

2017 Ecological Monitoring Summary

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The **rare Charitable Research Reserve** is a 900+ acre urban land trust and environmental institute in Waterloo Region/Wellington. In 2006, **rare** joined Environment Canada's Ecological Monitoring and Assessment Network (EMAN) to establish long-term ecological monitoring programs for the 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 2017, ecological monitoring programs occurred for butterflies, plethodontid salamanders, forest health and soil humus decay rates. The following is a summary of highlights from 2017 monitoring programs.

Butterfly Monitoring

Butterfly monitoring occurs at **rare** across four separate transects for fourteen weeks during the late spring and summer. In 2017, 4368 individual butterfly observations were recorded from 53 different species. Observed abundances are much lower than last year's abundances, with large differences in abundances of common butterfly species between years. A decrease in the top two butterfly species observed (Cabbage White and Clouded Sulphur) contributed to a difference of 1184 individuals. Some noteworthy observations are included below.

The first Mulberry Wing skipper was observed during monitoring; previously this species had only been recorded once during an Annual Butterfly Count. An American Snout and a Baltimore Checkerspot were observed during monitoring for the first time since 2012. Grey Comma, Crossline Skipper, and Silvery Blue butterflies, which were originally observed during monitoring in 2015, were observed for the third year in a row. Other species observed in 2017 that are infrequently observed across monitoring years were Coral Hairstreak and Common Buckeye butterflies.

The most abundant butterfly species were Cabbage White, Clouded Sulphur, Inornate Ringlet, European Skipper and Little Wood-Satyr respectively. Cabbage White and European Skipper are both non-native butterflies, and are consistently high in abundance across monitoring years. Monarch butterfly observations were higher this year than the three previous years with 150 observations during monitoring alone. This increase looks positive for monarch butterfly populations; however it is too soon to know whether this increase will be sustained.

During the 2017 Annual Butterfly Count 556 individuals from 36 species were observed. Of note was an observation of an Acadian Hairstreak, which had not been observed since 2008. In 2017 **rare** also joined PollardBase, an online data management and entry system that allows data sharing with other groups that conduct transect walks similar to the protocol at **rare**.

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. Eastern Red-backed Salamanders (*Plethodon cinereus*) were the most abundant species found in both Indian Woods and the Hogsback in 2017 and in every other monitoring year. Overall, observed salamander abundance was higher than last year in both forests, likely due to dry weather conditions in 2016 that are associated with decreased salamander detectability and health. Abundance thresholds were calculated based on the first five consistent and consecutive years of monitoring. Recorded abundances below threshold levels over time

may be indicative of Eastern Red-backed Salamander population decreases. Despite observed increases in abundance from 2016, Eastern Red-backed Salamander abundances in 2017 fell within threshold levels in the Hogsback, and were below threshold levels in Indian Woods. As in the majority of previous years, observed abundances and diversity were higher in the Hogsback.

Two salamander species were observed in the Hogsback this year, Eastern Red-backed Salamanders and Spotted Salamanders. In Indian Woods, only Eastern Red-backed Salamanders were observed. Outside of monitoring, Blue-spotted Salamanders were found under the Education cover boards in Cliffs and Alvars which is the first sighting of any species other than Eastern Red-backed Salamanders in this plot.

The salamander monitoring program acts as a warning sign for environmental change. Below threshold abundances observed in Indian Woods the past three monitoring seasons may be indicative of decreasing populations due to surrounding anthropogenic stressors and highlight the need for continued salamander monitoring at *rare*.

Forest Canopy and Tree Biodiversity Monitoring

The forest canopy and tree biodiversity monitoring program at *rare* occurs in all three major forest areas; the Hogsback, Indian Woods and the Cliffs and Alvars. Three permanent plots are set-up within each area to track changes in the health of the trees within these forests.

A review of the monitoring protocol was conducted in 2017, and it was determined that annual forest canopy and tree biodiversity monitoring would be reduced to monitoring once every five years. Therefore, a full inventory was not conducted in 2017. However, following the tree height monitoring protocol that was developed and implemented in 2016, tree height monitoring occurred in all three forest stands. The goal of the protocol revision was to improve accuracy of tree height measurements, as unrealistic changes in tree height have been documented across monitoring years. The revised protocol was not successful at yielding more consistent tree height measurements, and further consideration is being given to the challenge.

Emerald Ash Borer Monitoring

Emerald Ash Borer (EAB) monitoring was conducted in the Hogsback in 2017, completing a three year pilot study to assess the condition of ash trees, emerald ash borer presence, and the impact of invasive species on native species rejuvenation. The protocol was revised after each trial year to improve data collection efficiency and relevance. In 2017, ash trees made up 19 per cent of trees in plots; the majority of ash trees were black ash, and several were white ash. EAB presence was confirmed in 72% of surveyed ash trees, and 22% were considered at high risk for EAB based on the Emerald Ash Borer risk rating system used in 2015 and 2016 analysis. Considering the overall poor outlook for ash trees on *rare* property, rejuvenation surveys in plots with ash trees should be repeated in following years to monitor the succession of the forest in response to ash tree loss and future canopy openings.

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 forest stand. 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 data analysis was not conducted in 2017 however 2016-2017 decay rates have not increased or decreased notably from previous years. A quantitative analysis for soil decay rates is scheduled for 2020, after 10 years of data collection has been completed.



Photos by Owen Lucas and Allie Abram

Clockwise from top left: Painted Lady; Spotted Salamander; Emerald Ash-Borer D-shaped exit hole; Giant Swallowtail; Eastern Red-backed Salamanders