Appendix G11. Floristic Quality Assessment and Threatened and Endangered Species Plant Survey Investigation

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Floristic Quality Assessment and Threatened and Endangered Species Plant Survey Investigation

West Lake Corridor Project

Federal Transit Administration
and
Northern Indiana Commuter Transportation District

March 2018

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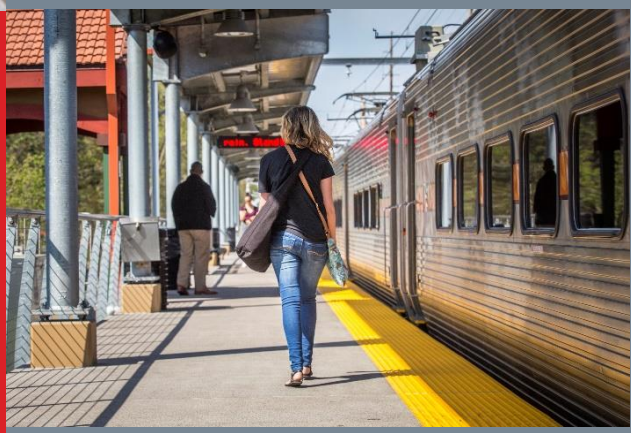

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Contents

Executive Summary v

1 Introduction 1-1

1.1 Purpose of Report 1-1
1.2 Project Description 1-1

1.2.1 No Build Alternative 1-1
1.2.2 FEIS Preferred Alternative 1-1

2 Coordination with the United States Fish and Wildlife Service, Indiana Department of Natural Resources, and Illinois Department of Natural Resources 2-1

2.1 Federal Threatened and Endangered Species 2-1
2.2 Indiana and Illinois State Threatened and Endangered Species 2-2

3 Previous Investigations 3-1

3.1 NICTD West Lake Corridor Project Natural Resources Technical Report 3-1

4 Methodology 4-1

4.1 Floristic Quality Assessment 4-1

4.1.1 Species Richness 4-2
4.1.2 Mean C Value 4-2
4.1.3 Floristic Quality Index 4-2

4.2 Endangered and Threatened Species Investigation 4-3
4.3 Woodland Characterization Survey 4-3

5 Results 5-1

5.1 Floristic Quality Assessment 5-1

5.1.1 Habitat Units 5-1
5.1.2 Wetland-only Habitats 5-7

5.2 Threatened and Endangered Species 5-11

5.2.1 USFWS Threatened and Endangered Species 5-11
5.2.2 INDNR Threatened and Endangered Species 5-16

5.3 Woodland Characterization 5-17

6 Mitigation 6-1

6.1 Long-term Operating Impacts 6-1
6.2 Short-term Construction impacts 6-1

7 Summary 7-1

8 Preparers 8-1

8.1 Staff Information 8-1

9 References 9-1

Tables

Table 2.1-1: USFWS Threatened and Endangered Vascular Plant Species in the West Lake Corridor Project Area 2-1

Table 2.2-1: Indiana and Illinois Threatened and Endangered Vascular Plant Species in the DEIS Project Area 2-2

Table 3.1-1: Potential Natural Areas in the Indiana Portion of the FEIS Preferred Alternative Project Area 3-2

Table 5.1-1: General Habitat Unit Descriptions and Areas within the Environmental Survey Area and the Project Footprint Area 5-2

Table 5.1-2: Wetlands Sampled in the FQA 5-7

Table 5.3-1: Summary of Woodland Characterization Plot Data 5-18

Table 5.3-2: Summary of Most Abundant and Dominant Canopy Species for Woodland Plots 5-18

Table 8.1-1: Lochmueller Group FQA Staff 8-1

Figures

Figure 4.3-1: British Columbia's Wildlife Tree Classification System 4-4

Figure 5.1-1: Species Richness for Habitat Units 5-3

Figure 5.1-2: Percentage of Nonnative Species Identified in Habitat Units 5-4

Figure 5.1-3: Mean C Value for Habitat Units 5-5

Figure 5.1-4: FQI Values for Habitat Units 5-6

Figure 5.1-5: Species Richness for Wetlands 5-8

Figure 5.1-6: Percentage of Nonnative Species Identified in Wetlands 5-9

Figure 5.1-7: Mean C Value for Wetlands 5-10

Figure 5.1-8: FQI Values for Wetlands 5-11

Appendices

Appendix A. Agency Coordination

Appendix B. Exhibit 1

Appendix C. Floristic Quality Assessment Habitat Units: Metrics

Appendix D. Floristic Quality Assessment Habitat Units: Inventory

Appendix E. Floristic Quality Assessment Wetland: Metrics

Appendix F. Floristic Quality Assessment Wetlands: Inventory

Appendix G. Forest Plot Inventory Worksheets

Appendix H. Project Photographs

Appendix I. Lochmueller Group Staff Résumés

Acronyms and Abbreviations

CMAP	Chicago Metropolitan Agency for Planning
CN	Canadian National Railway
CSX	CSX Transportation
dbh	diameter at breast height
DEIS	Draft Environmental Impact Statement
et al.	and others
FEIS	Final Environmental Impact Statement
FQA	floristic quality assessment
FQI	floristic quality index
FR	Federal Register
FTA	Federal Transit Administration
GIS	geographic information systems
GPS	global positioning system
I-80	Interstate 80
ID	identifier
IDNR	Illinois Department of Natural Resources
INDNR	Indiana Department of Natural Resources
IPaC	Information for Planning and Conservation
MIDNR	Michigan Department of Natural Resources
MDNR	Minnesota Department of Natural Resources
MED	Metra Electric District
n.d.	no date
NEPA	National Environmental Policy Act
NICTD	Northern Indiana Commuter Transportation District
ROW	right-of-way
sp.	unknown species
SSL	South Shore Line
USDA NRCS	United States Department of Agriculture, Natural Resource Conservation Service
USFWS	United States Fish and Wildlife Service
WDNR	Wisconsin Department of Natural Resources

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Executive Summary

The Federal Transit Administration (FTA) and the Northern Indiana Commuter Transportation District (NICTD) are conducting the environmental review process for the West Lake Corridor Project (Project) in Lake County, Indiana, in accordance with the National Environmental Policy Act (NEPA) and other regulatory requirements. The purpose of the current study is to determine whether building a 9-mile southern extension of the existing NICTD South Shore Line (SSL) between Dyer and Hammond, Indiana, would negatively affect either of federal or state listed plant species.

The Project team conducted a survey of vascular plants for the NICTD West Lake FEIS during the spring of 2017. A composite total of 322 plants was identified to the species level within the environmental survey area using 2015 and 2017 identifications. Floristic quality metrics (i.e., species richness, mean C value, floristic quality index [FQI]) for 25 mapped habitat areas and 22 delineated wetlands were collected and reported, along with the individual Chicago Floristic Quality Assessment (FQA) Calculator inventory reports. The combined 2015/2017 floristic inventory did not yield any occurrences of federally listed plant species, namely Mead's milkweed and Pitcher's thistle. However, these efforts did result in the identification of three species listed as threatened or rare by the State of Indiana. Three woodland plots showed that most of the trees in the woodland habitats of the Project environmental survey area were live, healthy trees. Tree density for stems greater than 6 inches in diameter at breast height ranged from 113 per acre to 239 per acre.

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1 Introduction

The Federal Transit Administration (FTA) and the Northern Indiana Commuter Transportation District (NICTD) are conducting the environmental review process for the West Lake Corridor Project (Project) in Lake County, Indiana, in accordance with the National Environmental Policy Act (NEPA) and other regulatory requirements. A Final Environmental Impact Statement (FEIS) is being prepared as part of this process, with the FTA as the federal lead agency and NICTD as the local Project sponsor responsible for implementing the Project under NEPA.

1.1 Purpose of Report

The purpose of this report is to provide information regarding natural resources in the Project Area, including location and general quality, and to provide a preliminary indication regarding the impacts of the Project.

1.2 Project Description

The environmental review process builds on NICTD's prior West Lake Corridor studies that examined a broad range of alignments, technologies, and transit modes. The studies concluded that a rail-based service between the Munster/Dyer area and Metra's Millennium Station in downtown Chicago would best meet the transportation needs of the northwest Indiana area. Thus, NICTD advanced a Preferred Build Alternative (referred to as the FEIS Preferred Alternative) for more detailed analysis in the FEIS. NEPA also requires consideration of a No Build Alternative to provide a basis for comparison to the Build Alternative.

1.2.1 No Build Alternative

The No Build Alternative is defined as the existing transportation system, plus any committed transportation improvements included in the Northwestern Indiana Regional Planning Commission's *2040 Comprehensive Regional Plan* (NIRPC 2011) and the Chicago Metropolitan Agency for Planning's (CMAP) *GO TO 2040 Comprehensive Regional Plan* (CMAP 2014) through the planning horizon year 2040. It also includes capacity improvements to the existing Metra Electric District (MED) line and Millennium Station, documented in NICTD's *20-Year Strategic Business Plan* (NICTD and Regional Development Authority 2014).

1.2.2 FEIS Preferred Alternative

The Project is an approximate 9-mile southern extension of the existing NICTD SSL between the town of Dyer and city of Hammond, Indiana. Traveling north from the southern terminus near Main Street at the Munster–Dyer municipal boundary, the Project would include new track operating at grade on a separate right-of-way (ROW) to be acquired adjacent to the CSX Transportation (CSX) Monon Subdivision rail line in Dyer and Munster. The Project alignment would be elevated from 45th Street to the Canadian National Railway (CN) Elsdon Subdivision rail line at Maynard Junction. North of the CN line, the Project alignment would return to grade and join with the publicly owned former Monon Railroad corridor in Munster and Hammond, Indiana, and continue north. The Project would relocate the existing Monon Trail pedestrian

bridge crossing over the Little Calumet River and build a new rail bridge at the location of the former Monon Railroad bridge. The Project alignment would cross under Interstate 80/94 (I-80/94) and continue north on the former Monon Railroad corridor to Sibley Street. From Douglas Street north, the Project would be elevated over all streets and rail lines using a combination of retaining walls, elevated structures, and bridges. The Project would terminate just east of the Indiana Harbor Belt at the state line, where it would connect with the SSL. Project trains would operate on the existing MED line for the final 14 miles, terminating at Millennium Station in downtown Chicago.

Four new stations would be constructed along the alignment; Munster/Dyer Main Street, Munster Ridge Road, South Hammond, and Hammond Gateway Stations. Each station would include station platforms, parking facilities, benches, trash receptacles, bicycle racks, and other site furnishings. Shelter buildings would only be located at the Munster/Dyer Main Street and Hammond Gateway Stations.The Project would include a vehicle maintenance and storage facility with a layover yard and traction power substation (TPSS) to power the overhead contact system, located just south of the Hammond Gateway Station, west of Sheffield Avenue. Additional TPSSs would be located at the South Hammond Station parking lot and Munster/Dyer Main Street Station. The TPSS would be enclosed to secure the electrical equipment and controls, with a footprint of about 20 feet by 40 feet.

2 Coordination with the United States Fish and Wildlife Service, Indiana Department of Natural Resources, and Illinois Department of Natural Resources

2.1 Federal Threatened and Endangered Species

The United States Fish and Wildlife Service (USFWS) administers regulatory authority over federally listed endangered and threatened species under Section 7 of the Endangered Species Act of 1973 (16 United States Code [USC] §1531–1544). Under Section 7(a)(2), "each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section."

As part of the initial efforts to identify potential federal threatened and endangered species in the West Lake Corridor DEIS Project Area in Lake County, Indiana, and Cook County, Illinois, the Project team accessed the USFWS Endangered Species Program website (USFWS 2014; NICTD 2016). Additionally, early coordination with the USFWS Bloomington Field Office resulted in the November 4, 2014, response letter that provided information regarding plant and animal species of potential occurrence in these counties, as well as known occurrences or absence of records in the DEIS Project Area. **Table 2.1-1** includes the five federal threatened and endangered species of potential occurrence in the DEIS Project Area.

Table 2.1-1: USFWS Threatened and Endangered Vascular Plant Species in the West Lake Corridor Project Area

Species	USFWS Status	Cook County, Illinois	Lake County, Indiana
Dalea foliosa Leafy-prairie clover	Endangered	Endangered	
Platanthera leucophaea Eastern prairie fringed orchid	Threatened	Endangered	
Lespedeza leptostachya Prairie bush clover	Threatened	Endangered	
Asclepias meadii Mead's milkweed	Threatened	Endangered	Endangered
Cirsium pitcheri Pitcher's thistle	Threatened		Threatened

Sources: USFWS 2014, 2016.

Since the FEIS Preferred Alternative terminates at the Indiana-Illinois state line where the proposed railroad track would connect with the existing SSL, the focus of this technical report is limited to habitat in Indiana that could support threatened and endangered species. As a follow-up, the Project team accessed the current USFWS Information for Planning and Conservation (IPaC) website (USFWS 2016) to obtain a current listing of potential plant species for Lake County, Indiana.

2.2 Indiana and Illinois State Threatened and Endangered Species

State endangered and threatened species of potential concern in the Project Area for Illinois and Indiana were originally identified during the Draft Environmental Impact Statement (DEIS) development stage as documented in the 2016 *Natural Resources Technical Report* (NICTD 2016). Potential state-listed species for Illinois were identified via the Illinois Department of Natural Resources (IDNR) Ecological Compliance Assessment Tool (IDNR 2014) and personal communication with staff of the Forest Preserve District of Cook County. The Indiana County Endangered, Threatened and Rare Species List for Lake County includes 177 state endangered, threatened, rare, watch list, or extirpated species (Indiana Department of Natural Resources [INDNR] 2016a). **Table 2.2-1** includes the state-listed species for the two-county DEIS Project Area. Since the Project Area for the FEIS Preferred Alternative is located entirely in Indiana, this survey does not address potential habitat for species of concern only in Illinois. According to the Indiana Department of Natural Resources (INDNR) Early Coordination/Environmental Assessment response dated October 6, 2014 and February 3, 2017 (**Appendix A**), there were no potential state-listed vascular plant species of concern for the Project Area in Indiana (INDNR 2014, 2017).

Table 2.2-1: Indiana and Illinois Threatened and Endangered Vascular Plant Species in the DEIS Project Area

Species	Cook County, Illinois	Lake County, Indiana
Calopogaon tuberosus Grass pink orchid	Endangered	No vascular plant species of concern for Project Area
Juncus alpinus Richardson's rush	Threatened	
Veronica scutellata Marsh speedwell	Threatened	

Sources: Personal communication with staff of the Forest Preserve District of Cook County; IDNR 2014; INDNR 2014, 2017.

3 Previous Investigations

3.1 NICTD West Lake Corridor Project Natural Resources Technical Report

NICTD prepared the *NICTD West Lake Corridor Project Natural Resources Technical Report* (NICTD 2016) during development of the DEIS. This report discussed the early coordination efforts with federal (USFWS) and state (IDNR and INDNR) fish and wildlife agencies to identify threatened and endangered species of concern, including designated critical habitat, related to potential impacts that might result from any of the three alternatives and options under consideration in the DEIS phase. This report also discussed preliminary assessments and summarized potential natural areas in the Project Area in Illinois and Indiana, the majority of which were located in Illinois. Because the FEIS Preferred Alternative terminates at the state line where the proposed railroad track would connect with the existing SSL, the focus of this technical report is limited to habitat in Indiana that could support threatened and endangered species.

The report identified six locations in the Indiana portion of the corridor (Areas P through U) that had potential natural habitats based on limited field reconnaissance and evaluation of aerial photographs. **Table 3.1-1** describes these six locations and the associated habitat unit designation for these areas as referenced later in this survey report.

No additional surveys or studies related to natural resources in the immediate Project Area were reviewed as part of this survey.

Table 3.1-1: Potential Natural Areas in the Indiana Portion of the FEIS Preferred Alternative Project Area

2016 Technical Report Designation	Description	2017 Habitat Unit Designation(s)
Area U North of 45th Street, Munster	Mowed lawn and invasive, weedy shrub and tree species intermixed with parcels of developed commercial and industrial property with limited habitat potential due to small size and extent of development.	H09, H10, H11
Area T South of Fisher Street, east of Pennsy Greenway, Munster	Wetland habitat on undeveloped parcel dominated by invasive species (*Phragmites australis* [common reed]), but with scattered *Populus deltoides* (eastern cottonwood) and *Salix* sp. (willow) and limited in value due to small size and surroundings.	H14, H16
Area S Little Calumet River, Hammond	Highly disturbed river habitat dominated by invasive species with surrounding residential development and habitat limited to urban tolerant wildlife.	H19
Area R Vine Street to I-80, Hammond	A strip of mowed lawn and strip of moderate quality prairie and woodland adjacent to the Monon Trail, with limited habitat potential due to size and configuration.	H21, H22, H23, H24
Area Q Grand Calumet River	A narrow strip of highly disturbed habitat with no vegetative diversity and dominated by invasive species, but with waterfowl habitat potential.	H29
Area P Wabash Avenue and Brunswick Street, Hammond	A small prairie remnant with moderate floristic quality and scattered trees adjacent to the SSL tracks between Wabash Avenue and Brunswick Street.	H30

Source: NICTD 2016.

4 Methodology

The botanical scope of services for the Project included three components: (1) a floristic quality assessment (FQA), (2) a threatened and endangered species investigation, and (3) a woodland characterization survey.

4.1 Floristic Quality Assessment

The Project team conducted the floristic inventory for FQA through a pedestrian meander survey in all available habitats. The entire investigation area was divided into general habitat types, and a list of all woody and herbaceous vascular plant species identified in each specific area was generated. Because of the Project's linear nature, the pedestrian surveys typically started at one intersecting crossroad or landscape feature and stopped at another crossroad or feature, provided the general habitat remained unchanged within this walk. For instance, a survey of plant species in the grassy field habitat associated with the Monon Trail between 173rd Street and 165th Street was performed as an individual habitat unit, while a separate survey of the adjacent woodland habitat was performed immediately to the east, north of 173rd Street. This approach resulted in 30 habitat unit areas. **Appendix B** includes maps (18 sheets) that identify the individual habitat areas.

Plants were identified in the field by one or two botanists walking through the environmental survey area covering as much of the surface area as possible. No time limit was set for each survey area for two reasons: (1) each individual survey area was of a different size; therefore, larger sites would naturally require more time to inventory using the same level of effort; and (2) some of the habitats were particularly difficult to navigate because of thick, woody underbrush of invasive bush honeysuckle, thus resulting in slower progress. When a species could not be readily identified in the field, a small voucher specimen was collected in a cooler for later laboratory analysis. When warranted, confirmation of voucher specimens was provided by Dr. Robert Mohlenbrock, PhD, from Biotic Consultants.

To provide supplemental floristic quality data for the waters of the United States delineation report prepared by HDR, subset plant inventory lists were generated for many of the individual field-delineated wetlands in the investigation area.

Because this survey was conducted in the early spring season of 2017, this inventory could be biased against the late summer blooming flora that might occur in these available habitats. Additionally, these individual habitat surveys are not considered to represent exhaustive inventories of the flora in the spring of 2017, since trace occurrences of several species undoubtedly were not encountered in the field. Nonetheless, this meandering transect-based methodology is considered to have more potential for identifying greater numbers of plant species than would a standardized random plot survey.

The plant species lists for the individual habitat areas and the individual wetlands were coded into the Chicago Region FQA Calculator (Herman 2013). The Chicago FQA Calculator includes a listing of 3,348 plant species, varieties, and hybrids based on *Plants of the Chicago Region, 4th Edition* (Swink and Wilhelm 1994). Taxonomic nomenclature for the Chicago FQA Calculator and this survey follows the *National Wetland Plant List* (Lichvar et al. 2014) and *Vascular Flora of Illinois: A Field Guide*, *4th Edition* (Mohlenbrock 2014). In those instances when a plant was identified only to the genus level, it was omitted from the FQA analysis. Similarly, any plant that was identified as a species or a hybrid that was not included in the list of 3,348 species was also excluded from the FQA analysis if an appropriate synonym did not exist.

Based on the plant species input data, the Project team used the following metrics generated by the Chicago FQA Calculator to summarize the quality of the botanical community for each area investigated:

- Species richness – all species and native species
- Mean C value – all species and native species
- Floristic Quality Index (FQI) – all species, native species, and adjusted

4.1.1 Species Richness

Species richness represents the total number of species entered into the program for a specific survey area or wetland. Usually, although not always, larger survey areas generate greater numbers of species. To generalize richness relative to a unit of area, a metric representing the density of species per acre was calculated.

4.1.2 Mean C Value

The coefficient of conservatism (C value) is a number from 0 to 10 assigned to a plant species to represent its affinity for occurrence in disturbed versus more natural communities. It is not an indication of how rare the species is in Indiana, but it is a measure of the likelihood that the specimen was taken from a natural plant community (Wilhelm and Masters 1995) as opposed to a disturbed setting. For this reason, nonnative or adventive species are assigned a C value of 0, while native species that are more likely to be found in a natural community would have a high C value. Using the C values included in the Chicago FQA Calculator for each species identified in the vegetation inventory survey, a mean C value for a specific vegetation assemblage can be calculated. The mean C value is simply the average of all of the C values for the species identified in a specific area where *C* is the coefficient of conservatism for each species, and *N* is the total number of species.

$$\frac{\sum_{n=1}^{i} Ci}{N}$$

Relative abundance or dominance of a species is not taken into account—there is no weighting. Additionally, the number of species inventoried does not influence the mean C value.

4.1.3 Floristic Quality Index

The FQI is an index that ranges from 0 to 60 and uses both the mean C value of the plant community multiplied by the square root of the total number of plant species. The FQI differentiates the quality of plant communities that might have similar mean C values but are decidedly different based on the degree of species richness. *C* is the coefficient of conservatism, and *N* is the total number of species in the sample area.

$$\left(\frac{\sum_{i=1}^{n} Ci}{N}\right)\sqrt{N}$$

Again, this measure is independent of the size of the plant community inventoried and does not take relative abundance or dominance into account. Generally, a native FQI below 20 indicates disturbed conditions, whereas values between 20 and 35 represent moderate diversity and vegetation quality. Values above 35 represent higher-quality communities that include species with affinity for more-native, undisturbed conditions. Wilhelm and Masters (1995) suggest that, for well-designed and -implemented projects, an FQI value of 25 to 35 can be expected.

4.2 Endangered and Threatened Species Investigation

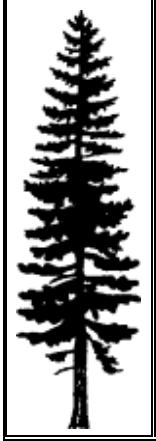
In its November 4, 2014, coordination response, USFWS stated that neither Mead's milkweed nor Pitcher's thistle were known to occur in the West Lake Corridor Project Area (**Appendix A**). Similarly, in its October 6, 2014 response, INDNR stated that there were no known occurrences of state-listed species in the Natural Heritage Program's data for a 0.5-mile buffer of the Project corridor (**Appendix A**). Because the methodology for the FQA component of the vegetation investigation was to identify all species encountered and comprehensively cover as much of all habitats in the investigation area as possible, the search for Indiana-listed endangered and threatened plants was incorporated into the FQA methodology. For this reason, no specifically targeted search for any one or group of listed species occurred.

4.3 Woodland Characterization Survey

The objective of the woodland habitat characterization survey was to provide a general description of the more notable woodland habitats within the environmental survey aera in terms of species composition and size class. To accomplish this, the Project team used a tree count inventory to survey about 20 percent or more of the woodland habitat identified in the environmental survey area. From previous experience and current coordination with USFWS in conducting woodland habitat characterizations for bat habitat, the Project team considered sampling 10 percent or more of each woodland habitat area potentially affected to provide suitable data regarding species composition, size classes, and snag density for habitat characterization. Woodland characterization was not conducted for the numerous narrow, linear tree row features along the old, abandoned Monon railroad tracks and the current Monon Trail.

For survey plots F1 and F2 north of 173rd Street, a linear tract of woodland habitat parallel to the proposed alignment was marked in the field, and all trees with a diameter breast height equal to or greater than 6 inches from the western woodland edge to the eastern property boundary were included in the inventory tally. For survey plot F3, trees were identified in an irregularly shaped polygon, and the boundary was generally delineated using a handheld global positioning system (GPS) device. Data collected for each inventoried tree included the species name, diameter at breast height (in centimeters), and stage of decay. The stage of decay classification was based on British Columbia's wildlife tree classification system (**Figure 4.3-1**).

Figure 4.3-1: British Columbia's Wildlife Tree Classification System

LIVE		DEAD					DEAD FALLEN	
Decay Class								
1	2	3	4	5	6	7	8	9
					approx. 2/3 original height 	approx. 1/2 original height 	approx. 1/3 original height 	
Description								
Live/healthy; no decay; tree has valuable habitat characteristics such as large, clustered, or gnarled branches, or horizontal, thickly moss-covered branches.*	**Live/unhealthy;** internal decay or growth deformities (including insect damage, broken tops); dying tree.*	**Dead;** needles or twigs may be present; roots sound.	**Dead;** no needles/twigs; 50% of branches lost; loose bark; top usually broken; roots stable.	**Dead;** most branches/bark absent; some internal decay; roots of larger trees stable.	**Dead;** no branches or bark; sapwood/ heartwood sloughing from upper bole; decay more advanced; lateral roots of larger trees softening; smaller ones unstable.	**Dead;** extensive internal decay; outer shell may be hard; lateral roots completely decomposed; hollow or nearly hollow shells.		**Debris;** downed trees or stumps.
* This classification system does not recognize root disease trees specifically. Such trees become unstable at or before death.								

Source: British Columbia Ministry of Forests (n.d.)

5 Results

The Project team assessed habitats and identified vascular plant species in 2017 on April 28; May 1, 2, 3, 4, 5, 9, and 10; and June 19. In 2015 (September 14, 17, and 30 and October 27), wetland floristic data were collected for multiple wetland areas throughout the Project Area under consideration in the DEIS phase. Data from the 2015 survey locations applicable to the FEIS Preferred Alternative under consideration in this survey have been integrated with the spring 2017 data for a collective FQA. Woodland characterization plot surveys were conducted on May 10 and June 19, 2017.

5.1 Floristic Quality Assessment

5.1.1 Habitat Units

Field surveys of the 208.84 acres that make up the environmental survey area area yielded multiple general habitat types totaling 112.68 acres. The remaining 96.16 acres consisted largely of unvegetated landscape (that is, roads, rail lines, gravel lots, parking lots, commercial properties, miscellaneous pavement, or maintained residential properties). The 112.68 vegetated acres within the environmental survey area were divided into 30 habitat units (see **Appendix C** for the FQA Summary Table and Worksheets). Habitat units H01 through H30 were enumerated in a south-to-north direction to follow the direction of the milepost (MP) stationing for the FEIS Preferred Alternative alignment. In most instances, a habitat unit might consist of multiple community types (that is, maintained green space with an adjacent tree row). The Project footprint includes 147.58 acres (143.26 acres of permanent and 4.32 acres of temporary impact). About 80.10 acres of the vegetated habitat units are within the Project footprint. **Table 5.1-1** lists the general habitat types, the estimated amount of each type within the environmental survey area, and the amount calculated to be within the Project footprint.

The inventory of vascular plants for the Project yielded a total of 322 vascular plants identified to the species level (including hybrids). An additional 14 specimens were identified to the genus level, some of which were nonnative occurrences escaped from cultivation, while others were likely native species lacking definitive identification characteristics.

Appendix C provides a summary table of the floristic quality metrics for the 30 mapped habitat areas where floristic inventory data were collected along with the individual Chicago FQA Calculator inventory reports. Floristic plant lists were not generated for five of the delineated habitat units: H03 is a regularly tilled agricultural field; H07 is a small, disturbed, regularly mowed field in a commercial development landscape; H12 is a narrow, wooded ditch adjacent to the Lansing Country Club golf course; H15 is a section of the abandoned Monon railroad tracks with dense brush between two wetlands; and H27 represents three inner-city, regularly mowed green-space strips between Sibley Street and Douglas Street.

Appendix D includes a master table of plants collected at each of the 25 habitat unit areas sampled. **Appendix H** includes representative photographs of the habitat areas.

Table 5.1-1: General Habitat Unit Descriptions and Areas within the Environmental Survey Area and the Project Footprint Area

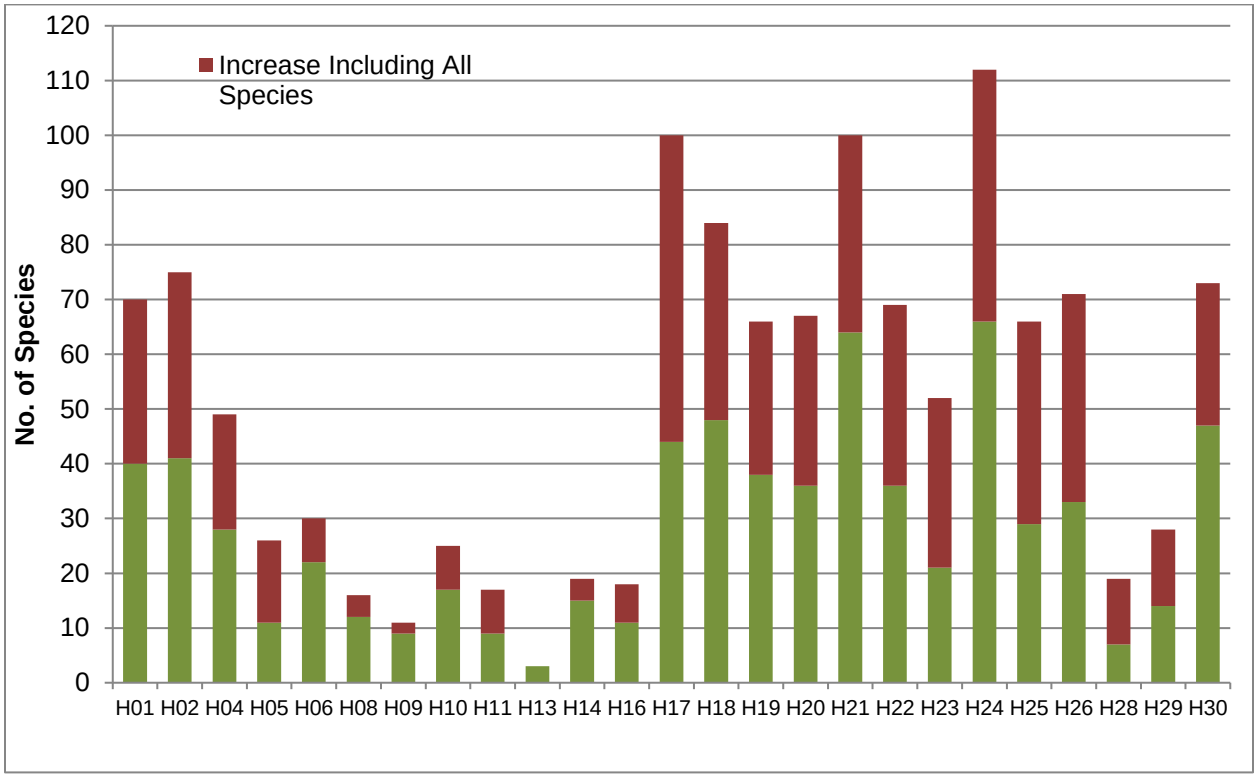
Species	Habitat Unit(s)	Area within Environmental Survey Area (acres)	Area within Permanent Project Footprint (acres)	Area within Temporary Project Footprint (acres)
Maintained green-space field	H27, H28	3.58	1.13	0.72
Maintained green-space field and tree row	H23, H25, H26	28.42	22.23	0.00
Undeveloped residential lots	H04	8.53	5.65	0.55
Unmaintained field	H07	0.53	0.28	0.06
Unmaintained field with associated tree row	H22	4.94	4.83	0.00
Unmaintained field with scattered trees	H01, H30	3.51	1.78	0.00
Disturbed field and woodland	H20	0.69	0.61	0.00
Disturbed abandoned Monon railroad tracks and wetlands	H10	0.71	0.24	0.06
Disturbed scrub on abandoned Monon railroad tracks	H15	0.82	0.74	0.01
Disturbed young growth woodland	H05	1.28	0.67	0.61
Disturbed woodland and maintained green space	H17, H18	10.01	9.21	0.01
Disturbed ditch with associated tree row	H12	0.82	0.00	0.07
Disturbed mesic woods	H21	6.65	4.36	0.00
Disturbed narrow riparian woods	H29	0.17	0.10	0.00
Disturbed herbaceous floodplain and upper bank	H19	0.71	0.52	0.08
Disturbed forested wetland	H14	0.54	0.01	0.07
Disturbed forested wetland and mesic woods	H24	5.29	2.15	0.00
Disturbed emergent wetland	H09, H11, H13, H16	2.74	1.63	0.00
Ditch emergent wetland	H06, H08	5.18	2.58	0.65
Ditch forested wetland and associated upper bank	H02	1.83	1.65	0.00
Agricultural field with emergent wetland	H03	25.73	19.72	0.00
Miscellaneous developed land		96.16	63.16	1.44
	Total	**208.84**	**143.26**	**4.32**
			147.58	

Source: Lochmueller Group 2017.

5.1.1.1 Species Richness

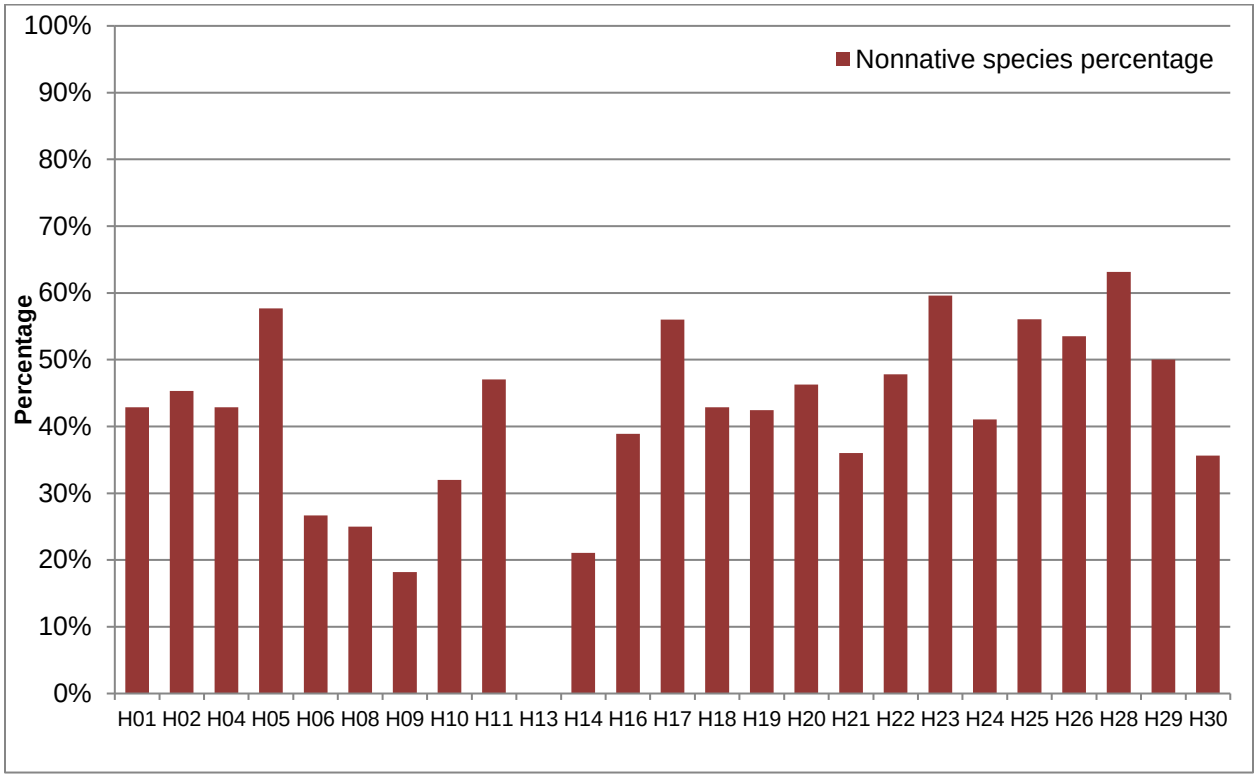
Figure 5.1-1 illustrates the native and nonnative species richness for each of the habitat units surveyed. Species richness ranged from as few as three species for the recently disturbed wetland area of habitat unit H13 (wetland 32) between the substation and the Lansing Country Club golf course south of Fisher Street. The greatest diversity was observed in the larger habitat units of H17 (n=100), H21 (n=100), and H24 (n=112). Habitat unit H17 is a 5-acre strip of disturbed woodland and maintained green space along the Monon Trail from Fisher Street to Ridge Road. Habitat unit H21 is a 6.6-acre tract of disturbed mesic woods east of Lyman Avenue and north of I-80/I-94. Habitat unit H24 is a mesic and wetland woods north of 173rd Street that parallels the Monon Trail east of Lyman Avenue. Excluding habitat unit H13, nonnative species accounted for between 18 percent (habitat unit H09) and 63 percent (habitat unit H28 at the Michigan Street park) of the inventory for each habitat unit surveyed (**Figure 5.1-2**).

Figure 5.1-1: Species Richness for Habitat Units



Source: Lochmueller Group 2017.

Figure 5.1-2: Percentage of Nonnative Species Identified in Habitat Units



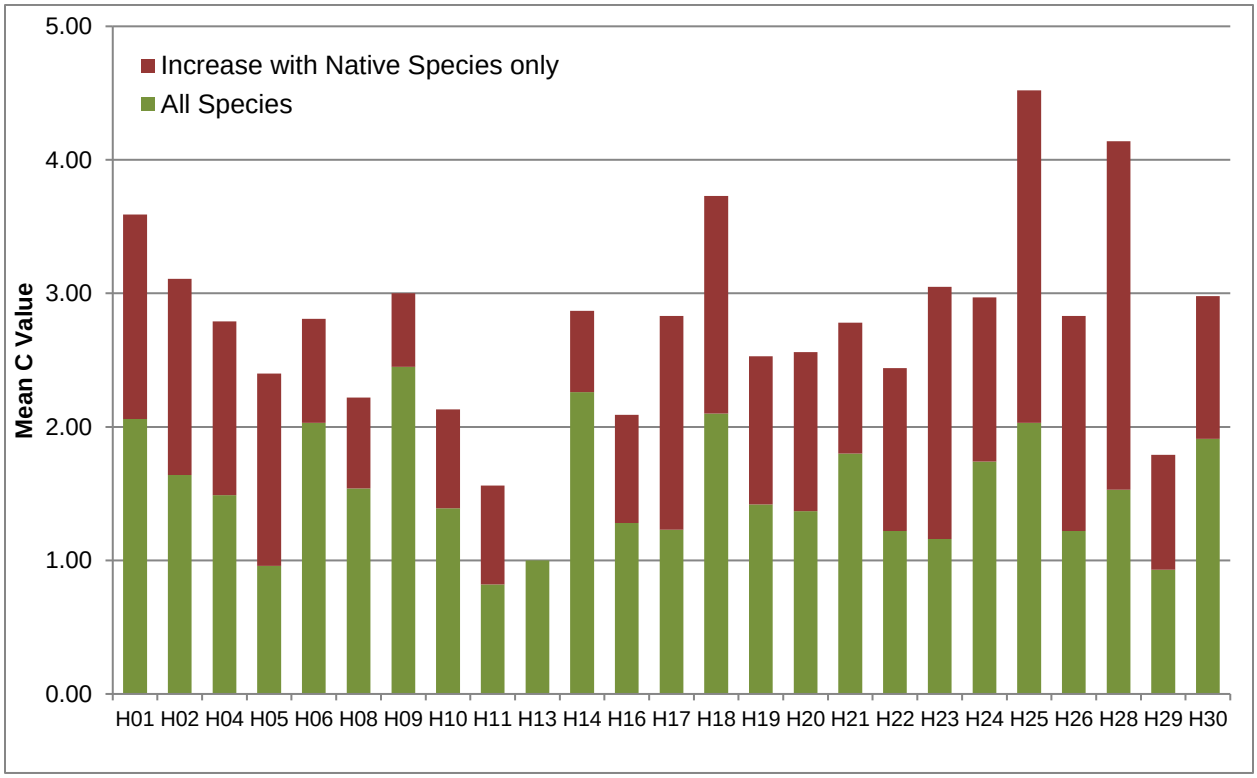
Source: Lochmueller Group 2017.

5.1.1.2 Mean C Value

Figure 5.1-3 illustrates the native and nonnative mean C value for each of the surveyed habitat units. With few exceptions, the mean C value (all species) for the habitat units was less than 2.0. The mean C value (all species) for each of the habitat units ranged from a low of 1.0 at habitat unit H13 to a high of 2.45 at habitat unit H09, a small, disturbed wetland surrounded by commercial development north of 45th Street.

When considering just the native component of the vegetation (excluding habitat unit H13), the mean C value increased anywhere from 0.55 (habitat unit H09) to 2.61 (habitat unit H28) above that for all species. The smaller increase at H09 reflects conditions in which adventives have less of an effect on the metric. In contrast, the greater increase for habitat unit H28 is an effect of the large number of adventives (n=12) compared to native (n=7) species identified at the site.

Figure 5.1-3: Mean C Value for Habitat Units

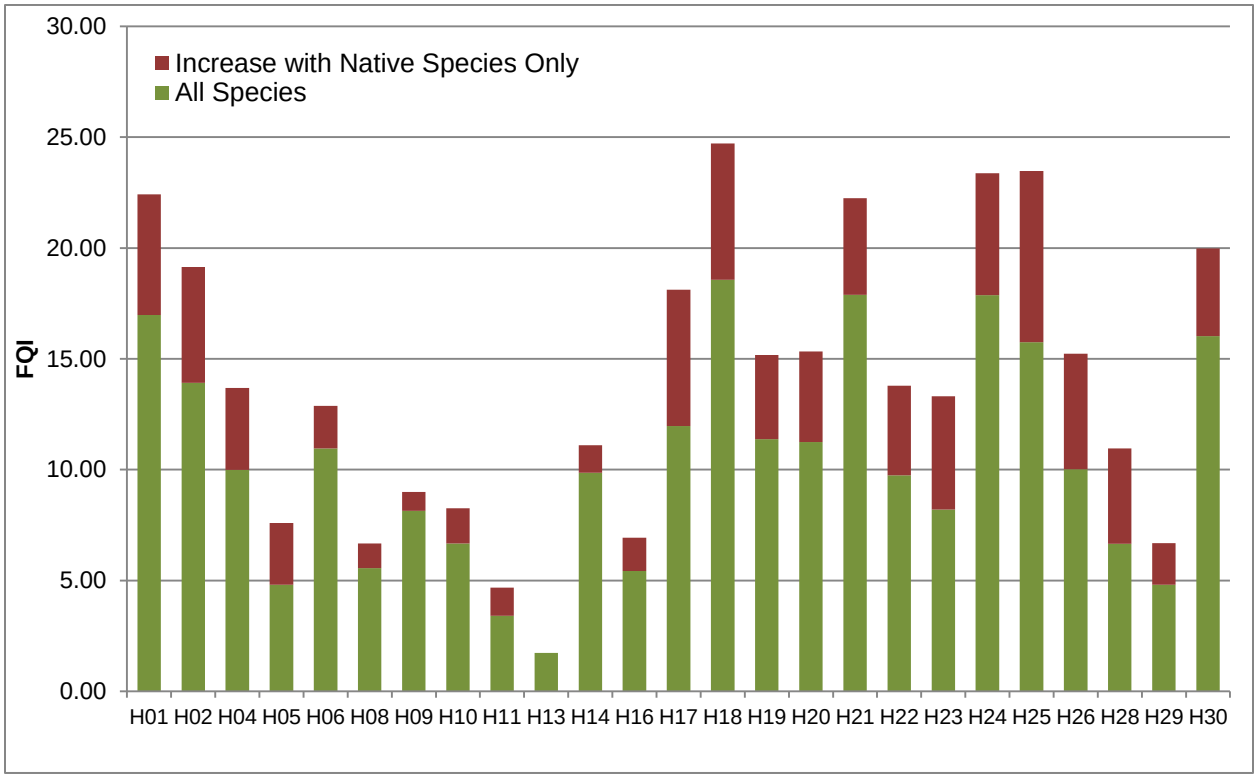


Source: Lochmueller Group 2017.

5.1.1.3 Floristic Quality Index

Figure 5.1-4 illustrates the native and nonnative FQI for each of the surveyed habitat units. The FQI (all species) for each habitat unit is less than 20 regardless of the size of the site surveyed and the number of species identified. When considering only the native species for each surveyed habitat unit, the FQI is increased to 20 or more at only six habitat units (H01, H18, H21, H24, H25, and H30). The lack of diversity and the influence of nonnative species on the vegetative quality of habitats in the Project Area are evident in the fact that more than half of the habitat units (n=17) surveyed have FQI values of 15 or less. FQI values for these more-disturbed habitats ranged from 1.73 to 18.57 for all species and from 1.73 to 24.95 for only native species. Collectively, these values support the expectation that the available habitat in this urban/suburban setting does not represent natural communities.

Figure 5.1-4: FQI Values for Habitat Units



Source: Lochmueller Group 2017.

5.1.2 Wetland-only Habitats

Floristic inventory data were generated for the 22 wetlands (24 individual polygons) that were identified in the DEIS phase. This effort represents a composite of floristic inventory data from 2015 and 2017. For some wetlands, the data presented were collected in the fall of 2015. Since floristic inventories for some wetlands could not be conducted in 2015, FQA has been based on the spring 2017 survey conducted by the Project team. For the remaining wetlands, fall 2015 inventories were combined with spring 2017 inventories for a composite sampling.

Table 5.1-2 illustrates the inventory sampling by wetland. A summary table of the wetland floristic quality is provided in **Appendix E** along with the individual Chicago FQA Calculator inventory reports. **Appendix F** includes a master table of plants identified at each of these wetlands.

Table 5.1-2: Wetlands Sampled in the FQA

2015[a]	2015[a] 2017[b]	2017[b]
W1, W2, W3, W4, W5, W6, W7, W36, W40	W8, W9, W10, W12, W33, W34, W38, W39	W11, W17, W32, W35, W37

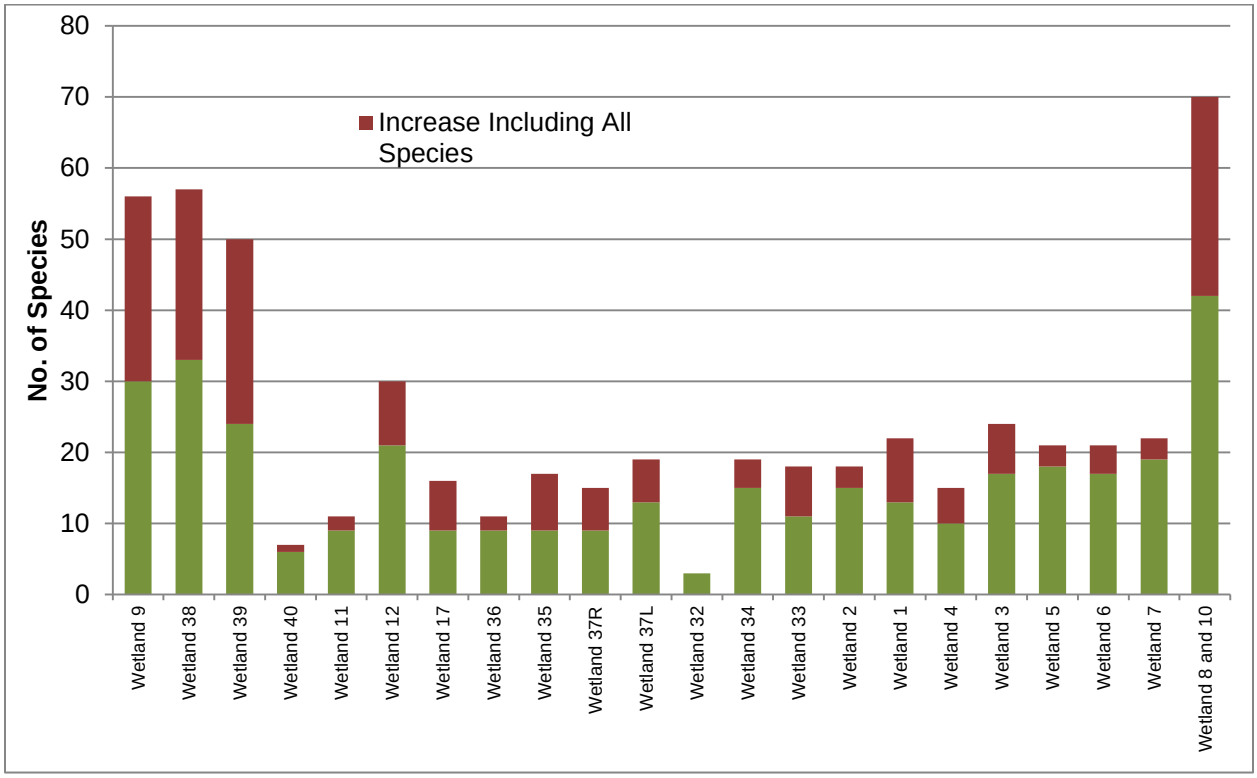
Source: [a] NICTD 2016.

[b] Lochmueller Group 2017.

5.1.2.1 Species Richness

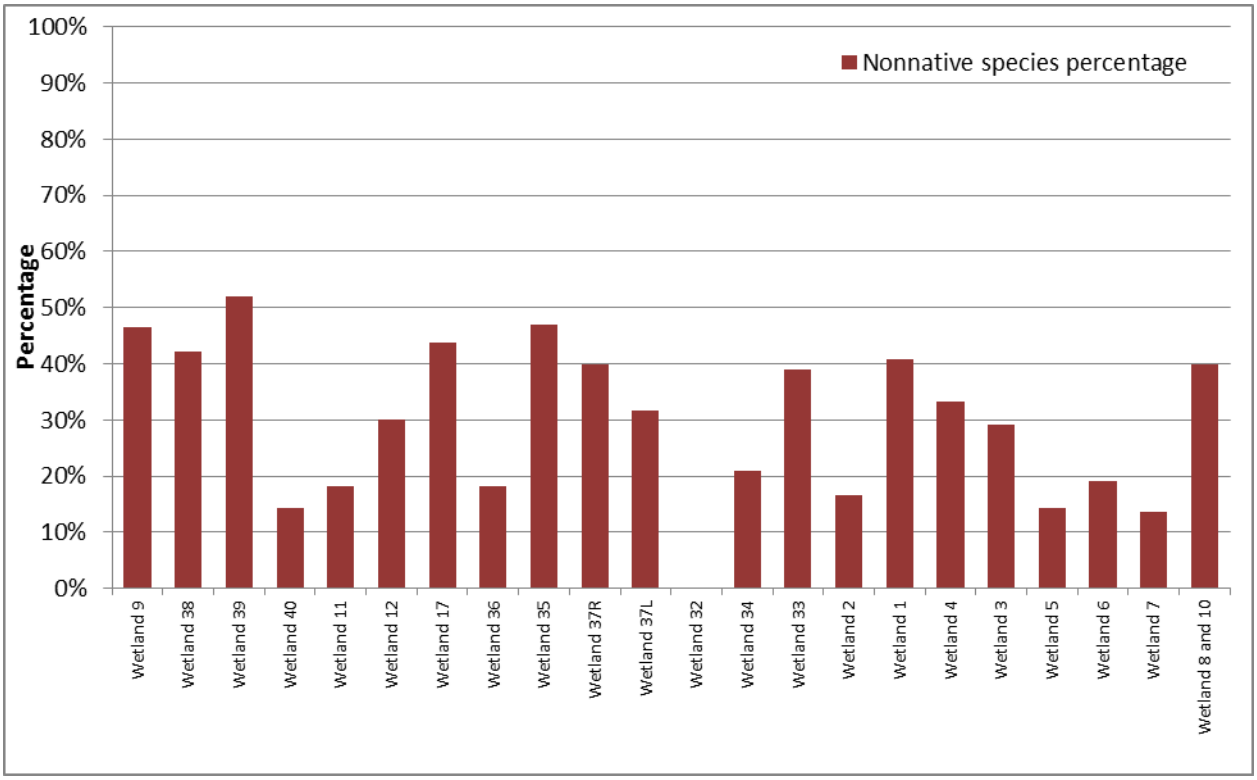
Figure 5.1-5 illustrates the native and nonnative species richness for each of the wetland features for which a floristic inventory was conducted. The vast majority of the wetlands surveyed had fewer than 20 species identified. This is both a function of true poor diversity and early spring seasonal sampling that excludes species that have not yet developed. The greatest species richness was from wetlands W9 (n=6), W8/10 (n=70), W38 (n=57), and W39 (n=50). Nonnative species accounted for between 13 and 52 percent of the inventory for each of the wetlands surveyed with greater than 5 species, excluding wetland W32 (**Figure 5.1-6**).

Figure 5.1-5: Species Richness for Wetlands



Source: Lochmueller Group 2017.

Figure 5.1-6: Percentage of Nonnative Species Identified in Wetlands

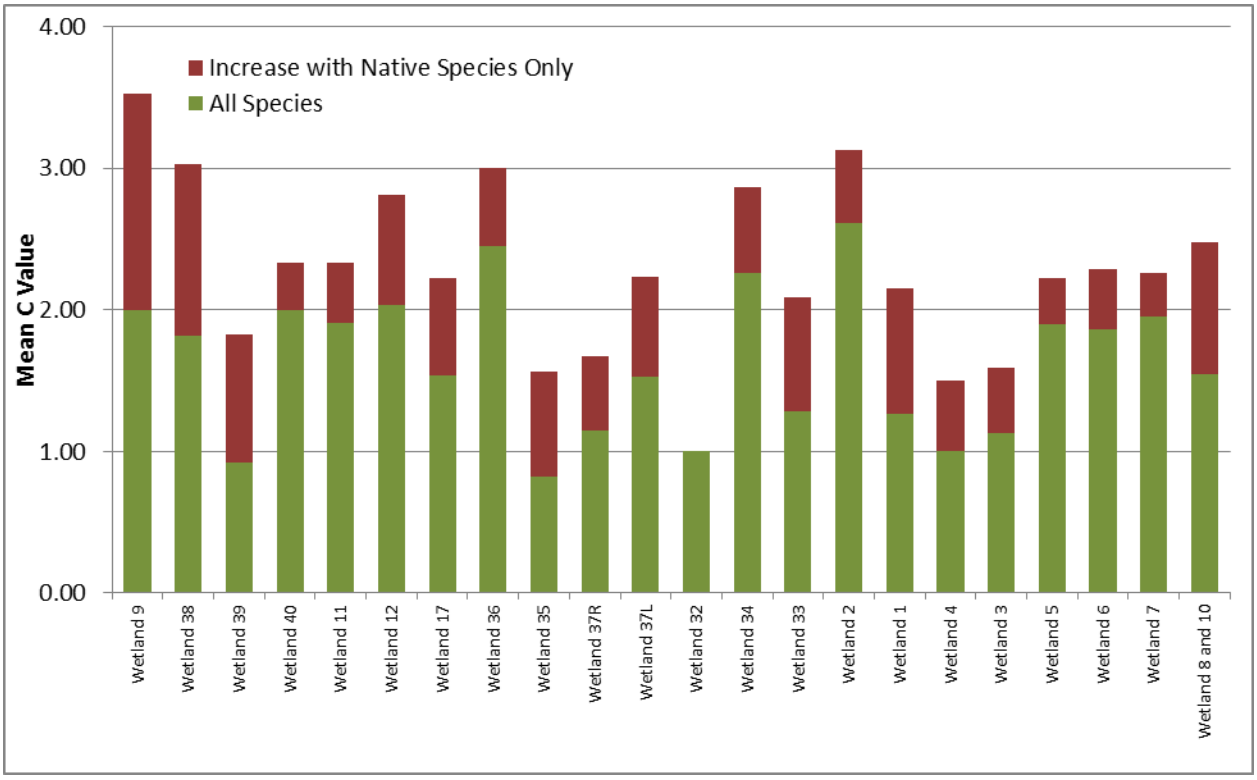


Source: Lochmueller Group 2017.

5.1.2.2 Mean C Value

Figure 5.1-7 Figure 5.1-7 illustrates the native and nonnative mean C value for each of the wetlands inventoried. The mean C value (all species) for the wetlands ranged from a low of 1.00 at the recently disturbed wetland W32 to 3.53 at wetland W9 (a small triangle wetland at the southern terminus between Sheffield Avenue and the CSX railroad tracks). The average of the C values (all species) for all of the wetlands was 1.64, while for native species the average was 2.28.

Figure 5.1-7: Mean C Value for Wetlands

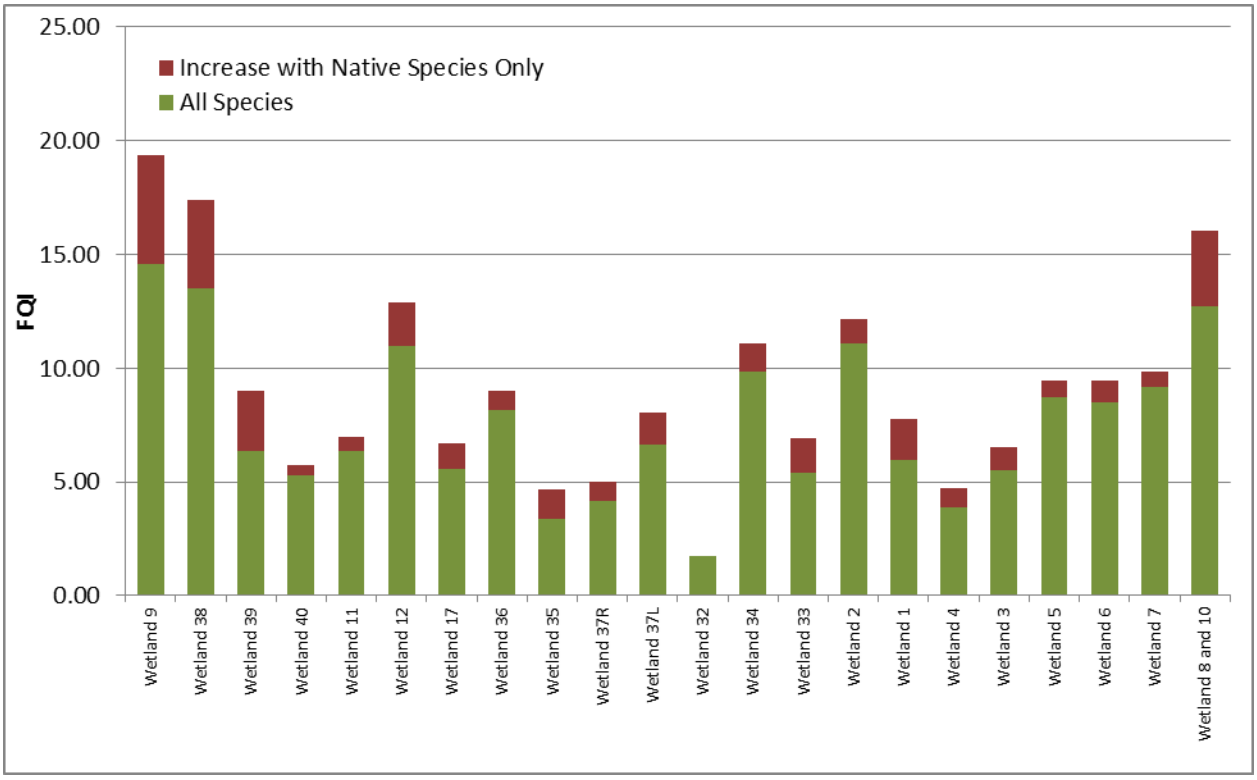


Source: Lochmueller Group 2017.

5.1.2.3 Floristic Quality Index

Figure 5.1-8 illustrates the native and nonnative FQI for each of the wetlands inventoried. The FQI values for the wetlands varied greatly and ranged from 1.73 at wetland W32 to 14.56 at wetland W9 (all species), the unmaintained field with young tree growth at the southern terminus of the Project Area. For native species only, the range increased from 1.73 to 19.35. These low values indicate disturbed habitat conditions with low diversity and high percentages of adventive species.

Figure 5.1-8: FQI Values for Wetlands



Source: Lochmueller Group 2017.

5.2 Threatened and Endangered Species

5.2.1 USFWS Threatened and Endangered Species

Under the No Build Alternative, no adverse permanent or temporary impacts on federally-listed plant species would occur as a result of the Project.

The 2017 floristic inventory of the FEIS Preferred Alternative environmental survey area did not yield any occurrences of USFWS federally listed plant species, namely the leafy prairie clover, eastern prairie-fringed orchid, prairie bush clover, Mead's milkweed, or Pitcher's thistle. The Project team did not consider the available disturbed habitats within the environmental survey area reviewed as part of this study to be suitable for supporting any of these species.

5.2.1.1 *Dalea foliosa (Leafy Prairie Clover)*

Status: Leafy prairie clover was proposed for listing as endangered by USFWS on March, 27 1990 (USFWS 1990) with the final rule effective May 31, 1991 (USFWS 1991). Globally, it is considered imperiled (G2) and rare or uncommon (G3) (NatureServe 2017). It is considered critically imperiled (S1) in Illinois where it is listed as endangered (Illinois Endangered Species Protection Board 2015). There are 29 known populations in three states—Alabama (2), Illinois (3), and Tennessee (24)—but many of these populations are not likely to persist under their current habitat conditions. Thirteen populations are considered to have high to moderate viability with potential for recovery and persistence, and, of these, 10 populations are protected to some degree (USFWS 1996). It is not currently known to occur in Indiana (USFWS 1996).

Description: Leafy prairie clover is a perennial legume wildflower of the Fabaceae (legume) family about 1 to 2 feet tall, branching occasionally to frequently; stems and branches are green and round to angular and hairless; leaves are alternate compound with 5 to 15 pairs of leaflets with a terminal leaflet and up to 3 inches long; leaflets are green 3/8 inch to 1/8 inch wide, hairless, entire, and with short petioles and tiny pointed tips; upper stems terminate in individual spikes of flowers that are short and cylindrical; individual flowers and their bracts are densely crowded together along the length of each spike in all directions; petals are rose-pink (rarely white), while their sepals and bracts are green-white; each flower has five petals, five sepals, five stamens, and a pistil with a single style; flowers are replaced by a short seedpod with a slender beak that is largely enclosed by the persistent sepals with each seedpod containing one to two smooth seeds (Hilty n.d.).

Leafy Prairie Clover (*Dalea foliosa*)
Photo Credit: USFWS

Distribution/Range (Full Range and Illinois Range): The distributional center for leafy prairie clover is the limestone cedar glades of central Tennessee and northern Alabama, where the species is considered nearly endemic (Baskin and Baskin 1973); disjunct in Illinois, where it is now restricted to dolomite prairies on river terraces in the northeastern part of the state (Kurz and Bowles 1981); and occurring with the glade endemic *Dalea gattingeri* in Tennessee and Alabama and with *Dalea purpurea* in Illinois (Mahler 1970; Swink and Wilhelm 1994).

Habitat: Leafy prairie clover is found in prairie remnants along the Des Plains River in Illinois, in thin soils over limestone substrate. In Alabama and Tennessee, it lives in prairie-like areas on the edges of cedar glades. It favors sites with a wet spring and fall and a dry summer (USFWS 1997).

Threats/Cumulative Impacts: Threats come from residential and commercial development, road construction, off-road vehicle use, and grazing by rabbits and deer (USFWS 1997).

5.2.1.2 *Platanthera leucophaea (Eastern Prairie Fringed Orchid)*

Status: Eastern prairie fringed orchid was proposed for listing as threatened by USFWS on October 11, 1988 (USFWS 1988a), with final rule effective September 28, 1989 (USFWS 1989; 54 Federal Register 39857). The 5-year status review was initiated on July 27, 2007 (72 Federal Register 41348) and received regional

Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)
Photo Credit: Mike Redmer

concurrence on August 10, 2010 (USFWS n.d.). Globally, it is considered imperiled (G2) and rare or uncommon (G3) (NatureServe 2017). In Indiana and Illinois, it is considered critically imperiled (S1) and is listed as endangered in both states (Illinois Endangered Species Protection Board 2015; INDNR 2016b). It currently is known to persist in 59 populations in six states. Most populations are in Wisconsin, Illinois, Michigan, and Ohio. Only 15 of the extant populations in the United States have full legal protection, and 11 populations have serious management problems. Six U.S. populations are considered to have high viability with potential for long-term persistence, and four of these sites have full legal protection (USFWS 1999).

Description: Eastern prairie fringed orchid belongs to the Orchidaceae (orchid) family. It is 8 to 40 inches tall with an upright leafy stem and a flower cluster with 3-to-8-inch lance-shaped leaves. Each plant has one single flower spike composed of 5 to 40 creamy white flowers, each having a three-part fringed lip less than 1 inch long and a nectar spur which is about 1 to 2 inches long (USFWS 2015).

Distribution/Range (Full Range and Indiana Range): Eastern prairie fringed orchid has extant populations in six states: Illinois (22 populations), Wisconsin (13 populations), Michigan (12 populations), Ohio (9 populations), Iowa (2 populations), and Maine (1 population) (USFWS 1999).

Habitat: Eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, and even bogs. It requires full sun for optimum growth and flowering, with seeds dependent upon the appropriate soil fungi for seedlings to become established (USFWS 2015). Flowering begins from late June to early July and lasts from 7 to 10 days, with blossoms often rising just above the height of the surrounding grasses and sedges (USFWS 2015).

Threats/Cumulative Impacts: Threats include habitat destruction, fire suppression and woody vegetation encroachment, impacts to pollinator populations, competition from nonnative plant species, overutilization for commercial and scientific purposes, and lack of existing regulatory mechanisms for occurrences on privately owned land (USFWS 1999).

5.2.1.3 Lespedeza leptostachya (Prairie Bush Clover)

Status: Prairie bush clover was proposed for listing as threatened by USFWS on December 6, 1985 (USFWS 1985) with the final rule effective February 9, 1987 (USFWS 1987a). Globally, it is rare or uncommon (G3) (NatureServe 2017). In Illinois, it is considered critically imperiled (S1) and is listed as endangered (Illinois Endangered Species Protection Board 2015). It is found in Illinois, Wisconsin, Minnesota, and Iowa (USFWS 2009). There are no records for the species in Indiana.

Prairie Bush Clover (*Lespedeza leptostachya*)
Photo Credit: Phil Delphey

Description: Prairie bush clover is a perennial forb of the Fabaceae (legume) family. It has loose spikes, interrupted, with flowers 0.15 to 0.23 inch; spikes are 0.78 to 1.18 inch long on peduncles 0.39 to 0.79 inch long; flowers are ochre-colored with the corolla about equal to the calyx; fruits are densely hairy and equal to the calyx; leaflets are narrowly oblong and 0.39 to 1.57 inch long by 0.12 to 0.27 inch wide, obtuse and tipped with a short, sharp, abrupt point, sparsely hairy above, silky beneath; petioles are 0.16 to 0.39 inch long (Wisconsin Department of Natural Resources [WDNR] 2016). It blooms in late July through late August and fruits early August through early September (WDNR 2016).

Distribution/Range (Full Range and Illinois Range): Prairie bush clover is a Midwestern "endemic" that occurs only in the tallgrass prairie of the upper Mississippi River Valley (USFWS 2009), with the majority of plants occurring in and near the Des Moines River Valley of southwestern Minnesota and the nearby lakes region of northwestern Iowa (Minnesota Department of Natural Resources [MDNR] n.d.). In Illinois, monitoring of populations of this federally threatened species is ongoing in the gravel hill prairie at Nachusa Grasslands in Franklin Grove and at Harlem Hills Nature Preserve (part of Rock Cut State Park in Rockford) (Chicago Botanic Garden n.d.).

Habitat: This plant is found in gravelly or sandy hillside prairies with soils dry, sandy and gravelly, and in dry prairie, dry-mesic prairie, and mesic prairie landscapes (WDNR 2016). The majority of Minnesota populations of prairie bush clover occur in prairies that have been or are presently used as pasture (MDNR n.d.). Seed viability is low, but once established, it is a long-lived species that is known to live for 20 years or longer (MDNR n.d.).

Threats/Cumulative Impacts: Prairie bush clover is rare because of loss and degradation of its prairie habitat; therefore, conservation considerations should be directed toward maintaining surviving prairie remnants that harbor this species (MDNR n.d.). Prescribed burns should be conducted in early spring before the plants appear above ground, since seedlings are very vulnerable to fire (MDNR n.d.). Some surviving populations are threatened by conversion of pasture to cropland, overgrazing, agricultural expansion, herbicide application, urban expansion, rock quarrying, transportation ROW maintenance and rerouting, and hybridization with the more common round-headed bush clover (USFWS 2009).

5.2.1.4 Asclepias meadii (Mead's Milkweed)

Status: Mead's milkweed was proposed for listing as threatened by USFWS on October 21, 1987 (USFWS 1987b) with the final rule effective October 3, 1988 (USFWS 1988b). Globally, it is considered imperiled (G2) (NatureServe 2017). Its historic range includes Indiana, Illinois, Iowa, Kansas, Missouri, and Wisconsin (USFWS 1988b). In Illinois, it is considered imperiled (S2) and is listed as endangered (Illinois Endangered Species Protection Board 2015), whereas in Indiana it is considered extirpated (SX) and is listed as endangered (INDNR 2016b). It currently is known to persist at 171 sites in 34 counties in eastern Kansas, Missouri, south-central Iowa, and southern Illinois. Populations no longer occur in Wisconsin and Indiana, even though population restoration efforts are being made in Illinois, Indiana, and Wisconsin by introducing Mead's milkweed into suitable habitat (USFWS 2003). Restoration efforts at Biesecker Prairie in Lake County, Indiana, showed 57.5 percent survivorship (Bowles et al. 2001).

Mead's Milkweed (*Asclepias meadii*)
Photo Credit: Mike Redmer

Description: Mead's milkweed is a long-lived tallgrass prairie herb of the Asclepiadaceae (milkweed) family (USFWS 2005). The Mead's milkweed is readily distinguished from other milkweed species by a combination of smooth "stalkless" opposite leaves with a herringbone venation and a single nodding umbel (a type of flower cluster) consisting of large, fragrant, greenish-cream flowers (USFWS 2003). It flowers as early as late May in the south through middle to late June in the north as pollinated by small bumblebees and miner bees. Young, green fruit pods appear by late June and reach a maximum length of 1.5 to 4 inches by late August or early September. Hairy seeds reach maturity by mid-October (USFWS 2005).

Distribution/Range (Full Range and Indiana Range): The range of Mead's milkweed follows the tallgrass prairie, extending from eastern Kansas through Missouri, Iowa, and Illinois to southwestern Wisconsin and northwestern Indiana, with outlier populations in southeastern Missouri and southern Illinois (Bowles et al. 2001). No natural populations are known in Indiana. At Biesecker Prairie in Lake County, Indiana, restoration efforts have planted many individual Mead's milkweed plants.

Habitat: Mead's milkweed requires moderately wet (mesic) to moderately dry (dry mesic) upland tallgrass prairie or glade/barren habitat characterized by vegetation adapted for drought and fire, and persists in stable late-successional prairie (USFWS 2005).

Threats/Cumulative Impacts: Mead's milkweed is federally threatened because of habitat loss, habitat fragmentation, and hay mowing (USFWS 2005). Mead's milkweed is also threatened by the destruction and alteration of tallgrass prairie due to farming along with residential and commercial development. Sites known to have Mead's milkweed were destroyed by plowing and land development. Smaller habitat fragments support lower numbers of plants, so fragmentation might hasten or explain the loss of genetic diversity and the failure of this plant to sexually reproduce. Populations with low numbers might not attract sufficient numbers or types of pollinators. Most Kansas and Missouri populations occur in prairie hay fields where mowing typically takes place in late June to early July, which removes immature Mead's milkweed fruits and prevents completion of the plant's life cycle.

5.2.1.5 Cirsium pitcheri (Pitcher's Thistle)

Status: Pitcher's thistle was proposed for listing as threatened by USFWS on July 20, 1987 (USFWS 1987c) with the final rule effective August 11, 1988 (USFWS 1988c). Globally, it is considered imperiled (G2) and rare or uncommon (G3) (NatureServe 2017). It is considered critically imperiled (S1) in Illinois and is imperiled (S2) in Indiana. It is listed as threatened in both states (Illinois Endangered Species Protection Board 2015; INDNR 2016b). There are 173 known occurrences in Michigan (90 percent), Indiana (5 percent) and Wisconsin (5 percent) (USFWS 2002).

Pitcher's Thistle (*Cirsium pitcheri*)
Photo Credit: USFWS

Description: Pitcher's thistle is a member of the Asteraceae (aster) family. It has a silvery appearance due to the dense, white, woolly hairs covering the bluish-green leaves and stems (Michigan Department of Natural Resources [MIDNR] n.d.). It is from 5 inches to 3.5 feet tall. Leaves are up to 1 foot long and are deeply divided into narrow, often spine-tipped segments. Prickly flower heads bloom from June to September and are cream-colored or slightly pinkish, with a faint, pleasant smell. The plant has two phases: flowering and non-flowering. It can be confused with wormwood; however, the latter has spines and finely divided leaves, often with purple at their base.

Distribution/Range (Full Range and Indiana Range): Pitcher's thistle grows only on shorelines or sand dunes of the Great Lakes in Michigan, Indiana, Wisconsin, and Ontario, Canada. It is restricted to the dunes of Lakes Michigan and Huron and a few dune sites along Lake Superior. It was once found in Illinois on the shore of Lake Michigan but is now extirpated there (MIDNR n.d.).

Habitat: Pitcher's thistle is found most frequently in the near-shore plant communities (USFWS 2002). This shoreline plant requires open, windblown sand dunes or low, open beach ridges. It can withstand the desert-like environment of Michigan's sand dunes because its root can

penetrate more than 6 feet into the sand, and its silvery hairs help retain water and reflect the sun's rays (MIDNR n.d.). This plant has been found associated with glossy-leaved dune grasses, the red-fruited bearberry, the bright-yellow-orange puccoon, and the blue bellflower in Michigan (MIDNR n.d.).

Threats/Cumulative Impacts: Pitcher's thistle is threatened by loss of habitat due to increased human activity in shoreline areas because of heavy foot traffic (trampling) in dune areas and along the shoreline (MIDNR n.d.). Additional threats are development (residential and commercial), sand mining, beach and dune stabilization projects, certain types of frequent recreational activities, snow removal, placement of rip-rap, fragmentation, and even hybridization with other *Cirsium* species (USFWS 2002).

5.2.2 INDNR Threatened and Endangered Species

Under the No Build Alternative, no adverse permanent or temporary impacts on federally-listed plant species would occur as a result of the Project.

Collectively, the 2015 wetland investigation efforts and the 2017 floristic inventory survey identified 322 vascular plants as species or hybrids. Cross-referencing this list with the *Endangered, Threatened, Rare, and Extirpated Plants of Indiana* (INDNR 2016b) yielded three species designated as threatened (one) or rare (two).

The following sections briefly describe each species and general location within the FEIS Preferred Alternative environmental survey area. The description includes the habitat units in which each species was documented and the sheet numbers of the vegetation community type (**Appendix B**) in which the habitat units are depicted. Identifications of *Carex bebbii*, *Catalpa speciosa, and Pinus strobus* were conducted in 2015 and/or in 2017.

5.2.2.1 Carex bebbii (Bebb's Sedge) – Indiana State Threatened

This obligate wetland plant of the Cyperaceae (sedge) family is a sedge with culms in tufts; sessile spikelets with the staminate flowers borne below the pistillate; scale-like perigynia; pistillate scales exceeded by the tips of the mature perigynia; spikelets less than 0.6 inch long; perigynia cuneate to rounded at the base; all spikelets crowded into a stiff, dense inflorescence; spikelets longer than wide; and perigynia nerveless or nearly so on the ventral face. It is sometimes found in calcareous fens, "alkaline bogs", or on morainic soils, and in low calcareous prairies and pothole marshes (Swink and Wilhelm 1994). Deam (1984) has found this species infrequent in marshes and interdunal swales in Lake County. In Noble County, Deam found a single collection in a ditch along a railroad track a mile east of Kimmel Road. The general distribution of this species is throughout the northern United States and Canada (eFloras 2008).

This species was identified in the following two habitat units of the environmental survey area but likely occurs elsewhere in wetland habitats:

- Wetland 38 is in habitat unit H02 (**Appendix B**, **Sheet 2**) in the ditch wetland habitat along the west side of the CSX railroad track (MP 61.40 to MP 64.54).
- Habitat unit 21 (**Appendix B**, **Sheet 10)** is in the disturbed mesic/wetland woods north of I-80 east of Lyman Avenue (MP 65.1 to MP 65.3).

5.2.2.2 Catalpa speciosa (Northern Catalpa) – Indiana State Rare

This facultative upland tree of the Bignoniaceae (bignonias) family is a deciduous tree with simple opposite or whorled leaves (appearing three or more per node). Leaves are large, ovate,

and cordate at the base with leaf margins essentially entire and unloboed. Fruits are long and cigar-shaped. It is native to the Lower Wabash Valley and is likely introduced to the north while occasionally escaping from cultivation, usually into weedy sites, especially along railroad tracks. Apparently the largest colony of this species in the area is along the Louisville and Nashville Railroad tracks near Erincroft Street in Michigan City in La Porte County. This species is not readily distinguished from *C. bignoniodes*, and few botanists agree on the different distinctions (Deam 1984; Swink and Wilhelm 1994). The general distribution of this species is the eastern, midwestern, and southern United States and the Great Plains. It is somewhat sporadic and localized in the southern reaches of its range. It has been introduced into Canada (United States Department of Agriculture, Natural Resources Conservation Service [USDA NRCS] 2017).

This species was identified in the following three habitat units of the environmental survey area:

- Wetland 9 is in habitat unit H01 (**Appendix B**, **Sheet 1**) between Sheffield Avenue and the CSX railroad tracks at the southern project terminus.
- Wetland 3 is in habitat unit H20 (**Appendix B**, **Sheets 9** and **10)** associated with the swale forested wetland south of I-80 and just east of the Monon Trail (MP 64.96 to MP 64.98).
- Habitat unit 21 (**Appendix B**, **Sheet 10**) is in the disturbed mesic/wetland woods north of I-80 east of Lyman Avenue (MP 65.1 to MP 65.3).

5.2.2.3 Pinus strobus (Eastern White Pine) – Indiana State Rare

This facultative upland tree of the Pinacea (pine) family has linear to needle-like leaves arranged spirally and grouped into fascicles mostly or entirely of five needles. At one time, this species was very common in the dune country in Lake, Porter, La Porte, and Berrien Counties. Most of this timber was harvested for lumber, and only small remnant areas persist. One individual tree was identified in a residential neighborhood and is not considered a remnant member, but rather a planted and cultivated specimen. There are a few stations near Lake Michigan and a few boggy woodlands where it still grows naturally (Swink and Wilhelm 1994). The general distribution of this species is the upper midwestern northeastern, and western United States, plus Canada (USDA NRCS 2017).

This species was identified in the following habitat unit of the environmental survey area:

- Habitat unit H17 (**Appendix B**, **Sheet 8**) is a narrow tree row adjacent to the Monon Trail south of Ridge Road (MP 63.41 to MP 64.14) and was apparently planted for landscaping.

5.3 Woodland Characterization

Three woodland plots ranging in size from 0.30 to 1.30 acres were inventoried for all tree species with a diameter at breast height greater than or equal to 6 inches. **Appendix G** includes data regarding the counts for each species by size class and the stage-of-decay classification for each species. These woodland plots generally represent 20 percent of habitat unit H21 (forest plot F3), 43 percent of habitat unit H24south (forest plot F2), and 26 percent of habitat unit H24north (forest plot F1) within the environmental survey area.

Note that the composition, density, and size mix of trees can vary throughout these woodland habitats; therefore, the sample data might not represent the entire woodland tract within which the inventory was conducted. Because the woodland plots vary in size, the count data were extrapolated to a density-per-acre metric for comparison. **Table 5.3-1** summarizes the data results in trees per acre.

Table 5.3-1: Summary of Woodland Characterization Plot Data

Plot ID	Number of Species	Size Class Distribution (trees per acre)				Stage of Decay (see Figure 4.3-1) (trees per acre)					
		6 to <9 Inches	9 to <18 Inches	≥18 Inches	Total	1	2	3	4	5	6
F1	10	80	81	23	184	153	12	11	3	3	2
F2	9	123	109	7	239	216	7	3	3	0	10
F3	10	53	53	7	113	97	12	2	2	0	0

Source: Lochmueller Group 2017.

In general, overall tree density for stems with a diameter at breast height greater than or equal to 6 inches ranged from 113 per acre for plot F3 (habitat unit H21) to 239 per acre for plot F2 (habitat unit H24south).

All three plots exhibited similar diversity, with 9 to 10 species with a diameter at breast height greater than 6 inches. About 87 percent of the trees were live, healthy Stage 1 individuals. Stage 2 and 3 trees made up 6 and 3 percent, respectively, with the remainder being a few Stage 4, 5, or 6 individuals.

Table 5.3-2 summarizes the most abundant and dominant canopy species in each surveyed plot. Abundant and dominant tree species were generally similar for each area surveyed, with Siberian elm (*Ulmus pumila*), eastern cottonwood, green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), and white mulberry (*Morus alba*) collectively being the most abundant. Siberian elm and eastern cottonwood were the most pervasive of the upper-canopy species for the survey areas.

Table 5.3-2: Summary of Most Abundant and Dominant Canopy Species for Woodland Plots

Plot ID	Most Abundant Trees	Dominant Canopy Trees
F1	Siberian elm, eastern cottonwood	Eastern cottonwood, Siberian elm
F2	Eastern cottonwood, black willow, white mulberry	Eastern cottonwood
F3	Siberian elm, eastern cottonwood, green ash	Eastern cottonwood, Siberian elm

Source: Lochmueller Group 2017.

6 Mitigation

6.1 Long-term Operating Impacts

The No Build Alternative would not result in any direct impacts on federal- or state-listed species and, therefore, would not require mitigation.

For the FEIS Preferred Alternative, INDNR did not advise any long-term mitigation measure for state-listed plant species. Northern catalpa (*Catalpa speciosa*) is common in the area and tends to be weedy. Eastern white pine (*Pinus strobus*) is likely a planted specimen. However, INDNR did suggest that measures be taken to avoid potential impacts to Bebb's sedge (*Carex bebbii*). Bebb's sedge grows in wetland habitats and impacts to wetlands were avoided where possible.

6.2 Short-term Construction impacts

Under the No Build Alternative, no adverse permanent or temporary impacts on biological resources would occur as a result of the Project.

Under the FEIS Preferred Alternative, construction impacts would include removal of suitable habitat for state-listed plant species.

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7 Summary

NICTD proposed construction of a new transit rail line (West Lake) from the town of Dyer north to Hammond, Indiana, where the rail line would connect with a realigned segment of the SSL. In addition to the new rail line, stations with parking are proposed at Dyer, Munster, and two locations in Hammond, including the Hammond Gateway station and maintenance facility.

In 2015, limited FQA inventories for vascular plants were conducted in wetlands throughout the Project Area as part of the DEIS phase of the Project. In the spring of 2017, the Project team completed a more-comprehensive survey of botanical resources in all habitat types within the FEIS Preferred Alternative environmental survey area. A total of 322 plants were identified to the species/hybrid level, with an additional 14 identified to the genus level. Floristic quality metrics (species richness, mean C value, and FQI) for 25 mapped habitat units and 22 delineated wetlands were determined using the Chicago FQA Calculator based on the collective floral inventories from 2015 and 2017. The FQI scores for the habitat units and the wetlands were considered low (most below 15) and were not considered indicative of natural plant communities. Similarly, the mean C values ranged from 2 to 3, indicating heavy influence by nonnative adventive species.

The 2015/2017 floristic inventory did not yield any occurrences of federally listed plant species for Indiana, namely Mead's milkweed (threatened) and Pitcher's thistle (threatened). The FEIS Preferred Alternative does not extend into Illinois, but this survey also did not identify any occurrences of the federally endangered leafy prairie clover or the federally threatened eastern prairie fringed orchid and prairie bush clover. However, three species listed as state threatened or rare by INDNR were identified within the FEIS Preferred Alternative environmental survey area.

Three woodland plots showed that most of the trees within each plot were live, healthy Stage 1 trees with roughly 13 percent represented in early to advanced stages of decay. Tree density for stems greater than 6 inches in diameter at breast height ranged from 113 per acre to 239 per acre. The larger woodland areas within the environmental survey area between I-80 and 173rd Street and between 173rd Street and 169th Street were composed primarily of native eastern cottonwood, American elm, silver maple, green ash, black walnut, boxelder, black willow, and black cherry along with nonnative Siberian elm, tree-of-heaven, and white mulberry. In many instances throughout the Project Area, nonnative trees and forbs are prevalent.

Based on the results of the 2015 and 2017 floristic investigations, no high-quality natural areas or wetlands would be affected by the construction of the Project.

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8 Preparers

8.1 Staff Information

Table 8.1-1 includes Lochmueller Group staff that were instrumental in the field investigations and preparation of this report. Professional résumés are provided in **Appendix I.**

Table 8.1-1: Lochmueller Group FQA Staff

Lochmueller Group Staff	Position	Contribution
Rusty Yeager	Environmental Biologist III	Field investigation and data collection Geographic information systems (GIS) analysis Report preparation
Thomas Cervone, PhD	Vice President, Environmental Practice Leader	Report preparation
Brenten Reust	Environmental Biologist I	Field investigation and data collection Report preparation
Sean Langley	Environmental Biologist I	Field investigation and data collection
Robert Mohlenbrock, PhD	Biotic Consultants	Taxonomic expert

Source: Lochmueller Group 2017.

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Appendix A. Agency Coordination

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United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

November 4, 2014

NICTD
West Lake Corridor Project
33 East U.S. Highway 12
Chesterton, Indiana 46304

Dear Sir:

This is in reference to the September 30, 2014 Federal Register Notice of Intent to Prepare an Environmental Impact Statement for development of a commuter rail line within an approximate 9-mile corridor between Dyer and Hammond, with a possible extension southeast to St. John, all in Lake County, Indiana. The U.S. Fish and Wildlife Service (FWS) offers the following comments.

A coalition of the Northern Indiana Commuter Transportation District (NICTD), Town of Munster, and City of Hammond owns the abandoned right-of-way of the Monon Railroad between the 45th/Fisher Streets area in Munster and Sibley Street in Hammond and proposes using this corridor, in conjunction with the active CSX track, currently utilized by Amtrak and freight trains, south of 45th Street, as the primary route of the proposed commuter rail line. New tracks will be required beyond Sibley Street. Use of a portion of the existing South Shore Line (SSL) and Metra Electric District (MED) facilities or alternative existing rail lines between Hammond and Chicago will also be addressed. Several alternatives for a rail yard/maintenance facility will be considered, including near US 41 at St. John, near Main Street in Dyer, and at the site of the former Monon rail yard in southern Hammond.

There may be wetlands in the Fisher/45th Streets area in southern Munster because numerous other proposed developments in that area have encountered wetlands. However, we do not know what specific parcel has already been purchased by the NICTD/Munster/Hammond coalition in anticipation of a passenger station in that area, so we do not know if wetlands are involved or not. Wetland delineations will therefore be necessary in this area.

There may also be wetlands associated with the proposed crossings of the West Branch Little Calumet River, West Branch Grand Calumet River, and/or Calumet River/Calumet Sag Channel, depending upon the route chosen. The crossing of the West Branch Little Calumet will likely be at the site of the existing abandoned bridge, and a crossing of the Calumet River/Cal Sag Channel would be in the vicinity of the existing Indiana Harbor Belt (IHB) Railroad bridge in Burnham. The IHB route bisects Beaubien Woods Forest Preserve in Illinois, which contains numerous wetlands, including adjacent to the existing single railroad track; in Burnham, the IHB is also adjacent to wetlands, plus the Burnham Prairie Nature Preserve. Since entirely new tracks will be required in the downtown Hammond area to connect the old Monon right-of-way with the existing SSL tracks north of the West Branch Grand Calumet River, it is currently unknown where there may be a new crossing of the West Branch Grand Calumet.

The existing bridge over the West Branch Little Calumet River includes several piers within the river channel which are known to collect debris and contribute to flooding problems during high water events. Therefore, the DEIS needs to evaluate the impacts of leaving this bridge in place to serve the commuter line versus removing it and replacing it at the same site with a clear span bridge with no in-channel piers.

The FWS will request mitigation for wetland losses; the mitigation ratio for the loss of forested wetland is 4:1, with 2: or 3:1 for emergent and scrub-shrub wetlands. The U.S. Army Corps of Engineers, Chicago District, will have to determine whether or not a Section 404 permit would be required for the filling of wetlands due to the rail project. However, the Federal Transit Administration has an obligation to minimize the destruction, loss, or degradation of wetlands pursuant to Executive Order 11990, as amended by Executive Order 12608, concerning protection of wetlands, regardless of the need for a wetland fill permit.

Of particular concern to the FWS is the possibility of a new crossing of the West Branch Grand Calumet River in Hammond. The FWS, in conjunction with the other Natural Resources Trustees (Indiana Departments of Natural Resources and Environmental Management) has been working with the U.S. Environmental Protection Agency (EPA) to remediate the severely polluted sediments within both the West and East Branches of the Grand Calumet River in Indiana utilizing Great Lakes Legacy Act and the Great Lakes Restoration Initiative funding. This multi-year project has been proceeding along various distinct segments of the river, with the westernmost portion, Reaches 6 and 7 between Hohman Avenue and the State Line, being the last segment to be remediated within the West Branch Grand Calumet; permits have been received and work will begin shortly. The work involves dredging of some of the contaminated sediments and capping of the remaining sediments with a geosynthetic grid, organoclay, and/or granulated activiated carbon a minimum of 2 feet deep, topped with several feet of clean sand. Because of the dredging and capping, the Trustees are opposed to any construction activities that could compromise the integrity of the cap, including the placement of piers and abutments for a new railroad bridge. If it is determined by the FTA that a new bridge will be necessary to cross the West Branch Grand Calumet within Hammond, this bridge must be a clear span, with no

piers or abutments within the river channel. We are not aware of similar constraints to the construction of a new bridge over the river in Illinois, because to our knowledge the State of Illinois has not proposed to dredge and cap the river in that state.

Executive Order 13186, issued on January 10, 2001, directs each Federal agency taking actions having or likely to have a negative impact on migratory bird populations to work with the FWS to develop an agreement to conserve those birds under the Migratory Bird Treaty Act (MBTA). In addition to avoiding or minimizing impacts to migratory bird populations, agencies will be expected to take reasonable steps that include restoring and enhancing habitat and incorporating migratory bird conservation into agency planning processes whenever possible. Therefore, the DEIS you are preparing will need to address this issue. Included in the migratory bird issue is the presence of bald eagles nesting/attempting to nest within wetland and woodland habitats in the Grand Calumet/Cal-Sag Channel/Lake Calumet area in Illinois during the past 4-5 years. An adult eagle pair has attempted to nest at several locations in this area, but we do not have information about the success of the most recent nesting attempt, although the first several attempts were not successful. Bald eagles are protected by the MBTA and also by the Bald and Golden Eagle Protection Act; please refer to the National Bald Eagle Management Guidelines available on the U.S. Fish and Wildlife Service's Website.

As discussed in the Federal Transit Administration's October 1, 2014 letter to the U.S. Fish and Wildlife Service, our agency agrees to be a Participating Agency during the EIS process. Staff at our Northern Indiana Suboffice is available to attend the interagency meetings and/or field reviews and to provide early coordination comments on the proposal. Please address correspondence to Mrs. Elizabeth McCloskey, U.S. Fish and Wildlife Service, Northern Indiana Suboffice, P.O. Box 2616, Chesterton, Indiana 46304, phone (219) 983-9753, elizabeth_mccloskey@fws.gov.

ENDANGERED SPECIES

Lake County, Indiana is within the range of the Federally endangered Indiana bat (Myotis sodalis) and Karner blue butterfly (Lycaeides melissa samuelis), the proposed endangered northern long-eared bat (Myotis septentrionalis), and the threatened Pitcher's thistle (Cirsium pitcheri) and Mead's milkweed (Asclepias meadii). Cook County, Illinois is within the range of the Federally endangered piping plover (Charadrius melodus), Hine's emerald dragonfly (Somatochlora hineana), and leafy-prairie clover (Dalea foliosa), the proposed endangered northern long-eared bat, the threatened prairie bush clover (Lespedeza leptostachya), eastern prairie fringed orchid (Platanthera leucophaea), and Mead's milkweed, and the candidate eastern massasauga rattlesnake (Sistrurus catenatus) and rattlesnake-master borer moth (Papaipema eryngii). Also in Cook County there is designated Critical Habitat for the Hine's emerald dragonfly.

None of the Lake County listed species are known within the West Lake Corridor Project Study Area. Most of the Cook County listed species are also not known within the Corridor, including the Hine's emerald dragonfly and its Critical Habitat. However, we do not know the status of some of the species within the Forest Preserves, Nature Preserves, and other protected habitats within the Corridor.

We appreciate the opportunity to provide input during this environmental scoping process. If you have any questions about our comments, please contact Elizabeth McCloskey at (219) 983-9753 or elizabeth_mccloskey@fws.gov.

Sincerely yours,

Elizabeth S. McCloskey

Acting for Scott E. Pruitt
Supervisor

cc: Regional Director, FWS, Ft. Snelling, MN (HC/EC/NWI) (ER 14/0622)
USDI, Office of Environmental Policy and Compliance, Washington, DC. (PEP/NRM)
Shawn Cirton, USFWS, Chicago Field Office, Barrington, IL
Carl Wodrich, IDNR, Land Acquisition, Indianapolis, IN
Lori White, IDNR, Regional Environmental Biologist, West Lafayette, IN
Christie Stanifer, IDNR, Environmental Coordinator, Indianapolis, IN
Marty Maupin, IDEM, Office of Water Quality, Indianapolis, IN
Paul Leffler, USACE, Regulatory Branch, Chicago, IL
Kenneth Westlake, USEPA, NEPA Implementation Section, Chicago, IL

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-17897 **Request Received:** October 6, 2014

Requestor:
US Department of Transportation
Mark Assam
Federal Transit Administration
200 West Adams Street, Suite 320
Chicago, IL 60606-5253

Project: West Lake Corridor Project, Lake Co., IN and Cook Co., IL EIS: new track improvements, four (4) new stations, and a maintenance facility along a 9 mile southern extension along the Northern Indiana Commuter Transportation District (NICTD) existing South Shore Line (SSL) between Dyer and Hammond, IN

County/Site info: Lake

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Regulatory Assessment: This proposal may require the formal approval of our agency pursuant to the Flood Control Act (IC 14-28-1) for any proposal to construct, excavate, or fill in or on the floodway of a stream or other flowing waterbody which has a drainage area greater than one square mile, or the Lake Preservation Act (IC 14-26-2) for any construction that will take place at or lakeward of the legal shoreline of a public freshwater lake. Please submit more detailed plans to the Division of Water's Technical Services Section if you are unsure whether or not a permit will be required.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
This project does not impact any DNR owned nature preserves. Also, no plant or animal species listed as state or federally threatened, endangered, or rare have been reported to occur within the proposed corridor. However, a historical record of the northern leopard frog (Lithobates pipiens), a state species of special concern, and a wet-mesic sand prairie "between EJE Railroad and Conrail Railroad tracks" near Dyer about 0.4 mile east of project, have been documented with 1/2 mile of the proposed corridor.

This review is based on the current proposed alignment. Once stations and maintenance sites are determined, or if the proposed alignment is changed, further review and comments may be needed.

Fish & Wildlife Comments: We do not foresee any impacts to the Northern leopard frog as a result of this project.

Avoid and minimize impacts to fish, wildlife, and botanical resources to the greatest extent possible, and compensate for impacts. The following are recommendations that address potential impacts identified in the proposed project area:

1) Stream Crossings:
Utilizing existing structures will produce fewer impacts to streams, wetlands, and surrounding habitats. If the rehabilitation of an existing structure is not feasible, consider the following:

Using a three span structure without piers within the Little Calumet River could provide benefits to the river by removing the existing structure and piers and allowing the river to flow unobstructed. Locating a new structure within the footprint of the existing structure and minimizing impacts to surrounding habitat will aid to further minimize impacts to the river, wetlands, and surrounding habitat.

For purposes of maintaining fish passage through a crossing structure, the Environmental Unit recommends bridges rather than culverts and bottomless culverts rather than box or pipe culverts. Wide culverts are better than narrow culverts, and culverts with shorter through lengths are better than culverts with longer through lengths. If box or pipe culverts are used, the bottoms should be buried a minimum of 6" (or 20% of the culvert height/pipe diameter, whichever is greater up to a maximum of 2') below the stream bed elevation to allow a natural streambed to form within or under the crossing structure. Crossings should: span the entire channel width (a minimum of 1.2 times the bankful width); maintain the natural stream substrate within the structure; have a minimum openness ratio (height x width / length) of 0.25; and have stream depth and water velocities during low-flow conditions that are approximate to those in the natural stream channel.

2) Bank Stabilization:
Establishing vegetation along the banks is critical for stabilization and erosion control. In addition to vegetation, some other form of bank stabilization may be needed. While hard armoring alone (e.g. riprap or glacial stone) may be needed in certain instances, soft armoring and bioengineering techniques should be considered first. In many instances, one or more methods are necessary to increase the likelihood of vegetation establishment. Combining vegetation with most bank stabilization methods can provide additional bank protection while not compromising the benefits to fish and wildlife. Information about bioengineering techniques can be found at http://www.in.gov/legislative/iac/20120404-IR-312120154NRA.xml.pdf. Also, the following is a USDA/NRCS document that outlines many different bioengineering techniques for streambank stabilization: http://directives.sc.egov.usda.gov/17553.wba.

The new, replacement, or rehabbed structure, and any bank stabilization under or around the structure, should not create conditions that are less favorable for wildlife passage under the structure compared to the current conditions. A level area of natural ground under the structure is ideal for wildlife passage. If hard armoring is needed, we recommend a smooth-surfaced material such as articulated concrete mats (or riprap at the toe and turf reinforcement mats above the riprap toe protection) be placed on the side-slopes instead of riprap. Such materials will not impair wildlife movement along the banks under the bridge.

Riprap must not be placed in the active thalweg channel or placed in the streambed in a manner that precludes fish or aquatic organism passage (riprap must not be placed above the existing streambed elevation). Riprap may be used only at the toe of the sideslopes up to the ordinary high water mark (OHWM). The banks above the OHWM must be restored, stabilized, and revegetated using geotextiles and a mixture of grasses, sedges, wildflowers, shrubs, and trees native to Northern Indiana and specifically for stream bank/floodway stabilization purposes as soon as possible upon completion.

3) Riparian Habitat:
We recommend a mitigation plan be developed (and submitted with the permit application, if required) if habitat impacts will occur. The DNR's Floodway Habitat Mitigation guidelines (and plant lists) can be found online at: http://www.in.gov/legislative/iac/20140806-IR-312140295NRA.xml.pdf.

Impacts to non-wetland forest over one (1) acre should be mitigated at a minimum 2:1 ratio. If less than one acre of non-wetland forest is removed in a rural setting, replacement should be at a 1:1 ratio based on area. Impacts to non-wetland forest under one (1) acre in an urban setting should be mitigated by planting five trees, at least 2 inches in diameter-at-breast height (dbh), for each tree which is removed that is 10" dbh or greater (5:1 mitigation based on the number of large trees).

Remediation efforts along the west and east branches of the Grand Calumet River under the Great Lakes Legacy Act and Great Lakes Restoration Initiative have been on-going, and the last segment of remediation work along the Grand Calumet River from Hohman Avenue to the state line will begin soon. Any work proposed within the Grand Calumet River floodway for this project should avoid impacts to any mitigation planting areas from the remediation project.

4) Wetlands:
A formal wetland delineation should be conducted in order to determine the presence of and extent of any wetland habitat within the project corridor. Impacts should be avoided and minimized to the greatest extent possible.
Due to the presence or potential presence of wetlands on site, we recommend contacting and coordinating with the Indiana Department of Environmental Management (IDEM) 401 program and also the US Army Corps of Engineers (USACE) 404 program. Impacts to wetlands should be mitigated at the appropriate ratio (see guidelines above).

5) Exposed Soils:
All exposed soil areas must be stabilized with temporary or permanent vegetation by November 1. Between November 1 and April 1, all exposed soils idle for longer than 7 days must be stabilized with erosion control blankets or with a bonded fiber matrix hydro-mulch. Sites must be protected from seasonal flooding by keeping traffic areas covered with stone and soil stockpiles seeded, stable and contained with silt fencing.

The additional measures listed below should be implemented to avoid, minimize, or compensate for impacts to fish, wildlife, and botanical resources:
1. Revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion.
2. Minimize and contain within the project limits inchannel disturbance and the clearing of trees and brush.
3. Do not work in the waterway from April 1 through June 30 without the prior written approval of the Division of Fish and Wildlife.
4. Do not cut any trees suitable for Indiana bat roosting (greater than 3 inches dbh, living or dead, with loose hanging bark) from April 1 through September 30.
5. Do not excavate in the low flow area except for the placement of piers, foundations, and riprap, or removal of the old structure.
6. Do not construct any temporary runarounds, causeways, or cofferdams.
7. Use minimum average 6 inch graded riprap stone extended below the normal water level to provide habitat for aquatic organisms in the voids.
8. Do not use broken concrete as riprap.
9. Minimize the movement of resuspended bottom sediment from the immediate project area.
10. Do not deposit or allow demolition materials or debris to fall or otherwise enter the waterway.
11. Appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized.
12. Seed and protect all disturbed streambanks and slopes that are 3:1 or steeper with

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

erosion control blankets (follow manufacturer's recommendations for selection and installation); seed and apply mulch on all other disturbed areas.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Date: November 7, 2014

Christie L. Stanifer
Environ. Coordinator
Division of Fish and Wildlife

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-17897-1 **Request Received:** December 14, 2016

Requestor: Northern Indiana Commuter Transportation District
Nicole Barker
33 East US Highway 12
Chesterton, IN 46304-3521

Project: West Lake Corridor Project, Lake Co., IN and Cook Co., IL DEIS: new track improvements, four (4) new stations, and a maintenance facility along a 9 mile southern extension along the Northern Indiana Commuter Transportation District (NICTD) existing South Shore Line (SSL) between Dyer and Hammond, IN

County/Site info: Lake

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Fish & Wildlife Comments: All of the recommendations in our previous letter dated November 7, 2014, still apply; however, we offer the following additional comments:

The alternatives that were evaluated had varying levels of environmental impact. Of the proposals that were evaluated, the selected proposal seems to be the alternative that will minimize impacts to fish, wildlife, and botanical resources, while still achieving the stated goals of the project.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Christie L. Stanifer **Date:** February 3, 2017

Christie L. Stanifer
Environ. Coordinator
Division of Fish and Wildlife

Appendix B. Exhibit 1

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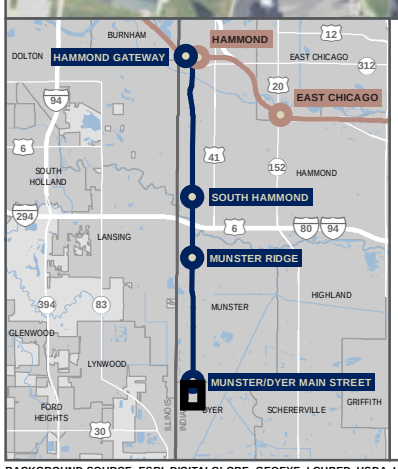
Habitat unit H01 - Wetland 9
Catalpa speciosa - state rare
Identified in 2015

W9

W9

Eagle Ct
Blue Jay Way
Oriole Ct
Seminary Dr
Swan Dr
Sheffield Ave
205th Pl
Pierce Ave
Northgate Dr
Polk Ave
Tyler Ave
Barberry Dr

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands

Habitat Description

Miscellaneous developed land
Unmaintained field with scattered trees

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

0 200
FEET

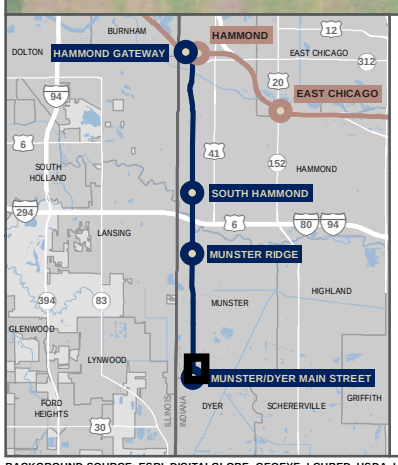
WEST LAKE CORRIDOR

SHEET 1 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Jenna Dr
Andrew Ln
Barbara Ln
Carnaby Pl
61.8
61.7
Donna Dr
Whitehall Garden
Mayfair Ct
Allison Dr
Lucy Ln
Columbia Ave
Sheffield Ave
61.6
Knightbridge Ct
W39
Habitat unit H02 - Wetland 38
Carex bebbii - state threatened
Identified in 2015
W38
61.5
Megan Way
61.4
MUNSTER/DYER MAIN STREET
Main St E 53rd Ave 205th St
F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands

Habitat Description

Agricultural field with emergent wetland
Ditch forested wetland and associated upper bank
Miscellaneous developed land
Undeveloped residential lots

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N
0 200
FEET

WEST LAKE CORRIDOR

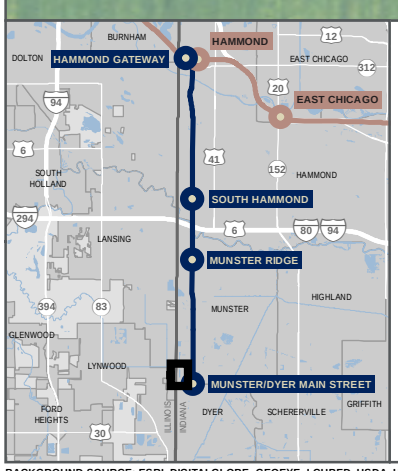
SHEET 2 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Exeter Rd
Margo Ln
Carnaby Pl
New Devon St
Westminster Pl
Mayfair Way
Paddington Cres
Knightbridge Pl
W39
W40
Rose Bush Ln

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands

Habitat Description

- Agricultural field with emergent wetland
- Ditch forested wetland and associated upper bank
- Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200
FEET

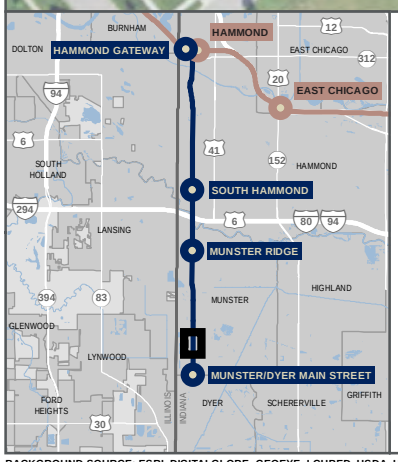
WEST LAKE CORRIDOR

SHEET 3 OF 18

Data for Reference Only

Glastonbury St
Whitehall Garden
Milford Haven Way
Leicester Dr
St Ives Ct
Margo Ln
Lands End
Salisbury Dr
Norwich Ct
Cornwall Cir
Norwich Dr
Exeter Rd
Indiana Pkwy
Progress Ave
Otis Bowen Dr
Jenna Dr
62.3
W12
62.2
62.1
62
W11R
61.9
W11L

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands

Habitat Description

Disturbed young growth woodland
Ditch emergent wetland
Miscellaneous developed land
Undeveloped residential lots
Unmaintained field

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

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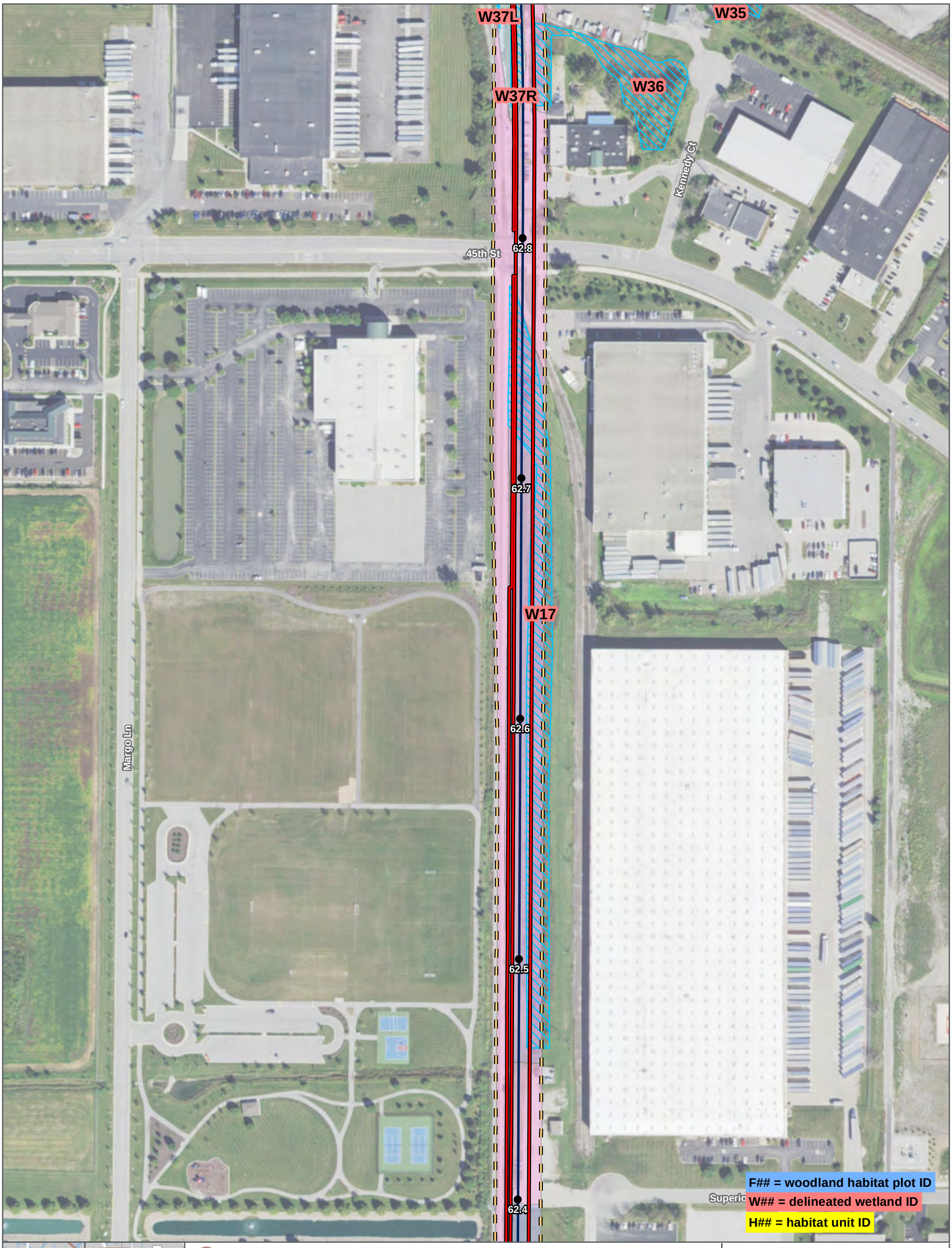
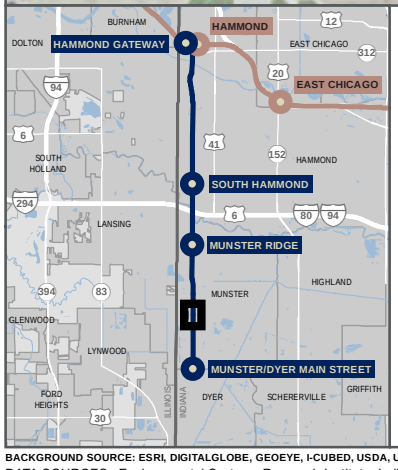
WEST LAKE CORRIDOR

SHEET 4 OF 18

Data for Reference Only





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands

Habitat Description

- Disturbed abandoned Monon railroad and wetlands
- Disturbed emergent wetland
- Ditch emergent wetland
- Miscellaneous developed land
- Unmaintained field

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200
FEET

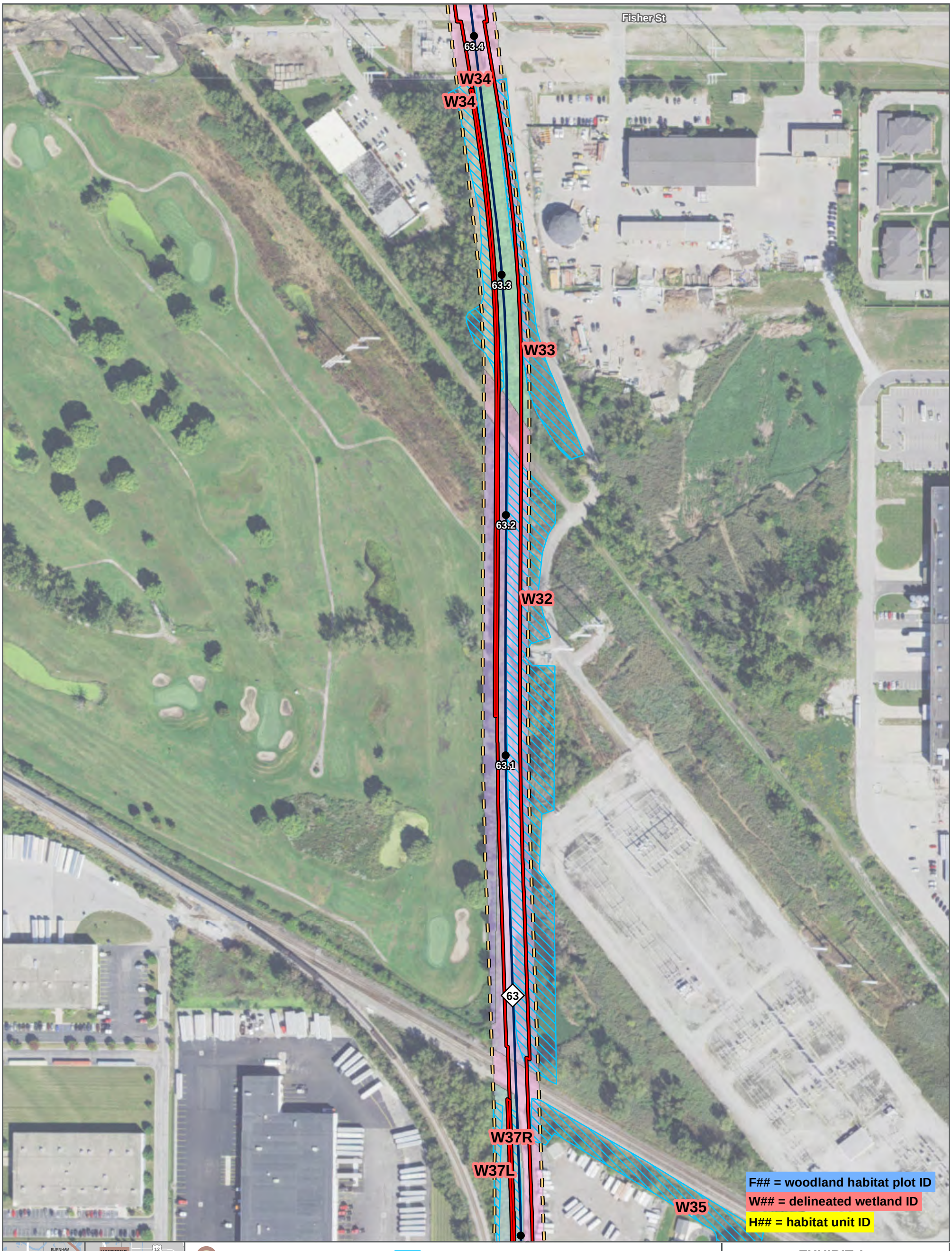
WEST LAKE CORRIDOR

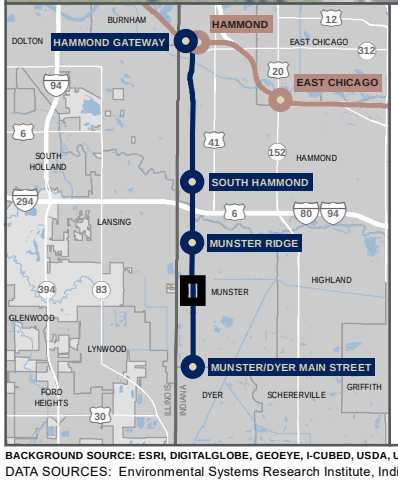
SHEET 5 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands

OCTOBER 23, 2017

Habitat Description

- Disturbed abandoned Monon railroad and wetlands
- Disturbed ditch with associated tree row
- Disturbed emergent wetland
- Disturbed forested wetland
- Disturbed scrub on abandoned Monon railroad tracks
- Miscellaneous developed land

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200
FEET

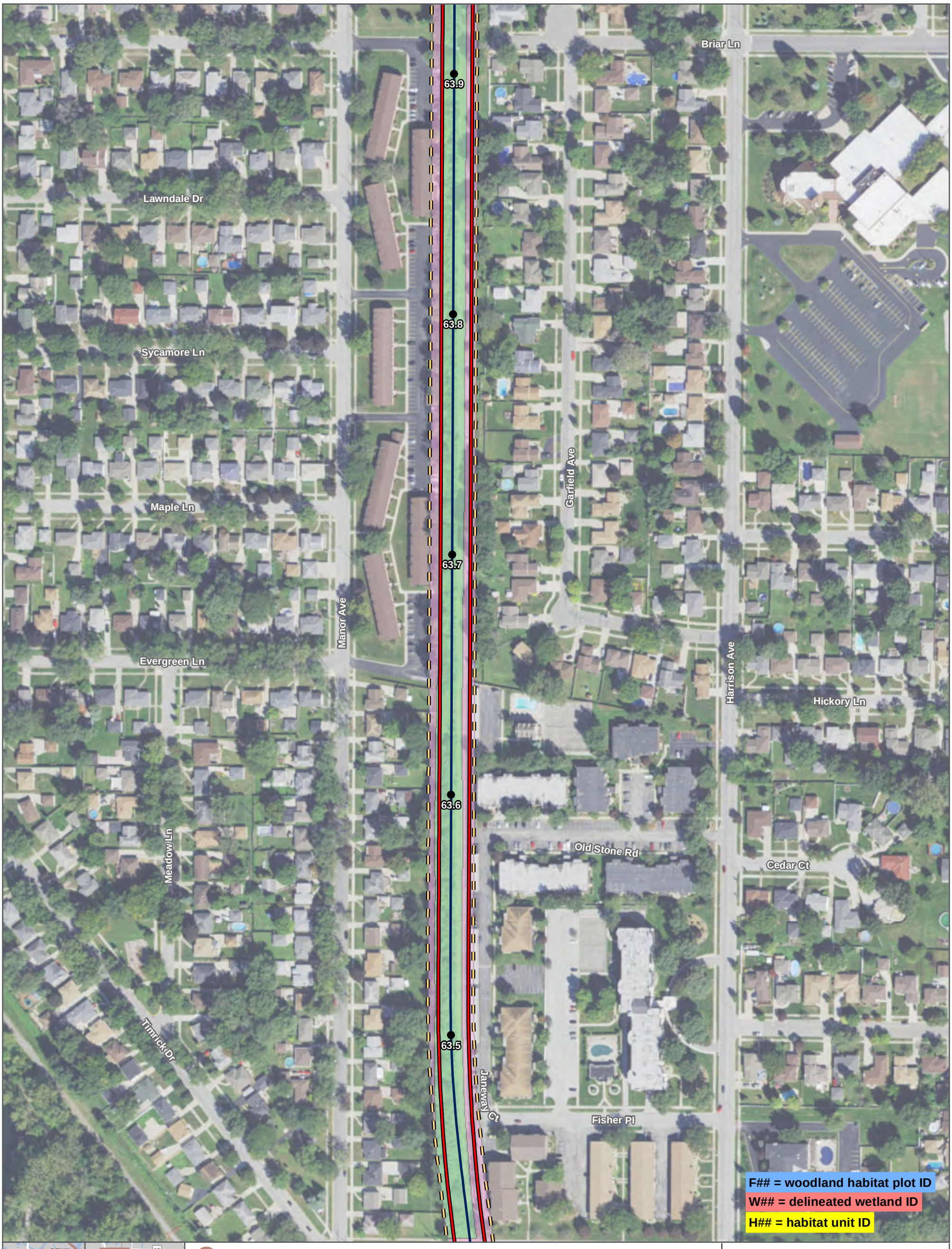
WEST LAKE CORRIDOR

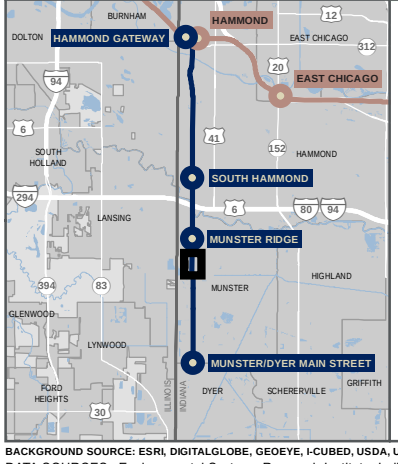
SHEET 6 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint

Habitat Description

- Disturbed woodland and maintained green space
- Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

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FEET

WEST LAKE CORRIDOR

SHEET 7 OF 18

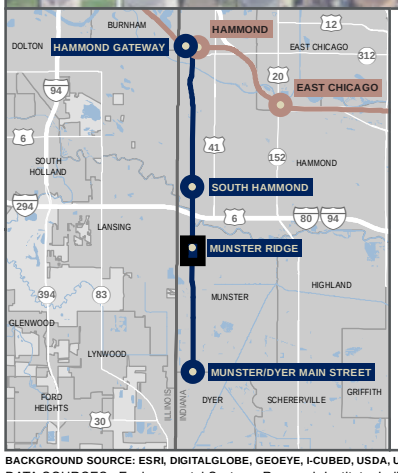
Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Broadmoor Ave
64.4
64.3
Meadow Ln
Highland Pl
Manor Ave
Frederick Ave
Van Buren Ave
30th St
MUNSTER RIDGE
30th Pl
64.2
Seberger Dr
Ridge Rd
64.1
Habitat unit H17
Pinus strobus - state rare
Identified in 2017
Terrace Dr
South St
Harrison Ave
64
Sunset Ln

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Habitat Description

Disturbed woodland and maintained green space
Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

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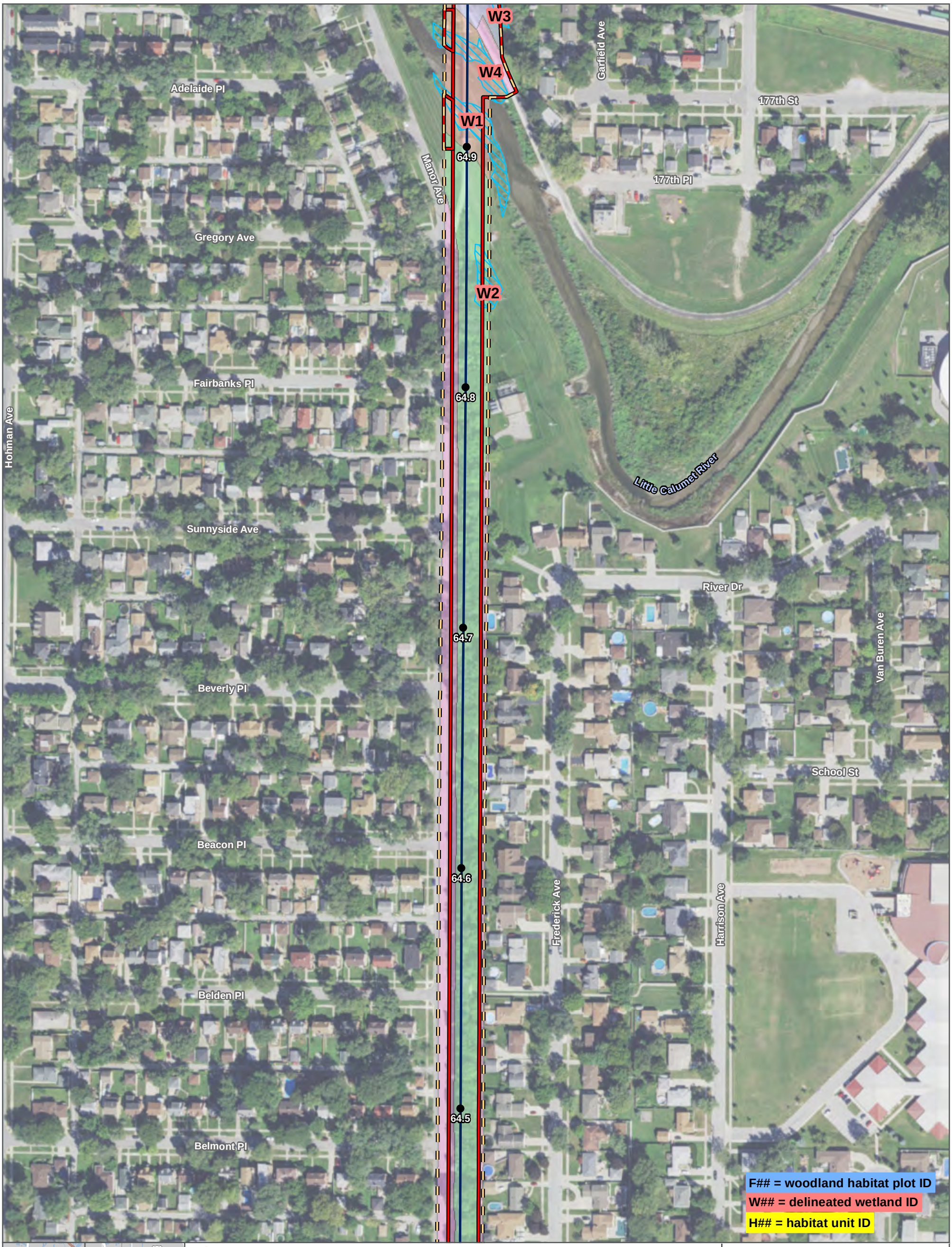
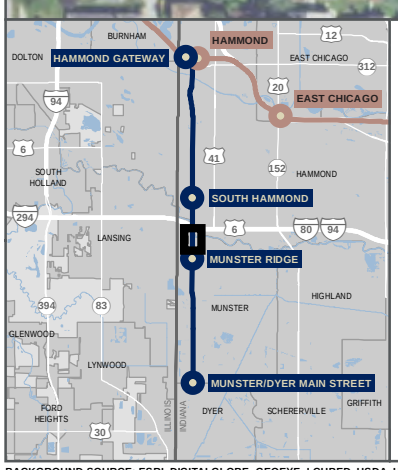
WEST LAKE CORRIDOR

SHEET 8 OF 18

Data for Reference Only





Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands

Habitat Description

Disturbed field and woodland
Disturbed herbaceous floodplain and upper bank
Disturbed woodland and maintained green space
Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

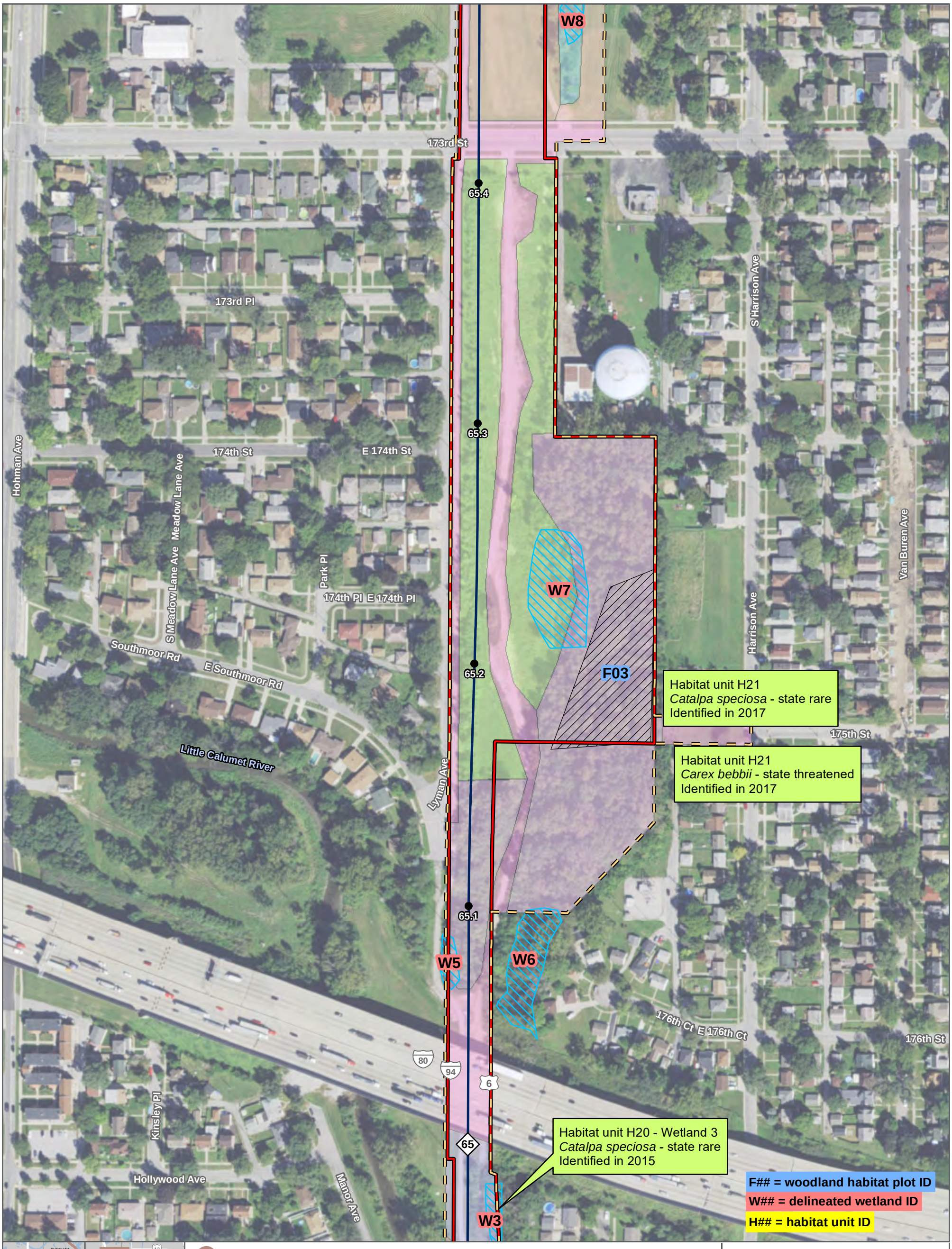
0 200
FEET

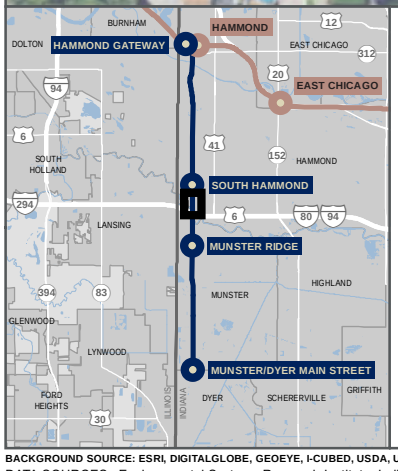
WEST LAKE CORRIDOR

SHEET 9 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland survey boundary

Habitat Description

Disturbed field and woodland
Disturbed forested wetland and mesic woods
Disturbed herbaceous floodplain and upper bank
Disturbed mesic woods
Maintained green-space field and tree row
Miscellaneous developed land
Unmaintained field with associated tree row

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200
FEET

WEST LAKE CORRIDOR

SHEET 10 OF 18

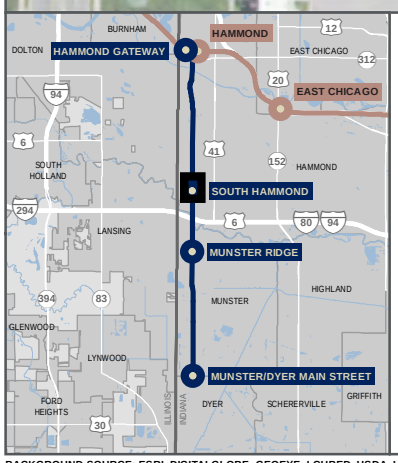
Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Fernwood St
Cherry St
169th St
65.9
Lawndale St
F01
65.8
170th St E 170th St
Ben Levin Dr
Meadow Lane Ave
Coolidge St
Hohman Ave
Lyman Ave
Harrison Ave
Van Buren Ave
65.7
171st St
SOUTH HAMMOND
65.6
172nd St E 172nd St
W10
F02
W8
65.5

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland survey boundary

Habitat Description

Disturbed forested wetland and mesic woods
Maintained green-space field and tree row
Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

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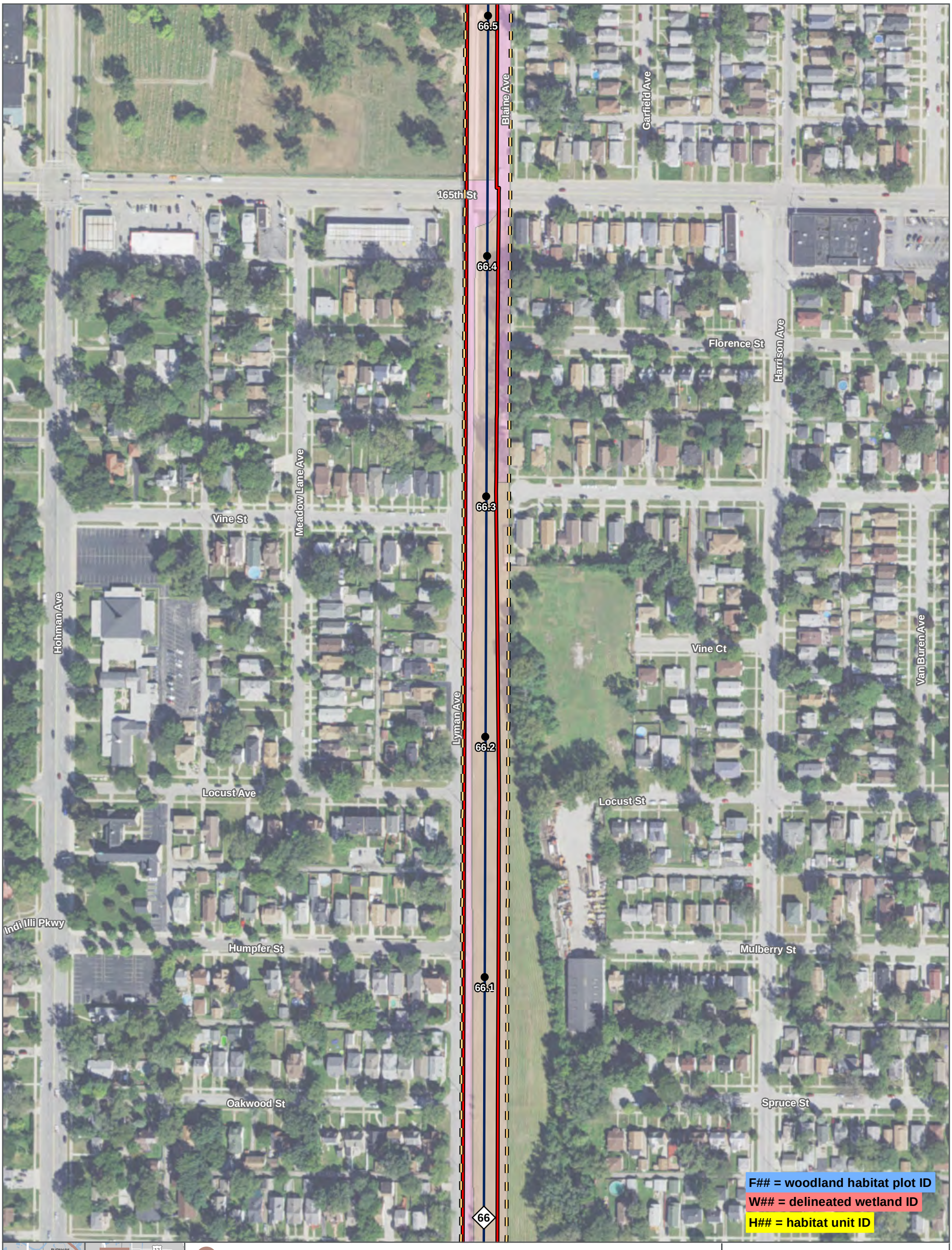
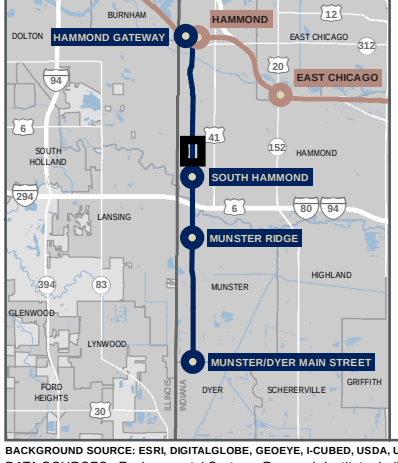
FEET

WEST LAKE CORRIDOR

SHEET 11 OF 18

Data for Reference Only





Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Habitat Description

Maintained green-space field and tree row
Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

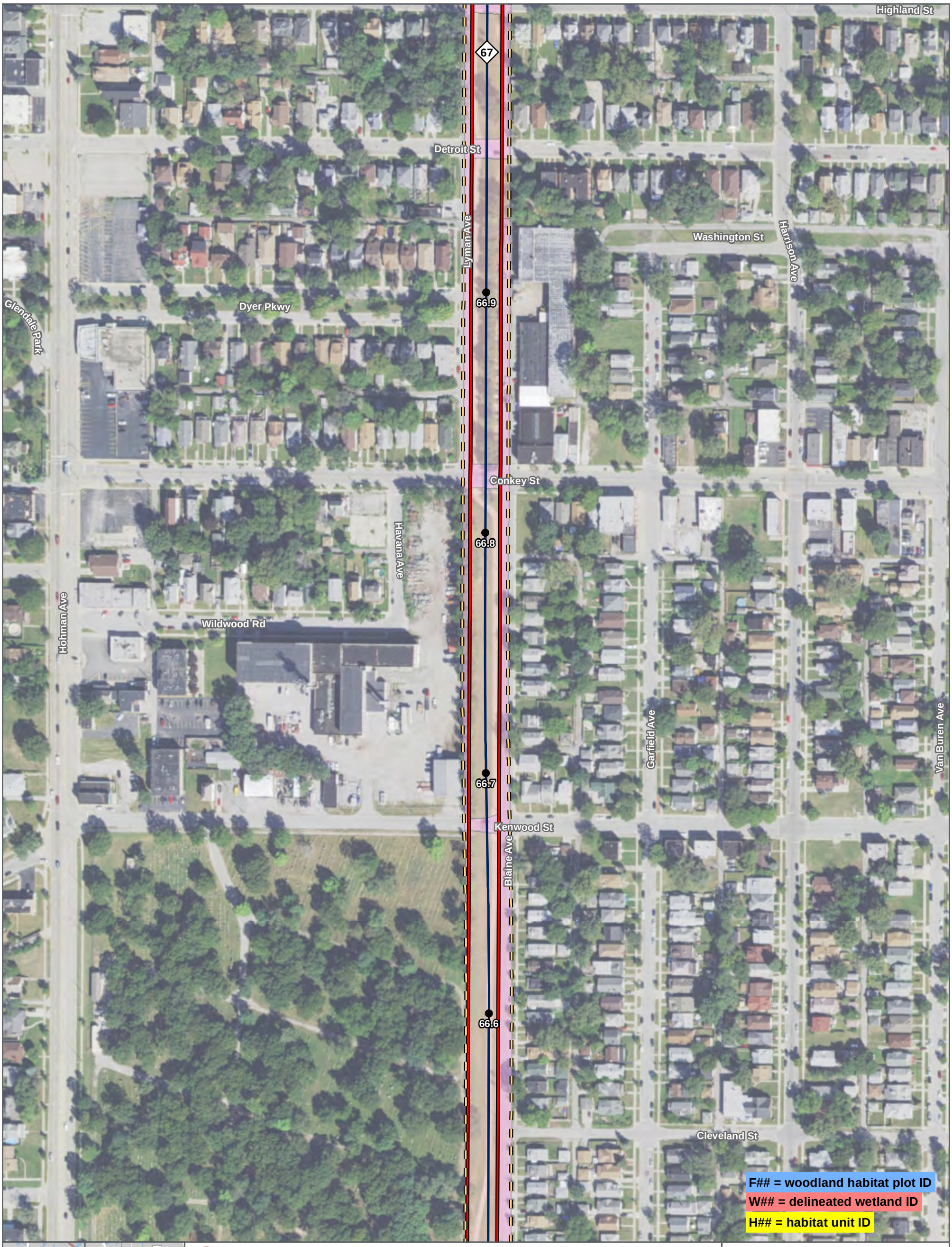
0 200
FEET

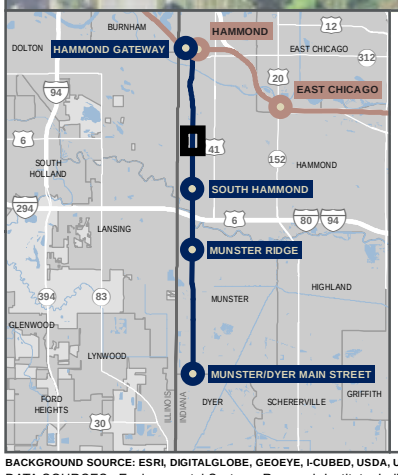
WEST LAKE CORRIDOR

SHEET 12 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint

Habitat Description

- Maintained green-space field and tree row
- Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200

FEET

WEST LAKE CORRIDOR

SHEET 13 OF 18

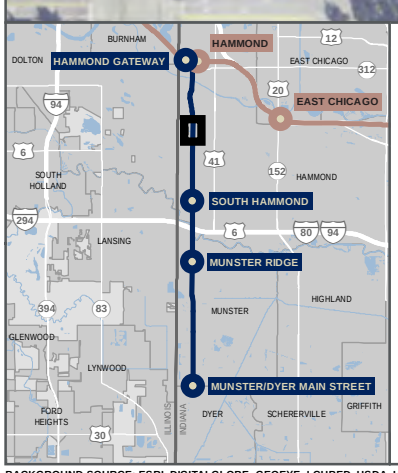
Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Williams St
Carroll St
Webb St
Warren St
Hohman Ave
Mason St
Ruth St
Elizabeth St
Hyslop Pl
Park Pl
Waltham St
Lyman Ave
Blaine Ave
Harrison Ave
Lewis St
Hyles Blvd
Hyles Ave
Hyles Ct
Pointe Dr
67.5
67.4
67.3
67.2
67.1

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Habitat Description

Maintained green-space field and tree row
Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

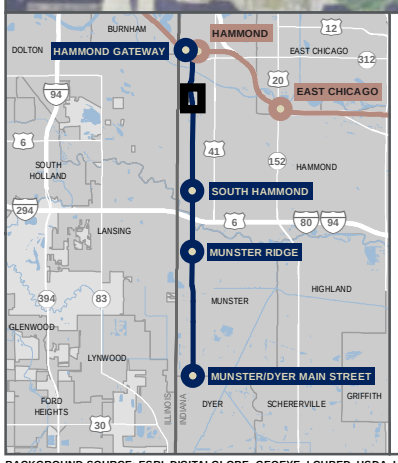
0 200
FEET

WEST LAKE CORRIDOR

SHEET 14 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Habitat Description

Maintained green-space field
Maintained green-space field and tree row
Miscellaneous developed land

OCTOBER 23, 2017

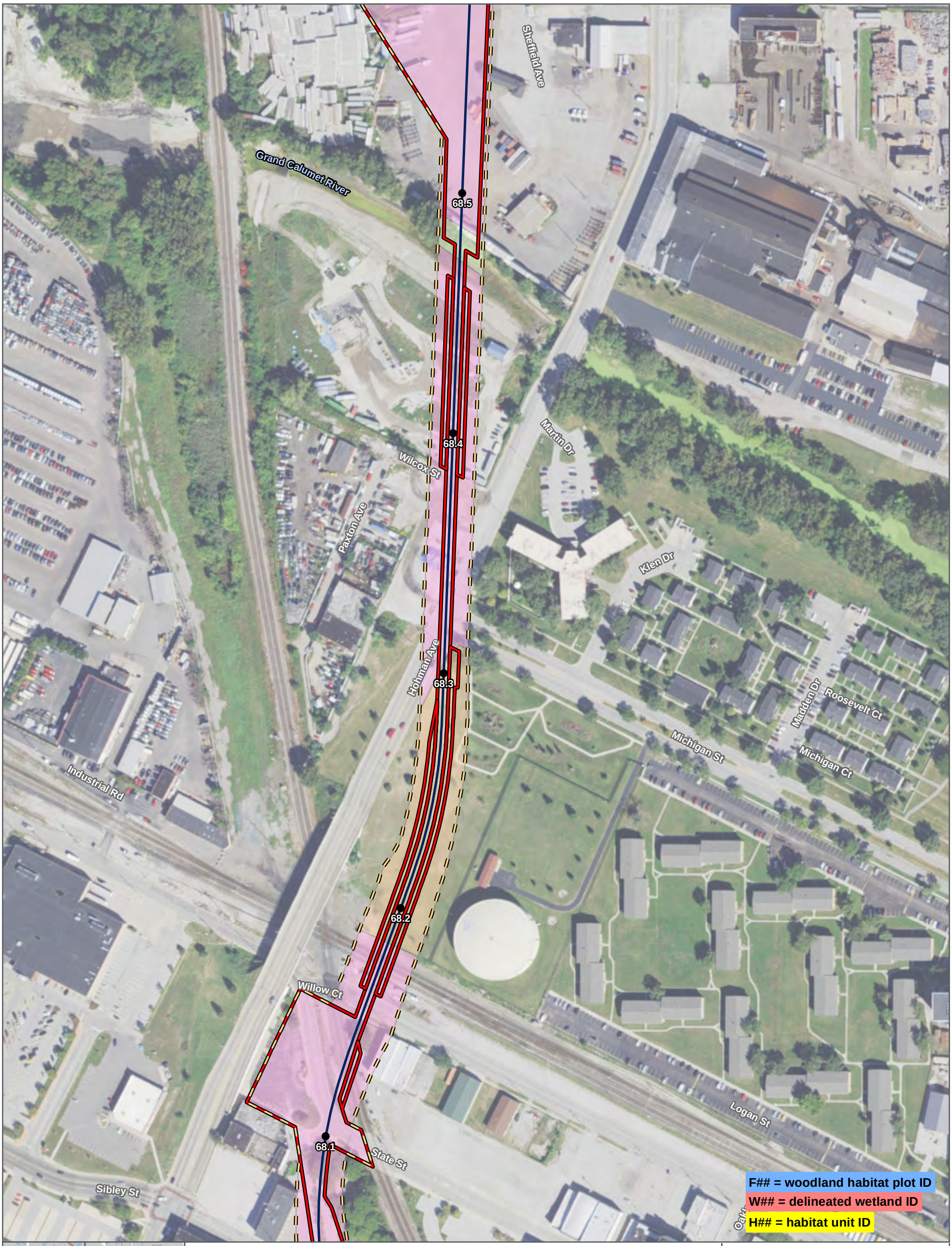
EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

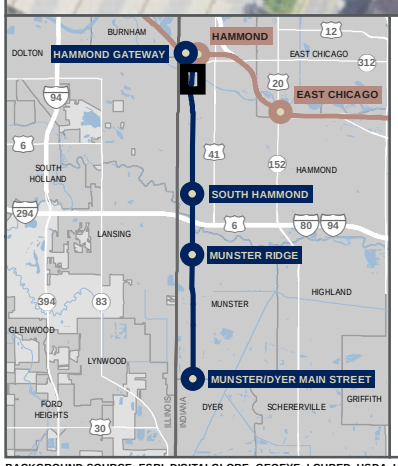
N

0 200
FEET

WEST LAKE CORRIDOR

Data for Reference Only





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint

Habitat Description

- Disturbed narrow riparian woods
- Maintained green-space field
- Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

0 200
FEET

WEST LAKE CORRIDOR

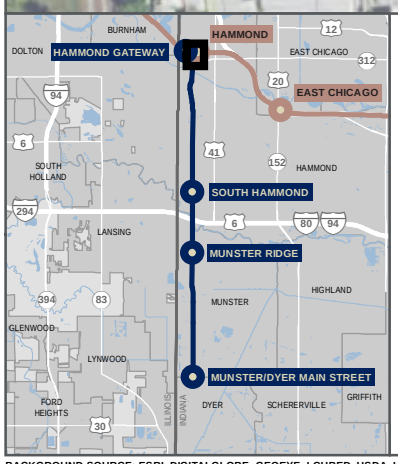
SHEET 16 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Huehn St
Grover Ave
Gostlin St
Wabash Ave
Brunswick St
HAMMOND
68.9
Hanover St
Sheffield Ave
Hohman Ave
Hudson St
68.8
312
Marble St
68.7
Chicago St
Towle Ave
Cameron Ave
68.6
Hoffman St

F## = woodland habitat plot ID
W## = delineated wetland ID
H## = habitat unit ID



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Habitat Description

Miscellaneous developed land

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

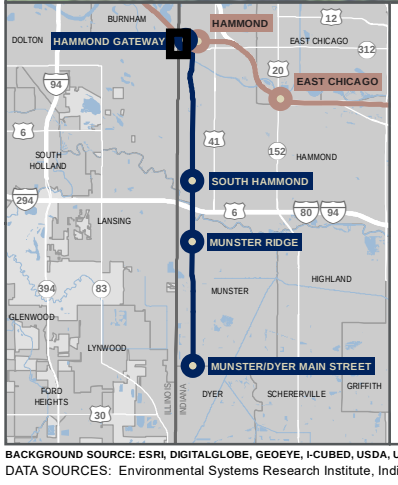
0 200
FEET

WEST LAKE CORRIDOR

SHEET 17 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service



Existing Station

Proposed Station

Existing South Shore Line

FEIS Preferred Alternative

Milepost

Milepost Stationing

Environmental Survey Area

Project Footprint

Habitat Description

Miscellaneous developed land

Unmaintained field with scattered trees

OCTOBER 23, 2017

EXHIBIT 1: VEGETATION COMMUNITY TYPE AND WOODLAND SURVEY PLOT LOCATION MAP

N

0 200

FEET

WEST LAKE CORRIDOR

SHEET 18 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Appendix C. Floristic Quality Assessment Habitat Units: Metrics

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Appendix C Floristic Quality Assessment, Mean C Value, and Species Richness for Habitat Units within NICTD West Lake Environmental Survey Area

Habitat Unit Code	MP Stations	Limits	Habitat Unit Description	Included Wetlands	Environmental Survey Area (acres)	FQI		Mean C		Species Richness		
						All species	Native Species	All species	Native Species	All species	Native Species	Species per acre
H01	0.00-64.10	Sheffield Avenue	unmaintained field w/ scattered trees	W9	1.7343	16.98	27.19	2.06	3.59	70	40	40.4
H02	61.40-61.54	Ditches west of CSX railroad	ditch wetland and associated upper bank	W38, W39	1.8331	13.91	22.56	1.64	3.11	75	41	42.2
H03[1]	64.40-61.53	West of CSX railroad south of Knightbridge Court	agricultural field w/ emergent wetland	W40	25.7332	5.29	5.72	2.0	2.33	7	6	NA
H04	61.40-61.91 62.00-62.10	Between Allison Drive and CSX railroad	undeveloped residential lots	W11	8.5279	9.99	20.39	1.49	2.79	49	28	6.2
H05	61.91-62.33	Along CSX railroad north of Jenna Drive	disturbed young growth woods		1.2839	4.80	15.18	0.96	2.40	26	11	21.9
H06	62.10-62.34	North and south of Progress Avenue east of CSX railroad	ditch emergent wetland	W12	2.2214	10.96	23.91	2.03	2.81	30	22	13.5
H07	62.34-62.45	East of CSX railroad south of Superior Avenue	disturbed field		0.5308	Inventory survey not warranted due to disturbance from mowing						
H08	62.45-62.78	South of 45th Street east of CSX railroad	ditch emergent wetland	W17	2.9578	5.55	18.49	1.54	2.22	16	12	5.4
H09	62.85-62.89	North of 45th Street east of access road	disturbed emergent wetland	W36	0.1239	8.14	27.14	2.45	3.00	11	9	88.8
H10	62.85-62.97	North of 45th Street east and west of abandoned Monon railroad	disturbed abandoned Monon railroad and associated ditch wetlands	W37L,W37R	0.7140	6.67	17.23	1.39	2.13	25	17	35.0
H11	62.94-62.95	South of railroad east of access road	disturbed emergent wetland	W35	0.0508	3.40	11.32	0.82	1.56	17	9	334.6
H12	62.97-63.23	East edge of golf course	disturbed ditch w/ associated tree row		0.8205	Inventory survey not conducted due to heavy debris in ditch						
H13	62.97-63.23	North of railroad west of substation	disturbed emergent wetland	W32	2.3054	1.73	10.00	1.00	1.00	3	3	1.3
H14	63.26-63.38	West of abandoned Monon railroad south of Fisher Street	disturbed forested wetland	W34	0.5350	9.86	25.47	2.26	2.87	19	15	35.5
H15	63.24-63.38	South of Fisher Street	disturbed scrub on abandoned Monon railroad		0.8159	Inventory survey not conducted due to heavy cover of honeysuckle gush						
H16	63.26-63.26	East of abandoned Monon railroad south of Fisher Street	disturbed emergent wetland	W33	0.2626	5.42	16.35	1.28	2.09	18	11	68.5
H17	63.41-64.14	Abandoned Monon railroad between Fisher Street and Ridge Road	disturbed woodland and maintained green space		4.9988	11.96	18.69	1.23	2.83	100	44	20.0
H18	64.16-64.89	Abandoned Monon railroad between Ridge Road and Gregory Street	disturbed woodland and maintained green space	W2	5.0149	18.57	27.99	2.10	3.73	84	48	16.8
H19	64.89-64.95	Little Calmuet River	herbaceous floodplain and associated upper bank	W1, W4	0.7085	11.38	18.96	1.42	2.53	66	38	103.2
H20	64.95-65.00	Little Calumet River to I-80	disturbed herbaceous and woodland	W3	0.6945	11.24	18.73	1.37	2.56	67	36	112.6
H21	65.05-65.15	East of Lyman Avenue north of I-80	disturbed mesic woods	W5,W6, W7	6.6525	17.80	22.25	1.80	2.78	100	64	15.1
H22	65.15-65.41	East of Lyman Avenue north between I-80 and 173rd Street	unmaintained field and associated tree row	W7	4.9357	9.75	17.24	1.22	2.44	69	36	14.0
H23	65.43-65.92	173rd Street to 165th Street	maintained green space field and associated tree row		16.7896	8.20	18.82	1.16	3.05	52	21	3.1
H24	65.43-65.92	173rd Street to 169th Street	mesic and wetland woods	W8, W10	5.2922	17.87	23.37	1.74	2.97	112	66	21.2
H25	66.43-67.14	165th Street to Waltham Street	maintained green space field and associated tree row		5.4216	15.75	23.48	2.03	4.52	66	29	12.4
H26	67.15-67.75	Waltham Street to Douglas Street	maintained green space field and associated tree row		6.2049	10.02	18.60	1.22	2.83	71	33	11.9
H27	67.76-68.03	Douglas Street to Sibley Street	maintained green space field		1.9200	Inventory survey not warranted due to disturbance from mowing						
H28	68.18-68.31	Michigan Street Park	maintained green space field and associated tree row		1.6607	6.65	25.15	1.53	4.14	19	7	11.4
H29	68.47-68.48	Grand Calumet River north bank	narrow riparian woods		0.1679	4.81	12.86	0.93	1.79	28	14	166.8
H30	69.00-69.10	Southwest of Brunswick Street	unmaintained field w/ scattered trees		1.7777	16.02	23.88	1.91	2.98	73	47	41.1

[1] Inventory for H03 limited to species documented for Wetland 40 in 2015. Weedy species in agricultural field not inventoried.

Red shading indicates habitat units for which FQA vegetation inventories were not conducted in the summer of 2016. These areas will be accessed in Spring 2017.

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Appendix D. Floristic Quality Assessment Habitat Units: Inventory

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Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
Acer negundo	Ash-Leaf Maple	FAC			2015 2017											2017	2015 2017	2017	2017	2015 2017	2017		2017	2017	2017		2017	2017
Acer rubrum	Red Maple	FAC																						2017				
Acer saccharinum	Silver Maple	FACW		2015 2017	2015 2017							2017				2017		2017	2017	2017	2017	2017	2015 2017	2017	2017	2017		2017
Acer saccharum	Sugar Maple	FACU															2017		2015			2017			2017	2017		2017
Achillea millefolium	Common Yarrow	FACU		2017												2017					2017	2017				2017		2017
Aesculus glabra	Ohio Buckeye	FAC														2017	2017						2017					
Aesculus glabra	Ohio Buckeye	FAC																							2017			
Aesculus hippocastanum	Horse Chestnut	UPL														2017				2017								
Ageratina altissima	White Snakeroot	FACU																							2017			
Agrimonia parviflora	Harvestlice	FACW		2017																								
Agrostis gigantea	Black Bent	FACW																2015										
Ailanthus altissima	Tree-of-Heaven	FACU														2017	2017		2017	2017		2017	2017	2017	2017		2017	2017
*Albizia julibrissin**																				2017								
Alisma subcordatum	American Water-Plantain	OBL																						2015				
Alisma triviale	Northern Water-Plantain	OBL																		2015								
Alliaria petiolata	Garlic-Mustard	FAC			2017											2017	2017	2017	2017	2017		2017	2017	2017	2017		2017	2017
*Allium ampeloprasum**																								2017				
Allium cernuum	Nodding Onion	FACU																					2015					
*Allium giganteum**																								2017				
*Allium porrum**																							2017					
*Allium sp.**																	2017				2017	2017	2017		2017			
Ambrosia artemisiifolia	Annual Ragweed	FACU							2017		2017							2017										2017
Ambrosia trifida	Great Ragweed	FAC														2017		2017	2015				2015					2017
Ammannia robusta	Grand Redstem	OBL									2017																	
Ampelopsis cordata	Turquoise-Berry	UPL																					2017					
Andropogon virginicus	Broom-Sedge	FACU																						2017				2017
Apocynum cannibinum	Indian-Hemp	FAC		2017							2017					2017				2017			2017					
*Arabis lyrata**																									2017			2017
Arctium lappa	Great Burdock	UPL		2015	2017											2017	2017	2015 2017	2015 2017	2017	2017	2017	2017					
Moehringia lateriflora	Blunt-Leaf Grove-	FACU																										2017

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013) and specimens only identified to genus.

Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
	Sandwort																											
Arenaria serpyllifolia	Thyme-Leaf Sandwort	FAC															2017											
Artemisia abrotanum	Southern Wormwood	UPL																			2017							
Artemisia absinthium	Southern Wormwood	UPL																2017	2017		2017				2017		2017	2017
Artemisia annua	Annual Wormwood	FACU			2017			2017			2017																	
Artemisia biennis	Biennial Wormwood	FACW		2017																								
Asclepias syriaca	Common Milkweed	FACU		2017	2015 2017	2017					2017					2017					2017		2017		2017			2017
Asparagus officinalis	Asparagus	FACU													2015													
Barbarea vulgaris	Garden Yellow-Rocket	FAC		2017	2017	2017					2017	2017							2017		2017	2017	2017					
Betula nigra	River Birch	FACW																			2017	2017		2017	2017			
Bidens cernua	Nodding Burr-Marigold	OBL						2015		2015							2015	2015	2015	2015			2015					2017
*Bidens connate**																									2017			
Bidens frondosa	Devil's-Pitchfork	FACW																		2015			2015					
Boehmeria cylindrica	Small-Spike False Nettle	OBL															2017			2017			2017				2017	2017
Bromus racemosus	Chess	UPL																						2017				
Bromus sterilis	Poverty Brome	UPL		2017																		2017				2017		
Buglossoides arvense	Corn Gromwell	UPL																				2017						
Calystegia sepium	Hedge False Bindweed	FAC																2017										
Campanula rapunculoides	European Bellflower	UPL														2017												
Capsella bursa-pastoris	Shepherd's-Purse	FACU																2017						2017	2017		2017	
Carex amphibola	Eastern Narrow-Leaf Sedge	FAC															2017	2017										
Carex bebbii	Bebb's Sedge	OBL	ST		2015															2017								
Carex blanda	Eastern Woodland Sedge	FAC															2017			2017	2017		2017					
Carex bromoides	Brome-Like Sedge	FACW				2017																						
*Carex sp.**				2017	2017	2017			2017		2017												2017				2017	
Carex stricta	Uptight Sedge	OBL		2015	2015																							
Carex trichocarpa	Hairy-Fruit Sedge	OBL					2017																					
Carex vulpinoidea	Common Fox Sedge	FACW																					2015					
Carex X subimpressa	hybrid sedge	OBL		2017																								
*Carya sp.**																									2017			
Carya tomentosa	Mockernut Hickory	UPL																						2017				

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013) and specimens only identified to genus.

Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
*Catalpa bignonioides**				2017														2017		2017				2017				
Catalpa speciosa	Northern Catalpa	FACU	SR	2015															2015									
Celastrus orbiculatus	Asian Bittersweet	UPL																					2017					
Celtis occidentalis	Common Hackberry	FAC														2017	2017	2017					2017	2017				2017
Cephalanthus occidentalis	Common Buttonbush	OBL																					2017					
Cerastium fontanum	Common Mouse-Ear Chickweed	FACU				2017										2017												
*Chaenomeles japonica**																							2017					
Chenopodium glaucum	Oak-Leaf Goosefoot	FACW																						2017				
Cicuta maculata	Spotted Water-Hemlock	OBL														2017								2017				
Circaea lutetiana	Broad-Leaf Enchanter's-Nightshade	FACU														2017												
Cirsium arvense	Canadian Thistle	FACU		2017	2017			2017			2017							201520 17	2015 2017						2017			
Cirsium discolor	Field Thistle	FACU			2017	2017		2017								2017				2017	2017		2017		2017			2017
Cirsium vulgare	Bull Thistle	FACU															2015											
Conium maculatum	Poison-Hemlock	FACW		2017	2017	2017	2017	2017								2017	2017	2017	2017									
Convallaria majalis	Lily-of-the-Valley	UPL														2017				2017			2017					2017
Coreopsis tinctoria	Golden Tickseed	FACU															2017											
Cornus alba	Red Osier	FACW		2017	2015 2017	2017		2015	2017		2017	2017		2015 2017	2015 2017	2017							2017					2017
*Cornus amomum**					2017	2017																						
Cornus florida	Flowering Dogwood	FACU																		2017								
*Cotoneaster sp.**																2017												
*Crataegus fecunda**																												2017
Crataegus mollis	Downy Hawthorn	FAC															2015											
Crataegus monogyna	English Hawthorn	FACU		2017	2017	2017																						2017
Crataegus phaenopyrum	Washington Hawthorn	FAC														2017				2017				2017				
*Crataegus sp.**																	2017											
Cyperus esculentus	Chufa	FACW						2015						2015				2015		2015			2015					
Cyperus flavescens	Yellow Flat Sedge	OBL															2015											
Dactylis glomerata	Orchard Grass	FACU																		2017	2017		2017	2017				
Daucus carota	Queen Anne's Lace	UPL		2017	2017	2017	2017									2017			2017	2017	2017		2017		2017			2017
Desmanthus illinoiensis	Prairie Bundle-Flower	FACU																		2015	2017							

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013) and specimens only identified to genus.

Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
Dichanthelium clandestinum	Deer-Tongue Rosette Grass	FACW																				2017						
Digitaria sanquinalis	Hairy Crab Grass	FACU																				2017		2017	2017			
Dipsacus fullonum	Fuller's Teasel	FACU				2017		2017	2017		2017												2017					
Echinochloa crus-galli	Large Barnyard Grass	FACW			2015									2015				2015		2015								
Elaeagnus angustifolia	Russian-Olive	FACU			2017	2017									2015	2017							2017					
Eleocharis palustris	Common Spike-Rush	OBL							2017																			
*Eleocharis sp.**						2017		2017	2017		2017										2017							
Elymus virginicus	Virginia Wild Rye	FACW																	2015	2015								
Epilobium coloratum	Purple-Leaf Willowherb	OBL		2015																								
Equisetum arvense	Field Horsetail	FAC		2017	2015 2017	2017					2017		2017	2017	2015 2017	2017	2017			2015 2017			2017					2017
Equisetum fluviatile	Water Horsetail	OBL			2015																							
Equisetum hyemale	Tall Scouring-Rush	FACW			2017										2017		2017				2017				2017			
Erigeron annuus	Eastern Daisy Fleabane	FACU		2017															2017	2017	2017		2017					
Erigeron philadelphicus	Philadelphia Fleabane	FACW														2017					2017		2017					2017
Erodium cicutarium	Storksbill	UPL																				2017		2017	2017			
Euonymus alatus	Winged Euonymus	UPL														2017							2017	2017				
Euonymus europaeus	European Spindle Tree	UPL														2017	2017						2017					
Euonymus hederaceus	Climbing Euonymus	UPL														2017	2017						2017	2017				
Eupatorium serotinum	Late-Flowering Thoroughwort	FAC		2015				2015		2015					2015	2017	2017	2015	2015	2015	2017		2015				2017	2017
Euthamia graminifolia	Flat-Top Goldentop	FACW		2017																2015								
Euthamia gymnospermoides	Texas Goldentop	FACW																			2017							
Festuca pratensis	Clustered Fescue	FAC		2017	2017	2017										2017	2017	2017	2017	2017		2017	2017	2017		2017		
Festuca rubra	Red Fescue	FACU																						2017	2017			
Fragaria virginiana	Virginia Strawberry	FACU		2017	2015 2017	2017										2017					2017			2017				2017
Frangula alnus	Glossy False Buckthorn	FACW		2015 2017	2017	2017	2017	2017			2017			2015 2017	2017	2017				2017			2017				2017	2017
Fraxinus americana	White Ash	FACU																				2017		2017				
Fraxinus pennsylvanica var. subintegerrima	Green Ash	FACW														2017												
Fraxinus pensylvanica	Green Ash	FACW		2017					2017					2017		2017	2015 2017	2015 2017	2015 2017	2017	2017	2017	2015 2017		2017			2017

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Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
Galium aparine	Sticky-Willy	FACU			2017	2017	2017				2017	2017				2017		2017	2017	2017		2017	2017	2017	2017		2017	2017
Galium tinctorium	Stiff Marsh Bedstraw	OBL			2017																							
Geranium carolinianum	Wild Cranesbill	UPL																										2017
Geum canadense	White Avens	FAC														2017	2017			2015 2017			2017		2017			2017
Geum laciniatum var. trichocarpum	Rough Avens	FACW		2015				2015						2015			2015			2017			2015					
Glechoma hederacea	Groundivy	FACU			2017							2017				2017	2017	2015 2017	2017	2015 2017	2017	2017	2017	2017	2017	2017		
Gleditsia tricanthos var. inermis	Honey-Locust	FACU				2017	2017									2017				2017			2017	2017	2017	2017		
Glyceria striata	Fowl Manna Grass	OBL																		2017								
Helianthus giganteus	Giant Sunflower	FACW																		2015								
Helianthus grosseserratus	Saw-Tooth Sunflower	FACW				2017																						
Helianthus tuberosus	Jerusalem-Artichoke	FACU															2015	2015	2015									
Heliopsis helianthoides	Smooth Oxeye	FACU																										2017
*Hemerocallis sp.**																	2017				2017							
Hesperis matronalis	Mother-of-the-Evening	FACU														2017												
Hibiscus moscheutos	Crimson-Eyed Rose-Mallow	OBL																							2017			
Hosta lancifolia	Plantain Lily	UPL														2017									2017			
Hypericum canadense	Lesser Canadian St. John's-Wort	FACW			2017																							
Hypericum mutilum	Dwarf St. John's-Wort	FACW																										2017
Hypericum perforatum	Common St. John's-Wort	FACU																										2017
Hypericum punctatum	Spotted St. John's-Wort	FAC						2017													2017							
*Ilex opaca**																2017												
Impatiens capensis	Spotted Touch-Me-Not	FACW																	2015 2017	2017		2017		2017			2017	
Ipomoea hederacea	Ivy-Leaf Morning-Glory	FAC																2015	2015				2015 2017					
Ipomoea lacunosa	Whitestar	FACW														2017			2017				2017		2017			
*Iris sp.**																						2017	2017	2017				
Juglans nigra	Black Walnut	FACU														2017		2017		2017	2017		2017	2017	2017			2017
Juncus dudleyi	Dudley's Rush	FACW								2015				2015						2015								

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*Juncus sp.**									2017																			
Juncus torreyi	Torrey's Rush	FACW								2015				2015						2015			2015					
Juniperus virginiana	Eastern Red-Cedar	FACU		2017	2017	2017	2017														2017							
Lactuca biennis	Wild Blue Lettuce	FAC																2017										
Lactuca canadensis	Canadian Blue Lettuce	FACU																									2017	
Lactuca serriolata	Prickly Lettuce	FACU																					2017					
Lamium amplexicaule	Henbit	UPL			2017											2017						2017		2017	2017			
Lamium galeobdolon	Golden Dead Nettle	UPL															2017											
Lamium purpureum	Purple Dead Nettle	UPL					2017									2017		2017	2017	2017	2017	2017	2017	2017	2017			2017
Laportea canadensis	Canadian Wood-Nettle	FACW																		2015							2017	
Leonurus cardiiaca	Motherwort	UPL														2017		2017	2017	2017		2017	2017				2017	
Lepidium campestre	Field Pepperwort	UPL		2017	2017		2017										2017				2017	2017						2017
Leucanthemum vulgare	Ox-Eye Daisy	UPL										2017																
Ligustrum vulgare	European Privet	FACU																					2017					
Lilium lancifolium	Tiger Lily	UPL														2017				2017			2017					
Linaria vulgaris	Butter-and-Eggs	UPL														2017												
Liriodendron tulipifera	Tuliptree	FACU																							2017			
Lonicera japonica	Japanese Honeysuckle	FACU																			2017							
Lonicera maackii	Amur Honeysuckle	UPL			2017											2017				2017	2017		2017	2017	2017			2017
Lonicera morrowii	Morrow's Honeysuckle	FACU		2017	2017	2017	2017				2017	2017				2017	2017		2017	2017	2017		2017					2017
*Lonicera sp.**																					2017							
Lonicera tatarica	Twinsisters	FACU			2017				2017						2017	2017	2017		2017	2017	2017	2017		2017	2017				2017
Lonicera X muendeniensis	hybrid honeysuckle	UPL																							2017			
Lotus corniculatus	Garden Bird's-Foot-Trefoil	FACU																			2017							
*Ludwigia decurrens**																											2017	
Lunaria annua	Silver-Dollar Plant	UPL																										2017
Lycopus uniflorus	Northern Water-Horehound	OBL								2015				2015														
Lysimachia ciliata	Fringed Yellow-Loosestrife	FACW															2017	2017	2017									2017
Lysimachia lanceolata	Lance-Leaf Yellow-Loosestrife	FAC																					2017					
Lysimachia nummularia	Creeping-Jenny	FACW																2015	2017	2017								

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Lythrum salicaria	Purple Loosestrife	OBL		2015 2017	2015 2017	2017	2017	2015 2017	2017	2015	2017	2017		2015 2017		2017	2017	2015 2017		2015	2017		2015 2017					
Maianthemum racemosum	Feathery False Solomon's-Seal	FACU															2017		2017	2017			2017	2017				2017
Malus baccata	Siberian Crab Apple	UPL			2017																							
Malus coronaria	Wild Sweet Crab Apple	UPL			2015																							
Malus ioensis	Iowa Crab Apple	UPL															2017											
Malus prunifolia	Plum-Leaf Crab Apple	UPL														2017												
Malus pumila	Apple	UPL			2017																							
*Malus sp.**																				2017								
Marrubium vulgare	White Horehound	FAC		2017																								
Medicago lupulina	Black Medick	FACU				2017										2017			2017								2017		
Melilotus officinalis	Yellow Sweet-Clover	FACU																		2017								
Morus alba	White Mulberry	FAC			2015 2017	2017	2017					2017				2017	2017	2015 2017	2015 2017	2017	2017	2017	2017	2017	2017	2017		2017	
Morus rubra	Red Mulberry	FACU																		2017								
Muscari botryoides	Grape Hyacinth	UPL																								2017		
Myosotis scorpioides	True Forget-Me-Not	OBL														2017					2017	2017				2017		
Nepeta cataria	Catnip	FACU		2017	2017												2017										2017	2017
Oenothera biennis	King's-Cureall	FACU		2017	2017	2017	2017										2017	2015 2017		2017	2017	2017			2017			2017
Onoclea sensibilis	Sensitive Fern	FACW												2017														
Ornithogalum umbellatum	Star-of-Bethlehem	UPL																				2017						
Osmorhiza claytoni	Black-Seed Rice Grass	UPL															2017						2017	2017	2017			
Osmunda cinnamomea	Cinnamon Fern	FACW																					2017					
Oxalis stricta	Upright Yellow Wood-Sorrel	FACU																		2017					2017			
Packera glabella	Cress-Leaf Groundsel	FACW			2017											2017		2017		2017				2017				
*Paeonia sp.**																												2017
*Panicum sp.**																					2017							
Panicum virgatum	Wand Panic Grass	FAC																		2015				2017				
Parthenocissus quinquefolia	Virginia-Creeper	FACU		2017	2017	2017	2017				2017	2017				2017	201520 17	2015	2017	2017	2017		2017	2017	2017		2017	2017
Persicaria amphibia	Water Smartweed	OBL		2015														2015										

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Persicaria hydropiper	Mild Water-Pepper	OBL												2015			2015	2015										
Persicaria lapathifolia	Dock-Leaf Smartweed	FACW		2015 2017				2045		2015								2015	2015	2015			2015					
Persicaria maculosa	Lady's-Thumb	FACW																	2017									
Persicaria virginianum	Jumpseed	FAC																		2017								
Phalaris arundinacea	Reed Canary Grass	FACW		2017	2017	2017										2017	2015	2015 2017	2015 2017	2017	2017		2017				2017	
Phegopteris hexagonoptera	Broad Beech Fern	FACU																						2017				
Philadelphus coronarius	Sweet Mock Orange	UPL																				2017						
Phragmites australis ssp. americanus	Common Reed	FACW		2015 2017	2015 2017	2017		2015 2017	2017	2015	2017	2017	2017	2015 2017	2015 2017	2017		2015	2015	2015 2017	2017		2015 2017				2017	
Physocarpus opulifolius	Atlantic Ninebark	FACW		2017																								
Phytolacca americana	American Pokeweed	FACU														2017	2017		2015				2015					
Picea abies	Norway Spruce	UPL					2017										2017								2017			
Pinus resinosa	Red Pine	FACU															2017									2017		
Pinus strobus	Eastern White Pine	FACU	SR													2017												
Plantago lanceolata	English Plantain	FACU				2017										2017			2017		2017	2017		2017	2017	2017		
Plantago major	Great Plantain	FAC															2017											
Plantago rugelli	Black-Seed Plantain	FAC				2017													2017	2015 2017								2017
Poa annua	Annual Blue Grass	FACU																					2015					
Poa bulbosa	Bulbous Blue Grass	UPL																							2017			
Poa chapmniana	Chapman's Blue Grass	FACU																							2017			
Poa pratensis	Kentucky Blue Grass	FAC															2017											
Polygonatum commutatum	King Solomon's-Seal	FACU														2017	2017						2017					
Populus deltoides	Eastern Cottonwood	FAC		2017	2017	2017	2017	2017	2017	2015	2017	2017	2017	2015 2017	2015					2015 2017	2017	2017	2015 2017		2017		2017	2017
Populus tremuloides	Quaking Aspen	FAC																					2017					
Potentilla recta	Sulfur Cinquefoil	UPL		2017		2017													2017		2017	2017	2017	2017	2017			2017
Prunus americana	American Plum	UPL		2017			2017									2017	2017		2017		2017			2017	2017		2017	
Prunus serotina	Black Cherry	FACU			2015 2017											2017				2017				2017				
Prunus virginiana	Choke Cherry	FACU			2017												2017					2017	2017	2017	2017			
Pseudotsuga taxifolia																	2017											

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Pycnanthemum virginianum	Virginia Mountain-Mint	FACW		2017		2017																						
Pyrus calleryana	Ornamental Pear	UPL		2015 2017	2017	2017	2017										2017				2017	2017	2017	2017	2017	2017		
Pyrus communis	Pear	UPL		2015																								
*Pyrus malus**																2017												
Quercus alba	Northern White Oak	FACU															2015 2017											
Quercus macrocarpa	Burr Oak	FAC															2015 2017			2017	2017		2017					
Quercus palustris	Pin Oak	FACW																						2017				2017
Quercus rubra	Northern Red Oak	FACU															2017							2017		2017		
Ranunculus abortivus	Kidney-Leaf Buttercup	FACW			2017						2017	2017				2017		2017		2017	2017		2017		2017		2017	2017
Ranunculus hispidus var. nitidus	Bristly Buttercup	FAC																	2017									
Ranunculus sclereatus	Cursed Buttercup	OBL						2017	2017																			
Reynoutria japonica	Japanese-Knotweed	FACU																					2017			2017		
Rhamnus cathartica	European Buckthorn	FAC													2015									2017				
Rhus hirta	Staghorn Sumac	UPL			2017															2015 2017			2017					
Ribes americanum	Wild Black Currant	FACW		2015															2017	2017								2017
Ribes cynosbati	Eastern Prickly Gooseberry	FAC																					2017					
Ribes rubrum	Red Currant	UPL																					2017				2017	
Robinia pseudoacacia	Black Locust	FACU																2017	2017	2017	2017		2015 2017	2017	2017			
Rosa blanda	Smooth Rose	FACU																					2017					
Rosa carolina	Carolina Rose	FACU															2017				2017							2017
Rosa multiflora	Rambler Rose	FACU		2017	2017		2017									2017				2017	2017		2017		2017			2017
Rosa palustris	Swamp Rose	OBL		2015	2017																							
Rubus allegheniensis	Allegheny Blackberry	FACU				2017										2017												
Rubus occidentalis	Black Raspberry	UPL		2017	2015 2017												2017		2017			2017	2017		2017		2017	
*Rubus sp.**					2017		2017																					
*Rubus steelei**																2017												
*Rubus strigosus**																							2017					

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Rubus wheeleri	Wheeler's Blackberry	FAC		2017																								
Rubus X neglectus						2017																						
Rudbeckia laciniata	Green-Head Coneflower	FACW																2017	2017									
Rumex crispus	Curly Dock	FAC			2017	2017										2017		2017		2017		2017	2017	2017		2017		
Rumex obtusifolius	Bitter Dock	FACW																					2017					
Salix discolor	Pussy Willow	FACW			2015 2017																							
Salix eriocephala	Missouri Willow	FACW																		2015								
Salix fragilis	Crack Willow	UPL			2015 2017							2017			2017	2017		2015 2017	2017	2017								
Salix interior	Sandbar Willow	FACW			2015 2017	2017		2015 2017	2017		2017	2017			2017	2017				2015	2017		2015 2017					2017
Salix myricoides	Bayberry Willow	FACW		2017	2017	2017																						2017
Salix nigra	Black Willow	OBL			2017															2017			2017					2017
Salix petiolaris	Meadow Willow	OBL			2017													2015				2017	2017					
Salix purpurea	Purple Willow	FACW						2017																				
Sambucus nigra ssp. canadensis	Black Elder	FACW		2015 2017	2017	2017		2017			2017	2017			2017	2017		2015 2017	2015 2017	2017			2017			2017		2017
Sanicula odorata	Clustered Black-Snakeroot	FAC															2017			2017								2017
Saponaria offinialis	Bouncing-Bett	FACU			2017											2017	2017			2017	2017	2017	2017	2017	2017			
Schoenoplectus tabernaemontani	Soft-Stem Club-Rush	OBL						2017												2015								
Scirpus atrovirens	Dark-Green Bulrush	OBL						2015						2015														
Scutellaria lateriflora	Mad Dog Skullcap	OBL																										
Securigera varia	Crown Vetch	UPL														2017		2017	2017		2017				2017			
Sedum sarmentosum	Yellow Stonecrop	UPL														2017	2017							2017				
Setaria faberii	Japanese Bristle Grass	FACU		2017																								
Setaria pumila	Yellow Bristle Grass	FAC																2015		2015		2017			2017			
Silene latifolia	White Campion	UPL																										2017
Silphium perfolistum	Cup-Plant	FACW																2017	2017									
Sium suave	Hemlock Water-Parsnip	OBL																			2017							
Smilax pulverulenta																									2017			
Solanum americanum	American Black Nightshade	FACU						2015											2015									

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Solanum dulcamara	Climbing Nightshade	FAC		2017	2017		2017									2017		2017		2017	2017		2017				2017	
Solidago altissima	Tall Goldenrod	FACU		2015 2017	2017	2017	2017	2015								2017	2017	2015	2015	2015 2017	2017	2017	2017		2017			2017
Solidago gigantea	Late Goldenrod	FACW																2015	2017	2017								
Solidago nemoralis	Gray Goldenrod	UPL														2017												
Solidago rugosa	Wrinkle-Leaf Goldenrod	FAC													2015													
Sonchus oleraceus	Common Sow-Thistle	FACU																2015										
Sorbus aucuparia	European Mountain-Ash	UPL																							2017			
Spartina pectinata	Freshwater Cord Grass	FACW		2015																								
Stellaria media	Common Chickweed	FACU														2017	2017					2017		2017	2017	2017		2017
*Symphyotrichum concinnum**																								2017				
Symphyotrichum lanceolatum	White Panicled American-Aster	FAC														2017	2015		2017	2017	2017		2015 2017					
Symphyotrichum lateriflorum	Farewell-Summer	FACW																					2017					
Symphyotrichum novae-angliae	New England American-Aster	FACW						2015		2015										2015								
Symphyotrichum racemosum	Fragile-Stem American-Aste	FACW		2015																								
Symphytrichum pilosum	Arrow-Leaf Aster	UPL																2015	2015									
*Syringa sp.**																								2017				
Taraxacum officinale	Common Dandelion	FACU		2017	2017	2017	2017									2017	2017		2017	2017	2017	2017	2017	2017	2017	2017	2017	2017
*Taxus sp.**																2017	2017											
*Thalitrum pubescens**																2017	2017											
Thlaspi arvense	Field Pennycress	FACU			2017																							
Tilia americana	American Basswood	FACU															2017		2017				2017	2017				2017
Toxicdendron radicans	Pale False Manna Grass	OBL		2015		2017										2017	2015			2017			2017					2017
Tradescantia ohiensis	Bluejacket	FACU																		2017								
Tragopogon dubius	Sand Goat's-Beard	UPL		2017												2017												
Trifolium hybridum	Alsike Clover	FACU				2017	2017									2017		2017	2017			2017			2017		2017	2017
Trifolium pratense	Red Clover	FACU				2017										2017		2017	2017	2017	2017	2017		2017	2017	2017		
Trifolium repens	White Clover	FACU														2017	2017					2017		2017				
Triticum aestivum	Wheat	UPL																2017										
Typha angustifolia	Narrow-Leaf Cat-Tail	OBL		2015	2015 2017			2015	2017	2015	2017			2015	2017		2015	2015	2015	2015			2015					

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013) and specimens only identified to genus.

Appendix D Floristic Quality Assessment Inventory for Habitat Units within NICTD West Lake Environmental Survey Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	H01 MP 0.00-0.00	H02 MP 61.4-61.54	H04 MP 0.00-61.91 MP 62.00-62.10	H05 MP 61.91-62.33	H06 MP 62.10-62.34	H08 MP 62.45-62.78	H09 MP 62.85-62.89	H10 MP 62.85-62.97	H11 MP 62.94-62.95	H13 MP 62.97-63.23	H14 MP 63.26-63.38	H16 MP 63.26-63.26	H17 MP 63.41-64.14	H18 MP 64.16-64.89	H19 MP 64.89-64.95	H20 MP 64.95-65.00	H21 MP 65.05-65.15	H22 MP 65.15-65.41	H23 MP 65.43-65.92	H24 MP 65.43-65.92	H25 MP 66.43-67.14	H26 MP 67.15-67.75	H28 MP 68.18-68.31	H29 MP 68.47-68.48	H30 MP 69.00-6.91
Typha latifolia	Broad-Leaf Cat-Tail	OBL						2017	2017						2015								2017					
Ulmus americana	American Elm	FACW														2017		2017	2017	2017	2017		2017					
Ulmus pumila	Siberian Elm	UPL		2017	2017		2017									2017	2017	2017	2017	2017	2017	2017	2017	2017	2017	2017		2017
Ulmus rubra	Slippery Elm	FAC															2015	2015				2017			2017			
*Urtica chamaedryoides**																		2017										
Urtica dioica ssp. gracilis	Tall Nettle	FACW																2015 2017	2015	2017		2017						2017
Valerianella locusta	European Corn Salad	UPL				2017																						
Verbascum thapsis	Showy Mullein	UPL		2017													2017			2017	2017		2017	2017	2017	2017		2017
Verbena hastata	Simpler's-Joy	FACW		2015				2015															2015					
Veronica arvensis	Corn Speedwell	FACU															2017					2017						
Veronica persica	Bird's-Eye Speedwell	UPL														2017	2017											
Viburnum acerifolium	Maple-Leaf Arrow-Wood	UPL														2017												
Viburnum dentatum	Southern Arrow-Wood	FAC		2017	2017							2017		2017			2017			2017								
Viburnum lantana	Wayfarinig Tree	UPL														2017					2017							
Viburnum opulus	Possumhaw	FACW		2017	2017			2017			2017					2017	2017						2017					
*Viburnum sieboldii**																							2017					
Vinca minor	Common Periwinkle	UPL														2017	2017											
Viola sororia	Hooded Blue Violet	FAC			2017											2017	2017			2017	2017	2017	2017					2017
Vitis riparia	River-Bank Grape	FACW		2015 2017	2015 2017	2017	2017				2017			2017	2015 2017	2017	2015 2017	2015 2017	2017	2015 2017	2017	2017	2015 2017	2017	2017		2017	2017
Yucca smalliana	Yucca	UPL														2017					2017							
Zizia aurea	Golden Alexanders	FAC																										2017

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013) and specimens only identified to genus.

Appendix E. Floristic Quality Assessment Wetland: Metrics

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Appendix E Floristic Quality Assessment, Mean C Value, and Species Richness for Wetlands within NICTD West Lake NWI Environmental Survey Area

Wetland ID	Cowardin Class	Wetland Size within Environmental Survey area (acres)	FQI			Mean C Value		Species Richness		
			All species	Native Species	Adjusted	All Species	Native Species	All Species	Native Species	Species Per Acre
Wetland 9	PFO	0.9671	14.56	19.35	26.58	2.00	3.53	56	30	57.9
Wetland 38	PFO	0.3017	13.48	17.41	2347.00	1.82	3.03	57	33	198.7
Wetland 39	PFO	0.0461	6.35	8.98	12.96	0.92	1.83	50	24	1084.0
Wetland 40	PEM	0.2562	5.29	5.72	21.60	2.00	2.33	7	6	27.3
Wetland 11	PEM	0.0704	6.33	7.00	21.11	1.91	2.33	11	9	101.2
Wetland 12	PEM	0.9466	10.96	12.87	23.91	20.30	2.81	30	21	31.7
Wetland 17	PEM	1.4162	5.55	6.67	18.49	1.54	2.22	16	9	11.3
Wetland 36	PEM	0.1065	8.14	9.00	27.14	2.45	3.00	11	9	103.3
Wetland 35	PEM	0.0421	3.40	4.67	11.32	0.82	1.56	17	9	403.6
Wetland 37R	PFO	0.2488	4.16	5.00	13.87	1.15	1.67	15	9	54.8
Wetland 37L	PFO	0.0909	6.65	8.04	18.45	1.53	2.23	19	13	166.4
Wetland 32	PEM	1.4236	1.73	1.73	10.00	1.00	1.00	3	3	1.3
Wetland 34	PFO	0.4797	9.86	11.10	9.86	2.26	2.87	19	15	32.1
Wetland 33	PEM	0.2626	5.42	6.93	16.35	1.28	2.09	18	11	68.5
Wetland 2	PFO	0.0801	11.08	12.14	28.60	2.61	3.13	18	15	224.7
Wetland 1	PEM	0.1359	5.97	7.77	16.56	1.27	2.15	22	13	162.3
Wetland 4	PFO	0.1372	3.87	4.74	12.25	1.00	1.50	15	10	148.2
Wetland 3	PEM	0.0726	5.51	6.55	13.37	1.13	1.59	24	17	1340.6
Wetland 5	PEM	0.0628	8.73	9.43	20.57	1.90	2.22	21	18	334.7
Wetland 6	PFO	0.0120	8.51	9.46	20.64	1.86	2.29	21	17	1750.3
Wetland 7	PEM	0.6556	9.17	9.86	21.03	1.95	2.26	22	19	33.6
Wetland 8 & 10	PFO & PEM	0.4952	12.71	16.05	19.61	1.55	2.48	70	42	141.4

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Appendix F. Floristic Quality Assessment Wetlands: Inventory

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Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
Acer negundo	Ash-Leaf Maple	FAC			2015/ 2017	2017												2015		2015		2015	2015		2017	
Acer rubrum	Red Maple	FAC																								
Acer saccharinum	Silver Maple	FACW		2015/ 2017	2015/ 2017	2017						2017								2015			2015	2015	2015/ 2017	
Acer saccharum	Sugar Maple	FACU																			2015					
Agrimonia parviflora	Harvestlice	FACW		2017																						
Agrostis gigantea	Black Bent	FACW																	2015							
Ailanthus altissima	Tree-of-Heaven	FACU																					2015		2017	
Alisma subcordatum	American Water-Plantain	OBL																							2015	
Alisma triviale	Northern Water-Plantain	OBL																						2015		
Alliaria petiolata	Garlic-Mustard	FAC				2017																			2017	
Allium cernuum	Nodding Onion	FACU																							2015	
*Allium porrum**																									2017	
Ambrosia artemisiifolia	Annual Ragweed	FACU								2017			2017	2017												
Ambrosia trifida	Great Ragweed	FAC																			2015				2015	
Ampelopsis cordata	Turquoise-Berry	UPL																							2017	
Apocynum cannibinum	Indian-Hemp	FAC																							2017	
Arctium lappa	Great Burdock	UPL		2015		2017													2015		2015				2017	
Artemisia annua	Annual Wormwood	FACU			2017	2017			2017					2017												
Artemisia biennis	Biennial Wormwood	FACW		2017																						
Asclepias syriaca	Common Milkweed	FACU		2017	2015/ 2017	2017																			2017	
Asparagus officinalis	Asparagus	FACU															2015									
Barbarea vulgaris	Garden Yellow-Rocket	FAC		2017		2017						2017	2017												2017	
Bidens cernua	Nodding Burr-Marigold	OBL							2015		2015							2015	2015		2015	2015	2015	2015	2015	
Bidens frondosa	Devil's-Pitchfork	FACW																						2015	2015	
Boehmeria cylindrica	Small-Spike False Nettle	OBL																							2017	
*Bromus rigidus**				2017																						
Carex bebbii	Bebb's Sedge	OBL	ST		2015																					
Carex blanda	Eastern Woodland Sedge	FAC																							2017	
*Carex sp.**				2017		2017				2017			2017												2017	
Carex stricta	Uptight Sedge	OBL		2015			2015																			
Carex vulpinoidea	Common Fox Sedge	FACW																							2015	
*Carex X subimpressa**				2017																						
Catalpa speciosa	Northern Catalpa	FACU	SR	2015																	2015					
*Chaenomeles japonica**																									2017	
Cirsium arvense	Canadian Thistle	FACU		2017	2017	2017			2017										2015		2015					

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013).
SE = state endangered, ST = state threatened, SR = state rare

Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
Cirsium discolor	Field Thistle	FACU			2017	2017			2017																2017	
Cirsium vulgare	Bull Thistle	FACU																2015								
Conium maculatum	Poison-Hemlock	FACW		2017	2017	2017			2017																	
Cornus alba	Red Osier	FACW		2017	2015/ 2017	2015/ 2017		2017	2015	2017		2017	2017	2017		2015/ 2017	2015/ 2017								2017	
*Cornus amomum**						2017																				
*Cornus baileyi**					2017																					
Crataegus mollis	Downy Hawthorn	FAC																2015					2015			
Crataegus monogyna	English Hawthorn	FACU		2017	2017																					
Cyperus esculentus	Chufa	FACW							2015							2015			2015			2015		2015	2015	
Cyperus flavescens	Yellow Flat Sedge	OBL																2015								
Daucus carota	Queen Anne's Lace	UPL		2017		2017																			2017	
Desmanthus illinoiensis	Prairie Bundle-Flower	FACU																				2015				
Dipsacus fullonum	Fuller's Teasel	FACU							2017	2017															2017	
Echinochloa crus-galli	Large Barnyard Grass	FACW			2015											2015			2015			2015				
Elaeagnus angustifolia	Russian-Olive	FACU			2017			2017									2015								2017	
Eleocharis palustris	Common Spike-Rush	OBL								2017																
*Eleocharis sp.**									2017	2017			2017													
Elymus virginicus	Virginia Wild Rye	FACW																			2015	2015				
Epilobium coloratum	Purple-Leaf Willowherb	OBL		2015																			2015			
Equisetum arvense	Field Horsetail	FAC		2017	2015/ 2017	2015	2015	2017					2017		2017	2017	2015/ 2017							2015	2017	
Equisetum fluviatile	Water Horsetail	OBL			2015																					
Equisetum hyemale	Tall Scouring-Rush	FACW			2017												2017									
Eupatorium serotinum	Late-Flowering Thoroughwort	FAC		2015					2015		2015						2015		2015		2015	2015	2015		2015	
Euthamia graminifolia	Flat-Top Goldentop	FACW																				2015				
Festuca pratensis	Clustered Fescue	FAC		2017	2017			2017																	2017	
Fragaria virginiana	Virginia Strawberry	FACU		2017	2015/ 2017	2017	2015																			
Frangula alnus	Glossy False Buckthorn	FACW		2015/ 2017	2017			2017	2017				2017	2017		2015/ 2017	2017									
Fraxinus pensylvanica	Green Ash	FACW		2017						2017						2017		2015		2015	2015	2015	2015	2015	2015/ 2017	
Galium aparine	Sticky-Willy	FACU			2017	2017						2017		2017											2017	
Galium tinctorium	Stiff Marsh Bedstraw	OBL			2017																					
Geum canadense	White Avens	FAC																						2015	2017	
Geum laciniatum var. trichocarpum	Rough Avens	FACW		2015					2015							2015		2015					2015		2015	
Glechoma hederacea	Groundivy	FACU			2017							2017							2015			2015			2017	
Gleditsia tricanthos var. inermis	Honey-Locust	FACU																							2017	

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Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
Helianthus giganteus	Giant Sunflower	FACW																						2015		
Helianthus tuberosus	Jerusalem-Artichoke	FACU																2015	2015		2015					
Hypericum canadense	Lesser Canadian St. John's-Wort	FACW			2017																					
Hypericum punctatum	Spotted St. John's-Wort	FAC							2017																	
Impatiens capensis	Spotted Touch-Me-Not	FACW																			2015		2015			
Ipomoea hederacea	Ivy-Leaf Morning-Glory	FAC																	2015		2015				2015/ 2017	
Juglans nigra	Black Walnut	FACU																							2017	
Juncus dudleyi	Dudley's Rush	FACW					2015				2015					2015						2015				
*Juncus sp.**										2017																
Juncus torreyi	Torrey's Rush	FACW									2015					2015						2015			2015	
Juniperus virginiana	Eastern Red-Cedar	FACU			2017	2017																				
Lactuca serriolata	Prickly Lettuce	FACU																							2017	
Lamium amplexicaule	Henbit	UPL				2017																				
Lamium purpureum	Purple Dead Nettle	UPL																							2017	
Laportea canadensis	Canadian Wood-Nettle	FACW																						2015		
Leonurus cardiiaca	Motherwort	UPL																							2017	
Lepidium campestre	Field Pepperwort	UPL		2017		2017																				
Leucanthemum vulgare	Ox-Eye Daisy	UPL										2017														
Lonicera maackii	Amur Honeysuckle	UPL				2017																				
Lonicera morrowii	Morrow's Honeysuckle	FACU		2017	2017							2017	2017													
*Lonicera sp.**																										
Lonicera tatarica	Twinsisters	FACU			2017					2017							2017								2017	
Lycopus uniflorus	Northern Water-Horehound	OBL									2015					2015										
Lysimachia nummularia	Creeping-Jenny	FACW																		2015						
Lythrum salicaria	Purple Loosestrife	OBL		2015/ 2017	2015/ 2017	2015/ 2017	2015		2015/ 2017	2017	2015	2017	2017	2017		2015/ 2017			2015			2015	2015	2015	2015/ 2017	
Malus baccata	Siberian Crab Apple	UPL				2017																				
Malus coronaria	Wild Sweet Crab Apple	UPL			2015																					
Malus pumila	Apple	UPL			2017																					
Morus alba	White Mulberry	FAC			2017	2015						2017								2015	2015			2015	2017	
Nepeta cataria	Catnip	FACU		2017	2017	2017																				
Oenothera biennis	King's-Cureall	FACU		2017	2017	2017	2015												2015							
Onoclea sensibilis	Sensitive Fern	FACW														2017										
Osmorhiza claytoni	Black-Seed Rice Grass	UPL																							2017	
Packera glabella	Cress-Leaf Groundsel	FACW			2017																					
Panicum virgatum	Wand Panic Grass	FAC																						2015		

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Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
Parthenocissus quinquefolia	Virginia-Creeper	FACU		2017	2017	2017		2017				2017	2017					2015		2015					2017	
Persicaria amphibia	Water Smartweed	OBL		2015															2015							
Persicaria hydropiper	Mild Water-Pepper	OBL														2015		2015	2015				2015			
Persicaria lapathifolia	Dock-Leaf Smartweed	FACW		2015/ 2017					2045		2015								2015		2015	2015	2015	2015	2015	
Phalaris arundinacea	Reed Canary Grass	FACW		2017		2017												2015	2015	2015	2015				2017	
Phragmites australis ssp. americanus	Common Reed	FACW		2015/ 2017	2015/ 2017	2015		2017	2015/ 2017	2017	2015	2017	2017		2017	2015/ 2017	2015/ 2017			2015	2015	2015	2015	2015	2015/ 2017	
Phytolacca americana	American Pokeweed	FACU																			2015				2015	
Plantago rugelli	Black-Seed Plantain	FAC																				2015				
Poa annua	Annual Blue Grass	FACU																							2015	
Populus deltoides	Eastern Cottonwood	FAC			2017	2017		2017	2017	2017	2015	2017	2017	2017	2017	2015/ 2017	2015					2015	2015	2015	2015/ 2017	
Populus tremuloides	Quaking Aspen	FAC																							2017	
Potentilla recta	Sulfur Cinquefoil	UPL		2017																						
Prunus pensylvanica	Fire Cherry	FACU				2017																				
Prunus serotina	Black Cherry	FACU			2015/ 2017	2015/ 2017																				
Prunus virginiana	Choke Cherry	FACU																							2017	
Pycnanthemum virginianum	Virginia Mountain-Mint	FACW		2017																						
Pyrus calleryana	Ornamental Pear	UPL		2015/ 2017	2017	2017																			2017	
Pyrus communis	Pear	UPL		2015																						
Quercus alba	Northern White Oak	FACU																2015								
Quercus macrocarpa	Burr Oak	FAC																2015								
Ranunculus abortivus	Kidney-Leaf Buttercup	FACW				2017						2017														
Ranunculus sclereatus	Cursed Buttercup	OBL							2017	2017																
Reynoutria japonica	Japanese-Knotweed	FACU																							2017	
Rhamnus cathartica	European Buckthorn	FAC															2015						2015			
Rhus hirta	Staghorn Sumac	UPL			2017	2017																		2015	2017	
Ribes americanum	Wild Black Currant	FACW		2015																			2015			
Robinia pseudoacacia	Black Locust	FACU																							2015	
Rosa multiflora	Rambler Rose	FACU		2017	2017																					
Rosa palustris	Swamp Rose	OBL		2015		2017																				
Rubus occidentalis	Black Raspberry	UPL		2017	2015	2017																				
*Rubus sp.**					2017																					
Rubus wheeleri	Wheeler's Blackberry	FAC		2017																						
Rumex crispus	Curly Dock	FAC			2017	2017																			2017	
Salix discolor	Pussy Willow	FACW			2015/																					

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Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
					2017																					
Salix eriocephala	Missouri Willow	FACW																				2015				
Salix fragilis	Crack Willow	UPL			2015	2015/ 2017						2017					2017			2015						
Salix interior	Sandbar Willow	FACW			2015/ 2017	2015/ 2017	2015	2017	2015/ 2017	2017		2017	2017	2017			2017							2015	2015/ 2017	
Salix myricoides	Bayberry Willow	FACW			2017																					
Salix nigra	Black Willow	OBL			2017	2017																			2017	
Salix petiolaris	Meadow Willow	OBL			2017														2015							
Salix purpurea	Purple Willow	FACW							2017																	
Sambucus nigra ssp. canadensis	Black Elder	FACW		2015/ 2017	2017			2017	2017			2017	2017				2017				2015				2017	
Saponaria offinialis	Bouncing-Bett	FACU				2017																			2017	
Schoenoplectus tabernaemontani	Soft-Stem Club-Rush	OBL							2017													2015				
Scirpus atrovirens	Dark-Green Bulrush	OBL							2015							2015										
Scutellaria lateriflora	Mad Dog Skullcap	OBL																					2015			
Setaria faberii	Japanese Bristle Grass	FACU		2017																						
Setaria pumila	Yellow Bristle Grass	FAC																	2015			2015				
Solanum americanum	American Black Nightshade	FACU							2015												2015					
Solanum dulcamara	Climbing Nightshade	FAC		2017		2017																				
Solidago altissima	Tall Goldenrod	FACU		2015/ 2017	2017	2017			2015										2015	2015	2015			2015	2015	
Solidago gigantea	Late Goldenrod	FACW																	2015	2015				2015		
Solidago rugosa	Wrinkle-Leaf Goldenrod	FAC															2015									
Sonchus oleraceus	Common Sow-Thistle	FACU																	2015							
Spartina pectinata	Freshwater Cord Grass	FACW		2015																						
Symphyotrichum lanceolatum	White Panicled American-Aster	FAC																2015					2015		2015/ 2017	
Symphyotrichum novae-angliae	New England American-Aster	FACW							2015		2015													2015		
Symphyotrichum racemosum	Fragile-Stem American-Aste	FACW		2015																						
Symphytrichum pilosum	Arrow-Leaf Aster	UPL																		2015	2015					
Taraxacum officinale	Common Dandelion	FACU			2017	2017																				
Thlaspi arvense	Field Pennycress	FACU				2017																				
Toxicdendron radicans	Pale False Manna Grass	OBL		2015														2015							2017	
Typha angustifolia	Narrow-Leaf Cat-Tail	OBL		2015	2015/ 2017				2015	2017	2015					2015	2017	2015		2015	2015		2015	2015	2015	
Typha latifolia	Broad-Leaf Cat-Tail	OBL							2017	2017							2015									
Ulmus americana	American Elm	FACW																					2015			
Ulmus pumila	Siberian Elm	UPL		2017	2017	2017																			2017	

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013).
SE = state endangered, ST = state threatened, SR = state rare

Appendix F Floristic Quality Assessment Inventory for Wetlands within NICTD West Lake Environmental Footprint Area

Scientific Name	Common Name	Wetland Indicator Status	State Status	W9	W38	W39	W40	W41	W11	W12	W17	W36	W35	W37R	W37L	W32	W34	W33	W2	W1	W4	W3	W5	W6	W7	W8&10
Ulmus rubra	Slippery Elm	FAC																2015		2015						
Urtica dioica ssp. gracilis	Tall Nettle	FACW																	2015		2015					
Verbena hastata	Simpler's-Joy	FACW		2015					2015																2015	
Viburnum dentatum	Southern Arrow-Wood	FAC		2017	2017	2017						2017				2017										
Viburnum opulus	Possumhaw	FACW		2017	2017				2017					2017												
Viola sororia	Hooded Blue Violet	FAC				2017																				
Vitis riparia	River-Bank Grape	FACW		2015/ 2017	2015/ 2017	2017		2017					2017	2017		2017	2015/ 2017	2015		2015	2015	2015			2015/ 2017	

*Indicates species, varieties or hybrids not included in the Chicago Region Floristic Quality Assessment Calculator database (Herman et al 2013).
SE = state endangered, ST = state threatened, SR = state rare

Appendix G. Forest Plot Inventory Worksheets

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NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F1			Date/Time: May 10, 2017 8:30 AM						
Stationing: MP 65.77 – MP 65.85			Location: south of 169th Street						
Plot Area: 1.2429 acre			Sub-Canopy Density: Moderate						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	23	13	1	21	6	7	1	1	1
Acer saccharinum	7	1	1	9	0	0	0	0	0
Ailanthus altissima	11	8	0	18	0	0	0	0	1
Fraxinius pennsylvanica	5	7	0	8	1	3	0	0	0
Juglans nigra	4	8	1	13	0	0	0	0	0
Morus alba	25	7	0	31	0	0	1	0	0
Populus deltoides	2	19	20	38	2	1	0	0	0
Prunus serotina	0	1	0	1	0	0	0	0	0
Ulmus americana	5	9	2	12	2	0	2	0	0
Ulmus pumila	15	26	4	39	4	2	0	0	0
Unknown	2	2	0	0	0	0	0	3	1
Total	99	101	29	190	15	13	4	4	3
	229								
Density (#/acre)	80	81	23	153	12	11	3	3	2
	184								

Facing south from north end of plot

Facing north from south end of plot

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	box elder	15	1
Acer negundo	box elder	16	3
Acer negundo	box elder	17	1
Acer negundo	box elder	17	1
Acer negundo	box elder	17	1
Acer negundo	box elder	17	2
Acer negundo	box elder	17	3
Acer negundo	box elder	18	1
Acer negundo	box elder	18	1
Acer negundo	box elder	19	1
Acer negundo	box elder	19	1
Acer negundo	box elder	19	3
Acer negundo	box elder	19	3
Acer negundo	box elder	19	6
Acer negundo	box elder	20	1
Acer negundo	box elder	20	1
Acer negundo	box elder	20	3
Acer negundo	box elder	20	3
Acer negundo	box elder	21	1
Acer negundo	box elder	21	1
Acer negundo	box elder	22	1
Acer negundo	box elder	22	1
Acer negundo	box elder	22	1
Acer negundo	box elder	23	1
Acer negundo	box elder	23	1
Acer negundo	box elder	24	1
Acer negundo	box elder	24	2
Acer negundo	box elder	26	2
Acer negundo	box elder	27	1
Acer negundo	box elder	27	4
Acer negundo	box elder	28	5
Acer negundo	box elder	29	1
Acer negundo	box elder	31	2
Acer negundo	box elder	32	2
Acer negundo	box elder	33	2
Acer negundo	box elder	36	1
Acer negundo	box elder	78	3
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	17	1
Acer saccharinum	silver maple	18	1
Acer saccharinum	silver maple	19	1
Acer saccharinum	silver maple	21	1
Acer saccharinum	silver maple	36	1
Acer saccharinum	silver maple	48	1
Ailanthus altissima	tree-of-heaven	15	1
Ailanthus altissima	tree-of-heaven	16	6
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1

Species	Common name	dbh (cm)	Stage of Decay
Ailanthus altissima	tree-of-heaven	20	1
Ailanthus altissima	tree-of-heaven	20	1
Ailanthus altissima	tree-of-heaven	21	1
Ailanthus altissima	tree-of-heaven	21	1
Ailanthus altissima	tree-of-heaven	22	1
Ailanthus altissima	tree-of-heaven	24	1
Ailanthus altissima	tree-of-heaven	25	1
Ailanthus altissima	tree-of-heaven	28	1
Ailanthus altissima	tree-of-heaven	28	1
Ailanthus altissima	tree-of-heaven	33	1
Ailanthus altissima	tree-of-heaven	34	1
Ailanthus altissima	tree-of-heaven	38	1
Ailanthus altissima	tree-of-heaven	42	1
Fraxinus pennsylvanica	green ash	16	3
Fraxinus pennsylvanica	green ash	17	1
Fraxinus pennsylvanica	green ash	18	1
Fraxinus pennsylvanica	green ash	18	3
Fraxinus pennsylvanica	green ash	21	1
Fraxinus pennsylvanica	green ash	24	3
Fraxinus pennsylvanica	green ash	25	1
Fraxinus pennsylvanica	green ash	26	1
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	29	1
Fraxinus pennsylvanica	green ash	30	1
Fraxinus pennsylvanica	green ash	36	1
Juglans nigra	black walnut	19	1
Juglans nigra	black walnut	19	1
Juglans nigra	black walnut	21	1
Juglans nigra	black walnut	22	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	26	1
Juglans nigra	black walnut	26	1
Juglans nigra	black walnut	31	1
Juglans nigra	black walnut	31	1
Juglans nigra	black walnut	35	1
Juglans nigra	black walnut	38	1
Juglans nigra	black walnut	46	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	18	1
Morus alba	white mulberry	18	1

Species	Common name	dbh (cm)	Stage of Decay
Morus alba	white mulberry	18	1
Morus alba	white mulberry	18	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	4
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	23	1
Morus alba	white mulberry	23	1
Morus alba	white mulberry	24	1
Morus alba	white mulberry	26	1
Morus alba	white mulberry	27	1
Morus alba	white mulberry	30	1
Morus alba	white mulberry	39	1
Populus deltoides	eastern cottonwood	21	1
Populus deltoides	eastern cottonwood	21	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	28	2
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	38	1
Populus deltoides	eastern cottonwood	38	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	40	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	42	1
Populus deltoides	eastern cottonwood	44	1
Populus deltoides	eastern cottonwood	44	1
Populus deltoides	eastern cottonwood	47	1
Populus deltoides	eastern cottonwood	48	2
Populus deltoides	eastern cottonwood	52	1
Populus deltoides	eastern cottonwood	54	1
Populus deltoides	eastern cottonwood	54	1
Populus deltoides	eastern cottonwood	57	1
Populus deltoides	eastern cottonwood	58	1
Populus deltoides	eastern cottonwood	60	1
Populus deltoides	eastern cottonwood	62	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	70	3

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	74	1
Populus deltoides	eastern cottonwood	75	1
Populus deltoides	eastern cottonwood	76	1
Populus deltoides	eastern cottonwood	78	1
Populus deltoides	eastern cottonwood	80	1
Populus deltoides	eastern cottonwood	80	1
Populus deltoides	eastern cottonwood	82	1
Prunus serotina	black cherry	31	1
Ulmus americana	American elm	17	1
Ulmus americana	American elm	17	1
Ulmus americana	American elm	18	1
Ulmus americana	American elm	18	1
Ulmus americana	American elm	20	1
Ulmus americana	American elm	24	1
Ulmus americana	American elm	24	1
Ulmus americana	American elm	27	1
Ulmus americana	American elm	28	4
Ulmus americana	American elm	31	1
Ulmus americana	American elm	31	2
Ulmus americana	American elm	34	1
Ulmus americana	American elm	40	1
Ulmus americana	American elm	42	2
Ulmus americana	American elm	49	1
Ulmus americana	American elm	63	4
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	20	2
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	2
Ulmus pumila	Siberian elm	23	1
Ulmus pumila	Siberian elm	24	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	27	1
Ulmus pumila	Siberian elm	28	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	30	1

Species	Common name	dbh (cm)	Stage of Decay
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	3
Ulmus pumila	Siberian elm	32	1
Ulmus pumila	Siberian elm	32	1
Ulmus pumila	Siberian elm	37	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	39	1
Ulmus pumila	Siberian elm	40	1
Ulmus pumila	Siberian elm	41	1
Ulmus pumila	Siberian elm	43	2
Ulmus pumila	Siberian elm	45	1
Ulmus pumila	Siberian elm	48	1
Ulmus pumila	Siberian elm	58	3
Ulmus pumila	Siberian elm	63	2
Unknown		18	5
Unknown		22	5
Unknown		26	6
Unknown		28	5

NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F2			Date/Time: May 10, 2017 12:00 PM						
Stationing: MP 65.49 – MP 65.53			Location: north of 173rd Street						
Plot Area: 0.3008 acre			Sub-Canopy Density: open and moderate						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	1	5	0	6	0	0	0	0	0
Acer saccharinum	5	0	0	5	0	0	0	0	0
Ailanthus altissima	1	0	0	0	0	1	0	0	0
Catalpa speciosa	4	0	0	4	0	0	0	0	0
Fraxinus pennsylvanica	2	0	0	2	0	0	0	0	0
Juglans nigra	8	1	0	8	0	0	0	0	1
Morus alba	7	3	0	10	0	0	0	0	0
Populus deltoides	6	11	2	18	0	0	0	0	1
Salix nigra	1	11	0	8	2	0	1	0	1
Ulmus pumila	2	2	0	4	0	0	0	0	0
Total	37	33	2	65	2	1	1	0	3
	72								
Density (#/acre)	123	109	7	216	7	3	3	0	10
	239								

Facing east from north end of plot

Facing north from south end of plot

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	box elder	21	1
Acer negundo	box elder	23	1
Acer negundo	box elder	24	1
Acer negundo	box elder	27	1
Acer negundo	box elder	27	1
Acer negundo	box elder	35	1
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	18	1
Acer saccharinum	silver maple	22	1
Ailanthus altissima	tree-of-heaven	18	3
Catalpa speciosa	catalpa	16	1
Catalpa speciosa	catalpa	16	1
Catalpa speciosa	catalpa	17	1
Catalpa speciosa	catalpa	20	1
Fraxinus pennsylvanica	green ash	16	1
Fraxinus pennsylvanica	green ash	16	1
Juglans nigra	black walnut	15	1
Juglans nigra	black walnut	15	1
Juglans nigra	black walnut	16	1
Juglans nigra	black walnut	17	6
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	25	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	19	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	26	1
Morus alba	white mulberry	27	1
Morus alba	white mulberry	30	1
Populus deltoides	eastern cottonwood	16	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	18	6
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	22	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	30	1
Populus deltoides	eastern cottonwood	31	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	34	1

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	45	1
Populus deltoides	eastern cottonwood	47	1
Salix nigra	black willow	18	6
Salix nigra	black willow	23	1
Salix nigra	black willow	26	1
Salix nigra	black willow	26	1
Salix nigra	black willow	27	2
Salix nigra	black willow	27	2
Salix nigra	black willow	28	4
Salix nigra	black willow	32	1
Salix nigra	black willow	33	1
Salix nigra	black willow	40	1
Salix nigra	black willow	41	1
Salix nigra	black willow	42	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	23	1
Ulmus pumila	Siberian elm	27	1
Ulmus pumila	Siberian elm	30	1

NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F3			Date/Time: June 19, 2017 1:00 PM						
Stationing: MP 65.10 – MP 65.29			Location: north of I-80						
Plot Area: 1.2956 acre			Sub-Canopy Density: closed						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	4	0	0	2	0	1	1	0	0
Acer saccharinum	1	2	0	3	0	0	0	0	0
Ailanthus altissima	1	1	0	2	0	0	0	0	0
Fraxinus pennsylvanica	10	13	0	12	9	2	0	0	0
Juglans nigra	1	4	0	5	0	0	0	0	0
Morus alba	4	0	0	4	0	0	0	0	0
Populus deltoides	13	26	8	46	1	0	0	0	0
Salix nigra	2	0	0	2	0	0	0	0	0
Ulmus americana	5	2	0	6	1	0	0	0	0
Ulmus pumila	26	21	1	44	3	0	1	0	0
Unknown	2	0	0	0	1	0	1	0	0
Total	69	69	9	126	15	3	3	0	0
	147								
Density (#/acre)	53	53	7	97	12	2	2	0	0
	113								

Facing north from southern portion of woods

Facing south from northern portion of woods

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	boxelder	19	3
Acer negundo	boxelder	21	1
Acer negundo	boxelder	22	4
Acer negundo	boxelder	22	1
Acer saccharinum	silver maple	22	1
Acer saccharinum	silver maple	23	1
Acer saccharinum	silver maple	24	1
Ailanthus altissima	tree-of-heaven	19	1
Ailanthus altissima	tree-of-heaven	24	1
Fraxinus pennsylvanica	green ash	15	1
Fraxinus pennsylvanica	green ash	18	2
Fraxinus pennsylvanica	green ash	18	1
Fraxinus pennsylvanica	green ash	19	2
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	20	1
Fraxinus pennsylvanica	green ash	20	2
Fraxinus pennsylvanica	green ash	21	1
Fraxinus pennsylvanica	green ash	25	1
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	28	1
Fraxinus pennsylvanica	green ash	28	2
Fraxinus pennsylvanica	green ash	30	2
Fraxinus pennsylvanica	green ash	33	1
Fraxinus pennsylvanica	green ash	33	2
Fraxinus pennsylvanica	green ash	33	1
Fraxinus pennsylvanica	green ash	34	3
Fraxinus pennsylvanica	green ash	35	1
Fraxinus pennsylvanica	green ash	37	2
Fraxinus pennsylvanica	green ash	39	3
Juglans nigra	black walnut	20	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	25	1
Juglans nigra	black walnut	25	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	19	1
Morus alba	white mulberry	21	1
Populus deltoides	eastern cottonwood	16	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	18	1
Populus deltoides	eastern cottonwood	18	1
Populus deltoides	eastern cottonwood	19	1
Populus deltoides	eastern cottonwood	19	1
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	20	1

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	22	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	24	1
Populus deltoides	eastern cottonwood	24	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	30	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	35	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	40	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	42	1
Populus deltoides	eastern cottonwood	46	1
Populus deltoides	eastern cottonwood	47	1
Populus deltoides	eastern cottonwood	48	1
Populus deltoides	eastern cottonwood	50	1
Populus deltoides	eastern cottonwood	86	2
Populus deltoides	eastern cottonwood	110	1
Populus deltoides	eastern cottonwood	135	1
Populus deltoides	eastern cottonwood	159	1
Salix nigra	black willow	17	1
Salix nigra	black willow	19	1
Ulmus americana	American elm	15	3
Ulmus americana	American elm	18	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	25	1
Ulmus americana	American elm	39	1
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	17	1

Species	Common name	dbh (cm)	Stage of Decay
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	4
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	20	2
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	21	2
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	24	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	2
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	30	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	33	1
Ulmus pumila	Siberian elm	39	1
Ulmus pumila	Siberian elm	40	1
Ulmus pumila	Siberian elm	41	1
Ulmus pumila	Siberian elm	42	1
Ulmus pumila	Siberian elm	42	1
Ulmus pumila	Siberian elm	47	1
Unknown		18	2
Unknown		21	4

Appendix H. Project Photographs

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Habitat Unit H01 (5/9/2017)

Habitat Unit H02 (5/9/2017)

Habitat Unit H03 (5/9/2017)

Habitat Unit H04 (5/9/2017)

Habitat Unit H05 (5/9/2017)

Habitat Unit H06 (5/9/2017)

Habitat Unit H08 (5/5/2017)

Habitat Unit H10 (5/5/2017)

Habitat Unit H11 (5/5/2017)

Habitat Unit H12 (5/4/2017)

Habitat Unit H13 (5/4/2017)

Habitat Unit H14 (5/4/2017)

Habitat Unit H15 (5/4/2017)

Habitat Unit H16 (5/4/2017)

Habitat Unit H17 (5/4/2017)

Habitat Unit H18 (5/3/2017)

Habitat Unit H19 Looking upstream (5/3/2017)

Habitat Unit H19 Looking downstream (5/3/2017)

Habitat Unit H19 (5/3/2017)

Habitat Unit H20 (5/3/2017)

Habitat Unit H21 (5/2/2017)

Habitat Unit H22 (5/2/2017)

Habitat Unit H23 (4/28/2017)

Habitat Unit H24 (5/1/2017)

Habitat Unit H24 (5/1/2017)

Habitat Unit H25 (4/28/2017)

Habitat Unit H26 (4/28/2017)

Habitat Unit H27 (5/10/2017)

Habitat Unit H28 (5/2/2017)

Habitat Unit H29 (5/2/2017)

Habitat Unit H30 (5/1/2017)

Appendix I. Lochmueller Group Staff Résumés

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Rusty Yeager

Senior Field Biologist – Senior Associate

Rusty is an expert Environmental Biologist and author of several articles for scientific journals. His work includes EAs, EISs, field studies in aquatic and terrestrial ecosystems, and floral/faunal investigations. In addition he is a noise and farmland specialist. He has completed numerous wetland delineations for state, county and local government entities in accordance with the USACE Wetland Delineation Manual Technical Report Y-87-1.

Rusty also acts as an Environmental Permit Manager for Kentucky. In this role he coordinates and monitors environmental permitting for all Lochmueller Group projects in Kentucky, serving as central point of contact for reviewing agencies. Rusty previously worked as Assistant Laboratory Manager for Toxicology and Pathology Services, Inc., where his responsibilities included maintenance, handling, and treatment of a variety of mammalian laboratory animals ranging from mice to two species of primates. As Study Manager, he provided oversight and execution of study events, administration of test materials via various routes, maintenance of study data, and monitoring of the study population for toxicological effects, all in accordance with strict USDA and FDA guidelines. Other duties included performing necropsy prosections at study termination, and personnel management.

As a Biologist Aide with the Indiana Department of Natural Resources Fisheries Biologist Aide at the Sugar Ridge (formerly Patoka) Fish & Wildlife Area, he assisted the property's Fisheries Biologist in conducting fish population estimates (growth analysis), limnology tests (dissolved oxygen, thermocline, etc.), creel surveys, and in implementing aquatic weed control measures. Emphasis was placed on the management of reclaimed coal stripper pits for the purpose of recreational sport fishing. Additional lake studies included Hoosier National Forest Lake, Scales Lake, Garvin Park Lake, as well as several other Southwestern Indiana lakes.

REPRESENTATIVE PROJECT EXPERIENCE

National Environmental Protection Act Training for INDOT – Class Leader responsible for presenting at INDOT's 5-day seminar to engineering consultants and others covering the basics of NEPA regulations. Responsible for developing subject materials and presenting on several topics: 1) noise impacts; and 2) farmland impacts. 2011

Electrofishing for Coal Mine Permit, Noble County, Ohio for Central Ohio Coal Company – Subconsultant responsible for performing electro-shocking for fish sampling on two streams.

Tier 2 EIS, I-69, Evansville to Indianapolis, for INDOT – As a Senior Biologist for this effort comprising six EISs, conducted numerous quantitative and qualitative aquatic and terrestrial samples (e.g., stream assessments such as QHEI and HHEI, wetland assessments (such as INWRAP) and mist netted for the bats (especially the Indiana bat) throughout the 142-mile corridor, largely on new terrain. He was also responsible for the review of biological survey reports and interpretation of ecological data as it applies to various species and their habitats; management and coordination of farmland impact evaluations; oversight of noise analysis modeling; identification of assessment methods; oversight and review of wetland delineation and identification; and ecological assessments for all six EISs. He developed and conducted training programs for all consultants involved in water resources evaluations, as well as review agencies involved to ensure consistent application of assessment methods and inclusion of agency considerations. To date RODs have been received on Sections 1- 5. As a result, he is now heavily involved in supervising and conducting radio-telemetry and pre- and post-construction monitoring for the Indiana bat in Sections 1, 2, and 3. 2004–Present

On-Call Environmental Services for INDOT, Crawfordsville District – Contract Manager responsible for assigning and overseeing work orders including development of CEs and supplemental documentation, natural resource assessments (streams and wetlands), Section 106 issues, Section 4(f), Section 6(f) issues, coordinating with agencies, and preliminary permitting activities.

WITH THE FIRM
Since 1992

YEARS OF EXPERIENCE
27

EDUCATION
BS, Biology, University of Southern Indiana, Evansville, Indiana, 1987

REGISTRATION
Scientific Purpose:

Indiana

CERTIFICATION
Indiana Scientific Purposes License (1992 to Present)

Kentucky Scientific Wildlife Collecting Permit (1994-2009)

Georgia Scientific Collecting Permit (2013)

USFWS Region 3 Indiana/Gray Bat Federal Fish & Wildlife Permit TE06845A-1 (2010 to Present)

USFWS Region 4 Indiana/Gray Bat Federal Fish & Wildlife Permit (2013)

OSHA Confined Space Entry

INDUSTRY ASSOCIATION
Indiana Academy of Science

Kentucky Academy of Science

Society of Wetland Scientists

Midwest Bat Working Group

- **CE, US 136 Partial 3-R, Waynetown for INDOT, Crawfordsville District** – Project Manager for environmental services related to pavement rehabilitation and sidewalks that included historic structure evaluation and documentation of potential impacts for application of the Section 106 Minor Projects Programmatic Agreement. Potential hazardous materials issues were also addressed due to USTs. (DES 0501067)
- **CE, US 52 Pavement Replacement for INDOT, Crawfordsville District** – Project Manager responsible for completing field reconnaissance and environmental coordination, including Section 106 Minor Projects Programmatic Agreement analysis and hazardous materials coordination relative to USTs and an active rail yard. Public lands were also reviewed for potential Section 4(f) applicability. (DES 0100699)
- **CE, SR 267 Reconstruction, Brownsburg for INDOT, Crawfordsville District** – Project Manager responsible for field reconnaissance and environmental coordination including Section 4(f) applicability review for Arbuckle Acres Park and for initial coordination with park staff regarding mitigation concerns. Section 106 coordination with INDOT Central Office that has included Section 106 analysis for multiple National Register Properties adjacent to the project. A stream assessment was also completed. (DES 9608920)

On-Call Wetland Services for INDOT, Central Office – Contract Manager responsible for assigning, overseeing, and/or managing more than 25 work orders statewide from 2008 to present. Projects assigned include:

- **Auburn Rest Area (I-69) Wetland Mitigation Design Re-Evaluation for INDOT, Central Office** – Project Manager for wetland mitigation site re-evaluation and design modification prior to letting. Site designs included excavation and planting plans and specifications. 2009-11
- **SR 62, Nord Wetland Site, Warrick County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation of a 45-acre mitigation site. Assessment of vegetation, hydrology and soil conditions concluded that site was meeting the required performance standards. 2009
- **SR 3, Lemon Wetland Mitigation Bank Site, Noble County for INDOT, Central Office** – Project Manager for wetland delineation and Floristic Quality Assessment of constructed wetland site proposed for use as a wetland mitigation bank by INDOT mitigation credits. 2009
- **SR 66, Big Creek Wetland Remediation Design for INDOT, Vincennes District** – Project Manager for assessment of existing wetland conditions and design of remediation action to increase the size of the wetland to meet the target mitigation criteria required under the Section 401 and 404 permits issued for the Big Creek overflow bridge construction. 2010
- **SR 237, Anderson River Bank Stabilization & Enhancement Remedial Action Plan, Perry & Spencer Counties for INDOT, Central Office** – Project Manager for coordination of activities required to prepare remediation plans to correct erosion problems on a stream mitigation site that does not currently meet performance standards. Activities include review of corrective action plans and unique special provisions developed by another consultant, coordination with state and federal permitting agencies, coordination with easement property owners and preparation of all documentation required by contracts to let the project. 2009-present
- **SR 237 Anderson River Bank Stabilization & Enhancement 4th Year Stream Mitigation Monitoring for INDOT, Central Office** – Project Manager overseeing and reviewing 4th year monitoring report prepared by others. 2010
- **SR 246 Fish Creek Tributary Relocation, Owen County for INDOT, Central Office** – Project Manager responsible for managing construction oversight performed by others for the relocation of 287 feet of stream channel, plus 300 feet of channel from a roadside drainage facility. Activities also included post construction evaluation of vegetation survival and recommendation for corrective action needed for the eroding roadside stream that developed immediately after construction. 2010 to present
- **SR 25 (Hoosier Heartland Highway) Improvements Wetland & Stream Mitigation, Tippecanoe & Carroll Counties for INDOT, Central Office** – Project Manager providing resource assessment and mitigation planning for bioengineering the bank stabilization effort and used natural channel design restoration techniques to relocate two Robinson Branch tributary streams. Included overall evaluation of the water resources identified to be impacted by this project, and completed habitat assessments for coordination with the permitting agencies and benchmarking for the ultimate mitigation success criteria. The water resources assessments completed for the project included Qualitative Habitat Evaluation Index (QHEI) for larger streams, Primary

Headwater Habitat Evaluation Index (HHEI) for small tributaries (<1 mi.^{2} drainage area), and Indiana Wetland Rapid Assessment Protocol (INWRAP) for all wetlands. The Stream and Wetland Mitigation and Monitoring Plan included wetland restoration and enhancement, stream restoration, riparian enhancement and major bank stabilization elements. The wetland mitigation included extensive enhancement of degraded fens at Prophetstown State Park as well as tile drain elimination to restore hydrology to a previously drained area within the Wabash River floodplain area. During construction of the mitigation projects, on-call consultation has been provided to INDOT and the contractor concerning the proper construction of the mitigation facilities. 2010 to present

- **SR 3, Freeman Farm Wetland Mitigation Site, Noble County, Indiana for INDOT, Central Office** – Project Manager and Field Investigator for wetland delineation, wetland determination documentation and Floristic Quality Assessment of constructed wetland site proposed for use as a wetland mitigation bank by INDOT mitigation credits. 2010-11
- **SR 44, Flatrock River Wetland Mitigation 5th Year Monitoring, Rush County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation, Floristic Quality Assessment, and coordination with IDEM and USACE on approval of the site and release from future monitoring. 2010-11
- **I-74, Batesville Wetland Mitigation 5th Year Monitoring, Ripley County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation, Floristic Quality Assessment, and coordination with IDEM and USACE on approval of this 6-acre site and release from future monitoring 2010-11
- **US 24 Wolfe Mitigation Bank Site, Miami County for INDOT, Central Office** – Project Manager providing oversight of herbicide treatments performed by others to control invasive species and meet performance standards required for IDEM and USACE acceptance as a mitigation bank. 2010
- **US 24 Sperry Wetland, Miami County for INDOT, Central Office** – Project Manager providing oversight of herbicide treatments performed by others to control invasive species and meet performance standards required for IDEM Section 401 and USACE Section 404 permit requirements. 2010
- **SR 145, Hurricane Creek Wetland Mitigation 2nd Year Monitoring, Perry County for INDOT, Central Office** – Project Manager for 2nd year wetland monitoring and Floristic Quality Assessment of this 2.5-acre site. Monitoring identified the need for continued invasive species control and recommended additional remediation plantings to correct high tree mortality and greater than acceptable open water habitat coverage. 2010
- **SR 641, Terre Haute Stream Mitigation 1st Monitoring, Vigo County for INDOT, Central Office** – Project Manager for 1st year monitoring evaluation of stream channel construction, wet meadow development and planted riparian zone development adjacent to Little Honey Creek. Provided oversight of stream channel monitoring by others and conducted Floristic Quality Assessment study for the stream channels, wet meadows and riparian habitats. 2010
- **SR 641, Terre Haute Wetland Mitigation Site, Vigo County for INDOT, Central Office** – Project Manager for 3rd year monitoring of a 149 acre mitigation site that included 90 acres of plantings. 2010
- **Statewide Monitoring Well Installation, Gibson, Miami, St. Joseph & Noble Counties for INDOT, Central Office** – Involved purchase of material and installation of six groundwater monitoring wells at four wetland. Water level data loggers were also deployed at each well. Data from the loggers was downloaded and analyzed to assess hydrology conditions for each site. 2010-11
- **SR145, Hurricane Creek Wetland, Perry County for INDOT, Central Office** – Project Manager oversight of herbicide treatments performed by others to control invasive species that had become established and exceed the success criteria performance standards in the Section 401 and 404 permits. 2010
- **US 231, Chrisney Lake Wetland Remediation, Spencer County, for INDOT, Vincennes Office** – Project Manager providing remediation plan consultation and remediation construction oversight. Heavy rain events in September 2009 resulted in notable sediment transport from the US231 construction site and deposition into a stream and wetland associated with Chrisney Lake. The extent of the sediment deposition was delineated and coordination with INDOT, the contractor, IDEM, USACE, and local officials was conducted to determine the appropriate measures to mitigate for the discharge. Prepared remediation plan with multiple options and provided oversight during the remediation which involved mechanical removal of the material with light machinery. 2009-11

- **SR 66, After-the-Fact Mitigation Design, Warrick County, for INDOT, Vincennes Office** – Project Manager responsible for all activities related to securing a suitable wetland mitigation site impacts to approximately 2 acres of forest and emergent wetlands associated with improvements to SR 66 east of Newburgh. Activities include identification and alternatives analysis for multiple potential sites, delineation of existing wetlands, coordination with IDEM and USACE on site selection, property owner coordination, NEPA documentation, mitigation design, bid package preparation, Construction in Floodway permit, if applicable, and acquisition or conservation easement acquisition. 2010 to 2015
- **SR 641, Terre Haute Stream Mitigation 2nd through 5th Year Monitoring, Vigo County for INDOT, Central Office** – Project Manager for continued monitoring of stream channel construction, wet meadow development and planted riparian zone development adjacent to Little Honey Creek. Provided oversight of stream channel monitoring and herbicide treatments performed by others and conducted Floristic Quality Assessment study for the stream channels, wet meadows and riparian habitats. 2011-15
- **SR 641, Terre Haute Wetland Mitigation Site, Vigo County for INDOT, Central Office** – Project Manager for 4th and 5th year monitoring of a 149 acre mitigation site that included 90 acres of plantings. As a result of the delineation of existing wetlands conducted in 2011, additional monitoring has been suspended since the site does not appear to meet the acreage requirements for the multiple phases of the SR 641 project. 2011.
- **SR 145, Hurricane Creek Wetland Mitigation 3rd through 5th Year Monitoring, Perry County for INDOT, Central Office** – Project Manager for continued wetland monitoring and Floristic Quality Assessment of this 2.5-acre site. In 2011 this included oversight of multiple herbicide treatments performed by others and coordination on remediation plantings of trees and herbaceous plugs performed by others. 2011 to 2013
- **US 24 Wolfe Wetland Mitigation Bank, Miami County for INDOT, for Central Office** – Project Manager and Field Investigator responsible for wetland delineation/documentation and assessment of tree/shrub survival success and invasive species cover for this proposed INDOT mitigation bank. Provided oversight for multiple herbicide treatments performed by others and assessment of effectiveness. 2011
- **US 24 Sperry Wetland, Miami County, for INDOT, Central Office** – Project Manager and Field Investigator responsible for delineation of developing forest habitat and assessment of invasive species cover for this proposed INDOT mitigation bank. Provided oversight for multiple herbicide treatments performed by others, as well as. 2011
- **US 24 Bonar Wetland, Cass County, for INDOT, Central Office** – Project Manager and field investigator responsible for assessment of invasive species cover and delineation of invasive species problem areas for this mitigation site. Provided oversight and assessed effectiveness of multiple herbicide treatments performed by others. 2011

US 68/KY 80 Trail, Land Between the Lakes (LBL) for Kentucky Transportation Cabinet (KYTC) – Conducted field reconnaissance for a proposed bike/pedestrian trail to be constructed through the LBL National Recreation Area. Associated with proposed highway improvements, this trail traverses LBL from east to west, crossing the Cumberland River/Tennessee River watershed divide including some rugged terrain. Provided cycling input on the potential route and potential combinations/variations on trail designs ranging from AASHTO standards to USDA National Forest Service trail standards, to address the terrain issues. 2008

I-65 to US 31W Connector Study, Bowling Green for KYTC – Senior Field Biologist responsible for research and conducting field studies, preparing ecological baseline study, and EIS chapters for a connector roadway between I-65 and US 31W. The study area was within a well-developed karst plain comprised of sinkholes and caves. Completed a Biological Assessment, conducted Section 7 consultation, and assisted with public involvement. Specific field tasks included an inventory of flora (including specific searches for the federally-listed Eggert's sunflower), small mammal trapping (237 trap-nights in multiple habitat types), and wetland delineations. Also included fall harp trapping at two cave entrances and summer mist netting at two potential maternity roosting sites, to survey for gray bats and/or Indiana bats, to facilitate a Biological Assessment. The survey resulted in the capture of three male gray bats, red bats, and eastern pipistrelles. Major considerations included sinkholes, caves, groundwater quality, the Mammoth Cave Shrimp, and historic resources. A Secondary and Cumulative Impact Analysis was also completed. 2008

EIS, I-69, Evansville, Indiana to Henderson, Kentucky for INDOT & KYTC – Senior Field Biologist responsible for an Ecological Assessment baseline study and assisted in completing the EIS. Provided input on possible mitigation efforts to address bike/pedestrian impacts, including the potential for a dedicated bike/pedestrian facility on the proposed Ohio River crossing bridge, which would provide connectivity between Kentucky's Audubon State Park and Indiana's Angel Mounds State Historic Site and their

respective trail systems. Also completed a review of potential bike/pedestrian impacts, including coordination with the public and local cycling groups on existing and proposed bike routes associated with dedicated bike/pedestrian facilities and other transportation facilities as well. This portion of the highway would begin in Indiana at Green River Road and continues south across the Ohio River and its floodplain, then connecting to the Pennyrile Parkway south of Henderson, Kentucky. The EIS was performed to identify the purpose and need for the project; conduct an alternative's analysis; identify environmental consequences; and propose mitigation measures. Major considerations were the Indiana bat (mist netting showed a pregnant female); wetlands; a bridge crossing; the proposed Green River National Wildlife Refuge; Green River State Forest; Henderson Landfill; bald eagle and blue heron rookeries; and an historic home razed during this project. 2005

Tier 1 EIS, I-69, Evansville to Indianapolis for INDOT – Noise Impact Specialist and Senior Biologist responsible for field surveys for homes and businesses in five final routes; research and writing the farmland impacts and noise analysis sections of the Draft EIS; and assisting in planning a highly successful 2-day tour for environmental review agencies. As part of this study, he managed and conducted extensive quantitative and qualitative ecological sampling for plants and animals for agency review, i.e., 250 plant species from 70 families were identified: no Threatened, Endangered and Sensitive plant species were observed. Biological assessments were completed for numerous mammal, reptile, amphibian, fish, mussel, and bird species. In addition, questionnaires on location, hydrology, soils, vegetation, and animals were completed for over 230 wetland and riparian habitats. His responsibilities included interpretation of ecological data collected and managing all studies on species and their habitats to completion. A ROD was received on March 24, 2004 and, in 2005, the EIS was recognized by the National Cooperative Highway Research Program study as one of the Top 10 NEPA documents in the nation and cited as an example of "best practice." 2004

EIS, US 31 Plymouth to South Bend, St. Joseph & Marshall Counties for INDOT – Senior Field Biologist responsible for coordinating field work, sampling perennial stream sites, and identifications and calculations of IBI and diversity indices for this segment of the US 31 study area, approximately 20 miles long by 10 miles wide, running from the southern terminus at US 30, near Plymouth, to the northern terminus at US 20 near South Bend, which resulted in a Record of Decision in 2006. He also conducted bat surveys in conjunction with another firm. Similarly, he coordinated with the NRCS on farmed wetlands and helped address the project's many other ecological considerations with agencies and others. The project was applauded for locating the roadway following sustainability concepts. 2004

EA, Bert T. Combs Mountain Parkway (KY 114) Reconstruction & Widening, Salyersville to Prestonsburg for KYTC – Senior Field Biologist responsible for study to evaluate upgrading existing KY 114 for approximately 21 miles. Major considerations included wetlands, forests, Middle Creek National Battlefield, stream crossings and water quality, residential and commercial relocations, and a 4(f) issue on a "death house." Unique to this project was a Community Impact Assessment and the development of Kentucky's first Public Involvement Plan and Public Involvement Action Plan which included four Community Impact Assessment Meetings. FONSI received March 4, 2003

KY 7 Reconstruction, KY 706 to Carter County Line, Elliott County for KYTC – Senior Field Biologist responsible for noise analysis at eight locations and evaluation of abatement feasibility along the proposed reconstruction of KY 7 from north of KY 706 to the Carter County Line. 2003

Noise Analysis Baseline Studies for KYTC – This contract involved noise analysis to determine highway-generated noise impacts according to FHWA guidelines. Included ambient field measurements and employed the STAMINA/OPTIMA 2.0 model to predict and compare design year highway noise levels at several rural and urban sites for multiple alternates. Each study also discussed the reasonableness and feasibility of potential noise abatement measures when the FHWA criteria for impacts had been met. Projects included:

- KY 114 from Salyersville to near Prestonsburg, Magoffin & Floyd Counties, 2003
- US 460, Menifee County, 2002
- KY 519 at Morehead, Rowan County, 1999

I-65 Noise Barrier Analysis, West 62nd Street to Springs Road for INDOT – Project Manager responsible for highway noise impacts and to evaluate the potential to abate any such highway noise impacts. 2002

I-465 Noise Barrier Analysis, Pendleton Pike to I-69 Interchange for INDOT – Project Manager for a noise impact analysis and abatement barrier evaluation along I-465 on the east side of Indianapolis between Pendleton Pike and Fall Creek. This interstate is heavily traveled and has many high density neighborhoods (single- and multi-family) and businesses along its course. Four noise

barrier segments were recommended totaling 2.6 miles at an estimated cost of $3.9 million that would benefit an estimated 173 residences. 2002

I-69 Noise Barrier Evaluation, Abiote Center Road to Covington Road for INDOT – Project Manager responsible for assessment of effectiveness of existing barrier walls along the east and west side of I-69 at Fort Wayne. TNM 2.5 models were created to replicate the existing barriers, roadways and receptors in the area and evaluate the predicted insertion loss expected to occur in the design year. The analysis concluded that a portion of the barrier was too low to provide a minimum 5dBA insertion loss for a small group of residences west of the interstate and provided a recommendation to raise the barrier height by as much as 5 feet to increase the effectiveness of the structure. 2010

Northfield Drive Highway Noise Analysis, Hendricks County, for Town of Brownsburg – Project Manager responsible for collecting ambient noise level data and TNM 2.5 assessment of predicted noise levels associated with proposed road reconstruction and design year traffic forecast in accordance with INDOT Traffic Noise Analysis Procedure. Analysis concluded that no highway noise impacts are anticipated within this mixed residential/commercial land use suburban area of Brownsburg. No abatement measures were required to be evaluation. 2011

Georgetown Road Highway Noise Analysis, Marion County, for City of Indianapolis – Project Manager responsible for collecting ambient noise level data oversight on TNM 2.5 assessment of predicted noise levels associated with reconstruction of Georgetown Road from 56th Street to 62nd Street in an area of high density residential (single family residence subdivisions and three apartment complexes) and commercial use. Analysis concluded that that a limited number of impacts were anticipated for the proposed reconstruction in the design year, but that abatement in the form of barrier wall construction was not feasible since the City of Indianapolis does not restrict access control along this portion of Georgetown Road. 2011

EA, KY 7 Reconstruction, Sandy Hook to Memory Gardens Cemetery, Elliott County for KYTC – Project Manager responsible for environmental documentation including baseline studies and the EA for the proposed reconstruction and widening of a 1.6-mile section of KY 7 in south-central Elliott County of eastern Kentucky. The project began in Sandy Hook and proceeded through Bell City to end just north of the Elliott County Memory Gardens Cemetery. 2000

EA, US 460, Frenchburg Hill to West Liberty Road, Menifee County for KYTC – Senior Field Biologist responsible for evaluating impacts of upgrading existing US 460 for approximately 4 miles. Major considerations included kudzu, relocation of a lumber company, residential relocations, a Civil War cemetery, an unmarked cemetery in Mariba, a stream relocation, the crossing of the Daniel Boone National Forest trail, and a big tree candidate. 2000

EA, KY 519 Roadway Design & Environmental Studies, Rowan County for KYTC – Senior Field Biologist responsible for completion of a socio-economic baseline study for this project that studied upgrading roadway for approximately 6 miles. Major considerations included the crossing of Tripplett and Morgan creeks, residential relocations, and floodplain encroachments. In addition, a historic train station and junkyard were included along with a trailer park and 4(f) impact to a Forest Ranger Station. A Community Impact Assessment was completed as was a 4(f) Programmatic Statement. The study reported population, housing, income, poverty, and employment demographics for the county and project area; profiled manufacturing, retail trade, recreation, agriculture, education, transportation, property taxes, local government, and community development within the county; and accessed probable impacts relating to land use, transportation, compatibility with other projects, neighborhood and community disruption, prime farmland, residential relocations, environmental justice, business viability, tourism, education. FONSI received October 2, 2000

Six Ecological Baseline Studies for KYTC – Provided field work for sampling of the aquatic and terrestrial fauna; classification of available habitat based on vegetative cover, terrain, and geology; wetland identification, description, delineation and measurement; and assessment of general water quality. The reports assessed potential impacts to threatened and endangered species, geologic resources, prime farmland resources, wetlands, water quality, floodplains, streams and ponds, and unique natural features. 1992–2000

Bat Habitat Assessment, SR 261 Utility Relocation, Warrick County, Indiana for Vectren Energy Delivery – Responsible for conducting evaluation of roosting habitat for Indiana bat along 0.25 miles of SR261 and conducting informal consultation with USFWS to secure approval to have trees removed within the tree clearing restriction period established by the USFWS. It was concluded that habitat for the Indiana bat was lacking and a finding of “not likely to adversely affect” received USFWS concurrence. 2011

Bat Habitat Assessment, BSCI Replacement Project, Vigo County for Vectren Energy Delivery – Responsible for conducting evaluation of roosting habitat for Indiana bat within a small woodlot that required tree removal within the tree clearing restriction period establish by the USFWS. The bat emergence survey at three potential roost trees yielded no emerging bats and through informal consultation the USFWS agreed that the action was "not likely to adversely affect" the species and that the tree removal was approved. 2011

I-69 Indiana Bat and Northern Long-eared Bat Surveys – Managed and organized annual bat field surveys for all six sections of the I-69 project from 2008 to the present. Also conducted annual bat mist net surveys for Sections 4 and 5 from 2010 to the present resulting in the capture of over 850 bats including Indiana bats and northern long-eared bats. Radio telemetry tracking was conducted for both species on multiple occasions resulting in the discovery of over 20 roost trees. 2008-present

I-69 Crayfish Frog Survey – Organized and conducted acoustic surveys for crayfish frogs in March 2013 totaling 30-40 man-hours. No crayfish frogs were heard at the site; however, the presence of the species was confirmed in nearby areas based on call recognition. Through coordination with IDNR, construction of INDOT mitigation wetlands (220 acres) was authorized and deemed to beneficial for wildlife, including the crayfish frog.

EA, St. Joseph Avenue for the City of Evansville, Indiana – Prepared NEPA documentation for expansion on 1.5 miles of an urban roadway. Involved a thorough inventory and project impact assessment for several sensitive historic and recreational sites, and required a moderate level of Section 106 coordination. Project also included wetland mitigation design at the Mesker Park Zoo and Botanic Gardens. 1999

EA, Industrial Park Road for the City of Ferdinand, Indiana – Senior Field Biologist responsible for studies of new roadway. Major issues included possible hazardous waste and underground storage tanks (USTs), Section 106 historic preservation, archaeology, and noise impacts. FONSI received February 2, 1998

CE, Ouabache State Park Bike Trail Design, Wells County, Indiana for the Indiana Department of Natural Resources – Responsible for NEPA documentation for the 4.2-mile bicycle trail in Ouabache State Recreational Area that links the town of Bluffton to Ouabache State Park. This opened up to the public a large section of park along the Wabash River that was not formerly accessible. The project required minimal disturbance to the sensitive surrounding areas, while remaining in conformance with the technical development of transportation enhancement projects and AASHTO's Guide for the development of Bicycle Facilities. 1998

CR 350S Wetland Monitoring & Mitigation Plan, Tippecanoe County, Indiana for INDOT – Responsible for preparation of Wetland Mitigation and Monitoring Plan. This portion of the project included identification and delineation of existing wetlands on mitigation site, development of final grading design, species planting/seeding recommendations, and wildlife enhancement amenity suggestions. 1998

EA, Airport Runway Extension for the Evansville Regional Airport, Indiana – Senior Field Biologist responsible for environmental studies related to the extension of runway 18-36, which addressed the major issue of relocations, noise, air quality, and visual impacts. FONSI received January 24, 1997

US 31 Corridor Study & Environmental Overview, St. Joseph & Marshall Counties for INDOT – Field Biologist responsible for assisting in a study to determine the feasibility of converting US 31 from an at-grade expressway to a freeway. The corridor links the communities of Indianapolis and South Bend and is the primary travel route between northern and central Indiana. 1997

Southwest Indiana Highway Corridor, Evansville to Bloomington for INDOT – Environmental Planner responsible for conducting many field surveys for animals and plants. Field sampling included the following: 93 stations for fish; 41 locations for mussels; 21 locations for bats; 30 sites sampled twice each (spring and fall) for birds; and trapping for vertebrates for one month at each of two locations in the Patoka River bottoms. Furthermore, sampled for plants via forest plots, wetland surveys, and walking the corridors. This study reviewed more than 100 areas for wetland jurisdictional status, and US Army Corps of Engineers' wetland field forms were completed for each wetland. The fish surveys identified 7,911 individuals from 71 species, while mussel surveys showed 68 individuals from 12 different species. Trapping for vertebrates showed 268 individuals from 15 different species, bird observations totaled 101 from 34 different families, and plants totaled 361 species. In all of these studies, only one federally-listed species was found: the Indiana bat. During this study, many alternative alignments were developed based on the location of socioeconomic, geological, ecological, historical archaeological and public concern areas. Proposed alignments were located to avoid and/or minimize impacts on these resources. 1996

Corridor Location Study, Bloomington to Evansville, Highway (Section III) for INDOT – Assisted in field collections on fishes and environmental data. Assisted in locating approximately 4,000 recorded geological, ecological, historical, and public concern sites. These sites included karst features (e.g., sinkholes and caves), limestone reserves, oil/gas wells, wetlands, threatened and endangered plants and animals records, nature preserves, parks, homes and businesses, bridges, archaeological sites (burial and artifacts), cemeteries, landfills, schools, industrial parks, and others. Proposed alignments were positioned to avoid as many of these areas as possible. 1990–1992

PUBLICATION

Cervone, T.H., J. Sias, **R.K. Yeager,** R. King and M. Allen, 2008 *Bat Occupancy Under a Bridge in Southwestern Indiana*. In Progress. 9pp, 10 figs.

Cervone, T.H. and **R.K. Yeager**, *A Walking Tour of Planted and Lowland Trees in Historic New Harmony (20 years later).* February 2008. University of Southern Indiana Press, Evansville, Indiana 122 pp, 57 illus., 1 fig.

Cervone, T.H. and **Yeager, R.K**. 1988. *Planted and Lowland Trees in Historic New Harmony,* University of Southern Indiana Press, Evansville, Indiana, 172 pp, 57 illus., 1 fig.

Schultheis, S.J., Berger, K.D., Agee, D.M., **Yeager, R.K.**, and Cervone, T.H. 1988, *Summer Fishes of Pigeon Creek Drainage*, Proc. Ind. Acad. Sci. for 1987.

Yeager, R.K., Nichols, D.S., Schultheis, S.J., Galbraith M.T., Lenn S.E., and Cervone, T.H. 1988, *Fishes of Goose Pond and its Drainage Basin*. Proc. Ind. Acad. Sci. for 1987. 96:533-558.

CONTINUING EDUCATION

NEPA Refresher Course, INDOT, November 19, 2014

Acoustic Techniques Course, Helen, GA, April-May 2013

Analook with BCID Analysis Course, Helen, GA, April-May 2013

Confined Space Entry, Environmental Management Institute, July 16, 2013

Design and Implementation of Erosion and Sediment Control, National Highway Institute, Evansville, IN December 11-12, 2012

NEPA Initial Course, INDOT, April 9-12, 2012

National Environmental Policy Act (NEPA) and the Transportation Decision-Making Process, 2012, 2007, 2003

Case Study Workshop-Interstate Engineering CSW, XL Insurance, June 30, 2010

Developing A Biological Assessment, U.S. Fish and Wildlife Service, Frankfort, KY, April 2009

Level 1 Applied Fluvial Geomorphology, Pilot View Resource Conservation & Development, Inc., Asheville, NC, February 23-27, 2009

Level 2 River Morphology & Applications, Pilot View Resource Conservation & Development, Inc., Asheville, NC, March 8-12, 2010

Level 3 River Assessment & Monitoring, National Training Center, Shepherdstown, WV, May 16-26, 2011

Amphibian & Reptile Identification Course, conducted by Dr. Thomas Pauley, May 2008

National Environmental Policy Act Refresher. Conducted by INDOT & FHWA, March 13, 2007

Road Crossing Structure Improvements to Accommodate Wildlife Passage, American Society of Civil Engineers, November 2006

Planning, Site Selection, & Hydrology Models for Constructed Wetlands, Wetland Training Institute, October 2006

Wetland Plant Identification, Wetland Training Institute, Ft. Wayne, Indiana, September 26-29, 2006

Highway Traffic Noise Impacts, INDOT & FHWA, Indiana, September 2006

Principles & Techniques of Electrofishing, US Fish & Wildlife National Conservation Training Center, Ludington, Michigan, April 2006

Biocriteria & QHEI Training, Ohio EPA, Groveport, Ohio, July 2005

Primary Headwater Habitat Program Training, Ohio EPA, Woodlake Environmental Field Station, May 2005

Endangered Species Act: Section 7 – Interagency Cooperation, FHWA, Indianapolis, Indiana, April 2005

Managing Wildlife for Sustainable Forests, IDNR, Indianapolis, Indiana, March 2005

Wetland Delineation with Emphasis on Soils & Hydrology, Wetland Training Institute, New Harmony, Indiana, October 20-25, 2003

Managing the Environmental & Transportation Development Process, Ohio Department of Transportation, 10-day course, August 2002, 3 CEU

Noise Analysis Modeling, KYTC, 1998

Wetland Plant Identification, Biotic Consultants, Inc., 2015, 2013, 2012, 2010, 2008, 2007, 2003, 2000, 1999, 1998, and 1997

Highway Traffic Noise Analysis, University of Louisville, July 1999

Highway Noise Analysis Seminar, University of Louisville, April 1999, 3.2 CEU

Jurisdictional Delineation of Wetlands in Michigan, Michigan Department of Natural Resources, Michigan State University, September 1993, 3.0 CEU

Thomas Cervone, PhD

Vice President & Director of Environmental Services – Principal

"Dr. Tom" serves on Lochmueller Group's (Lochgroup) Board of Directors and as the firm's Director of Environmental Services. His strong academic and professional background in the environmental sciences includes expertise in ecology, herpetology, ichthyology, wetlands, and botany. He is responsible for the management of all environmental studies completed at Lochgroup and has published a number of papers and books.

Dr. Tom enjoys an outstanding reputation with federal and state environmental review agencies. For 8 years, he has served as an Instructor for Indiana Department of Transportation's (INDOT's) NEPA workshops teaching *Section 7 Consultation* and *Secondary and Cumulative Impact* and then later developed curriculum as INDOT's selected provider for the entire NEPA training course. As a result, Dr. Tom and his staff have provided NEPA Training for approximately 120 NEPA consultants, including representatives from INDOT, FHWA, and 6 other states.

Tom was also featured in the Indiana Department of Environmental Management's (IDEM's) video entitled *Wetland Permitting in Indiana* and spoke on Environmental Policy at the 1994 Indiana Governor's Environmental Conference. He also assisted agencies in developing guidelines for streams and wetlands, such as the *Floodway Habitat Mitigation Guidelines for the Indiana Department of Natural Resources (IDNR)*, and assisted with the *Headwater Guidelines Forum* for IDEM. He has developed training in a number of field assessment methods including QHEI, HHEI, box turtle surveys, wildlife crossings, and bridge surveys for bats.

To date, Tom has been responsible for over 100 environmental documents ranging from complex EISs to CEs. In 2004 and 2005, he headed the most comprehensive study on the federally endangered Indiana bat by locating 148 sampling sites, 347 cave evaluations, 60 to 70 cave surveys, 60 to 80 harp trappings and has reviewed a bridge roost for that last 6 years (2006 – 2011). He has worked cooperatively with the USFWS in continuing pre- and post-construction monitoring for this species and has been responsible for all of the Biological Assessments completed on this project. He recently co-authored a paper on Thermal Dataloggers making noise that has worldwide implications, and has a federal permit to study this species as well as the gray bat and the northern long-eared bat. From his work and others, much new information has surfaced on this species, including bridges used as roosting bat habitat.

In 2005, the American Association of State Highway and Transportation Officials Standing Committee on the Environment cited the I-69 Tier 1 Final EIS prepared under Dr. Tom's guidance as one of the top ten examples of best practice nationwide. According to the study, the Lochgroup document "*illustrates how a complex and potentially overwhelming project with multiple impacts on multiple potential alignments over a very large study area can be analyzed in a relatively succinct manner*."

Prior to joining Lochgroup, Dr. Tom taught at St. Bonaventure University, University of Pittsburgh, University of Southern Indiana, Northeastern University, and University of Kentucky where he instructed students in the natural sciences and field study research projects. Under his direction, his students published one book and four papers in Indiana alone.

REPRESENTATIVE PROJECT EXPERIENCE

Electro-Shocking for Coal Mine Permit, Noble County, Ohio for Central Ohio Coal Company – Subconsultant to Strategic Environmental & Ecological Services to provide electro-shocking for fish sampling on two streams.

Surveyed Fishes in the Following Kentucky Projects

- *KY 114 (Salyersville to Prestonsburg) – Middle Creek (especially notable was the northern studfish)*
- *KY 519 (Morehead) – Triplett Creek (especially notable were darters and diversity)*

WITH THE FIRM
Since 1985

YEARS OF EXPERIENCE
41

EDUCATION
Post-Doctorate, Insect Bioassay, St. Bonaventure University, Allegany, New York, 1982-1983

PhD, Ecology, (Mountain Earth Snake) St. Bonaventure University, Allegany, New York, 1983

Masters Studies, Fisheries, St. Bonaventure University (Fish Distribution), 1975

BS, Biology, Lock Haven State University, Lock Haven, Pennsylvania, 1974

REGISTRATION
Scientific Purpose: Indiana

CERTIFICATION
USFWS Region 3 (2010-Present) & Region 4 (2013) Indiana/Gray Bat Federal Fish & Wildlife Permits

Indiana (1992 to Present), Kentucky (1994-2009) & Georgia (2013) Scientific Collecting Permits

INDUSTRY ASSOCIATION
Advisory Board, Indiana State University Center for North American Bat Research Conservation

Midwest Bat Working Group

Indiana Association of Environmental Professionals

Wesselman Woods Nature Center, Board of Directors & Natural Resource Committee

Friends of Patoka River National Wildlife Refuge, Board Member

- *Cooksey's Spring (near Trenton) – West Fork of the Red River (especially notable were the snubnose darter)*
- *Land between the Lakes (Golden Pond – US 68/KY 80) – Streams mostly dry and karst conditions in eastern half*

National Environmental Protection Act Training for INDOT – Developed curriculum and presented at INDOT's 5-day seminar to consultants and INDOT staff. The course covered NEPA requirements and how consultants/INDOT should approach the necessary documentation, including FHWA standards. Responsible for developing course materials and presenting on several topics: 1) agency coordination including early coordination; 2) hazardous material impacts; 3) threatened and endangered species and wildlife impacts; 4) mitigation commitments; 5) organizing a field outing to apply NEPA documentation skills; and 6) a summary of NEPA tips. Also responsible for organizing and scheduling guest speakers from environmental review agencies and private sector. 2011

Wetland & Stream Mitigation for SR 25 (Hoosier Heartland Highway) Improvements, Tippecanoe & Carroll Counties for the Indiana Department of Transportation (INDOT) – Senior Advisor/Technical Review responsible for bioengineering the bank stabilization effort and used natural channel design restoration techniques to relocate two Robinson Branch tributary streams. 2010

Bridge 75 (High Bridge) at CR 450 N over Little Pine Creek Historic Bridge Rehabilitation for Warren County, Indiana – Environmental Lead responsible for Level 3 bridge rehabilitation 2008.

EA, I-65 to US 31W Connector Study, Bowling Green, Kentucky for KYTC – Project Manager responsible for all activities and documentation for a connector roadway between I-65 and US 31W near TransPark. The study area was within a well-developed karst plain comprised of sinkholes and caves. Completed a Biological Assessment, conducted Section 7 consultation, and assisted with public involvement. Specific field tasks included an inventory of flora (including specific searches for the federally listed Eggert's sunflower), small mammal trapping (237 trap-nights in multiple habitat types), and wetland delineations. Also included fall harp trapping at two cave entrances and summer mist netting at two potential maternity roosting sites to survey for gray bats and/or Indiana bats for the purposes of preparing a Biological Assessment. The survey resulted in the capture of three male gray bats, red bats, and eastern pipestrelles. Major considerations included sinkholes, caves, groundwater quality, the Mammoth Cave Shrimp, and historic resources. A Secondary and Cumulative Impact Analysis was also completed. 2008

EA, US 50 Corridor Planning Study, North Vernon for INDOT – Environmental Document Manager responsible for overseeing environmental studies and assessment of an approximate 18-mile segment of the US 50 corridor from I-65 in Jackson County, eastward through North Vernon in Jennings County to near the Jennings/Ripley County Line. The study provided a system-level planning and safety analysis, as well as detailed planning analysis and environmental evaluation of two through-town options (widening and one-way pair) and five new alignment bypasses. Key components of the study were public and agency involvement in the decision-making process and social and environmental impact analysis of project alternatives. A number of alternatives were evaluated both north and south of North Vernon. Three alternatives were recommended for further investigation in an EIS. Major issues were socioeconomic, historic, 4(f), and water resources. Duties also included coordination with many resource agencies, consulting parties, the public, and local elected officials. Includes coordination with the IDEM; the IDNR; EPA; Historic Landmarks Foundation of Indiana; the City of North Vernon; Jackson and Jennings Counties; and many others. 2006-2008

Tapawingo Drive for the City of West Lafayette, Indiana – Environmental Lead responsible for environmental documents for new construction of a 4-lane urban arterial, with a paved walking and biking trail with greenspace, intended to alleviate congestion and open the area for future development. Construction completed in 2006.

EIS, US 31 Plymouth to South Bend, St. Joseph & Marshall Counties for INDOT – Environmental Lead responsible for preparation of an EIS and EA to evaluate this segment of the US 31 study area, approximately 20 miles long by 10 miles wide, running from the southern terminus at US 30, near Plymouth, to the northern terminus at US 20 near South Bend. ROD received 2006.

EA, US 68/KY 80, Marshall & Trigg Counties for KYTC – Senior Advisor/Technical Review for EA for improvements for approximately 27.2 kilometers. FONSI received October 24, 2006

Canal Road Corridor Study & Design for Vigo County, Indiana – Environmental Lead for permitting related to realignment and widening of a 4-lane facility from the proposed SR 641 interchange to I-70 and constructing a bridge over the CSXT Railroad. 2005

EIS, I-69, Evansville, Indiana to Henderson, Kentucky for the INDOT & KYTC – Lochgroup Project Manager responsible for the aquatic and terrestrial baseline report and the noise and conceptual stage relocation plan. This highway starts in Indiana at Green River Road and continues south across the Ohio River and its floodplain to connect to the Pennyrile Parkway south of Henderson, Kentucky. The EIS was performed to identify the purpose and need for the project, conduct an alternative's analysis, identify the

environmental consequences, and propose mitigation measures. Major considerations were the Indiana bat (mist netting showed a pregnant female), wetlands, a bridge crossing, the proposed Green River National Wildlife Refuge, Green River State Forest, Henderson Landfill, bald eagle and blue heron rookery, and a historic home that was razed during the project. A maternity colony for the Indiana bat was developed from the mist netting of a pregnant female. In addition, Dr. Tom worked with both the Indiana and Kentucky regulatory departments for wetlands, animals and plant listings. 2005

Red Bank Commons Permitting, Evansville, Indiana for Kite Capitol, LLC – Senior Advisor/Technical for this effort that entailed impacts to approximately 0.2 acres of jurisdictional stream and 1,300 square feet of palustrine emergent wetlands. 2005

Tier 2 EIS, I-69 Evansville to Indianapolis, Project Management Consultant for INDOT – Deputy Project Manager for Environmental Services responsible for environmental studies and the Section 7 consultation process with USFWS with regard to the Indiana bat, bald eagle, and endangered mussel species. Lochgroup was hired to oversee the project development activities of six section consultants. The development activities include preparation of all EISs and alternatives analysis, environmental impact statement review, travel demand modeling and traffic analysis, corridor travel demand model, traffic microsimulation, design concept traffic performance measures, environmental studies, and public involvement. Unique considerations addressed during Tier 2 were the location and coordination of 50 to 60 wildlife crossings for permeability and cross-connections for wildlife; mist netting and radio-tracking in pre-construction and post-construction monitoring for the Indiana bat; developing a box turtle protocol for surveys and holding through winter and release of an estimated 150-200 box turtles in the spring; and the location, agency coordination, environmental documentation, surveying, Section 106 (historic and archaeological), right-of-way engineering and right-of-way services for an acquisition for some 46 mitigation properties equaling approximately 5,200 acres or 8.1 square miles. Such properties are or will include forest preservation, reforestation, wetlands and stream development, and protection of existing water resources and karst features. In Progress since 2004

University Parkway Permitting for the Vanderburgh County, Indiana – Senior Advisor/Technical Review for field studies and agency coordination in securing permits. 2004

EA, KY 7, Sandy Hook to Memory Gardens, Elliott County for the Kentucky Transportation Cabinet (KYTC) – Senior Advisor/Technical Review for environmental documentation including baseline studies and EA for the proposed reconstruction and widening of a 1.6-mile section in South Central Elliott County of eastern Kentucky. The project began in Sandy Hook and proceeded through Bell City to end just north of the Elliott County Memory Gardens Cemetery. FONSI received March 8, 2004.

I-66 Corridor & Outer Beltline Planning Studies, Bowling Green for KYTC – Environmental Lead responsible for study incorporating two separate projects in the same general vicinity. Each project had its own purpose and need, but because portions of the I-66 Corridor had the potential to serve as a part of the Outer Beltline, a rigorous study of the compatibility of the two projects was conducted. 2004

EA, Bert T. Combs Mountain Parkway (KY 114) Reconstruction & Widening, Salyersville to Prestonsburg for KYTC – Environmental Manager responsible for study to evaluate upgrading existing KY 114 for approximately 21 miles. Major considerations included wetlands, forests, Middle Creek National Battlefield, stream crossings and water quality, residential and commercial relocations, and a 4(f) issue on a "death house." Unique to this project was a Community Impact Assessment and the development of Kentucky's first Public Involvement Plan and Public Involvement Action Plan which included four Community Impact Assessment Meetings. A large tent was set-up along KY 114 where food, drinks, and maps of the project were available during two weekends. FONSI received March 4, 2003

US 231 Improvements, Wetland & Stream Mitigation for Spencer County, Indiana for INDOT – Project Manager responsible for improvements from the Ohio River north to I-64 for approximately 21 miles. Completed and obtained an IDEM 401 Water Quality Certification and USACE Section 404 Permit. Permitting was divided by watershed, with Phase 1 in the Honey Creek Watershed and Phases 2 through 6 in the Little Pigeon watershed. The project included both jurisdictional and isolated wetland impacts as well as stream impacts. 2003

US 231, West Lafayette for INDOT – ROLE responsible for identifying many plants and wetlands throughout this 16-20 mile proposed 4-lane freeway. Most notable a discovery was the cleft phlox, which at that time was a state endangered species. Also within this project, Dr. Tom identified buttonbush and many of obligates associated with Celery Bog and facultative wetland plants in adjoining flatwoods.

Lynch Road Extension Phase III Permitting for Warrick County, Indiana – Senior Advisor/Technical Review for field studies and agency coordination for this proposed road/bridge project. 2003

Silver Spring Permitting, Jasper, Indiana for Kerstien Homes &Designs – Senior Advisor/Technical for this effort that entailed impacts to approximately 0.84 acres of jurisdictional palustrine emergent wetlands and 300 linear feet of stream. 2003

I-66 from Natcher Parkway to I-65 Environmental Overview for KYTC – Project Manager responsible for all field work and public information, as well as creation of GIS layers for human and natural resources in the vicinity of Bowling Green. The project area included Mammoth Cave, karst plain and features, Dripping Springs Escarpment, and historic resources. Suggested using local fire stations to hold public information meetings and solicit feedback from the communities. This innovative approach was a great success, garnering a large amount of information on the project. 2001-2003

EA, US 460, Frenchburg Hill to West Liberty Road, Menifee County, Kentucky for KYTC – Project Manager responsible for a study to evaluate impacts of upgrading existing US 460 for approximately 4 miles. Major considerations included kudzu, relocation of a lumber company, residential relocations, a civil war cemetery, an unmarked cemetery in Mariba, a stream relocation, the crossing of the Daniel Boone National Forest trail, and a big tree candidate. FONSI received August 1, 2002

Pigeon Creek Greenway Passage, West Levee/Industrial Corridor for the City of Evansville, Indiana Parks & Recreation – Environmental Lead for a 3.2-mile Section 3C of this proposed 42-mile greenway along the city's West Levee. The initial phase of the project involved all surveying, environmental studies and permitting, and design through 80% for the entire section. Final design is being done in segments as construction funding becomes available. One segment has been constructed with a second under design. 2001-2003

I-75/US 150 Environmental Overview, Lincoln & Rockcastle Counties for KYTC – Project Manager, 2001

Heim Road Wetland Design, Mitigation & Monitoring for Warrick County, Indiana – Project Manager for replacement of wetlands in the Chandler Bottoms. 2001

CE, Perry Crossing Road for Clark County, Indiana – Environmental Lead for a CE for addition of turn-lanes and shoulders, realignment of curves, and drainage improvements to roadway in a developing area of the county. Major land use changes were occurring along this road including the opening of a nationally known golf course. Residential development was also occurring near the project location. 2001

Hilsmeyer No. 2 Surface Coal Mining for Sun Energy Group, LLC – Completed the Biological Survey of aquatic resources proposed to be impacted by the 350-acre surface mine operation. 2001

Tier 1 EIS, I-69, Evansville to Indianapolis, for INDOT – Environmental Lead responsible for management of the environmental field studies of this major project. As part of this study, over 250 plant species from 70 families were identified; no TES plant species were observed; and biological assessments were completed for a number of mammal, reptile, amphibian, fish, mussel, and bird species. In addition, this project transferred field data into computer-generated forms. Questionnaires on location, hydrology, soils, vegetation, and animals were completed for over 230 wetland and riparian habitats. In the study's final phase, a detailed impact analysis of the remaining alternatives was undertaken. Based on GIS data, specific corridors were identified and mapped for each alternative. Within these corridors, representative "working alignments" were designed to minimize potential environmental disruption within the corridor. The study developed a preferred alternative based on transportation, economic and environmental factors. The Final EIS was recognized by the National Cooperative Highway Research Program as one of the Top 10 NEPA documents in the nation and cited as an example of "best practice." 2000 - 2004

KY 55 Corridor Environmental Overview, Nelson & Spencer Counties, Kentucky for KYTC – Project Manager responsible for a study to evaluate impacts of upgrading approximately 12 miles of KY 55 from Bluegrass Parkway up to Taylorsville, Kentucky. Major considerations included a historic district in Bloomfield, a historic district in Camp Branch, a Civil War battlefield (Quantril Raiders), and a crossing at Salt River. 2000.

Historic Gospel Street Bridge Rehabilitation (Bridge 200) for Orange County, Indiana – Environmental Lead responsible for the rehabilitation of this historic bridge. 2000

US 6 Added Travel Lane Wetland Mitigation & Monitoring Plan, LaPorte County for INDOT – Project Manager for an added a travel lane at the intersection of US 6 and CR 400W that impacted wetland within the Mill Creek drainage basin. In addition, approximately 0.92 acres of jurisdictional palustrine emergent wetlands were filled in. 2000

US 60 Environmental Footprint, Ballard & McCracken Counties, Kentucky for KYTC – Project Manager, 2000

KY 2121 Environmental Overview, Daviess County for KYTC – Project Manager, 2000

US 421 Madison-Milton Bridge Environmental Overview for KYTC

I-66 (Southern Kentucky Corridor) Environmental Overview, Pike County, Kentucky & Mingo County, West Virginia for KYTC – Project Manager that completed all field studies and documentation for this project in eastern Kentucky that crossed Tug Fork. Included working with many communities, including McVay. This is an extremely hilly area of Kentucky with many springs, coal mining, and many streams like Blackberry Creek. Presented information for the governor in Hazard and Pikeville, Kentucky. This information was used for an EIS that followed. 1999 - 2000

CE, Wabash Landing for the City of West Lafayette, Indiana – Environmental Lead for a CE related to the development of the a commercial development. Wetlands, hazardous material and historic resources were the primary consideration. 1999

EA, KY 519 Roadway Design & Environmental Studies, Rowan County, Kentucky for KYTC – Project Manager responsible for upgrade of 6 miles of roadway. Major considerations included the crossing of Tripplett and Morgan creeks, residential relocations, and floodplain encroachments. In addition, a historic train station and junkyard were included along with a trailer park and 4(f) impact to a Forest Ranger Station. A Community Impact Assessment was completed as was a 4(f) Programmatic Statement. The study reported population, housing, income, poverty, and employment demographics for the county and project area; profiled manufacturing, retail trade, recreation, agriculture, education, transportation, property taxes, local government, and community development within the county; and accessed probable impacts relating to land use, transportation, compatibility with other projects, neighborhood and community disruption, prime farmland, residential relocations, environmental justice, business viability, tourism, education. 1999

Environmental Management Consulting, Evansville, Indiana – Project Manager responsible for the development of laboratory designs and protocol on bioassays in testing acute toxicity of effluents; pesticide exposure studies; underground storage tank testing; and inspection/management reports on asbestos in schools (AHERA) and commercial buildings. Certified AHERA Building Inspector and Management Planner as accredited by EPA through the School of Public Health at the University of Illinois.

Wetland Mitigation & Design Plans for INDOT – Completed studies for 28 INDOT wetland mitigation sites. 1998-2004

US 27, Adams County for INDOT – Project Manager for wetland redesign of this mitigation site. INDOT selected the site and completed all studies and coordination prior to monitoring. Responsibilities included redesigning and monitoring this wetland's success. The wetland was ponding too much from the original design. Modifications were made in the design, plus larch and other northern plant species were recommended in the new design (DES 9102421). 1998 - 2004

Wolfe Site Bank, Miami County, Indiana for INDOT – Project Manager responsible for monitoring a wetland mitigation site west of US 31. The area used was a farm field in the floodplain as connected to a forested area with springs. This emergent wetland was dominated by cattails and Scirpus acutus (DES 0012430). 1998 - 2004

US 24 & US 35 Wetland Mitigation Bank, Miami County, Indiana for INDOT – Project Manager for redesign and monitoring a wetland mitigation site west of US 31. The area used was a farm field in the floodplain as connected to a forested area with springs. Many different species of plants were planted in this design including oak and hickories (DES 0012440). 1998 - 2004

US 24, Miami County, Indiana for INDOT – Project Manager responsible for the redesign of the wetland mitigation site near US 24 not far from Logansport. The outlet structure was the main issue. Habitat in this wetland attracted many Canada geese (DES 7302471, 7200430). 1998-2004

SR 26, Knox County, Indiana for INDOT – Project Manager responsible for assisting in the right-of-way services with some discussion on wetland mitigation. The mitigation site was selected and designed by INDOT. Lochgroup completed the purchase of the property (DES 8610865). 1998-2004

Centerville Rest Area, Richmond, Indiana for INDOT – Prepared a Wetland Mitigation and Monitoring Report including determination and delineation of jurisdictional wetlands behind the rest area. INDOT had proposed expanding the rest area lateral to I-69. With the identification of wetlands behind the rest area and review agencies requesting an avoidance of these wetlands, INDOT and the review agencies worked together to reach the decision to expand longitudinally along I-69 rather than away from it. 1998 - 2004

SR 37/I-69 Environmental Overview, **Marion County, Indiana for INDOT** – Project Manager for an Environmental Overview for this is a heavily traveled corridor in northeast Indianapolis. Environmental issues were for the most part socio-economic. The proposed widening would affect many businesses and access, which was a major consideration. All efforts were made by INDOT and consultants to avoid and minimize impacts to both the human and natural environment. 1998

EA, Industrial Park Road for the City of Ferdinand, Indiana – Project Manager responsible for issues related to this new road including possible hazardous waste and underground storage tanks, Section 106 historic preservation, archaeology, and noise impacts. 1998

Ouabache State Park Bike Trail Design, Wells County, Indiana for IDNR – Environmental Lead for a 4.2-mile bicycle trail in Ouabache State Recreational Area that links the town of Bluffton to the state park. This opened up to the public a large section of park along the Wabash River that was not formerly accessible. The project required minimal disturbance to the sensitive surrounding areas, while remaining in conformance with the technical development of transportation enhancement projects and AASHTO's Guide for the development of Bicycle Facilities. 1998

EA, for Runway Extension for the Evansville Regional Airport, Indiana – Lochgroup Project Manager responsible for all activities for completion of an EA for the extension of Runway 18-36 which addressed the major issue of relocations, noise, air quality, and visual impacts. 1997-1999

KY 101 Environmental Overview, Smith Grove, Kentucky for KYTC – Project Manager for study to evaluate upgrades to existing KY 101 for 2 to 3 miles through Smith Grove or a by-pass to the west. Major considerations included Crum Cave (with a moratorium on the grey and Indiana bats, environmental justice, hazardous material, residential and commercial relocations, sinkholes, farming, and archaeology. A historic district was crossed in the heart of the town along with an active railroad. 1997

US 31 Corridor Study & Environmental Overview, Marshall & St. Joseph Counties for INDOT – Environmental Lead responsible for a study to determine the feasibility of converting US 31 from an at-grade expressway to a freeway. The corridor links the communities of Indianapolis and South Bend and is the primary travel route between northern and central Indiana. 1997

Southwest Indiana Highway Corridor, Evansville to Bloomington, Indiana for INDOT – Environmental Lead responsible for evaluating a number of alternative alignments based on socioeconomic, geological, ecological, historical archaeological, and public concern areas. Proposed alignments were located to avoid and/or minimize impacts on these resources. 1996

US 31 Corridor Location & Environmental Studies, Carmel & Hamilton Counties for INDOT – Environmental Lead responsible for completion of all activities in the development of an Environmental Overview to analyze alternative transportation improvements to alleviate congestion on US 31. 1993

EIS, US 231 Corridor Location Study, Lafayette for INDOT – Environmental Lead responsible for overseeing field studies and the documentation of the EIS for this relocation around Purdue University. The project included the complete alternative corridor analysis, thorough environmental analysis, and location planning of a new Wabash River Bridge. 1990

Water Quality of Tunungwant Creek, Northwestern Pennsylvania – Tested water and completed bacteriological identification in Tunungwant Creek. Most notable results showed elevated colony counts of *Escherichia coli* from the grandfathering of old leach beds draining into the creek, especially in Lewis Run. From such data, a sewer line was connected from Lewis Run to Bradford for treatment. In addition, Tunungwant Creek receive effluents in Bradford that caused eutrophication and especially high dissolved oxygen levels during the day and especially low levels at night. The effluents caused for a lush growth of algae on rocks and with the oil sheen on the surface, it is not uncommon for supersaturation levels of oxygen during the day causing bubbles to form in the veins of the caudal fin of fish, and for fish prior to dusk to migrate up adjoining tributaries.

Thomas Cervone, PhD

Vice President & Director of Environmental Services – Principal

ACADEMIC EXPERIENCE

Before joining Lochgroup, Tom served as a Professor of Biology at the University of Southern Indiana and University of Kentucky where, he and his students completed research projects in ichthyology, water quality, and botany. He taught wildlife biology, environmental conservation, plant taxonomy, aquatic biology, and many other courses.

In 1986, he taught the course "Tropical Park Management" for the School for Field Studies. This course, developed by Tom was offered by Northeastern University, with classes held in Big Cypress National Preserve. Research projects involved fishes of Big Cypress Preserve, fuel load estimation of *Cladium jamaicense* prairies, chemical control of *Melaleuca,* and survey studies on a cypress-mixed swamp, a cypress dome, and two pinewoods of the national park. As a graduate student, he taught "Ecology of the Everglades" (field work in the Everglades), ecology of the Allegheny State Park (field work) and other courses at St. Bonaventure University and University of Pittsburgh.

His post doctorate fellowship, which was supported by an EPA-funded grant, was on toxicity, mode of action, and effects on reproductive cycles on the wasp *Bracon hebetor* for various carcinogens. His doctorate was the Antecological study of the Mountain Earth Snake, while his master's research on Fishes in Tunungwant Creek, a brackish drainage in northwestern Pennsylvania. This stream flows through Bradford, one of the major oil producing regions of the US. Point source and non-point sources of brine and oil were evident in his results.

Dr. Tom also served as a Professor for the Allegheny Institute of Natural History in the University of Pittsburgh System where he taught "Vertebrate Natural History" (two-week summer course) to professors and students. This four-credit course includes: lectures on vertebrates and field trips to unique ecosystems in the Allegheny Mountains of Western Pennsylvania and New York. Field trips include sampling aquatic and terrestrial habitats for mammals, birds, fishes, reptiles, and amphibians.

PUBLICATIONS

Cervone, T.H., R.K. Yeager, J. Sias and R. King, 2015. Bats under an Indiana Bridge. Submitted to the Proceedings of the Indiana Academy of Science. 17 pp, 6 figs., 3 tables.

Cervone, T.H., J. Sias, R.K. Yeager, R. King and M. Allen, 2011 Bat Occupancy Under a Bridge in Southwestern Indiana. In Progress. 9 pp, 10 figs.

Willis, K. R., J. W. Jameson, P. A. Faure, J. G. Boyles, V. Brack, Jr. and **T. H. Cervone. 2009.** Thermocron IButton and IBBat Temperataure dataloggers emit ultrasound. Journal of Comparative Physiology B: Biochemistry, Systemic, and Environmental Physiology. Volume 179(7):867-874.

Cervone, T.H. and R.K. Yeager, A Walking Tour of Planted and Lowland Trees in Historic New Harmony (20 years later). February 2008. University of Southern Indiana Press, Evansville, Indiana 122 pp, 57 illus., 1 fig.

Cervone, T.H. 2000. Vertebrate Natural History. 2-Week Course for University of Pittsburgh (Bradford Campus). Pp 238.

Cervone, T.H., Historical and Present Distribution of Fishes in the Patoka River Basin in Pike, Gibson and Dubois Counties, Indiana, 1996, PIAS, 98:165-175.

Cervone, T.H., New Records for *Lythrurus fumeus* (Ribbon Shiner) in Indiana**,** 1993. PIAS, Abstract, p 118.

Cervone, T.H., S.A. Letherland, J.T. Lanigan III, T. K. Spindler, and R.A. Pace, Winter fishes of Bayou Creek drainage. 1989, Proc. Pa, Acad. of Sci., 63(1):20-24.

Cervone, T.H. and R.K. Yeager, Planted and Lowland Trees in Historic New Harmony. 1988, University of Southern Indiana Press, Evansville, IN 172 pp, 57 illus., 1 fig.

Cervone, T.H., W.L. Wissinger, R.V. Mettus, and R.M. Petters, Sterility in adult Bracon hebetor (Hymenoptera: Braconidae) induced by 5-flourouracil. 1988, Jour. Econ. Entomology, 81(1):102-105.

Schultheis, S.J., K.D. Berger, R.K. Yeager, D.M. Agee, and **Cervone, T.H.,** Summer fishes of Pigeon Creek drainage. 1988, Proc. Ind. Acad. Sci. for 1987. 96:523-530.

Yeager, R.K.., D.S. Nichols, S.J. Schultheis, M.T. Galbraith, S.E. Lenn, and **Cervone, T.H.,** Fishes of Goose pond and its drainage basin. 1988, Proc. Ind. Acad. Sci. for 1987. 96:533-558.

Agee, D.H., W.J. Alvey, K.D. Berger, B.S. Leinenbach, and **Cervone, T.H.,** Winter fishes of Stinking Fork. 1988, Proc. Ind. Acad. Sci. for 1987. 96:507-512.

Cervone, T.H., R.M. Langianese, and S.M. Stayer, The fishes of Tunungwant Creek drainage. 1985, Proc. Pa. Acad. Sci., 59:138-146.

Wissinger, W.L., and **Cervone, T.H.**, Reproductive performance and mutagenic response of the wasp bracon hebetor following treatment with the antibiotic bleomycin. 1985, Mutation Research, 149:375-383.

Wissinger, W.L., and **Cervone, T.H.**, Vitellogenic and embryogenic activity of the microtubule disruptor vinblastine following ingestion by the wasp Bracon hebetor. 1985, J. Insect. Physiol., 31(6):471-476.

Cervone, T.H. and R.C. Bothner, The habitat of Virginia valeriae pulchra (Serpentes: Colubridae) in northwestern Pennsylvania. 1984, Pa. Acad. of Sci. Newsletter, 42(2):18.\

Cervone, T.H., W.L. Wissinger, R.V. Mettus, and R.M. Petters, Genotoxic response of the wasp Bracon hebetor (Say) fed 5-fluorouracil and 6-mercaptopurine (Hymenoptera: Braconidae). 1983, Regional Meeting in Providence, R.I., Journal of Econ. Entomology.

Wissinger, W.L., **Cervone, T.H.**, R.M. Petters, and R.W. Mettus, A comparison of bleomycin and vinblastine effects on reproduction in adult Bracon hebetor (Say) wasps (Hymenoptera; Braconidae). 1983, Regional Meeting in Providence, R.I., Jour. of Econ. Entomology.

Cervone, T.H. The natural history of Virginia valeriae pulchra (Serpentes; Colubridae). 1983, Diss. Abstr. (Nov. 1983), 44(5):1332-B.

Cervone, T.H. and R.C. Bothner, The female reproductive cycle of Virginia valeriae pulchra (Serpentes: Colubridae) in northwestern Pennsylvania. 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

Cervone, T.H. and R.C. Bothner, Diet, seasonal occurrence and population structure of Virginia valeriae pulchra (Serpentes; Colubridae) in northwestern Pennsylvania. 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

Cervone, T.H. and W.L. Wissinger, Antivitellogenic properties of purine and pyrimidine analogs on reproductive performance in Bracon hebeter (Hymenoptera: Braconidae). 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College Rochester, NY.

Wissinger, W.L. and **Cervone,T.H**., Contrasting the biological effects of the direct and indirect acting mutagens bleomycin and vinblastine using fecundity and fertility patterns of the wasp Bracon hebetor. Proc. Roch. 1983, Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

CONTINUING EDUCATION

NEPA Refresher, INDOT & FHWA, 2 hour training course, 2015

Week Class in West Virginia on Mussels, 2014

Southern Gas Association Conference, hosted by SGA in Louisville, KY, June 2014

Wetland Plant Identification, Conducted by Biotic Consulting, Inc. (Robert Mohlenbrock, PhD) 1997-2012, 2014, 2015

Anabat Techniques Workshop, Conducted by Livengood Consulting, Warsaw, Illinois. April 27-30, 2010

Indiana GIS Conference, Conducted by the Indiana Geographic Information Council, February 23-24, 2010

Wetland Plant Identification, Biotic Consultants, September 15-18, 2008

NEPA Refresher, INDOT & FHWA, August 22, 2008

Amphibian & Reptile Identification Course, conducted by Dr. Thomas Pauley, May 2008

Project Management Bootcamp I, PSMJ Resources, Inc., April 22 & 23, 2008

Liability IQ for Architects & Engineers, XL Insurance July 30, 2007

Section 4(f) Class, INDOT & Federal Highway Administration (FHWA), August, 2006

NEPA Categorical Exclusion, INDOT & FHWA, 8-hour training course, March, 2006

NEPA & the Indiana Transportation Decision-Making Process, Conducted by INDOT & FHWA on July, 2003

Section 7 Consultation, Instructor for INDOT since 2004

Managing Wildlife for Sustainable Forests, IDNR, Indianapolis, Indiana, March, 2005

NEPA Conducting Quality Cumulative Effects Analyses, Conducted by INDOT, March, 2001

Secondary & Cumulative Impact Analysis, FHWA-sponsored Workshop 2001

Wetland Delineation – Emphasis on Hydrology & Soils, Wetland Training Institute, 1999

Seed Anatomy & Identification (SC 280A), Colorado State University, 1999

Wetland Training, Wetland Delineator Certification Program, August 1999

Fishes of Indiana, Sampling & Research for Book, 1996

Identification of Bat Species, Indiana State University, Terre Haute, Indiana**,** 1996

Collection of Kentucky Crayfishes - Identified Species, Kentucky Transportation Cabinet, 1996

Highway Noise Analysis, University of Louisville, 3.2 CEU, 1995

Modeling of Mobile Source Air Quality Impacts, University of Central Florida, May, 1993

Delineation of Wetlands, USACE, Wilmington, NC 1991

POST-DOCTORATE

Brenten Reust

Environmental Biologist

Brenten is an environmental biologist with eight years of experience in restoration ecology, permitting, and environmental field work. Brenten specializes in stream and wetland mitigation and has experience with jurisdictional determination, Rosgen Level 3 classifications, rapid bioassessment protocols for stream physical habitat assessments, 401 Water Quality Certification (WQC) and USACE Section 404 permits, compliance monitoring, botanical surveys, fish and macroinvertebrate surveys, groundwater investigations, water quality assessments, nuisance wild animal controls, and habitat restoration. He has completed stream and wetland characterizations of over 5,000 acres for jurisdictional determination, biannual assessments of 250 acres of wetland, and monitored 200,000 linear feet of stream for compliance. Brenten also has extensive experience with invasive plant and animal control throughout the Eastern US for habitat conservation in wetlands, forests, and prairies using a highly selective Integrated Pest Management Program.

While a faculty research assistant with the Oregon State University College of Agricultural Sciences and Forestry, he researched science based best management practices to prevent the spread of *Phytophthora ramorum*, the sudden oak death pathogen. He coordinated this research with state governments, academic entities, and private nursery growers throughout the Northwest in an effort to manage *Phytophthora spp*.

Brenten also performed research at Indiana University Department of Geography that was funded by Department of Energy and NASA grants. He investigated biogeochemical processes that occur at the level of canopy leaves and soil microbes to those occurring at the ecosystem, landscape, and regional scales using a variety of micrometeorological measurements, remote sensing, and ecosystem modeling. He used a suite of instruments to collect data including: incoming radiation, CO2 and H2O concentrations, wind speed and direction, precipitation, temperature, relative humidity, sap flow velocity, photosynthesis, soil moisture, and arbuscular and ectomycorrhizal fungi associations.

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YEARS OF EXPERIENCE
8

EDUCATION
MS, Environmental Science, Major in Applied Ecology and Water Resources, Indiana University, Bloomington, IN 2012

BS, Public Affairs, Major in Environmental Policy, Indiana University - Fort Wayne, 2008

AS, Business, Indiana University - Fort Wayne, 2007

CERTIFICATION
Nuisance Wild Animal Control Permit: Indiana

United States Forest Service Class A Faller Certification (2009-2012): North Carolina

Pesticide Applicator License (2009-2014): Indiana

Pesticide Applicator License (2009-2009): Massachusetts

REPRESENTATIVE PROJECT EXPERIENCE

NEPA Services for West Lake Corridor New Starts Project for Northern Indiana Commuter Transportation District (NICTD) – Environmental Biologist on the team that is preparing a combined Final Environmental Impact Statement/ROD on an aggressive schedule. The project will advance a nine-mile extension of the South Shore Line, known as the West Lake Corridor, southward to provide new passenger rail services to Lake County, Indiana.

Double Track NWI for NICTD – Environmental Biologist that was part of a team that investigated approximately 25 miles of various habitats adjacent to the South Shore line tracks from Gary to Michigan City, Indiana. The purpose of the investigation was to assess the presence of federal (Mead's milkweed, Pitcher's thistle, and white prairie fringed-orchid) and state listed plant species and conduct a habitat assessment for the Indiana bat and northern long-eared bat. Additionally, floristic quality assessments (FQA) were conducted at 37 habitat unit areas and 47 individual wetland locations, and woodland tree composition was quantified in terms of species, size and stage of decay at 11 locations. A Phase 1 bat habitat assessment was conducted at 24 woodland locations in accordance with the U.S. Fish and Wildlife Service 2016 Range-Wide Indiana Bat Summer Survey Guidelines to identify potential bat roost and foraging habitat for the Indiana bat and the northern long-eared bat. Field efforts required close coordination with NICTD operations personnel to insure worker safety including Railroad Education training.

CONTINUING ENGINEERING

Redefining the Waters of the U.S. Wetland Training Institute – Webinar 2015

Indiana Society of Mining and Reclamation Annual Seminar – Jasper, Evansville Indiana 2014, 2015

NC State University River Course 101: Stream Morphology Assessment (16 PDHs) – Ashville, North Carolina 2014

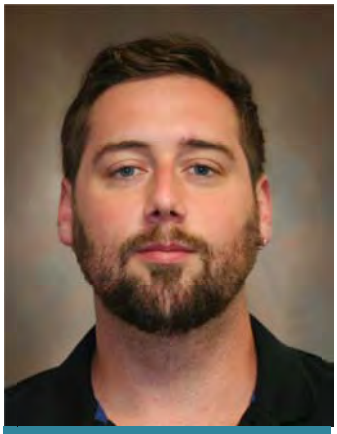
Sean Langley

Environmental Biologist

Sean is an Environmental Biologist that specializes in bat ecology. His field experience includes harp trapping, wind turbine mortality surveys, SensorGnome set up and use, telemetry tower construction, infrared bat portal surveys, bat identification in the Eastern US, bat roost emergence counts, portal surveys, bird banding, and mist netting. He researched roosting dynamics of the northern long-eared bat, *Myotis septentrionalis*, for Virginia Tech, US Geological Survey, and the Army Corps of Engineers Co-op during the summer of 2012.

REPRESENTATIVE PROJECT EXPERIENCE

Tier 2 EIS, I-69, Evansville to Indianapolis, for INDOT – Bat Ecologist involved in conducting radio-telemetry and pre- and post-construction monitoring for the Indiana bat.



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YEARS OF EXPERIENCE
4

EDUCATION
BS, Biology and Environmental Studies, Manchester University, North Manchester, Indiana, 2013