ADDITIONS TO THE VASCULAR FLORA OF PIERCE CEDAR CREEK INSTITUTE, BARRY COUNTY, MICHIGAN

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ABSTRACT

This paper reports 87 vascular plant species newly vouchered from Pierce Cedar Creek Institute, Barry County, Michigan. Fifty-three of these species were collected from the 321-ha (792-ac) main campus, increasing the total tally to 821 taxa. Thirty-four taxa apparently restricted to the separate 23-ha (58-ac) Little Grand Canyon parcel are also reported. For the first time, all parcels comprising Pierce Cedar Creek Institute have been comprehensively inventoried. Additional inventory and examination of spatial patterns of diversity are recommended.

KEYWORDS: Pierce Cedar Creek Institute, Barry County, Michigan, vascular plants, flora.

INTRODUCTION

Pierce Cedar Creek Institute (the Institute) is a 352-ha (871-ac) nature center, environmental education center, and biological field station located in south-central Barry County, Michigan (42.5369, –85.2967). The Willard G. Pierce and Jessie M. Pierce Foundation purchased the original 224 ha (553 ac) in sections 19 and 30, Baltimore Township, in August 1998. Shortly following this initial acquisition, Slaughter and Skean (2003a, 2003b) conducted a floristic inventory of approximately 125 ha (300 ac) that resulted in the identification and collection of 394 vascular plant species (Slaughter and Skean 2003b). A revised and expanded inventory of the approximately 278 ha (688 ac) main campus conducted in 2018 increased the tally to 767 taxa (Slaughter 2020). An additional inventory was conducted in 2022, targeting two recent additions to the Institute's main campus (Jones North and Mary Pierce) and a separate, 23-ha (58-ac) parcel known as Little Grand Canyon (Figure 1). This paper reports newly vouchered taxa for the entire 321-ha (792-ac) main campus and a separate list of vouchered taxa that are apparently restricted to Little Grand Canyon.

Physical Description of the Study Area

The following is an abbreviated description of the three parcels surveyed in 2022. For a more detailed physical description of the Institute's main campus, see Slaughter (2020). Jones North is an approximately 34-ha (83-ac) parcel extending the northern boundary of the main campus to Pritchardville Road (Figure 1). Elevations on the hummocky glacial till range from approximately 266 m (873 ft) at Aurohn Lake to 297 m (974 ft) along Pritchardville Road (USGS

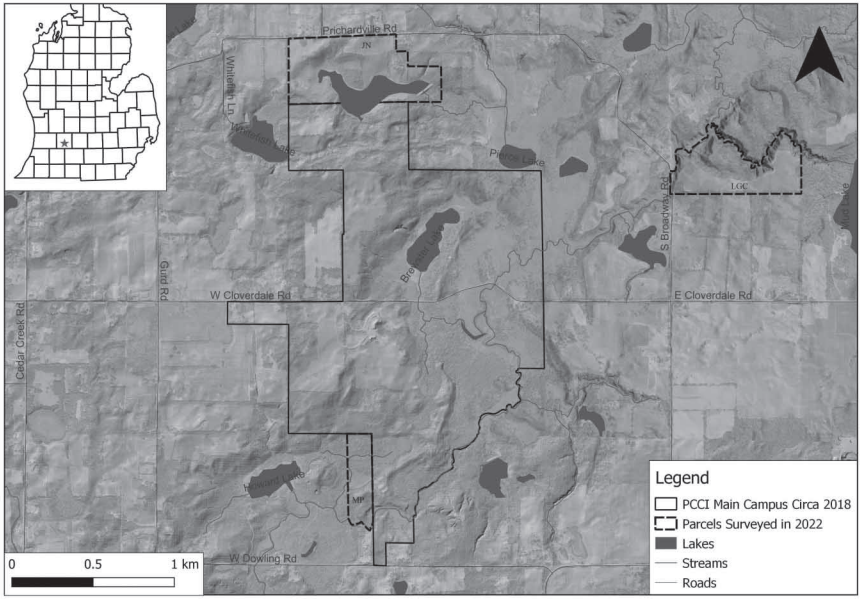

FIGURE 1. Location of Pierce Cedar Creek Institute in south-central Barry County, Michigan, USA. Dashed lines indicate locations of properties surveyed in 2022: JN (Jones North, 34 ha), LGC (Little Grand Canyon, 23 ha), MP (Mary Pierce, 8 ha). The solid line delimits the main campus prior to the acquisition of JN and MP. Map created in QGIS 3.22 Białowieża. Basemap: Google Satellite. Data layers: Pierce Cedar Creek Institute; State of Michigan—Michigan GIS Open Data; USGS (2020a, 2020b, 2020c).

2020a). Filer loam is the principal upland soil map unit, with limited areas of Spinks loamy sand, Coloma loamy sand, and Oshtemo sandy loam (Soil Survey Staff, NRCS, USDA 2023). Lowlands are characterized by organic deposits, with an area of Parkhill loam mapped for the drainage east-southeast of Aurohn Lake. Jones North was interpreted as supporting beech–maple and oak–hickory forest circa 1800 (Comer et al. 1995). The uplands were cleared and converted to agricultural fields, with only one small remnant woodlot left untilled (HistoricAerials.com 2023). Most of the low-lying wetland acreage on the south margin of the property was excavated and converted to the man-made Aurohn Lake in the 1960s or 1970s. At present, Jones North consists primarily of old fields, prairie plantings, and successional shrubland and forest (Figure 2). Remnant habitats include the approximately 1-ha (2.5-ac) oak–hickory woodlot (dry-mesic southern forest; Cohen et al. 2020) on the north shore of Aurohn Lake, a small area of wooded bog in the northeastern arm of Whitefish Lake (see Slaughter 2020), and patches of several wetland communities associated with springs and drainages surrounding Aurohn Lake.

Mary Pierce is an 8-ha (21-ac) parcel at the southwestern margin of the main campus, north of W Dowling Road and Cedar Creek (Figure 1). This parcel is situated entirely in a glacial tunnel valley[1] (Kehew et al. 2014) and includes the

FIGURE 2. Most of the uplands at Jones North were farmed historically, and support old field, planted prairie, and successional forest. Aurohn Lake (center) is situated among the rolling hills.

southwestern margin of the prominent esker discussed in Slaughter (2020). Elevations range from approximately 260 m (853 ft) at Cedar Creek to 272 m (892 ft) on the crest of the esker (USGS 2020b). Upland soils are classified to several slope classes within the Marlette–Oshtemo complex, and Houghton muck characterizes the wetlands (Soil Survey Staff, NRCS, USDA 2023). Uplands were interpreted as supporting beech–maple and oak–hickory forest circa 1800, with mixed conifer swamp in the lowlands (Comer et al. 1995). All uplands were cleared and farmed except for a narrow band of forest at the northern margin of the parcel (HistoricAerials.com 2023). Formerly farmed areas have succeeded to young woody vegetation, principally in the past two decades. Lowlands have mostly been forested since at least the 1940s, with one area of open southern wet meadow that was likely used as pasture or for hay production (HistoricAerials.com 2023). Firmer, drier organic deposits support southern hardwood swamp (Figure 3), with patches of southern shrub-carr and rich tamarack swamp in low-lying areas, such as along Cedar Creek and a small spring-fed tributary (Cohen et al. 2020). Small patches of northern white-cedar are present here, too.

Little Grand Canyon is a 23-ha (58-ac) parcel located approximately 1 km east of the main campus, between S Broadway Road and Mud Lake. This parcel

[1] See Kirkham et al. (2022) for a recent discussion of tunnel valleys and tunnel valley formation.

FIGURE 3. Closed-canopy southern hardwood swamp dominated by *Betula alleghaniensis* (yellow birch) and *Tilia americana* (American elm) occupies the higher, drier parts of the wetland basin at Mary Pierce.

is situated on hummocky glacial till at the eastern margin of the tunnel valley (Kehew et al. 2014). Elevations range from approximately 257 m (843 ft) at Cedar Creek to 291 m (955 ft) on the southern and eastern part of the property (USGS 2020c). The "Little Grand Canyon" itself is a steep-sided stream valley incised approximately 20 m (66 ft) below the general land surface. The small, ephemeral stream at the bottom of the valley—Gulley Creek—belies the likely origin of this valley as a glacial lake outburst resulting from the failure of an ice or sediment dam (M. Dykstra, pers. comm.) (Figure 4). Another valley, this one muck-bottomed, occurs to its south. Several soil map units are mapped for the uplands, with Filer loam predominating in the wooded valleys and the western uplands and Oshtemo sandy loam and Marlette–Oshtemo complex on the eastern uplands (Soil Survey Staff, NRCS, USDA 2023). Unique to this parcel is a small area of Algansee loamy fine sand, an alluvial soil located near the confluence of Gulley and Cedar Creeks. Houghton muck is mapped in the immediate vicinity of Cedar Creek.

Historically, Little Grand Canyon is interpreted to have supported beech–maple forest, which was the matrix forest cover just east of the area on the Lansing Loamy Plains physiographic region (Albert 1995; Comer et al. 1995; Schaetzl et al. 2013). Essentially all but the steepest and wettest terrain (valley slopes and bottoms) was converted to agriculture. The largest of these areas was

FIGURE 4. Gulley Creek (Little Grand Canyon) is an intermittent stream that flows following snowmelt or heavy rain events and is reduced to scattered pools of water during dry periods and summer. The ravine slopes are densely vegetated in mid-spring.

farmed until 2016 and converted to prairie planting in 2017. A smaller area between the two valleys was abandoned earlier and has since succeeded to old field and successional shrubland. Mature forest is present in two areas—on the valley slopes and floor along and above Gulley Creek, and on a small area of tableland near the northeastern margin of the property. The Little Grand Canyon is principally mesic southern forest (Cohen et al. 2020) with floodplain elements along Gulley Creek. The floodplain character increases from east to west, and the area mapped as Algansee loamy fine sand is a representative, if small, example of floodplain forest. The valley south of the Little Grand Canyon supports mid-successional forest with a lush but weedy herbaceous layer. The small area of mature forest on the tableland is dominated by white oak, suggesting dry-mesic southern forest might have been the historical cover type of the uplands here (Figure 5). Last, organic deposits and seepage slopes near Cedar Creek support patches of southern shrub-carr and southern wet meadow.

METHODS

Collections were made on 21 dates from May to September 2022 and one date each in July 2023 and May 2025. Most specimens were collected at Jones North, Mary Pierce, and Little Grand Canyon, but several were collected elsewhere on the main campus. Collections consisted primarily

FIGURE 5. A small patch of mature dry-mesic southern forest dominated by *Quercus alba* (white oak) occurs on the tableland at Little Grand Canyon.

of species not previously vouchered from the field station and species requiring further identification. Ornamentals and other planted species that were not represented by native or naturalized individuals were not collected. Specimens were deposited at the Institute herbarium. Duplicates for The University of Michigan Herbarium (MICH) were collected for most rare species and species not previously vouchered from Barry County.

RESULTS

A total of 54 previously undocumented taxa, including 34 native taxa, were vouchered from the main campus (Appendix 1). Among the highlights were two state-listed plant species not previously recorded from the Institute or Barry County (Michigan Flora Online 2011; MNFI 2023). Both species—*Endodeca serpentaria* (L.) Raf. (Virginia snakeroot) and *Geum virginianum* L. (pale avens)—occurred at the lower margin of the small remnant oak–hickory woodlot, just above the marshy shoreline of Aurohn Lake. *Endodeca serpentaria* was concentrated in the shaded understory, whereas *Geum virginianum* was most frequent in a partially shaded ecotone where soils were disturbed by fluctuating lake levels and animal activity.

Thirty-four species appear to be restricted to Little Grand Canyon, including 28 native species (Appendix 2). Among the native taxa, 26 (93%) were essentially restricted to mesic southern forest and floodplain forest, one occurred on a

TABLE 1. Summary of vascular plants (species, subspecies, and hybrids) collected from Pierce Cedar Creek Institute Main Campus, 1969–2025. Native species are native to Michigan but not necessarily the Institute.

			Taxa		
Taxonomic Group	Families	Genera	Native	Introduced	Total
Lycophytes	2	3	6	0	6
Ferns	8	15	24	0	24
Conifers	2	5	6	3	9
Angiosperms	93	358	607	175	782
Total	105	380	643	178	821
Percentage of Total Species			78.3%	21.5%	

TABLE 2. Summary of vascular plants (species, subspecies, and hybrids) collected from Pierce Cedar Creek Institute Main Campus and Little Grand Canyon, 1969–2025. Native species are native to Michigan, but not necessarily to the Institute.

			Taxa		
Taxonomic Group	Families	Genera	Native	Introduced	Total
Lycophytes	2	3	6	0	6
Ferns	9	17	29	0	29
Conifers	2	5	6	3	9
Angiosperms	97	368	630	181	811
Total	110	392	671	184	855
Percentage of Total Species			78.5%	21.7%	

streambank, and one was an escape from nearby prairie plantings. The forest species are predominantly ecological specialists, with an average coefficient of conservatism $\overline{C}$ of 7.4 (Reznicek et al. 2014). Among these are five ferns and three state-listed species not documented from the main campus—*Galearis spectabilis* (L.) Raf. (showy orchis), *Morus rubra* L. (red mulberry), and *Panax quinquefolius* L. (ginseng).

DISCUSSION

A total of 821 vascular plant taxa[2], including 643 native taxa, have now been vouchered from the main campus (Table 1). Collectively, the main campus and Little Grand Canyon support 855 total taxa, including 671 native taxa (Table 2). As mentioned in Slaughter (2020), environmental heterogeneity is likely a key driver of this apparent concentration of vascular plant species richness. The role of survey effort, too, cannot be dismissed—the figures presented here benefit from three periods of focused inventory (1999–2001; 2018; and 2022) over the span of 23 years. This is an unusual concentration of floristic work at a single lo-

[2] This figure includes 814 species, two subspecific taxa, and two hybrids.

TABLE 3. Native species as a percentage of species pools[1] at several scales. Michigan-specific data from Michigan Flora Online (2011).

Site	# Native Species	Barry County[2]	Southwestern Lower Michigan[3]	Southern Michigan/Northern Indiana Drift Plains[4]	Michigan Lower Peninsula	Michigan—Statewide	Western Great Lakes States[5]
Main Campus	639	71.3	43.1	41.9	37.9	35.2	11.8
Main Campus + Little Grand Canyon	667	74.5	45.1	43.9	39.6	36.8	12.4

[1]Species pools based on voucher specimens. Vouchered species pools more closely approximate actual species pools at greater scales.
[2]Includes species collected by the author that are not yet mapped for Michigan Flora Online (2011).
[3]Allegan, Barry, Berrien, Branch, Calhoun, Cass, Eaton, Ionia, Kalamazoo, Kent, Ottawa, St. Joseph, and Van Buren counties.
[4]U.S. Environmental Protection Agency (2013) and Merit Exchange LLC (2023).
[5]Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin. USDA, NRCS (2023).

cation, precluding simple comparisons with other sites in the region. What is clear is that the Institute supports a substantial fraction of the local and regional native flora (Table 3).

Steep gradients in and interplay among microclimate, topography, and soils are likely drivers of the unique floristic attributes of Little Grand Canyon, including its richness and abundance of ferns and lycophytes. Twenty fern and lycophyte species were documented at Little Grand Canyon, approaching the total of 25 taxa known from the much larger main campus. Five of these are apparently restricted to Little Grand Canyon—*Cystopteris tenuis* (Michx.) Desv. (fragile fern), *Dryopteris goldieana* (Hook.) A. Gray (Goldie's woodfern), *D. marginalis* (L.) A. Gray (marginal woodfern), *Homalosorus pycnocarpos* (Spreng.) Pic. Serm. (narrow-leaved spleenwort), and *Matteuccia struthiopteris* (L.) Todaro (ostrich fern) (Appendix B). The abundance of *Dryopteris marginalis* on the ravine slopes is particularly striking, as this species is sparsely distributed outside the Lake Michigan dune region in interior southern Lower Michigan (Michigan Flora Online 2011).

No less striking than the ferns is the concentration of other species conservative to rich, relatively undisturbed mesic forests and floodplain terraces. Some of these are common elements of the mesic southern forest that are nonetheless apparently absent from the main campus—e.g., *Allium tricoccum* Aiton (wild leek)[3], *Caulophyllum thalictroides* (L.) Michx. (blue cohosh), *Dicentra canadensis* (Goldie) Walp. (squirrel-corn), and *Hydrophyllum appendiculatum* Michx. (great waterleaf). Many are of relatively restricted distribution, with an affinity for base-rich forests—e.g., *Carex careyana* Dewey (sedge), *C. jamesii* Schwein. (James' sedge), *Dirca palustris* L. (leatherwood), *Galearis spectabilis*, *Morus rubra*, and *Solidago flexicaulis* L. (zigzag goldenrod) (Michigan Flora Online 2011) (Figure 6). Floodplain taxa such as *Platanus occidentalis* L. (sycamore) and *Staphylea trifolia* L. (bladdernut) add a distinctive character to the valley bottoms. As mentioned in the results, the 26 native forest taxa restricted to Little Grand Canyon have an average coefficient of conservatism $\overline{C}$ of 7.4 (Reznicek et al. 2014). This figure is an indication of both the specialized habitat at Little Grand Canyon and the fact that most of the less conservative matrix species are shared with the mesic southern forest on the main campus.

CONCLUSIONS

This paper addresses two of the four recommendations of Slaughter (2020)—additional inventory and collecting at the main campus and inventories of three previously unsurveyed parcels. Although most of the new collections from the main campus came from the new parcels, over 20 of the taxa reported in Appendix 1 occur within the boundaries of the earlier surveys. Several are transient weeds on disturbed ground such as parking lots, but many are locally distributed native taxa of remnant natural communities. The frequency of new species encounters was high enough to suggest many more taxa will be discovered with additional survey effort.

[3] Curiously, *Allium burdickii* appears to be restricted to the main campus.

FIGURE 6. *Dirca palustris* (leatherwood) is one of the 27 forest species apparently restricted to Little Grand Canyon.

Little Grand Canyon has long been recognized by Institute staff and local naturalists for its unusual environment and flora. This flora was comprehensively inventoried for the first time in 2022, resulting in the documentation of 443 native or naturalized vascular plant species (Slaughter 2023). While over 90% of these taxa are shared with the main campus, the mature forest comprising the "Little Grand Canyon" proper, an area of little more than 5 ha (12 ac), supports a distinctive flora including most of the taxa listed in Appendix 2. Collecting was limited to species new to the Institute and a subset of the remaining flora, so additional collecting is recommended towards completing a fully-vouchered checklist of vascular plants for this parcel.

There is a continued need to collect vouchers for species introduced to the Institute, particularly the constituents of the various prairie plantings on the main campus and Little Grand Canyon. Fortunately, data on species introduced to many of the plantings on the main campus were collated in Howell and Lucas (2018), but there are apparently no records for the plantings on Jones North (or Jones South, which was surveyed in 2018), and the planting at Little Grand Canyon was undertaken sometime after Howell and Lucas (2018). Over time, the origins of some of these introductions will be obfuscated due to species spreading to other habitats where they did not occur naturally (e.g., *Rudbeckia triloba* L. [three-lobed coneflower] at Little Grand Canyon), or, in the case of some taxa collected at Jones North but ultimately excluded from Appendix 1

(e.g., *Carex hirsutella* Mack. [sedge]), persisting where other more obvious introductions have since been reduced or eliminated through succession in the absence of management. Accessible vouchers of these species, with details of their origins, can reduce the likelihood of misinterpretations that could potentially have ramifications for stewardship decisions.

Considering rapid developments in species distribution modeling, spatial technologies, remote imagery, and artificial intelligence, this coinciding with rapid anthropogenic climate change, multi-scale, multi-variable environmental analysis has never been more achievable or necessary. Floristic and ecological studies at the Institute (Slaughter and Skean 2003a, 2003b; Slaughter 2020; this paper) have identified several critical attributes, including high vascular plant species richness; the presence of the largest and highest-quality northern white-cedar swamp documented in southwestern Lower Michigan; the presence of several patches of mature forest on a variety of landforms, including an esker and a glacial-lake outburst valley; and the presence of many plant species at or near their southern range margins. These are but a few of the potential targets for further study and monitoring. Returning to floristics, it is likely that ~95% of the native and naturalized vascular taxa at the Institute have been documented and vouchered. But species richness is but one component of diversity. More work is needed to assess species abundances, distributions, and turnover between and among habitats (beta diversity). An examination of diversity need not focus on species identities, either—approaches centered on trait–environment relationships have demonstrated value in predicting species composition and relative abundances and have potential application in ecological restoration and climate adaptation (Funk 2021; Green et al. 2022; Keddy and Laughlin 2022).

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APPENDIX 1. Annotated checklist of the vascular plants newly collected from Pierce Cedar Creek Institute (main campus), Barry County, Michigan.

The following is a checklist of vascular plant species collected for the first time at Pierce Cedar Creek Institute in 2022, 2023, or 2025. Species, subspecies, varieties, and common names follow Michigan Flora Online (2011). Families for the most part follow Michigan Flora Online (2011), with exceptions reflecting recent updates by the Angiosperm Phylogeny Group (APG IV 2016). In these instances, families used in Michigan Flora Online (2011) are included in the checklist and cross-referenced to the new familial placements.

Introduced species are indicated with an asterisk (*) preceding the scientific name. Species without an asterisk are considered native to Michigan (Michigan Flora Online 2011) but are not necessarily native to the Institute (see annotations). Many species have been introduced to the Institute, particularly in grassland plantings. Species that occur at the Institute only as plantings are generally not included in the checklist, unless they are documented as part of the spontaneous flora (Michigan Flora Online 2011) and/or have the potential to escape.

Collections are indicated by collector initials, collection number, and location of specimens, following the Index Herbariorum (Thiers 2023). Collectors are Bradford S. Slaughter (BSS) and Matt Dykstra (MD). Herbaria are MICH (University of Michigan) and PCCI (unofficial designation for Pierce Cedar Creek Institute Herbarium).

Species distribution and abundance is as follows: Abundant (widespread, in many habitats, perhaps as a dominant; Locally Abundant (localized but in very high numbers); Common (widespread, in few to many habitats with high frequency, or as a dominant in one major habitat); Locally Common (localized in high numbers); Frequent (widespread, in few to many habitats with low frequency, or common in one habitat); Occasional (widespread in low numbers or occurring in two or more small colonies); and Rare (widespread in very low numbers or localized in relatively low numbers).

Locations and (colloquial) habitats are briefly noted for each species following the abundance ranks. For native and naturalized species that are also present as plantings, a dagger (†) and list of associated locations as reported in Howell and Lucas (2018) follows the main entry. Locations of plantings referenced in the appendices are as follows: H (Hedgerow Prairie); LT (Lupine Trail Prairie); ME (Middle East Prairie); NE (North East Prairie); SE1 (Southeast Prairie 1); SE2 (Southeast Prairie 2); SW (South West Prairie); WOOD (North Prairie Young Forest). Note that the prairie plantings at Jones North and Little Grand Canyon are not described in Howell and Lucas (2018).

Species listed as Endangered, Threatened, or Special Concern in Michigan (following MNFI 2023) are denoted as such following annotations on locations and habitats.

LYCOPODIIDAE (Lycopods)

LYCOPODIACEAE

Huperzia lucidula (Michx.) R. Trevis., shining clubmoss—*BSS 3493* (MICH, PCCI). Rare, beech–maple forest. First reported by Lohman (2023).

POLYPODIIDAE (Leptosporangiate Ferns)

CYSTOPTERIDACEAE

Cystopteris bulbifera (L.) Bernh., bulblet fern—*BSS 3367* (MICH, PCCI). Rare, cedar swamp.

Gymnocarpium dryopteris (L.) Newm., oak fern—*BSS 3366* (MICH, PCCI). Rare, cedar swamp.

MONOCOTS

ALISMATACEAE

Alisma subcordatum Raf., southern water-plantain—*BSS 3376* (PCCI). Occasional, mucky shoreline of Aurohn Lake.

ALLIACEAE – see AMARYLLIDACEAE

AMARYLLIDACEAE

**Allium sativum* L., garlic—*BSS 3359* (MICH, PCCI). Locally Common, large colony in moist old field/thicket N of Aurohn Lake, likely spread clonally from old planting.

**Allium vineale* L., field garlic—*BSS 3312* (MICH, PCCI). Occasional, old field near Pritchardville Rd.

ASPARAGACEAE

**Muscari botryoides* (L.) Mill., grape-hyacinth—*BSS 3160* (MICH, PCCI). Occasional, roadsides and adjacent disturbed ground.

**Scilla siberica* Haw., squill—*BSS 3159* (MICH, PCCI). Rare, thicket.

CONVALLARIACEAE – see LILIACEAE

CYPERACEAE

Carex atherodes Spreng., sedge—*BSS 3322* (MICH, PCCI). Rare, open seepage slope N of Aurohn Lake.

Carex canescens L., sedge—*BSS 3233* (PCCI). Occasional, wooded bog in NE arm of Whitefish Lake.

Carex gracilescens Steud., sedge—*BSS 3204* (MICH, PCCI). Locally Common, oak–hickory woodlot N of Aurohn Lake. †WOOD.

Carex prasina Wahlenb., sedge—*BSS 3567* (MICH). Rare, swamp margins. Earlier collections are from Little Grand Canyon—*BSS 736* (MICH), *3199* (PCCI).

Carex scoparia Willd., sedge—*BSS 3323* (MICH, PCCI). Occasional, wet meadow on W shore of Aurohn Lake.

Cyperus odoratus L., umbrella sedge—*BSS 3371* (PCCI). Occasional, mucky shores of Aurohn Lake.

HYACINTHACEAE – see ASPARAGACEAE

JUNCACEAE

Juncus pylaei Laharpe, Pylaei's soft rush—*BSS 3321* (MICH), *3372* (PCCI). Occasional, shores, marshes, wet meadows, depressions on uplands.

LILIACEAE

Medeola virginiana L., Indian cucumber-root—*BSS 3227* (PCCI). Rare, swamp margins and slopes in hardwood forest.

ORCHIDACEAE

Liparis loeselii (L.) Rich., Loesel's twayblade—*BSS 3360* (PCCI). Rare, mixed swamp.

Platanthera aquilonis Sheviak, northern green orchid—*MD s.n.* (PCCI). Rare, cedar swamp.

POACEAE

**Bromus commutatus* Schrad., hairy chess—*BSS 3314* (MICH, PCCI). Occasional, thicket N of Aurohn Lake.

Poa palustris L., fowl meadow grass—*BSS 3326* (PCCI). Occasional, hummocks on banks of Cedar Creek.

EUDICOTS

APOCYNACEAE

Apocynum androsaemifolium L., spreading dogbane—*BSS 3324* (PCCI). Occasional, woodline N of old Jones barn, S of Pritchardville Rd.

ARISTOLOCHIACEAE

Endodeca serpentaria (L.) Raf., Virginia snakeroot—*BSS 3228* (MICH, PCCI). Rare, oak–hickory woodlot N of Aurohn Lake. **THREATENED.**

ASTERACEAE

Cirsium altissimum (L.) Spreng., tall thistle—*BSS 3406* (PCCI). Rare, young *Rubus* thicket in prairie planting.

**Dipsacus fullonum* L., wild teasel—*BSS 3358* (MICH, PCCI). Locally Common, old field and disturbed wet meadow N of Aurohn Lake.

**Matricaria discoidea* DC., pineapple-weed—*BSS 3208* (PCCI). Rare, parking lots.

Prenanthes alba L., white lettuce—*BSS 3405* (PCCI). Rare, mixed swamp ENE of Howard Lake. †WOOD.

**Senecio vulgaris* L., common groundsel—*BSS 3361* (MICH, PCCI). Occasional, gravel near greenhouse on main campus.

Solidago canadensis L., Canada goldenrod—*BSS 3369* (MICH, PCCI). Locally Common, wet meadow opening E of Howard Lake.

BIGNONIACEAE

**Catalpa speciosa* Warder, northern catalpa—*BSS 3380* (MICH, PCCI). Rare, opening in successional forest SSE of Meadow Lodge.

CAMPANULACEAE

Lobelia cardinalis L., cardinal-flower—*BSS 3383* (PCCI). Rare, mucky banks of Cedar Creek.

CAPRIFOLIACEAE

**Lonicera japonica* Thunb., Japanese honeysuckle—*BSS 3234* (MICH, PCCI). Rare, Pritchardville Rd.

CARYOPHYLLACEAE

**Dianthus barbatus* L., sweet William—*BSS 3327* (MICH, PCCI). Occasional, thickets and wooded borders N of Aurohn Lake.

FABACEAE

Cercis canadensis L., redbud—*BSS 3325* (PCCI). Rare, escape in weedy thicket N of Aurohn Lake.

Desmodium marilandicum (L.) DC., small-leaved tick-trefoil—*BSS 3378* (MICH, PCCI). Rare, semi-open knob at W margin of Aurohn Lake

**Lathyrus sylvestris* L., perennial pea—*BSS 3330* (MICH, PCCI). Rare, thicket border along exit drive from main campus.

Vicia caroliniana Walter, wood vetch—*BSS 3205* (MICH, PCCI). Rare, oak–hickory woodlot N of Aurohn Lake.

LAMIACEAE

**Mentha ×piperita* L., peppermint—*BSS 3377* (MICH, PCCI). Occasional, seeps and shoreline of Aurohn Lake.

OLEACEAE

**Ligustrum obtusifolium* Siebold & Zucc., border privet—*BSS 3379* (MICH, PCCI). Rare, woodline SSE of Meadow Lodge.

PLANTAGINACEAE

Veronica peregrina L., purslane speedwell—*BSS 3183* (MICH, PCCI). Occasional, parking lots.

**Veronica polita* Fries, speedwell—*BSS 3158* (MICH, PCCI). Rare, parking lots.

Veronicastrum virginicum (L.) Farw., culver's-root—*BSS 3363* (PCCI). Rare, single colony in woodline along Pritchardville Rd. †SE1.

POLYGALACEAE

Polygala senega L., Seneca snakeroot—*BSS 3224* (PCCI). Rare, mixed swamp NE of Howard Lake.

ROSACEAE

Agrimonia parviflora Aiton, swamp agrimony—*BSS 3386* (MICH, PCCI). Rare, small clearing/access area N of W Dowling Rd.

Amelanchier sanguinea (Pursh) DC., round-leaved serviceberry—*BSS 3317* (MICH). Rare, woodline N of Aurohn Lake.

Crataegus crus-galli L., cockspur thorn—*BSS 3387* (PCCI). Rare, degraded wet meadow S of Cedar Creek, N of W Dowling Rd.

**Crataegus monogyna* Jacq., English hawthorn—*BSS 3231* (PCCI). Occasional, old fields, borders, and prairie plantings.

Crataegus succulenta Link var. *succulenta*, hawthorn—*BSS 3315* (PCCI). Rare, thicket N of Aurohn Lake.

Geum aleppicum Jacq., yellow avens—*BSS 3329* (PCCI). Rare, moist open ground and prairie planting SW of Aurohn Lake.

Geum virginianum L., pale avens—*BSS 3356* (MICH, PCCI). Rare, margin of oak–hickory woodlot above N shore of Aurohn Lake. **THREATENED.**

**Malus baccata* (L.) Borkh., Siberian crab—*BSS 3230* (MICH), *3232* (PCCI). Occasional as young trees in old fields and prairie plantings N of Aurohn Lake.

**Prunus tomentosa*, nanking cherry—*BSS 3163* (MICH, PCCI). Rare, N shore of Aurohn Lake.

Rubus hispidus L., swamp dewberry—*BSS 3226* (PCCI). Occasional, lower slopes in forests, swamp borders, and wooded bog in NE arm of Whitefish Lake.

SCROPHULARIACEAE

**Verbascum blattaria* L., moth mullein—*BSS 3311* (MICH, PCCI). Occasional, old fields.

VIOLACEAE

**Viola odorata* L., sweet violet—*BSS 3162* (PCCI). Occasional, old field and roadside.

APPENDIX 2. Annotated checklist of the vascular plants vouchered from and apparently restricted to Little Grand Canyon, Pierce Cedar Creek Institute, Barry County, Michigan.

The following is a checklist of vascular plant species apparently restricted to Little Grand Canyon. See Appendix 1 for a description of the checklist structure.

LEPTOSPORANGIATE FERNS

CYSTOPTERIDACEAE

Cystopteris tenuis (Michx.) Desv., fragile fern—*BSS 3144* (MICH, PCCI). Occasional, mature forest on slopes.

DIPLAZIOPSIDACEAE

Homalosorus pycnocarpos (Spreng.) Pic. Serm., narrow-leaved spleenwort—*BSS 3184* (MICH, PCCI). Common, forming scattered dense colonies on wooded terraces.

DRYOPTERIDACEAE

Dryopteris goldieana (Hook.) A. Gray, Goldie's woodfern—*BSS 3212* (PCCI). Occasional, mature forest on lower slopes and terraces.

Dryopteris marginalis (L.) A. Gray, marginal woodfern—*BSS 3141* (MICH, PCCI). Common, mature forest on slopes and terraces.

ONOCLEACEAE

Matteuccia struthiopteris (L.) Todaro, ostrich fern—*BSS 3194* (PCCI). Rare, wooded terraces.

MONOCOTS

ALLIACEAE – see AMARYLLIDACEAE

AMARYLLIDACEAE

Allium tricoccum Aiton, wild leek—*BSS 3130* (MICH, PCCI). Occasional, mature forest on lower slopes. †WOOD.

ASPARAGACEAE

**Ornithogalum umbellatum* L., star-of-Bethlehem—*BSS 3218* (MICH, PCCI). Rare, disturbed ground along S Broadway St.

CYPERACEAE

Carex careyana Dewey, sedge—*BSS 3185* (MICH, PCCI). Occasional, mature forest on lower slopes and terraces.

Carex grayi J. Carey, sedge—*BSS 3301* (PCCI). Rare, wooded terraces. †WOOD.

Carex jamesii Schwein., James' sedge—*BSS 3209* (MICH, PCCI). Rare, mature forest on lower slope above Gulley Creek. †WOOD.

HYACINTHACEAE – see ASPARAGACEAE

ORCHIDACEAE

Galearis spectabilis (L.) Raf., showy orchis—*BSS 739* (MICH), *3198* (PCCI). Occasional, mature forest on lower slopes and terraces. **THREATENED.**

POACEAE

**Bromus squarrosus* L., brome—*BSS 3235* (PCCI). Frequent, prairie plantings.

Muhlenbergia tenuiflora (Willd.) Britton, Sterns & Poggenb., slender satin grass—*BSS 3353* (PCCI). Rare, wooded terraces near confluence of Gulley and Cedar Creeks.

SMILACACEAE

Smilax ecirrata (Kunth) S. Watson, upright carrion flower—*BSS 3200* (PCCI). Rare, wooded terraces near confluence of Gulley and Cedar Creeks.

EUDICOTS

ARALIACEAE

Aralia racemosa L., spikenard—*BSS 3351* (MICH, PCCI). Occasional, mature forest on slopes and terraces. †WOOD.

Panax quinquefolius L., ginseng—*BSS 3306* (PCCI). Occasional, mature forest on slopes and terraces. **THREATENED.**

ASTERACEAE

Arnoglossum atriplicifolium (L.) H. Rob., pale Indian plantain—*BSS 3307* (PCCI). Rare, wooded terraces near confluence of Gulley and Cedar Creeks. Only basal rosettes observed.

Packera obovata (Willd.) W. A. Weber & Á. Löve, round-leaved ragwort—*BSS 734* (MICH), *3197* (PCCI). Rare, wooded ridgetop along trail. †LT.

Rudbeckia triloba L., three-lobed coneflower—*BSS 3382* (PCCI). Rare, local escape from prairie plantings in old field/thicket on upland between ravines. †H, LT, ME, NE, SE2, SW.

Solidago flexicaulis L., zigzag goldenrod—*BSS 3402* (MICH, PCCI). Occasional, mature forest on slopes and terraces near confluence of Gulley and Cedar Creeks.

BERBERIDACEAE

Caulophyllum thalictroides (L.) Michx., blue cohosh—*BSS 3145* (PCCI). Occasional, mature forest on slopes and terraces. †WOOD.

BORAGINACEAE

Hydrophyllum appendiculatum Michx., great waterleaf—*BSS 735* (MICH), *3195* (PCCI). Locally Common, wooded terraces and successional forest. †WOOD.

LAMIACEAE

**Mentha spicata* L., spearmint—*BSS 3403* (PCCI). Rare, ditch along S Broadway St.7

MORACEAE

Morus rubra L., red mulberry—*BSS 3244* (MICH, PCCI). Rare, wooded slopes and terraces near Cedar Creek. **THREATENED.**

PAPAVERACEAE

Dicentra canadensis (Goldie) Walp., squirrel-corn—*BSS 3138* (PCCI). Occasional, mature forest on slopes and terraces.

PLANTAGINACEAE

Veronica anagallis-aquatica L., water speedwell—*BSS 3354* (PCCI). Rare, mucky banks of Cedar Creek.

PLATANACEAE

Platanus occidentalis L., sycamore—*BSS 3309* (PCCI). Occasional, scattered trees on wooded terraces along Gulley and Cedar Creeks, especially near their confluence.

POLYGONACEAE

Rumex verticillatus L., water dock—*BSS 3305* (PCCI). Rare, raw soil in and along Gulley Creek.

ROSACEAE

**Crataegus laevigata* (Poir.) DC., English hawthorn—*BSS 3220* (PCCI). Rare, banks above S Broadway St.

SCROPHULARIACEAE

Scrophularia marilandica L., late figwort—*BSS 3352* (MICH, PCCI). Rare, wooded terraces along Gulley and Cedar Creeks.

SIMAROUBACEAE

**Ailanthus altissima* (Mill.) Swingle, tree-of-heaven—*BSS 3401* (MICH, PCCI). Rare, old field/thicket on upland between ravines.

STAPHYLEACEAE

Staphylea trifolia L., bladdernut—*BSS 3188* (PCCI). Locally Common, wooded terraces near confluence of Gulley and Cedar Creeks.

THYMELAEACEAE

Dirca palustris L., leatherwood—*BSS 3151* (MICH, PCCI). Occasional, mature forest on slopes and terraces.

ULMACEAE

**Ulmus pumila* L., Siberian elm—*BSS 3350* (MICH, PCCI). Rare, old field/thicket on upland between ravines.