

2021 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 2021, ecological monitoring programs occurred for butterflies, plethodontid salamanders, soil humus decay rates, and aquatic monitoring.

The **rare Charitable Research Reserve** acknowledges and is grateful to all of the original stewards of the land in which **rare** resides, within the Haldimand Tract, spanning six miles on either side of the Grand River from source to mouth. Understanding that this land has been rich in diverse Indigenous presence since time immemorial, there are several Indigenous Nations that we would like to mention. We would like to honor and respect the sovereignty of both First Nations in our area: the Haudenosaunee Peoples of Six Nations of the Grand River and the Anishinaabe Peoples of Mississaugas of the New Credit First Nation. Nia:wen and Miigwech to these Nations who share their lands with us. We would also like to acknowledge the Neutral Peoples (and their ancestors) and the Indigenous Paleo hunters that we have archeological evidence for dating back 1,200 and 10,500 years, respectively. Lastly, we would like to acknowledge those Indigenous Peoples who currently live, work, and learn in the urban landscape around us such as other self-identified and status First Nations, Métis, and Inuit.

The following is a summary of highlights from 2021 monitoring programs.

Butterfly Monitoring

The 14th year of butterfly monitoring at **rare** was carried out for 14 weeks from May 17 to August 19, 2021, with 4389 total individual butterfly observations made. This is an 11% decrease from 2020 and a 34% decrease from the penultimate peak of 6627 in 2018. Individuals consisted of 47 total species, placing 2021 within the 30th percentile of the annual total species at **rare** since 2006. This decrease of diversity is impacted by the absence of species that have been documented consistently over the 14 years of monitoring. Approximately 16% of these regularly observed species were not recorded in 2021.

However, this season documented the recurrence of several species of interest: Baltimore Checkerspot (rare), Compton Tortoiseshell (uncommon), Dion Skipper (rare), Grey Comma (uncommon), Hackberry Emperor (no status), and Spicebush Swallowtail (no status). These species have been observed more frequently since 2018, with 2021 being the sixth monitoring sighting for the Grey Comma, the second sighting of the Hackberry Emperor, and the third sighting for the Baltimore Checkerspot, Compton Tortoiseshell, Dion Skipper and Spicebush Swallowtail since the monitoring program began.

The Cabbage White was the most abundant species of 2021 and remains within the top two most abundant species for the 13th consecutive year. Of the total butterflies observed this season 31% were Cabbage Whites, followed by the Inornate Ringlet (12%), Little Wood Satyr (7%) and Clouded Sulphur (7%). This is consistent with previous years except for the Little Wood Satyr, most often averaging as the sixth most abundant species over 14 years. Other notable changes in

abundance include the European Skipper and Northern Pearly-Eye whose observations were noticeably lower this year.

The Monarch Butterfly, a species at risk in Canada, was observed 193 times this year, a 39% increase from 2020 and still a decline from the peak of 367 individuals in 2019 which is consistent with data from previous years.

Data collected during the 2021 monitoring season was shared to the 'Pollard Base' database, an online platform that allows for easier data tracking, analyzing, and sharing. The 2021 Annual Butterfly Count occurred with limited participation due to the ongoing COVID-19 pandemic and saw 444 individuals and 32 total species observed by 4 participants.

Plethodontid Salamander Monitoring

A total of 219 salamanders were observed during the 2021 monitoring season (August 31 – October 26). Monitoring occurred weekly, for nine weeks in two long-term forest plots at **rare Charitable Research Reserve**: Ancient Woods (formerly 'Indian Woods'; 32 artificial cover boards, "ACO") and the Hogsback (20 ACOs). A total of three species of salamanders were observed within the two forests. 100 salamanders were observed in the Hogsback, including two Four-toed salamanders and 98 Eastern Red-backed salamanders (*Plethodon cinereus*) (including 17 lead-backed phase individuals). The remaining 119 salamanders were observed in Ancient Woods, comprised of 115 Eastern Red-backed salamanders (including 14 lead-backed phase individuals), and 4 Spotted salamanders (*Ambystoma maculatum*). No salamander mortalities occurred throughout monitoring activities, and all individuals were released alive back under cover boards following monitoring. Non-target reptile and amphibian species observed during monitoring included American Toad, Eastern Gartersnake, and DeKay's Brownsnake.

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. Quantitative analysis was completed in 2020 and is scheduled to be repeated in 2025.

Aquatic Monitoring

The aquatic monitoring program at **rare** was implemented to examine the ecological health of the creeks and wetlands on the Blair property. A benthic macroinvertebrate monitoring program was piloted at **rare** in 2006, and is now repeated every three years. In 2021, seven sites were sampled on Cruickston Creek and five sites were sampled along Bauman Creek in both spring and fall. Dry conditions prevented sampling from Newman Creek and Blair Flats in 2021, and Preston Flats was sampled exclusively in the fall. Ekman grab samples and surber samples were used at most sites, however when conditions were unsuitable a D-net was used to collect a kick-sweep sample. Once sampling was complete, air temperature, water velocity and stream depth and width were recorded on field data sheet. Dissolved oxygen (DO), pH, water temperature and conductivity were also measured. Visually, macrophyte and algae abundance was recorded in addition to substrate

description and water clarity/color. Samples were preserved in formalin and sieved before being sorted. Using a dissecting microscope, all organisms found were identified to the OBBN 27 coarse-level benthic groups. Once sorted, individuals were placed in 70 per cent ethanol solution.

Water samples were collected in June and September 2021 from water quality sites in **rare** waterbodies and were tested for total organic carbon, nitrate, chloride, and heavy metals in partnership with Wilfrid Laurier University. Complete data analysis is planned for 2026.



Photos (clockwise from top left): Spotted Salamander (J. Quinn), Silvery Blue Butterfly (J, Labelle), soil stick after one year on forest floor (J. Quinn).