Emma Cole Project: A 100-year Reassessment of *Grand Rapids Flora (*1901)

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Emma J. Cole, a beloved high school teacher and distinguished botanist in the Grand Rapids area, published *Grand Rapids Flora: A Catalogue of the Flowering Plants and Ferns Growing Without Cultivation in the Vicinity of Grand Rapids, Michigan* (1901). Despite the passing of 115 years and tremendous development in Grand Rapids that has led to drastic changes to the natural landscape, Cole's Floristic inventory remains the most comprehensive study for the area. With that in mind, this project aims to recreate Emma Cole's inventory by discovering and reassessing the sites she described. This will contribute to our understanding of how the development of Grand Rapids over the last century has affected the flora. This project will also lead to the publishing of an updated inventory of Greater Grand Rapids' plant species, thus some locations not described by Emma Cole are included in this project.

Student researchers Lydia Abma and Alan Stockdale inventoried eight locations in Kent County over the course of ten weeks. When sites were visited, all species in flower or fruit were collected, and species not in flower or fruit were noted separately as sight records. Each location was visited multiple times, and the primary locations, Mill Creek Woods, Soldiers' Home Woods, and Bradford Dickinson White Preserve, were visited weekly or bi-weekly. Once the inventories seemed complete for the time period given, the species lists were used to calculate a Floristic Quality Index (FQI). This index is a quantitative measurement; it is obtained by recording the number assigned to each native species a number called a "coefficient of conservatism", finding the average for the site, and then multiplying it by the square root of the total number of plant species (see Michigan's Universal FQA Calculator, http://universalfqa.org). Because FQIs are an indication of the native vegetative quality for an area, they are very helpful in comparing the overall ecological integrity of various locations.

Mill Creek Woods, a rich deciduous woods in Comstock Park, was inventoried extensively by two of Emma Cole's students in 1895 and 1896. After calculating an FQI for both the species lists from 1895-96 and 2016, it was found that the floristic integrity of the area had decreased, but not as dramatically as one might expect over a 121 year period. Some plants, like the Tulip tree (*Liriodendron tulipifera*) and Indian-pipe (*Monotropa uniflora*), were collected both in 1895 and in 2016, but many species collected in 1895 were not found.

Soldiers' Home Woods is also a deciduous forest inventoried by Emma Cole in the late 1800s. While the overall size of the deciduous forest has shrunk due to urban development, the FQI comparison of 2015 and 2016 versus the 1890s indicates only a slight drop in the native species richness with an increase of adventive species. The state threatened species, Rock Cress (*Boechera dentata),* was found in this site, which had also been collected in the 1890s.

Bradford Dickinson White Preserve is made up of a dry oak-hickory forest and a shrub-carr wetland. The area, found off of 36th Street in Lowell Township, was established as a preserve by the Land Conservancy of West Michigan in 2005. This location had the highest floristic quality of all the sites examined. Findings included over 170 native species!

Other sites, such as Kensington Park and Ball-Perkins Park (referred to as Mr. Lowe's woods by Emma Cole), received much lower FQI values. Both sites had been heavily disturbed by nearby development and contained many invasive species. The rare Green Violet (*Hybanthus concolor*) collected in 1892 at Mr. Lowe's Woods could not be relocated.

Through this project, Alan and Lydia have learned how to identify many of the native plants of Michigan, as well as many invasive species, and how to preserve plant collections so that they can be added to the herbaria of Calvin College and MSU. They have also gained useful knowledge about the history of Grand Rapids, how the development in the last 120 years has affected native environments, and the importance of conservation efforts in West Michigan and elsewhere.