

Rare Plant Surveys for the Michigan Department of Transportation: US-12 at M- 51, Niles (Berrien County) MDOT project No. 202003



Prepared By:
Elizabeth A. Haber
Michigan Natural Features Inventory
Michigan State University Extension
P.O. Box 30444
Lansing, MI 48909-7944

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Cover: Clockwise from top right: City of Niles Welcome sign in park at north terminus of project area; *Veronicastrum virginicum* (Culver's root) inflorescence, in the center of the southbound M51 offramp from westbound US-12; cluster of *Opuntia caespitosa* plants in the US-12 median to the east of the eastbound onramp from northbound M51. All photos taken by Elizabeth Haber.

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Introduction and Methods

A summary of rare plant surveys for MDOT project area 202003 is presented in this report. Surveys for rare plant species are required for this project to ensure compliance with regulations regarding potential impacts of road improvement projects on rare species. This project area is located in the city of Niles, Michigan, and in Niles Charter Township (Figure 1). Specifically, this project is located along M-51 from just south of Chestnut Lane at the south terminus of the project area northward to the intersection of M-51/11th Street and M-60/Oak Street in the city of Niles. This project also occurs on US-12, from 1000 feet west of 3rd Street eastward to east of the intersection with M-51. The US-12 bridges over M-51 will be removed and replaced with a graded and signalized intersection. Work will also be done on US-12 at the intersection with 3rd Street, while localized sidewalk and drainage improvements, as well as resurfacing and repairing of concrete, will occur on M-51.



Figure 1: Overview map of MDOT project area 202003. This project area is located in southwest Michigan in the city of Niles (red rectangle in inset map). The roads impacted by this MDOT project are shown as black lines in the larger map.

A search of the Michigan Natural Heritage Database was performed to identify rare plant species records and high-quality natural communities (element occurrences [EOs]) found within a two-kilometer buffer of the project area. Survey search efforts focused on species that have been recently observed within the buffer of the project area (Table 1) and were informed by the historical presence of other species in the area (Table 2) and by the presence of high-quality Natural Communities (Table 3) nearby.

Three surveys were carried out during the 2021 growing season in this project area. These corresponded as closely as possible to early, mid, and late season phenology to capture the changing plant species composition and abundance over the growing season and to maximize the chances to observe the target rare plant species. The early survey was conducted on June 18, 2021, the mid-season survey on July 21, 2021, and the late season survey on October 4, 2021.

The entire project area was surveyed either on foot or by car during each of the three visits. Walking surveys focused on areas that were either most likely to have intact natural habitat, which were determined using recent aerial imagery, or were likely to be significantly altered by construction activities. These areas included: the woods adjacent to Brandywine Creek Nature Park, all on- and off-ramps at the intersection between US-12 and M-51, and a stretch of median on US-12 to the east of the intersection of US-12 and M-51. In addition to searching for the target rare species, several other categories of observations were collected. These include: presence and identification of non-native invasive species, high-quality habitats, locations which may be sensitive to runoff, and other notable features.

Results and Discussion

Biotics Database search results

The results of the Biotics database queries for listed plant species and Natural Community Element Occurrences found near this project area are presented in Tables 1-3.

Thirteen rare plant species have been recently located within two kilometers of the roads impacted by this MDOT project (Table 1). Of these species, three are listed as Special Concern and ten as Threatened. Special Concern species are tracked by MNFI; however, they do not have the legal protections that Threatened and Endangered species do.

Historically, 21 additional rare plant species have been found near this MDOT project area (Table 2). Many of the historical species occurrences have very general location information, and therefore it is not certain if these species were specifically found within the 2-kilometer buffer of this MDOT project area. However, if the potential range of an historical observation intersected with the project buffer, it was included in the table. Of these 21 species, six are listed as Special Concern, 12 are Threatened, two are Endangered, and one is presumed to be extirpated from Michigan.

Table 1: Recent records of rare plant species located near the project area.

Latin name	Common name	State status	Target season
<i>Arnoglossum plantagineum</i>	Prairie Indian-plantain	Special concern	Mid-late summer, autumn
<i>Carex davisii</i>	Davis' sedge	Special concern	Late spring – mid summer
<i>Coreopsis palmata</i>	Prairie coreopsis	Threatened	Early-late summer, autumn
<i>Eryngium yuccifolium</i>	Rattlesnake-master	Threatened	Mid-summer, autumn
<i>Helianthus hirsutus</i>	Whiskered sunflower	Special concern	Early-late summer, autumn
<i>Ipomoea pandurata</i>	Wild sweet-potato	Threatened	Mid-late summer
<i>Panax quinquefolius</i>	Ginseng	Threatened	Early-late summer, autumn
<i>Phlox maculata</i>	Wild sweet William	Threatened	Early-mid summer
<i>Polemonium reptans</i>	Jacob's ladder	Threatened	Late spring
<i>Silphium integrifolium</i>	Rosinweed	Threatened	Mid-late summer, autumn
<i>Silphium perfoliatum</i>	Cup plant	Threatened	Mid-late summer, autumn
<i>Trillium recurvatum</i>	Prairie trillium	Threatened	Early spring – early summer
<i>Trillium sessile</i>	Toadshade	Threatened	Early-late spring

Table 1: Results of a query of the Biotics database listing recent (last seen since 1970) occurrences of protected plant species within a two-kilometer buffer of the project area. These are focal species for search efforts in this project area.

Table 2: Historical records of rare plant species located near the project area.

Latin name	Common name	State status	Target season
<i>Androsace occidentalis</i>	Rock-jasmine	Endangered	Mid-late spring
<i>Brickellia eupatorioides</i>	False boneset	Special concern	Mid-late summer, autumn
<i>Carex oligocarpa</i>	Eastern few-fruited sedge	Threatened	Late spring – mid summer
<i>Carex seorsa</i>	Sedge	Threatened	Early-mid summer
<i>Cirsium hillii</i>	Hill's thistle	Special concern	Early-late summer
<i>Collinsia verna</i>	Blue-eyed Mary	Special concern	Mid-spring – early summer
<i>Corydalis flavula</i>	Yellow fumewort	Threatened	Early-mid spring
<i>Draba reptans</i>	Creeping Whitlow-grass	Threatened	Early-late spring
<i>Euphorbia commutata</i>	Tinted spurge	Threatened	Mid-spring – early summer
<i>Filipendula rubra</i>	Queen-of-the-prairie	Threatened	Mid-late summer, autumn
<i>Galearis spectabilis</i>	Showy orchis	Threatened	Mid-spring – early summer
<i>Gentianella quinquefolia</i>	Stiff gentian	Threatened	Early-late autumn
<i>Hybanthus concolor</i>	Green violet	Special concern	Mid-spring – late summer
<i>Linum virginianum</i>	Slender yellow flax	Threatened	Early-mid summer
<i>Lithospermum molle</i>	Marbleweed	Extirpated	Early-mid summer
<i>Lycopodiella subappressa</i>	Northern clubmoss	Special concern	Late summer – late autumn
<i>Platanthera ciliaris</i>	Orange fringed orchid	Endangered	Mid-late summer
<i>Pycnanthemum pilosum</i>	Hairy mountain mint	Threatened	Mid-late summer
<i>Silene stellata</i>	Starry campion	Threatened	Mid-late summer
<i>Smallanthus uvedalia</i>	Yellow-flowered leafcup	Threatened	Late spring – late summer
<i>Thaspium chapmanii</i>	Meadow-parsnip	Special concern	Mid-late summer

Table 2: Results of a query of the Biotics database listing historical (last seen before 1970) occurrences of protected plant species within a two-kilometer buffer of the project area. These species were not the focus of search efforts, although their historical presence in the area informed searching behavior.

Table 3: Natural Community Element Occurrences located near the project area.

Natural Community Name	General Location	Last observed
Prairie Fen	Along Brandywine Creek, south of US-12 and east of Brandywine High and Middle School	1981

Table 3: Results of a query of the Biotics database listing Natural Community Event Occurrences within a two-kilometer buffer of the project area.

One MNFI Natural Community element occurrence is mapped within two kilometers of this MDOT project area (Table 3). An MNFI Natural Community is “an assemblage of interacting plants, animals, and other organisms that repeatedly occurs under similar environmental conditions across the landscape and is predominantly structured by natural processes rather than modern anthropogenic disturbances.”¹ This mapped natural community is a prairie fen, and it is located adjacent to Brandywine High School and Middle School to the southeast of US-12. Eight of the rare plant species listed in Tables 1 & 2 occur in prairie fen habitats, so extra search effort was devoted to these species.



Figure 2: Notable landcover types encountered while surveying this project area.

Protected plant species observations

No State Threatened, Endangered, or Special concern plant species were found during the surveys in this project area.

Project area landcover and plant community descriptions

An overview map of notable landcover types encountered while surveying this project area is presented in Figure 2. Four landcover types are highlighted in this report: Urban, Dry-mesic prairie, Wet-mesic prairie, and Degraded woodland. The dry-mesic prairie and wet-mesic prairie landcovers correspond to the MNFI Natural Community types. The dry-mesic prairie and wet-mesic prairie habitats found in this project area are of moderate or high quality in terms of plant community diversity and habitat provisioning services for animals. Although these areas may not be considered as EOs of natural communities by MNFI due to their small size and context, they are still notable in their quality. The degraded woodlands are found adjacent to Brandywine Creek and bordering Brandywine Creek Nature Park.

Urban Landcover

The majority of this project area lies in an urban environment. No suitable habitat for sensitive plant species was found in these urban sections of the project area. From the northern terminus of the project area (intersection of M-51/11th Street and M-60/Oak Street) southward on M-51 until Brandywine Street, the M-51 right-of-way consists of concrete driveways/sidewalks and mowed vegetation (Figure 3).

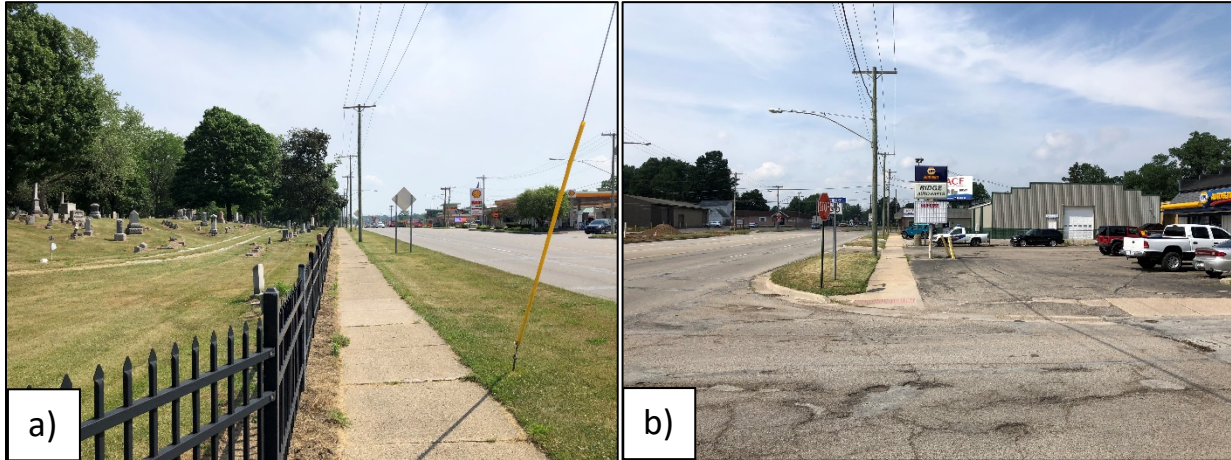


Figure 3: Urban landcover along M-51 north of US-12. a) Mowed vegetation adjacent to Silverbrook Cemetery on the east side of M-51 south of Cherry Street. b) Driveway and parking lot with a small, mowed right-of-way on the east side of M-51 north of Cherry Street.

Another stretch of urban landcover occurs at the southern part of this project area, on both sides of M-51 from the south terminus at Chestnut Lane going northward until the intersection between M-51 and US-12. With the exception of a small, degraded woodland across the street from Prime Table restaurant, the landcover adjacent to this stretch of M-51 consists of mowed rights-of-way, concrete driveways/parking lots, and sidewalks (Figure 4).

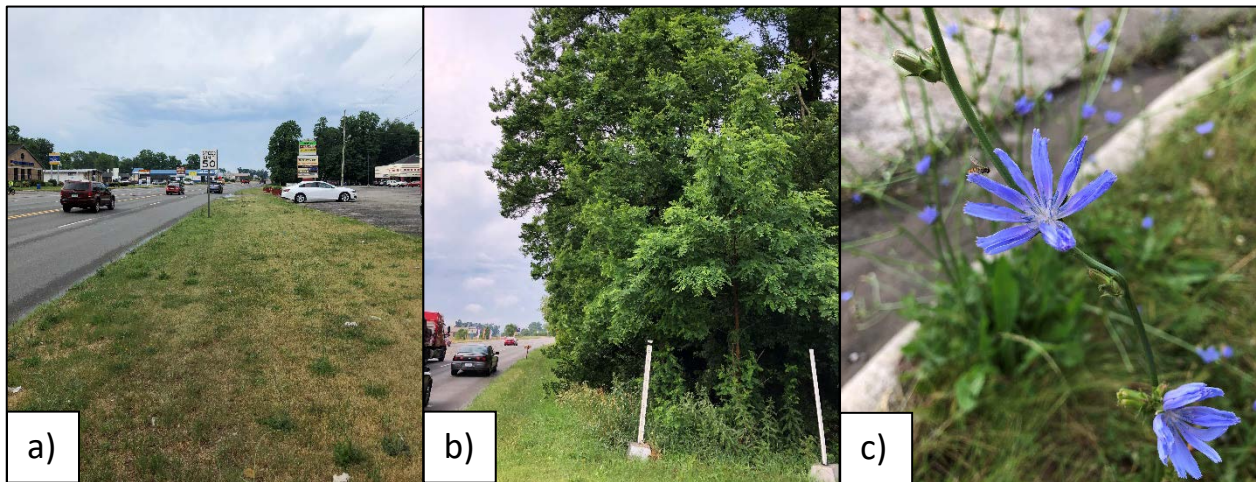


Figure 4: Land cover and common plant species adjacent to M-51 in the southern part of the project area. a) Urban landcover with parking lots and mowed right-of-way on the west side of M-51 just south of the intersection with Bell Road. b) Degraded woodland across the street from Prime Table restaurant. Invasive *Robinia pseudoacacia* (Black Locust) is in the foreground. c) Typical roadside vegetation on this stretch of the project area includes non-native *Cichorium intybus* (Chicory).

In the Urban landcover sections of this project area, much of the right-of-way areas are frequently mowed and therefore host a specific assemblage of mostly non-native plant species (Table 4). The species in this assemblage are well-adapted to mowing/grazing, spread easily, and therefore are often found in habitats with similar mowing practices in the upper Midwest.

Table 4: Roadside weeds commonly found in mowed Urban areas.		
Latin name	Common name	Origin
<u>Graminoids</u>		
<i>Bromus inermis</i>	Smooth brome	Non-native
<i>Dactylis glomerata</i>	Orchard grass	Non-native
<i>Digitaria spp.</i>	Crab grasses	Non-native
<i>Elymus repens</i>	Quack grass	Non-native
<i>Poa pratensis</i>	Kentucky bluegrass	Non-native
<u>Forbs</u>		
<i>Achillea millefolium</i>	Yarrow	Native
<i>Ambrosia artemisiifolia</i>	Common ragweed	Native
<i>Cichorium intybus</i>	Chicory	Non-native
<i>Hypochaeris radicata</i>	Cat's ear	Non-native
<i>Medicago lupulina</i>	Black medic	Non-native
<i>Plantago lanceolata</i>	English plantain	Non-native
<i>Taraxacum officinale</i>	Dandelion	Non-native
<i>Tragopogon dubius</i>	Goat's beard	Non-native

Table 4: Plant species found in frequently mowed roadside rights-of-way in urban areas in this MDOT project area. Most of these species are non-native and well-adapted to frequent mowing.

Some stretches in the urban landcover areas to the south of US-12 on M-51 are mowed less frequently, albeit still mowed a few times during the growing season, and therefore host a slightly different assemblage of plant species. In addition to many of the species listed in Table 4, these less frequently mowed areas contain some troublesome non-native invasive species such as: *Centaurea stoebe* (spotted knapweed), *Cirsium arvense* (Canada thistle), *Dipsacus*

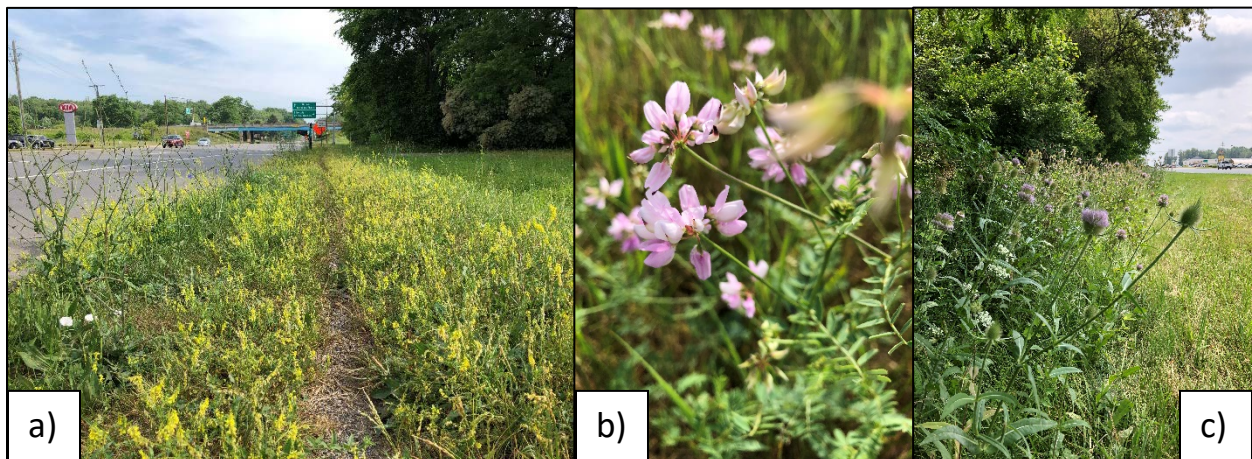


Figure 5: Non-native, invasive plant species of concern found in areas with urban landcover in this MDOT project area. These species were found in areas that were not as frequently mowed as those hosting the species assemblage presented in Table 4. a) *Melilotus officinalis* (yellow sweet-clover), b) *Securigera varia* (crown-vetch), and c) *Dipsacus fullonum* (teasel) with *Daucus carota* (Queen Anne's lace).

fullonum (wild teasel), *Melilotus officinalis* (yellow sweet-clover), *Securigera varia* (crown-vetch), *Ulmus pumila* (Siberian elm), and *Verbascum thapsus* (common mullein) (Figure 5). Although there isn't much high-quality habitat for these invasive species to spread into directly adjacent to these populations, care should be taken to clean mowing equipment so these species don't spread into the dry-mesic prairie-like and wet-mesic prairie-like habitats near the US-12/M-51 interchange (see next section for description of these habitats).

MNFI Natural Communities

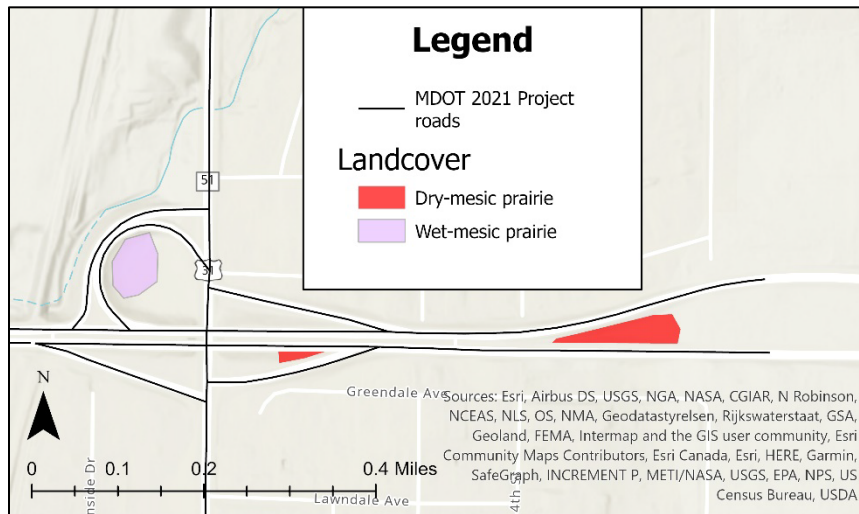


Figure 6: Map of the intersection between M-51 and US-12 showing areas with high quality habitats.

Three instances of plant communities resembling two MNFI Natural Community types were found near the intersection between M-51 and US-12 (Figure 6). Two areas resembling a dry-mesic prairie were located to the east of M-51 within the median between the on-ramp to eastbound US-12 and US-12, and the median between eastbound and westbound US-12. One area resembling a wet-mesic prairie was found within the offramp loop from westbound US-12 to southbound M-51.

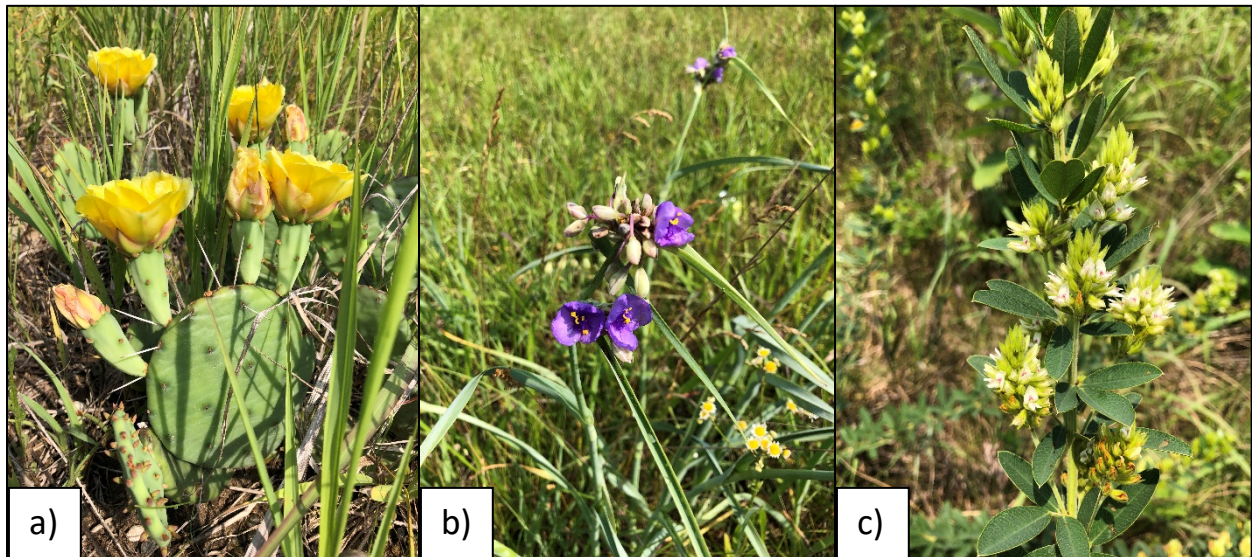


Figure 7: Plant species indicative of a dry-mesic prairie natural community found while surveying this MDOT project area. a) *Opuntia cespitosa* (Eastern prickly-pear) in the median between the onramp to eastbound US-12 and US-12. b) *Tradescantia ohioensis* (common spiderwort). c) *Lespedeza capitata* (round-headed bush-clover).

Dry-Mesic Prairie

Several patches of habitat resembling dry-mesic prairie were located during the first survey of this project area and revisited during the second and third surveys. These patches are mapped as red polygons in Figure 6. Historically, dry-mesic prairies could be found in southwest and south central Michigan in open areas within a larger mosaic of dry forest and oak barrens habitats¹. Although degraded and dominated by invasive smooth brome (*Bromus inermis*), the habitats found in this MDOT project area also include species that are indicative of a dry-mesic prairie natural community. Such species include: *Opuntia cespitosa* (Eastern prickly-pear), *Tradescantia ohioensis* (common spiderwort), *Rosa carolina* (pasture rose), *Monarda fistulosa* (wild bergamot), *Lespedeza capitata* (round-headed bush-clover), and *Asclepias tuberosa* (butterfly milkweed) (Figure 7).

It is notable to see such large and healthy populations of *Opuntia cespitosa*. Ample flowering and fruiting plants were found in both areas of dry-mesic prairie-like habitat, as well as seedlings and young plant recruitment. Although this species is not protected in Michigan, it is not common and has a lower tolerance for disturbance (coefficient of conservatism = 7)².

Threats to these dry-mesic prairie-like habitats include encroachment of both herbaceous and woody invasive plant species and habitat destruction. It is recommended that these sections of median not be sprayed (Figure 8a) or dug up to maintain the populations of the *Opuntia cespitosa*. Occasional mowing could help suppress shrub and tree species from establishing in these habitats and crowding out the native prairie species (Figure 8b). Several aggressive herbaceous invasive plant species are present in the dry-mesic prairie-like habitat areas. These species are: *Agrostis gigantea* (redtop), *Bromus inermis* (smooth brome), *Centaurea stoebe* (spotted knapweed), *Dipsacus fullonum* (teasel), *Hypericum perforatum* (common St. John's wort), *Linaria vulgaris* (butter-and-eggs), *Melilotus albus* (white sweet-clover), and *Saponaria*

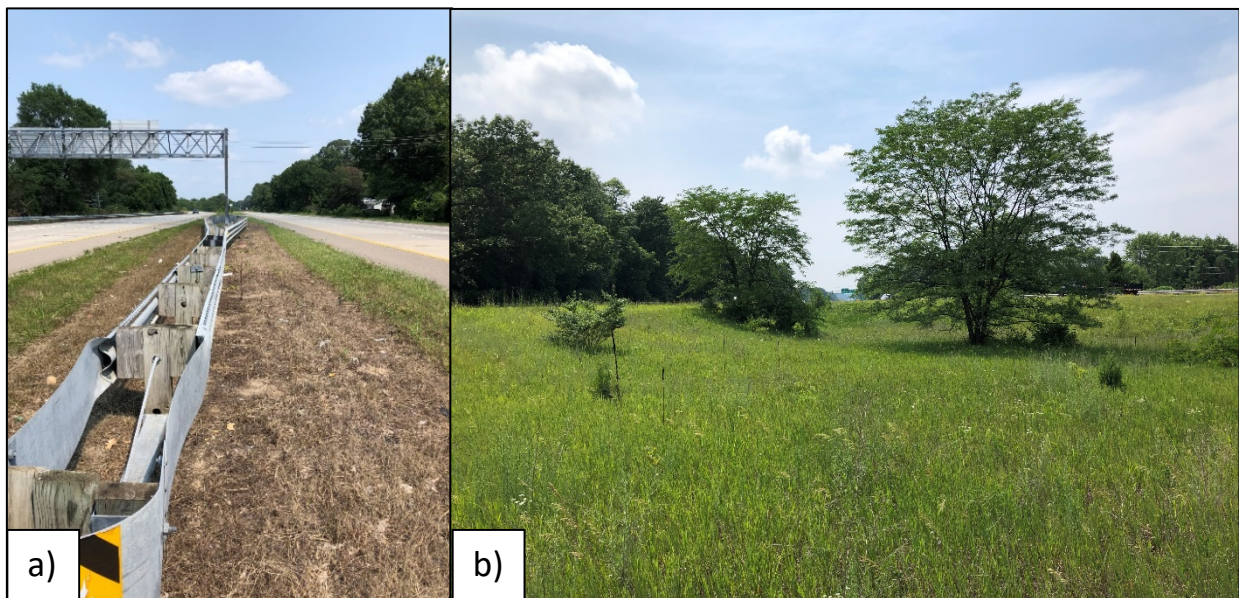


Figure 8: Potential threats to the dry-mesic prairie-like habitats found in this MDOT project area. a) Herbicide application near the guardrail just west of the large patch of dry-mesic prairie-like habitat within the median of US-12, seen on July 21, 2021. b) Woody plants (*Gleditsia triacanthos*, honey-locust, *Lonicera* spp., non-native honeysuckles, and *Juniperus virginiana*, red-cedar) establishing in the median of US-12.

officinalis (soapwort). Control of these invasive species will contribute to continued existence of these dry-mesic prairie-like habitats.

Wet-Mesic Prairie

A habitat resembling a wet-mesic prairie was found within the offramp loop from westbound US-12 to southbound M-51 and the extent of this habitat is mapped as a lilac-colored polygon in Figure 6. The wet-mesic prairie-like habitat lies in a low area in the landscape, with runoff from the surrounding roads contributing largely to the hydrology of the habitat. Historically, this area would have been part of Brandywine Creek's meandering path, and construction of the off- and on-ramps most likely cut this area off from the creek. Since anthropogenic processes (road runoff) are currently important factors determining the environmental conditions of this site, this habitat is not considered a natural community EO by MNFI. However, the plant community present has elements of a wet-mesic prairie and this habitat provides important ecosystem services so is therefore a valuable part of the natural landscape.

The wet-mesic prairie-like habitat consists of a very wet area in the northwest part of the habitat polygon that is bordered by an abrupt slope upward to the offramp on the west and an intermediately wet area on a gradual upward slope to the east.

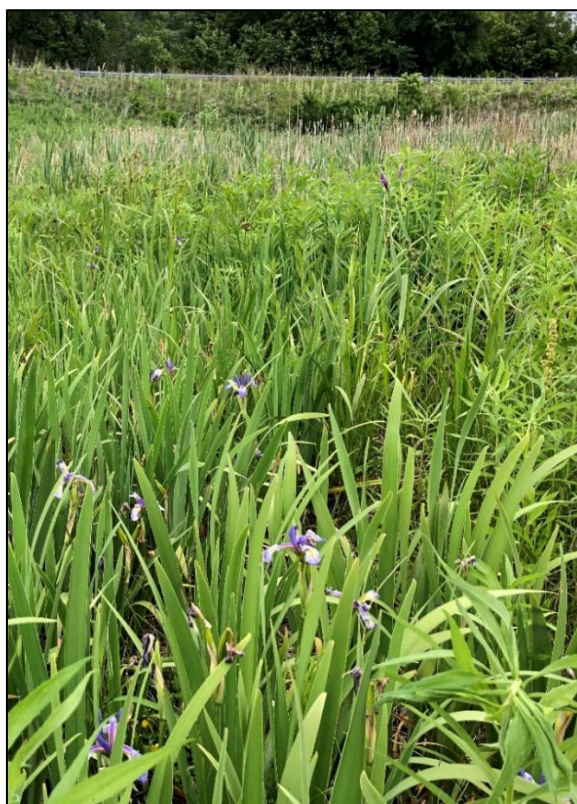


Figure 9: *Iris virginica* (southern blue flag iris) with last season's *Typha x glauca* (hybrid cattail) and *Phragmites australis* subsp. *australis* (reed) remnants visible in the background.

The very wet areas in this habitat are dominated by aggressive non-native invasive plant species: *Typha x glauca* (hybrid cattail) and *Phragmites australis* subsp. *australis* (reed). Notably, a large patch of native *Iris virginica* (southern blue flag iris) is present in the wettest areas of this habitat (Figure 9), interspersed with native *Vernonia missourica* (Missouri ironweed) and *Scirpus atrovirens*. Even though much of the wettest portion of this habitat is covered by invasive plant species, there are still areas where native wetland plant species are thriving and thus provide valuable genetic, carbon sequestration, habitat, biodiversity, and provisioning ecosystem services.

In areas where there is less water accumulation, but still enough to support wetland communities, there is a diverse mix of native and non-native plant species present. Native wetland species present include: *Carex hystericina* (Figure 10a), *Eutrochium maculatum* (Joe-pye-weed), *Scirpus atrovirens* (bulrush), *Symphyotrichum novae-angliae* (New England aster), *Verbena hastata* (blue vervain; Figure 10b), and *Vernonia missourica* (Missouri ironweed). In more upland areas, *Andropogon gerardii* (big bluestem) occurs.

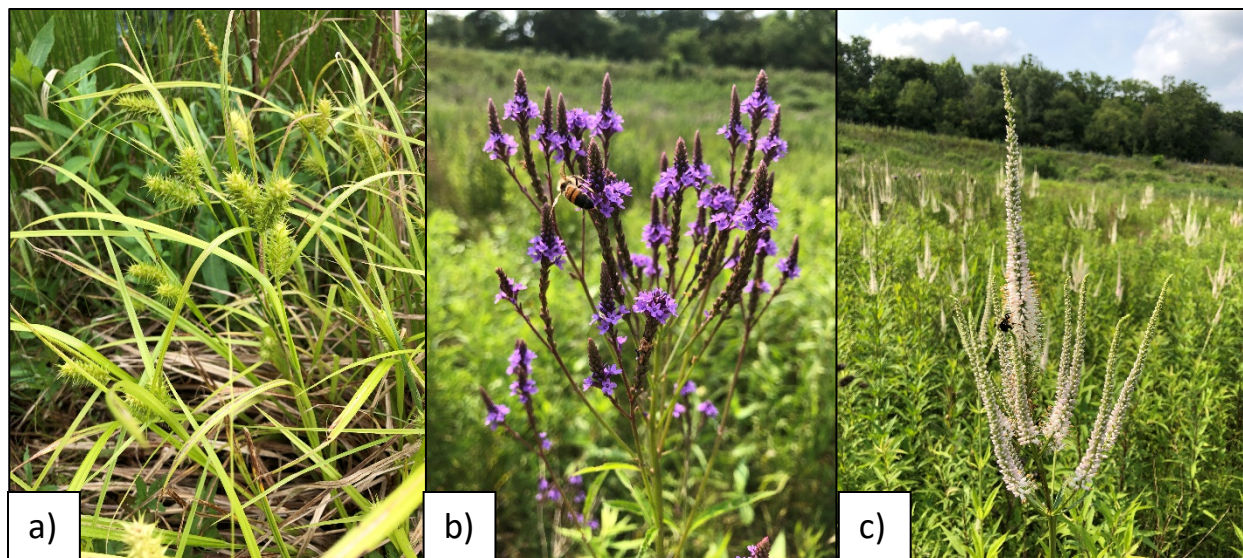


Figure 10: Plant species found in the wet-mesic prairie-like habitat. a) *Carex hystericina*, b) *Verbena hastata* (blue vervain) with a foraging honeybee, c) *Veronicastrum virginicum* (culver's root) with a foraging bumblebee.



Figure 11: Diverse native wildflowers found at the margin of the wet-mesic prairie-like habitat. Native species visible in this photo include: *Monarda fistulosa* (wild bergamot), *Rudbeckia hirta* (black-eyed Susan), and *Veronicastrum virginicum* (Culver's root).

Most notably, there is a large population of *Veronicastrum virginicum* (culver's root; Figure 10c) in the wetland area. Although this species is not rare, it is the host plant to a rare species of borer moth. The Culver's root borer moth (*Papaipema sciata*) is a Special Concern species in Michigan and it relies on *Veronicastrum virginicum* for the larval stage of its life cycle. After conferring with Lepidoptera specialists at MNFI, it was determined that this population of *Veronicastrum virginicum* could be large enough to host a population of the Culver's root borer moth. If funds and project timelines allow, it is recommended that surveys for this moth be done during the 2022 growing season, preferably in either mid-late July or mid-late September, as those are the time periods when it is most likely to encounter the moths.

This wet-mesic prairie-like habitat and the surrounding upland areas within the offramp loop contain quite a few non-native, invasive plant species of concern (Table 5). These species, especially those found in the intermediate and wettest areas of the off-ramp loop, pose threats to the persistence of the diverse wetland flora and associated ecosystem services present in this habitat. It is recommended that control of the invasive species found in the intermediate and wettest parts of this habitat be carried out. Hybrid cat-tail and invasive phragmites are the most immediate concerns here.

Table 5: Non-native invasive species found in and adjacent to the wet-mesic prairie-like habitat.

Latin name	Common name	Sub-habitat	habit
<i>Bromus inermis</i>	smooth brome	upland	graminoid
<i>Cirsium arvense</i>	Canada thistle	intermediate and upland	forb
<i>Conium maculatum</i>	poison hemlock	intermediate and upland	forb
<i>Dipsacus fullonum</i>	wild teasel	intermediate and upland	forb
<i>Hesperis matronalis</i>	Dame's rocket	upland	forb
<i>Hypericum perforatum</i>	common St. John's wort	upland	forb
<i>Leonurus cardiaca</i>	motherwort	upland	forb
<i>Lonicera morrowii</i>	Morrow honeysuckle	upland	shrub
<i>Lysimachia nummularia</i>	moneywort	intermediate	forb
<i>Lythrum salicaria</i>	purple loosestrife	intermediate and upland	forb
<i>Phragmites australis</i> subsp. <i>australis</i>	reed	wettest	graminoid
<i>Robinia pseudoacacia</i>	black locust	upland	tree
<i>Rosa multiflora</i>	multiflora rose	upland	shrub
<i>Typha x glauca</i>	hybrid cattail	wettest	forb

Table 5: Non-native invasive plant species found within the offramp loop from westbound US-12 to southbound M-51. These species are separated into the sub-habitats where they were found, ranging from upland to intermediately wet to the wettest sub-habitats.

Although there are multiple stressors impacting this wet-mesic prairie-like habitat, it is still notable to see so many native species persisting in this area. During the second visit to this project area, the habitat was in full bloom (Figure 11) and it was heartening to see so many pollinators visiting the flowering native plant species (Figure 10b, 10c). Even though this habitat is degraded, it is still an important part of the natural landscape, especially being so close to an urban environment.

Degraded Woodlands near Brandywine Creek

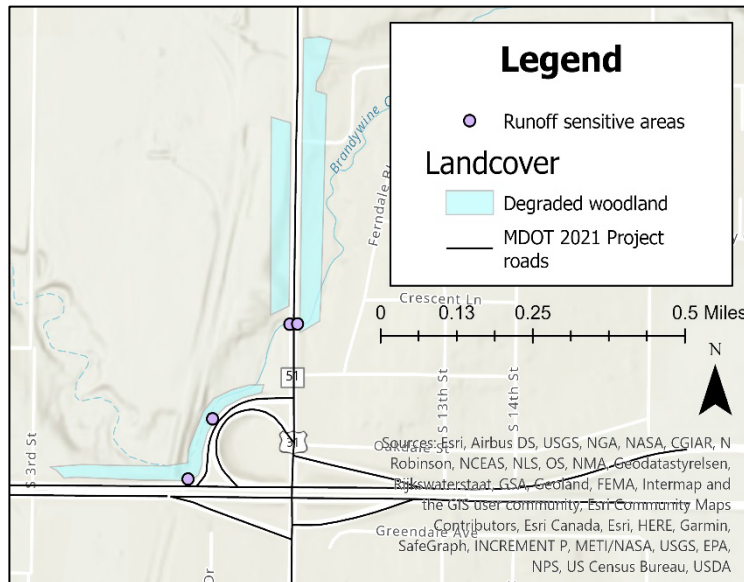


Figure 12: Map showing the locations of degraded woodland landcover and areas sensitive to runoff near Brandywine Creek.

A degraded closed-canopy forest borders this MDOT project area near the intersection of US-12 and M-51. Specifically, this forest occurs on the east and west sides of M-51 just north of the intersection with US-12, north and west of the onramp to westbound US-12, and on the north side of US-12 spanning from the end of the westbound onramp to just before the intersection with 3rd Street (Figure 12).

Tree canopy species in these degraded forest areas include: *Acer negundo* (box-elder), *Acer saccharum* (sugar maple), *Prunus serotina* (black cherry), *Quercus rubra* (red oak), and *Ulmus*

americana (American elm). The shrub layer in these forests is dominated by non-native, invasive shrubs: non-native honeysuckles (*Lonicera* spp.) and *Ligustrum vulgare* (common privet). A few *Cercis canadensis* (redbud) and *Sassafras albidum* (sassafras) small trees occur along the margins of the woodlands. A clone of *Robinia pseudoacacia* (black locust) occurs at the end of the onramp to westbound US-12, with vigorous sprouts regenerating in the powerline cut (Figure 13a). The groundcover layer in these degraded forest areas is depauperate in most places, however, there are some areas especially on the west side of M-51 with the following invasive species: *Alliaria petiolata* (garlic mustard), *Hesperis matronalis* (Dame's rocket), and an extensive clone of *Vinca minor* (periwinkle; Figure 13b). A single clump of *Conium maculatum* (poison-hemlock) occurs on the west side of M-51 (for specific location, see Figure 15 map).

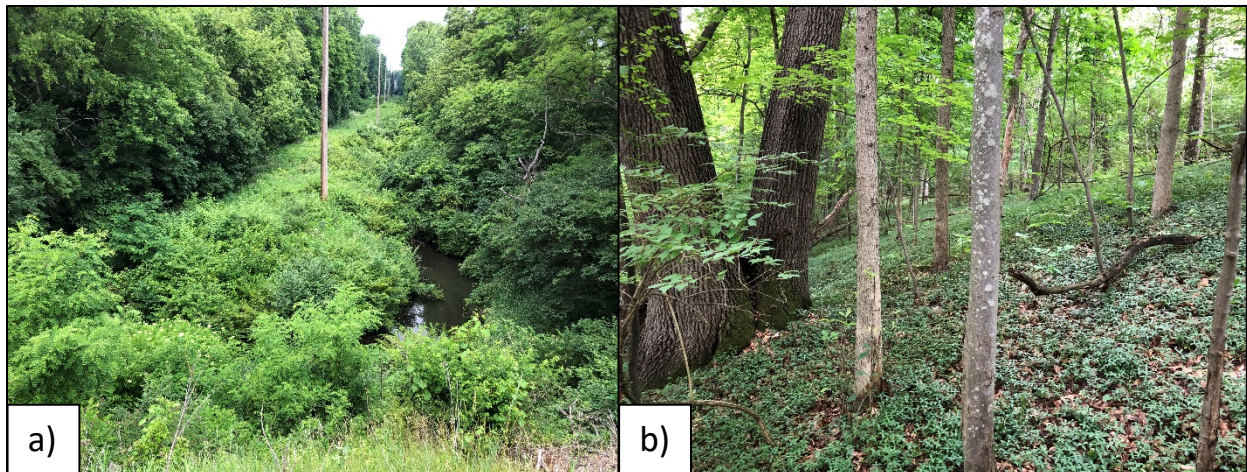


Figure 13: Non-native, invasive plant species found in the degraded woodland habitats near Brandywine Creek. a) A powerline cut near the end of the onramp to westbound US-12 where abundant *Robinia pseudoacacia* (black locust) is regenerating. Brandywine Creek can be seen at the right side of this photo. b) A carpet of *Vinca minor* (periwinkle) on the forest floor on the west side of M-51.

What makes this degraded woodland landcover noteworthy is its proximity to Brandywine Creek. Although seriously degraded by invasive plant species, these forested areas nevertheless provide protection from runoff and shading/water temperature regulation for Brandywine Creek, which is a designated Type 1 trout stream and is actively managed for trout fishing³. Several locations that may be particularly susceptible to runoff are noted on the map in Figure 12 (photos in Figure 14). It is recommended that care be taken to avoid removing tree cover and introducing sediment into the creek when removing the on- and offramps near the US-12 and M-51 intersection.



Figure 14: Locations sensitive to runoff at Brandywine Creek. a) Culvert going under M-51 north of the US-12 intersection. b) Steep slopes going down to Brandywine creek to the west of the onramp to westbound US-12.

Non-native invasive plant species occurrences

In addition to the invasive, non-native species listed in the previous sections of this report, 17 observations of 11 invasive plant species were collected in this project area using the Midwest Invasive Species Information Network (MISIN) app. A map showing these observations is presented in Figure 15. These species span a diversity of habits: perennial and biennial forbs, shrubs, and trees. All species presented in Figure 15 have spread into many areas of the state, so eradication is not feasible. However, care can be taken to control some invasive species populations and prevent local spread.

For example, there is a growing infestation of *Euonymus europaeus* (European spindle tree; Figure 16a) at the west end of the project area on the north and south sides of US-12. This species is still relatively uncommon in the greater landscape, so it would be beneficial to remove this population before it spreads too much into nearby woodlands. This species spreads mainly by birds ingesting the brightly-colored fruits and dispersing the seeds in their droppings.

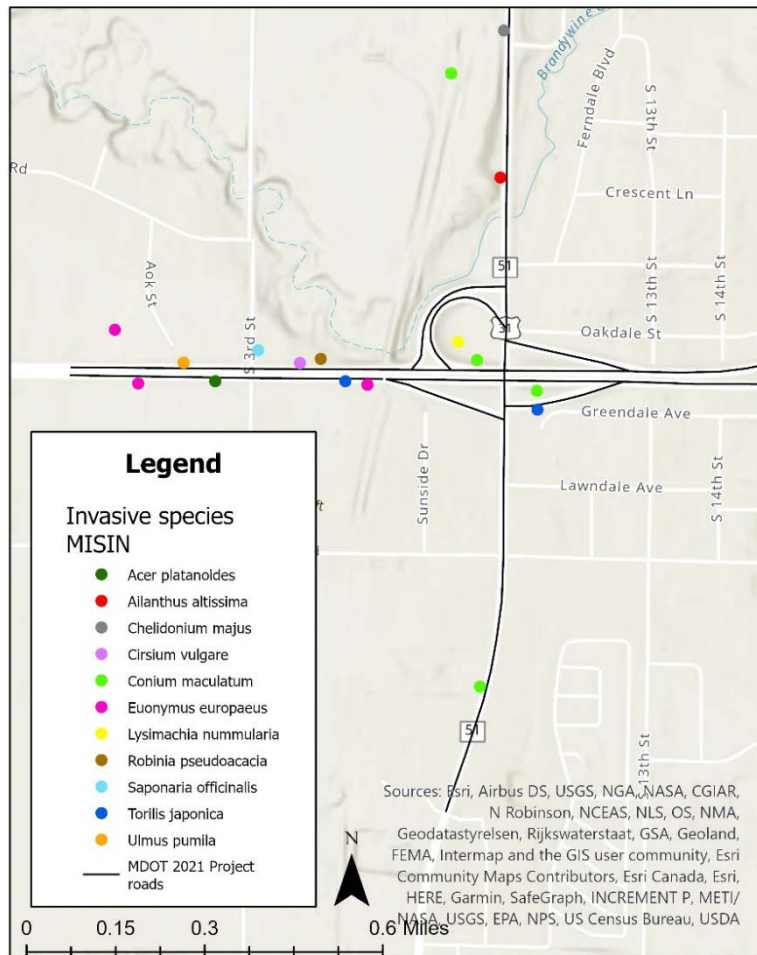


Figure 15: Map showing the locations of invasive plant species occurrence GPS points collected using the MISIN app.

Another notable invasive plant found at four locations in this project area is *Conium maculatum* (poison-hemlock; Figure 16b). This species can have severe consequences for public health because all parts of the plant are deadly if ingested. This species can be spread by wind- or animal-dispersed seeds, as well as mowing machinery. Therefore it is important to clean mowers after working in an area where this species grows.

Lastly, there are areas of the wet-mesic prairie-like habitat within the offramp loop from westbound US-12 to southbound M-51 that host a spreading population of *Lysimachia nummularia* (moneywort). This species is readily available in the horticultural trade and escapes to invade wetlands. It carpets the ground with its creeping stems and round leaves (Figure 16c). This plant is a threat to the diverse wetland community found in the area where it is growing.

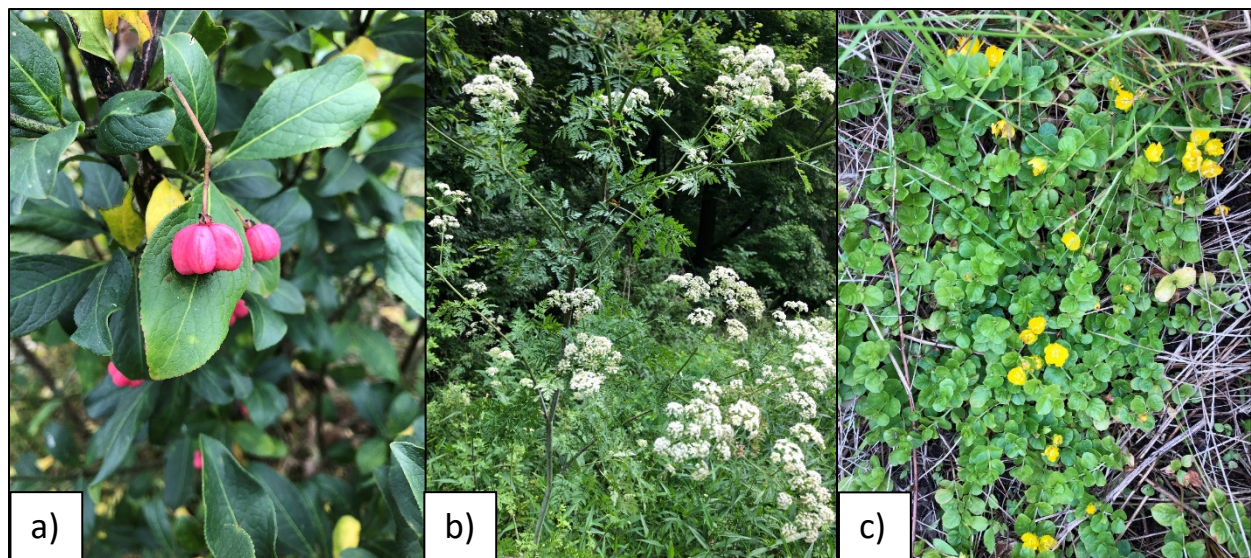


Figure 16: Non-native, invasive plant species found in this project area with data collected using the MISIN app. a) *Euonymus europaeus* (European spindle tree), b) *Conium maculatum* (poison-hemlock), c) *Lysimachia nummularia* (moneywort).

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