any moisture that attracted butterflies.

Small numbers of Cabbage Whites (*Pieris rapae*), and Field Crescents (*Phyciodes pulchella*) were the most often seen. Common Checkered-skippers (*Burnsius communis*) were found on the hot, dry bare spots as researchers walked on the two-track road.

## C. Heil Valley Ranch

This year the count at Heil Valley Ranch was modified by Sue Hirschfeld and Chris Friedman who made observations at the Plumely Crossing instead of walking through the Geer Meadow. The early season was about two and a half weeks late, making nectar-producing blossoms late, and so butterfly species emerged later than usual. During June, greater amounts of rain resulted in tall strong prairie grasses. Results for Heil Valley Ranch are listed in two sections in 2023: Heil North (North Pointe, Red Gulch), and Geer Watershed (Plumely Crossing, Wapiti Trail).

### 1. Heil North – North Pointe, Red Gulch

This area in the northern portion of Heil Valley Ranch was inventoried four times. The butterfly observations began later in 2023, on May 29. For comparison, the Heil-North surveys began May 1, 2021, and May 16, 2022. Later, extended hot temperatures followed the heavy rains. Thirteen Anise Swallowtails were seen on May 29. Three *Papilio* species, Western Tiger Swallowtail (*P. rutulus*), Pale (*P. eurymedon*), and Two-tailed (*P. multicaudata*) were flying on June 20.

We have permission to cross Ron LaFollette's property on Red Gulch Road to enter Heil Ranch. On August 23 we were at Red Gulch especially to see the Hackberry Emperors (*Asterocampa celtis*). Nine were found in and near their hackberry host trees. The stream was dry and weed-filled. Twelve Edward's Fritillaries (*Argynnis edwardsii*) were nectaring on composite blossoms. Other large-sized brush-footed butterflies were flying high and fast, making identification difficult. Melissa Blues (*Plebejus melissa*) gathered on August 23, as did Common Checkered-skipper (*Burnsius communis*), on moist earth below LaFollette's clay drainage pipes. As Linda Hardesty sat watching, 67 individual blues were seen in an hour. Two uncommon Sooty-wings (*Pholisora catullus*) were found in the ragweed patch where we especially look for this species. In 2023, the northern portion of Heil Ranch, Cabbage Whites, Melissa Blues, and Common Checkered-Skipper were numerous.

## 2. Geer Watershed - Including Plumely Crossing, Wapiti Trail

Only three of the nineteen field days were in the Geer Meadow which had burned in 2020, above the Ranger's Cabin. In 2021 seven counts were made, and in 2022 twelve counts occurred in the Meadow. This makes the records discontinuous for the Geer Meadow.

In the Geer Meadow, on April 30, with a cool 12 degrees C temperature, only 23 individuals were found. Cabbage Whites were especially numerous on July 30 and August 20. In fact, on July 30, 109 Cabbage Whites were the most numerous, when compared to every other individual count and more than any other species single-day count during 2023. In fact, they were so common, we ignored and undercounted them. Orange Sulphurs (*Colias eurytheme*) and Common Wood-nymphs (*Cercyonis pegala*) continue to be abundant species, as they were in 2021 and 2022 following the Meadow fire. Immigrating Variegated Fritillaries (*Euptoieta claudia*) were numerous on July 30, as were the resident Viceroy (*Limenitis archippus*). American Ladies (*Vanessa virginiensis*) appeared in unusually large numbers here and in many of the county inventory areas in 2023. Within the streamlet there would be eight to ten American Ladies, gathered on wet sand, each fresh and not weather-worn. Other surveyed areas were within the Geer Watershed including Plumely Crossing and Wapiti Trail. "Plumely Crossing" stream was given this name by the researchers. Outstanding numbers of butterflies were seen at this bike crossing, so several photographers stopped to take photos of the males puddling.

From May 31 through June 10, Gorgone Checkerspots (*Chlosyne gorgone*) were present in numbers ranging between eighteen and thirty. On July 27, thirty American Ladies were observed. By July 30 there remained only smaller areas of moist sand. During the final visit on August 22, Cabbage Whites continued to be the most numerous butterflies. Pale Swallowtails outnumbered other *Papilio*. Clouded Sulphur (*Coleus philodice*), as well as Orange Sulphurs (*C. eurytheme*), Painted Ladies (*Vanessa cardui*), and Common Checkered-skippers (*Burnsius communis*) appeared as scattered individuals most of the summer. Arrowhead Blues (*Glaucopsyche*

*piasus*), were numerous as were the Melissa Blues (*Plebejus melissa*). Overall, the blues were few in 2023.

Variiegated Fritillary and Aphrodite Fritillaries (*Argynnis aphrodite*) made scattered appearances all season.

#### **D. Walker Ranch, Meyer's Homestead Trail**

On May 15, the Julia Orangetips (*Anthocharis julia*) were easy to see, as they are bright white and fly at eye-level. In May the Western Pine Elfins (*Callophrys eryphon*), and Hoary Elfins (*C. polios*), and as well as one Brown Elfin (*C. augustinus*), graced the low hills with their colors, especially around the Kinnikinnick (*Arctostaphylos uva-ursi*) Western Green Hairstreaks (*C. affinis homoperplexa*) were numerous in June and July. A few Mourning Cloaks (*Nymphalis antiopa*) appeared in May, and then again in August. The number of individuals per hour (32) was lower than average and the number of species per hour was higher (3.6) although this varies greatly from year to year at Walker.

#### **E. Reynold's Ranch, North Bog**

This year the livestock were not allowed to graze around North Bog, and therefore the flowers were more numerous, such as Blue Closed-Bottle Gentians, noticed for the first time. North Bog was visited only once, on September 1, 2023. There was a considerable amount of water in the lower bog where *Potentilla* bushes grow. Canada thistle (*Cirsium arvense*) patches were large and became nectaring plants for the American Ladies and Painted Ladies. Pine Whites (*Neophasia menapia*) were numerous, especially in the roadside weeds, but also in their usual habitats in the tops of Ponderosa Pines. Pairs of Ruddy Coppers (*Lycaena rubidus*) flew among the Bull Thistles (*Cirsium vulgare*). Both species of Wood-nymphs were photographed, Small (*Cercyonis oetus*) and Common (*C. pegala*). These don't often appear on a site together.

#### **F. Caribou Ranch Open Space**

Venice is to be congratulated! She continued her observations on the Sherwood Transect, spending 26 days making observations on the Transect including four in Caribou Ranch, at the Blue Bird Mine. The Sherwood

Transect is in the Mud Lake Open Space, but near and adjacent to the Caribou Entrance. One of the special values of these observations is to see that they include special active flight times for each species.

*To everything, turn, turn, turn. There is a season, turn, turn, turn.*

*And a time to every purpose under heaven. A time to be born, a time to die.*

I'm tempted to paraphrase this a bit and write,

*For every creature, there is a season, a time to fly, a time to metamorphose. ....*

Two-banded Checkered-skipper	May 16 - June 14
Julia Orangetip	May 16-July 11
Elfins	May 9-July 2
Rocky Mountain Parnassian	July 1-August 23
Queen Alexandra's Sulphur	July 11-August 23
Northern Checkerspot	July 1-August 15
Small Wood-nymph	July 22-/September 8,
Pine White	August 30- September 22

There are also two species that fly in the early spring, go into estivation, and wait through the heat, to reemerge in late season:

Mourning Cloak	April 10-June 25- August 23-September 22
Hoary Comma	April 10-June 6 - September 8- Sept 22

## **G. Sherwood Transect and Caribou Report by Venice Kelly**

Caribou Open Space and the Front Range typically have snow in April and sometimes in May. This year, the temperatures remained low during these months. On April 4, there was a 10" snowstorm with below zero temperatures. Six days later April 10, the temperature zoomed up to 11 ° C. Snow was still on the ground but five Hoary Commas and two Mourning Cloaks were flying. These butterflies hibernate during the winter as adults and revive to fly in early spring. On April 14, the temperature dropped to 1° C. with a cold wind. This continued for several days, but on April 29 a Green Comma (*Polygonia faunus*) was seen on Sherwood along with seven Mourning Cloaks and four Hoary Commas.

I visit the Sherwood Transect every week throughout the season, visiting other Caribou Open Space locations in-between. The beginning of May was cold and cloudy keeping the butterflies under cover.

On May 9, eight species were seen with White-Lined Green Hairstreak (*Callophrys sheridanii*), Western Pine Elfin, Brown Elfin, and Painted Lady added to the species count. By May 21 the Two-banded Checkered-skipper (*Pyrgus ruralis*) emerged, a little later than usual. This tiny skipper is attracted to the Sherwood seep and made a good showing this year.

The first week of June was rainy with temperatures in the 4-8 °C range. On June 6 Sherwood had seventeen species. Julia Orangetip (*Anthocharis julia*) numbers were low. A few Large Marbles (*Euchloe ausonides*) were seen, along with Western Pine Elfins; Duskywings Persius (*Erynnis persius*) and Dreamy (*Erynnis icelus*) in small numbers. Nevada Skippers (*Hesperia nevada*) were late, and I only found 2 throughout their flight time. June 23, Wynne Whyman, Richard Holmes and I walked Sherwood and found 27 species: fourteen Persius Duskywings and one Draco Skipper (*Polites draco*). A first for Sherwood was a Sleepy Orange Sulphur (*Abaeis nicippe*) found by Wynne. On June 25 Jan brought several other butterflies to Sherwood and saw 19 species. One was the first Arctic Blue (*Agriades glandon rustica*) of the season and a Mexican Cloudywing (*Thorybes mexicana*) the second ever seen on the transect.

July 1<sup>st</sup>, from the parking lot to the big meadows in Caribou Open Space, the Rocky Mountain Parnassians were flying in fair numbers with Western Tiger Swallowtails. I found the only Common Alpine (*Erebia epipsodea*) of the season plus two Mexican Yellow Sulphurs (*Eurema mexicana*) new to Caribou. I found another Mexican Yellow the very next day on Sherwood transect. With more flowers blooming in July, more butterflies were showing up. Many of the “regulars” that I expected to see were late by another week, and the individual numbers lower. Queen Alexandra’s Sulphurs were lower than in past years as were Common Ringlets (*Coenonympha tullia ochracea*). Purplish Coppers (*Lycaena helloides*) were also very low numbers, and the only Fritillary that was flying in the mountain transect was the Variegated Fritillary. On July 16 in Caribou Open Space, Northern Checkerspots and Northern Crescents had started flying. Four Garita Skipperlings (*Oarisma garita*) were found along with three Boisduval’s Blues (*Plebejus icarioides*), one Melissa Blue, three Lupine Blues (*P. lupini lutzi*), and one

Arctic Blue. Nice to see more blue species.

July 22 there were 26 species on Sherwood Transect. Five Edith Coppers (*Tharsalea editha*) were found, both male and female. Three Silvery Checkerspots (*Chlosyne nycteis*), a Weidemeyer's Admiral, four Greenish Blues (*Plebejus saepiolus*), and two Russet Skipperlings (*Piruna pirus*) were flying with a Blue Copper (*Tharsalea heteronea*), one Arachne Checkerspot (*Polydryas arachne*), and a Small Wood-nymph. This was an outstanding day for the numbers of species found on Sherwood.

On July 27 I surveyed Blue Bird Mine. Twenty species were found, mostly in low numbers for this location. The day was very hot and suddenly a strong wind picked up causing butterflies to really hang on to their flowers as they swayed back and forth. Still, an old Thicket Hairstreak (*Callophrys spinetorum*) was found with nine Northern Checkerspots, an Anise Swallowtail, and three Painted Ladies. My last July survey of Sherwood was on July 30. I was glad for the 25 species that I found even though the individual numbers were still lower. A Gray Hairstreak (*Strymon melinus*), a Thicket Hairstreak, two Purplish Coppers and one Dainty Sulphur were seen.

On August 15, 21 species including an Edward's Fritillary were flying. Typical of 2023 surveys, the individual numbers were very low. Small Wood-nymphs look like their numbers were high with 36 on this day, but in the past, it was common to see 50+ in one count.

I went to Blue Bird Mine on 8/16 with Wynne Whyman. The day was hot and breezy. We identified 12 species. A couple of Fritillary fly-by's were not identified. We saw two Red Admirals and a Margined White (*Pieris marginalis*). Margined Whites are not typically seen anywhere in Caribou or Sherwood. Field Crescents were starting their late season flight time, and we also found a Clouded Sulphur. On August 23, there were nine Common Checkered-skippers, two American Ladies, six Dainty Sulphurs, six Woodland Skippers (*Ochlodes sylvanoides*), and two Mormon Fritillaries (*Argynnis mormonia*). The surprise of the day was a new species for Sherwood, one that I have been hoping to find for several years. It was a *Polygonia (Nigrozephyrus oreas)*, confirmed by Mike Fisher. On August 30, John Barr and I walked Sherwood specifically to look for Pine Whites. They were late to emerge this year, but 26

species showed; eleven individuals were Pine Whites. We also saw twelve Woodland Skippers, two Western Branded Skippers (*Hesperia colorado*) and two Ruddy Coppers. I found 45 Pine Whites on September 8 along with 20 Small Wood-nymphs, three Red Admirals, and a Mormon Fritillary.

This year it was more noticeable that overall the butterfly populations are decreasing year by year. I am concerned about the little grass skippers (*Hesperia*). Their numbers have been decreasing each year. July 30 I was wondering where the Ruddy Coppers; they typically would have been flying. However, they showed up late on August 30. For some butterflies, changes in their habitats are contributing factors. A Mexican Yellow was photographed on Sherwood transect. My question is, “Why were these butterflies at this elevation?” Herbicide use also contributes to decreasing populations. Weather conditions are causing butterflies to emerge before flowers bloom, or to emerge after flowers have dried up. These are all things to think about when making plans for the future.

#### **IV. Conclusion**

The butterfly season began two and a half weeks late in 2023. The soil was still cold from the exceedingly cold November and December in 2022, which caused plants to grow and bloom later. Bird watchers as well as butterfly observers agreed the season was late. Steve Jones reported the lower mean temperature of 13.4 degrees C, lower than previous years. He also noted the great amount of water at Boulder Weather station -12.83” in April – June 2023 \* The following July was hot and discouraged the researchers from venturing out. The season ended in late August for most team observations on Boulder County properties. Venice Kelly continued the Sherwood Transect, Caribou Ranch, and Chris Friedman, on Open Spaces, until the end of September. This year for the first time I feel comfortable saying that there is climate change affecting the habitats and phenology of the butterflies. “Species richness of Lepidoptera shows an increasing trend across years, and this effect is statistically supported (“significant”) for Lepidoptera as a whole and for butterflies. On the other hand,

abundance has declined over time both for Lepidoptera overall and for butterflies” concludes Jere Tolvanen (University of Oulu) of the Global Research team. \*\*

\*Personal email. Stephen Jones. Sep 16, 2023

\*\*Personal email. Dr. Sami Kivela. Effects of Global Change on Diversity of Lepidoptera. October 3, 2023.

## V. References

2021. Chu, Janet R., and S. Hirschfeld and V. Kelly. Lepidoptera of North America 18-  
Butterfly Inventories within Boulder County Open Spaces, Boulder, Colorado.  
C.P. Gillette Museum of Arthropod Diversity, Department of Agricultural Biology, Colorado  
State University, Fort Collins, Colorado. ISSN 1084-8819
2020. Chu, Janet R., and Stephen R. Jones. Butterflies of the Colorado Front Range – A  
Photographic Guide to 100 Species. Second Edition. Boulder County Nature Association, Boulder,  
Colorado.
2017. Chu, Janet, and Ziskin D. Inventories Producing Trends of Butterfly Populations Within Communities  
in Certain Boulder County Open Spaces. Boulder, Colorado. Self-Published
2021. Pelham, Jonathan P. A Catalogue of the Butterflies of the United States and Canada. The Lepidoptera  
Research Foundation.
1993. Pollard, E., and T. J. Yates. Beverly Hills, California.

## On-line References

Butterflies of America < [www.butterfliesofamerica.com](http://www.butterfliesofamerica.com)

Butterflies of the Colorado Front Range < [www.coloradofrontrangebutterflies.com](http://www.coloradofrontrangebutterflies.com)>

Boulder County Open Space < [www.bouldercounty.gov/open-space/education/research/](http://www.bouldercounty.gov/open-space/education/research/)

Butterflies and Moths of North America. < [www.butterfliesandmoths.org](http://www.butterfliesandmoths.org)>

North American Butterfly Association <[www.naba.org](http://www.naba.org)>

**VI. Data Tables** follow. Each Open Space area has three tables: a) The actual data for each field day. Note that the row with no data shows this butterfly was found in the past; therefore, the sighting is important to preserve; b) The table lists the specific location the counts were made, the conditions (date, time, temperature, sky condition), butterfly behavior (nectaring, ovipositing, puddling, interacting), researcher’s name. c.) Summary records for all the data from that site 2007-2023.

## A. South County Grassland

South County Grassland	2023	5/23	8/16
<i>Papilio polyxenes</i>	Black Swallowtail		
<i>P. zelicaon</i>	Anise Swallowtail	1	
<i>P. rutulus</i>	W. Tiger Swallowtail		
<i>P. multicaudata</i>	Two-tailed Swallowtail		
<i>Pontia protodice</i>	Checkered White		
<i>P. occidentalis</i>	Western White		
<i>Pieris rapae</i>	Cabbage White	7	7
<i>Euchloe olympia</i>	Olympia Marble		
<i>E. ausonides</i>	Large Marble		
white sp.		4	
<i>Colias philodice</i>	Clouded Sulphur	3	4
<i>C. eurytheme</i>	Orange Sulphur	2	5
sulphur sp.			5
<i>Zerene cesonia</i>	Southern Dogface		
<i>Abaeis nicippe</i>	Sleepy Orange		
<i>Kricogonia lyside</i>	Lyside Sulphur		
<i>Nathalis iole</i>	Dainty Sulphur		
<i>Lycaena dione</i>	Gray Copper		
<i>Strymon melinus</i>	Gray Hairstreak		
<i>Cupido amyntula</i>	W. Tailed-blue		
<i>Glaucopsyche lygdamus</i>	Silvery Blue		
<i>Euphilotes ancilla</i>	Rocky Mtn. Dotted-Blue		
<i>Echinargus isola</i>	Reakirt's Blue		1
<i>Plebejus melissa</i>	Melissa Blue		1
blue sp.		3	
<i>Danaus plexippus</i>	Monarch		
<i>Agraulis vanilla</i>	Gulf Fritillary		
<i>Euptoieta claudia</i>	Variegated Fritillary		1
<i>Argynnis aphrodite</i>	Aphrodite Fritillary		
<i>A. edwardsii</i>	Edwards' Fritillary		
fritillary sp.			
<i>Chlosyne fulvia</i>	Fulvia Checkerspot		
<i>C. gorgone</i>	Gorgone Checkerspot		1
<i>Phyciodes tharos</i>	Pearl Crescent	1	1
<i>P. pulchella</i>	Field Crescent	6	9
checkers'/crescent sp.		2	
<i>Aglais milberti</i>	Milbert's Tortoiseshell		
<i>Nymphalis antiopa</i>	Mourning Cloak		
<i>Vanessa atalanta</i>	Red Admiral		
<i>Vanessa cardui</i>	Painted Lady		
<i>Junonia coenia</i>	Common Buckeye		1
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral		
<i>Coenonympha tullia ochracea</i>	Common Ringlet		
<i>Cercyonis pegala</i>	Common Wood Nymph		1
<i>Erynnis afranius</i>	Afranius Duskywing		
<i>E. persius</i>	Persius Duskywing		
duskywing sp.			
<i>Burnsius communis</i>	Common Checkered-skipper	24	25
<i>Pyrgus scriptura</i>	Small Checkered-skipper		
<i>Pholisora catullus</i>	Common Sootywing		
<i>Hesperia uncas</i>	Uncas Skipper		
<i>H. ottoe</i>	Ottoe Skipper		
<i>H. leonardus</i>	Leonard's Skipper		
<i>Atrytone arogos</i>	Arogos Skipper		
<i>Anatrytone logan</i>	Delaware Skipper		

3.5 Research hours

12.5 Volunteer Hours for Boulder County

## Southeast Grassland Buffer (Continued)

	Date, Conditions		Location within				Butterfly Activity	Blossoming Plants				Researcher					
	5/23/2023 10:15-11:45 am 21 °C, Smoky (Canadian fires)		Coalton Trail, then south toward water tank				Not many flying, field crescents nectaring					Chris Friedman Jean Morgan Jan Chu					
	8/16/2023 9:15-11:00 am 29-32 °C, Clear, negligible wind		Coalton Trail, south along Rock Creek, and to puddles near water tank.				Only found near mud or left-over pond	Liatris. Hard to walk through 3 ½ ft grasses; followed cow paths.				Chris Friedman Linda Hardesty Jean Morgan Jan Chu					
<b>Southeast Buffer</b>	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
# Species identified during the year	25	20	21	24	19	18	20	15	23	13	16	18	12	17	16	17	13
Cumulative # Species 2007-2023 sighted	21	23	33	37	41	44	44	44	46	46	47	47	47	47	47	48	48
Research Hours on Site	5	21	9	7.7	11.5	9	12	8	12	4.5	8	9	5.5	6.5	3.5	9.5	3.5
# Individual Butterflies Counted	256	373	353	443	160	227	169	178	294	121	119	271	39	57	478	175	115
# Individuals / Research Hour	51	18	39	40	14	25	14	22	24.5	27	15	30	7	8.8	139	18	33
# Species / Research Hour	5	0.9	2	3	2	2	1.6	2	2	3	2	2	2	2.6	4.2	1.8	3.7

### B. Anne U. White Trail

Anne U. White Trail	2023	6/29	7/9
<i>Parnassius smintheus</i>	Rocky Mountain Parnassian		
<i>Papilio polyxenes</i>	Black Swallowtail	1	
<i>P. zelicaon</i>	Anise Swallowtail		
<i>P. indra</i>	Indra Swallowtail		
<i>P. rutulus</i>	W. Tiger Swallowtail	5	4
<i>P. eurymedon</i>	Pale Swallowtail	7	2
<i>P. multicaudata</i>	Two-tailed Swallowtail	2	2
yellow swallowtail sp.		12	
<i>Pontia protodice</i>	Checkered White		1
<i>P. occidentalis</i>	Western White		
<i>P. sisymbrii</i>	Spring White		
<i>Pieris rapae</i>	Cabbage White	4	3
<i>Euchloe ausonides</i>	Large Marble		
<i>E. olympia</i>	Olympia Marble		
white sp.		8	5

<b>Anne U. White Trail</b>			
<i>Anthocharis sara julia</i>	Julia Orangetip	1	
<i>Colias philodice</i>	Clouded Sulphur		
<i>C. eurytheme</i>	Orange Sulphur		1
<i>Nathalis iole</i>	Dainty Sulphur		
<i>Callophrys affinis homoperplexa</i>	W. Green (Bramble) Hairstreak		
<i>C. sheridanii</i>	White-lined Green Hairstreak		
<i>C. gryneus</i>	Siva Juniper Hairstreak		
<i>C. mossii</i>	Moss's Elfin		
<i>C. polios</i>	Hoary Elfin		
<i>C. eryphon</i>	Western Pine Elfin		
<i>Satyrium titus</i>	Coral Hairstreak		
<i>Strymon melinus</i>	Gray Hairstreak		
<i>Cupido amyntula</i>	Western Tailed-Blue		
<i>Celastrina ladon sidara</i>	Echo Azure		
<i>C. l. lucia</i>	Lucia form - Echo Azure		
<i>Glaucopsyche piasus</i>	Arrowhead Blue		
<i>G. lygdamus</i>	Silvery Blue		
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted-Blue		
<i>Echinargus isola</i>	Reakirt's Blue		
<i>Plebejus saepiolus</i>	Greenish Blue		
<i>P. melissa</i>	Melissa Blue		
<i>P. icarioides</i>	Boisduval's Blue		
<i>P. lupini lutzi</i>	Lupine Blue		
<i>P. glandon rustica</i>	Arctic Blue		
blue sp.		1	
<i>Apodemia nais</i>	Nais Metalmark		
<i>Danaus plexippus</i>	Monarch		
<i>Libytheana carinenta</i>	American Snout		
<i>Euptoieta claudia</i>	Variegated Fritillary		
<i>Argynnis aphrodite</i>	Aphrodite Fritillary		
<i>A. edwardsii</i>	Edwards' Fritillary		
<i>A. coronis</i>	Coronis Fritillary		
<i>A. callippe</i>	Callippe Fritillary		
<i>A. hesperis</i>	Northwestern Fritillary		
<i>A. mormonia</i>	Mormon Fritillary		
fritillary sp.			2
<i>Chlosyne gorgone</i>	Gorgone Checkerspot		
<i>C. palla</i>	Northern Checkerspot		
<i>Phyciodes pallida</i>	Pallid (Pale) Crescent		3
<i>P. tharos</i>	Pearl Crescent		
<i>P. cocyta</i>	Northern Crescent		
<i>P. pulchella</i>	Field Crescent		
** <i>Polygonia interrogationis</i>	Question Mark		1
<i>Polygonia gracilis</i>	Hoary Comma		
<i>Polygonia satyrus</i>	Satyr Comma		
comma sp.			
<i>Junonia coenia</i>	Common Buckeye		
<i>Nymphalis antiopa</i>	Milbert's Tortoiseshell		
<i>N. californica</i>	California Tortoiseshell		
<i>N. antiopa</i>	Mourning Cloak	2	1
<i>Vanessa atalanta</i>	Red Admiral		3
<i>V. cardui</i>	Painted Lady	2	
<i>V. virginiensis</i>	American Lady		
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral	6	6
<i>Coenonympha tullia ochracea</i>	Common Ringlet	3	2
<i>Cercyonis pegala</i>	Common Wood-Nymph		
<i>C. oetus</i>	Small Wood-Nymph		
<i>Oeneis uhleri</i>	Uhler's Arctic		

<i>Epargyreus clarus</i>	Silver-spotted Skipper	1	3
<i>Pholisora catullus</i>	Common Sootywing		
<i>Erynnis persius</i>	Pacuvius Duskywing		
<i>E. persius</i>	Persius Duskywing		
<i>E. icelus</i>	Dreamy Duskywing		
<i>Burnsius communis</i>	Common Checkered-Skipper		1
<i>Piruna pirus</i>	Russet Skipperling		11
<i>Hesperia juba</i>	Juba Skipper		
<i>H. colorado</i>	W. Branded Skipper		
<i>H. viridis</i>	Green Skipper		
<i>Polites themistocles</i>	Tawny-edged Skipper		
<i>P. mystic</i>	Long Dash		
<i>Ochlodes sylvanoides</i>	Woodland Skipper		
<i>Polites peckius</i>	Peck's Skipper		
<i>Poanes taxiles</i>	Taxiles Skipper		3
<i>Euphyes vestris</i>	Dun Skipper	2	9
<i>Atrytonopsis hianna</i>	Dusted Skipper		
skipper sp.		3	

\*\* Newly observed species in Anne U. White

4.5 Research hours      11.5 Volunteer hours for the County

Date, Conditions	Location within Anne U White	Butterfly Activity	Blossoming Plants	Researcher
6/29/2023 10-12:00 pm 23 °C 90% sun to 40%, sprinkles at noon	Parking lot, just past stream.			Cathy Cook
7/9/2023 9:00-11:30 am 18-22 °C sunny	Parking lot to trail's end			Cathy Cook Jeremy Hurst Jan Chu

**B. Anne U. White Trail (Continued)**

Anne U. White Trail	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
# Species Identified during the year 2023	44	45	35	31	47	50	29	17	10	flood	24	32	23	4	33	28	20
Research Hours on Site	9.5	16	10	10.5	19.5	13.5	11	6	3		3.5	18.5	10	1	15	9.5	4.5
Individual Butterflies Counted	366	536	217	112	773	509	334	105	33		96	319	216	22	215	240	123
Individuals / Research Hour	38.5	33.5	21.7	10.7	39.6	37.7	30	17.5	11		27.4	24	21.6	22	14	25	27
# Species / Research Hour	4.6	2.8	3.5	3	2.4	3.7	2.6	2.8	3.3		6.8	1.7	2.2	4	2.7	2.9	4.4
Total # species 2021-2023															83	83	84

### C. Heil Valley Ranch (North)- North Pointe, Red Gulch

Heil Valley Ranch (North) North Pointe, Red Gulch	2023	5/ 2 9	6/ 9	6/ 2 0	8/ 2 3
<i>Parnassius smintheus</i>	Rocky Mountain Parnassian				
<i>Papilio polyxenes</i>	Black Swallowtail				
<i>P. zelicaon</i>	Anise Swallowtail	13			
<i>P. indra</i>	Indra Swallowtail				
<i>P. rutulus</i>	Western Tiger Swallowtail			7	
<i>P. eurymedon</i>	Pale Swallowtail			1	
<i>P. multicaudata</i>	Two-tailed Swallowtail			1	
swallowtail yel.			4		
swallowtail black				1	
<i>Neophasia menapia</i>	Pine White				
<i>Pontia protodice</i>	Checkered White				
<i>P. occidentalis</i>	Western White				
<i>P. sisymbrii</i>	Spring White				
<i>Pieris rapae</i>	Cabbage White	2		3	5
white sp.					
<i>Euchloe ausonides</i>	Large Marble	2			
<i>E. olympia</i>	Olympia Marble				
<i>Anthocharis sara julia</i>	Julia Orangetip				
<i>Colias philodice</i>	Clouded Sulphur			1	
Alba form					
sulphur sp.		3	1		1
<i>C. eurytheme</i>	Orange Sulphur			1	5
<i>C. alexandra</i>	Queen Alexandra's Sulphur				
<i>Nathalis iole</i>	Dainty Sulphur				
<i>Zerene cesonia</i>	Southern Dogface				
sulphur sp.					
<i>Lycaena dione</i>	Gray Copper				
<i>Lycaena heteronea</i>	Blue Copper				
<i>L. helloides</i>	Purplish Copper				
<i>Callophrys affinis</i>	Western Green Hairstreak				
<i>C. gryneus</i>	Siva Juniper Hairstreak				
<i>C. sheridanii</i>	White-lined Green Hairstreak				
<i>C. eryphon</i>	Western Pine Elfin				
elfin sp.					
<i>Satyrium behrii</i>	Behr's Hairstreak				
<i>S. titus</i>	Coral Hairstreak				
<i>Strymon melinus</i>	Gray Hairstreak				
<i>Leptotes marina</i>	Marine Blue				
<i>Cupido amyntula</i>	Western Tailed-blue				
<i>Celastrina echo sidara</i>	Echo Azure				
<i>C. humulus</i>	Hops Azure				
<i>Glaucopsyche piasus</i>	Arrowhead Blue				
<i>G. lygdamus</i>	Silvery Blue	1			
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted-blue			3	
<i>Euphilotes ancilla barnesi</i>	ssp. RM Dotted-blue ID -Opler				
<i>Echinargus isola</i>	Reakirt's Blue				
<i>Plebejus melissa</i>	Melissa Blue	1		6	
<i>P. icarioides</i>	Boisduval's Blue	1			
<i>P. lupini lutzi</i>	Lupine Blue				
<i>P. glandon rustica</i>	Arctic Blue				
blue sp.		9	4	2	30
<i>Libytheana carinenta</i>	American Snout				
<i>Danaus plexippus</i>	Monarch				
<i>Limenitis archippus</i>	Viceroy				

<b>Heil Valley Ranch North Pointe, Red Gulch</b>	<b>2023</b>	<b>5/ 2 9</b>	<b>6/ 9</b>	<b>6/ 2 0</b>	<b>8/ 2 3</b>
<i>Euptoieta claudia</i>	Variegated Fritillary	3	2		
<i>Argynnis aphrodite</i>	Aphrodite Fritillary				
<i>A. edwardsii</i>	Edwards' Fritillary				
<i>A. coronis</i>	Coronis Fritillary				
<i>A. callippe</i>	Callippe Fritillary				
<i>A. hesperis</i>	Northwestern Fritillary				
<i>A. mormonia</i>	Mormon Fritillary				
fritillary sp.		2	1	7	
<i>Euphydryas anicia</i>	Variable Checkerspot				
<i>Chlosyne gorgone</i>	Gorgone Checkerspot	1			
crescent/checkerspot			1		30
<i>C. nycteis</i>	Silvery Checkerspot				
<i>C. palla</i>	Northern Checkerspot				
<i>Phyciodes pallida</i>	Pallid (Pale) Crescent				
<i>P. tharos</i>	Pearl Crescent				
<i>P. cocyta</i>	Northern Crescent				
<i>P. pulchella</i>	Field Crescent	2		3	
crescent sp.			1	1	
<i>Polygonia satyrus</i>	Satyr Comma				
<i>P. faunus</i>	Green Comma			1	
<i>P. gracilis</i>	Hoary Comma			1	1
<i>Nymphalis antiopa</i>	Mourning Cloak			3	
<i>Junonia coenia</i>	Buckeye, Common				
<i>N. californica</i>	California Tortoiseshell				
<i>Vanessa atalanta</i>	Red Admiral	2		6	1
<i>Aglais milberti</i>	Milbert's Tortoiseshell				
<i>V. cardui</i>	Painted Lady			3	4
<i>V. virginiensis</i>	American Lady				
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral			3	
<i>Limenitis archippus</i>	Viceroy				
<i>Asterocampa celtis</i>	Hackberry Emperor				9
<i>Coenonympha tullia ochracea</i>	Ochre (Common) Ringlet	24	5	27	4
<i>Cercyonis pegala</i>	Common Wood-Nymph				
<i>C. oetus</i>	Small Wood-Nymph				
wood nymph sp.					
<i>Erebia epipsodea</i>	Common Alpine				
<i>Epargyreus clarus</i>	Silver-spotted Skipper				
<i>E. pacuvius</i>	Pacuvius Duskywing			3	
<i>E. persius</i>	Persius Duskywing				
<i>E. icelus</i>	Dreamy Duskywing			1	
duskywing sp		3			10
<i>Burnsius communis</i>	Common Checkered-skipper	4	2	8	3
<i>Pholisora catullus</i>	Common Sootywing				2
<i>Piruna pirus</i>	Russet Skipperling			2	
<i>Oarisma garita</i>	Garita Skipperling				
<i>Hesperia juba</i>	Juba Skipper				
<i>H. colorado</i>	W. Branded Skipper				
<i>H. pahaska</i>	Pahaska Skipper				
<i>H. viridis</i>	Green Skipper				
<i>H. nevada</i>	Nevada Skipper				
<i>Polites themistocles</i>	Tawny-Edged Skipper				
<i>P. mystic</i>	Long Dash				
<i>Atrytone arogos</i>	Arogos Skipper				
<i>Ochlodes sylvanoides</i>	Woodland Skipper				
<i>Poanes taxiles</i>	Taxiles Skipper				
<i>Euphyes vestries</i>	Dun Skipper			2	
<i>Atrytonopsis hianna</i>	Dusted Skipper				

### C. Heil Valley Ranch (North)- North Pointe, Red Gulch

15 Research Hours

42 Volunteer Hours for Boulder County

Date, Conditions	Location	Butterfly Behavior	Blossoming Plants	Researchers
6/9/2023 10:00-12 20 °C  2	North Pointe Road to pond.	Nectaring on yellow composites.		Cathy Comstock Cathy Cook Chris Friedman Jan Chu Linda Hardesty Sue Hirschfeld
6-20-2023 9:30-10:45 a.m. 20-24 °C Overcast. No breeze 1hr.	Red Gulch	Not flying during overcast, then warming at wall during sunshine. Nectaring blue flax.	Dandelion Blue Flax Globe mallow Blue flag	Dan Fosco Jan Chu John Barr Sue Hirschfeld
8/23/2023 9:10-11:10 26-31 °C Slight breeze, slight smoky haze, partly cloudy 1	Red Gulch  Including drainage clay pipes from LaFollette's home	Large butterflies flying high, hard to ID. Blues found small amount of mud.	Liatris Gumweed	Chris Friedman Jan Chu Jean Morgan Linda Hardesty Sue Hirschfeld

### C. Heil Valley – North (Concluded)

Years of Counts in Heil North	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
# of Species Identified During season in Heil-North	34	45	41	40	33	24	30	50	38	31	33	50	35	32	31	48	29
Cumulative # Species 2007-2023 Sighted in Heil-North	50	62	77	81	81	85	86	89	90	91	91	92	93	93	93	95	95
Research Hours on Site	8	17	12.5	11.5	11.5	6.5	12	27	32	13	7.5	13.5	12	8	8	12.5	15
# Individual Butterflies Counted 2023	579	654	488	429	272	188	402	1077	508	246	204	442	359	298	675	940	259
# Individuals / Research Hour	72	38	39	37	24	29	36	40	16	19	27	33	29	37	84	75	20
# Species / Research Hour	4	2.6	3.3	3.4	2.9	3.6	2.5	1.9	1.2	2.4	4.4	3.7	2.9	4.7	3.9	3.8	2

### D. Heil Valley Ranch – Geer Watershed, Plumely Crossing, Wapiti Trail

Heil Valley Ranch - Geer Watershed	2023	4/30	7/30	8/20	5/20	5/27	5/28	5/31	6/7	6/10	6/19	6/24	7/7	7/21	7/27	8/4	8/8	8/11	8/20	9/28
<i>Papilio polyxenes</i>	Black Swallowtail												1							
<i>P. zelicaon</i>	Anise Swallowtail			1	2								2							
<i>P. indra</i>	Indra Swallowtail				8				3	1										
<i>P. rutulus</i>	Western Tiger Swallowtail		1							1			4							
<i>P. eurymedon</i>	Pale Swallowtail				1	4	2	2	3	1	2		1							
<i>P. multicaudata</i>	Two-tailed Swallowtail		1						1	1			3	1						
Swallowtail yel sp.			2		5	6		2	4	2	3		1	6	1					
<i>Neophasia menapia</i>	Pine White																			
<i>Pontia sisymbria</i>	Spring White																			
<i>P. protodice</i>	Checkered White		1	4										1						
<i>P. occidentalis</i>	Western White									1										
<i>Pieris rapae</i>	Cabbage White	14	109	65	2	11	5	2	9	4			3	3	6	1	6		1	7
<i>P. marginalis</i>	Margined White																			
							1													
<i>Euchloe ausonides</i>	Large Marble																			
<i>E. Olympia</i>	Olympia Marble																			
<i>Anthocharis sara Julia</i>	Julia Orangetip																			
white sp.					2		1	6	5	5	11	9		51					40	
<i>Colias philodice</i>	Clouded Sulphur		8	2			2			1		2	5	3			4			
<i>C. eurytheme</i>	Orange Sulphur	1	16	13				3	1	2		1		6	5	2				8
<i>C. alexandra</i>	Queen Alexandra's Sulphur									1										
<i>C. cesonia</i>	Southern Dogface																			
<i>Eurema Mexicana</i>	Mexican Sulphur																			
<i>Nathalis iole</i>	Dainty Sulphur		1																	5
sulphur sp.		3	5	9		7		1	6		7	3	7	7	13	2			2	1
<i>Lycaena dione</i>	Gray Copper																			

Heil Valley Ranch - Geer Watershed	2023	4/30	7/30	8/20	5/20	5/27	5/28	5/31	6/7	6/10	6/19	6/24	7/7	7/11	7/17	8/4	8/8	8/11	8/20	9/28	
<i>L. heteronea</i>	Blue Copper																				
<i>Tharsalea Hyllus</i>	Bronze Copper																				
<i>Lycaena. Helloides</i>	Purplish Copper																				
<i>Callophrys affinis homoperplexa</i>	Western Green Hairstreak																				
<i>C. gryneus</i>	Siva Juniper Hairstreak																				
<i>C. sheridanii</i>	White-lined Green Hairstreak																				
<i>C. augustinus</i>	Brown Elfin																				
<i>C. eryphon</i>	Western Pine Elfin																				
elfin sp.																					
<i>Satyrium titus</i>	Coral Hairstreak																				
<i>S. liparops</i>	Striped Hairstreak																				
<i>S. saepium</i>	Hedgerow Hairstreak																				
<i>Strymon melinus</i>	Gray Hairstreak		1											1							1
hairstreak sp.	hairstreak sp.																				
<i>Leptotes marina</i>	Marine Blue																				
<i>Brephidium exile</i>	Western Pygmy-Blue						2														
<i>Cupido amyntula</i>	Western Tailed-Blue			1		6				2											
<i>Celastrina echo sidara</i>	Echo Azure									3											
<i>C. echo lucia</i>	“ Lucia type																				
<i>C. humulus</i>	Hops Azure							2	3	2											
<i>Glaucopsyche piasus</i>	Arrowhead Blue				18	5	4	8	5	8											
<i>G. lygdamus</i>	Silvery Blue					4		1	3	2											
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted-Blue																				
<i>Echinargus isola</i>	Reakirt's Blue						3														
<i>Plebejus Melissa</i>	Melissa Blue		10	2		2	1		1	6			2	2	3						
<i>P. saepiolus</i>	Greenish Blue					2			2												
<i>P. icarioides</i>	Boisduval's Blue					1		1	1	3											
<i>P. lupini lutzi</i>	Lupine Blue																				

Heil Valley Ranch - Geer Watershed	2023	4/30	7/30	8/20	5/20	5/27	5/28	5/31	6/7	6/1	6/9	6/4	7/7	7/1	7/7	8/4	8/8	8/1	8/0	9/28
<i>P. glandon rustica</i>	Arctic Blue																			
blue sp.			8					41	12	53							1			2
<i>Danaus plexippus</i>	Monarch													1						
<i>Apodemia nais</i>	Nais Metalmark																			
<i>Euptoieta Claudia</i>	Variegated Fritillary		13	8		1			3	1		3	2	11		5				2
<i>Argynnis aphrodite</i>	Aphrodite Fritillary		2					2	3		1		1	5						
<i>A. edwardsii</i>	Edward's Fritillary																			
<i>A. coronis</i>	Coronis Fritillary																			
<i>A. callippe</i>	Callippe Fritillary																			
<i>A. hesperis</i>	Northwestern Fritillary																			
<i>Ax. mormonia</i>	Mormon Fritillary																			
fritillary sp.			11		2	4	2	1		11	8	3	8	7	3	3	1			1
<i>Chlosyne gorgone</i>	Gorgone Checkerspot					6		18	20	30										
<i>C. nycteis</i>	Silvery Checkerspot												1							
<i>C. palla</i>	Northern Checkerspot																			
<i>Phyciodes pallida</i>	Pallid (Pale) Crescent																			
<i>P. tharos</i>	Pearl Crescent									1	1									
<i>P. cocyta</i>	Northern Crescent						7							1						
<i>P. pulchella</i>	Field Crescent			7		9		6		2										
<i>Polygonia satyrus</i>	Satyr Comma						1													
<i>P. gracilis</i>	Hoary Comma	2		2																1
<i>Junonia coenia</i>	Common Buckeye		2											1						4
<i>Aglais milberti</i>	Milbert's Tortoiseshell																			
<i>Nymphalis antiopa</i>	Mourning Cloak																			
<i>N. californica</i>	California Tortoiseshell						1													
<i>Vanessa atalanta</i>	Red Admiral					1	4						3	5						

Heil Valley Ranch - Geer Watershed	2023	4/30	7/30	8/20	5/20	5/27	5/28	5/31	6/7	6/10	6/19	6/24	7/7	7/21	7/27	8/4	8/8	8/11	8/20	9/28
<i>V. cardui</i>	Painted Lady		6	1		5		3	2	4	4	10	1	1			1			2
<i>V. virginensis</i>	American Lady		3	1						1	1		5	3	1	4			3	1
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral								2	4										
<i>L. archippus</i>	Viceroy			1															2	
<i>Asterocampa celtis</i>	Hackberry Emperor						4													
<i>Coenonympha tullia ochracea</i>	Common Ringlet					15		9	8	4										
<i>Cercyonis pegala</i>	Common Wood-Nymph		3	2									3							
<i>C. oetus</i>	Small Wood-Nymph			1									3							
wood-nymph sp.			4										4		1					
<i>Erebia epipsodea</i>	Common Alpine																			
<i>Oeneis chryxus</i>	Chryxus Arctic																			
<i>O. uhleri</i>	Uhler's Arctic																			
<i>Epargyreus clarus</i>	Silver-spotted Skipper							2		1										
<i>Thorybes pylades</i>	N. Cloudywing							3	2	2										
<i>Erynnis icelus</i>	Dreamy Duskywing						2													
<i>E. pacuvius</i>	Pacuvius Duskywing					4		4	2	6										
<i>E. afranius</i>	Afranius Duskywing						1													
<i>E. persius</i>	Persius Duskywing					3				3										
duskywing sp.			3				3													
<i>Burnsius communis</i>	Common Checkered-skipper	2	6	1		6	3			3		3	1	3	1	5			1	8
<i>Pholisora Catullus</i>	Common Sootywing		2			2				3										
<i>Piruna pirus</i>	Russet Skipperling																			
<i>Oarisma garita</i>	Garita Skipperling																			
<i>Hesperia leonardus pawnee</i>	Leonard's Skipper																			

<i>Hesperia juba</i>	Juba Skipper					2			1	4									7	
Heil Valley Ranch - Geer Watershed	2023	4/30	7/30	8/20	5/20	5/27	5/28	5/31	6/7	6/10	6/9	6/4	7/7	7/17	7/27	8/4	8/8	8/11	8/20	9/28
<i>H. colorado</i>	Western Branded Skipper																			
<i>H. nevada</i>	Nevada skipper																			
<i>Polites themistocles</i>	Tawny-edged Skipper																			
<i>P. peckius</i>	Peck's Slipper																			
<i>Ochlodes sylvanoides</i>	Woodland Skipper			1																
<i>Poanes taxiles</i>	Taxiles Skipper																			
<i>Euphyes vestries</i>	Dun Skipper																			
<i>Atrytonopsis hianna</i>	Dusted Skipper																			
<i>Polites mystic</i>	Long Dash skipper																			
skipper sp.						2			1										1	

29 Research Hours      69 Volunteer Hours for Boulder County

Date Conditions	Location	Butterfly Activity	Researchers
4/30/2023 10:30-12:00 pm 12 °C Clear, E.wind, 5-10 mph	Heil Ranch Geer Watershed		Chris Friedman Linda Hardesty Amy Chu Connie Redak Richard Holmes, Venice Kelly Wynne Whyman Sue Hirschfeld Jean Morgan Jan Chu
5/20/2023 9:15-10:30 am 18-24 °C , hazy slight breeze	So. parking lot to Plumely Crossing		Joe Krieg
5/31/2023 9:30 - 11:30 am 18-24 °C . sunny, not windy	Heil parking lot to stream.	Puddling males.	Sue Hirschfeld Joe Krieg
June 7, 2023 9:100 -10:30, Then 12:00 21-25 °C. High clouds, sunshine. None to Slight breeze	N of parking lot to stream crossing	Big puddle at upper parking lot with large collections of Pale Swallowtails, plus a few Duskywings, Cloudywings and Sulphurs puddling.	Sue Hirschfeld Joe Krieg
6/10/2023 9:30-1:00 pm 26-28 °C Sun	Parking area, road to stream crossing by Geer gate		Venice Kelly Wynne Whyman
6/18/2023 9:45-12:30 pm 18 °C cloudy	Wapiti Trail		Chris Friedman
6/19/2023 9:45-10:45 am 26-28°C, clear, calm	So. parking lot to Plumely Crossing		Joe Krieg
6-21-2023 9:00-11:45 a.m. 19-24 °C Sunny to cloud, quiet to breeze 3	Parking lot north to stream		Sue Hirschfeld Sue Olmstead
6/24/2023	So. parking lot to Plumely Crossing	Swarms of Painted, Am Ladies (13) Sulphurs, whites, checkered-skippers	John Barr

6/28/2023 10:30-12:45 pm 18 °C partly cloudy 2	Wapiti Trail	Butterflies did not land long enough to photograph.	Chris Friedman
7/17/2023 9:00-10:15 am	Parking lot to Plumely Crossing		Joe Krieg
7/21/2023 9:30-12:30 pm 19-26 °C Slight breeze to light, sun, low clouds to full sun	Parking lot to stream crossing	Second generation Ladies and Variegated Frits	Sue Hirschfeld Sue Olmsted
7/27/2023 10:20-11:20 am 29-30 °C C Clear	Parking lot to Plumely Crossing	Stream crossing dry except for one- square ft heavily used.	Joe Krieg
7/30/2023 8:30-12:30 pm 30% High clouds 23-29 °C	Geer Meadow, then Wapiti trail	Butterflies only on moist sand or mud. Many American Ladies.	Sue Hirschfeld Chris Friedman Jan Chu
8/4/2023 9:00-10:30 am 21°C , high clouds some sun,slight breeze	Parking to stream crossing	Variegated nectaring on gumweed. Only few wet spots in Plumely crossing stream	Sue Hirschfeld
8/8/2023 19-20 °C Clear, Still air.	North footbridge, South parking lot	Minimal flow in creek Butterflies in flight.	Joe Krieg
8/11/2023 9:25-11:30 am 22-28 °C Mostly clear, no wind	Lichen Loop and Wapiti Trail		Sue Hirschfeld Chris Friedman
8/20/2023 9:30-11:30 am 21-26 °C High clouds, no breeze	Geer drainage, along roadway then stream. Bat trough	Few flowers, butterflies near wet sand, or mud	Sue Hirschfeld Linda Hardesty Chris Freidman Jan Chu
8/22/2023 9:00-10:00am 24-26 °C Haze, Still air.	North footbridge, South parking lot		Joe Krieg

### D. Heil Valley Ranch– Geer Watershed plus Plumely Crossing, Wapiti Trail

Heil-Geer Watershed	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
# Species Identified Annually	42	56	44	49	36	38	38	42	22	43	30	40	44	40	46	55	50
Cumulative # Species 2007-2023	81	87	90	91	91	91	91	92	92	92	93	93	94	94	100	102	102
Research Hours at Sites	15.5	21	12.5	14	14	10	11	18	11	10	21	20	13.5	16.5	20	29	29
# Individual Butterflies Counted	569	1225	492	419	436	530	264	738	200	488	628	665	584	346	2375	1847	1880
# Individuals / Research Hour	37	58	39	30	31	53	24	41	18	29	39	33	43	21	119	64	65
# Species / Research Hour	2.7	2.7	3.5	3.5	2.6	3.8	3.5	2.3	2	4.3	1.4	2	3.3	2.5	2.3	1.9	1.7

### E. Walker Ranch – Homestead Trail

Walker Ranch-Meyer's Homestead Trail	2023	5/22	5/28	6/19	6/21	7/15
<i>Parnassius smintheus</i>	Rocky Mountain Parnassian					
<i>Papilio polyxenes</i>	Black Swallowtail					
<i>P. zelicaon</i>	Anise Swallowtail				1	
<i>P. indra</i>	Indra Swallowtail					
<i>P. rutulus</i>	Western Tiger Swallowtail					
<i>P. eurymedon</i>	Pale Swallowtail			1	8	
<i>P. multicaudata</i>	Two-tailed Swallowtail					
swallowtail sp.	swallowtail sp.				3	1
<i>Neophasia menapia</i>	Pine White					
<i>Pontia protodice</i>	Checkered White					
<i>P. sisymbrii</i>	Spring White	2				
<i>P. occidentalis</i>	Western White					
<i>Pieris rapae</i>	Cabbage White		1		1	4
white sp.	white sp.		5			
<i>Euchloe ausonides</i>	Large Marble		3			
<i>Anthocharis julia</i>	Julia Orangetip	15	8	2		

<b>Walker Ranch- Meyer's Homestead</b>	<b>2023</b>	<b>5/22</b>	<b>5/28</b>	<b>6/19</b>	<b>6/21</b>	<b>7/15</b>
<i>Colias philodice</i>	Clouded Sulphur				4	
<i>Alba form female</i>	alba form	2	1			
<i>C. eurytheme</i>	Orange Sulphur		2			
<i>C. alexandra</i>	Queen Alexandra's Sulphur					
<i>Nathalis iole</i>	Dainty Sulphur					1
sulphur sp.	sulphur			3		1
<i>Lycaena heteronea</i>	Blue Copper					
<i>Satyrrium saepium</i>	Hedgerow Hairstreak					
<i>Callophrys affinis</i>	W. Green Hairstreak	12	25	30	5	
<i>C. sheridanii</i>	White-line Green Hairstreak					
<i>C. gyrneus siva</i>	Siva Juniper Hairstreak					
<i>C. spinetorum</i>	Thicket Hairstreak					
<i>C. augustinus</i>	Brown Elfin	1	1			
<i>C. polios</i>	Hoary Elfin	40	20			
<i>C. eryphon</i>	Western Pine Elfin	10	5			
elfin sp.	elfin sp.		10			
<i>Strymon melinus</i>	Gray Hairstreak					
<i>Cupido amyntula</i>	Western Tailed-Blue					
<i>Celestrina echo</i>	Echo Azure	20	20		2	
<i>Glaucopsyche piasus</i>	Arrowhead Blue				1	
<i>G. lygdamus</i>	Silvery Blue		5			
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted-Blue					
<i>Echinargus isola</i>	Reakirt's Blue					4
<i>Plebejus melissa</i>	Melissa Blue					10
<i>P. saepiolus</i>	Greenish Blue					
<i>P. icarioides</i>	Boisduval's Blue				1	
<i>P. lupini lutzii</i>	Lupine Blue					
<i>Agriades glandon rustica</i>	Arctic Blue					
blue sp.	blue sp.			25	1	
<i>Danaus plexippus</i>	Monarch					
<i>Apodemia nais</i>	Nais Metalmark					
<i>Euptoieta claudia</i>	Variegated Fritillary		1			
<i>Speyeria aphrodite</i>	Aphrodite Fritillary					
<i>S. edwardsii</i>	Edwards' Fritillary					
<i>S. callippe</i>	Callippe Fritillary					
<i>S. hesperis</i>	Northwestern Fritillary					
<i>S. mormonia</i>	Mormon Fritillary					
fritillary sp.					2	
<i>Chlosyne gorgone</i>	Gorgone Checkerspot				1	
<i>C. nycteis</i>	Silvery Checkerspot					
<i>C. palla</i>	Northern Checkerspot					

<b>Walker Ranch- Meyer's Homestead</b>	<b>2023</b>	<b>5/22</b>	<b>5/28</b>	<b>6/19</b>	<b>6/21</b>	<b>7/15</b>
<i>Phyciodes cocyta</i>	Northern Crescent					
<i>P. pulchella</i>	Field Crescent		1		3	2
<i>Phyciodes pallida</i>	Pallid (Pale) Crescent	2				
<i>Polydryas arachne</i>	Arachne Checkerspot					
<i>Euphydryas anicia</i>	Variable Checkerspot					
checkerspot sp.	checkerspot sp.					
<i>Polygonia faunus</i>	Green Comma					
<i>Polygonia satyrus</i>	Satyr Comma		1			
<i>Polygonia gracilis</i>	Hoary Comma	3	6	1		
Comma sp.	comma					
<i>Aglais milberti</i>	Milbert's Tortoiseshell					
<i>Nymphalis antiopa</i>	Mourning Cloak	2	5	1		2
<i>N. californica</i>	California Tortoiseshell	1	1			
<i>Vanessa atalanta</i>	Red Admiral					
<i>V. cardui</i>	Painted Lady				3	4
<i>V. virginiensis</i>	American Lady					5
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral					
<i>Coenonympha tullia ochracea</i>	Common Ringlet		1	5	13	
<i>Cercyonis pegala</i>	Common Wood Nymph					
<i>C. oetus</i>	Small Wood Nymph					11
<i>Erebia epipsodea</i>	Common Alpine					
<i>Oeneis chryxus</i>	Chryxus Arctic					
<i>O. uhleri</i>	Uhler's Arctic			3		
<i>Erynnis icelus</i>	Dreamy Duskywing		1			
<i>E. pacuvius</i>	Pacuvius Duskywing		1	2		
<i>E. persius</i>	Persius Duskywing		2			
duskywing sp.	duskywing	1	6	20		
<i>Burnsius communis</i>	Common Checkered-skipper		1			
<i>Pholisora catullus</i>	Common Sootywing					
<i>Piruna pirus</i>	Russet Skipperling					
<i>Oarisma garita</i>	Garita Skipperling					
<i>Hesperia uncas</i>	Uncas Skipper					
<i>H. juba</i>	Juba Skipper					
<i>H. colorado</i>	Western Branded Skipper					
<i>Polites themistocles</i>	Tawny-edged Skipper					
<i>P. mystic</i>	Long Dash					1
<i>Ochlodes sylvanoides</i>	Woodland Skipper					
<i>Poanes taxiles</i>	Taxiles Skipper					
<i>Euphyes vestris</i>	Dun Skipper					
skipper sp.						1

17.5 Research Hours 21 Research Volunteer Hours for Boulder County

## E. Walker Ranch – Homestead Trail

Conditions Walker Ranch, Meyer's Homestead Trail	Location	Butterfly Behavior	Researchers
5-22-2023 10:30 am – 2pm Mostly sunny thru smoky haze Temp 15-18 °C Slight breeze	Went to the power lines	Puddling areas were abundant	Dan Fosco John Barr
5/28/2023 10-2:00 pm	Meyer's Gulch		Richard Holmes
6-19-2023 10-1:00 pm 16° C, sunny turning cloudy.	Meyer's Gulch		John Barr
6/21/2023 8:10-11:05 am 18-22 °C Sunny to cloudy	Meyer's Gulch		Richard Holmes
8/15/2023 24-29 °C 11-2:45 pm Clear sky, slight breeze	Meyer's Gulch	Few damp places	Richard Holmes

<b>Walker Ranch, Meyer's Homestead Trail</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
# Species Identified during 2023	30	35	45	35	50	47	62	43	45	43	31	58	47	37	55	52	38
# Species Sighted 2007-2023	33	38	60	70	75*	78 *	79*	80 *	81 *	81 *	83*	84 *	84 *	84 *	<b>85</b>	86	86
# Research Hours on Site	5	4	18	16	16. 5	7	14. 5	11	29	17	13. 5	53	27	6	28	25. 5	17. 5
# Individual Butterflies Counted	16 0	20 3	114 4	43 7	472	39 9	394	32 2	35 1	54 9	299	75 9	44 9	30 5	905	561	443
# Individual Butterflies / Research Hour	32	54	64	27	29	57	27	29	12	32	22	14	16	51	32	22	25
# Species / Research Hour	6.0	8.8	2.5	2.2	3.0	6.7	4.3	3.9	1.5	2.5	2.3	1	1.7	6.1	2.0	2.0	2.2

## F. Reynold's Ranch – North Bog, Giggey Lake

Reynold's Ranch Giggey Lake, North Bog	2023	9/1 North	9/1 Giggey
Rocky Mountain Parnassian	<i>Parnassius smintheus</i>		
Black Swallowtail	<i>Papilio polyxenes</i>		
Anise Swallowtail	<i>P. zelicaon</i>		
Western Tiger Swallowtail	<i>P. rutulus</i>		
Pale Swallowtail	<i>P. eurymedon</i>		
Two-tailed Swallowtail	<i>P. multicaudata</i>		
	yellow swallowtail sp		
Pine White	<i>Neophasia menapia</i>	18	
Cabbage White	<i>Pieris rapae</i>	3	
Checkered White	<i>Pontia protodice</i>		
Western White	<i>P. occidentalis</i>		
	white sp.	5	3
Large Marble	<i>Euchloe ausonides</i>		
Julia Orangetip	<i>Anthocharis julia</i>		
Clouded Sulphur	<i>Colias philodice</i>	2	
Orange Sulphur	<i>C. eurytheme</i>	17	
Queen Alexandra's Sulphur	<i>C. alexandra</i>		
Dainty Sulphur	<i>Nathalis iole.</i>		
	sulphur sp.	5	3
Ruddy Copper	<i>Lycaena rubidus</i>	7	
Blue Copper	<i>Tharsalea. heteronea</i>		
Purplish Copper	<i>Lycaena helloides</i>		
Green Hairstreak	<i>Callophrys affinis</i>		
Thicket Hairstreak	<i>C. spinetorum</i>		
Western Pine Elfin	<i>C. eryphon</i>		
Hoary Elfin	<i>C. polios</i>		
Brown Elfin	<i>C. augustinus</i>		
Hedgerow Hairstreak	<i>Satyrium saepium</i>		
Gray Hairstreak	<i>Strymon melinus</i>		
Echo Azure	<i>Celastrina ladon sidara</i>		
Silvery Blue	<i>Glaucopsyche lygdamus</i>		
Reakirt's Blue	<i>Echinargus isola</i>		
Melissa Blue	<i>Plebejus melissa</i>		
Rocky Mountain Dotted-Blue	<i>Euphilotes ancilla</i>		
Greenish Blue	<i>Plebejus saepiolus</i>		
Lupine Blue	<i>Icaricia lupini lutzi</i>		
Arrowhead Blue	<i>Glaucopsyche piasus</i>		
Boisduval's Blue	<i>P. icarioides</i>		
Arctic Blue	<i>P. glandon rustica</i>		
	blue sp.	2	
Monarch	<i>Danaus plexippus</i>	1	
Weidemeyer's Admiral	<i>Limenitis weidemeyerii</i>		
Variegated Fritillary	<i>Euptoieta claudia</i>	3	
Aphrodite Fritillary	<i>Argynnis aphrodite</i>		
Edward's Fritillary	<i>A. edwardsii</i>		
Coronis Fritillary	<i>A. coronis</i>		
Callippe Fritillary	<i>A. callippe</i>		
Northwestern Fritillary	<i>A. hesperis</i>		
Mormon Fritillary	<i>A. mormonia</i>	3	1
Silver-bordered Fritillary	<i>Boloria selene</i>		
	fritillary sp.	8	
Northern Checkerspot	<i>Chlosyne palla</i>		
Arachne Checkerspot	<i>Polydryas arachne</i>		
Pallid Crescent	<i>Phyciodes pallida</i>		
Pearl Crescent	<i>P. tharos</i>		
Northern Crescent	<i>P. cocyta</i>		

Reynold's Ranch Giggey Lake, North Bog	2023	9/1 North	9/1 Giggey
Field Crescent	<i>P. pulchella</i>		
Hoary Comma	<i>Polygonia gracilis</i>	1	
American Lady	<i>Vanessa virginiensis</i>	3	
Painted Lady	<i>Vanessa cardui</i>	44	
Milbert's Tortoiseshell	<i>Aglais milberti</i>	1	
Mourning Cloak	<i>Nymphalis antiopa</i>	1	1
Common Ringlet	<i>Coenonympha tullia ochracea</i>		
Red Admiral	<i>Vanessa atalanta</i>	1	
Small Wood-nymph	<i>Cercyonis oetus</i>	7	3
Common Wood-nymph	<i>C. pegala</i>	3	
	wood nymph sp.		
Common Alpine	<i>Erebia epipsodea</i>		
Chryxus Arctic	<i>Oeneis chryxus</i>		
Dreamy Duskywing	<i>Erynnis icelus</i>		
Pacuvius Duskywing	<i>E. pacuvius</i>		
Persius Duskywing	<i>E. persius</i>		
	duskywing sp.		
Garita Skipperling	<i>Oarisma garita</i>		
Western Branded Skipper	<i>Hesperia colorado</i>		
Draco Skipper	<i>Polites draco</i>		
Tawny-edged Skipper	<i>P. mystic</i>		
Woodland Skipper	<i>Ochlodes sylvanoides</i>	6	
Common Checkered-skipper	<i>Burnsius communis</i>	8	
Dun Skipper	<i>Euphyes vestris</i>		

3 Research Hours 17 Volunteer Hours for County

#### F. Reynold's Ranch – North Bog, Giggey Lake

Date, Conditions	Location within Reynold's	Butterfly Activity	Blossoming Plants	Researchers
9/1/2023 9:30-11:30 am 21-30 °C full sun, high clouds, slight breeze	North Bog	flowers at roadside; thistle patch. cattle had not grazed in 2023.	Blue Bottle Gentian Canada Thistle Bull Thistle	Amy Chu Ann Cooper Chris Friedman Jan Chu Jean Morgan Linda Hardesty Pam Piombino Venice Kelly
9/1/2023 11:30-12:30 pm	Giggey Lake		Blue Bottle Gentian	John Barr

Reynold's Ranch, Giggey Lake, Western Trail	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
# Species Identified during 2023 in Reynold's	32	46	36	9	26	32	26	29	25	12	19	21	17
# Species Sighted in Reynold's 2011-2023	35	55	55	55	57	57	63*	66*	67*	69*	72	73	73
# Research Hours on Site	13	11.5	10.5	4	6	11	10	10	5	3	6.5	4	3
# Individual Butterflies Counted	541	635	395	47	183	612	171	199	237	92	87	154	160
# Individuals / Research Hour	41.6	55	37.6	12	3	5.6	17	20	47	30	12.6	38.5	53
# Species / Research Hour	2.5	4	3.4	2.1	4	3	2.6	2.9	5	4	3	5	5.7

G. Sherwood Road - Caribou Ranch -

Caribou, Sherwood Road	2023	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	7	7	7	8	8	8	8	9	9	9	9	9	
		/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
		1	1	2	9	1	2	2	6	1	2	2	1	2	1	1	2	2	3	1	1	2	3	7	8	1	2	2	
		0	7	9	6	1	6		4	3	5								0	5	6	3	0				8		
<i>Parnassius smintheus</i>	Rocky Mountain Parnassian									1			1	3	1	1	1	2	1	4	1	1							
<i>Battus philenor</i>	Pipevine Swallowtail																												
<i>Papilio polyxenes</i>	Black Swallowtail																												
<i>P. zelicaon</i>	Anise Swallowtail							2		1		1		1	1		1												
<i>P. rutulus</i>	W. Tiger Swallowtail									2	1	7	3	1	3	2	1	1			1								
<i>P. eurymedon</i>	Pale Swallowtail									2	1	3			1	2	1	1											
<i>P. multicaudata</i>	Two-tailed Swallowtail																												
<i>Neophasia menapia</i>	Pine White																					1	3	4	1	1			
<i>Pontia sisymbrii</i>	Spring White																					1	9	5	1	3			
<i>Pontia protodice</i>	Checkered White									3	2	3	1					4	2		7	2							
<i>P. occidentalis</i>	Western White																												
<i>Pieris rapae</i>	Cabbage White												3				2	3	2			2							
<i>P. marginalis</i>	Margined White																			1									
<i>Euchloe ausonides</i>	Large Marble								3	4	5	3																	
<i>Anthocharis julia</i>	Julia Orangetip				2	5	8	5	4	5	4		1	2															
white sp.				1		1	1	2	2	9	4		5	3		1	2	3		1	3	3	2						
<i>Colias philodice</i>	Clouded Sulphur							1	1	3										1		3	1	2	1	1			
<i>C. eurytheme</i>	Orange Sulphur						2	1		3	3	1		2	5	2	1	5	2	2	1	7	2	4	3	9			
<i>C. alexandra</i>	Queen Alexandra's Sulphur													1	3	9	5	9	6	1	1								
<i>Phoebis sennae eubule</i>	Cloudless Sulphur																												
sulphur sp.								1																2	1				
* <i>Eurema mexicana</i>	Mexican Yellow											2	1																

Caribou, Sherwood Road	2023	4 / 1 0	4 / 1 7	4 / 2 9	5 / 9 6	5 / 1 2	5 / 2 6	6 / 6 4	6 / 1 2	6 / 2 3	6/ 2 5	7/ 1	7/ 2	7/ 1 1	7/ 1 6	7/ 2 2	7/ 2 7	7/ 3 0	8/ 1 5	8/ 1 6	8 / / 2 3	8/ 3 0	9 / / 7	9 / / 8	9 / / 1 7	9/ 2 2	
<i>Abaeis nicippe</i>	Sleepy Orange									1																	
<i>Nathalis iole</i>	Dainty Sulphur												1	1				1	3			6	5	3	2		1
<i>Tharsalea editha</i>	Edith's Copper															5		1	1								
<i>Lycaena rubidus</i>	Ruddy Copper																						2		1		
<i>Tharsalea heteronea</i>	Blue Copper															1			1	2	1						
<i>Lycaena helloides</i>	Purplish Copper													4		1		2	2	1	2	2					
<i>Callophrys affinis homoperplexa</i>	Western Green Hairstreak							3		2	1		2														
<i>C. sheridanii</i>	White-lined Green Hairstreak				3																						
<i>C. spinetorum</i>	Thicket Hairstreak										2							1	1								
<i>C. augustinus</i>	Brown Elfin				1		3		3	3	1			1													
<i>C. polios</i>	Hoary Elfin					1 1	9	9	1 3	5	5	2	1	3													
<i>C. eryphon</i>	Western Pine Elfin				3	4		3	1 1	3	4	4															
elfin sp.																											
<i>Satyrium saepium</i>	Hedgerow Hairstreak																						1				
<i>Strymon melinus</i>	Gray Hairstreak																		1	1		1					
<i>Cupido amyntula</i>	Western Tailed-Blue								2	1	5		1	2	1				2	1		1					
<i>Celastrina echo sidara</i>	Echo Azure						3	2	4	1	1	2															
<i>C.e. marginata</i>	Sub-species marginata					1																					
<i>C.e.lucia</i>	lucia form																										
<i>Glaucopsyche pius</i>	Arrowhead Blue																										
<i>G. lygdamus</i>	Silvery Blue					2	1	4	9	4	5	2	2	3													
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted-Blue												1	1 2	1 9	5	9		5								
<i>Echinargus isola</i>	Reakirt's Blue																		2	1	2	1		1			
<i>Plebejus melissa</i>	Melissa Blue																						1				

Caribou, Sherwood Road	2023	4 / 1 0	4 / 1 7	4 / 2 9	5 / 9 6	5 / 1 2	5 / 2 6	6 / 6 4	6 / 1 2	6 / 2 3	6/ 2 5	7/ 1	7/ 2	7/ 1 1	7/ 1 6	7/ 2 2	7/ 2 7	7/ 3 0	8/ 1 5	8/ 1 6	8 / / 2 3	8/ 3 0	9 / / 7	9 / / 8	9 / / 1 7	9/ 2 2	
<i>P. saepiolus</i>	Greenish Blue										2	1		1		4					1	1					
<i>P. icarioides</i>	Boisduval's Blue													2	2	3	4	4	1	2							
<i>P. lupini lutzi</i>	Lupine Blue												1	4	3	4	2	3	4		1						
<i>P. glandon rustica</i>	Arctic Blue										1	8		3	3	4	1	3	2	4		1		2		1	
blue sp.						1	1	4	2	8	5	8	6	7	1	6	4	5	3	3		2					
<i>Euptoieta claudia</i>	Variigated Fritillary								1	2	2	1	1	3		1		2			1	1		2		1	
<i>Argynnis aphrodite</i>	Aphrodite Fritillary																										
<i>A. atlantis</i>	Atlantis Fritillary																										
<i>A. edwardsii</i>	Edwards' Fritillary																		1								
<i>A. coronis</i>	Coronis Fritillary																										
<i>A. hesperis</i>	Northwestern Fritillary																										
<i>A. mormonia</i>	Mormon Fritillary																				2			1			
Fritillary sp.									2					1					1	2		1	1				
<i>Poladryas arachne</i>	Arachne Checkerspot															1											
<i>Chlosyne gorgone</i>	Gorgone Checkerspot																										
<i>C. nycteis</i>	Silvery Checkerspot												1	1		3											
<i>C. palla</i>	Northern Checkerspot											1	4	9	6	1	9	5	2								
<i>Phyciodes pallida</i>	Pallid Crescent																										
<i>P. tharos</i>	Pearl Crescent																										
<i>P. coccyta</i>	Northern Crescent													4	2	2	1	8	1	2		1	1	1			
<i>P. pulchella</i>	Field Crescent								2	1	1	2	2	1						1				1	1	5	
<i>Euphydryas anicia</i>	Variable Checkerspot																										
<i>Polytonia faunus</i>	Green Comma			1	1	2															1	4			1	2	
<i>P. gracilis</i>	Hoary Comma	5	3	4	5	4	3		1	1	1		1			1					1	3	1	1	2	1	
<i>P. satyrus</i>	Satyr Comma																										
comma sp.																						1					
<i>Junonia coenia</i>	Common Buckeye														1												1

Caribou, Sherwood Road	2023	4 / 1 0	4 / 1 7	4 / 2 9	5 / 9 6	5 / 1 2	5 / 2 6	6 / 6 4	6 / 1 2	6 / 2 3	6/ 2 5	7/ 1	7/ 2	7/ 1 1	7/ 1 6	7/ 2 2	7/ 2 7	7/ 3 0	8/ 1 5	8/ 1 6	8 / / 2 3	8/ 3 0	9 / / 7	9 / / 8	9 / / 1 7	9/ 2 2	
<i>Nymphalis californica</i>	California Tortoiseshell																										
<i>Aglais milberti</i>	Milbert's Tortoiseshell																										
<i>Nymphalis antiopa</i>	Mourning Cloak	2	1 0	7	7	5	8	2	1	1	3	1			1							1	1	1	3	3	3
<i>Vanessa atalanta</i>	Red Admiral																			2		1	1	1	3	1	1
<i>V. cardui</i>	Painted Lady				2	2	4	1	1	2	3	5	1	1	5	6	6	3	6	7		7	3	6	5	1	3
<i>V. virginiana</i>	American Lady																				2	1					
<i>Danaus plexippus</i>	Monarch																										
<i>Limnitis weidemeyerii</i>	Weidemeyer's Admiral															1	4		1						1		
<i>Coenonympha tullia ochracea</i>	Common (Ochre) Ringlet										5		8	5	9	8	2		3								
<i>Cercyonis pegala</i>	Common Wood-Nymph																										
<i>C. oetus</i>	Small Wood-Nymph															1	9	1	3	1	3	2	1	2	7	4	
<i>Erebia epipsodea</i>	Common Alpine											1															
<i>Oeneis chryxus</i>	Chryxus Arctic																										
<i>O. uhleri</i>	Uhler's Arctic																										
<i>Cecropterus pylades</i>	Northern Cloudywing																										
<i>Erynnis icelus</i>	Dreamy Duskywing								3	4	5	4			5	4		2	1								
<i>E. pacuvius</i>	Pacuvius Duskywing										1		1						1								
<i>E. persius</i>	Persius Duskywing						1	4	8	1	1	3	8	4	4	2	1										
Duskywing sp.										3	1		1		3			1									
<i>Cecropterus pylades</i>	Northern Cloudywing																										
<i>Thorybes mexicana</i>	Cloudywing Mexican																										
<i>Pyrgus ruralis</i>	Two-banded Checkered-Skipper				8	5	5	4	2			1															

Caribou, Sherwood Road	2023	4/10	4/17	4/29	5/6	5/13	5/20	5/27	6/3	6/10	6/17	6/24	7/1	7/8	7/15	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/9	9/16	9/23
<i>Burnsius communis</i>	Common Checkered-Skipper									2										9		9	2	2	
<i>Piruna pirus</i>	Russet Skipperling														2	1	1								
<i>Oarisma garita</i>	Garita Skipperling													4	2		2								
<i>Hesperia juba</i>	Juba Skipper																								
<i>H. colorado</i>	Western Branded Skipper																			2	1		1	1	
<i>H. colorado ochracea</i>	Ochre Branded Skipper																								
<i>H. pahaska</i>	Pahaska Skipper																								
<i>H. viridis</i>	Green Skipper																								
<i>H. nevada</i>	Nevada Skipper										2														
<i>Polites draco</i>	Draco Skipper								1	1					2										
<i>P. mystic</i>	Long Dash																								
<i>Lon taxiles</i>	Taxiles Skipper																								
<i>Ochlodes sylvanoides</i>	Woodland Skipper																			6	1	7	7	3	
<i>Euphyes vestries</i>	Dun Skipper																								

70 Research Hours 101 Volunteer Hours for Boulder County

**G. Caribou Ranch – Sherwood Transect**

Date, time, temp. sky, wind	Location	Butterfly Behavior	Researcher
4/10/2023, 11:30 –1:15 pm 11-16 °C Sunny breezy blue sky	Sherwood Transect	Cloaks and Commas at the seep.	Venice Kelly
4/17/2023 11:40-1:30 pm 8-10 °C 80%blue sky windy with strong gusts	Sherwood Transect		Venice Kelly
4/29/2023 11:40-2:30 p.m. 8-10 °C 25- 70% cloud	Sherwood Transect		Venice Kelly

5/9/2023 10:15-12:30 p.m. 10 °C 20% clouds-increasing breezy	Sherwood Transect		Venice Kelly
5/16/2023 9:40-12:30 p.m. 10-16 °C Windy 15-20 mph 10% to 30%clouds	Sherwood Transect	Butterflies puddling, Green Comma nectaring on candytuft; Chasing behavior two-banded skippers	Venice Kelly
5/21/2023 10:45-12:50pm 11-14 °C , 20-40% cloud Breezy	Sherwood Transect	Male Orangetips patrolling, Brown Elfins fresh. Cloak guarding territories chasing anyone doming neat	Venice Kelly Jeff MacLachlan
5/26/2023 9:30-11:30 am 11-13 °C 30-75% cloud cover, windy/	Sherwood Transect	Butterflies drop into grass when the sun is covered. Sulphur and lady were hiding in grass.	Venice Kelly
6/6/2023 9:15-12:00 13-16 °C Clouds building, breezy	Sherwood Transect	Puddling, chasing. Dreamy duskywing and w. tailed blues interacting.	Venice Kelly
6/14/2023 9:30-12:00 p.m.10-16 °C Windy 20% cloudy	Sherwood Transect	Windy sending butterflies to the ground.	Venice Kelly
6/23/2023 9:30-2:30 p.m. 16-21 °C 40%cloud with breaks of sun	Sherwood Transect		Venice Kelly Wynne Whyman Richard Holmes
6/25/2023 9:45-12:15 p.m. 18-19 °C Clear, no wind	Sherwood Transect	Puddling, Tiny Perseus	Amy Chu Cathy Comstock Chris Friedman Jan Chu Jean Morgan Sue Hirschfeld Venice Kelly
7/1/2023 10:15- 1:30 p.m. 60-70 % sun	Caribou Open Space		Venice Kelly
7/2/2023 10-12:30 p.m. 20 °C 50% cloud cover	Sherwood Transect	1 <sup>st</sup> Mexican yellow on Sherwood.	Venice Kelly
7/11/2023 20-26 °C Blue sky 100% Quite breezy	Sherwood Transect	Ladies may be in second generation locally. New-mid-summer species showing up..	Venice Kelly
7/16/2023 9:45-11:30 pm 24-26 °C, Blue sky	Caribou to large meadow and the marshy area.	Buckeye, a surprise. Two tigers were flying together then stopped for refreshments. First Reakirt's of the season	Venice Kelly Richard Holmes
7/22/2023 9:30-12:30 pm 18-23 °C 30% cloud cover, slight breeze	Sherwood Transect many blooming sedum	Edith Copper and Blue, Purplish, showing for the first time this season. Courtship flights. Nectaring on sulphur and asters.	Venice Kelly
7/27/2023 9:30-11:45 am 21-26 °C windy 90% blue sky	Blue Bird Mine Caribou Open Space	blues chasing and doing the "getting to know" one another circling high. Weidemeyer's patrolling along the road. lack of fritillaries this year	Venice Kelly

7/30/2023 9:40-12:30 pm 21-26 °C sunny	Sherwood Transect	Garita ovipositing on grass	Venice Kelly
8/15/2023 10:00-12:30 pm 21-26 °C 90% blue sky, calm	Sherwood Transect	Wood-nhmphs courting and fluttering.	Venice Kelly
8/16/2023 10:00-1:30 pm 24-28 °C Sunny, breezy	Bluebird Mine		Venice Kelly Wynne Whyman
8/23/2023 9:30-12:30 pm 23 °C 30% clouds to 100%	Sherwood Transect	Am Lady, Mormon, Woodland Skipper showing up the first time this summer. Dainty Sulphurs in good numbers	Venice Kelly Monica Tymcio
8/30/2023 9:45-2:143 pm 21-27 °C Sunny, breezy	Sherwood Transect		Venice Kelly John Barr
9/7/2023 9:30-11:45 am 17-21 °C mostly clear, windy	Sherwood Transect		Chris Freidman Linda Hardesty Amy Chu Jan Chu Venice Kelly
9/8/2023 9:45 – 1:00 pm 15-26 °C blue sky, breezy to windy	Sherwood Transect	Many male pine whites, three females. Many nectaring on same flower	Venice Kelly
9/17/2023 12:30-2:30 pm 21 °C sunny, breezy	Sherwood Transect	Few butterflies near gumweed and purple asters blooming. Skipper, Cloak and Comma at seep.	Venice Kelly Steve Miller
9/22/2023 11:45-2:30 pm 14-18 °C sunny, breezy	Sherwood Transect	pine whites still flying and nectaring on blooming yellow asters. Orange sulphurs at seep puddling in mud. Unexpected arctic blue	Venice Kelly

### G. Caribou Ranch - Sherwood Transect (Concluded)

<b>Caribou Ranch-Sherwood Road</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
# Species Identified in Caribou Ranch	48	48	40	20	46	28	38	47	55	50	59	61	65	64	71	70	68
Cumulative # Species Sighted in Caribou	75	75	80	80	81	82	83	83	84	85	86	88	88	95	97	98	98
Research Hours on Site	10	12	8.5	6	12.5	8	8	14	15	10	27.5	43	53	57.5	71.5	73.5	70.5

Individual Butterflies Counted	358	647	278	145	488	304	361	752	587	657	770	1071	2336	1692	2080	2092	2043
Individuals /Research Hour	36	54	33	24	39	38	45	54	39	65	28	25	44	29	29	28.5	29
Species/ Research Hour	4.8	4.0	4.7	3.3	3.7	3.5	4.8	3.4	3.6	5.0	2.0	1.0	1.2	1.1	1.0	1.0	1.0

## Appendix A.

### Effects of Global Change on Diversity of Lepidoptera and on their trophic interactions with birds and bats.

Information from Butterfly Inventories over seventeen years at seven Boulder County Open Spaces was contributed to this Global Change study by Jan Chu 2022. We are anticipating a final report in the future.

The project has currently access to 92 Lepidoptera monitoring time series from 42 countries, bird monitoring time series from 26 countries.

“Species richness of Lepidoptera shows an increasing trend across years, and this effect is statistically supported (“significant”) for Lepidoptera as a whole and for butterflies, but not for moths. On the other hand, abundance has declined over time both for Lepidoptera overall and for butterflies and moths separately, but these declines are not statistically supported – i.e. are not statistically different from zero at the 95% credibility level. For both species richness and abundance, the trends are stronger for moths than for butterflies, although the moth estimates are statistically not different from zero.”

The core research team:

Dr. Sami Kivelä (University of Oulu)

Prof. Thomas Merckx (Free University of Brussels (VUB))

Dr. Laura Antão (University of Helsinki)

Prof. Tomas Roslin (University of Helsinki, Swedish University of Agricultural Sciences)

Dr. Mira Kajanus (University of Jyväskylä)

Dr. Tuomas Kankaanpää (University of Oulu)

Dr. Jere Tolvanen (University of Oulu)

M.Sc. Mahtab Yazdanian (University of Oulu)

Personal email: October 3, 2023. Dr. Sami Kivela, University of Oulu.