

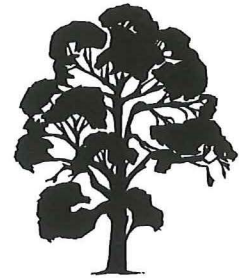
MERIDIAN TOWNSHIP

Land Preservation Advisory Board



TO: Land Preservation Advisory Board Members

Julie Brixie
Roland Harmes
Frank Hatfield
Jon Mayes
Robert Rusch
Margo Smith
Mark Stephens



FROM: James Kielbaso, Chair

DATE: September 4, 2015

In lieu of the September meeting, the Land Preservation Advisory Board Members will be conducting a site visit of the Hubbel Land Preserve on Wednesday, September 9. Members will meet at the Meridian Township Service Center, 2100 Gaylord C Smith Court, Haslett, at 6 pm.

This is a discussion/site tour event and although a quorum of the Land Preservation Advisory Board may be present, there will be no decisions made at this time.

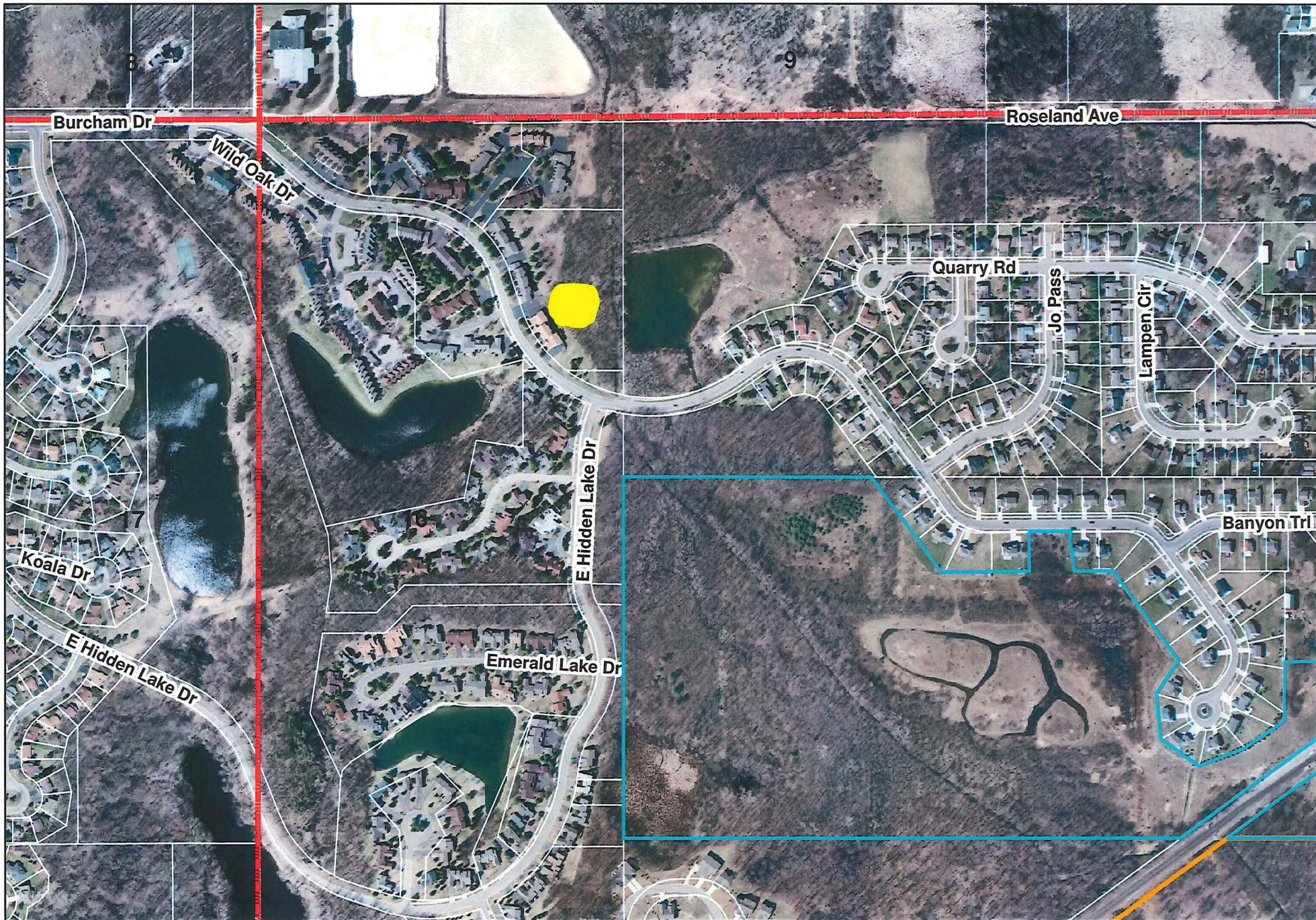
Tour Date, Time, Location:

- Wednesday, September 9, 2015 at 6 pm

Hubbel Preserve

- Location: Okemos Road approximately ½ mile north of Grand River Avenue and north of railroad crossing
- Area: 57.66 acres
- Year Acquired: 2003
- Purchase Price: Donation
- Description: Mixed deciduous lowland forest and shrub-scrub upland
- Floodplain Acreage: 51.76
- See Attachments

cc: Frank Walsh
Derek Perry
Mark Kieselbach
LuAnn Maisner
Jane Greenway
Clerk's Office
Bulletin Board
HOM-TV Generator
Website



**Hubbell Land Preserve
Meridian Township, MI**

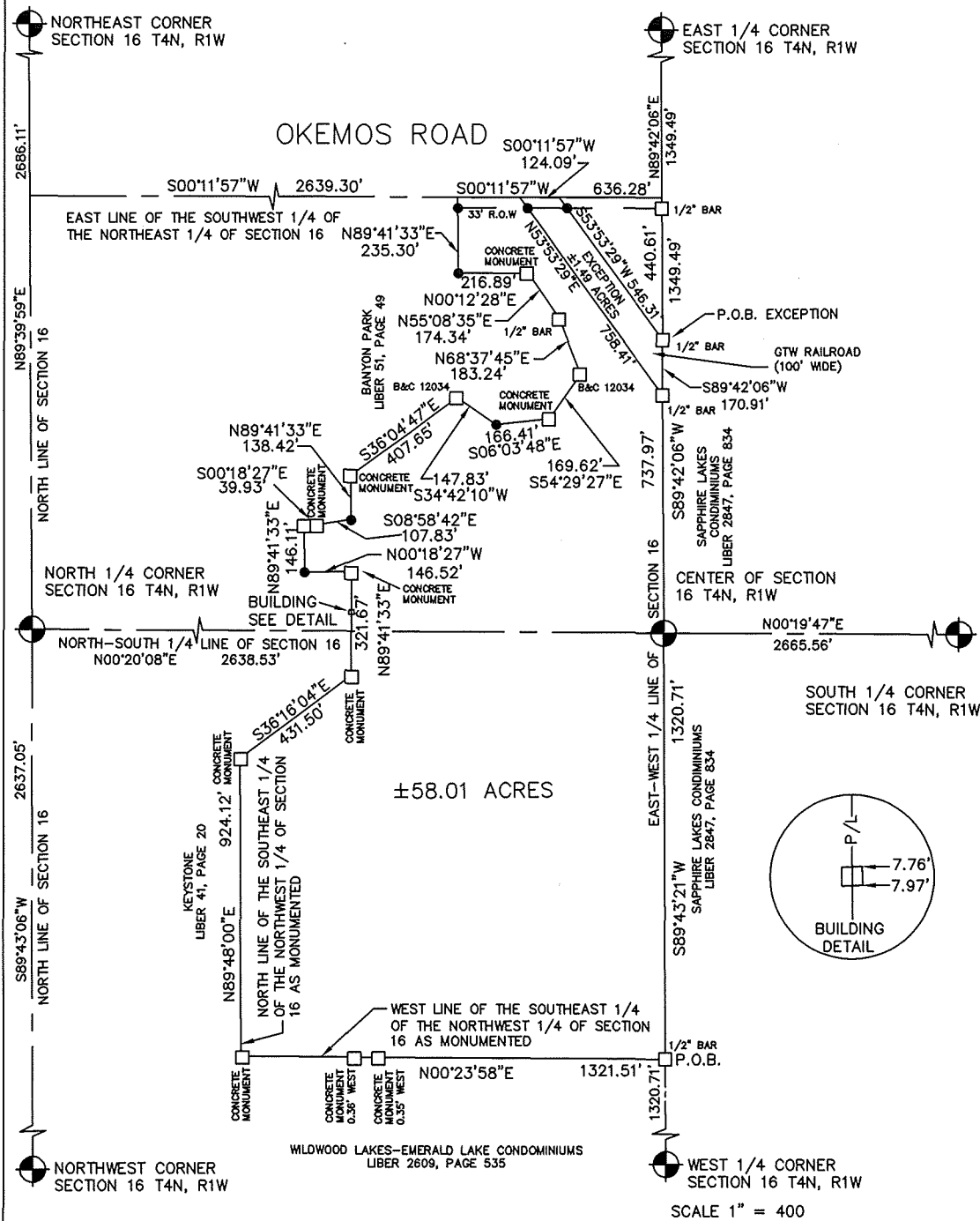
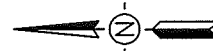
September 6, 2011



0 230 460 920 1,380 1,840 Feet

CERTIFIED BOUNDARY SURVEY

FOR: MERIDIAN TOWNSHIP LAND PRESERVATION
BANYON PARK



LEGEND

- = Set 5/8" Bar with Cap
- = Found Iron as Noted
- = Survey Boundary Line
- = Distance Not to Scale
- x—x— = Fence

All Dimensions are in Feet and Decimals Thereof.

All Improvements Not Shown.



	KEBS, INC.	KYES ENGINEERING BRYAN LAND SURVEYS
	2116 HASLETT ROAD, HASLETT, MI 48840 PH. 517-339-1014 FAX. 517-339-8047	
Charlotte Office Ph. 517-543-7076		Marshall Office Ph. 269-781-9800
DRAWN BY SLH	SECTION 16, T4N, R1W	
FIELD WORK BY RDF	JOB NUMBER:	
SHEET 1 OF 3	05-B-76412	

INVASIVE SPECIES ASSESSMENT

HUBBELL PRESERVE

**PREPARED FOR:
CHARTER TOWNSHIP OF MERIDIAN**

**MARCH 22, 2012
PROJECT NO. G100421H**

REVIEW DRAFT

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LIST OF ABBREVIATIONS/ACRONYMS

EDRR Early Detection and Rapid Response
 FTC&H Fishbeck, Thompson, Carr & Huber, Inc.
 GPS Global Positioning System
 MDEQ Michigan Department of Environmental Quality

1.0 INTRODUCTION

Meridian Township's (Township) Land Preservation program seeks to preserve and enhance the Township's natural heritage, natural resources, and open space for current and future generations. In accordance with this initiative, the Township requested that FTC&H identify and assess the invasive and non-native plant species present at the Hubbell Preserve, one of the Township's Land Preservation sites. FTC&H conducted a biological field inventory and assessment of this preserve in summer 2011. This report presents FTC&H's findings, analysis, and recommendations regarding invasive and non-native plant species on the subject property.

2.0 SITE INVESTIGATION

2.1 LOCATION

The subject property is approximately 57.7 acres in size. It is located in the southwest quarter of the northeast quarter of Section 16 of the Charter Township of Meridian, Township 4 North, Range 1 West, Ingham County, Michigan (Figure 1). The parcel identification number for the preserve is 33-02-02-16-100-014. Nancy Moore Park (a Township owned park) and vacant land are located to the east of the subject property, and the Wildwood Lakes and Emerald Lakes subdivisions are located to the west of the subject property. Banyon Park subdivision and vacant land are located to the north, and Sapphire Lakes Development and vacant land are located to the south.

2.2 METHODOLOGY

FTC&H staff conducted a vegetative assessment of the subject property on September 14 and 15, 2011. The occurrence and distribution of invasive and non-native plant species were evaluated through a meander survey. The Ecological Community Map included in the Banyon Park Property (currently, the Hubbell Preserve) Stewardship Plan (Wetland and Coastal Resources, Inc., 2005) was utilized to ensure all ecological communities were surveyed. Hand-held GPS units were used to survey locations of individual plants and dense colonies. Photographs were taken of invasive plant species, noting their general habit, leaves, and fruit. In addition, the site's property corners if staked were documented.

2.3 OVERVIEW OF ECOLOGICAL IMPORTANCE

The Stewardship Plan for the Hubbell Preserve identified nine ecological communities. During the vegetative survey, it was observed that the wet meadow community noted in the site's Stewardship Plan had transformed into an emergent wetland. Therefore, this community was included in the mixed emergent and scrub/shrub wetland community (F3), located directly north of this area. The eight ecological communities observed during the vegetative survey in 2011 (Figure 1) are briefly described below.

Emergent Wetland in and Adjacent to Ditch (Eberly Drain) (A): The Eberly Drain traverses the Preserve from the northern property boundary to the southern property boundary. The drain contains an emergent wetland community dominated by smartweed (*Polygonum sp.*), water plantain (*Alisma plantago-aquatica*), and arrowhead (*Sagittaria latifolia*). An open corridor runs along the north side of the drain along the top of bank and may have historically contained an access road. Most of this corridor is thickly vegetated with reed canary grass (*Phalaris arundinacea*) and multiflora rose (*Rosa multiflora*).

Abandoned Fields and Tree Lines (C): Most of the site east of the Eberly Drain contains abandoned agricultural fields and tree lines that separate the fields. This area now contains a scrubby mixture of trees, shrubs, forbs, and grasses. The dominant plant species in this community are Scotch pine (*Pinus sylvestris*), black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), gray dogwood (*Cornus foemina*), black cherry (*Prunus serotina*), autumn olive (*Eleagnus umbellata*), tall goldenrod (*Solidago altissima*), wild carrot (*Daucus carota*), pussy-toes (*Antennaria parlinii*), wild strawberry (*Fragaria virginiana*), white sweet clover (*Mellilotus alba*), poison ivy (*Toxicodendron radicans*), and Canada bluegrass (*Poa compressa*). Canada bluegrass is a non-native species that is mostly limited to heavily disturbed areas of the site. The Stewardship Plan states that Canada bluegrass will likely decline as closed-canopy communities replace open portions of the site. Many of the species present in the abandoned fields are not native and are characteristic of a Eurasian meadow. Overall, this area has low-quality habitat.

Second-growth Upland Forest (D): Young, second-growth upland forest is located north (D1), east (D2) of the emergent marsh at the southwest end of the Preserve, adjacent to Eberly Drain (D3), and at the southeast end of the Preserve (D4). This community is composed of young trees and shrubs with herbaceous growth of varying density. The dominant plant species in the second-growth upland forest community type are red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), prickly-ash (*Zanthoxylum americanum*), Amur honeysuckle (*Lonicera maackii*), Morrow's honeysuckle (*Lonicera morrowii*), sedge (*Carex gracillima*), and poison ivy.

Open Water Wetland (E): A small open water wetland is located in the southwestern corner of the site. This wetland contained standing water approximately 12 inches deep, with a few emergent species growing around its perimeter. The dominant plant species in this community are lake sedge (*Carex lacustris*), water-parsnip (*Sium suave*), water-plantain, and bur-reed (*Sparganium eurycarpum*).

Mixed Emergent and Scrub/Shrub Wetland (F): This plant community (F1) is located in a network of man-made trenches constructed in the abandoned field. The dominant plant species are eastern cottonwood, reed canary grass (*Phalaris arundinacea*), water-plantain, broad-leaf cattail, ditch stone-crop (*Penthorum sedoides*), spike-rush (*Eleocharis obtusa*), rush (*Juncus sp.*), water-purslane (*Ludwigia palustris*), and narrow-leaf cattail (*Typha angustifolia*). Narrow-leaf cattail is an invasive species. The Stewardship Plan notes that it has limited distribution in this ecological community.

A second mixed emergent and scrub-shrub wetland (F2) occurs along a man-made drainage course south of the terminus of Burcham Drive. The ditch appears to carry storm water from the northern subdivision to Eberly Drain. The dominant plant species in this wetland are eastern cottonwood, pussy willow (*Salix discolor*), sandbar willow (*Salix exigua*), willow (*Salix sp.*), common reed (*Phragmites australis*), green bulrush (*Scirpus atrovirens*), fragrant-goldenrod (*Euthamia graminifolia*), water horehound (*Lycopus americanus*), bur-reed, rice cut-grass (*Leersia oryzoides*), crested sedge (*Carex cristatella*), and fringed loosestrife (*Lysimachia ciliata*).

Mature Upland Forest (G): A small stand of mature upland forest is located along the southern site boundary. The dominant plant species in this area are basswood (*Tilia americana*), black walnut, northern hackberry (*Celtis occidentalis*), bitternut hickory (*Carya cordiformis*), hornbeam (*Carpinus caroliniana*), garlic mustard (*Alliaria petiolata*), and white avens (*Geum canadense*). Garlic mustard is widespread in the mature upland forest and has largely displaced the native flora in this area.

Emergent Marsh (H): An emergent marsh occupies the southwestern corner of the site. The dominant plant species in this area is broad-leaved cattail (*Typha latifolia*).

Forested Wetland (I): Most forested wetland is located directly southwest of Eberly Drain (I1). A second forested wetland area (I2) is west of Burcham Drive, on the northeast side of the subject property. The forested wetland community is mostly composed of green ash, eastern cottonwood (*Populus deltoides*), American elm, silver maple (*Acer saccharinum*), prickly-ash, fowl manna grass (*Glyceria striata*), giant goldenrod (*Solidago gigantea*), and jump-seed (*Polygonum virginianum*).

2.4 INVASIVE AND NON-NATIVE PLANTS

Twenty-one invasive and non-native plant species were observed on the preserve during the biological field inventory and assessment and/or were noted in the site's Stewardship Plan (Table 1). Table 1 describes each species' overall density, location on the subject property, and primary methods of dispersal. Appendix 1 contains photographs of the observed species.

Documented locations of invasive species observed in 2011 are shown in Figure 1. Trends between invasive species presence/density and ecological community were apparent. In general, a higher concentration of invasive species was present in previously disturbed areas and forest openings. Dense colonies of invasive species were observed in several areas of the Preserve and are noted as shaded areas on Figure 1:

- As previously noted, an extensive colony of reed canarygrass is present in the open corridor on the north side of Eberly Drain. Multiflora rose was also common in this area.
- Approximately, half of the drain at F2 contains a colony of common reed.
- The interface between the second-growth upland forest (D3) and the abandoned fields (C) contains thick shrub thickets comprised of invasive shrubs.
- A lily of the valley colony is present at the northeast end of the Preserve. This colony may have escaped from the adjacent residential property.

The abandoned fields (C) contain many non-native and invasive species commonly found in former agricultural fields or pastureland, including wild carrot, spotted knapweed (*Centaurea maculosa*), white sweet clover, Canada bluegrass, and Canada thistle (*Cirsium arvense*). In general, these species are well integrated into the herbaceous plant community throughout the open fields.

Invasive shrubs are prevalent throughout the site. Multiflora rose is distributed in both open and shaded areas, while autumn olive is primarily found in open areas of the abandoned fields. Amur and Morrow's honeysuckles were commonly observed in second-growth upland forest, scrubby areas of the abandoned fields, and tree lines. Additional shrub species observed in the Preserve at varying densities include tatarian honeysuckle, common buckthorn, glossy buckthorn, Japanese barberry, and common privet.

Table 1 - Invasive Species Observed on Site, Hubbell Preserve

Scientific Name	Common Name	Plant Type	Frequency and Location of Occurrence	Method of Dispersal
<i>Alliaria petiolata</i>	Garlic Mustard	Herbaceous	Abandoned Fields and Tree Lines (C) - Rare Mature Upland Forest (G) - Common	By seeds disseminated by animals and humans
<i>Berberis thunbergii</i>	Japanese Barberry	Shrub	Second-growth Upland Forest (D2) - Rare Forested Wetland (I1) - Occasional	By seeds disseminated by animals, creeping roots and cut stumps, and branches that root freely when touching ground
<i>Celastrus orbiculatus</i>	Oriental Bittersweet	Woody vine	Second-growth Upland Forest (D3)- Rare on north edge	By seeds dispersed by birds and small mammals, rhizomes, and root suckering
<i>Centaurea maculosa</i>	Spotted Knapweed	Herbaceous	Abandoned Fields and Tree Lines (C) – Common in open field at east end	By seeds and to a lesser extent by lateral roots
<i>Cirsium arvense</i>	Canadian Thistle	Herbaceous	Second-growth Upland Forest (D3) - Rare	Primarily by creeping, laterally spreading rhizomes, also by seed dispersed by wind
<i>Convallaria majalis</i>	Lily of the Valley	Herbaceous	Abandoned Fields and Tree Lines (C) - Rare	Reproduces vegetatively via sprigs or bulbs
<i>Daucus carota</i>	Wild Carrot	Herbaceous	Abandoned Fields and Tree Lines (C) - Common Mixed Emergent and Scrub/Shrub Wetland (F1) - Rare	By seeds
<i>Elaeagnus umbellata</i>	Autumn Olive	Shrub	Abandoned Fields and Tree Lines (C) - Common Second-growth Upland Forest (D4) - Rare Mixed Emergent and Scrub/Shrub Wetland (F1, F2, F3) – Rare to Common	Primarily by seeds, also by stump and root sprouting
<i>Glechoma hederacea</i>	Ground Ivy	Herbaceous	Emergent Wetland in and Adjacent to Ditch (A) - Rare	By vegetative regeneration; seedlings uncommon
<i>Ligustrum vulgare</i>	Common Privet	Shrub	Abandoned Fields and Tree Lines (C) - Rare Second-growth Upland Forest (D1) - Rare Forested Wetland (I1) - Rare	By seeds primarily dispersed by birds
<i>Lonicera maackii</i>	Amur Honeysuckle	Shrub	Emergent Wetland in and Adjacent to Ditch (A) - Rare Abandoned Fields and Tree Lines (C) - Occasional Second-growth Upland Forest (D1) - Common Mature Upland Forest (G) - Rare Forested Wetland (I1) - Rare	By seeds primarily dispersed by birds

Table 1 - Invasive Species Observed on Site, Hubbell Preserve

Scientific Name	Common Name	Plant Type	Frequency and Location of Occurrence	Method of Dispersal
<i>Lonicera morrowii</i>	Morrow's Honeysuckle	Shrub	Abandoned Fields and Tree Lines (C) - Common Second-growth Upland Forest (D2) - Common Forested Wetland (I1) - Rare	By seeds primarily dispersed by birds
<i>Lonicera tatarica</i>	Tatarian Honeysuckle	Shrub	Abandoned Fields and Tree Lines (C) - Occasional Second-growth Upland Forest (D2, D3, D4) – Rare to Common Forested Wetland (I1) - Rare	By seeds primarily dispersed by birds
<i>Melilotus albus</i>	White Sweet Clover ¹	Herbaceous	Abandoned Fields and Tree Lines (C) – Common	By seeds
<i>Phalaris arundinacea</i>	Reed Canary Grass	Herbaceous	Emergent Wetland in and Adjacent to Ditch (A) - Common Second-growth Upland Forest (D4) - Rare Mixed Emergent and Scrub/Shrub Wetland (F1, F3) – Common Forested Wetland (I1) - Rare	Propagates mainly by rhizomes, but also by seeds
<i>Phragmites australis</i>	Common Reed	Herbaceous	Mixed Emergent and Scrub/Shrub Wetland (F2) - Common	By seeds and rhizomes
<i>Poa compressa</i>	Canada Bluegrass ¹	Herbaceous	Abandoned Fields and Tree Lines (C) - Common	By seeds and rhizomes
<i>Rhamnus cathartica</i>	Common Buckthorn	Shrub	Abandoned Fields and Tree Lines (C) - Common Second-growth Upland Forest (D2, D3) - Rare Forested Wetland (I1, I2) – Rare to occasional	By seeds disseminated primarily by birds
<i>Rhamnus frangula</i>	Glossy Buckthorn	Shrub	Second-growth Upland Forest (D3) - Rare Forested Wetland (I1) - Rare	By seeds disseminated primarily by birds
<i>Rosa multiflora</i>	Multiflora Rose	Shrub	Emergent Wetland in and Adjacent to Ditch (A) - Occasional Second-growth Upland Forest (D2, D3) - Rare Mixed Emergent and Scrub/Shrub Wetland (F1) – Rare to common Mature Upland Forest (G) - Common Forested Wetland (I1) – Common in clearings	By seeds falling from parent plants, horizontal stems that root at the node, and shoots that root at the tips
<i>Typha angustifolia</i>	Narrow-leaf Cattail	Herbaceous	Open Water Wetland (E) - Rare Mixed Emergent and Scrub/Shrub Wetland (F1) - Common	By seeds, rhizomes, and fragmentation

¹ Species was not observed during the 2011 vegetative survey, but was noted in the Site's Stewardship Plan (Wetland and Coastal Resources, Inc., 2005).

3.0 RECOMMENDATIONS

This section includes an overview of invasive species control methods, estimated costs associated with this control, and recommendations regarding invasive species management at the Hubbell Preserve, based upon ecological and treatment prioritization.

3.1 APPROACH TO CONTROL AND MANAGEMENT

The most effective means of slowing the spread of new infestations is to implement EDRR. The three steps of EDRR are as follows:

- Verification of the detected species
- Assessment of the extent of the invasion
- Implementation of a treatment response

This Invasive Species Assessment initiated steps 1 and 2 of the EDRR, and identified 21 invasive and non-native species. These species varied in density and spread of infestation within the Land Preservation sites' ecological communities. Treatment response will vary, depending on whether the species are rare or common.

3.1.1 CONTROL OF SPECIES WITH LIMITED INFESTATION

A primary goal is to control newly established invasive plants. Removing invasive plants in areas where they are rare will prevent further spread and preserve ecological quality. Invasive species that are rare in one ecological community may be common in adjacent communities (especially if they were previously disturbed). The proximity of this seed source puts high-quality communities at risk of infestation. Overall, the highest-quality habitat is present in those areas that have not been historically disturbed and/or are not adjacent to developed property (i.e., the forested wetland at I1, the open water wetland E, and the mature upland forest G).

Some rare occurrences of invasive species in an ecological community may be due to growing conditions that are not optimal for the individual species, such as the presence of a sun loving meadow species found along the forested edge or autumn olive in forested wetland. Other occurrences are due to recent infestation that poses a threat of spreading throughout the ecological community. Such examples at the Hubbard Preserve include:

- Japanese barberry in second-growth upland forest (D2)
- Oriental bittersweet covering several trees on the north edge of second-growth upland forest (D3)
- Colony of lily of the valley at the northeast end of the Preserve
- Ground ivy on the bank of the Eberly Drain

- Narrow-leaf cattail in the open water wetland (E)
- Common reed in the north half of the F2 ditch

3.1.2 CONTROL OF SPECIES WITH WIDESPREAD INFESTATION

A secondary goal for the Hubbell Preserve is to control well-established invasive plants. The abandoned fields (C) contain many non-native and invasive species commonly found in former farmland. In general, these species are well integrated into the herbaceous plant community in the open field areas and physical removal would be difficult without disturbing adjacent native species. Restoration of these fields into prairie may be possible through prescribed burns and overseeding with a prairie seed mixture. Prescribed burns would also assist in suppressing invasive shrubs in this area.

As previously noted, an extensive colony of reed canarygrass is present in the open corridor on the north side of Eberly Drain. Multiflora rose is also common in this area. Reed canarygrass is extremely difficult to eradicate.

Invasive shrubs are prevalent throughout the Preserve. The density of infestation varies from extremely dense along the north edge of D3 to light infestation through the forested wetland. Multiflora rose is the most prevalent shrub species, with dense colonies located in the open corridor adjacent to the Eberly Drain, in the abandoned fields and tree lines, mature upland forest, and forested wetland. Autumn olive, amur honeysuckle, Morrow's honeysuckle, tatarian honeysuckle, common buckthorn, glossy buckthorn, Japanese barberry, and common privet are also present in the Preserve at varying densities.

Total eradication of large colonies of invasive species is often an unlikely prospect. Therefore, priority should be given to controlling, managing, and removing invasive species in areas with the highest ecological quality and lowest density of infestation. Depending on the availability of funding, control efforts may be extended into lower-quality habitat with higher invasive density. The treatment plan should include repeated control treatments over several years to effectively remove invasive saplings and deplete the seedbank.

High priority areas for invasive species control in areas with widespread infestation include:

- Removal of garlic mustard in the understory of the mature upland forest (G).
- Eradication of invasive shrubs in areas with light to moderate infestation and high-quality habitat, including the forested wetland (I1), mature upland forest (G), and the open water wetland.

3.2 OVERVIEW OF CONTROL METHODS

Methods to control unwanted vegetation include mechanical control, herbicide treatments, and prescribed burns. Typically, the most effective approach involves a combination of methods.

Mechanical controls include hand-pulling, digging, or cutting plants. It is important to know how a plant regenerates if using this method. Complete removal of all roots and stem fragments is necessary if a plant can regenerate from its roots or stems. Appropriate disposal of plant material is also important. Plants can be incinerated or placed in landfills. While landscape trimmings are not allowed in landfills, an exception has been made for invasive plants collected as part of a control program. If plants are composted, fruits and seeds should be incinerated or disposed of in a landfill if the species reproduces by seed.

Girdling is another form of mechanical control. It involves removing a band of bark (the cambium layer) to prevent the flow of sap between the roots and leaves. For smaller trees or shrubs, this band should be six to eight inches wide, while one to two inches is sufficient for smaller trees or shrubs. Removal of the bark should occur before the spring sap flow. Treating the ring with herbicide increases the rate of success.

Herbicide application is an effective option for controlling invasive species. Herbicides are applied to green leaves of target species using sprayers, wick applicators, or gloves. Herbicides should not be sprayed on windy days. They are also applied to cut stumps using sprayers, sponge brushes, or weed wands. Some herbicides must be applied to stumps directly after cutting. Applying herbicides in a 6- to 18-inch wide band at the base of a tree or shrub is called basal bark treatment. A penetrating oil or other additive can be added to increase absorption during this treatment. It is important to refer to bottle labels for directions on proper use and personal protective equipment. For restricted use herbicides a certified pesticide/herbicide applicator should be used. Certified applicators can apply both general use and restricted use herbicides. It should be noted that herbicide use near an aquatic system requires a permit from the MDEQ since herbicides can negatively impact water quality. Some herbicides (e.g. Habitat[®] and Rodeo[®]) are formulated for use near aquatic systems to reduce or eliminate ecological impacts.

Prescribed burning may be an effective means of controlling invasive species infestation at the Preserve if burning follows the best management practices established by the Michigan Prescribed Fire Council. The prescribed burn must be done according to a burn plan and would require obtaining necessary permits before conducting the burn.

3.3 RECOMMENDED CONTROL METHODS BY PLANT TYPE

The recommended control methods to manage both woody and herbaceous invasive and non-native plant species on the Hubbell Preserve are described in this section.

3.3.1 CONTROL OF INVASIVE TREES

No invasive trees were observed on the Hubbell Preserve.

3.3.2 CONTROL OF INVASIVE SHRUBS

Nine invasive shrub species exist on the Hubbell Preserve: *Berberis thunbergii* (Japanese barberry), *Elaeagnus umbellata* (autumn olive), *Ligustrum vulgare* (common privet), *Lonicera maackii* (amur honeysuckle), *Lonicera morrowii* (morrow's honeysuckle), *Lonicera tatarica* (tatarian honeysuckle), *Rhamnus cathartica* (common buckthorn), *Rhamnus frangula* (glossy buckthorn), and *Rosa multiflora* (multiflora rose).

Seedlings and small shrubs can be hand-pulled or dug from the ground. It is important to remove all roots for honeysuckles, common privet, Japanese barberry, and multiflora rose plants. If cutting stems, apply an herbicide to stumps to prevent regrowth. Use a foliar spray to target large, dense colonies of fruit bearing plants (not recommended for autumn olive or multiflora rose). Applying an herbicide with an additive to increase absorption to the base of stems (in a 6- to 18-inch wide band) is also an effective control method (though not recommended for Japanese barberry).

3.3.3 CONTROL OF INVASIVE WOODY VINES

One invasive woody vine species was observed on the Hubbell Preserve: *Celastrus orbiculatus* (oriental bittersweet). To manage small infestations of oriental bittersweet cut vines and remove all root material. Apply herbicide to foliage or cut stems for large infestations.

3.3.4 CONTROL OF INVASIVE HERBACEOUS PLANTS

Eleven invasive herbaceous species exist on the Hubbell Preserve. These species and control methods are described below.

Alliaria petiolata (garlic mustard) is difficult to control. Hand-pull seedlings if there are only a few plants present. Otherwise, target second year plants since garlic mustard flowers in the second year. Plants should be pulled before seeds are produced in early spring. Remove upper half of root to avoid resprouting. Pack down soil to minimize recolonization. Dispose of flower and seed heads properly by removing them from the site. Use a foliar herbicide in early spring or late fall when native plants are dormant. Continue control efforts for several years until the seed bank is exhausted.

Centaurea maculosa (spotted knapweed) – When working with spotted knapweed wear gloves, long pants and sleeves to prevent skin contact with the plant and avoid skin irritation. For small infestations, hand-pull or dig out plants and remove entire root. Remove flower and seed heads from the site to prevent seed dispersal. Apply a foliar herbicide application to rosettes before the stems elongate. Continue control efforts until the seed bank is exhausted.

Cirsium arvense (Canadian thistle) is difficult to eradicate. Hand-pull seedlings within 2.5 weeks of germination. Remove all roots and root fragments. Dig out any resprouts. Herbicides are most effective when using two applications per season. Apply first application in the spring before flowering. Apply the second application in the fall on new growth after mowing. Canadian thistle is clonal so all stems must be treated. Follow-up treatments may be required for five to ten years.

Convallaria majalis (lily of the valley) reproduces vegetatively. Use a shovel to dig out plants, removing all roots to avoid resprouting. Apply herbicide in early spring while the plants are flowering. Several follow-up applications may be necessary.

Daucus carota (wild carrot) – Mow frequently to reduce plant size and seed production. Alternatively, a single plant clipping in July has been shown to stop seed production. Mow or clip plants at the flowering stage, when plants are most susceptible. Uproot, chop, and bury the taproot to prevent resprouting. Herbicide applications in the spring are effective in controlling seedlings. However, herbicide applications are more effective in the fall once plants are established. Follow-up herbicide applications may be necessary.

Glechoma hederacea (ground ivy) is difficult to control. Small patches can be hand pulled or raked. All roots must be removed to avoid resprouting. Dig up any resprouts. Systemic herbicides can be applied for large infestations.

Mellilotus albus (white sweet clover) – Pull first year plants in late fall for small infestations, after the root-crown buds have developed. Pull second year plants in May or June before flowering. Pulling plants is easier when the soil is wet. Plants can also be cut at ground level with brush loppers. For very dense small patches, cutting with a power brush-cutter is effective. Flowering plants should be removed so seeds do not develop. Sweet clover can be managed using mechanical controls and should not require the use of herbicide.

Phalaris arundinacea (reed canary grass) is extremely difficult to eradicate. Mechanical control of reed canary grass is not effective since remaining underground rhizomes will produce new plant growth. An herbicide treatment in late summer or fall is the most effective treatment. Reseed impacted area with desired native plant species. Follow-up is required for five to ten years until the seed bank is exhausted.

Phragmites australis (common reed) – Treat stands with herbicide (imazapyr) in July. Alternatively, glyphosate or an imazapyr/glyphosate combination can be applied in September. Wait two weeks to allow full plant exposure to the herbicide. Use hand tools, weed whips, or small mowers to remove plants in late summer (after September 1) or fall (prior to spring green-up). Follow-up control efforts will likely be necessary since common reed is difficult to control.

Poa compressa (Canada bluegrass) – A combination of tilling, smothering the grass, and herbicide can be used to control bluegrass. Till infested areas several times a year for at least one season to expose the seed bank and prevent further growth. Applying herbicide before a season of tilling is also effective. On small sites, bluegrass can be killed by covering infested areas with black plastic during the growing season.

Typha angustifolia (narrow-leaf cattail) – Cut stems above the ground surface just before flowering. For larger stands, mow cattails after the heads are well formed, but not mature; then follow up with a second mowing approximately one month later (when new growth is 2-3 feet high). The use of a foliar herbicide is also effective, particularly when followed by cutting or mowing. Follow-up control efforts will likely be necessary since narrow-leaf cattail is difficult to control.

3.4 COSTS TO IMPLEMENT RECOMMENDATIONS

The cost to implement invasive species control measures for the invasive shrubs varies significantly, depending on a variety of factors, including:

- Size and density of the plants
- Site accessibility
- Materials management
- Time of year work is completed
- Number of years treatment occurs

In general, the first year's treatment will be the most expensive, due to removal of large areas of vegetation. Costs decrease in subsequent years, as saplings are removed and the seed bank is exhausted. Burning cut vegetation is significantly less expensive than chipping it, especially if the brush is incinerated near its site of origin. Moving cut vegetation incurs additional expense. Sites that are accessible to heavy equipment may be more economically treated than remote sites that solely rely on human labor. Brush removal during the dormant season will cost less than during the growing season, when there are more demands on contractor availability and leaf matter creates additional waste. Finally, the total cost for treatment depends on the length of time it takes to implement the treatment. A minimum of three years of treatment is recommended, although continuous monitoring and treatment may be required to prevent the reestablishment of the species of concern.

Many of the herbaceous invasive species may be controlled at nominal cost with mechanical methods. If the work is completed by volunteer labor, no cost is anticipated. Alternatively, these plants could be removed by Meridian Township Parks staff.

3.5 RESTORATION PRIORITIES

The proposed strategy for managing invasive species at the Hubbell Preserve is based on the ecological status of the site and prioritization of treatment options. Ecological prioritization is based solely on the ecological value and level of impairment occurring on the site. Treatment prioritization considers estimated costs and ease of treatment. The following priorities are proposed:

1. Remove isolated occurrences of invasive species to prevent the spread of these species at the site. Section 3.1.1 lists locations of rare occurrences of invasive species at the Land Preservation site.
2. Treat high-quality ecosystems first to prevent future degradation. These higher-quality communities typically consist of the mature upland forest, the open water wetland, and the forested wetland.
3. Monitor forest openings for the presence of invasive species. The lack of tree cover in these areas allows sunlight to reach the forest floor, creating beneficial conditions for the establishment of invasive shrubs.
4. Utilize volunteer labor to remove those invasive species that can be effectively controlled through pulling or digging out. These species include ground ivy, lily of the valley, garlic mustard, and oriental bittersweet.
5. Develop a long-term plan to address invasive shrubs throughout the Hubbell Preserve, based upon available funds. Eradication of invasive shrubs would require repeated control treatments over several years to effectively remove invasive saplings and deplete the seed bank.

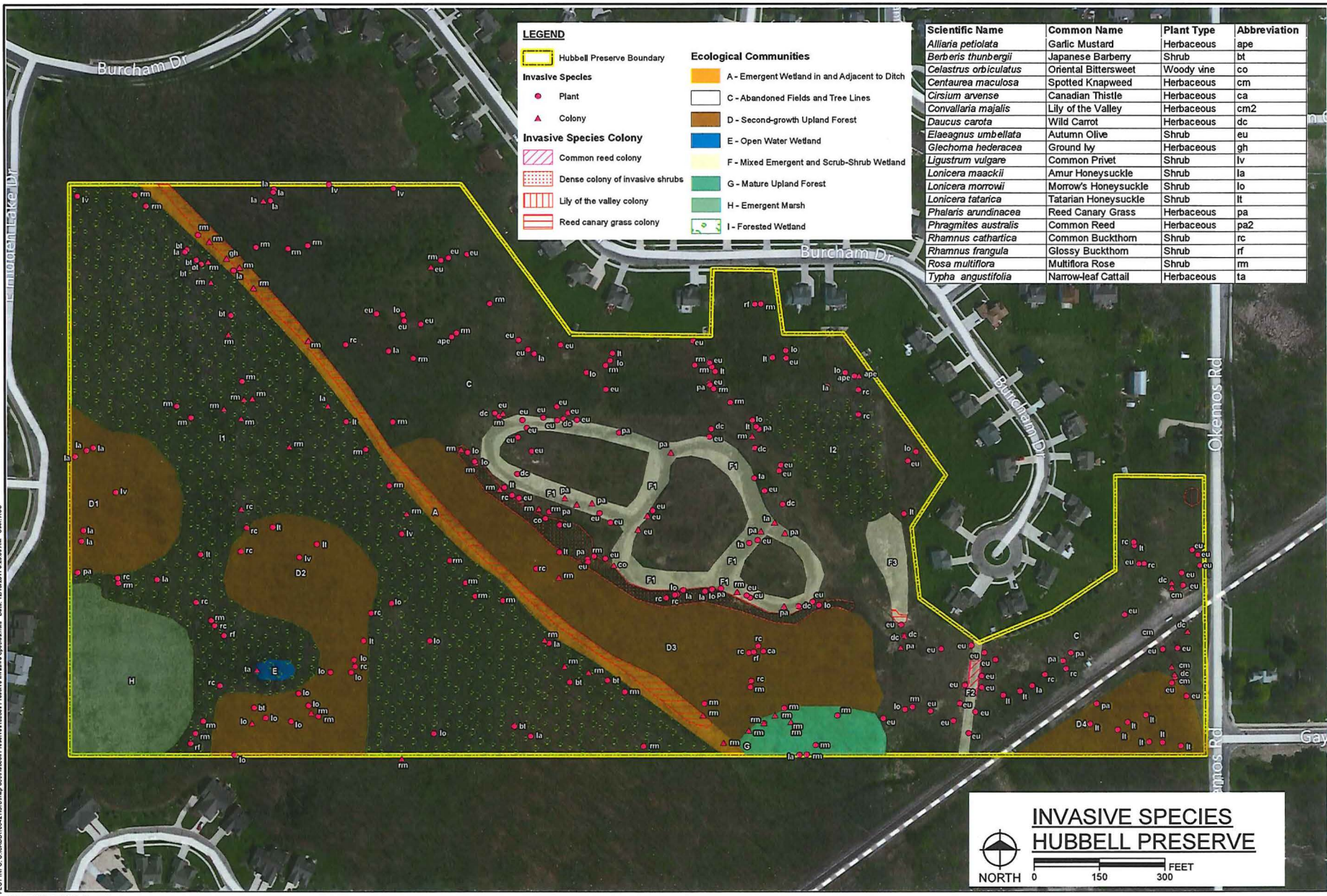
4.0 REFERENCES

Wetland and Coastal Resources. 2005. Banyon Park Property, Stewardship Plan; Site Inventory, Analysis, and Recommendations; Prepared for the Charter Township of Meridian. Wetland and Coastal Resources, Lansing, MI.

DRAFT

Figure

F:\07 INFO: LUC\000100421H\Preserve\Hubbell Preserve Invasive Species.mxd Date: 12/15/2011 12:25:59 AM User: ACS



engineers

 scientist

 architects

 constructors

fishbeck, thompson, carr & hubel, inc.

 Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Charter Township of Meridian

 Ingham County, Michigan

Invasive Species Assessment

PROJECT NO. G100421H

 FIGURE NO. 1

Appendix 1

Fishbeck, Thompson, Carr & Huber, Inc.

HUBBELL PRESERVE

Invasive Species Assessment



Project No. G100421H



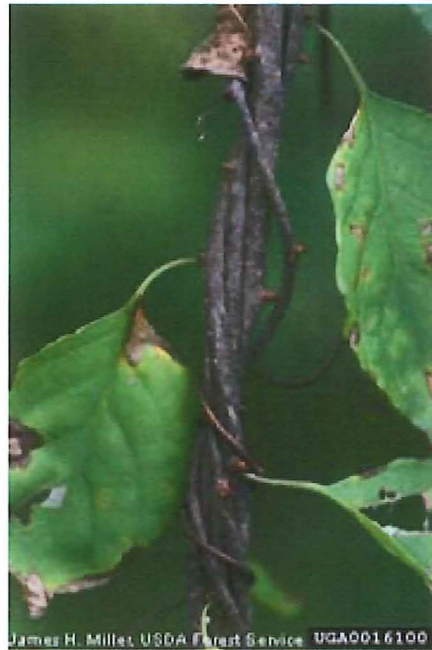
Alliaria petiolata (garlic mustard), Photo Credit: MNFI



Berberis thunbergii (Japanese Barberry), Photo Credit: MNFI



Elizabeth J. Czaraneta



James H. Miller, USDA Forest Service UGA0016100

Celastrus orbiculatus (oriental bittersweet), Photo Credit: Wisconsin DNR

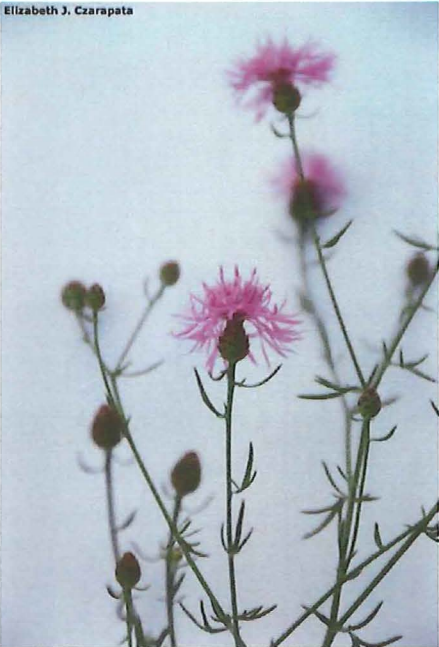


UGA1148104



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Centaurea maculosa (spotted knapweed), Photo Credit: USDA



Cirsium arvense (Canadian thistle), Photo Credit: Wisconsin DNR



Convallaria majalis (lily of the valley)



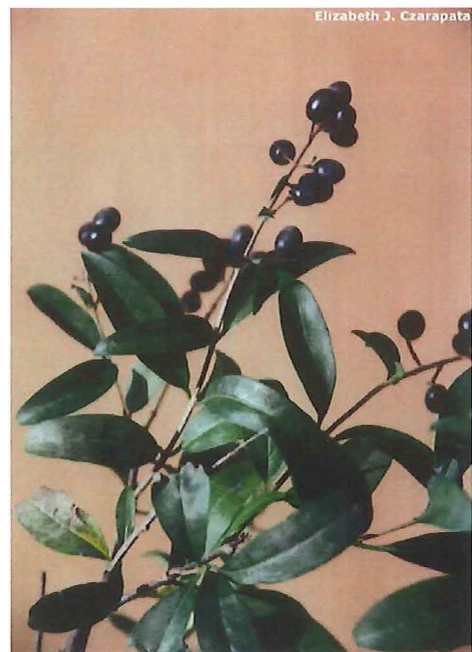
Daucus carota (wild carrot), Photo Credit: Wisconsin DNR



Elaeagnus umbellata (autumn olive), Photo Credit: MNFI



Glechoma hederacea (ground ivy), Photo Credit: USDA



Ligustrum vulgare (common privet), Right Photo Credit: Wisconsin DNR



Lonicera maackii (Amur honeysuckle)



Lonicera morrowii (Morrow's honeysuckle), Photo Credit: MNFI



Lonicera tatarica (tatarian honeysuckle), Photo Credit: MNFI



Melilotus albus (white sweet clover), Photo Credit : Wisconsin Botanical Information System



Phalaris arundinacea (reed canary grass),
 Left Photo Credit: Wisconsin DNR, Right Photo Credit : MNFI



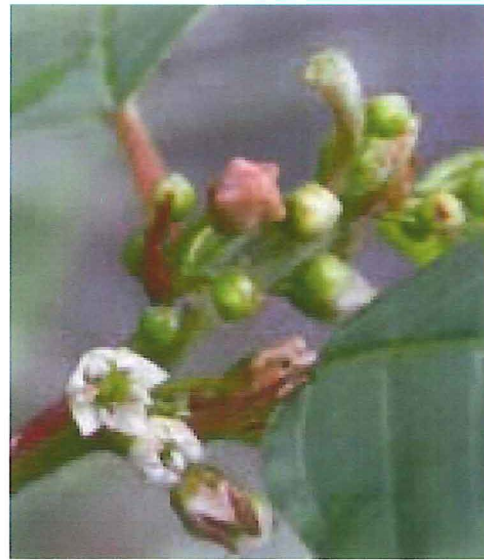
Phragmites australis (common reed),
 Left Photo Credit : USDA, Right Photo Credit: Wisconsin DNR



Poa compressa (Canada bluegrass), Photo Credit: USDA



Rhamnus cathartica (common buckthorn)



Rhamnus frangula (glossy buckthorn), Photo Credit: MNFI



Rosa multiflora (multiflora rose), Photo Credit: MNFI



Typha angustifolia (narrow-leaf cattail), Photo Credit: Wisconsin DNR