

# Rare Plant Species Surveys for the Michigan Department of Transportation: US-12 at Edwardsburg, Ontwa Township MDOT project No. 209402



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Cover: Clockwise from top right: State Threatened *Sabatia angularis* (rose-pink) flower and buds, view from above; rose-pink flower and buds, view from side; *Asclepias syriaca* (common milkweed) in front of the Village of Edwardsburg sign at the west terminus of the project. All photos in this report taken by Elizabeth Haber unless otherwise attributed in the figure captions.

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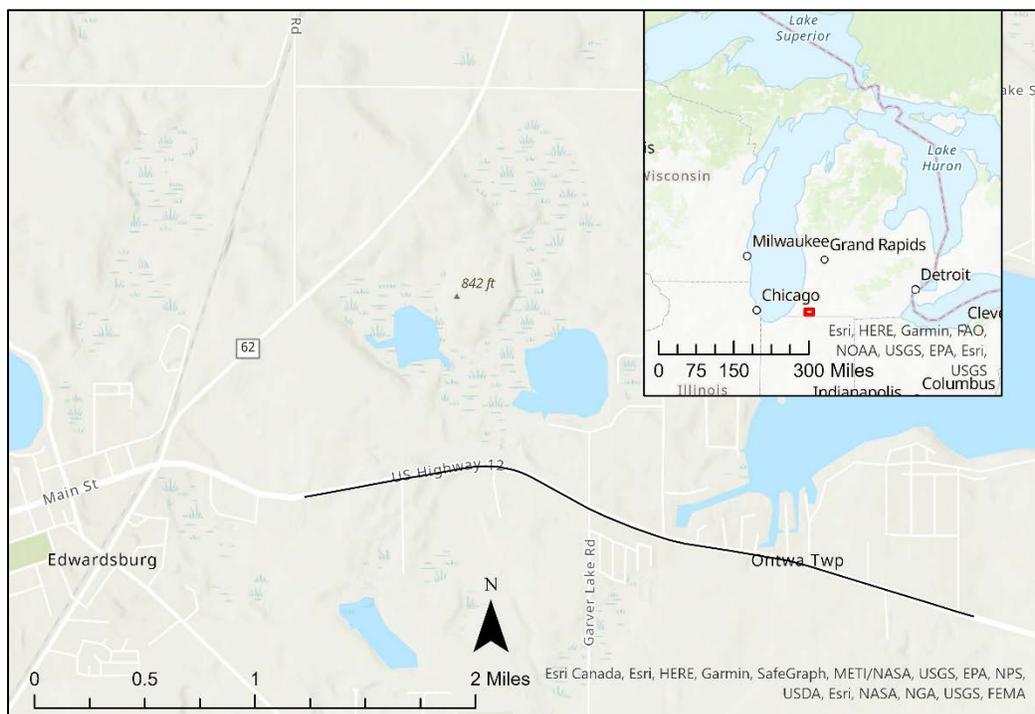
# Introduction and Methods

A summary of rare plant surveys for MDOT project area 209402 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. The project area is located in Ontwa Township, along US-12 starting just east of Edwardsburg and continuing eastward for about six kilometers until Brady Road (Figure 1). Paved shoulders along the margins of US-12 will be widened and a center left turn lane will be added at Brady Road.

A search of the Michigan Natural Heritage Database was performed to identify rare plant species records and high-quality natural communities 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 also 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 23, the mid-season survey on July 20, and the late season survey on October 4.

Since this project area is relatively small, the entire project area was walked during each visit. 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, examples of Natural Communities, and other notable features.



*Figure 1:* Overview map of MDOT project area 209402. The project area is located in Southwest Michigan just east of Edwardsburg in Ontwa Township (red rectangle in insert map). The roads impacted by this MDOT project are shown as black lines in the larger map.

# 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.

Seven rare plant species have been located within two kilometers of the roads impacted by this MDOT project within the past 50 years (Table 1). Of these species, two are listed as Special Concern, four are Threatened, and one is Endangered. Special Concern species are tracked by MNFI; however, they do not have the legal protections that Threatened and Endangered species do. These seven species were the focal species for search efforts in this project area.

Prior to 1970, three 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 two-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 three species, one is listed as Special Concern, one is Threatened, and one is presumed to be extirpated from Michigan. These species were not the primary focus of search efforts, although their historical presence in the area informed searching behavior.

The majority of the rare plant species in Tables 1 and 2 preferentially occur in oak-dominated Natural Communities such as bur oak plains, oak openings, and oak barrens; prairie community types such as prairie fens and dry-mesic, mesic, and wet prairies; and coastal plain or intermittent wetlands.

**Table 1:** Post-1970 records of rare plant species located near the project area.

Latin name	Common name	State status	Target season
<i>Amorpha canescens</i>	Leadplant	Special concern	Early-late summer
<i>Arnoglossum plantagineum</i>	Prairie Indian-plantain	Special concern	Mid-late summer, autumn
<i>Baptisia leucophaea</i>	Cream wild indigo	Endangered	Mid-late summer
<i>Coreopsis palmata</i>	Prairie Coreopsis	Threatened	Early-late summer, autumn
<i>Gratiola virginiana</i>	Annual hedge hyssop	Threatened	Early-late summer, autumn
<i>Silene stellata</i>	Starry campion	Threatened	Mid-late summer
<i>Silphium integrifolium</i>	Rosinweed	Threatened	Mid-late summer, autumn

Table 1: Results of a query of the Biotics database listing occurrences of protected plant species within a two-kilometer buffer of the project area last observed since 1970.

**Table 2:** Pre-1970 historical records of rare plant species located near the project area.

Latin name	Common name	State status	Target season
<i>Baptisia lactea</i>	White false indigo	Special concern	Mid-late summer
<i>Fuirena pumila</i>	Umbrella-grass	Threatened	Mid-late summer, autumn
<i>Houstonia caerulea</i>	Azure bluet	Extirpated	Mid spring – 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.

Four MNFI Natural Community element occurrences are 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.”<sup>1</sup> These mapped element occurrences are of two natural communities: oak barrens and prairie fen.

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

Natural Community Name	General Location	Last observed
Oak Barrens	Two patches of habitat south of US-12 on either side of Red Pine Lane	1985
Oak Barrens	Part of the forested area to the east of Spring Lake, north of US-12	1985
Oak Barrens	Two patches of habitat on either side of the Railroad tracks to the west of Hess Road, north of US-12	1985
Prairie Fen	Habitat forming a ring around Spring Lake, north of US-12	1985

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

## Protected plant species observation

During the mid-season visit to the project area (July 20, 2021), two individual State Threatened *Sabatia angularis* (rose-pink) plants were observed (Figure 2). After a thorough search in nearby suitable habitat, it was determined that only two plants of this species are growing at this site. Both plants were observed flowering, although it was too early in the plants’ phenology to determine if fruits would develop. The overall vigor of the plants was fair; although multiple flowers were developing on each plant, the plants were somewhat spindly and were being crowded by other vegetation. During the late-season visit to the project site, there was an attempt to relocate these plants to see if they were fruiting. The attempt was unsuccessful, but that does not necessarily mean the plants have disappeared.

The *Sabatia angularis* plants were observed on the north side of US-12, just to the west of a small creek flowing out of Coberts Lake. The site where this species was observed is in a powerline cut adjacent to a wooded wetland on the southwest lobe of Coberts Lake (Table 4; Figure 3). The habitat type is difficult to categorize because it has been heavily altered by disturbance from the power line cut, road construction, and invasive plant species. However, the immediate habitat where the *Sabatia angularis* plants are growing most resembles a southern wet meadow natural community. Native plant associates include: *Carex scoparia* (broom sedge), *C. vulpinoidea* (fox sedge), *Ilex verticillata* (Michigan holly), *Lindera benzoin* (spicebush), *Onoclea sensibilis* (sensitive fern), *Rubus flagellaris* (northern dewberry), *Solidago canadensis* (Canada goldenrod), and *Vernonia missurica* (Missouri ironweed).

There are many non-native species in the immediate area surrounding the *Sabatia angularis* plants, which constitute a severe threat to the persistence of this small population. These include: *Celastrus orbiculatus* (Oriental bittersweet), *Cirsium arvense* (Canada thistle), *Elaeagnus umbellata* (autumn-olive), *Frangula alnus* (glossy buckthorn), *Lythrum salicaria*

(purple loosestrife), *Phalaris arundinacea* (reed-canary grass), and *Rosa multiflora* (multiflora rose). Removal of these invasive species, especially the *Celastrus orbiculatus*, which is growing within 1 meter of the *Sabatia angularis* plants, is important for the long-term survival of this vulnerable population. *Celastrus orbiculatus* is a fast-growing liana that can quickly form a carpet over open areas and other vegetation, which reduces the availability of light to the soil surface and therefore could suppress germination and growth of other plants.



Figure 2: *Sabatia angularis* (rose-pink) plants found in this MDOT project area. a) face-view of an open flower; b) side-view of flowers and buds showing the distinguishing characteristic of a very short corolla tube; c) side-view of flowers and buds, as well as the stem showing paired, sessile leaves.

**Table 4: GPS coordinates for the *Sabatia angularis* observation**

Latin name	Common name	Latitude	Longitude
<i>Sabatia angularis</i>	Rose-pink	41.7998553	-86.0552886

Table 4: GPS coordinates for *Sabatia angularis* (rose-pink) plants found in this MDOT project area.

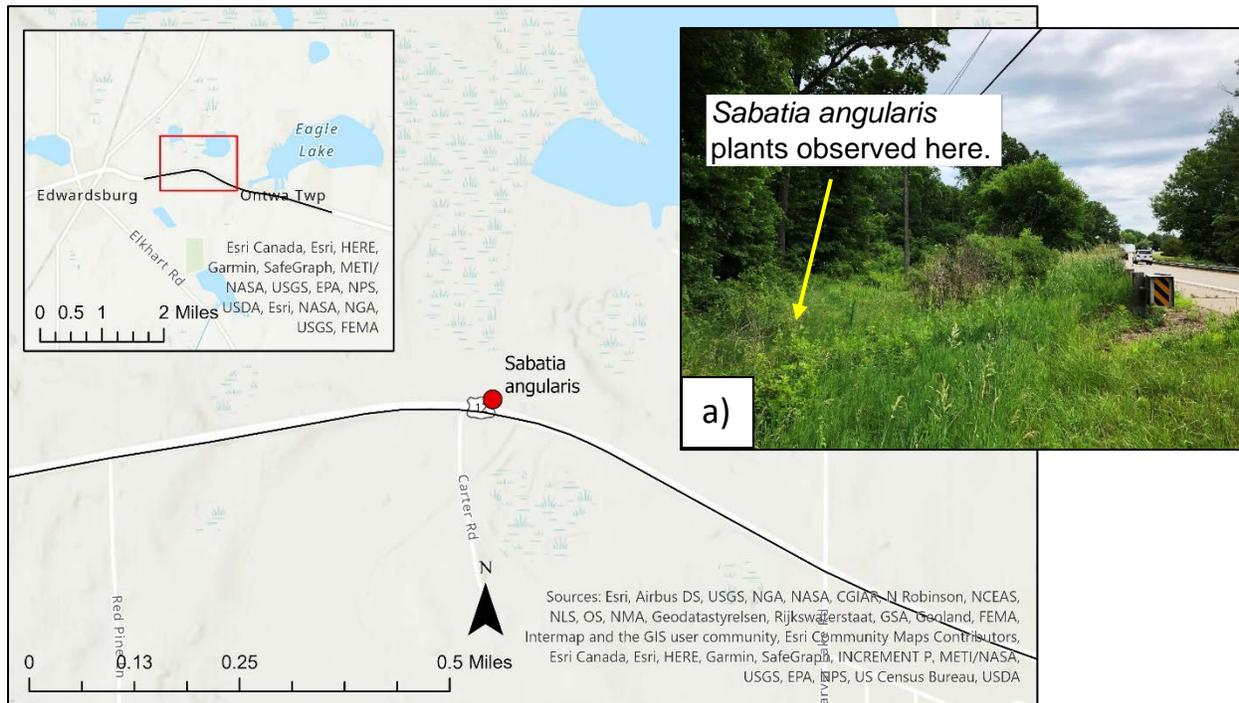


Figure 3: Map showing the location of the *Sabatia angularis* plants found in this project area. The larger map corresponds to the area delineated with the red rectangle in the inset map. a) An annotated photograph shows a view of the location of the *Sabatia angularis* plants from the north side of US-12 looking eastward.

*Sabatia angularis* is generally found in a variety of open, wet habitats, ranging from coastal plain marshes to emergent marshes to interdunal wetlands<sup>2</sup>. The habitat where this species was found in this MDOT project area is a southern wet meadow adjacent to a small stream near the shore of Coberts Lake. Mowing the powerline ROW maintains an open canopy that is required for this species to persist. Since *Sabatia angularis* is a biennial<sup>3</sup>, populations are heavily dependent on seed dispersal and germination for continuity. The small number of plants found in this project area indicate that this population is quite vulnerable. Open and wet conditions must be maintained here, with invasive plant removal and mowing maintenance activities a priority.

## Project area landcover and plant community descriptions

An overview map of notable landcover types encountered while surveying this project area is presented in Figure 4. Four landcover types are highlighted in this report: Agricultural, Low-Density Urban, southern wet meadow and degraded oak openings. The southern wet meadow and oak openings landcovers correspond to MNFI Natural Community types. Although the southern wet meadow and oak openings habitats found in this project area are highly degraded, they are important remnants of historical landcover within the project area. These areas are not considered Element Occurrences of natural communities by MNFI because of their small size and degraded quality, but they are still notable in their persistence in the landscape, and in the case of the southern wet meadow, its ability to host a few plants of the State Threatened *Sabatia angularis* (rose-pink).

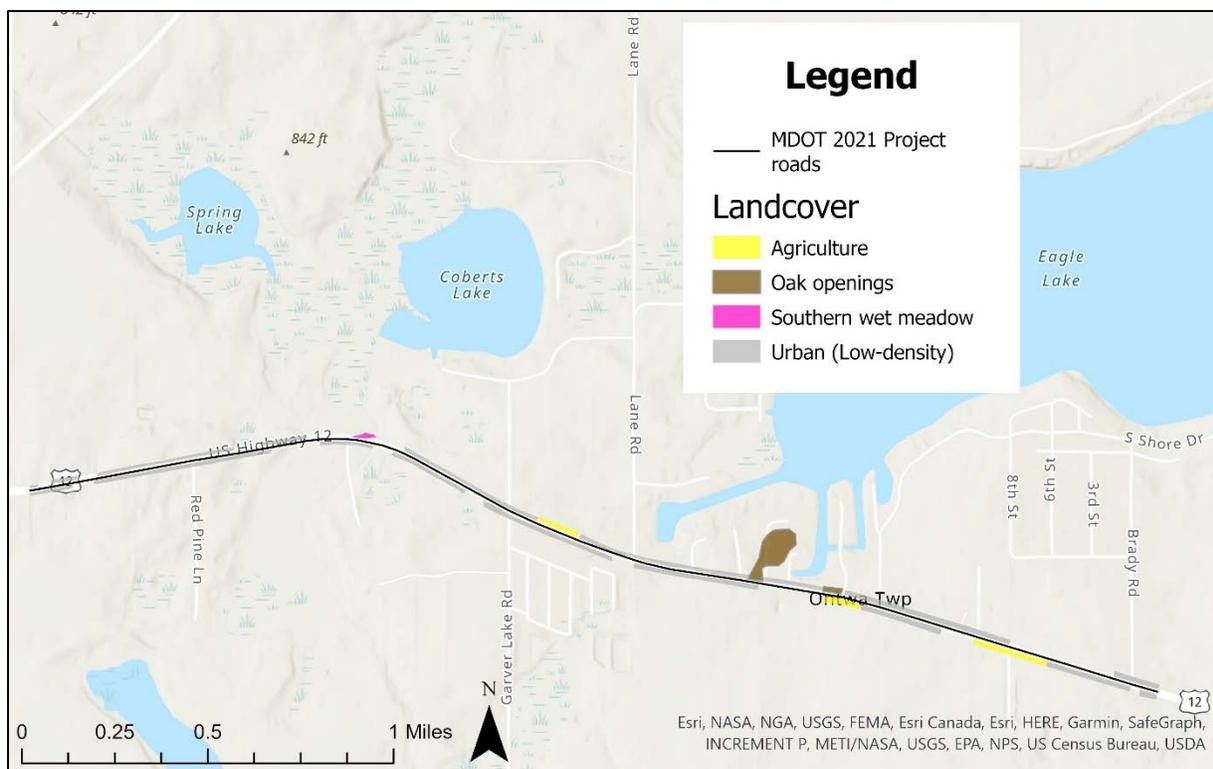


Figure 4: Notable landcover types encountered while surveying this project area.

## Agricultural Landcover



Figure 5: Overspray from the adjacent soy field on the north side of US-12 between Garver Lake Road and Lane Road. The overspray was documented on June 23, 2021.

Active agricultural fields were found at three locations along this MDOT project ROW (Figure 4, yellow polygons). No suitable habitat for sensitive plant species was found adjacent to these agricultural fields. In the 1930's, agricultural fields covered most of the US-12 ROW in this project area<sup>4</sup>. Currently, agricultural land use is much less prevalent in the project ROW, although still present in a few places. There is a large field on the north side of US-12 between Garver Lake Road and Lane Road. There are two fields on the south side of US-12: one field spanning the east and west sides of Rylynn Lane near the east terminus of the project area, and one field south of Eagle Lake at Island Drive. Descriptions of habitats found near the field between Garver Lake Road and Lane Road and the field located to the east and west of Rylynn Road are presented below.

During the 2021 growing season, the field between Garver Lake Road and Lane Road was cultivated with soybeans. Herbicide was used, and overspray onto the US-12 ROW was documented during the early-season visit to this project area on June 23, 2021 (Figure 5). Although this habitat is unlikely to support rare species, overspray of herbicide further hinders the establishment and persistence of plant communities.

On the south side of US-12, to the east (Figure 6a) and west of Rylynn Lane, is an open field habitat that was mowed at least once during the 2021 growing season. The ROW hosts a mixture of weedy native and non-native species, including: *Apocynum cannabinum* (Indian-hemp), *Asclepias tuberosa* (butterfly milkweed; Figure 6b), *Asclepias verticillata* (whorled milkweed), *Bromus inermis* (smooth brome), *Centaurea stoebe* (spotted knapweed), *Chondrilla juncea* (skeleton weed, Figure 6c), *Cichorium intybus* (Chicory), *Daucus carota* (Queen Anne's lace), *Erigeron philadelphicus* (common fleabane), *Medicago lupulina* (black medic), *Plantago lanceolata* (English plantain), *Trifolium arvense* (rabbitfoot clover), and *Trifolium pratense* (red clover).

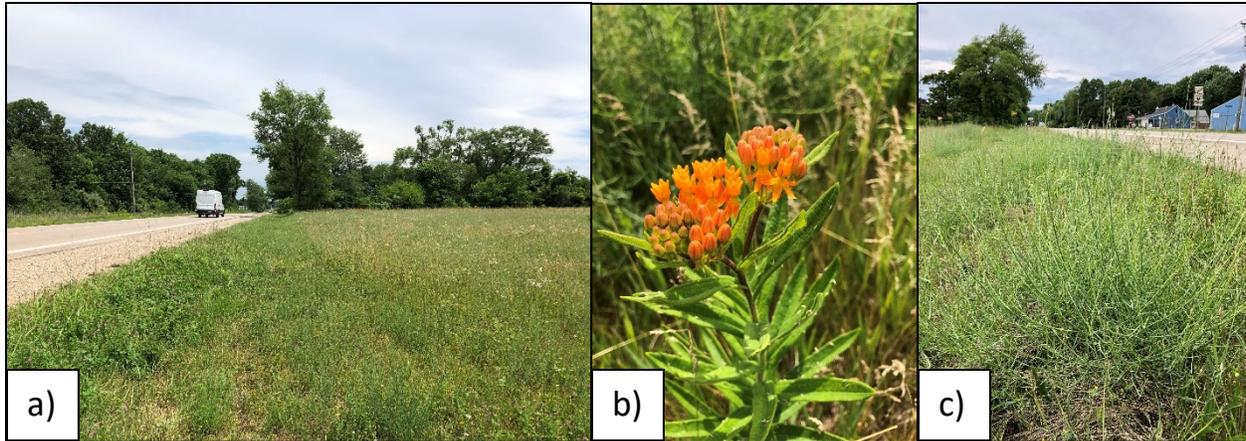


Figure 6: Mowed field adjacent to Rylynn Lane on south side of US-12. a) View from Rylynn Lane looking eastward; b) *Asclepias tuberosa* (butterfly milkweed) growing in unmowed margin of field; c) *Chondrilla juncea* (skeleton weed) population to the west of Rylynn Lane.

## Low-Density Urban Landcover

The majority (70%; calculated from the landcover categories presented in Figure 4) of US-12 in this project area is bordered by low-density urban landcover. This landcover includes mowed residential lawns, mowed yards in front of commercial buildings, and degraded woodlands adjacent to residential properties (Figure 7). No suitable habitat for sensitive plant species was found in the low-density urban landcover in this project area.

Plant species that were frequently encountered while surveying in this landcover type tended to be those that are fast-growing and tolerant of disturbance. In low-density urban areas with a closed tree canopy (for example, Figure 7d), the canopy hosts the following species: *Acer negundo* (box-elder), *Acer platanoides* (Norway maple), *Acer saccharum* (sugar maple), *Juglans nigra* (black walnut), *Morus alba* (white mulberry), *Robinia pseudoacacia* (black locust), and *Ulmus americana* (American elm). The shrub layer, when present, consists of a mixture of native and non-native species. Some non-native shrub species encountered, such as *Hibiscus syriacus* (rose-of-Sharon) and *Hydrangea arborescens* (wild hydrangea, Figure 8a), are escapes from nearby yards. Other shrub/small tree species found growing in the low-density urban habitats include the following native species: *Cercis canadensis* (redbud), *Rhus copallina* (winged sumac; Figure 8b), and *Sassafras albidum* (sassafras). Non-native shrub species are abundant in this landcover type and include *Elaeagnus umbellata* (autumn-olive), non-native *Lonicera* spp. (honeysuckles), *Rhamnus cathartica* (common buckthorn), and *Rosa multiflora* (multiflora rose).

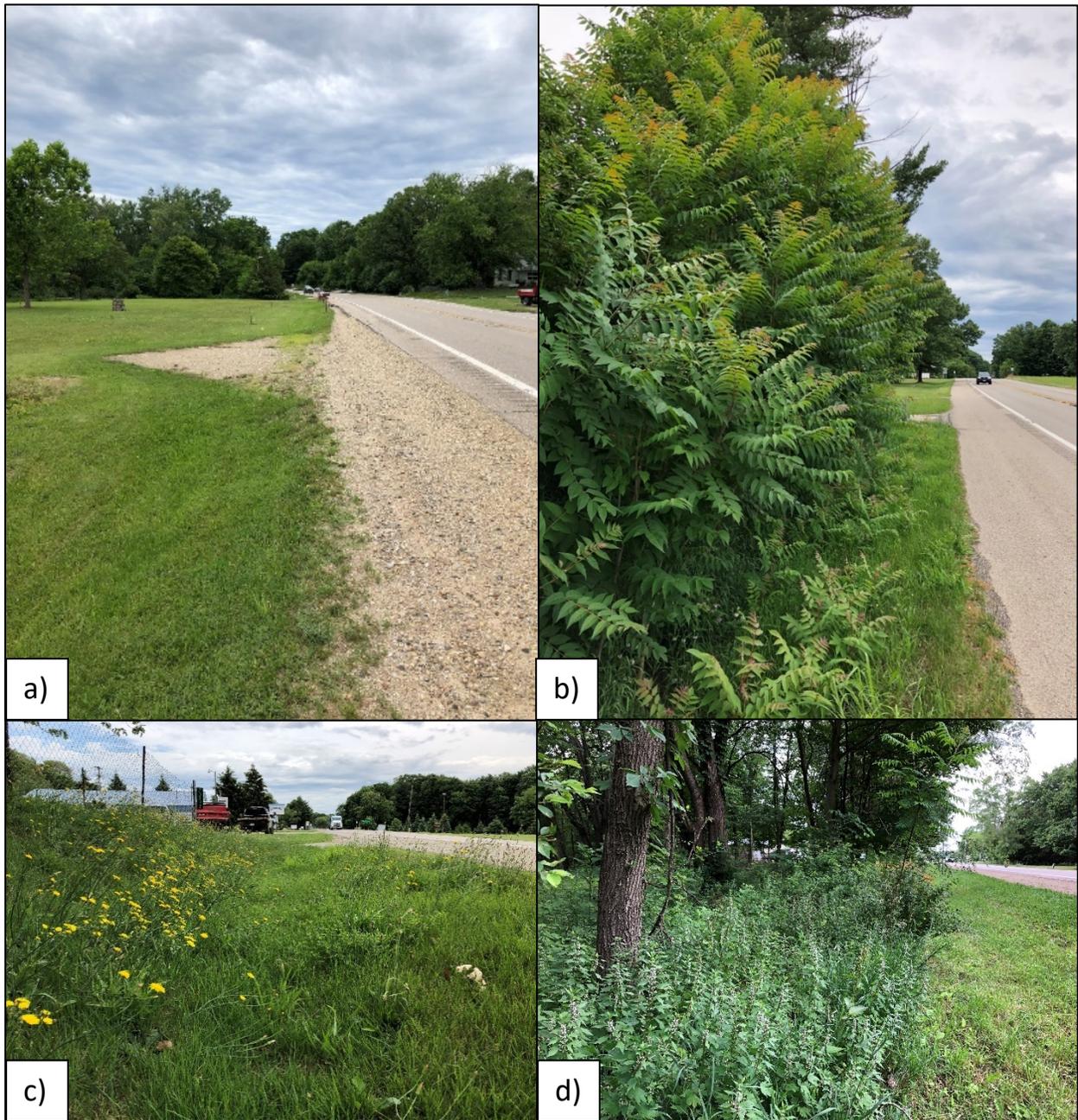


Figure 7: Low-density urban landcover in the project ROW. a) Mowed residential lawns on the south side of US-12; b) *Ailanthus altissima* (tree-of-heaven) clone in front of residential property on the south side of US-12 across from Our Lady of the Lake Parish; c) Less-frequently mowed ROW to the west of Stateline Diesel with non-native *Hypochaeris radicata* (cat's-ear); d) disturbed wooded parcel next to houses on the south side of US-12 at the west terminus of the project area with invasive *Leonurus cardiaca* (motherwort) carpeting the understory.

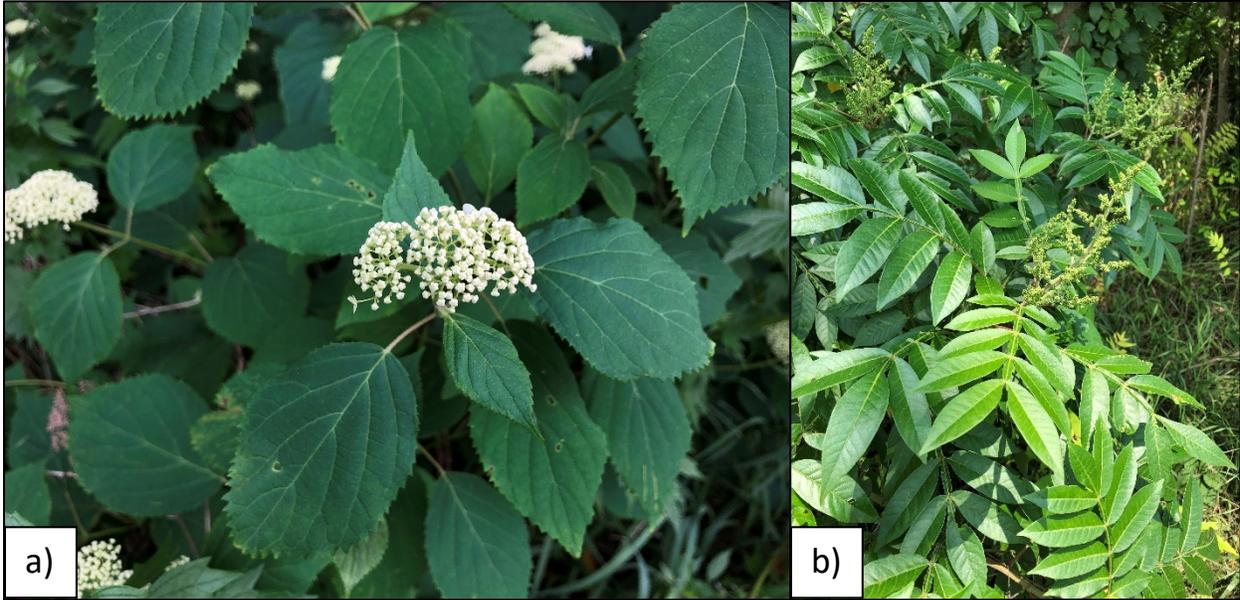


Figure 8: Selected shrub species found in the low-density urban landcover areas. a) *Hydrangea arborescens* (wild hydrangea); b) *Rhus copallina* (winged sumac).

Herbaceous species found in low-density urban landcover are generally weedy upland species that are widespread in disturbed habitats in southern Michigan. These species include: *Achillea millefolium* (yarrow), *Agrostis gigantea* (redtop; Figure 9a), *Ambrosia artemisiifolia* and *A. trifida* (ragweeds), *Asclepias syriaca* (common milkweed), *Bromus inermis* (smooth brome), *Cichorium intybus* (chicory), *Cirsium arvense* (Canada thistle), *Dactylis glomerata* (orchard grass), *Daucus carota* (Queen Anne's lace), *Elymus repens* (quack grass), *Hypochaeris radicata* (cat's-ear; Figure 9b), *Lathyrus latifolius* (everlasting pea, Figure 9c), *Melilotus albus* and *M. officinalis* (sweet-clovers), *Plantago lanceolata* and *P. major* (plantains), *Trifolium repens* (white clover), and *Verbascum blattaria* and *V. thapsus* (mulleins). The majority of these species are non-native and spread readily into disturbed and mowed habitats.

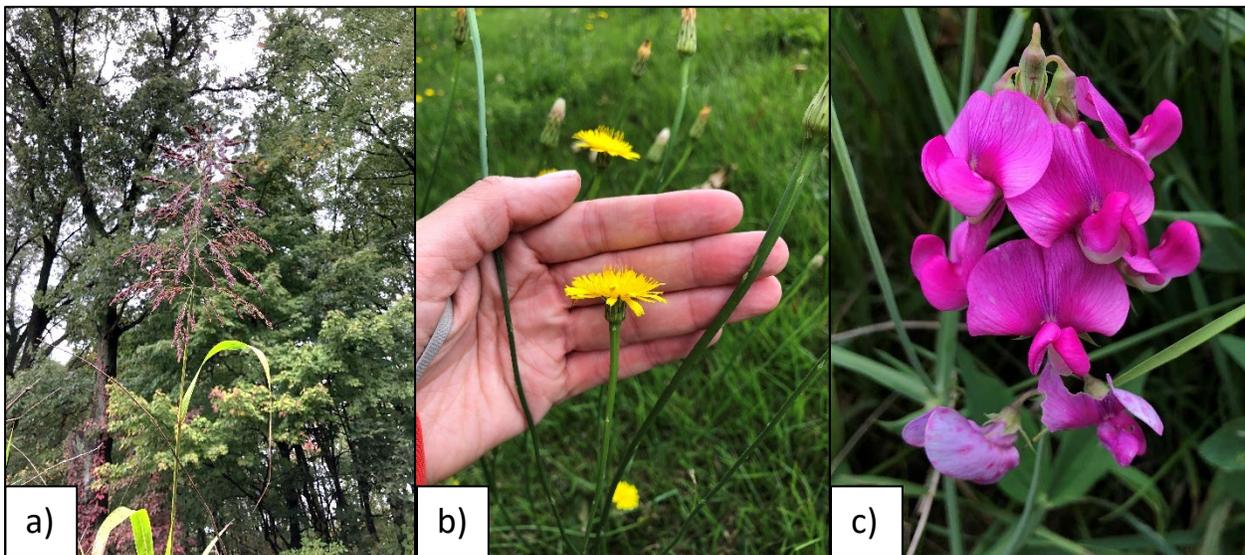


Figure 9: Herbaceous species found in the low-density urban landcover areas. a) *Agrostis gigantea* (redtop); b) *Hypochaeris radicata* (cat's ear); c) *Lathyrus latifolius* (everlasting pea).

## MNFI Natural Communities

Three instances of plant communities resembling two MNFI Natural Community types were found in this project area (Figure 10). Two areas resembling highly degraded oak openings were located to the southwest of Eagle Lake on the north side of US-12. One area resembling a degraded southern wet meadow was located near the outlet stream from Coberts Lake on the north side of US-12.



Figure 10: Map of the central section of this project area showing areas with habitats resembling MNFI Natural Communities.

## Oak Openings

Historically, the upland landcover in this project area consisted of oak-hickory forest and oak savanna<sup>5</sup>. By 1938, most of that upland landcover had been converted into agriculture, leaving small remnants of the forested areas scattered throughout the project area<sup>4</sup>. Two such remnants still exist. Although no oak trees in the ROW were aged during this year's surveys, the sizes of these oak trees and the presence of trees in these areas in 1938<sup>4</sup> suggests that these trees have existed for at least 80 years. The two areas where large oak trees were found are located at the southwest corner of Eagle Lake, on the north side of US-12 (Figure 10, brown polygons).

One patch of oak opening-like habitat is located at South Beach Road, a private drive at the southwest end of Eagle Lake. This degraded remnant is roughly 5.5 acres in area and contains large oak trees with evidence of open growth, with large lateral branches near the lower part of the trunk (Figure 11). Oak tree species observed in this area include: *Quercus alba* (white oak), *Q. macrocarpa* (bur oak), and *Q. velutina* (black oak). Although it is not clearly visible in the

photo in **Figure 11**, the large oak trees continue further north from US-12. The understory in this habitat is wholly altered from its natural state and consists of mostly non-native turf grasses. Even though the native understory has been destroyed in this remnant, the large trees are valuable and should be protected. Several large trees occur within a few meters of the US-12 shoulder, and care should be taken to avoid damaging or cutting them.



Figure 11: Google Street View screen capture of degraded oak openings habitat near South Beach Road. Photo taken in August 2019.



A second area with large oak trees occurs just to the west of Island Drive, at the southwest corner of Eagle Lake (Figure 10). A small portion of this degraded remnant occurs adjacent to the north side of US-12, and the rest of the remnant extends to the north and east toward South Shore Drive. The canopy here is dominated by *Quercus velutina* (black oak; Figure 12). The subcanopy hosts abundant non-native invasive shrub and tree species including: *Elaeagnus umbellata* (autumn-olive), *Ligustrum vulgare* (common privet), non-native honeysuckles, and *Morus alba* (white mulberry). Even though the subcanopy is highly degraded in this remnant, the presence of large, old, open-grown oaks is noteworthy. Several large trees occur within a few meters of the US-12 shoulder, and care should be taken to avoid damaging or cutting these trees.

Figure 12: Oak openings remnant to the west of Island Drive.

## Southern Wet Meadow

A very small area of habitat, ~0.3 acres, resembling a southern wet meadow occurs on the north side of US-12 along the outlet stream from Coberts Lake (Figure 10, magenta polygon). Historically, most of the landcover just to the west and south of Coberts Lake was open marshland<sup>5</sup>, and this small southern wet meadow habitat could be a remnant of this formerly extensive open wetland landcover. The State Threatened *Sabatia angularis* (rose-pink) was found in this habitat, which gives evidence that this habitat could be a remnant of a larger and higher quality open wetland.

The southern wet meadow-like habitat consists of a low, flat area bounded to the south by a steep bank upward to US-12 (Figure 3a). The eastern edge of this habitat abuts a stream flowing out of Coberts Lake (Figure 13). To the north, the habitat ends abruptly at the boundary with a closed-canopy forest.

Table 5: Species composition of the southern wet meadow habitat			
Latin name	Common name	Origin	Habit
<i>Achillea millefolium</i>	yarrow	native	forb
<i>Agrostis gigantea</i>	redtop	non-native	grass
<i>Bromus inermis</i>	smooth brome	non-native	grass
<i>Carex lacustris</i>	lake sedge	native	sedge
<i>Carex scoparia</i>	broom sedge	native	sedge
<i>Carex vulpinoidea</i>	fox sedge	native	sedge
<i>Celastrus orbiculatus</i>	Oriental bittersweet	non-native	vine
<i>Cercis canadensis</i>	redbud	native	tree
<i>Cirsium arvense</i>	Canada thistle	non-native	forb
<i>Cirsium muticum</i>	swamp thistle	native	forb
<i>Daucus carota</i>	Queen Anne's lace	non-native	forb
<i>Elaeagnus umbellata</i>	autumn-olive	non-native	shrub
<i>Euthamia graminifolia</i>	grass-leaved goldenrod	native	forb
<i>Frangula alnus</i>	glossy buckthorn	non-native	shrub
<i>Hemerocallis fulva</i>	orange day-lily	non-native	forb
<i>Ilex verticillata</i>	Michigan holly	native	shrub
<i>Lindera benzoin</i>	spice bush	native	shrub
<i>Lonicera</i> spp.	honeysuckles	non-native	shrub
<i>Lythrum salicaria</i>	purple loosestrife	non-native	forb
<i>Nepeta cataria</i>	catnip	non-native	forb
<i>Onoclea sensibilis</i>	sensitive fern	native	fern
<i>Phalaris arundinacea</i>	reed-canary grass	non-native	grass
<i>Rosa multiflora</i>	multiflora rose	non-native	vine
<i>Rosa palustris</i>	swamp rose	native	shrub
<i>Sabatia angularis</i>	rose-pink	native	forb
<i>Schoenoplectus tabernaemontani</i>	softstem bulrush	native	sedge
<i>Solidago canadensis</i>	Canada goldenrod	native	forb
<i>Symphyotrichum lanceolatum</i>	panicked aster	native	forb
<i>Symphyotrichum novae-angliae</i>	New England aster	native	forb
<i>Verbascum thapsus</i>	mullein	non-native	forb
<i>Vernonia missurica</i>	Missouri ironweed	native	forb

Table 5: Plant species found in the southern wet meadow-like habitat near Coberts Lake.

A mixture of native and non-native wetland plant species occurs in this habitat (Table 5, Figure 14). Several characteristic species of southern wet meadows were noted during the surveys, including: *Carex lacustris* (lake sedge), *Carex vulpinoidea* (fox sedge), *Cirsium muticum* (swamp thistle), *Onoclea sensibilis* (sensitive fern), *Rosa palustris* (swamp rose), *Symphotrichum lanceolatum* (panicked aster), and *Vernonia missurica* (Missouri ironweed)<sup>6</sup>. Non-native invasive plant species pose an immediate threat to this habitat; 14 species are already established. Control of invasive species, as well as continued mowing under the powerline, will help maintain the open wet meadow habitat.



Figure 13: Stream flowing out of Coberts Lake at the east boundary of the southern wet meadow habitat.



Figure 14: Southern wet meadow habitat. The open parts of the habitat are dominated by graminoids: *Carex lacustris* (lake sedge), *Carex vulpinoidea* (fox sedge), and *Schoenoplectus tabernaemontani* (softstem bulrush). Non-native *Lonicera* spp. (honeysuckles) can be seen in the background of this photo.

## Non-native invasive plant species occurrences

In addition to the invasive, non-native species listed in the previous sections of this report, 15 observations of seven 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. Several selected invasive species found in this project area are highlighted in the following paragraphs.

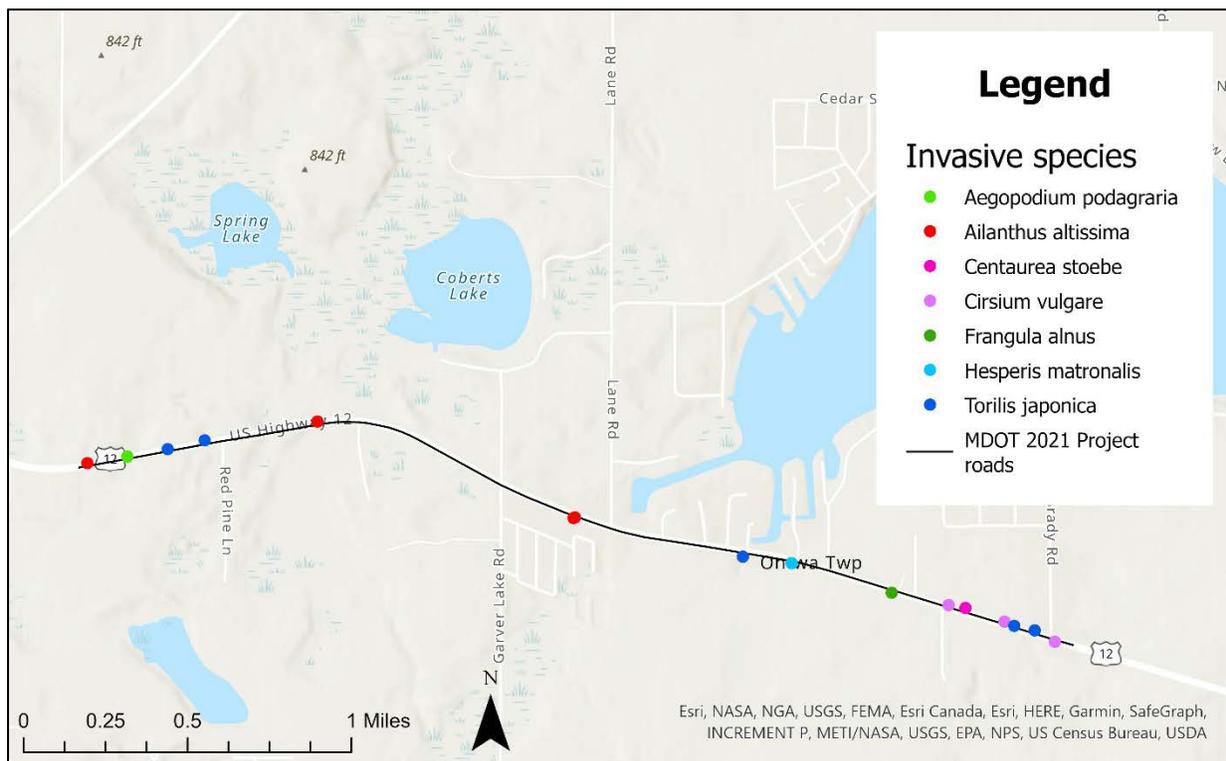


Figure 15: Locations of non-native invasive species GPS points collected using the MISIN app.

Three clones of *Ailanthus altissima* (tree-of-heaven) were documented in this MDOT project area (Figure 15, red dots; Figure 16a). These clones consist of mostly seedlings/saplings and small trees; however, one clone with larger trees occurs just to the east of the site where *Sabatia angularis* was found. This species can form dense thickets and releases chemicals into the soil that suppress the growth of other plant species, making it a substantial threat to natural habitats. Mowing will not eradicate this clonal species, as cutting saplings will stimulate the genet to send out more ramets. In Figure 16a, the effects of mowing are illustrated: an abundance of new sprouts are regenerating in the mowed ROW while larger saplings just outside of the mowing path are visible. Treating the stumps of saplings, whether by cutting and quickly painting the cut stump with herbicide or basal barking, is the best treatment for controlling this species. It is important to control this species while saplings are still small, because mature female trees can produce thousands of wind-dispersed seeds.

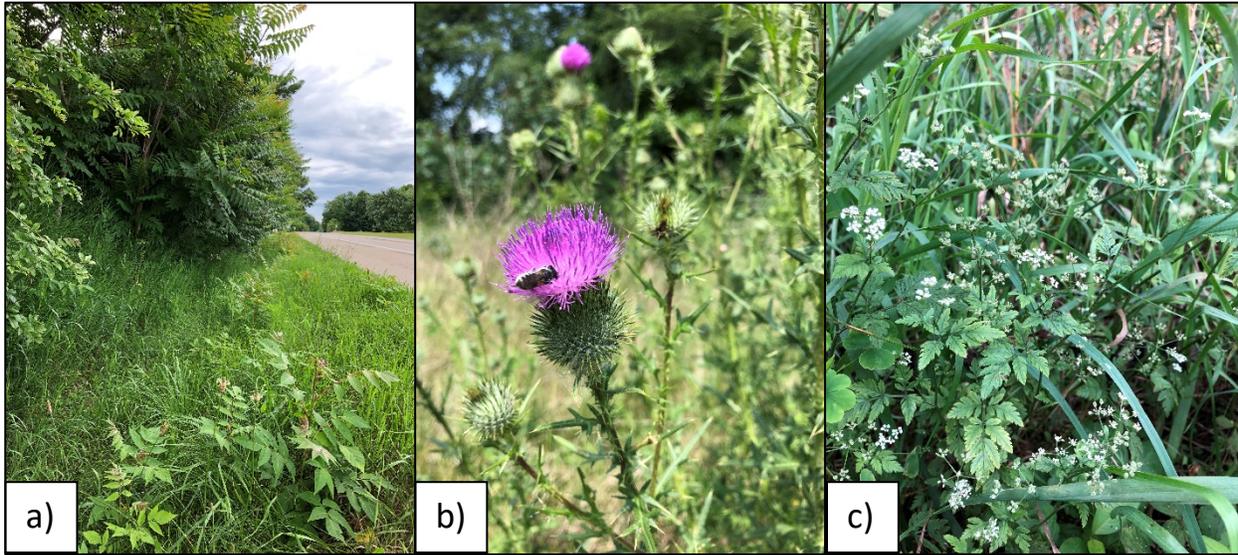


Figure 16: Non-native, invasive plant species found in this project area with data collected using the MISIN app. a) *Ailanthus altissima* (tree-of-heaven); b) *Cirsium vulgare* (bull thistle) with foraging honeybee; c) *Torilis japonica* (Japanese hedge-parsley).

Three populations of *Cirsium vulgare* (bull thistle) were found near the eastern terminus of the project area (Figure 15, purple dots; Figure 16b). These populations occur in periodically mowed open areas in the ROW. This species is a serious threat to livestock, as it readily invades open areas and reduces the quality and quantity of forage for animals. It also poses an ecological threat, as this species produces large colonies that can outcompete other plant species. The large basal rosettes shade out other plants and prevent species from germinating underneath. Control of this species is best carried out in the early to mid-summer, before the flowers go to seed. Flowering stalks can be mowed before seeds are produced and rosettes can be treated with herbicide.

Five populations of *Torilis japonica* (Japanese hedge-parsley) were found in the shaded and moist (but not wet) habitats throughout this project area (Figure 15, blue dots; Figure 16c). This species is a biennial, and the hooked seeds are dispersed by attaching to animals' fur. However, mowing equipment can also spread the seeds of this species, especially if mowing is done after seeds mature.

Several additional invasive species of concern which were not mapped with GPS were found in this project area. These species are *Hypericum perforatum* (St. John's wort) and *Securigera varia* (crown-vetch) (Figure 17). These two species spread readily in disturbed and mowed habitats and can outcompete other plant species by quickly creating dense carpets of vegetation. A patch containing both species is located on the south side of US-12 just east of Garver Lake Road. A second patch of *Securigera varia* occurs on the south side of US-12 just north of Colonial Acres Mobile Home Park.



Figure 17: Additional invasive plant species found in this project area that were not part of the MISIN app's list. *Securigera varia* (crown-vetch) and *Hypericum perforatum* (St. John's wort) are present in the foreground. A clone of *Ailanthus altissima* (tree-of-heaven) can be seen in the background.

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