



Toumey Woodlot

Bio-Inventory Report

Submitted to
MSU Campus Natural Areas Classroom, Curriculum and Conservation
Committee Submitted August 2021 by Matthew Peña

Executive Summary and Recommendations

Toumey Woodlot is an excellent representation of mature southern mesic forest. It has a high diversity of tree species present, although many of these are clearly planted species that would not occur naturally in this forest type. Toumey Woodlot is known for a section of old-growth forest that has been registered as a natural landmark. The old-growth status is evident in some extremely large specimens of sugar maple, American beech and northern red oak, as well as a relatively high density of standing dead trees and downed woody debris. As with other mesic forest Campus Natural Areas, tree species diversity is expected to decline over time at Toumey as a single species (sugar maple) dominates understory strata from seedling layer to the largest saplings. Invasive species are present at Toumey but at low densities. Garlic mustard and Amur honeysuckle are the invasive species that are best established in the forest interior. Toumey Woodlot has at least two vernal pools and an intermittent stream which add to its conservation value as these sensitive habitats harbor a unique set of flora and fauna (Thomas et al. 2010).

Toumey Woodlot clearly has value as a research site as evidenced by the artifacts of several research studies. The combination of being difficult to access, landmark old-growth status and the presence of vernal pools, means that Toumey's greatest values lie in preservation and as a site for ecological research. A greater emphasis on public nature viewing is possible, but would require development of a parking area and clean up of fencing and research materials. Toumey Woodlot is not a good candidate for forest management activities other than invasive species control.

Recommendations

1. Work with researchers and volunteers (Forestry Club or other student groups), to remove older research detritus.
2. If resources are available treatment of garlic mustard and amur honeysuckle while their densities are low.
3. Consider the development of a parking area and interpretative materials centered on the landmark old-growth portions of Toumey.

Forest Inventory

Overstory

In total, we encountered 21 species of trees in the overstory (>4" dbh) at Toumey Woodlot. 7 of these trees were encountered in our fixed-area plot inventory, and the other 14 of them were found during our walking survey of the woodlot. The living overstory trees (>4" dbh) at Toumey Woodlot had a total basal area of 233.5 ft² ac⁻¹ and a stem density of 110 trees per acre. Sugar maple (*Acer saccharum*) was by far the most important overstory tree species due to it having the highest relative dominance, relative density, and relative frequency of any species that we encountered within our plots (Table 1). The next most important overstory tree in Toumey Woodlot is American beech (*Fagus grandifolia*) which barely edges out red oak (*Quercus rubra*) due to American beech having a higher relative density and frequency. While red oak has a higher relative dominance, it is important to note that it is because of a small number of massive red oaks that we encountered in our plots, with two of the four surpassing 50" in dbh. The smaller and less frequent trees included basswood (*Tilia americana*), bitternut hickory (*Carya cordiformis*), ironwood (*Ostrya virginiana*), and American elm (*Ulmus americana*). Basswood was the only tree of this group that was encountered more than just a couple times, but all but one of the basswoods we saw were young. In our final walking survey of Toumey Woodlot, we encountered 14 additional tree species in the overstory that were not seen in any of our 10 plots. These species are: black maple (*Acer nigrum*), black walnut (*Juglans nigra*), chinkapin oak (*Quercus muehlenbergii*), Douglas fir (*Pseudotsuga menziesii*), eastern larch (*Larix laricina*), eastern white pine (*Pinus strobus*), Norway spruce (*Picea abies*), scotch pine (*Pinus sylvestris*), slippery elm (*Ulmus rubra*), tuliptree (*Liriodendron tulipifera*), white oak (*Quercus alba*), white spruce (*Picea glauca*), wild crab apple (*Malus coronaria*), and a member of the hawthorn (*Crataegus*) genus. While the exact species of hawthorn is not certain, we believe it may be fireberry hawthorn (*Crataegus chrysocarpa*). Of these species, the most abundant were black walnut, eastern white pine, scotch pine, and white spruce. However, of these, black walnut is the only significant species that was completely missed by our plot sampling due to the fact that it is the only species of the 4 listed above that is naturally occurring throughout the woodlot. In contrast, the conifers were mostly found along the western and northern edges of the woodlot, along with a cluster of dead scotch pine near the middle. Apart from the dead scotch pine in the center, we did not observe a single conifer that was more than 10 feet away from the forest edge. The remaining tree species were only encountered as a single tree in our walking survey: black maple, chinkapin oak, Douglas fir, eastern larch, fireberry hawthorn, Norway spruce, slippery elm, tuliptree, white oak, and wild crab apple.

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	21.5	14.5	40	25.3
American Elm	0.2	1.8	10	4.0
Basswood	2.8	9.1	20	10.6
Bitternut Hickory	2.4	3.6	10	5.4
Ironwood	0.3	3.6	10	4.6
Red Oak	29.0	7.3	30	22.1
Sugar Maple	43.9	60	100	68.0

Understory

Based on our inventory plots, we estimate that there are about 790 trees per acre in the sapling layer (at least 4.5 feet tall and a dbh less than 4") at Toumey Woodlot. This understory class is overwhelmingly dominated by sugar maple saplings, as they account for about 66% of all saplings and were observed in every one of our 10 plots (Table 2). The next most abundant species is white ash (*Fraxinus americana*) which has a relative density of nearly 19%, but was only found in 2 of the 10 plots. Following white ash is black cherry (*Prunus serotina*) at 6.3% relative density and a 20% relative frequency, prickly ash (*Zanthoxylum americanum*) with a 3.8% relative density and 10% relative frequency, and American beech with a 2.5% relative density and a 10% relative frequency. Along with those, bitternut hickory and red oak both account for 1.3% of the relative density and a 10% relative frequency. The distribution of saplings across the different diameter classes shows that sugar maple is dominating each size class. American beech, black cherry, and red oak can be found very sparsely in the larger diameter classes while bitternut hickory and white ash are currently confined to the smallest sapling size class.

Table 2. Composition and size class distribution of the sapling layer in Toumey Woodlot. 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 Beech	2.5	10	0	10	0	10
Bitternut Hickory	1.3	10	10	0	0	0

Black Cherry	6.3	20	40	0	10	0
Prickly Ash	3.8	10	30	0	0	0
Red Oak	1.3	10	0	0	0	10
Sugar Maple	65.8	100	270	160	70	20
White Ash	19.0	20	150	0	0	0

Regeneration Layer

We observed 7 tree species regenerating in the seedling layer (<4.5 feet tall) at Toumey Woodlot: American beech, black cherry, boxelder maple (*Acer negundo*), ironwood, red oak, sugar maple, and white ash (Table 3). Sugar maple seedlings were overwhelmingly dominant as they were observed in every single plot with an average coverage percentage of 58%. Out of the rest of the species from the seedling layer, American beech, black cherry, and white ash were the only ones to be seen in more than 1 plot, and American beech is the only one of those species that has an average coverage percentage greater than 2.5%.

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 Beech	8.75	40
Black Cherry	2.5	20
Boxelder Maple	2.5	10
Ironwood	2.5	10
Red Oak	2.5	10
Sugar Maple	58	100
White Ash	2.5	40

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 basal area of 233.5 ft² ac⁻¹, 58% (135 ft² ac⁻¹) was in Risk Class 1 trees, 31% (73 ft² ac⁻¹) was in Risk Class 2, and 11% (26 ft² ac⁻¹) was in Risk Class 3. It is important to note that although 31% of the total basal area is in Risk Class 2, 89% (65 ft² ac⁻¹) of the Risk Class 2 basal area comes from just two trees: two large, old red oaks that have diameters of 50.8" and 58.7". On an individual tree basis, 85% (94 trees per acre) were in Risk Class 1, 11% were in Risk Class 2, and 4% (4 trees per acre) were in

Risk Class 3. In addition to living trees, we found 4 standing dead (snags) trees per acre, which account for 0.5 ft² ac⁻¹. Only 2 standing dead trees were observed, and both of them were in decay class 5.

Across the woodlot, we found an average of 63.1 m³ ha⁻¹ of coarse woody debris (CWD). Coarse woody debris was distributed across the woodlot with 8 of 10 plots having at least one piece of CWD. Seven percent of the CWD volume was in decay class 1, 23% in decay class 2, 52% in decay class 3 and 18% in decay class 4. We did not estimate volumes for decay class 5 CWD.

Forest Inventory Summary and Conclusions

Toumey Woodlot has a diverse overstory that includes a mix of both native hardwoods and planted conifers. There is good recruitment throughout the sapling layers, however it is still very much dominated by sugar maple saplings, meaning that Toumey Woodlot will be much less diverse in the future if it continues on this trajectory. Sugar maple saplings are also very abundant in the smallest diameter class, suggesting that the deer pressure within this woodlot is not preventing recruitment from seedling to sapling layers. Toumey is known for its designation as an old growth forest and this is reflected in a very high basal area and large volume of coarse woody debris.

Botanical Assessment

Overall we found 67 different species of vascular plants in Toumey Woodlot, however two of these could not be identified to species (Table 4). One of these was an unknown member of the family Apiaceae, and the other was an unidentified member of the family Poaceae. Of the 65 species completely identified, 49 were native and 16 were non-native. Many of the native species have high C values, indicating that Toumey Woodlot has high quality native habitats. The species list overall resulted in a Floristic Quality Index (FQI) of 26.8 for Toumey Woodlot - the exact same rating as Hudson Woodlot. 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 Toumey Woodlot in May and June, 2021.

Scientific Name	Family	Native?	C	Form	Duration	Common Name
<i>Acer negundo</i>	Sapindaceae	native	0	tree	perennial	box-elder
<i>Acer nigrum</i>	Sapindaceae	native	4	tree	perennial	black maple
<i>Acer saccharum</i>	Sapindaceae	native	5	tree	perennial	sugar maple
<i>Actaea pachypoda</i>	Ranunculaceae	native	7	forb	perennial	dolls-eyes

<i>Alliaria petiolata</i>	Brassicaceae	non-native	0	forb	biennial	garlic mustard
<i>Amelanchier laevis</i>	Rosaceae	native	4	tree	perennial	smooth shadbush
<i>Arctium minus</i>	Asteraceae	non-native	0	forb	biennial	common burdock
<i>Arisaema triphyllum</i>	Araceae	native	5	forb	perennial	jack-in-the-pulpit
<i>Berberis thunbergii</i>	Berberidaceae	non-native	0	shrub	perennial	japanese barberry
<i>Cardamine concatenata; dentaria laciniata</i>	Brassicaceae	native	5	forb	perennial	cut-leaved toothwort
<i>Carex albursina</i>	Cyperaceae	native	5	sedg e	perennial	sedge
<i>Carya cordiformis</i>	Juglandaceae	native	5	tree	perennial	bitternut hickory
<i>Caulophyllum thalictroides</i>	Berberidaceae	native	5	forb	perennial	blue cohosh
<i>Circaea canadensis; c. lutetiana</i>	Onagraceae	native	2	forb	perennial	enchanters-nights hade
<i>Crataegus chrysoarpa</i>	Rosaceae	native	4	tree	perennial	hawthorn
<i>Dryopteris carthusiana</i>	Dryopteridaceae	native	5	fern	perennial	spinulose woodfern
<i>Erythronium americanum</i>	Liliaceae	native	5	forb	perennial	yellow trout lily
<i>Euonymus alatus</i>	Celastraceae	non-native	0	shrub	perennial	winged euonymus
<i>Euonymus obovatus</i>	Celastraceae	native	5	shrub	perennial	running strawberry-bush
<i>Fagus grandifolia</i>	Fagaceae	native	6	tree	perennial	american beech
<i>Frangula alnus; rhamnus frangula</i>	Rhamnaceae	non-native	0	shrub	perennial	glossy buckthorn
<i>Fraxinus americana</i>	Oleaceae	native	5	tree	perennial	white ash
<i>Galium aparine</i>	Rubiaceae	native	0	forb	annual	annual bedstraw

<i>Geum canadense</i>	Rosaceae	native	1	forb	perennial	white avens
<i>Hesperis matronalis</i>	Brassicaceae	non-native	0	forb	perennial	dames rocket
<i>Hydrophyllum appendiculatum</i>	Boraginaceae	native	7	forb	biennial	great waterleaf
<i>Hydrophyllum canadense</i>	Boraginaceae	native	7	forb	perennial	canada waterleaf
<i>Impatiens pallida</i>	Balsaminaceae	native	6	forb	annual	pale touch-me-not
<i>Juglans nigra</i>	Juglandaceae	native	5	tree	perennial	black walnut
<i>Larix laricina</i>	Pinaceae	native	5	tree	perennial	tamarack
<i>Liriodendron tulipifera</i>	Magnoliaceae	native	9	tree	perennial	tulip tree
<i>Lonicera maackii</i>	Caprifoliaceae	non-native	0	shrub	perennial	amur honeysuckle
<i>Lonicera oblongifolia</i>	Caprifoliaceae	native	8	shrub	perennial	swamp fly honeysuckle
<i>Maianthemum racemosum; smilacina r.</i>	Convallariaceae	native	5	forb	perennial	false spikenard
<i>Malus coronaria</i>	Rosaceae	native	4	tree	perennial	american crab
<i>Ostrya virginiana</i>	Betulaceae	native	5	tree	perennial	ironwood; hop-hornbeam
<i>Parthenocissus quinquefolia</i>	Vitaceae	native	5	vine	perennial	virginia creeper
<i>Picea abies</i>	Pinaceae	non-native	0	tree	perennial	norway spruce
<i>Picea glauca</i>	Pinaceae	native	3	tree	perennial	white spruce
<i>Pinus strobus</i>	Pinaceae	native	3	tree	perennial	white pine
<i>Pinus sylvestris</i>	Pinaceae	non-native	0	tree	perennial	scotch pine
<i>Podophyllum peltatum</i>	Berberidaceae	native	3	forb	perennial	may-apple
<i>Populus alba</i>	Salicaceae	non-native	0	tree	perennial	white poplar
<i>Prunus serotina</i>	Rosaceae	native	2	tree	perennial	wild black cherry
<i>Prunus virginiana</i>	Rosaceae	native	2	shrub	perennial	choke cherry

<i>Pseudotsuga menziesii</i>	Pinaceae	non-native	0	tree	perennial	douglas-fir
<i>Quercus alba</i>	Fagaceae	native	5	tree	perennial	white oak
<i>Quercus muehlenbergii</i>	Fagaceae	native	5	tree	perennial	chinquapin oak
<i>Quercus rubra</i>	Fagaceae	native	5	tree	perennial	red oak
<i>Rhamnus cathartica</i>	Rhamnaceae	non-native	0	tree	perennial	common buckthorn
<i>Ribes cynosbati</i>	Grossulariaceae	native	4	shrub	perennial	prickly or wild gooseberry
<i>Ribes nigrum</i>	Grossulariaceae	non-native	0	shrub	perennial	black currant
<i>Sambucus racemosa</i>	Adoxaceae	native	3	shrub	perennial	red-berried elder
<i>Sanguinaria canadensis</i>	Papaveraceae	native	5	forb	perennial	bloodroot
<i>Smilax hispida; s. tamnoides</i>	Smilacaceae	native	5	vine	perennial	bristly greenbrier
<i>Sonchus asper</i>	Asteraceae	non-native	0	forb	annual	prickly sow-thistle
<i>Symplocarpus foetidus</i>	Araceae	native	6	forb	perennial	skunk-cabbage
<i>Taraxacum officinale</i>	Asteraceae	non-native	0	forb	perennial	common dandelion
<i>Tilia americana</i>	Malvaceae	native	5	tree	perennial	basswood
<i>Toxicodendron radicans</i>	Anacardiaceae	native	2	vine	perennial	poison-ivy
<i>Ulmus americana</i>	Ulmaceae	native	1	tree	perennial	american elm
<i>Ulmus rubra</i>	Ulmaceae	native	2	tree	perennial	slippery elm
<i>Viola pubescens</i>	Violaceae	native	4	forb	perennial	yellow violet
<i>Vitis aestivalis</i>	Vitaceae	native	6	vine	perennial	summer grape
<i>Wisteria sinensis</i>	Fabaceae	non-native	0	vine	perennial	chinese wisteria
<i>Zanthoxylum americanum</i>	Rutaceae	native	3	shrub	perennial	prickly-ash

Invasive Species

In Toumey Woodlot, we identified 16 non-native species, 6 of these were observed only along the fenceline, meaning that 10 exotic species are found within the interior of the forest. However, it is important to note that 9 of the 16 total exotic species were only observed once throughout all the plot surveys and the forest walking survey, meaning that it would be fairly easy to manage over half of the exotic species in Toumey Woodlot. Two of these species, burdock (*Arctium minus*) and chinese wisteria (*Wisteria sinensis*) were spotted only a small handful of times throughout the forest. The remaining 5 exotic species were all observed many times, however two of these, dandelion (*Taraxacum officinale*) and prickly sowthistle (*Sonchus asper*) were only seen along the fenceline. The remaining three species, amur honeysuckle (*Lonicera maackii*), garlic mustard (*Alliaria petiolata*) and scotch pine (*Pinus sylvestris*) were all seen frequently throughout the interior. Scotch pine is quite intolerant of shade and does not represent a threat to this woodlot. In contrast, garlic mustard and amur honeysuckle appear to be the most widespread and problematic invasive species that exist in Toumey Woodlot. These two species were observed all throughout the forest at low densities, not concentrated in any particular areas. This could be a cause for concern because if they are all over the woodlot, it may be hard to stop or contain their reproduction.

Human Impacts

Research/Teaching Artifacts

There is lots of evidence for research and/or teaching artifacts within Toumey Woodlot. The most common pieces of evidence were various white poles that were sticking out of the ground all throughout the woodlot (Figure 1), and small rectangular plot areas that were covered with labeled wooden boards. Another piece of research that we spotted only once was a tag on a very large red oak tree. Due to the tree being tagged, it is likely that this tree is part of a long-term tree monitoring project. As for the other two pieces of equipment, it is unclear what they would be used for.

Figure 1. Photos of old research material



Trash, Structures or Other Human Disturbance

While there were a few glass bottles scattered sparsely throughout Toumey Woodlot, the main concern for trash was a large pile of bags and bottles (Figure 2). We spotted a couple structures in the forest as well: A hunting stand attached to a tree, a small plot of chopped logs, and a deliberately stacked pile of logs. The hunting stand merits further investigation as hunting is prohibited in campus natural areas.

Figure 2. Photos of trash and human structures in Toumey Woodlot



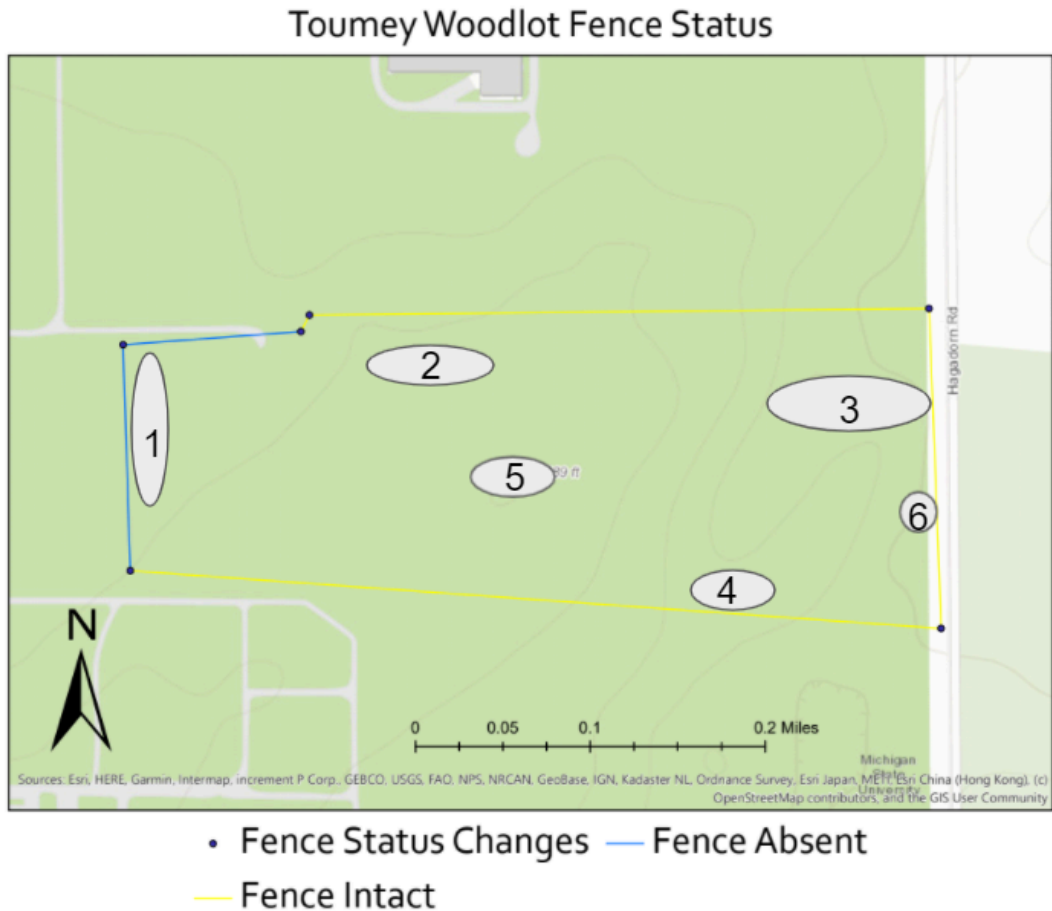
Boundary Issues

Overall, the fences surrounding Toumey Woodlot are in good shape. The Western edge and a part of the Northern edge have no fencing whatsoever, but everywhere else, the fence is intact.

Water features

We observed two vernal ponds in Toumey Woodlot, both in the eastern portion. Their locations are indicated in the map below. The larger pond to the north shows evidence of an intermittent stream flowing into it from the east.

Figure 3. Map of fenceline: SW corner (42.70311N 84.46880W); NW corner (42.70448N 84.46886W); NE corner (42.70470N 84.46220W); SE corner (42.70276N 84.46210W)



Key to Map Above:

1. Lots of wood chips along this edge. Many coniferous trees with chopped limbs too, mostly Scotch Pine in this area.
2. Leftover research equipment; one of a few locations where there are many wooden tiles laid out.
3. Vernal pond. There is also the indentation of a stream going into it from the east side that clearly has wetter soil than surrounding areas.
4. Another vernal pond.
5. Someone dumped a lot of trash in this general area
6. A couple *Populus x canescens* plants here, on the northern side of a small clearing right along the fence