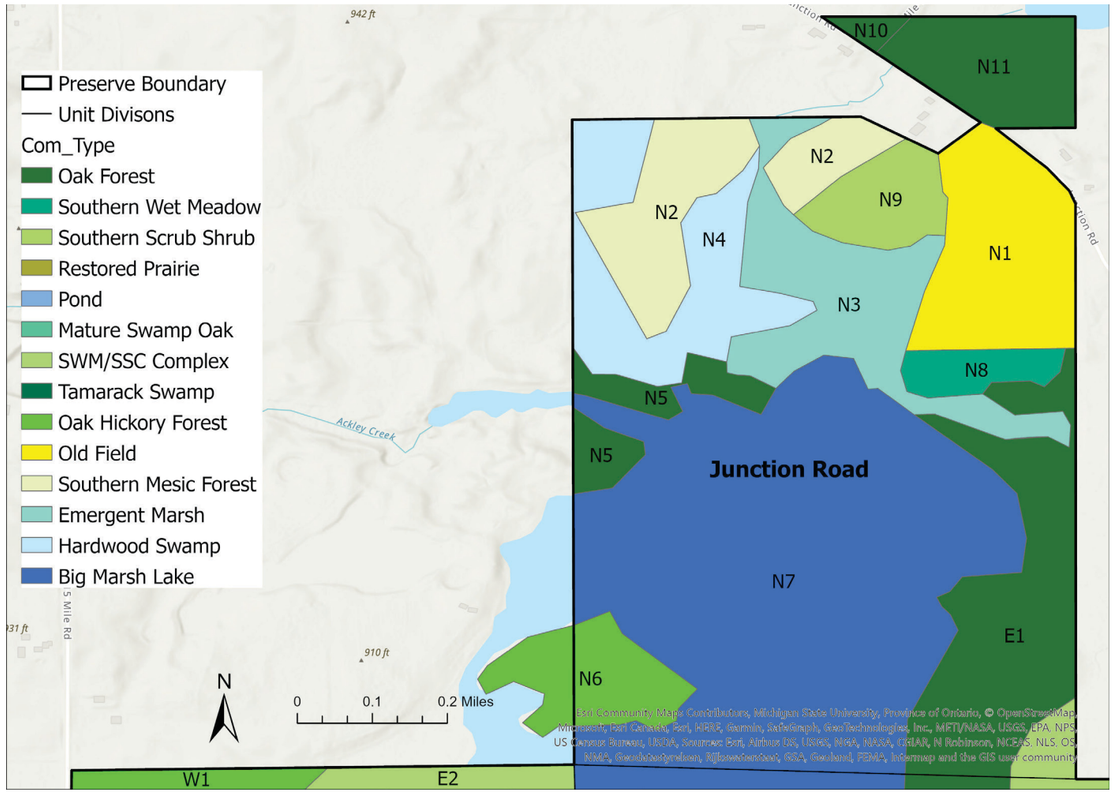
2.6.2 JUNCTION ROAD



The Junction Road parcel contains plant communities that are connected through patterns of succession and are representative of the dynamic ecosystems present at Baker Sanctuary. This land was subject to significant anthropogenic manipulation prior to its incorporation as a preserve. Past farming and grazing practices, as well as other land use changes, have altered the successional and hydrological processes in a sizable portion of the Junction Road parcel. This catalyzed the loss of native biodiversity and encouraged the proliferation of invasive graminoids, forbs, and shrubs.

Soil texture and structure, topography, and cyclical environmental processes affect the characteristics of each site and influence species composition (Jenny, 1980). For this reason, we have grouped certain habitat types within this parcel to better represent the management decisions for each. From this point, Junction Road will be divided into 'Mesic Upland' representing the oak and oak hickory forests, and 'wetlands and old f ield', which accounts for the ecotone between the forests and Big Marsh Lake. Plant communities present in the mesic upland portions of this section of the preserve include oak forest, oak forest/wetland, southern mesic forest, and an oak hickory island. The wetlands contain emergent marsh, southern wet meadow, shouthern shrub scrub (southern shrub-carr), hardwood swamp, emergent marsh, and southern wet meadow plant communities. Big Marsh Lake is located at the center of the Junction Road unit.

Specific Property Goals

- Decrease abundance and frequency of non-native species.
- Increase native species plant cover.
- Gain a better understanding of what organisms are utilizing these communities.
- Maintain open conditions to support oak regeneration in forested subunits.
- Reintroduce natural disturbance regimes such as fire and other mechanical, biological, and chemical treatments to the landscape.
- Prevent dramatic fluctuations in water levels in wetlands by limiting the amount of additional nutrients and sediment from runoff of surrounding areas.
- Monitor the water levels in wetlands using the MiRAM methodology.
- Monitor and control deer populations to prevent overgrazing.

Wetlands and Old Field of Junction Road

Current Condition

The 'wetlands and old field' communities of Junction Road consist of old field, southern scrub-carr, and southern wet meadow. Old field is a generally drier habitat than southern wet meadow and southern shrub-carr, and is typically a mixture of grasses, forbs, shrubs, and weeds. The species composition of old fields is dependent on a variety of factors including the characteristics of the site, the land use history, the ecological composition of the surrounding landscape, and the type of management that occurred after initial abandonment.

Southern wet meadow, a groundwater-influenced community, is a sedge-dominated wetland. Its community structure and species composition are influenced by natural and anthropogenic processes including seasonal flooding, flooding by beaver, and fire. Southern shrub-carr, a shrub-dominated wetland, typically occurs on saturated organic soils within depressions of a variety of landforms. The species composition and community structure of this natural community is influenced by natural and anthropogenic processes such as fluctuating water levels, flooding beaver, and windthrow.

Of the four transect site surveys that were conducted in the Junction Road unit, two were in old field communities. According to the surveys, the old field communities had a combined total of 47 plant species with 16 being non-native. Of the 16 total non-native species discovered in the two old field communities, two species, timothy grass (*Phleum pratense*) and Kentucky bluegrass (*Poa pratensis*), were in at least 75% of the surveyed quadrants.

One of the four transect site surveys that was conducted in the Junction Road unit was in a southern shrub-carr community. According to this survey, the southern shrub-carr contained 33 identifiable plant species with 13 being non-native. The most common non-native species in the southern shrub-carr were Kentucky bluegrass (*Poa pratensis*) and multiflora rose (*Rosa multiflora*), which were present in 100% of the surveyed quadrants. Further, autumn olive (*Elaeagnus umbellata*), timothy grass (*Phleum pratense*), and cow parsley (*Anthriscus sylvestris*) were present in at least 50% of the surveyed quadrants.

The last of the four transect site surveys conducted in the Junction Road unit was an emergent marsh/wet meadow community. This habitat type contained 30 plant species with nine being non-native. Of the nine total non-native species found in the emergent marsh/wet meadow community, Kentucky bluegrass (*Poa pratensis*) is by far the most prevalent and was in 100% of the surveyed quadrants. Purple coneflower (*Echinacea purpurea*), the second most prevalent, was found in 67% of the surveyed quadrants.

TABLE 2.3 JUNCTION ROAD TRANSECTS DOMINANT PLANT SPECIES (2021)

Junction Road Transect	JR2 + JR3	JR1	JR4
Natural Community	Old field	Southern shrub-carr	Emergent marsh / wet meadow
Species Composition	47 total species 16 non-native	33 total species 13 non-native	30 total species 9 non-native
Species present in 100% of surveyed quadrats	*Phleum pratense* and *Poa pratensis*	*Poa pratensis* and *Rosa multiflora*	*Poa pratensis*
Species present in >75% of quadrats	*Phleum pratense* and *Poa pratensis*	—	—
Species present in >50% of quadrats	—	*Elaeagnus umbellata, Phleum pratense,* and *Anthriscus sylvestris*	*Echinacea purpurea*

The floral inventory assessment for the entire Junction Road unit includes a combined total of 67 species, with 50 native species and the remaining 17 being non-native. This translates to an FQI score of 22.1, indicating that the vegetative quality of this site could be improved. However, it is important to note this assessment combined the surveys from all the habitat types of Junction Road. Compiling a fully comprehensive floral inventory assessment of each habitat type within the different units of Baker Sanctuary will require additional time and resources that were not available to produce this report.

While the FQI score indicates that there is average vegetative quality for Junction Road, it is important to note not only the presence of plant species but also their richness. This is better represented by the individual transect site surveys done within the specific communities in each unit of Baker Sanctuary. According to the transect surveys conducted in the open field and wetland communities, non-native species represent 30-40% of the total species present. Additionally, many of the non-native species present have a high abundance in their associated transects, indicating the possible displacement of native plant species.

Management History

The management history of Junction Road is separated based on the habitat type. Appropriately, there is an extensive management history of the old field communities. In the pre-settlement era, the areas of what is now old field were oak savanna habitat. After settlement, they were converted to agricultural fields of either or both row crops/forage/hay. Agriculture continued until the 1940s when Michigan Audubon acquired the land. There were no known management practices of the old field communities from that time until 2012 when Baker Sanctuary was

was professionally surveyed. Based on this survey, the recommended management of the old field communities are listed in the table below.

TABLE 2.4 2013 MANAGEMENT RECOMMENDATIONS FOR THE OLD FIELD COMMUNITIES WITHIN JUNCTION ROAD

Date	Task	Time of Year	Performed by
Year			
2012-13	Evaluate Site	Fall	RM/TF
2014	Bulldoze/grub autumn olive	Late Winter/Spring	Contractor
	Spot treat random Autumn Olive	Late Winter/Spring	SC/Volunteers
	Herbicide Brome Grass	Spring	Contractor
	Prescribed Burn	Fall	Contractor
	Interseed with native grasses	Late Fall	Contractor
	Plant native Shrubs	Lake Fall	SC/Volunteers
2015	Thin out tree lines of red maple, walnut	Mid-winter	SC/DC/Volunteers (firewood)
	Mow	Early Fall	Contractor
	Burn	Late Fall	Contractor

There is less known about the management history for the southern shrub-carr and southern wet meadow communities. However, the survey completed in 2013, outlines the management practices necessary for these community types in the following table.

Management Strategies / Objective

TABLE 2.5 2013 MANAGEMENT RECOMMENDATIONS FOR THE SOUTHERN SHRUB-CARR AND SOUTHERN WET MEADOW COMMUNITIES WITHIN JUNCTION ROAD

Date	Task	Time of Year	Performed by
Year			
2013	Evaluate Site	Fall	RM/TF
	Mechanical Removal	Winter	RM/Volunteers
	Chemical Treatment	Summer	RM
	Prescibed Fire	Fall	Burn Crew
	Plant Seeds/shrubs	Winter-Spring	RM/Volunteers

The old field, southern wet meadow, and southern shrub-carr sections of the Junction Road parcel are adjacent and comprise the northeastern corner of Baker Sanctuary. The old field shares its western border with a road that delineates the eastern edge of the preserve. It also borders an emergent marsh to the west and south. The southern wet meadow is located directly below the old field and functionally exists as the gradient between the old field and emergent marsh. The southern shrub-carr plant community borders the western edge of the old field and provides a similar buffer from the emergent marsh. It is likely that the loss of historical disturbance regimes catalyzed its succession from southern wet meadow and without action it will likely succeed to a tamarack or hardwood swamp, which both exist nearby and comprise a sizable portion of Baker Sanctuary north of Big Marsh Lake (White, 1965).

The old fields at Baker Sanctuary were farmed for nearly a century prior to abandonment when the land was donated to Michigan Audubon. Similarly, to the old fields which exist in the 15 Mile unit, a long-term restoration goal in the Junction Road parcel is the establishment of a tallgrass restoration prairie which will support high levels of diversity and contribute to the overall ecosystem function of the protected land.

The southern wet meadow is located directly to the south of the old field and has a similar current species composition. It is likely that a portion of the old field was also southern wet meadow prior to European settlement, and that it existed as part of a dynamic complex of wetland natural communities that together encompassed the perimeter of Big Marsh Lake. These plant communities experienced frequent disturbances from fire and seasonal water level fluctuations, which kept them free from encroaching shrub-carr and encouraged the establishment of shade intolerant species. Southern wet meadow ecosystems were viewed as excellent for agriculture by European settlers and have been nearly extirpated from Michigan as a result of land use conversion. Because of their value to regional biodiversity, they are often the focus of restoration efforts that include the reintroduction of fire to the landscape and the protection of nearby sites that influence the hydrology of the ecosystem (Kost, 2001).

Similarly, the site containing southern shrub-carr is directly west of the old field and was likely a southern wet meadow that was invaded by shrubs due to the historical loss of fire to the landscape. While southern shrub-carr is a valuable natural community that supports an abundance of native plant species, it has invaded other plant communities such as southern wet meadow, which are now far rarer. To ameliorate this, restoration efforts sometimes focus on removing the woody vegetation via prescribed burns and setting back succession to an earlier stable state (Cohen, 2020; Kost 2010).

Southern wet meadow and southern shrub-carr exist within a matrix of wetland ecotones with emergent marsh and southern hardwood swamp in the Junction Road unit. These four wetland plant communities share common attributes, which makes their management recommendations similar, so they will be

combined in this report. In addition to these specific recommendations regarding southern wet meadow and southern shrub-carr, these four natural communities are sensitive to pollution from agricultural runoff and other anthropogenic sources, and they respond negatively to hydraulic manipulations of any kind. It is imperative that runoff from nearby developed sites is contained and other nearby lands which impact the hydrology are protected from development. Southern hardwood swamps and emergent marshes experience infrequent fire events, but more so when they are located adjacent to fire-dependent ecosystems (Cohen, 2020; Kost 2010). Fragmentation of hardwood swamps has caused an invasion of non-native vegetation which negatively affects community structure and function, and mechanical removal is recommended in these instances. Deer populations must be monitored and controlled, as overbrowsing has a deleterious effect on the recruitment of herbaceous and woody vegetation. Other woody debris such as rotting logs and dead standing wood should be left in place, as they build structural complexity in the ecosystem and provide habitat or substrate suitable for numerous species (Slaughter, 2009).

TABLE 2.6 JUNCTION ROAD WETLANDS AND OLD FIELD QUALITY SITE INDICATORS/ OUTCOME

Organism/ Characteristic	Current Condition	Evaluation Method	Desired Condition
Invasive Plants	Present; <25% *Elaeagnus umbellata* *Rosa multiflora* *Rubus occidentalis* *Acer rubrum*	Presence/ Absence	Absent; 5%
Plant Species	# observed species: 68 Total MeanC: 2.7 Native Mean C: 3.6 Total FQI: 22.1	Nested Plot	# observed species: >200 Total MeanC: >4 Native Mean C: >4 Total FQI: >35
C-Value 7-10 *Tiarella cordifolia*	*Present*	Nested Plot Site Survey	Increase abundance of high quality native species
Dominant Canopy Species: *Prunus serotina* *Quercus spp.* *Ulmus americana* *Acer rubrum*	Relative Dominance: *Prunus serotina*: 17.86% *Quercus ellipsoidalis*: 53.11% *Ulmus americana*: 10.97% *Quercus rubra*: 5.16% *Acer rubrum*: 9.97% Other: 2.93%	*Nested Plot Site Survey*	Maintain and preserve current conditions
Notable Species: *Dichanthelium oligosanthes* *Carex pensylvanica* *Onoclea sensibilis* *Bromus ciliatus* *Symphyotrichum oolentangiense*	Present	Nested Plot Site Survey	Increase abundance and encourage establishment of complimentary species

TABLE 2.7 OLD FIELD MANAGEMENT TASK CALENDER

Year	Task	Time of Year
1	Site Evaluation	Summer
2-3* *Adaptability for repeated process	Chemical treatment of small-medium populations of invasive and undesirable woody vegetation. (*Elaeagnus umbellata* and *Rosa multiflora*). -Stump Cut—Cut stem 2" above ground and immediately apply herbicide to the cross-section of the stem.	Late Summer-Early Fall (July-September)
4	Prescribe Burn Mid-Spring burn targets control of cool season grasses such as *Phleum pratense* and *Poa pratensis.* ** Mowing as close to the ground as possible is sufficient in managing old fields if burning is not available.*	Alternating Spring & Fall
5	Reintroduction and establishment of native herbaceous plant species– plant and interseed with native grasses and shrubs ** Determine seeding rate from instructions provided by seed supplier*	Late Fall
6	Site Evaluation	Spring/Summer
7-9	Continue management of non-native species through mechanical, chemical, and prescribed burn.	Spring/Fall
10	Site Evaluation	Spring/Summer

This unit contains several small to medium clusters of autumn olive and multiflora rose. An integrated method is suggested to control these species. Stump-cut, performed in the late summer-early fall consists of cutting the stem about 2” above the ground and immediately applying herbicide. This method is also referred to as ‘Cut-and-Squirt’. Annual follow-up is required to control both species. In addition, monitoring of 20’ from the population is recommended for multiflora rose specifically.

For larger populations, mowing/brush hogging followed by foliar spray is suggested. For autumn olive specifically, mowing alone is not an adequate process of removal, as it will result in a regrowth of smaller stems. The regrowth should be chemically treated with a foliar spray July-September, after bird nesting season.

A late spring/early summer prescribed burn (Mid to late May) will severely damage the leafed out woody species, including autumn olive. In addition, a late spring burn targets cool-season grasses such as Timothy and Kentucky bluegrass and allows native grass species the ability to out-compete these plants.

These low-intensity prescribed-fires should be administered to the old field/prairie system every two to three years. However, it is good practice to alternate prescribed burns between the spring and fall seasons. This provides balance to the ecosystem, as repeated annual spring burns can negatively affect the abundance of native early season grasses and forbs.

Mowing the old field/prairie might be suggested to reduce fuel and ensure a low-intensity fire. However, the Burn Plan constructed by a certified burn boss may not include mowing in the weeks leading up to a controlled burn.

Following a controlled burn (and at times, the chemical removal of woody species) the reintroduction and establishment of native plant species is crucial. This can be accomplished by broadcasting seeds over bare soil or injecting them into the ground. After the initial year of habitat management, it is important to perform annual site evaluations to determine what species are present and their abundance as well as to determine the effectiveness of the removal treatments.

TABLE 2.8 SSC/SWM MANAGEMENT TASK CALENDER

Year	Task	Time of Year
1	Site Evaluation	Summer
2-3* *Adaptability for repeated process	Chemical treatment of small-medium populations of invasive and undesirable woody vegetation. (*Elaeagnus umbellata* and *Rosa multiflora*). -Stump Cut—Cut stem 2” above ground and immediately apply herbicide to the cross-section of the stem.	Late Summer-Early Fall (July-September)
4	Prescribe Burn Mid-Spring burn targets control of cool season grasses such as *Phleum pratense* and *Poa pratensis*. ** Mowing as close to the ground as possible is sufficient in managing old fields if burning is not available.*	Alternating Spring & Fall
3-4	Reintroduction and establishment of native herbaceous plant species– plant and interseed with native grasses and shrubs	Winter-spring
Annually	Groundwater monitoring using the MiRAM methodology detailed in the “State of Michigan Wetland Monitoring and Assessment Strategy” (Michigan Department of Environmental Quality (MDEQ) Water Resources Division, 2015)	All

These habitat management methods are similar and less extensive than those of the old field community. If needed, refer to the above paragraph for further explanation of each task.

Mesic Uplands of Junction Road

Current Condition

The surveyed 'mesic uplands' communities include an oak and oak hickory forest habitat.

These drier forests are commonly found south of Michigan's tension zone on porous, loose-textured soils. These forests have an open canopy that admits considerable sunlight to the forest floor year-round. The understory of this mesic upland community consists of woody and non-woody vegetation with few saplings. According to the nested plot surveys, the understory consisted of a total of 41 species, with ten being non-native. Some of the most common native plant species include *Vitis riparia* (riverbank grape), *Fragaria virginiana* (Virginia strawberry), *Achillea millefolium* (yarrow), *Carex pensylvanica* (Pennsylvania sedge), and *Rubus allegheniensis* (common blackberry).

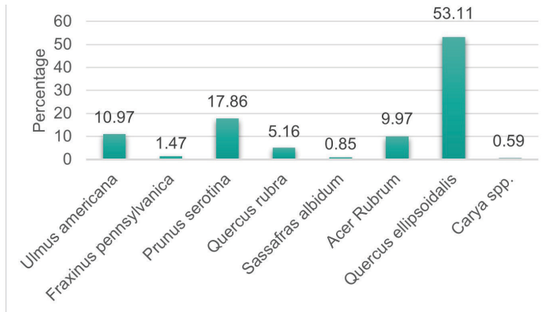
The most common non-native species that are present in the understory of this mesic upland community are *Elaeagnus umbellata* (autumn olive), *Rosa multiflora* (multiflora rose), *Berberis spp.* (Japanese barberry), V*eronica officinalis* (common speedwell), and *Geum urbanum* (wood avens). Species richness and diversity values were determined based on their plot prevalence. The species listed as the most common were present in every plot within the nested plot. Further, based on the nested plot survey, the saplings that were present in the mesic upland understory include *Sassafras albidum, Fraxinus pennsylvanica, Carya spp., Acer rubrum, Juniperus virginiana, Ulmus americana, Quercus rubra, and Quercus alba.* However, it is important to note the *Ulmus americana, Quercus rubra,* and *Quercus alba* were the least prevalent sapling species that were identified in this community possibly indicating a shift in forest type.

TABLE 2.9 SPECIES COMPOSITION OF JUNCTION ROAD UNIT (2021)

Nested Plot JR1 (50 total species)	Native	Non-native
Number of Species	41	9
Present in 100% of nested plots	*Vitis riparia, Fragaria virginiana, Achillea millefolium, Carex pensylvanica, Rubus allegheniensis*	*Elaeagnus umbellata,Rosa multiflora, Berberis thunbergii, Veronica officinalis, Geum urbanum*
Saplings	*Sassafras albidum, Fraxinus pennsylvanica, Carya spp., Acer rubrum, Juniperus virginiana, Ulmus americana, Quercus rubra, Quercus alba*	

As mentioned in the 'Wetlands and Old Field' community above, the floral inventory assessment for the entire Junction Road unit shows a combined total of 67 species in the Junction Road plots with 50 species being native and the remaining 17 being non-native. An FQA analysis of this list produced an FQI score of 22.1, indicating a site of reasonable vegetative quality. Again, it is important to note this assessment combined the surveys from all the habitat types of Junction Road, including four transects and one closed-canopy nested plot. Additional time and resources are required to create a fully comprehensive floral inventory assessment of each habitat type within the different units of Baker Sanctuary.

Also, it is important to note that the FQI score does not include any canopy data from the forest communities. The survey of the overstory of nested plot JR1 reveals a total of 53 trees consisting of eight different species. Native species include American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), black cherry (*Prunus serotina*), red oak (*Quercus rubra*), sassafras (*Sassafras albidum*), Red Maple (*Acer rubrum*), northern pin oak (*Quercus ellipsoidalis*), and hickory (*Carya spp.*). The two most common tree species are *Ulmus americana* and *Quercus ellipsoidalis*, with 13 and 10 trees, respectively. The two least common trees in the overstory of the mesic upland community are *Sassafras albidum* and the unidentified Carya species.



FFIGURE 2.6 RELATIVE DOMINANCE: JUNCTION ROAD NESTED PLOT (JR4)

Management History

There were no known management practices of the mesic upland communities until 2012 when Baker Sanctuary was professionally surveyed

TABLE 2.10 2013 MANAGEMENT RECOMMENDATIONS FOR THE MESIC UPLAND COMMUNITIES WITHIN JUNCTION ROAD

Date	Task	Time of Year	Performed by
Year			
2012	Evaluate Site	Fall	RM/TF
	Mechanical Removal	Winter	RM/Volunteers
	Chemical Treatment	Summer	RM
	Prescibed Fire	Fall	Burn Crew
	Plant Seeds/shrubs	Winter-Spring	RM/Volunteers

Management Strategies/Objectives

Several parcels located near the perimeter of the Junction Road property contain forested natural communities. These patches exist along a mesic gradient that is driven by topography and proximity to Big Marsh Lake. The northwest corner contains a patch of southern mesic forest surrounded by a hardwood swamp, the southwest corner contains an oak-hickory island that extends into Big Marsh Lake, and the northeast and southeast corners are dominated by oak forests in mesic soils with varying elevations and gradients. Due to logistical issues as well as time and budgetary constraints the oak-hickory island and most of the oak forests were not observed for this study and no surveys were conducted at these locations. The one oak forest parcel that was observed is disconnected from the rest of the preserve by Junction Road and anthropogenic development.

Because the natural communities' boundaries within the preserve were defined in multiple management plans within the last ten years, we reasonably conclude that current conditions in these forested patches are like those descriptions. The oak-hickory island is a dry-mesic southern forest, and management should reflect the goals associated with improving biodiversity in that ecosystem. Similarly, management of the oak forest should be oriented towards the restoration of either dry-mesic southern forest or southern mesic forest paradigms, depending on the unique characteristics of each patch. Each forest fragment must be analyzed for its physiological properties and species composition to determine the correct management strategy moving forward.

As previously discussed in the Isham Preserve section, the principal focus of dry-mesic

forest management is increasing oak recruitment. This is historically a fire-dependent ecosystem, where periodic ground fires removed unwanted woody vegetation and promoted oak regeneration. In a post fire paradigm those species must be removed mechanically or with the application of herbicides. Additionally, deer densities should be monitored and controlled to encourage the establishment of herbaceous and woody understory vegetation. Over browsing by deer can have a negative impact on the richness and diversity of native forbs and catalyze changes to the structure of the ecosystem (Augustine, 1998).

The mesic southern forest portions of the Junction Road parcel are larger than the other forested areas and spread throughout the northeastern and southeastern corners. When managing these fragments to improve biodiversity generally it is prudent to leave sites undisturbed whenever possible. It is also important not to remove downed woody debris, snags, and other organic matter of varying size and age to mimic the old growth conditions of larger patches (Kost, 2007). Most parcels currently exist within a dense agricultural matrix and suffer from anthropogenic degradation and invasions of non-native flora and fauna, so it is often necessary to monitor site conditions and remove unwanted woody vegetation. This ecosystem is heavily impacted by deer browsing, and many native species will be eliminated from the landscape if deer populations are not carefully managed.

TABLE 2.11 JUNCTION ROAD MESIC UPLANDS QUALITY SITE INDICATORS /OUTCOME

Organism/ Characteristic	Current Condition	Evaluation Method	Desired Condition
Invasive Plants	Present; <25% *Elaeagnus umbellata* *Rosa multiflora* *Rubus occidentalis* *Acer rubrum*	Presence/ Absence	Absent; 5%
Plant Species	# observed species: 68 Total MeanC: 2.7 Native Mean C: 3.6 Total FQI: 22.1	Nested Plot	# observed species: >200 Total MeanC: >4 Native Mean C: >4 Total FQI: >35
C-Value 7-10 *Tiarella cordifolia*	*Present*	Nested Plot Site Survey	Increase abundance of high quality native species
Dominant Canopy Species: *Prunus serotina* *Quercus spp.* *Ulmus americana* *Acer rubrum*	Relative Dominance: *Prunus serotina*: 17.86% *Quercus ellipsoidalis*: 53.11% *Ulmus americana*: 10.97% *Quercus rubra*: 5.16% *Acer rubrum*: 9.97% Other: 2.93%	*Nested Plot Site Survey*	Maintain and preserve current conditions
Notable Species: *Dichanthelium oligosanthes* *Carex pensylvanica* *Onoclea sensibilis* *Bromus ciliatus* *Symphyotrichum oolentangiense*	Present	Nested Plot Site Survey	Increase abundance and encourage establishment of complimentary species

TABLE 2.12 MESIC UPLAND TASK CALENDER

Year	Task	Time of Year
1	Site Evaluation	Summer
1-2	Mechanical removal of large populations of invasives and non-native woody vegetation, specifically: *Elaeagnus umbellata, Rubus occidentalis, Acer rubrum, Rosa multiflora*	Winter
3* *Adaptability for repeated process	Chemical treatment of: Small-medium populations of invasive and undesirable woody vegetation. - Stump Cut—Cut stem 2" above ground and immediately apply herbicide to the cross-section of the stem. Large populations of invasive and undesirable woody vegetation. - Foliar spray *Berberis thunbergii:* A systemic herbicide can provide control in a single step	Late Summer-Early Fall (July-September)
4	Prescribe Burn: - Target woody species (such as *Rosa multiflora, Berberis thunbergii*, and *Elaeagnus umbellata)*. - Infrequent - Maintain once every 5-10 years	Spring
5-6	Reintroduction and establishment of native herbaceous plant species in areas of invasive wood removal. – plant and inter-seed with native grasses and shrubs. * *Determine seeding rate from instructions provided by seed supplier*	Winter/Spring
Annually	Monitor and control deer population	All

In order to properly manage a mesic upland plant community, it is necessary to conduct a site evaluation to determine what plant species are present. In this mesic upland community, autumn olive (*Elaeagnus umbellata*), black raspberry (*Rubus occidentalis*), red maple (*Acer rubrum*), and multiflora rose (*Rosa multiflora*), and Japanese barberry (*Berberis thunbergii*) are present. An integrated method is suggested for these species, and autumn olive, black raspberry, red maple, and multiflora rose should be mechanically removed, followed by a chemical treatment.

For small to medium populations stump-cut, , performed in the late summer-early fall consists of cutting the stem about 2” above the ground and immediately applying herbicide. This method is also referred to as ‘Cut-and-Squirt’. Annual follow-up is required to control both species. In addition, monitoring of 20’ from the population is recommended for multiflora rose specifically.

For larger populations, mowing/brush hogging followed by foliar spray is suggested. For autumn olive specifically, mowing alone is not an adequate process of removal, as it will result in a regrowth of smaller stems. The regrowth should be chemically treated with a foliar spray July-September, after bird nesting season. Japanese barberry can follow these treatments; however, a systemic herbicide could provide control in a single step.

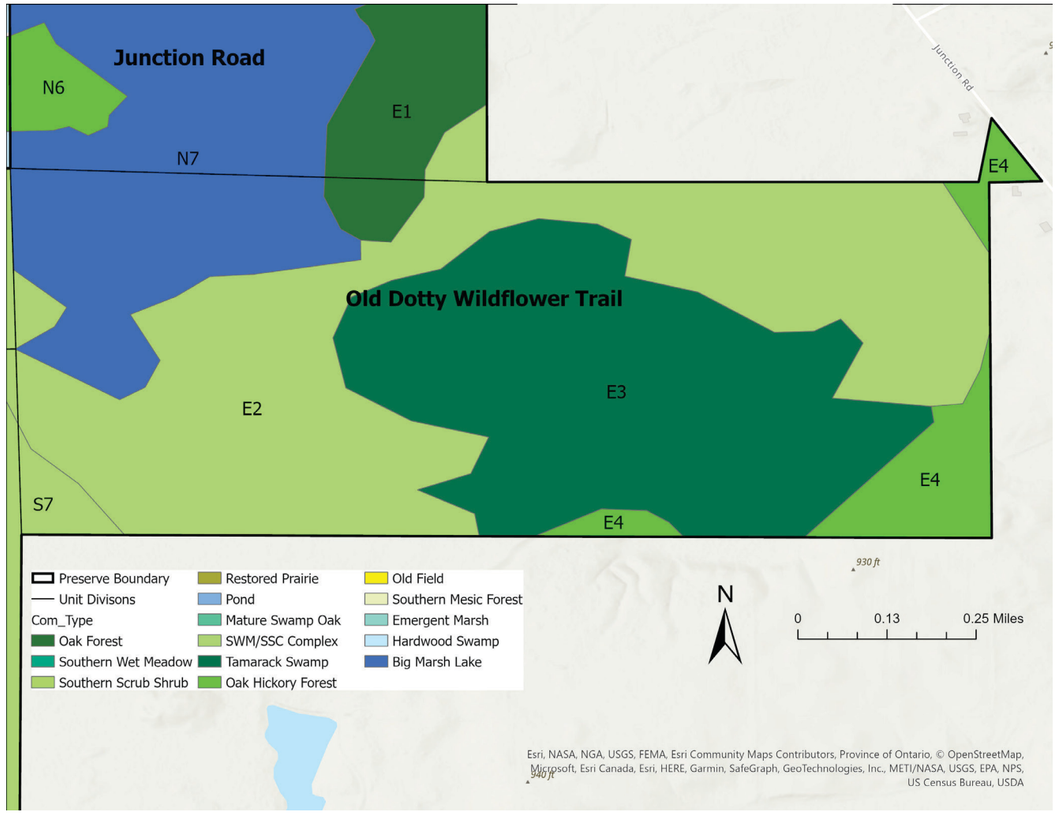
As previously mentioned, prescribed fire is required at less frequent intervals in mesic upland habitat than in grassland or prairie habitat. It is recommended that low-intensity surface fires be spread once every five to ten years. Oaks have evolved with adaptations that make them successful at surviving fire such as the ability to resprout due to their large root system, their formation of root collar buds belowground, and their thick bark. Fire is necessary in these habitat types to control the density of the forest. Without fire, trees that cannot survive fire, and other woody plants, begin growing in and invading the oak forests. As the trees become denser, the canopy will begin to close which will affect forest succession because oaks cannot regrow under a closed canopy. However, in established oak forests, it is important to administer low-intensity surficial fires on a rather limited basis. As mentioned in the ‘management strategies/objectives’ section, in order to improve biodiversity in mesic southern forest fragments, there needs to be minimal site disturbance as well as retaining downed woody debris, snags, and other organic matter.

Lastly, to maintain and restore an oak forest community, there needs to be the reintroduction and establishment of native plant species. This can be accomplished by either seeding or planting native vegetation in the understory of this mesic upland community.

The current conditions of the hardwood swamp, oak-hickory island, oak-hickory forest, and Big Marsh Lake located in the Junction Road Unit is unknown. Time and resources prevented vegetative sampling of these areas. An assumption that can be made based on the broader context of natural areas in this region is that non-native/ invasive species are present in the wetlands. To what extent they are present is unknown.

Further, there are several patches of the same natural communities within Junction Road unit. Due to the lack of time, resources, and the difficulty of accessing many of these patches, we were unable to survey each individual habitat patch. However, we can make broad assumptions about the habitat composition and structure based on the data collected from the surveyed patches of the same habitat type.

2.6.3 OLD DOTY WILDFLOWER TRAIL



The Old Doty Wildflower Trail (ODWT) occupies the southwest portion of Baker Sanctuary and is similar in composition to the Junction Road parcel. Its northeastern and southeastern corners are higher in elevation and contain oak hickory forest. These patches are closely related to the other areas of oak and oak hickory forest that occupy the perimeter of the entire preserve and are representative of the plant communities that historically comprised Baker Sanctuary. Additionally, the tip of the oak forest from the eastern edge of the Junction Road parcel extends south into the ODWT as a forested peninsula surrounded by wetlands. When moving from the edges of the parcel towards the middle the elevation gradient drops, and the bulk of the interior of the ODWT is comprised of a matrix of tamarack swamp, southern wet meadow, and southern shrub carr. Big Marsh Lake protrudes into the parcel from its northern boundary and makes up a significant portion of the eastern half of the ODWT.

The ODWT is the least accessible of the four parcels in the preserve. There are no connecting trails or boardwalks with the 15 Mile parcel to the west, and it is separated from the Junction Road and Isham Preserve units by Big Marsh Lake. It is named in honor of Iva Dotty, a generous benefactor who grew up in Battle Creek. She had envisioned the creation of a wildflower garden in the area, and in 1963 she came to an agreement with Michigan Audubon to develop one within Baker Sanctuary (Funke, 2013). A boardwalk trail was constructed and then renovated in the 1990’s, but it fell into disrepair and was largely removed. The only evidence of the trail on Junction Road is a small pavilion. This site was once a principal attraction of Baker Sanctuary and has significant potential for recreational development. However, infrastructure improvements would be necessary to ensure public safety at this entrance.