Biebesheimer Woodland

Bio-Inventory Report

Submitted to

MSU Campus Natural Areas Classroom, Curriculum and Conservation
Committee Submitted February 2024 by Sean Ward

Executive Summary and Recommendations

Biebesheimer Woodland is a good representation of a southern mesic forest. Its 15 native tree species in the canopy are notable for its relatively small size. However, this diversity is expected to decline over time because a single species (sugar maple) dominates all other strata. A total of 115 species of vascular plants were found in this woodland. Of these, 104 were native species to Michigan. This woodland has a high diversity of native ferns compared to other woodlands of similar size. Based on a Floristic Quality Assessment, the plant diversity represented here is high considering its small size and landscape context. Several non-native species were found, but abundance was low within the woodland. Most non-native species are confined to the edges around the fence line. There is evidence of past and ongoing research here, but it is not clear that any of it is currently active.

From a conservation perspective, Biebesheimer's most notable feature is its high biodiversity of native plants. Most fragmented woodlands in this area have far greater abundance of invasive species. Despite being surrounded by agricultural land and major roads (US Highway 127), Biebesheimer Woodland appears to be a "healthy" forest in this regard. It will be important to manage this woodland to maintain high biodiversity in the canopy and in the ground layer. This woodland's isolation from the public and proximity to the MSU

horticulture teaching and research center gives it high value for research and teaching. This woodland was surveyed June 2023.

Recommendations
1. Abandoned research materials (plastic milk jugs) should be removed from this woodland. Current research projects (bug collection devices) should be encouraged to continue being used.
2. Non-native and invasive species that have invaded the interior of this woodland should be managed while they are relatively non-abundant to prevent spreading and a subsequent loss of biodiversity.
3. This woodland should be prioritized for teaching non-flowering plants (ferns and mosses) because of its species richness of ferns compared to other areas on campus.

Forest Inventory

Overstory

Fifteen tree species were found in the overstory (>4" dbh) within Biebesheimer Woodland. Of these, seven were encountered in a fixed-area plot inventory and the other eight were encountered during a meandering survey of the woodland. Living overstory (>4" dbh) trees had a total basal area of 181.1 ft^2 ac^{-1} and a stem density of 173 trees per acre. Sugar maple (*Acer saccharum*) is this woodland's most important overstory species and it has the highest relative density. However, American beech (*Fagus grandifolia*) has the highest relative dominance (Table 1). Basswood (*Tilia americana*), Northern red oak (*Quercus rubra*), and black cherry (*Prunus serotina*) are also common throughout this woodland. The final three overstory species are each found in one plot. These are musclewood (*Ostrya virginiana*), eastern cottonwood (*Populus deltoides*), and American elm (*Ulmus americana*).

The eight other overstory species which were identified during a meandering survey include American hornbeam (*Carpinus caroliniana*), Red maple (*Acer rubrum*), White oak (*Quercus alba*), red elm (*Ulmus rubra*), bitternut hickory (*Carya cordiformis*), white ash (*Fraxinus americana*), and green ash (*Fraxinus pennsylvanica*). Red maple was common in and around wet depressions. Despite having many such depressions, all six plots occurred on upland and avoided these areas and their differing overstory, understory and herbaceous components.

Table 1. Overstory stand composition. Relative dominance is the percentage of the total stand basal area made up by each species, relative density is the percentage of total individuals and relative frequency is the percentage of plots in which a species was found. Importance Value (IV) is a summary statistic that averages across relative dominance, density and frequency.

Species	Rel. Dominance	Rel. Density	Rel. Frequency	Importance Value
Acer saccharum	21.5	46.2	83.3	50.4
Fagus grandifolia	23.9	13.4	50.0	29.1
Ostrya virginiana	0.3	1.9	16.7	6.3
Populus deltoides	11.4	3.8	16.7	10.6
Prunus serotina	5.2	9.6	66.7	27.2
Quercus rubra	12.6	9.6	33.3	18.5
Tilia americana	23.8	13.4	33.3	23.5
Ulmus americana	1.4	1.9	16.7	6.6

Understory

Biebesheimer supports an estimated 949 sapling stems per acre (at least 4.5 feet tall and </= 4" dbh). The dominant species in the sapling class is sugar maple, with a 83% relative frequency. These saplings were common in five of six plots and throughout the rest of the woodland. American beech has a 50% relative frequency, while eastern hophornbeam, and basswood both have a 16% occupy the sapling layer, although at dramatically lower densities (Table 2). The overwhelming density of sugar maples in the sapling layer coupled with a lack of larger diameter saplings suggests that this species will continue to dominate in the overstory.

Table 2. Composition and size class distribution of the sapling layer in Biebesheimer Woodland. Relative density and relative frequency for each species are expressed as a percentage of the total number of saplings, whereas individuals within each sapling size class are expressed as trees per acre.

Species	Rel. Dens.	Rel. Freq.	1" TPA	2" TPA	3" TPA	4" TPA
Acer saccharum	91.3	83.3	616.7	266.7	66.7	50.0
Fagus grandifolia	5.3	50.0	33.3	0.0	0.0	16.7
Ostrya virginiana	1.8	16.7	0.0	0.0	16.7	0.0
Tilia americana	1.8	16.7	16.7	0.0	0.0	0.0

Regeneration Layer

Seven tree species were identified in the seedling layer (<4.5 feet tall): sugar maple, bitternut hickory, American beech, green ash, muscle wood, black cherry, and red oak (Table 3). The dominating species in the seedling layer is sugar maple, which occurs in 100% of plots and has an average estimated ground coverage of 38%. American beech seedlings were found in half the plots at a 6% coverage; however, it is important to note that all basswood observed were new germinants. The complete lack of 2nd year or older basswood seedlings suggests that this species is not regenerating within Biebesheimer Woodland.

Table 3. Coverage and relative frequency of tree species in the seedling layer. Coverage is an estimate of the ground area of the plot covered by that species and relative frequency is the percentage of plots in which that species was found.

Species	Average % Coverage	Rel. Frequency
Acer saccharum	38.2	100.0
Carya cordifolia	2.5	50.0
Fagus grandifolia	6.7	50.0
Fraxinus pennsylvanica	4.6	100.0
Ostrya virginiana	15.0	16.7
Prunus serotina	2.5	33.3
Quercus rubra	2.5	16.7

Stand Condition, Snags and Coarse Woody Debris

All of the inventoried overstory trees were assigned to one of three Risk Classes based on structural integrity and evidence of disease/pest issues: RC1 = very low probability of dying during the next 20 years, RC2 = moderate probability of dying over the next 20 years, and RC3 = high probability of dying over next 20 years. Of the total stand basal area of 181.1 ft^2 ac^{-1}, 99% (179 ft^2 ac^{-1}) was in Risk Class 1 trees, 1% (1 ft^2 ac^{-1}) was in Risk Class 2 with 0% (0 ft^2 ac^{-1}) in Risk Class 3. On an individual tree basis, 98% (51 trees per acre) were in Risk Class 1, 2% (1 trees per acre) were in Risk Class 2, and 0% (0 trees per acre were in Risk Class 3. In addition to living trees, 10 standing dead (snags) trees were found per acre, which together accounted for 3.67 ft^2 ac^{-1}. Of the 10 snags per acre 33% were in decay class 1, 66% in decay class 2, and 0% for decay classes 3, 4 and 5.

Across the woodland, an average of 50.4 m^3 ha^{-1} of coarse woody debris (CWD) was identified. Variability across the woodland was high with a range across our 16 plots from 0 to 372.18 m^2 ha^{-1}. A CV of 226% was determined.

Forest Inventory Summary and Conclusions

Biebesheimer Woodland contains a good representation of a mesic southern forest as defined by the Michigan Natural Features Inventory (Cohen et al. 2020). The overstory is dominated by shade-tolerant sugar maple and American beech, but also has excellent representation of a diverse mix of associated species. Many hardwood forests of the southern Lower Peninsula are heavily impacted by deer browsing and have poor stocking in the sapling layer and/or dominance of the sapling layer by undesirable species such as white ash and ironwood (*Ostrya virginiana*). White ash and ironwood are unpalatable to deer and are undesirable from a forestry perspective because they are incapable of growing to canopy size; ironwood due to its inherent growth potential and white ash due to Emerald Ash Borer (EAB). Biebesheimer Woodland, in contrast, has a well-stocked sapling layer composed of species capable of recruiting into the canopy as gaps form above them. One cause for concern, however, is the nearly complete dominance of the sapling layer by a single species - sugar maple. Without a major disturbance or management intervention the tree species diversity of this woodland will decline overtime as mid-tolerant and intolerant canopy species die and are replaced overwhelmingly by sugar maple.

Botanical Assessment

Overall, 115 different species of vascular plants were identified in Biebesheimer Woodland, although four of these could not be identified to species (Table 4). These included *Equisetum* sp., *Solidago* sp., and *Viola* sp. Of the 115 species completely identified, 104 were native and 11 were non-native. Several of the native species have a high C value, indicative of fidelity to high quality native habitats. This species list resulted in a Total Floristic Quality Index (FQI) of 40.8 for Biebesheimer Woodland. The FQI measures the botanical quality of a site from a biodiversity conservation perspective, an FQI score less than 20 indicates that the site is of insignificant value in terms of plant biodiversity, a score greater than 35 indicates an important site for plant biodiversity, and a score greater than 50 indicates a site with outstanding plant biodiversity value.

Table 4. Listing of all vascular plants identified to species in and around Biebesheimer Woodland in June and July of 2023.

Scientific Name	Family	Native?	Physiognomy
Acer rubrum	Sapindaceae	native	tree
Acer saccharum	Sapindaceae	native	tree
Actaea pachypoda	Ranunculaceae	native	forb
Allium tricoccum	Alliaceae	native	forb
Apocynum cannabinum; a. sibiricum	Apocynaceae	native	forb
Arisaema triphyllum	Araceae	native	forb
Asimina triloba	Annonaceae	native	tree
Athyrium filix-femina	Athyriaceae	native	fern
Berberis thunbergii	Berberidaceae	non-native	shrub
Boehmeria cylindrica	Urticaceae	native	forb
Cardamine concatenata; dentaria laciniata	Brassicaceae	native	forb
Cardamine douglassii	Brassicaceae	native	forb
Cardamine pensylvanica	Brassicaceae	native	forb

Carex bromoides	Cyperaceae	native	sedge
Carex crinita	Cyperaceae	native	sedge
Carex cristatella	Cyperaceae	native	sedge
Carex gracillima	Cyperaceae	native	sedge
Carex grayi	Cyperaceae	native	sedge
Carex grisea; c. amphibola	Cyperaceae	native	sedge
Carex hirtifolia	Cyperaceae	native	sedge
Carex lupulina	Cyperaceae	native	sedge
Carex muskingumensis	Cyperaceae	native	sedge
Carex pedunculata	Cyperaceae	native	sedge
Carex pensylvanica	Cyperaceae	native	sedge
Carex prasina	Cyperaceae	native	sedge
Carex rosea; c. convoluta	Cyperaceae	native	sedge
Carex stipata	Cyperaceae	native	sedge
Carex tribuloides	Cyperaceae	native	sedge
Carex woodii	Cyperaceae	native	sedge
Carpinus caroliniana	Betulaceae	native	tree
Carya cordiformis	Juglandaceae	native	tree
Castanea mollissima	Fagaceae	non-native	tree
Celastrus orbiculatus	Celastraceae	non-native	vine
Cephalanthus occidentalis	Rubiaceae	native	shrub
Circaea canadensis; c. lutetiana	Onagraceae	native	forb
Claytonia virginica	Montiaceae	native	forb
Cornus alternifolia	Cornaceae	native	tree

Cornus foemina	Cornaceae	native	shrub
Corylus americana	Betulaceae	native	shrub
Dryopteris carthusiana	Dryopteridaceae	native	fern
Dryopteris intermedia	Dryopteridaceae	native	fern
Enemion biternatum; isopyrum b.	Ranunculaceae	native	forb
Epifagus virginiana	Orobanchaceae	native	forb
Epilobium parviflorum	Onagraceae	non-native	forb
Epipactis helleborine	Orchidaceae	non-native	forb
Equisetum fluviatile	Equisetaceae	native	fern
Erigeron philadelphicus	Asteraceae	native	forb
Erythronium americanum	Liliaceae	native	forb
Euonymus alatus	Celastraceae	non-native	shrub
Euonymus obovatus	Celastraceae	native	shrub
Fagus grandifolia	Fagaceae	native	tree
Fragaria vesca	Rosaceae	native	forb
Fraxinus americana	Oleaceae	native	tree
Fraxinus pennsylvanica	Oleaceae	native	tree
Galium aparine	Rubiaceae	native	forb
Galium obtusum	Rubiaceae	native	forb
Geranium maculatum	Geraniaceae	native	forb
Geum canadense	Rosaceae	native	forb
Glyceria septentrionalis	Poaceae	native	grass
Glyceria striata	Poaceae	native	grass
Hamamelis virginiana	Hamamelidaceae	native	shrub

Hydrophyllum virginianum	Boraginaceae	native	forb
Ilex verticillata	Aquifoliaceae	native	shrub
Impatiens capensis	Balsaminaceae	native	forb
Iris virginica	Iridaceae	native	forb
Lindera benzoin	Lauraceae	native	shrub
Liriodendron tulipifera	Magnoliaceae	native	tree
Lonicera maackii	Caprifoliaceae	non-native	shrub
Lycopus rubellus	Lamiaceae	native	forb
Lysimachia thyrsiflora	Myrsinaceae	native	forb
Maianthemum canadense	Convallariaceae	native	forb
Monotropa uniflora	Ericaceae	native	forb
Onoclea sensibilis	Onocleaceae	native	fern
Osmunda cinnamomea	Osmundaceae	native	fern
Osmunda regalis	Osmundaceae	native	fern
Ostrya virginiana	Betulaceae	native	tree
Parthenocissus inserta	Vitaceae	native	vine
Parthenocissus quinquefolia	Vitaceae	native	vine
Persicaria virginiana; polygonum v.	Polygonaceae	native	forb
Phalaris arundinacea	Poaceae	native	grass
Pilea pumila	Urticaceae	native	forb
Pinus strobus	Pinaceae	native	tree
Podophyllum peltatum	Berberidaceae	native	forb
Polygonatum pubescens	Convallariaceae	native	forb
Polystichum acrostichoides	Dryopteridaceae	native	fern

Populus deltoides	Salicaceae	native	tree
Prunus serotina	Rosaceae	native	tree
Prunus virginiana	Rosaceae	native	shrub
Quercus alba	Fagaceae	native	tree
Quercus rubra	Fagaceae	native	tree
Ranunculus abortivus	Ranunculaceae	native	forb
Ranunculus sceleratus	Ranunculaceae	native	forb
Rhamnus cathartica	Rhamnaceae	non-native	tree
Ribes cynosbati	Grossulariaceae	native	shrub
Rosa multiflora	Rosaceae	non-native	shrub
Rubus allegheniensis	Rosaceae	native	shrub
Rubus occidentalis	Rosaceae	native	shrub
Sambucus racemosa	Adoxaceae	native	shrub
Sanguinaria canadensis	Papaveraceae	native	forb
Sium suave	Apiaceae	native	forb
Solanum dulcamara	Solanaceae	non-native	vine
Solidago caesia	Asteraceae	native	forb
Symphyotrichum pilosum; aster p.	Asteraceae	native	forb
Thelypteris noveboracensis	Thelypteridaceae	native	fern
Tilia americana	Malvaceae	native	tree
Toxicodendron radicans	Anacardiaceae	native	vine
Trillium grandiflorum	Trilliaceae	native	forb
Ulmus americana	Ulmaceae	native	tree
Ulmus rubra	Ulmaceae	native	tree

Viburnum lentago	Adoxaceae	native	shrub
Viburnum opulus	Adoxaceae	non-native	shrub
Viola pubescens	Violaceae	native	forb
Viola sororia	Violaceae	native	forb
Vitis riparia	Vitaceae	native	vine
Zanthoxylum americanum	Rutaceae	native	shrub

Several species of non-native plants were identified within Biebesheimer Woodland with most being right along the fence line. Non-native species may likely be amplified by Biebesheimer's immediate placement next to a major highway and agricultural/horticultural land. The only invasive species consistently observed in the forest interior were multiflora rose (*Rosa multiflora*) and honeysuckles (*Lonicera spp.*) which appeared throughout the woodland. All invasive shrubs occurred as widely spaced, isolated individuals with no apparent invasion front. Cut and spray treatments of these species would be quite manageable at this stage and could prevent further spread.

With its mix of both upland and wetlands, this woodland hosts an array of native ferns, fern allies, and sedges. Cinnamon fern (*Osmundastrum cinnamomeum*) and American royal fern (Osmunda spectabilis) are found on logs in wet depressions while woodferns (*Dryopteris* spp.) occur in uplands.

Concerns, Threats, and Human Impacts

Research/Teaching Artifacts

There is evidence of research and/or teaching activities within Biebesheimer Woodland. Roughly three large bug traps were present in summer of 2023. These were not found in January 2024. Roughly ~40-50 plastic milk jugs litter the grounds and appear to be past their use of collecting data/research.

Figure 1. Human Disturbances: Left to right: Animal trap with plastic milk jugs and funnels in the back, metal pole, and a mound of large rocks near the entrance of the woodland.

Trash, Structures or Other Human Disturbance
Very little non-research trash was evident anywhere within Biebesheimer Woodland.

Boundary Issues
The fence around Biebesheimer Woodland is in great shape along the boundary between the woodland and the horticulture and agriculture fields. On the boundary between the woodland and US Highway 127, the fence has been downed by fallen trees. This boundary also crosses through the wet depressions where the fence has been completely downed by trees in some places.

Biotic Concerns
With a tall fence intact around most of the woodland, Biebesheimer is well insulated from deer over browsing. However, with its placement around horticultural and agricultural areas, invasive species will likely continue to invade the woodland and degrade the otherwise high quality land.

Water Features
Wet depressions and intermittent wetlands are common throughout Biebesheimer, especially on the western and southern sides. About seven or eight were identified, varying from medium-sized to pond like areas. Although most had little to no standing water during the time of the

survey, the high abundance of wetland associates suggests these areas are seasonally inundated. One wet area is covered in winterberry (*Ilex verticillata*) and is likely wet year-round. These areas are home to high biodiversity of ferns, grasses, and forbs.

Figure 2. Water Features: Left to right: The largest water feature, which was inundated during the summer and winter months. On the right, a smaller, but wooded water feature supports winterberry and ferns.

Figure 3. Map of Biebesheimer: Outlined in green ink, with blue stars and ovals representing some of the water features.
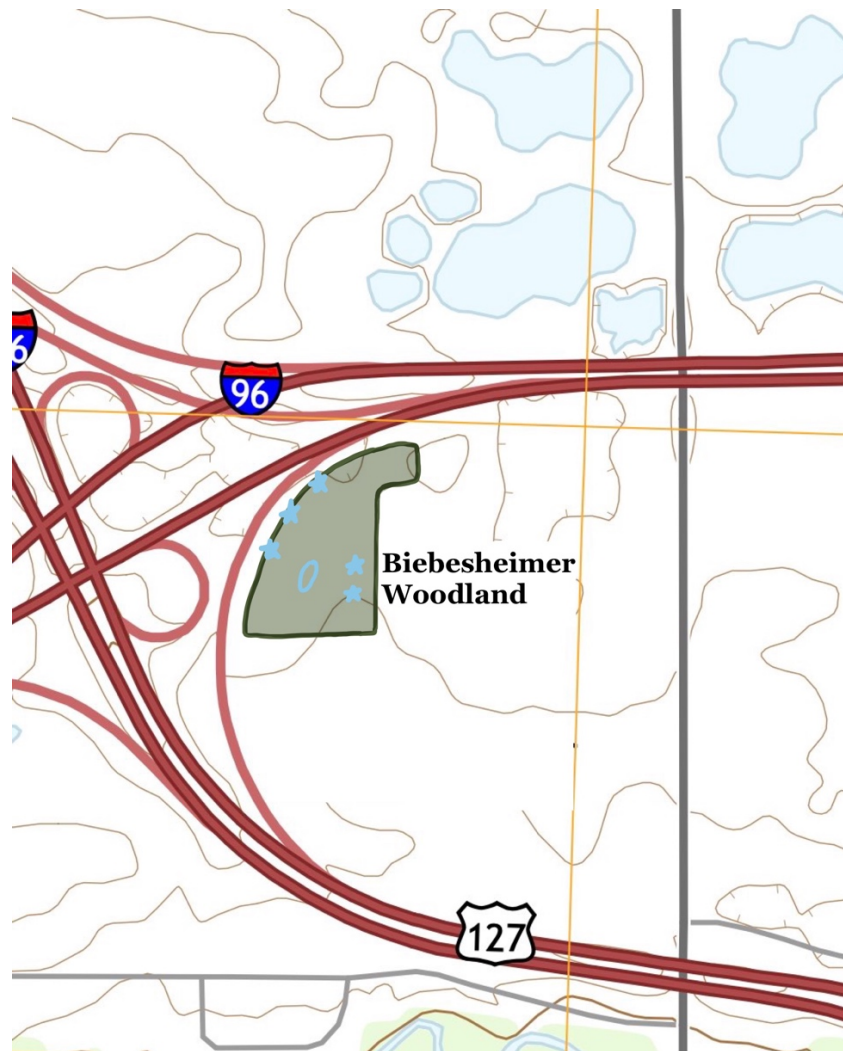
Acknowledgements

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