[redacted]

29 October 2025

Alana Solman, CAO
The Township of North Kawartha
280 Burleigh Street
Box 550
Apsley, Ontario, K0L 1A0

Dear Ms. Solman

I am pleased to provide you again this year with a copy of the results of the 2025 Petroglyphs Butterfly Count for the information of the Township. This count is sponsored by the Peterborough Field Naturalists.

Last winter a Trent University student completed an analysis of the first 25 years of this count. A copy of her final report and the article which appeared in the newsletter of the Peterborough Field Naturalists in also enclosed.

Yours very truly

[redacted]

Martin Parker
Count Compiler

Twenty-five Years of Butterfly Counts

Submitted by Shannon Taylor

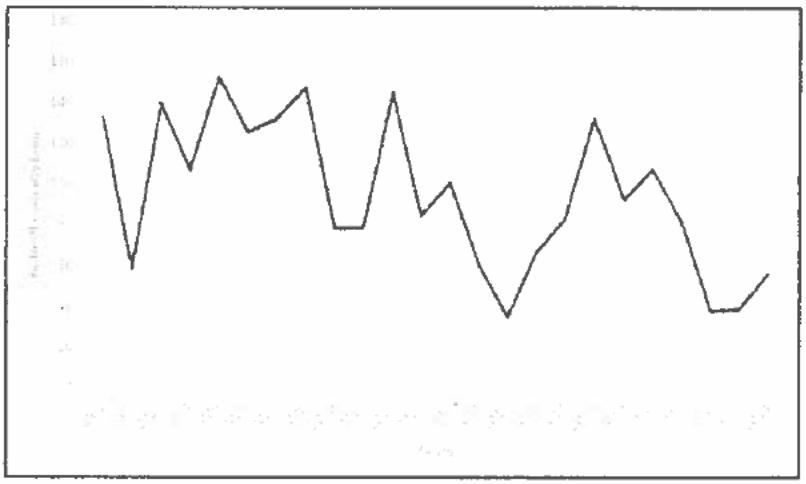
I am a fourth-year undergraduate student majoring in conservation biology at Trent University. As part of my placement for the conservation biology course, I was able to do an internship with the Peterborough Field Naturalists working with the Petroglyphs Butterfly Count.

The Petroglyphs butterfly count is an annual count conducted by volunteers in July. The first count started back in 1998, and it has been run for 25 years. For my internship, I looked at the abundance of each species, population trends, and possible factors influencing variation in numbers between years. Across these 25 counts, 78 different species totalling over 95,000 individuals were counted. The most abundant species is the Dun Skipper with over 41,000 counted.

This long-term data can be used to identify changes in the butterfly community over time. For example, the count data picked up the arrival of the Wild Indigo Duskywing, which first appeared in 2021. It had not previously been seen in the area, but it is now shifting its range following the spread of its host plant.

This data can also be used to pick up on trends. The number of individual butterflies per party hour cycled through high and low years (see Table 1), but there appears to be a general decrease in count numbers over time. The reason why there are less butterflies during counts could potentially be due to population declines or butterflies shifting their flight timing.

Table 1: Total butterflies per party hour for each count excluding 1998 since it was held at a different time of year.



I decided to investigate temperature and precipitation as potential factors driving butterfly numbers. Looking at summer and spring temperatures and precipitation, there were no strong correlations with total butterflies per party hour, so I decided to investigate the potential influence of degree days.

Degree days are the total accumulated heat units above a threshold temperature. They are often used in agricultural and insect studies. I calculated degree days using RStudio and found that butterflies per party hour and degree days exhibited similar patterns suggesting there could be a link between them. More frequent hotter days could lead to a change in the abundance of butterflies or what time of year we see them.

Future work can investigate further into degree days or into other potential factors influencing count numbers, such as mowing schemes near the date of the count, or the length and severity of winter. Butterflies have a variety of overwintering strategies, and this could result in them being affected differently with more mild and shorter winters.

I appreciate the opportunity to work with the PFN and would like to thank Martin Parker and Sue Paradisis for being my supervisors for this project. I learned a lot about working with datasets and about various butterfly species. I think the Petroglyphs Butterfly Count, and the many counts like it that occur across North America, are amazing opportunities for us to learn more about butterflies through the hard work of volunteers. I look forward to participating in the 2025 Petroglyphs Butterfly Count!

25 years of the Petroglyphs butterfly count

Shannon Taylor

For my 2024-2025 academic year at Trent University, I completed a project working with the Peterborough Field Naturalists as part of my placement in Conservation Biology course. During my 4th year of my Conservation Biology degree, I did my project working with the 25 years' worth of data for the Petroglyphs butterfly count.

The Petroglyphs butterfly count is one of many that occur across Mexico, the US, and Canada. These counts are organized by the North American Butterfly Association (NABA). Their purpose is to gather information on butterfly populations and distributions, and to get people involved. The first count in Petroglyphs was back in 1998, and from 2001 onward there has been a count held every year.

I looked for any trends or patterns in count numbers to see how and why populations might be changing. To start off my project, I compiled all 25 years into excel, updating the data with the missing years and the yet to be entered years. I looked for trends in butterfly counts, looked at relative abundances and community structure, and investigated potential effects of weather on counts. For my weather analyses I looked at temperature highs, means, and lows, precipitation, and degree days.

Data modifications and adjustments

Before running any analyses, I made a few modifications to the data. The first one was to account for the difference in sampling effort. Higher sightings could be due to more extensive searching as this is not consistent year to year. To account for this, I used total party hours and ran analyses using butterflies per party hour instead of the raw numbers. The exception to this was for my calculations of relative abundance.

The second adjustment I made was removing 1998. I would have liked to include this count; however, it was done in late June, and all other counts were done the third week of July. Since it is at a different time of year it makes it hard to compare with the other counts as there could be different butterflies and abundances at separate times of the year based on individual species flight periods. Only one species was exclusively sighted in 1998, and this was the Harris' Checkerspot. 1998 was still counted for my calculations of abundance but was not used for my weather calculations.

Another modification I made was lumping immatures with adults for the three species where immatures were counted, Viceroys, Monarchs, and American Ladies. I did this instead of removing immatures from analyses because they still represent individuals of their respective species and were recorded as present. I specified for these species that the numbers include immatures.

Additionally, I merged all yellow swallowtail species together. This is due to the identification of the Mid-summer tiger swallowtail. It was not previously classified as its own

species so we cannot say for sure that yellow swallowtails had properly been classified in past counts.

For my weather analyses, I used average maximum, mean, and low temperatures for each month March to July from 2001 to 2024. From the stations I used the monthly averages for each of these for testing correlations, but for calculating degree days I needed daily temperatures and unfortunately there were several years with missing days. I estimated missing daily temperatures by calculating the average of the two closest dates before and after where data was available.

Analyses

I calculated the total number of butterflies in total and for each individual species. I then sorted species by most prevalent. In total, there were 78 different species present. The most abundant species was the Dun Skipper with over 41000 individuals counted in total. The least abundant species were the Early Hairstreak and the Indian Skipper with only one individual each after 25 years' worth of counts.

Table 1 Top 10 most abundant species and their total counts over 25 years.

	total
Dun Skipper (*Euphyes vestris*)	41654
European Skipper (*Thymelicus lineila*)	8505
Broad-winged Skipper (*Poanes viator*)	7040
Northern Crescent (*Phyciodes cocyta*)	6915
Monarch immatures and adults (*Danaus plexippus*)	4988
Columbine Duskywing (*Erynnis lucilius*)	1849
Aphrodite Fritillary (*Speyeria aphrodite*)	1685
Mulberry wing (*Poanes massasoit*)	1663
Eyed Brown (*Satyrodes eurydice*)	1614
Great Spangled Fritillary (*Speyeria Cybele*)	1496

Table 2 The 11 least abundant species and their counts over 25 years.

	total
Black Swallowtail (*Papilio polyxenes*)	7
Dreamy Duskywing (*Erynnis icelus*)	7
American Copper (*Lycaena phlaeas*)	6
Tawny Crescent (*Phyciodes batesii*)	5
Harvester (*Feniseca tarquinius*)	3
Harris's Checkspot (*Chlosyne harrisii*)	3
Common Sootywing (*Pholissore catullus*)	3
Milbert's Tortoiseshell (*Aglais milberti*)	2
Common Roadside Skipper (*Amblyscirtes vialis*)	2
Early Hairstreak (*Erora laeta*)	1
Indian Skipper (*Hesperia sassacus*)	1

Butterflies per party hour fluctuated year to year with numbers cycling through high and low years. There does seem to be a slight overall decline in butterfly numbers on the count. It is important to know though this could be due to butterflies shifting the timing of their flight and not necessarily a decline in the population.

The relative abundances of each group were calculated using the total butterflies caught that year. I looked at these abundances for Swallowtails, Sulphurs and Whites, Copper Blues, Brushfoot species, and Skippers. The five groups showed no difference in the long run in relative abundance, though year to year they fluctuated. The most abundant group was Skippers, followed by Brushfoot species; Copper Blues and Sulphurs and Whites were similar in abundance, and Swallowtails were the least abundant.

I wanted to investigate what is driving fluctuations in butterfly counts and looked at different weather variables. I used weather information from the stations that have been located at the Peterborough Airport. These were used as they were the closest stations where the location remained relatively unchanged over the years. I looked at the following weather variables:

a) Mean temperature the day of the count
b) Mean temperature of July (up to and including the day of)
c) March-July total precipitation
d) March-April precipitation
e) May-July precipitation
f) March-April:
    a. Average high temperature
    b. Average mean temperature
    c. Average low temperature
g) May-July:
    a. Average high temperature
    b. Average mean temperature
    c. Average low temperature

For each of these I tested for correlations with butterfly counts. There were no strong correlations between these weather variables and the 5 major groupings of butterflies. On the species level, there were a few strong correlations. There were two strong positive correlations and six strong negative correlations. For this report I considered a strong correlation as one with a correlation coefficient of ≤ -0.6 or ≥ 0.6.

Table 3 Strong correlations (coefficient ≤ -0.6 or ≥ 0.6) between individual species and weather variables and the respective correlation coefficients.

Species	Weather variable	Correlation coefficient
Aphrodite Fritillary	Average temperature the day of	0.62
Viceroy (immatures + adults)	March-April average high temperature	0.64
Northern Pearly-eye	May-July average high temperature May-July average mean temperature	-0.68 -0.61
Eyed Brown	May-July average high temperature May-July average mean temperature	-0.65 -0.60

European Skipper	May-July average high temperature May-July average mean temperature	-0.67 -0.61

I calculated degree days using the single sine method through the program R with the package Degday. The number of degree days and the total butterflies per party hour did not match up numerically, however, they exhibited similar patterns of fluctuation suggesting there could be a link between the 2.

For future work it would be interesting to look further into other factors that could be influencing counts. A few things to look at could be the mowing scheme. There would likely be less butterflies the day of the count if there are no flowers on the routes that volunteers follow. Another area to investigate could be the length and severity of winter. Butterflies have a variety of overwintering strategies, and this could result in them being affected differently with more mild and shorter winters.

Excel document

The excel document attached titled "Petroglyphs butterfly count 1998-2024" contains the following:

- The 78 species listed from most to least abundant
- Measures of sampling effort for each year
- The weather variables I used and their calculations
- The degree days for each year for monarchs and for the other butterfly species
- The numeric date for each count
- Graphed data
- A copy of the raw data
- The calculated relative abundances for each of the 5 groups
- Correlation coefficients for the 5 groups and each individual species

Date - 19 July 2025...	Park Stoney L.	Nephton Trai;	Kawartha Ski Trails	Sandy L. Road South	Sandy L. Road North	Cty. Rd.46 North	McCoy Road	Forest Access Rd	Western Jack Lake	**Total**
Black Swallowtail		1							1	2
Midsummer Tiger Swllowtail	3		1	1	1	6	11		20	43
Mustard White							1			1
Cabbage White		1	3	1	2	2				9
Clouded Sulphur	9	3	4	3	4	4		9	9	45
Orange Sulphur						1				1
Pink-edged Sulphur				4						4
Bog Copper				1	4					5
Early Hairstreak										
Acadian Hairstreak				3						3
Coral Hairstreak	1	3		19	10					33
Banded Hairstreak			1	1						2
Striped Hairstreak		2								2
Gray Hairstreak	3	10	2	34	13	4	1	2		69
Eastern Tailed Blue		5			2		3		1	11
Northern Azure		1			1					2
Summer Azure				3	1					4
Great Spangled Fritillary	1	3	1		5	3	1	5	1	20
Aphrodite Fritillary	2	6		8	16	5		5		42
Atlantis Fritillary								3		3
Silver-bordered Fritillary		1		3						4
Tawny Crescent										
Pearl Crescent	2	3		87	17	19	70	6		204
Northern Crescent	30	16	6	1	3		57	24	19	156
Eastern Comma		1						1		2
Green Comma										
Gray Comma								1		1
Mourning Cloak							1	2		3
American Lady							1	1		2
White Admiral		1		2	3		3	10	3	22
Viceroy	1	1			3	1		1	2	9
Northern Pearly-Eye	2						2			4
Eyed Brown	1	8		3	11	6		4	4	37
Appalachian Brown			1	4						5
Little Wood-Satyr				29						29

2025 Petroglyphs Butterfly Count -- 19 July 2025

Date - 19 July 2025...	Park Stoney L.	Nephton Trai	Kawartha Ski Trails	Sandy L. Road South	Sandy L. Road North	Cty. Rd.46 North	McCoy Road	Forest Access Rd	Western Jack Lake	**Total**
Common Wood-Nymph	4					1		10		15
Monarch	5	4	3	8	5	12	24	10	13	84
Silver-spotted Skipper	2	1							2	5
Dreamy Duskywing							3			3
Northern Cloudywing									4	4
Columbine Duskywing	74	4	2	32	16		35	103	6	272
Wild Indigo Duskywing	71	5				1	5		2	84
Delaware Skipper	1	1	1	7	15	5	3	7	1	41
Least Skipper	1	2	1	2	6	7	6		15	40
European Skipper							1	2	2	5
Peck's Skipper	1	1		4			1	1	1	9
Tawny-edged Skipper	1				1					2
Crossline Skipper	1	5	2	2	1		1	4		16
Long Dash				2			1	1		4
Northern Broken-Dash	10	6	3	3	6	3	28	1	1	61
Little Glasstwing			1			2			1	4
Hobomok Skipper									1	1
Mulberry Wing		2			10			14	2	28
Broad-winged Skipper	1	15		87	51	8		6		168
Dion Skipper		2		4	3			3		12
Two-spotted Skipper				1			1			2
Dun Skipper	82	40	40	255	170	73	206	61	125	1052
Unidentified										
Fritillary Sp.				2	1	4				7
Swallowtail Sp										
Brown)Lethe) Sp.		1								1
Skipper Sp					1	4			5	10
Duskwing Sp.		80	5			3				88
White Sp.					1					1
Individuals	309	235	77	616	383	174	466	297	241	2798
Species	24	30	15	30	27	19	22	27	23	54
Monarch Caterpillars				3	8		9		4	24
Viceroy Caterpillar					1					1
Monarch Eggs				2						2

2025 Petroglyphs Butterfly Count -- 19 July 2025

Participants

Park & Stoney Lake
Nephton Trail
Kawartha Ski Trails
Sandy Lake Rd South
Sandy Lake Rd North
County Rd 46 North
McCoy Road
Forest Access Road
North Jack Lake

2025 Petroglyphs Butterfly Count -- 19 July 2025