

Botanical Inventory Highlights and Management Considerations for Covenant Park: City of Kentwood Parks & Recreation

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In the spring and summer of 2021, Calvin University students and faculty conducted a botanical inventory and assessment of the natural areas in Covenant Park, located at 3724 Shaffer Avenue SE, Kentwood, MI 49512. Given that the property was recently acquired by the City of Kentwood Parks & Recreation, the purpose of this inventory is to inform Kentwood Parks and Recreation staff about the site's floristic quality, diversity, and ecological significance. The specific objectives of this study are to 1) provide a comprehensive inventory of the species of plants occurring on the property, 2) identify particular areas that would benefit from preservation or restoration efforts, and to 3) inform Kentwood Parks and Recreation as they determine what land use activities best fit certain areas within this parcel.

During early spring of 2021, the Calvin University Biology 346 Plant Taxonomy class (taught by Dr. Warners) took on a project to document the spring flora on the park property. Groups of 3 or 4 students were assigned to one of five sections of natural habitat at Covenant Park (see map of parcels below). These sites were visited weekly during April and early May, and botanical lists for each site were initiated.

Subsequently, student researchers with the Emma Cole Project under the Calvin Summer STEM Research Program visited Covenant Park eight times to continue these inventories (May 20, June 2, June 21, June 23, July 6, July 21, August 5, and August 6). During our visits, we carefully walked each of the five remnant parcels, identifying each vascular plant species we could and observing how the flora developed through the season. In addition to keeping detailed field notes and photographs, we documented permanent records of our inventory



by collecting voucher specimens that were deposited in the Calvin University Herbarium with duplicates submitted to the Michigan State University and University of Michigan herbaria.

Background

The botanical inventory of the natural habitats on the Covenant Park property is part of a larger Emma Cole Grand Rapids Flora Project. This is a project led by Dr. Crow and Dr. Warners which, for the past seven years, has studied the work of Emma Jane Cole. Ms. Cole was a highly

respected scientist and teacher at Grand Rapids Central High School around the turn of the 20th century. In 1901 Cole published a book entitled *Grand Rapids Flora: A Catalogue of the Flowering Plants and Ferns Growing Without Cultivation in the Vicinity of Grand Rapids, Michigan*. By carefully reading her book, combing through her correspondences with students and colleagues at the time, seeking out her herbarium specimens, and trying to piece all this information together, we have been delighted to learn a great deal about what the Grand Rapids landscape looked like 120 years ago.

The goal of the Emma Cole Grand Rapids Flora Project is to revisit high quality remnant natural

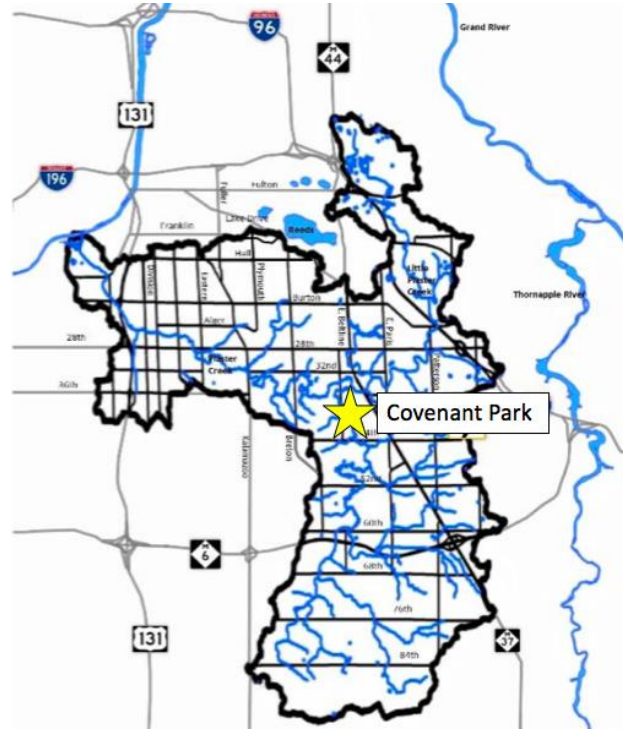


sites that still exist within the 16 townships (585 square miles) covered in Cole's (1901) *Grand Rapids Flora*, especially seeking out those sites of high conservation value that exhibit a pre-settlement character resembling their appearance when Emma Cole studied them. Although we cannot determine if Emma Cole's field work along Plaster Creek included the area currently occupied by the Covenant Park property, we have encountered 101 specimens she or her colleagues collected along Plaster Creek. These collections appear to have been focused on the Plaster Creek-Madison Ave. crossing, at Plaster Creek near

the Paris Town Hall (area around the Kalamazoo Ave. crossing/Ken-O-Sha Park), and Crystal Springs (Plaster Creek crossing at 68th St., just west of Dutton). In the summer of 2021, our field work for the Emma Cole Project included inventories of four sites along Plaster Creek, adding valuable information to inventories already conducted at Ken-O-Sha Park, Paris Park, and Shadyside Park. We are in the process of using these data to compile a checklist of all the current species that occur in close proximity to Plaster Creek to compare with the list we have compiled from Emma Cole's work along the creek. Knowing which species have been gained and lost over time provides critical information for developing effective management and restoration plans as we move into the future.

Plaster Creek and the botanical and ecological contents of its floodplain present a unique case study for how drastically the development of Grand Rapids has altered the area's biodiversity and ecological integrity since the time of Emma Cole. The main channel of the creek, originally known as "Ken-O-Sha" ("Water of the Walleye") is about 14 miles long, and its watershed occupies approximately 58 square miles of southeastern Kent County. Its headwaters are located southeast of Grand Rapids in the agricultural areas of Dutton and Caledonia. The creek then

meanders through present-day Kentwood and into the city of Grand Rapids, moving through commercial, residential, and industrial areas, and eventually emptying into the Grand River about one mile south of the city center. Plaster Creek is classified as one of the most degraded waterways in West Michigan, due in large part to the ecologically uninformed way the watershed was developed over time. While some intact floodplain does still exist in the creek's watershed (like that at the Covenant Park property!), most of the original floodplain has been cleared and developed into residential neighborhoods, commercial properties, or industrial zones. In addition, the impermeable surfaces (parking lots, roadways, rooftops, etc.) that cover much of the watershed today carry large volumes of polluted stormwater runoff into the creek with each rainfall or snow melt event. Especially after these events, the creek carries a high sediment load, toxic levels of *E. coli*, and countless other harmful substances like road salts, pesticides, fertilizers, and hydrocarbons, which have been documented by Calvin University researchers (<https://calvin.edu/plaster-creek-stewards/research/>).



The importance of intact floodplain in the Plaster Creek watershed cannot be overstated. The creek bears scars of repeated decades of careless damage, and much work is needed to restore this creek to any semblance of its pre-settlement condition. One way to uphold the health of the creek is to protect and preserve its remnant floodplain areas where the creek can overflow its banks naturally during times of high volume. In these floodplain areas, as we witnessed firsthand at the Covenant Park property while conducting our research, the creek leaves its main channel, encounters floodplain vegetation, slows down and drops out significant amounts of sediment. Healthy floodplains upstream decrease flooding downstream and reduce the amount of sediment that flows into the Grand River, and eventually, Lake Michigan. Additionally, floodplains can support a rich assemblage of native Michigan plants that not only soak up the excess water, but also add beauty and diversity to the watershed. The Covenant Park property represents an extensive area of floodplain and former floodplain that has great potential for benefitting the water quality of Plaster Creek and enhancing downstream communities of humans and other watershed inhabitants.

Covenant Park Property: Site Description and Inventory Results

Covenant Park occupies 109 acres of land at the southeast corner of the intersection of Shaffer Avenue and 36th Street. Previously known as The Christian Reformed Recreation Center which included Fellowship Greens Golf Course (later renamed “Stormy Creek Golf Course), the park property contains many open grassy areas, but also some remnant forested sections. Plaster

Creek enters Covenant Park from the south, meandering through the property and exiting toward the northwest corner of the park, under an overpass of Shaffer Avenue. Further upstream (southward), the creek's headwaters are located in the agriculturally dominated Gaines Township area south of Dutton; the creek then flows through suburban areas of Kentwood, including Covenant Park, before making its way through the highly commercialized, residential, and industrial areas of southeast Grand Rapids. While much of the creek's natural floodplain in Covenant Park had been converted into fairways, some important remnants of natural areas remain in the park. These natural areas were divided up into 5 parcels, each inventoried independently (see map above). We also generated an overall species list for the 5 parcels collectively to calculate a floristic quality assessment of the entire site.

Throughout our multiple visits to Covenant Park in the summer of 2021, we witnessed the dynamic nature of Plaster Creek's floodplain ecology firsthand. In particular, one notable heavy rain event at the end of June 2021 demonstrated the importance of floodplain habitats for Plaster Creek and its watershed. Between June 24 and 26, the Grand Rapids area received 6.17 inches of rain

(<https://www.weather.gov/wrh/Climate?wfo=grr>). Before the rain event, the creek flowed steadily, but well below its bankfull level. After the rain event, we waited a few days before visiting the site again, thinking we had allowed enough time for the flood waters to recede so that we could navigate the floodplain safely. However, upon arriving at the park, we quickly realized that we would not be able to conduct our research that day because the entirety of the floodplain was still covered in several inches of water! It took over a week for the creek's water level to return to its

pre-flood condition. Even after the flood waters

disappeared, the floodplain bore evidence of that event the rest of the summer: a layer of sediment covered the plants that had been underwater for days during the flood. The two photos included in this section were taken in the same location at different times after the flood event, the first (above) only a few days after the rain (June 28) and the second (left) several days later (July 6).



The intact remnants of forested floodplain in Covenant Park are home to a number of native trees that typically grow in saturated soils, including many beautiful, mature specimens. Of the 30 species of trees we documented in our inventory, 25 are native. Several high-quality tree species were found in the floodplain forests, including silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), 3 species of young ash trees (*Fraxinus nigra*, *F. americana* and *F. pennsylvanica*), black walnut (*Juglans nigra*), black willow (*Salix nigra*), cottonwood (*Populus*

deltoides), sycamore (*Platanus occidentalis*), swamp white oak (*Quercus bicolor*), and American elm (*Ulmus americana*). Additionally, pawpaw (*Asimina triloba*), shellbark hickory (*Carya laciniosa*), and bur oak (*Quercus macrocarpa*) were also identified.

In the less disturbed areas, several native shrubs are present. A total of 18 shrub species were found growing in the forest parcels, 11 of which are native. Some of the less common native shrubs we found are buttonbush (*Cephalanthus occidentalis*), prickly gooseberry (*Ribes cynosbati*), and maple-leaved viburnum (*Viburnum acerifolium*). Willow species (*Salix exigua* and *S. discolor*), staghorn sumac (*Rhus typhina*), wild black raspberry (*Rubus occidentalis*), and common blackberry (*R. allegheniensis*) are frequent along forest edges.

Covenant Park supports a diversity of high-quality native wildflowers, including an impressive display of Michigan's spring flora. In total, 89 species of herbaceous flowering plants were documented in Covenant Park. Among these are Canada anemone (*Anemone canadensis*), cut-leaved toothwort (*Cardamine concatenata*), spring beauty (*Claytonia virginica*), false rue-anemone (*Enemion biternatum*), both yellow trout lily (*Erythronium americanum*) and the less commonly seen white trout lily (*E. albidum*), wood sandwort (*Moehringia lateriflora*), May apple (*Podophyllum peltatum*), skunk cabbage (*Symplocarpus foetidus*), two species of meadow-rue (*Thalictrum dasycarpum* and *T. dioicum*), and three species of violets (*Viola pubescens*, *V. sororia*, and *V. striata*).

Other later-season flowering plants of interest in the natural areas at Covenant Park include swamp milkweed (*Asclepias syriaca*), southern blue flag (*Iris virginica*), cardinal flower (*Lobelia cardinalis*), swamp buttercup (*Ranunculus hispidus*), cut-leaf coneflower (*Rudbeckia laciniata*), the relatively uncommon native water dock (*Rumex verticillatus*), as well as an uncommon plant largely restricted to floodplains and wet forests, green dragon (*Arisaema dracontium*—see photo to the right). One species we found, black snakeroot (*Sanicula canadensis*), had never been documented from Kent County before this study.



In addition to the beautiful diversity of flowering species in Covenant Park, some less flashy but equally noteworthy groups to mention are the sedges and grasses. A total of 18 sedge and 8 grass species were documented in the park. Six of the eight grasses are native, but reed canary grass (*Phalaris arundinacea*) and the common lawn grass, Kentucky bluegrass (*Poa pratensis*), are two problematically invasive species that are widespread in the forest. Reed canary grass is an especially aggressive species that tends to reduce biodiversity and dominate ecosystems where it gains a presence, which it has done in sections of Covenant Park. All 18 sedge species (*Carex* spp.) are native to Michigan, three of which are especially notable. *Carex jamesii* (James' sedge), a clump-forming species characteristic of rich moist forests has only been formally documented in Kent County twice. *Carex emoryi* (Emory's sedge) is a rather uncommon sedge that often grows on riverbanks, and our identification of this species is the first official documentation in Kent County since Emma Cole collected it in 1897. And *Carex trichocarpa* (hairy fruited sedge), is listed as a state Special Concern species because of its rarity and it has also only been

documented once before in Kent County, back in 1879. Sedges are a critical, yet often overlooked part of Michigan's native wetland ecosystems, so it is encouraging to find such a wide diversity and abundance of these plants growing in Covenant Park.

Although the tree canopy in the floodplain forest is populated by mostly high-quality native species, the forest understory bears more evidence of disturbance. Common non-native invasive shrubs, like buckthorn (*Rhamnus cathartica*), autumn olive (*Elaeagnus umbellata*), and multiflora rose (*Rosa multiflora*), are abundant throughout large sections of the forest understory. In some areas these non-natives have developed into a dense shrubby thicket, yet other areas of the floodplain remain mostly populated by native species. Indeed, the natural areas at Covenant Park are somewhat of a patchwork, with some spots exhibiting more significant disturbance than others.

In addition to the problematic shrubs listed above, there are several non-native herbaceous species (some with rather showy flowers) that have become widespread in the floodplain too. These include garlic mustard (*Alliaria petiolata*), yellow rocket (*Barbarea vulgaris*), two species of thistle (*Cirsium arvense* and *C. vulgare*), ground ivy (*Glechoma hederacea*), dame's rocket (*Hesperis matronalis*), motherwort (*Leonurus cardiaca*), moneywort (*Lysimachia nummularia*)—which often forms large carpets—and two species of dock (*Rumex crispus* and *R. obtusifolius*). Many other non-native flowering species are present but less dominant. The abundance of non-native species increases closer to the edges of the forested parcels.

Quantitative Analysis of Floristic Quality

Based on the species list compiled during the 2021 growing season, we performed a quantitative analysis to evaluate the floristic quality of the natural remnant habitats in Covenant Park using the Michigan Floristic Quality Assessment database (online Universal FQA Calculator, <https://universalfqa.org>). This assessment allows for an estimate of the overall floristic quality of a parcel of land by utilizing the Coefficient of Conservatism values (*C*) of all of the species growing in a site to produce a quantitative value called the Floristic Quality Index (FQI).

A Coefficient of Conservatism (*C*) is a number from 0-10 that is assigned to each native species. This *C* value indicates how allegiant that particular species is to its favored undisturbed habitat. Thus, species with low *C* values tend to thrive in a variety of disturbed areas and can be weedy, whereas species with high *C* values are typically found growing in specific habitats that have experienced little disturbance, such as an unaltered prairie, bog, or old-growth forest. Species with high *C* values are generally “uncommon” or “rare” because so much of the Michigan landscape has experienced disturbance over time, so the pristine habitats that they require are today few and far between. Conversely, species with low *C* values tend to be much more common, especially in areas that have experienced alteration and disturbance over the years. All non-native species are assigned a *C* value of zero.

The Floristic Quality Index (FQI) is a simple calculation based on the number of species identified at a site and their average *C* value, providing a quantitative measure of the floristic quality of a site. In the state of Michigan, since most habitats have experienced some level of disturbance over the years, relatively low FQI scores of 20-25 are common. Scores above 35

indicate that a parcel is of such high natural quality that it is worthy of preservation; it could not be re-created by humans and should therefore be considered “unmitigable.” The highest FQI threshold set by the state is 50. Sites with FQI scores above 50 are said to accurately represent the pre-settlement condition of the land; such sites are rare and therefore have statewide significance (see Table 1).

We documented a total of 174 species growing within the Plaster Creek floodplain on the Covenant Park property. 75% (130 species) of those are native Michigan species, and 25% (44 species) are non-native. A total of 9 species were found that have a *C* value of 8-10 (Table 2).

Our analysis of the floodplain areas in Covenant Park shows the site to be above average for natural quality, representing an important remnant of the intact Plaster Creek floodplain. The natural areas along Plaster Creek in Covenant Park not only serve an important functional role for the creek and its watershed but these habitats also support an impressive representation of Michigan’s native flora. When non-native species are excluded from the calculation, the overall Native FQI score is 43.3, relatively close to the highest FQI threshold established for the state. But the Total FQI score, taking into account the non-native species, is 38.3. This lower number reflects the impact of non-native species on the natural quality of these remnant habitats. When taken together, these two values illustrate that while the floodplain has experienced notable disturbance and now is degraded by invasive species, it continues to support a wide diversity of native plants that make it worthy of protection, management, and enhancement.

When considering the floristic quality of Covenant Park, it is also important to note that the quality of the flora and the level of disturbance differed between each of the five parcels. A comparative summary of the floristic quality metrics of the five parcels is outlined in Table 3. Of the five parcels, parcels 3 and 4 stand out to us as displaying notably higher floristic quality than the other three parcels. Both parcel 3 and 4 border Plaster Creek and support important floodplain vegetation. Parcel 3, while having the lowest species richness of the five parcels (77 species documented in total), is home to the highest percentage of native species. In terms of calculated metrics, this site also reports the highest total FQI value, the highest number of species with *C* values of 8-10, and the highest mean *C* value. In Parcel 4 we recorded the highest species richness (102 species documented) and also a high percentage of native species. The total mean *C* value and FQI were also quite high compared to the other parcels.

Management Considerations

As seen from this study, the natural remnants in Covenant Park as a whole are supporting a wide variety of Michigan’s native biodiversity, making the entirety of the site worthy of careful preservation. However, most likely related to the extreme fluctuations in Plaster Creek hydrology, sections of Covenant Park have also become heavily populated with several problematic non-native species that thrive in volatile, frequently disturbed areas. While natural floodplains are adapted to periodic flooding, the fluctuations in water volume experienced today by the floodplain at Covenant Park are likely more extreme than any natural floodplain dynamics. Together with the past forest clearing and the influence of the golf course, non-native species have been able to gain a significant presence, but they have not yet completely excluded native plants from the site

The two parcels we found to have the highest conservation value are sites 3 and 4. Therefore, we recommend prioritizing these areas because they contain especially high floristic quality.

“Prioritizing” may include only allowing passive recreation, removing invasive species, and enhancing these areas by adding additional native plants. We advise that if park managers are considering constructing trails in forested areas of the park, they should be constructed in the sections that already bear more evidence of disturbance (parcels 1, 2, and 5). However, since so much of the landscape of the entirety of Covenant Park has already been altered by the golf course and athletic fields, we recommend preserving all remaining natural areas if possible.

Additionally, we urge those in charge to consider restoring low lying areas of former golf course fairways and greens into native floodplain habitat. This effort would allow the riparian zones along Plaster Creek to absorb more water during times of peak flow, and it would connect the somewhat isolated patches of natural habitat as they exist today. Indeed, park managers have a unique opportunity to improve the environmental health and overall beauty of the Plaster Creek watershed on this new park property, which is in need of restoration efforts like this, especially because of the long history of damage and degradation to Plaster Creek. If park managers are interested in partnering with a local non-profit to conduct some restoration work, they should contact the Program Coordinator of Plaster Creek Stewards (<https://calvin.edu/plaster-creek-stewards/plaster-creek-watershed/>), to discuss restoration options and strategies.

A small but effective action park managers could take immediately would be to decrease the amount of disturbance occurring along forest remnants by mowing less of the property, or by mowing the property less frequently. Allowing vegetation to grow without mowing decreases ecological disturbance and promotes natural recolonization of native species into previously degraded areas.

Conclusion

Our inventories demonstrate that the Covenant Park property is already an important green space that contains significant areas of natural habitat and has potential to increase in native biodiversity and natural quality over time if management efforts support that aim. Consequently, we recommend that the City of Kentwood should continue to seek input on how best to manage and restore the park for the shared benefit of Kentwood residents and for the health of our local environment.

We would like to thank the City of Kentwood for permission to do this work. It was a joy to engage in this botanical assessment, in large part because of its practical applications for the planning of Covenant Park by the City of Kentwood. Additionally, this project provided an excellent learning opportunity for Plant Taxonomy students, and the botanical inventory is a valuable contribution to our ongoing research for the Emma Cole project.

TABLE 1. Significance of the Michigan Floristic Quality Assessment System for determining the value of individual natural habitats in reflecting Michigan’s native biodiversity and natural landscapes, based on Herman et al. (2001).

Native FQI	Significance of habitat quality to Michigan	Value of site to Michigan
< 20	Minimal indication of natural quality	Low value
> 35	Important representation of native flora; unmitigable	Floristically important statewide
> 50	Significant component of Michigan’s remaining native biodiversity	Extremely high value worthy of protection and conservation

TABLE 2. Species having a *C* value of 8–10, indicating a high level of fidelity to a narrow range of undisturbed ecological conditions.

Species	Common Name	<i>C</i> value
<i>Arisaema dracontium</i>	Green Dragon	8
<i>Asimina triloba</i>	Paw Paw	9
<i>Carex jamesii</i>	James Sedge	8
<i>Carex trichocarpa</i>	Hairy Fruited Sedge	8
<i>Carya laciniosa</i>	Shellbark Hickory	9
<i>Cornus florida</i>	Flowering Dogwood	8
<i>Enemion biternatum</i>	False Rue-anemone	8
<i>Quercus bicolor</i>	Swamp White Oak	8
<i>Sanicula canadensis</i>	Black Snakeroot	8
	Total	9

TABLE 3. Floristic quality metrics for each of the five parcels inventoried in Covenant Park.

Parcel	# of Species	% Native	Total Mean <i>C</i>	# Spp. with <i>C</i> of 8-10	Native FQI	Total FQI
1	101	69.3	2.5	3	29.3	25.1
2	89	75.3	2.5	3	27.8	23.6
3	77	81.8	3.5	5	34.1	30.7
4	102	78.4	3.0	4	34.0	30.3
5	90	73.3	2.6	3	29.2	24.7
Overall	174	74.7	2.9	9	43.3	38.3