Southworth Woodland

Bio-Inventory Report

Submitted to

MSU Campus Natural Areas Classroom, Curriculum and Conservation

Committee Submitted August 2021 by Matthew Peña

Executive Summary and Recommendations

Southworth Woodland is a fairly poor representation of mature southern mesic forest. Its overstory, sapling layer, and seedling layers are all overwhelmingly dominated by a single species (sugar maple). We observed a total of 40 vascular plants within Southworth, 36 of which were native species. Based on a Floristic Quality Assessment, the plant diversity represented at Southworth is good, but not exceptional from a conservation perspective. Only a few invasive species were observed at Southworth, but only one such species was observed frequently (garlic mustard). Activities and use of Southworth includes a large, active maple syrup operation ongoing at Southworth as well as some active forest pest research. There were no issues with the fencing of Southworth, and there were no access points for cows or other farm animals that would allow them inside of the woodland.

Overall, the most significant observation from Southworth Woodland was the lack of woody plant diversity and overwhelming dominance by sugar maple. The lack of tree diversity, lack of public access and lack of sensitive habitats make this woodland an excellent candidate for forestry research and demonstration projects. In particular, this woodland is well suited for experimenting with forest management activities designed to promote regeneration and recruitment of species other than sugar maple. Due to the lack of invasive species and presence of higher-quality native species, this woodland is absolutely capable of supporting a high quality diverse forest. Any such efforts would need to be coordinated to ensure they do not impact the maple syrup operation.

Recommendations
1. Explore opportunities with the Forestry Department to initiate forest restoration and/or diversification activities. This could be done as part of FOR 406L Silviculture Lab.
2. Treatment of garlic mustard, amur honeysuckle, and multiflora rose while there is no large-scale invasion.

Forest Inventory

Overstory

We found a total of 7 species of trees in the overstory (>4" dbh) at Southworth Woodland; 5 of these species were observed in at least one of our 6 fixed-area plots, and the other 2 were observed during our walking survey of the woodland. Living overstory (>4" dbh) trees at Southworth Woodland had a total basal area of 99.4 ft^2 ac^{-1} and a stem density of 73.3 trees per acre. Sugar maple (*Acer saccharum)* was overwhelmingly the most important overstory tree based on our plot survey due to the fact that it had the highest relative dominance, density and frequency of any species (Table 1). American beech (*Fagus grandifolia)* follows as the next most important species with ironwood *(Ostrya virginiana)* close behind American beech. Black cherry (*Prunus serotina)* and American elm (*Ulmus americana)* were also observed within our plots, but neither were observed as living overstory trees. For the living overstory trees that we did observe, it is important to note that according to our plot samples, American beech and ironwood are still both fairly insignificant to the woodland as a whole. Throughout the 22 overstory trees we sampled during our survey, 19 of those were sugar maples, 2 were American beech, and 1 was an ironwood. Along with that, of the 3 non-sugar maples we observed, the largest one was an American beech with a 8.2" in dbh. Furthermore, there were only 2 additional species of trees observed in the overstory throughout our walking survey of the woodland: basswood (*Tilia americana)* and red oak (*Quercus rubra)*. While only one red oak tree was observed, basswood was a very abundant species, suggesting that our random plot sampling failed to capture a key component of this woodland.

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	IV
American Beech	1.978420226	9.090909091	33.33333333	14.80088755
Ironwood	0.7028694407	4.545454545	16.66666667	7.304996884
Sugar Maple	97.31871033	86.36363636	100	94.56078223

Understory

Based on our inventory plots we estimate that there are a total of 1617 stems per acre of trees recruiting into the sapling class (at least 4.5 feet tall and </= 4" dbh) at Southworth

Woodland. Sugar maple overwhelmingly dominated the saplings layer in Southworth. Overall, sugar maple accounted for 95% of all saplings measured, and it was encountered in the sapling layer of every single plot (Table 2). There were only two other species that we encountered in the sapling layer at Southworth: American elm (*Ulmus americana)* and black cherry (*Prunus serotina*). American elm was the second most dominant species by having a 4% relative density and a 33% relative frequency. The least dominant sapling layer species was black cherry, which was found at a 1% relative density and was only found in one plot (16.7% relative frequency). The distribution of species across the different sapling size classes further demonstrates that sugar maple is dominating the recruits in this stand that will replace overstory trees as they die. In the 1" in., 2" in., and 3" in. classes, sugar maple was the clear dominant species, having hundreds of trees per acre more than either of the other 2 species. American elm occurred the most in the 4" in. diameter class, however it is important to note that, although it accounts for 16.7 trees per acre, there was only one individual that we recorded in our data for that diameter class. Black cherry was restricted to the 1" in. diameter class, but only one black cherry sapling was found across all 6 plots, so that number likely does not accurately represent black cherry representation in the entire woodland.

Table 2. Composition and size class distribution of the sapling layer in Southworth 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
American Elm	4.1	33.33	0	33.3	16.7	16.7
Black Cherry	1.03	16.7	16.7	0	0	0
Sugar Maple	94.8	100	833.3	583.3	116.7	0

Regeneration Layer

We identified 4 tree species regenerating in the seedling layer (<4.5 feet tall) of Southworth Woodland: American elm, bitternut hickory (*Carya cordiformis)*, black cherry, and sugar maple. The seedling layer was dominated by sugar maple due to the fact that sugar maple was not only the only species to occur in more than one plot, but it also occurred within every single plot at an average coverage percentage of about 15%. Each of the other species, American elm, bitternut hickory, and black cherry, were only observed in 1 of the 6 plots, and only occurred at an average coverage percentage of 2.5%. Along with these species, we observed paw paw (*Asimina triloba)* in the seedling layer throughout our walking survey. While we observed between 5 and 10 seedling-size individuals, we did not spot any mature paw paw individuals.

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
American Elm	2.5	16.66666667
Bitternut Hickory	2.5	16.66666667
Black Cherry	2.5	16.66666667
Sugar Maple	14.58333333	100

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 99.4 ft^2 ac^{-1}, 84% (83.9 ft^2 ac^{-1}) was in Risk Class 1 trees, 16% (15.5 ft^2 ac^{-1}) was in Risk Class 2 and no trees were observed in Risk Class 3. On an individual tree basis, 91% (66.67 trees per acre) were in Risk Class 1, 9% (6.67 trees per acre) were in Risk Class 2, and none were in Risk Class 3. In addition to living trees, we found 6.67 standing dead (snags) trees per acre (2 trees total), which together accounted for 7.7 ft^2 ac^{-1}. Of the 6.67 snags per acre 50% were in decay class 1, and 50% were in decay class 2.

Averaged across the woodland we found an average of 14.9 m^3 ha^{-1} of coarse woody debris (CWD). CWD was observed at least once in all 6 of our plots. Twenty-nine percent of the CWD volume was in decay class 1, 14% in decay class 2, 29% in decay class 3 and 29% in decay class 4. We did not estimate volumes for decay class 5 CWD.

Forest Inventory Summary and Conclusions

Southworth Woodland overall does not have a very diverse overstory, as it is dominated by sugar maple along with the occasional beech, ironwood, red oak, basswood, black cherry, or American elm. There is fairly poor recruitment in the sapling layer due to it being heavily dominated by sugar maple while only having a handful of other individual trees spread across only 2 species. As observed in other woodlots like Hudson and Toumey, sugar maple is very abundant throughout the sapling and seedling layers of many woodlots on MSU's campus. The current state of Southworth could provide an example for what these woodlots might look like if they are not managed properly: they will be overwhelmingly dominated by sugar maple with little diversity of tree species. The sugar maples in Southworth currently have a 95% relative density in the sapling layer and a 86% relative density in the overstory.

Botanical Assessment

Overall we found 40 different species of vascular plants at Southworth Woodland (Table 4). Of these 40 species, only 4 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 an overall Floristic Quality Index (FQI) of 25.3 for Southworth 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 Southworth Woodland in June, 2021.

Scientific Name	Family	Native?	C	Form	Duration	Common Name
Acer saccharum	Sapindaceae	native	5	tree	perennial	sugar maple
Actaea pachypoda	Ranunculaceae	native	7	forb	perennial	dolls-eyes
Alliaria petiolata	Brassicaceae	non-native	0	forb	biennial	garlic mustard
Arctium minus	Asteraceae	non-native	0	forb	biennial	common burdock
Arisaema triphyllum	Araceae	native	5	forb	perennial	jack-in-the-pulpit
Asimina triloba	Annonaceae	native	9	tree	perennial	pawpaw
Cardamine concatenata; dentaria laciniata	Brassicaceae	native	5	forb	perennial	cut-leaved toothwort
Carex albursina	Cyperaceae	native	5	sedge	perennial	sedge
Carya cordiformis	Juglandaceae	native	5	tree	perennial	bitternut hickory
Caulophyllum thalictroides	Berberidaceae	native	5	forb	perennial	blue cohosh
Circaea canadensis; c. lutetiana	Onagraceae	native	2	forb	perennial	enchanters-nightshade
Elymus hystrix; hystrix patula	Poaceae	native	5	grass	perennial	bottlebrush grass
Euonymus obovatus	Celastraceae	native	5	shrub	perennial	running strawberry-bush
Fagus grandifolia	Fagaceae	native	6	tree	perennial	american beech
Galium aparine	Rubiaceae	native	0	forb	annual	annual bedstraw
Hydrophyllum canadense	Boraginaceae	native	7	forb	perennial	canada waterleaf
Hydrophyllum virginianum	Boraginaceae	native	4	forb	perennial	virginia waterleaf
Lindera benzoin	Lauraceae	native	7	shrub	perennial	spicebush
Lonicera maackii	Caprifoliaceae	non-native	0	shrub	perennial	amur honeysuckle
Maianthemum racemosum; smilacina r.	Convallariaceae	native	5	forb	perennial	false spikenard
Ostrya virginiana	Betulaceae	native	5	tree	perennial	ironwood; hop-hornbeam
Parthenocissus quinquefolia	Vitaceae	native	5	vine	perennial	virginia creeper

Phryma leptostachya	Phrymaceae	native	4	forb	perennial	lopseed
Podophyllum peltatum	Berberidaceae	native	3	forb	perennial	may-apple
Polygonatum biflorum	Convallariaceae	native	4	forb	perennial	solomon-seal
Prunus serotina	Rosaceae	native	2	tree	perennial	wild black cherry
Prunus virginiana	Rosaceae	native	2	shrub	perennial	choke cherry
Quercus rubra	Fagaceae	native	5	tree	perennial	red oak
Ribes cynosbati	Grossulariaceae	native	4	shrub	perennial	prickly or wild gooseberry
Rosa multiflora	Rosaceae	non-native	0	shrub	perennial	multiflora rose
Sambucus racemosa	Adoxaceae	native	3	shrub	perennial	red-berried elder
Sanguinaria canadensis	Papaveraceae	native	5	forb	perennial	bloodroot
Smilax hispida; s. tamnoides	Smilacaceae	native	5	vine	perennial	bristly greenbrier
Solidago caesia	Asteraceae	native	6	forb	perennial	bluestem goldenrod
Symplocarpus foetidus	Araceae	native	6	forb	perennial	skunk-cabbage
Tilia americana	Malvaceae	native	5	tree	perennial	basswood
Toxicodendron radicans	Anacardiaceae	native	2	vine	perennial	poison-ivy
Trillium grandiflorum	Trilliaceae	native	5	forb	perennial	common trillium
Ulmus americana	Ulmaceae	native	1	tree	perennial	american elm
Urtica dioica	Urticaceae	native	1	forb	perennial	stinging nettle

Invasive Species

Throughout Southworth Woodland, we only observed 4 invasive species, but only one of them, burdock (*Arctium minus)* was observed on the fenceline. The three species that we observed throughout the interior of the woodland, garlic mustard (*Alliaria petiolata),* amur honeysuckle (*Lonicera maackii*), and multiflora rose (*Rosa multiflora)*, were observed at varying frequency levels. Garlic mustard was spotted fairly frequently throughout the woodland while we observed amur honeysuckle only a few times and spotted multiflora rose only once. We did not notice any one area with a dense invasion of garlic mustard.

Human Impacts
Research Artifacts

There are some large research structures throughout Southworth Woodland. The most significant of which appears to be a maple-tapping project shown in the top picture of Figure 1. We observed this in three different locations, all of which occur on the northern half of the woodland, and one of which occurs not too far west of the main gate. The other research experiment, the 2 smaller pictures in Figure 1, was located in the northwestern corner of the

woodland. As shown on the tag, it is an experiment conducted by D. Mccullough and P. Payter who are studying exotic forest pests.

Figure 1. Photos of research material

Trash, Structures or Other Human Disturbance
 The largest piece of evidence of human disturbances were these large pieces of leftover farm equipment (Figure 2). They are what appears to be some metal parts to some old equipment along with a barrel. This equipment is located inside a small valley on the northeastern corner of the woodland. Other pieces of human interference include some leftover stumps from someone who chopped wood not too far from the equipment, and some wooden panels located on the southwestern corner.

Figure 2. Photos of human interference at Southworth Woodland

Boundary Issues

      The fences at Southworth Woodland are perfectly intact. Another positive observation is that no cows were seen inside the woodland. We did spot them just outside the fences and they were able to access an area with trees on the western edge of the woodland, but none were seen inside, and we did not spot any opening that could allow cows inside.

Figure 3. Map of fenceline: SW corner (42.68819N 84.46961W); NW corner (42.68991N 84.46956W); NE corner (42.68991N 84.46687W); SE corner (42.68812N 84.46700W)

Southworth Woodlot Fence Status

· Gates — Intact Fences
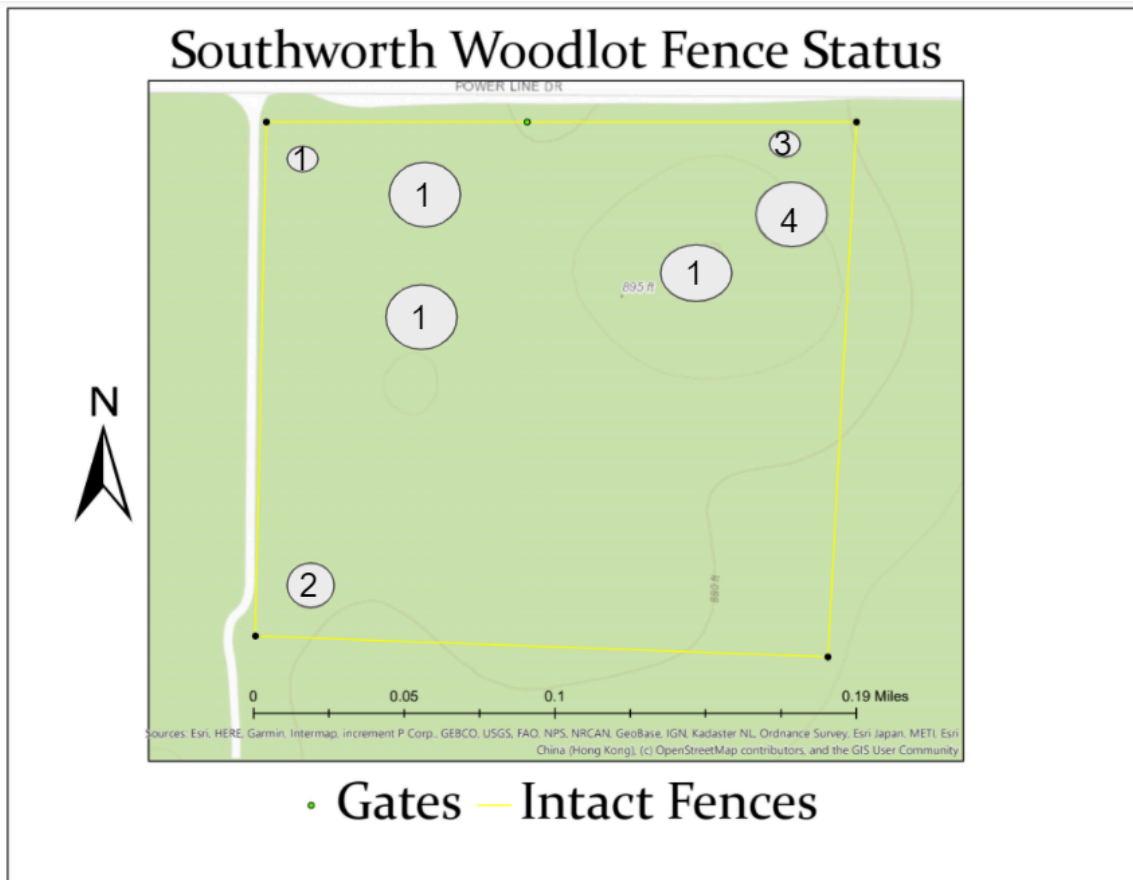
1. Research equipment that appears to be a total of 2 projects. The small circle in the NW corner is its own project on pests while the other 3 circles are the maple tapping project.
2. Wooden planks that look like they may have formerly been used as floorboards or doors.
3. Leftover stumps from someone chopping wood
4. Big pit that has old farm equipment and a barrel