

2019 Ecological Monitoring Summary

Founded in 2001, the **rare Charitable Research Reserve** is an urban land trust and environmental institute with its headquarters and first four locations comprising over 900 acres in Waterloo Region and Wellington County, Ontario. In 2006, **rare** joined Environment Canada's Ecological Monitoring and Assessment Network (EMAN) to establish long-term ecological monitoring programs for the Blair Site of the **rare** property with the objective of determining the status of **rare's** ecosystems and tracking how they change over time. Since 2006, several ongoing monitoring programs have been established at **rare** and have been carried out in subsequent years. In 2019, ecological monitoring programs occurred for butterflies, plethodontid salamanders, and soil humus decay rates (and see separate report for a summary on Vegetation Sampling Protocol). The following is a summary of highlights from 2019 monitoring programs.

Butterfly Monitoring

Annual butterfly monitoring at **rare** continued in 2019 for fourteen weeks from May 20th to August 23rd. A total of 2615 individual butterflies were observed, from 52 different species. Observed abundances were the lowest ever recorded since consistent monitoring across all weeks and transects began at **rare**. Although it is typical for butterfly numbers to fluctuate, observations of a few species have drastically decreased this year including the Cabbage White and the Clouded Sulphur. These two species combined for 2379 observations alone in 2018, in comparison to 572 in 2019. Several noteworthy observations from the 2019 monitoring season are included below.

Spicebush Swallowtail was observed on the property for the second consecutive year. This observation is significant as **rare** is at the edge of the historical range for this species which is rarely observed in Waterloo Region. A Silvery Checkerspot was observed for the third time this year, with prior observations in 2012 and 2014. Mulberry Wing skipper was observed for the third consecutive year in 2019.

Despite the noticeable decline in abundance, the Cabbage White was still the most commonly observed species, accounting for 19.0% of all observations. The second most abundant species was the Monarch, which made up 14.0% of all observations. Monarch numbers continued to increase this year relative to past monitoring seasons with a total of 367 observed in 2019, up from 171 in 2018. The third most abundant species was the Red Admiral, making up 10.2% of all observations.

After historical data integration last year, 2019 was the first year to have data entered directly through PollardBase, an online platform that allows for easier data tracking, analyzing, and sharing. During the 2019 Annual Butterfly Count, 418 individuals from 38 species were observed.

Plethodontid Salamander Monitoring

Monitoring of lungless (Plethodontid) salamanders occurs at **rare** by turning over pre-placed wooden cover boards in Indian Woods and the Hogsback once a week for nine weeks each fall. Total salamander abundances in 2019 were slightly lower compared to 2018 observations; however, abundances greatly varied between the two forests across the years. Observed abundances in Hogsback fell within threshold levels after falling below those levels in 2018 and the reverse was true for Indian Woods, with abundances falling below threshold levels in 2019. It is worth noting the absence of juvenile salamanders observed in Indian Woods this year and near-absence in the Hogsback, with only a single juvenile observed. This is especially concerning after no juvenile observations were recorded in Hogsback in 2018, and should be closely monitored in subsequent years. Species diversity continued to be low, with both forests being comprised mainly of eastern red-backed salamanders. Yellow-spotted salamanders were observed at both sites and one *Ambystoma* species (blue-spotted/Jefferson) was observed in the Hogsback during monitoring. Non-

target reptile and amphibian species observed during monitoring included American toad, eastern gartersnake, spring peeper, wood frog, Gray treefrog, DeKay's brownsnake, and leopard frog.

Data acquired over the twelve years of consistent salamander monitoring at **rare** has proven to be useful as it provides empirical evidence on temporal changes in salamander abundances and a closer look at the potential impacting factors. Long-term plethodontid monitoring in concert with vegetation sampling, forest health, soil, and bird monitoring can give us a glimpse into the state of our forests at **rare** and any spatial and temporal changes that occur over time. Only by continuing long-term monitoring, can **rare** best assess the impact of land management decisions both on and adjacent to the property.

Soil Humus Decay Rate Monitoring

Changes in decay rates may indicate changes in temperature, moisture, substrate type, nutrient concentrations and availability, litter type and size, and soil organisms. Importantly, increased decay rates over decades can be an indication of climate change, as increased soil temperatures increase decay rates and release of stored carbon. Decay rate monitoring occurred in early November around one of the permanent forest canopy plots in each of the three main forest stands at **rare**. Decay rates are determined by burying wooden tongue depressors below the soil surface and comparing their mass lost over a period of a year to those left on the soil surface. A quantitative analysis for soil decay rates is scheduled for 2020, after 10 years of data collection has been completed.



Photos by Abby Leavens, Kristi Neufeld and Jenna Quinn

Clockwise from top left: Question Mark Butterfly; Blue-spotted Salamander, Giant Swallowtail, Gray Treefrog