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Vegetation Changes from 2009 to 2015 in Prairie and Old Field Habitats following Restoration at the North Chicago Wetland Mitigation Site, Lake County, Illinois

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INTRODUCTION

The North Chicago Wetland Mitigation Site in Lake County, Illinois (Figure 1) includes a highly diverse mosaic of prairie, old field, and wetland habitats (Taft et al. 2010). Following extensive general botanical surveys, a vegetation monitoring program was established in 2009. The principal goals of the monitoring were to further assess habitat quality in terrestrial plant communities including Prairie and Old Field habitats throughout the site and to document and interpret vegetation changes associated with habitat restoration efforts. Prior to 2015 monitoring, habitat management has included removal of invasive shrubs and trees, control of invasive species in terrestrial and wetland communities, localized seeding of native prairie and wetland species, mowing, and applications of prescribed fire (2012-2014). Objectives for 2015 monitoring were to collect and analyze data on species composition, diversity, and structural characteristics from permanent vegetation sample plots and to evaluate trends among vegetation types since the 2009 baseline sample. The 2015 sample data represent the fifth complete year following removal of invasive shrubs and saplings (shrub removal was ongoing in a few plots during 2011) and the final sample in the study period. Previous work at this site included botanical surveys (e.g., Taft 1996 and 2006), wetland mapping that identified 29 wetland acres (Olson et al. 1991; Plocher et al. 1996, Plocher and Ketzner 2006a, and Plocher and Ketzner 2006b), and monitoring results from the 2009 baseline and 2010-2014 sample data (Taft et al. 2010, Taft and Kron 2011, Taft and Kron 2012, Taft et al. 2013, Taft et al. 2014, and Taft et al. 2015). The baseline, pre-management habitat conditions demonstrated evidence of species and plant functional group losses associated with woody encroachment (Taft and Kron 2014).

2015 Study Questions - This report focuses on results from vegetation monitoring in terrestrial plant communities during 2015 and examines and compares trends among Reference Prairie, Transect Prairie, and Old Field habitats. There are five main questions:

1. What are the site-level comparative trends in species composition, total richness, and floristic quality and, for Old Field and Prairie habitats (combining Reference Prairie and Transect Prairie habitats), what are the changes in species composition and abundance?
2. Based on 2015 sample data, are there significant between-subjects (vegetation types) differences with regard to ground layer and shrub/sapling parameters (e.g., composition, species richness, diversity, and cover - see Methods for full list and parameter definitions)?

3. Are there significant within-subjects (year) differences in these parameters since the 2009 baseline data for each vegetation type and when (what year) do the differences occur?
4. What are the between-subjects and within-subjects interactions (i.e., vegetation type x sample year) for selected vegetation parameters since 2009?
5. As a summary evaluation, how do baseline species composition, structure, and diversity patterns compare to the 2015 final sample?

METHODS

Sample Design - As previously reported (Taft et al. 2010), a stratified vegetation sampling design was utilized with 10 parallel transects running west to east, each separated by intervals of 500-ft (152 m). Five sample points were established on each transect separated by 250 ft (76 m) with the exception of the northern-most transect which, due to location of a fire station in northwest corner of the unit, had four sample points. This array provided 49 sample plots including 37 in non-wetland terrestrial vegetation and 12 in areas previously determined to be wetland habitat (Plocher et al. 1996). In addition, eight reference plots were established in prairie remnants in the far southern portion of the study area and five plots were placed in selected wetland communities, mostly in the southern half of the study area (Figure 2). Specific plot locations for targeted sampling of prairie reference habitats were determined randomly. It was determined following property boundary delineation that one of the Reference Prairie plots (Prairie Plot 8) occurred outside of the property and treatment area and was dropped from further analysis (this plot, coincidentally, also was identified as an exceptional outlier in data analysis). This yields a total of 44 terrestrial vegetation sample plots examined in the current study. During 2013, 5 additional sample points were established in shrub-encroached prairie habitat just east of the property boundary near the southeastern corner. These plots serve as untreated control plots for comparison with long-term monitoring trends; they are similar in composition to the baseline Reference Prairie plots albeit with an even higher degree of woody encroachment (Grant 2015). The current report focuses on the sample data from within the mitigation site property boundary.

Vegetation Sampling - Vegetation was sampled using 25-m^2 (5m x 5m) sampling plots for shrub/sapling data with ground layer quadrats (1-m^2 [1 m x 1 m]) nested within. The baseline point for all sample plots is the southwest corner of the shrub/sapling plots, corresponding to the

geographic coordinates associated with plot locations (Figure 2). Steel posts, 38.1 cm (15 inches) in length, were placed at the SW corner during 2010, replacing plastic posts established in 2009, to permanently mark each plot with fire-resistant markers. Plot sides were oriented along cardinal directions (the southern boundary runs W-E at 90°).

Composition and density of shrubs and saplings (all woody stems ≥ 1-m tall and < 10 cm diameter-at-breast-height [dbh]) were recorded within the 25-m^2 plots. Stems and clumps of stems from root crowns when joined above soil level were treated as individuals. For terrestrial vegetation plots, percent shrub cover was determined using digital photography with a hemi-view lens oriented vertically in the plot center on a tripod (about 45 cm above the ground) to photograph the canopy of the plot area (narrowed to the approximate plot area with a lens tube). Percent visible sky and leaf area index (LAI) were calculated from these images using HemiView Canopy Analysis Software, ver. 2.1. Percent canopy cover was calculated as 100 - % visible sky. Each image was classified to accurately depict canopy cover by adjusting the contrast threshold display in comparison to continuous tone images (this procedure avoids tabulating clouds, for example, as canopy). A horizontal habitat image also was taken of each plot oriented from the southwest to the northeast corner. Trees (woody stems ≥ 10 cm dbh) were sampled in 200-m^2 (14.14 m x 14.14 m) sample plots anchored at the SW corner of the shrub plot.

Ground layer vegetation in terrestrial plots was sampled with 3 quadrats nested within each shrub plot, with quadrats placed in the southwest and northeast corners and one in the plot center. Data collected from each quadrat include species presence and percent cover for individual species estimated with a modified Daubenmire cover-class scale (0-1%, 1-5%, 5-25%, 25-50%, 50-75%, 75-95%, 95-100%). All species rooted within quadrat frames were recorded including woody species < 1-m tall. Sample dates during 2015 were from 15 June to 15 July and correspond to previous sample periods.

Data Preparation - Species abundance is measured by frequency, percent cover, and Importance Value (IV 200). IV 200 for ground-layer samples was calculated as the sum of relative frequency and relative cover. For the shrub/sapling stratum, IV is calculated as the sum of relative frequency and relative density. For trees, IV is calculated as the sum of relative density and relative basal area. Cluster analysis was utilized to produce a hierarchical classification of sites from the 2009 baseline quantitative ground-layer sample data, based on the Sørensen

similarity distance measure and flexible Beta linkage method (ß = -0.25). This procedure yielded 29 plots classified as Old Field/Shrubland (now "Old Field", following shrub removal) and 15 plots classified as prairie, including eight from the stratified array of plots and seven from the targeted Reference Prairie sampling effort (Taft et al. 2010). This classification is used as a framework for 2015 between-group comparisons and within-group comparisons across time intervals.

Ground layer vegetation parameters were calculated at both quadrat and plot spatial scales. Quadrat means include the average among the 3 quadrats in each plot and the plot sum combines data from all 3 quadrats. Vegetation parameters include native and non-native species richness (termed species density at the quadrat scale), Shannon-Wiener Index of diversity (H' [native species only]), Simpson's Index of Dominance (including all species), percent cover and percent bare ground, and metrics for Floristic Quality Assessment (FQA) including calculations based on native and total species. FQA metrics include Mean Coefficient of Conservatism and the Floristic Quality Index (Taft et al. 1997). These parameters were calculated following Whittaker (1975) and Taft et al. (2006):

Ground Layer Vegetation Diversity Measures

Native Species Density: Mean number of native species/quadrat (1 m^2)

Non-Native Species Density: Mean number of non-native species/quadrat (1 m^2)

Native Species Richness: Total number of native species/plot (sum of three quadrats)

Non-native Species Richness: Total number of non-native species/plot (sum of three quadrats)

Shannon-Wiener Index of Diversity (H'n): $-\sum [p_i \ln(p_i)]$, where p_i is the relative abundance of each native species (based on importance values [IV200] calculated as the sum of relative cover and relative frequency),

Simpson's Dominance Index: $\sum p_i^2$, where p_i is the relative importance value for each species in the sample area (transect),

Ground Layer Structure

Percent Cover: Sum cover for each species in sample area

Percent Bare Ground: Estimate of bare ground for each quadrat

Floristic Quality Assessment (using ground-layer vegetation data)

Mean Coefficient of Conservatism (Mean C): $\sum$ CC/S, where CC = Coefficient of Conservatism and S = total species richness

Floristic Quality Index (FQI): Mean C ($\sqrt{N}$) where N = native species richness

Mean Cn and **FQIn** are calculated using only native species.

Shrub-Sapling Layer

Shrub Density: Total stem number per plot (sum of all species)

Shrub Canopy Cover: 100 - % visible sky, as determined from analysis of digital canopy photos with Hemi-View Canopy Analysis Software (ver. 2.1).

Leaf Area Index (LAI): The amount of leaf surface area per unit ground area as determined from analysis of digital canopy photos with Hemi-View Canopy Analysis Software (ver. 2.1).

Botanical nomenclature follows Mohlenbrock (2002). Non-native species in the report will be indicated with an asterisk (*).

Statistical Analysis - Comparisons of vegetation parameters among Old Field, Transect Prairie, and Reference Prairie vegetation types were examined with means comparison tests. Assumptions for means comparison tests, including repeated measures, are multivariate normality, equality of variance of the within-subjects factor (sphericity), and homogeneity of variance for two or more groups (homoscedasticity or homogeneity of variance). Data found to be non-normally distributed were square-root transformed; however, this seldom improved data properties and untransformed values are presented in tables. Tests of equality of variance of the within-subjects factor time (year) were made with Mauchly's test. Tests for homoscedasticity were made with Levene's test. Statistical tests were performed with SPSS ver. 24 (IBM SPSS 2016).

Profile analysis (von Ende 1993) provides a framework for exploring patterns of change for the within-subjects factor (time [i.e., year]), between subjects factors (vegetation types), and the interaction. With profile analysis, the test of the within-subject factor examines the *flatness hypothesis* with the null expectation of no change over time. The between-subject factor is a test of the *levels hypothesis* with the null expectation of no difference among vegetation types. The

test of interactions for each parameter, the major focus for profile analysis, is an examination of the *parallelism hypothesis*. The null expectation is a parallel response over time for vegetation types.

Question 1 – Site-level data on vegetation parameters are shown (e.g., total richness, dominant species, increasing and decreasing species). No statistical analysis.

Question 2 – Between-subject comparisons (vegetation types) for vegetation parameters (dependent variables) in 2015 were examined with one-way analysis of variance (1-way ANOVA). Homogeneity of variance, a required assumption for ANOVA, was examined with Levene's test statistic. With heteroscedasticity (when data lack homogeneity of variance), Welch's test statistic (asymptotic F distribution) was used. The null expectation is no difference between subjects (vegetation types).

Question 3 - Within-subject differences (year) for each vegetation parameter (dependent variable) and vegetation type (independent variable) from 2009 to 2015 (test of flatness hypothesis) were examined with one-way repeated measures analysis of variance (1-way RM ANOVA). Where sphericity is lacking (significant Mauchly's test), the Greenhouse-Geisser adjustment to the degrees of freedom was applied. Non-normal data were examined with Friedman's test, a non-parametric alternative to RM ANOVA. The null expectation for all tests is no within-subject differences (no change over time).

Question 4 - Between subjects differences (vegetation types, combining years), within subjects differences (year, combining vegetation type), and interactions (year x vegetation type [test of parallelism]) were examined with mixed model RM ANOVA using a 3 x 7 design (3 vegetation types and 7 years). With heteroscedasticity of variance across groups (significant Levene's test), the multivariate Pillai's Trace statistic was applied. The null expectation is no differences in the interaction profiles between years and vegetation types.

Question 5 – Paired comparisons between 2009 baseline and 2015 final samples for parameters of conservation interest (e.g., native species density, native diversity, percent cover, floristic quality,

and species composition) were examined with paired t-tests, or in the case of non-normal data (e.g., dominance, shrub density, shrub canopy cover, leaf area index) the Wilcoxon paired samples sign-test. Variance in the species assemblages associated with the vegetation parameters (predictor variables) was examined with distance-based linear models (DistLM) which examines the fit of individual variables with marginal tests. Stepwise sequential tests, the result of forward selection and backward elimination at each step, were utilized for determining the best combination of predictors. Distance-based redundancy analysis (dbRDA) was used for ordination and the graphical depiction of the fitted DistLM models (Legendre and Anderson 1999, McArdle and Anderson 2001). Statistical significance for the degree of variance in species composition explained by predictor variables was determined with permutation tests (n = 4,999). Species abundance was square-root transformed to lessen impact of dominant species in analysis of species assemblages. Differences in species composition were examined by measuring mean centroid distance between vegetation type and sample year and with the ANOSIM (Analysis of Similarity) procedure in Primer (ver. 7).

RESULTS AND DISCUSSION

Ground-Layer Vegetation

Site Summary (all vegetation types combined)

Species Richness

About 239 taxa of vascular plants were recorded in 2015 from the combined ground-layer samples (44 plots, 132 quadrats) including 192 native species (about 78%), 47 non-native species, and a few vegetative specimens undetermined to species (Figure 3, Appendix 1). Combining results from previous general surveys and the 2009-2015 monitoring efforts, a total of 451 vascular plant species have been recorded from the North Chicago Wetland Mitigation Site (Appendix 2) including two state threatened (*Amelanchier interior* and *Veronica scutellata*) and one state endangered (*Elymus trachycaulus*) species. Recent changes in the Illinois list of threatened and endangered species list (IESPB 2015) resulted in a delisting of *Oenothera perennis* (formerly State threatened) and a change in status for *Elymus trachycaulus* from state threatened to state endangered.

Throughout the study area there was an average species density per quadrat (1-m^2) of 18.1 native and 5.5 non-native species (Table 1). Total plot richness averaged 32.3 native and 9.3

non-native species. Average percent ground cover was 137.7% and bare ground averaged 18.2%.

Dominant Species

The top-10 dominant species in 2015, in descending rank order, accounted for 37.1% of the total importance. These species were: *Rhamnus cathartica**, *Solidago canadensis*, *Andropogon gerardii*, *Sorthastrum nutans*, *Fragaria virginiana*, *Poa pratensis**, *Poa compressa**, *Ratibida pinnata*, *Helianthus grosseserratus,* and *Dactylus glomerata** (Appendix 1). This list suggests some ongoing changes among dominants. Although 8 of 10 are similar to 2014 (underlined taxa), the rank order has changed with a return of *Rhamnus cathartica** as the overall dominant species, occurring in 69% of sample quadrats and totaling 10.3% cover. *Lolium multiflorum**, an annual species planted as a cover crop, was the top-ranking species in 2012 (Taft et al. 2013) but has declined from 68% plot frequency in 2012, to 37% in 2013 and 9% in 2015. *Cirsium arvense** was formerly among dominant species but declined to 26th rank-order of abundance in 2015.

Overall Trends in Species Richness, Diversity, and Percent Cover

Total species richness in sample quadrats has increased since the baseline sample (Figure 3), from 204 species in 2009 (not including undetermined specimens [80.7% native]) to 236 in 2011-2012 and about 239 in 2015 (75.5% native). The 7-15 unidentified specimens from each year (Figure 3), typically seedlings and other vegetative material, likely include documented taxa. Average native species density from all 132 sample quadrats, combining all vegetation classes, initially declined from 17.3 ± 1.2 SE to 15.5 ± 1.4 SE in 2011; since that time it has increased to 18.1 ± 1.01 SE (Table 1) and the overall differences are significant (RM-ANOVA F = 3.32, df = 2.8, 121.6, P = 0.024). Similarly, mean plot species richness initially declined from 29.4 ±1.8 SE species per plot (combing species from three nested quadrat samples in each plot) to 25.3 ± 2.2 SE in 2011 but since has increased to 32.3 ± 1.5 SE in 2015 (RM-ANOVA F = 6.87, df = 3.3, 140.5, P = 0.0001). As in previous years, native species richness in 2015 is highly correlated to native species density (Pearson Correlation Coefficient r = 0.97). Non-native species density increased since the baseline sample from 4.7 ± 0.34 SE to 5.52 ± 0.27 and the trend is significant (RM-ANOVA F = 3.78, df = 3.9, 169, P = 0.006). The mean has declined slightly since 2013 but

generally has increased since the baseline sample. Total richness of non-native species declined slightly from 2014 but the overall trend represents a significant increase (RM-ANOVA F = 10.0, df = 3.7, 157.2, $P < 0.0001$). The Shannon-Wiener index of diversity has varied from the baseline, with a value in 2015 similar to the baseline; the overall trend is not significant (RM-ANOVA F = 2.32, df = 3.1, 132.1, $P = 0.077$). Total percent ground cover also has varied over time with percent cover in 2015 of about 138%, approximately the baseline level; however, the differences over time are significant (RM-ANOVA F = 11.8, df = 2.9, 123.7, $P < 0.0001$). Percent bare ground initially was about 26% but since 2011 has been ranged from 11 to 19%; the trend represents significant differences over time (RM-ANOVA F = 15, df = 2.6, 112.9, $P < 0.0001$).

Trends with Floristic Quality Assessment

The overall Mean Coefficient of Conservatism (Mean C) for the site based on total 2015 plot sample data was 3.62 ± 0.09 SE and Mean Cn was 4.26 ± 0.1 SE (Table 1). The Floristic Quality Index (FQI) was 42.6 and native floristic quality (FQIn) was 52.0. Average plot Mean C initially declined from 2.33 ± 0.1 SE (2009); however, since reaching a minimum of 1.89 ± 0.13 SE in 2011 Mean C has increased. Overall Mean C in 2015 was 2.41 ± 0.11 SE and the difference over time is significant (RM-ANOVA F = 15.9, df = 3.6, 152.8, $P < 0.0001$). Similar to Mean C, average plot FQI initially declined but since 2011 has increased. Overall plot average FQI in 2015 was 10.46 ± 0.72 SE and the difference over time is significant (RM-ANOVA F = 11,66, df = 3,1, 129.7, $P < 0.0001$).

2015 Habitat Characteristics

Dominant Species

OLD FIELD HABITAT. The top ten most abundant species from the Old Field habitat, accounting for 40.8% of the total importance value (IV 200), were *Solidago canadensis*, *Andropogon gerardii*, *Sorghastrum nutans*, *Rhamnus cathartica**, *Fragaria virginiana*, *Poa compressa**, *Ratibida pinnata*, *Poa pratensis**, *Dactylus glomerata**, and *Helianthus grosseserratus*. Nine of these species (underlined) also were among the ten dominants in 2014. The establishment of two native warm-season prairie grasses, *S. nutans* and *A. gerardii*, into the top-ranking species observed in 2013 has been maintained; both have frequencies from 48 to

53%, respectively, and cover increased in 2015 to just over 9% for each species.

PRAIRIE HABITAT (combining Transect and Reference Prairie plots). The top ten ranking species from Prairie habitat, accounting for 32.4% of the total importance, included *Rhamnus cathartica**, *Andropogon gerardii*, *Sorghastrum nutans*, *Poa pratensis**, *Fragaria virginiana*, *Poa compressa**, *Solidago canadensis*, *Parthenium integrifolium*, *Schizachyrium scoparium*, and *Ratibida pinnata*. Nine of these (underlined) also were among top dominant species in 2014. *Solidago canadensis* is new to this list compared to 2014 replacing its congener *S. juncea.* Three warm-season prairie grasses rank among the top-ten ranking species. However, by a substantial margin the highly invasive shrub *Rhamnus cathartica** has returned to its former rank as the most dominant species in the ground layer samples where it occurs as seedlings and sprouts.

Changes in Species Composition and Abundance

Thirty species recorded in the 2009 baseline sample were absent during the 2015 sample while 65 species recorded in 2015 were not recorded in 2009. Of the total of about 239 species recorded in 2015, 172 (72%) were recorded during both the baseline and 2015 samples. About 64 other species were recorded sometime during the 2010 to 2014 period but were absent in the baseline and 2015 samples. This fluctuation in the species pool is exclusively among low frequency taxa. Species increasing and decreasing greatest in frequency and percent cover since the 2009 baseline differ between the Old Field and Prairie habitats (Tables 2a and 2b). In general, there has been a greater net increase in frequency and percent cover among species in Old Field habitat compared with Prairie habitat.

OLD FIELD HABITAT. Twenty-one species increased in frequency greater than 15% since the 2009 baseline sample (Table 2a). The greatest increase was 53% by *Andropogon gerardii*. Other species with prominent increase in frequency (> 40%) include *Ratibida pinnata, Cirsium arvense*,* and *Sorghastrum nutans*. Seventeen species increased in percent cover greater than 1%, most notably (> 5%) *Solidago canadensis, Andropogon gerardii, Sorghastrum nutans, Dactylis glomerata*, and Poa pratensis*.*

Eleven species decreased in frequency by more than 15% (Table 2a). The greatest

decreasing species (≥ 30%), mostly woody species, were *Cornus racemosa, Vitis riparia, Aster drummondii,* and *Rhamnus cathartica*.* Six species declined in cover more than 1%, most notably *Rhamnus cathartica*, Allium canadense,* and *Cornus racemosa* (Table 2a). Prescribed burning, generally appearing more thorough in Old Field plots compared particularly with Reference Prairie plots, may account for maintaining these changes among woody plants.

Invasive species identified previously that can be management concerns still remain in Old Field habitat, most notably *Cirsium arvense**. Originally scarce in the baseline sample (3.5% frequency), this noxious species increased in frequency to 67% in Old Field plots during 2014 before declining to 49% in 2015; more promising is the decline in percent cover from 7% to just over 1% during 2015 (Figures 4a, 4b). *Cirsium vulgare**, another noxious thistle, was absent in the baseline sample but increased dramatically in Old Field plots in 2010 before declining to 1.2% frequency and 0.01% cover in 2015 *Dactylis glomerata** evidently was introduced either as a cover crop or unintentionally from seed in straw layered throughout most of the study area following shrub clearance. It occurred in 24% of the 87 Old Field sample plots in 2015 and had 6.4% cover. The annual grass *Lolium multiflorum** was planted as a cover crop in 2010-2011 and became widely established; it has declined since 2011 to 14% frequency and 0.1% cover in Old Field plots during 2015. *Rhamnus cathartica** remains among the most dominant species in the ground layer of Old Field habitat; however, it has declined from the first to fourth-ranking species. There has been a 32.7% decline in frequency and 25.1% decline in cover since the 2009 baseline sample (Table 2a).

PRAIRIE HABITAT. Nine species increased in frequency by more than 15% since the 2009 baseline sample. Major increasers (> 20%) were *Andropogon gerardii, Sorghastrum nutans, Carex granularis, Liatris* sp. (basal rosettes), and *Crataegus coccinea* (Table 1b). Only eight species have increased in cover more than 1%; the largest increasers (>3%) were *Carex stricta, Poa compressa*, Spartina pectinata,* and *Poa pratensis*.*

Seventeen species declined in frequency > 15%. Species declining greatest (> 20%) were *Solidago juncea, Lobelia spicata, Hieracium caespitosum*, Vitis riparia, Liatris spicata, Cerastium vulgatum*, Anemone virginiana, Antennaria neglecta,* and *Rosa carolina* (Table 2b). A total of 23 species declined in cover more than 1%, most notably (> 3% cover) *Solidago juncea, Cornus racemosa, Schizachyrium scoparium, Rhamnus cathartica*, Carex pellita, Daucus*

carota, Antennaria neglecta, Agrostis alba, Agrostis alba* var. *palustris,* and *Silphium terebinthinaceum*.

Problem invasive species generally are less common in Prairie habitats compared to Old Field (Figures 4a, 4b). After increases from 2012 to 2014, *Cirsium arvense** declined in frequency in Transect Prairie plots to 12.5% in 2015 and declined in percent cover to 0.06%. In Reference Prairie plots, percent frequency and cover declined to 4.8% and 0.02%, respectively. *Cirsium vulgare** was absent in all Prairie plots in 2015. *Dactylis glomerata,* still absent in Reference Prairie, increased in Transect Prairie plots from 8% frequency in 2014 to nearly 17% in 2015 and percent cover increased to 1.0% (Figure 4b). For the first time since 2010, *Lolium multiflorum** was absent from all Prairie plots. Although *Rhamnus cathartica** generally has declined in frequency and cover since the 2009 baseline sample, there was a substantial increase in percent cover since 2014 from 8.8% to 15.7%; the increase was particularly pronounced in Reference Prairie plots where *R. cathartica* increased from 6.7% in 2014 to nearly 20% in 2015. The increase was far less in Old Field and Transect Prairie plots (0.5% to 1.5%, respectively) where prescribed fire (conducted in 2014 on 11 April) appeared more widespread and effective.

Species Diversity, Structure, and Floristic Quality

There were significant between-group differences ($P < 0.05$) among Reference Prairie, Transect Prairie, and Old Field habitats for native species density, native species richness, and the Shannon-Wiener index of diversity (Table 3); former differences in non-native species richness were not found in 2015. Post hoc pairwise test results indicate differences were due to higher values in Reference Prairie habitat for native species density; Reference Prairie and Transect Prairie had greater native species richness and species diversity compared to Old Field. Species density in Reference Prairie was 34% to 39% greater than Transect Prairie and Old Field habitats, respectively. Reference Prairie had greater percent cover compared to Transect Prairie and Old Field plots and the differences were statistically significant ($P < 0.001$). Percent bare ground was lower in Reference Prairie and Transect Prairie compared to Old Field habitat and the differences were significant ($P = 0.005$). Floristic Quality Assessment (FQA) values (Mean C, Mean Cn, FQI, and FQIn) were significantly greater in Reference Prairie ($P <0.001$) compared to Transect Prairie and Old Field (Table 3).

Time Series Differences for Vegetation Types (2009-2015)

Mean values (± 1 SE) for all parameters from 2009 to 2015 for each vegetation type (Reference Prairie, Transect Prairie, combined Prairie plots, Old Field) and overall are shown in Table 1. The results for test of time differences (repeated measures analysis of variance within-subjects tests) for each vegetation type (Reference Prairie, Transect Prairie, and Old Field) indicate significant within-subject differences (years – test of flatness hypothesis) for several metrics and vegetation types (Table 4). Pairwise between-year comparisons, adjusted with the Sidak multiple comparison test, indicate the greatest differences sometimes occur between beginning and final years of the monitoring program (Table 4). However, compared to past years the number of non-significant trends is increasing as some trends are non-linear with parameters returning during 2015 to approximately baseline levels. In general, habitat types demonstrate somewhat individualistic trajectories since the baseline sample for several parameters with some evidence of convergence between Transect Prairie and Old Field habitats (Figure 5). See section Between-Subjects & Within-Subjects Differences and Interactions for further accounts of the test of the parallelism hypothesis (i.e., interaction between vegetation type and time [year]).

REFERENCE PRAIRIE. Native species density and richness reached their maximum values in 2011 following shrub removal and effective fire management, declined during 2012-2013 (drought years), and have shown minor fluctuations since (Table 1, Figure 5). The trends for native species density over time indicate significant differences; however, trends for species richness are not significant (Table 4). Fire increases species diversity in Illinois prairies (Bowles and Jones 2013) and fire management has occurred in non-wetland habitats during dormant and early spring periods from 2012-2015. However, the burns appear to have been patchy, particularly in the Reference Prairie zone during most years.

Trends for non-native species density and richness since the baseline measure have varied with increases and decreases (Table 1, Figure 5) and the overall trends are significant for non-native species density but not for non-native richness (Table 4). Percent cover has fluctuated greatly since the baseline measure and the overall declining trend is significant; however, percent bare ground has not changed (Table 4). Reduced cover during 2012 to nearly

half the baseline level may have been a drought effect; however, the general trend of declining percent ground cover and recent increases in *Rhamnus cathartica* suggests a need for more effective burns. Diversity, dominance, and FQA metrics have not changed (Table 4).

TRANSECT PRAIRIE. Native species density and richness initially declined in Transect Prairie plots but since 2011 these parameters have increased; however, they have yet to match baseline levels and appear to be asymptotically leveling out (Table 1, Figure 5). Nevertheless, the differences among years are significant and the null expectation of no change over time is rejected (Table 4). The prominent decline in native species density and richness during 2011 may be the result of disturbance related to mechanized shrub removal. This decline was not observed in Reference Prairie plots where shrub removal was performed manually, or in Old Field plots dominated by ruderal species with perhaps relatively greater disturbance tolerance.

Mean non-native species density and richness have fluctuated with increases and decreases since the baseline measure (Table 1, Figure 5); however, the overall differences among years are not statistically significant (Table 4). Percent ground cover initially declined during the shrub removal phase of the restoration and since has shown both increase and decrease and the trends are significant. Percent bare ground increased to 31% in 2011, possibly a result of disturbances related to shrub-removal activities, but since has declined; however, the overall trend is not significant (Table 4). In contrast to Reference Prairie, dominance and diversity have fluctuated widely in Transect Prairie plots (Figure 5); however, only the overall trend for diversity is significant (Table 4). Floristic quality indices initially declined in Transect Prairie plots reaching minimum levels in 2011 (Table 1, Figure 5); however, since 2011 FQA indices have gradually increased to near baseline levels and the overall trends are significant (Table 4).

OLD FIELD PLOTS. Since 2011, native species density and richness gradually increased during most years, reaching maximum levels in 2015 (Table 1, Figure 5), and the differences are significant (Table 4). Non-native species density and richness initially increased but have remained relatively unchanged since 2011 (Table 1, Figure 5) and the trends are significant (Table 4). Native species diversity has changed little; in contrast, dominance in Old Field plots sharply declined since 2011 (Table 1, Figure 5) and the overall difference is significant (Table 4). Percent cover and percent bare ground have fluctuated since 2009 with cover generally increasing

and bare ground decreasing, although 2015 samples represent a reversal (Table 1, Figure 5); the overall trends are significant (Table 4). Mean C and FQI initially declined but since 2011 have steadily increased to maximum levels in 2015 (Table 1, Figure 5) and the differences are significant (Table 4).

Between-Subjects (Vegetation Types) & Within-Subjects (Time) Differences and Interactions

The null parallelism hypothesis suggests that interactions of the between-subjects factor and within-subjects factor do not differ and that slopes remain parallel over time. The null parallelism hypothesis can be rejected at the North Chicago Wetland Mitigation Site for most of the measured parameters. Interactions between vegetation type and year indicate significant differences for all vegetation parameters except Mean C, dominance, and diversity (Table 5). There are significant differences in between-subject (vegetation type) comparisons (i.e., examining dissimilarity in vegetation type by combining within-subject [year] differences as a test of the general levels hypothesis) for all ground layer parameters (Table 5). Within-subjects differences (years, combining vegetation types and examining effect of year alone, a test of the general flatness hypothesis) are significant for most parameters and the exception, non-native species density, is marginally significant (Table 5). In general, Reference Prairie plots have the highest values through time for native species density, richness, percent cover, and floristic integrity (Figure 5). Transect Prairie plots in the baseline sample were intermediate between Reference Prairie and Old Field plots, declined in several parameters until converging with Old Field plots in 2011, and then for several parameters (e.g., native species density, richness, percent cover, bare ground, dominance, diversity, Mean C, and FQI) there has been a trend of recovery to approximate baseline levels (Figure 5).

Shrub/Sapling Stratum

Site Summary

Overall density of woody stems has greatly declined from 22,898/ha to 1,200/ha in 2015, a reduction of about 95%. (Table 6) Mean shrub density throughout the study area initially declined from an average of 58 stems/25-m^2 plot to less than 1 stem/plot in 2011; subsequently, overall shrub density has increased to 2.95 stems/plot in 2015 (Table 1). Mean percent canopy cover in 2015 was 15.5%, an increase from 13.1 in 2014 (8.8% in 2013) and mean leaf area index

(LAI) was 0.17, a slight increase from 0.15 in 2014. The overall test of time (within-subjects differences combing vegetation types) indicate significant differences (Friedman's test results, $P < 0.0001$) for shrub density, percent canopy cover, and leaf area index (Table 5).

Nine species were recorded in 2015 compared to 24 in the 2009 baseline sample and 33 taxa overall (some taxa were only present from 2010 to 2014). Dominant species in the combined Old Field and Prairie plots were *Rhamnus cathartica*, Viburnum lentago,* and *Lonicera* x *bella** accounting for about 83% of the total stem counts. *Rhamnus cathartica** remains the dominant species with 33.6% of the IV and 39% of total stems.

2015 Habitat Differences

There were no differences in shrub density among the vegetation types for 2015; however, there were differences for percent canopy cover and LAI and the pairwise differences were between the Prairie habitats and Old Field (Table 3) where percent cover and LAI are greatest (Figure 6). Time series differences (from 2009 to 2015) were found with all vegetation types for shrub density, percent canopy cover, and LAI (Table 4). Primarily, differences were found between 2009 and 2010 and selectively between 2010 and 2011; overall there has been a dramatic decline since the 2009 baseline sample for each vegetation type in stem density, percent canopy cover, and LAI (Figure 6). The vegetation type x year interactions were all significantly different (Table 5). The between-subjects differences (i.e., comparisons among vegetation types, averaging all years) were found for percent canopy cover and LAI but not stem density (Table 5). Within-subject differences (comparison among years, averaging vegetation types) were highly significant.

Stem density for *Rhamnus cathartica** has been reduced 96% from the baseline total, yet this species remains the most dominant in the shrub-sapling stratum even though it is limited to 23% of sample plots (Table 6), an increase from 13.6% in 2014. *Rhamnus cathartica** was recorded in 69% of all ground-layer sample quadrats, including 82% of the combined Reference and Transect Prairie quadrats (Appendix 1). Similar frequencies were observed in the 2014 ground layer samples. Continued management such as with effective prescribed fire will be needed to prevent re-establishment of *R. cathartica** into the shrub-sapling stratum.

Tree Stratum

Trees (woody stems $\geq$ 10 cm dbh) were recorded in 23 plots (52%) during 2015 when tree density was 52.5/ha, an increase from 34.3/ha in 2014, and basal area of 1.35 m^2/ha, an increase from 1.23 m^2/ha in 2014. Nine species were recorded in the tree sample plots with *Crataegus coccinea* the dominant with about 31.6% of the IV for all species (Table 7). Other species include *Prunus serotina* and *Ulmus americana* with 20 to 22% of the importance value, respectively. Most trees occur outside the 25-m^2 shrub-sapling plots and in many cases near the outer margins of the tree plots. Since the 2009 baseline samples, *Crataegus coccinea* and *Prunus serotina* have increased in stem density greater than 350% (Table 7). There were many submature specimens in the study area that have now reached the 10 cm minimum diameter for recording in tree sample plots. Tree species eliminated from samples include *Acer negundo*, *Populus deltoides*, and *Rhamnus cathartica**.

Paired Comparisons: Baseline (2009) to 2015

Previous analyses have examined whether there are difference between vegetation types, whether trends over time have been flat or varied, and whether there have been interactions between vegetation type and time. For most parameters, null expectations of no differences between vegetation types, time intervals, or their interactions can be rejected; however, for many, general trends have involved fluctuations with outcomes approximating baseline condition. Paired comparisons between 2009 baseline condition and observed levels in 2015, the final year of monitoring, can highlight which vegetation types and parameters have undergone the greatest transformation.

Overall mean comparisons of all 44 sample plots indicate that there have been significant increases in non-native species density and richness, a decline in species dominance, and an increase in Native Mean C (Table 8). All measured parameters of the shrub/sapling stratum (e.g., stem density, canopy cover, LAI) indicate significant reduction from the baseline levels. In Reference Prairie, the only ground layer parameter that differs from the baseline condition is percent cover (Table 8). As with the overall comparison, all shrub/sapling parameters also were significantly reduced from the baseline. For Transect Prairie the only parameters that differ from the baseline are in the shrub/sapling stratum; none of the ground layer parameters differ from the baseline levels. Old Field plots demonstrate the greatest differences from baseline condition.

All parameters except diversity and Mean C were statistically different from the baseline condition (Table 8).

After removing co-variables (with $r > 0.9$), factors that explain the greatest amount of variance in species assemblages among the vegetation types from the baseline to 2015 final sample, identified using sequential step-wise analysis of distance-based linear models, are percent canopy cover, Mean C, percent ground cover, dominance, non-native species richness, and shrub density (Table 9). A comparative study carried out at this site based on observed patterns of the baseline vegetation indicated that woody encroachment was associated with loss of native species and plant functional groups in the ground-layer (Taft and Kron 2014). Removal of the shrub/sapling layer at this site likely then reduced a limiting factor for propagule establishment; however, the response in the ground layer vegetation appears to have been forestalled. Although in the five years since 2011, when most performance criteria of conservation interest reached their minimum levels, there has been steady progress of recovery, evidence of restoration beyond reaching the baseline condition appears limited.

Principal Coordinates Analysis (PCO) was used to further explore trends in species composition among vegetation types based on baseline and final sample periods. Distance between centroids among vegetation types and time intervals using PCO reveal that the greatest distance in ordination space (greatest Bray-Curtis dissimilarity in patterns of species composition and abundance) is between baseline Old Field and baseline Reference Prairie; the least distance (greatest similarity) is between 2015 Old Field and 2015 Transect Prairie (Table 10). Transect Prairie has grown slightly more dissimilar from Reference Prairie while with the increase in warm-season grasses Old Field plots have grown slightly more similar to Reference Prairie plots. Comparative within-group differences indicate that Reference Prairie plots have been the least changed (distance between centroids between baseline and 2015 samples of 27.2 compared with 39.4 for Transect Prairie and 45.2 for Old Field plots). The ANOSIM (Analysis of Similarity) procedure identifies pairwise differences in species composition and generates probabilities of observed patterns from permutations of the data compared to a completely randomized species distribution model. Results from ANOSIM support the analysis of centroid distance in PCO. All pairwise comparisons between the three main vegetation types and baseline and 2015 time intervals indicate that the only differences that are not statistically significant are comparisons between the Reference Prairie samples (baseline and 2015) and comparison between 2015

Transect Prairie and 2015 Old Field (Table 11). Overall, there has been a parallel shift in the Transect Prairie and Old Field plots corresponding to restoration efforts, resulting particularly from reduction in woody stem density, percent canopy cover, and ground layer species dominance; however, in contrast to restoration goals there is no strong evidence of convergence in composition towards Reference Prairie (Figure 7).

Threatened and Endangered Species

Previously, four state threatened species (*Elymus trachycaulus*, *Oenothera perennis*, *Veronica scutellata,* and *Amelanchier interior*) have been reported from the study site, with all but *V. scutellata* found in sample plots. However, during 2014 the Illinois Endangered Species Protection Board delisted *Oenothera perennis* after determining it was more common than previously believed (this study site is believed to support the state's largest population). Population size for *O. perennis* has fluctuated widely at this site over many years of observation; it was locally common during 2015, occurring in a few sample quadrats. *Amelanchier interior* formerly had three stems but in 2011 only a single small tree was found with two stems. In the baseline sample, 33 *Amelanchier* seedlings were recorded; however, none were recorded in 2015. A determination to species can be difficult with flowering and fruiting material of *Amelanchier* and typically is not possible with sterile seedlings; when present seedlings may represent one or more of three species: *A. interior*, *A. arborea*, and possibly *A. laevis*. *Elymus trachycaulus*, recently changed from state threatened to state endangered, remains locally occasional in the southern quarter of the site. It was recorded in 4 quadrats in 2015, a decline from 8 in 2014.

SUMMARY AND CONCLUSIONS

Compared to recent samples, total species richness from vegetation sample plots remained nearly constant in 2015 at 239 taxa (75.5% native). Species increasing in percent frequency and cover exceeded declining species in the Old Field vegetation type while declining species exceeded increasing species in the Prairie vegetation type. The adventive shrub *Rhamnus cathartica** returned as the overall dominant species, replacing the warm-season prairie grass *Sorghastrum nutans* (Indian grass) which had emerged in 2014 as the overall dominant species.

Tests of the parallelism hypothesis, the null expectation being no difference in the interaction between vegetation type (between-subjects factor) and year (within-subjects factor),

indicate significant differences in the profiles for all three vegetation types for all parameters except Mean C (the average coefficient of conservatism), species dominance, and native species diversity. Between-subjects differences were found for all parameters indicating that the averages for vegetation types over time differ and the differences are statistically significant. Furthermore, within-subjects differences were found for all parameters except non-native species density (marginally significant [$P = 0.074$]) indicating that significant time differences were found when combining vegetation types.

Reference Prairie plots, although showing yearly fluctuation, continue to have the highest values for native species density and richness, percent ground cover, and FQA indices and in 2015 had the lowest non-native species density and richness. Native species richness declined from 45/plot (combined data from 3 quadrats [1-m^2]) in 2014 to 42 in 2015, a trend that can be expected with fire absence. Burning promotes species coexistence in the eastern tallgrass prairie and can result in increased species richness (Bowles and Jones 2013). Formerly, Transect Prairie plots had values for native species richness, diversity, and floristic quality that were intermediate between Reference Prairie and Old Field vegetation types. During 2010 and 2011, these parameters declined and Transect Prairie merged with the Old Field vegetation type, possibly a response to disturbances related to mechanized shrub removal. From 2012 to 2015, native species parameters gradually increased in Transect Prairie plots, returning to their intermediate position, but mostly below baseline levels.

Transect Prairie plots have had the greatest non-native species density and richness and that remains true in 2015. These values increased after initial management involving shrub/sapling removal and have fluctuated since that time. There are promising trends for general declines among certain invasive species (e.g., *Cirsium arvense**, *C. vulgare**, and *Lolium multiflorum**); however, *Dactylus glomerata** continues to increase in Transect Prairie plots and non-native species richness has increased overall. Although *Cirsium arvense** (Canada thistle), declined in frequency and percent cover compared to 2014 this noxious species still occurs in 36% of sample quadrats. The non-native cool season grasses *Poa pratensis** and *P. compressa** have notably increased throughout the study site and currently rank among the most dominant species.

Old Field plots have shown the greatest changes in response to restoration activities. Native species density and richness have gradually increased, particularly since 2011, and species

dominance has declined. Floristic quality has gradually increased since 2011 to approximately baseline levels. Species composition between Old Field and Transect Prairie has grown more similar as the warm-season prairie grasses (e.g., *Andropogon gerardii* and *Sorghastrum nutans*) and *Ratibida pinnata* have become widely established, imparting a prairie-like appearance to these zones.

Several conservative prairie and savanna species (as well as many fine unnamed wetland species) remain common to occasional at the study site (e.g., *Arnoglossum plantaginea, Asclepias purpurescens, A. tuberosa, Carex buxbaumii, Castilleja coccinea, Gentiana* spp., *Hierachlöe odorata, Hypoxis hirsuta, Liatris* spp., *Oenothera perennis, Parthenium integrifolium, Pedicularis canadensis, Spiranthes* spp., *Veronicastrum virginicum, Viola pedatifida,* and *Zizea aptera*). These species persist from the antecedent vegetation of the study area. Some, by happenstance, were missed by the vegetation samples. Interestingly, *Liparis loeselii* (lesser twayblade orchid), an uncommon species not previously recorded from the study site, appeared in a sampling quadrat during 2015 (3B, an Old Field plot). This is the fourth orchid species to be recorded from the study area. However, despite an intensive survey during the blooming time in 2015 and substantial apparently suitable habitat, the federally threatened *Platanthera leucophaea* (Eastern Prairie Fringed Orchid) remains unknown from the site.

Among the most dynamic ground layer parameters at the study site have been percent ground cover and percent bare ground with each vegetation type showing increases and decreases but not always synchronous or parallel. Prior to shrub removal, percent shrub canopy cover was inversely related to percent ground layer cover and positively correlated with percent bare ground (Taft and Kron 2014). Based on the baseline patterns, it was expected that with reduction in the canopy cover of the shrub/sapling stratum percent ground cover would increase and percent bare ground would decline. Puzzlingly, the greatest overall change observed has been a decrease in percent ground cover in the Reference Prairie plots where shrub encroachment was least pronounced. There has been no change in Transect Prairie plots in ground cover or percent bare ground and while ground cover in Old Field plots has increased overall, there was a sharp decline parallel with the other vegetation types in 2015 and, exclusive to Old Field plots, a sharp increase in percent bare ground. Overall, there is less between-group variance in percent ground cover and bare ground and while there remain some independent variation, there appears to be some convergence of these structural parameters.

The shrub/sapling stratum control efforts greatly reduced the canopy and stem density of woody species throughout the study area and the ongoing management appears to be maintaining current structure. However, the highly invasive shrub *Rhamnus cathartica** persists among the dominant species in the ground layer. There was a sharp increase in cover in the Reference Prairie plots during 2015 indicating that for the foreseeable future it will continue to have great potential to become re-established in the woody overstory and lead to suppression of native prairie species diversity. Ongoing management with frequent applications of prescribed fire (e.g., every 1-2 years) will be key to sustaining the restoration efforts to date, promote native species, and control invasive herbaceous and woody species. It is essential that the Reference Prairie zone, a vital template for restoration, is included in site management efforts to conserve these remnant habitats and maintain the unique species pool as a resource for colonization of the site.

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Table 1. Summary variables for the North Chicago Wetland Mitigation Site from terrestrial (non-wetland) communities presenting data from the 2009 baseline samples to 2015. See Methods section for detailed description of metrics and parameters. COMBINED PRAIRIE combines data from transects and reference prairie samples. n = sample size (quadrat #); quadrats are 1-m^2. SE = standard error.

		TOTAL (n = 132)		OLD FIELD (n = 87)		COMBINED PRAIRIE (n = 45)		TRANSECT PRAIRIE (n = 24)		REFERENCE PRAIRIE (n = 21)	
	YEAR	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**
Species Diversity and Structure Parameters											
Native Species Density	2009	17.28	1.23	13.66	1.31	24.27	1.32	20.18	1.07	28.95	0.58
	2010	16.97	1.20	13.61	1.32	23.47	1.30	19.50	0.94	28.00	0.94
	2011	15.53	1.41	12.77	1.31	20.86	2.88	12.10	2.48	30.86	1.43
	2012	15.72	1.14	13.92	1.35	19.20	1.83	13.46	1.46	25.76	0.67
	2013	15.70	1.05	13.26	1.17	20.40	1.52	16.79	1.74	24.52	1.46
	2014	17.53	1.13	15.08	1.20	22.27	1.86	17.29	1.83	27.95	1.65
	2015	18.07	1.01	16.22	1.11	21.64	1.74	17.50	1.56	26.38	2.20
Non-Native Spp.	2009	4.75	0.34	3.93	0.34	6.33	0.55	6.88	0.80	5.71	0.74
	2010	5.42	0.37	4.67	0.44	6.89	0.51	8.21	0.45	5.38	0.58
	2011	5.97	0.32	5.56	0.32	6.76	0.69	7.33	1.05	6.10	0.86
	2012	5.36	0.25	5.40	0.33	5.29	0.37	5.96	0.48	4.52	0.44
	2013	5.89	0.27	5.78	0.33	6.11	0.47	7.13	0.48	6.11	0.47
	2014	5.82	0.25	5.61	0.32	6.22	0.39	7.00	0.47	6.22	0.39
	2015	5.52	0.27	5.44	0.33	5.69	0.48	6.54	0.62	4.71	0.57
Native Richness	2009	29.39	1.82	24.69	2.13	38.47	1.79	33.25	1.47	44.43	1.45
	2010	27.18	1.79	22.59	1.94	36.07	2.40	28.63	1.46	44.57	1.80
	2011	25.32	2.18	21.00	2.18	33.67	4.13	20.88	3.50	48.29	1.46
	2012	28.66	1.85	26.21	2.38	33.40	2.56	26.13	2.60	41.71	1.44
	2013	28.48	1.65	24.97	1.95	35.27	2.18	30.50	2.39	40.71	2.61
	2014	31.09	1.67	27.76	1.92	37.53	2.49	30.88	2.36	45.14	2.31
	2015	32.25	1.48	30.14	1.81	36.33	2.31	31.38	2.16	42.00	3.21
Non-Native Richness	2009	6.86	0.54	5.72	0.58	9.07	0.88	10.88	0.90	7.00	1.21
	2010	8.11	0.51	7.17	0.60	9.93	0.78	12.00	0.42	7.57	1.02
	2011	10.25	0.50	10.17	0.53	10.40	1.10	12.13	1.61	8.43	1.17
	2012	8.84	0.45	9.17	0.58	8.20	0.68	9.63	0.98	6.57	0.48
	2013	9.39	0.42	9.48	0.49	9.20	0.82	11.13	0.93	7.00	0.82
	2014	9.57	0.40	9.62	0.50	9.47	0.69	11.13	0.83	7.57	0.57
	2015	9.27	0.47	9.59	0.57	8.67	0.84	10.00	1.21	7.14	0.94
C dom 45 (allspp)	2009	0.21	0.03	0.27	0.03	0.10	0.01	0.11	0.02	0.09	0.00
	2010	0.16	0.02	0.20	0.02	0.09	0.00	0.08	0.00	0.10	0.00
	2011	0.25	0.03	0.29	0.04	0.18	0.04	0.25	0.07	0.09	0.01
	2012	0.18	0.02	0.20	0.03	0.13	0.01	0.15	0.02	0.11	0.01
	2013	0.11	0.01	0.12	0.02	0.08	0.01	0.08	0.01	0.09	0.01

	YEAR	TOTAL (n = 132) Mean	SE	OLD FIELD (n = 87) Mean	SE	COMBINED PRAIRIE (n = 45) Mean	SE	TRANSECT PRAIRIE (n = 24) Mean	SE	REFERENCE PRAIRIE (n = 21) Mean	SE
	2014	0.12	0.01	0.11	0.01	0.13	0.03	0.16	0.05	0.09	0.02
	2015	0.12	0.01	0.14	0.01	0.10	0.01	0.10	0.01	0.10	0.01
Hn 45	2009	2.43	0.09	2.30	0.12	2.66	0.06	2.56	0.09	2.78	0.06
	2010	2.46	0.08	2.33	0.12	2.72	0.05	2.71	0.06	2.73	0.09
	2011	2.36	0.10	2.35	0.12	2.37	0.17	1.97	0.22	2.83	0.08
	2012	2.22	0.08	2.10	0.11	2.46	0.09	2.25	0.12	2.69	0.07
	2013	2.52	0.07	2.40	0.09	2.74	0.08	2.69	0.11	2.80	0.11
	2014	2.52	0.06	2.49	0.08	2.57	0.09	2.37	0.08	2.80	0.11
	2015	2.45	0.06	2.32	0.07	2.69	0.07	2.64	0.07	2.74	0.14
% Cover	2009	131.26	12.84	85.76	6.85	219.22	21.59	154.96	20.87	292.67	7.96
	2010	105.52	11.32	68.18	7.69	177.70	19.00	126.48	18.19	236.24	17.09
	2011	130.09	9.97	110.23	7.30	168.50	23.00	95.29	10.96	252.17	17.26
	2012	149.81	6.35	150.37	8.68	148.72	8.47	129.69	7.79	150.37	8.68
	2013	148.26	6.17	140.47	6.30	163.33	12.84	128.08	13.89	203.62	7.73
	2014	176.43	6.52	169.55	7.33	189.72	12.52	173.63	13.32	208.12	21.01
	2015	137.66	5.61	126.92	6.07	158.41	9.72	133.92	10.02	186.40	9.68
% BG	2009	25.91	2.90	34.34	3.30	9.60	2.20	13.39	3.56	5.26	1.21
	2010	34.07	3.92	44.93	4.34	13.07	4.21	20.15	6.83	4.98	2.41
	2011	18.98	2.58	19.50	3.12	17.99	4.70	30.92	5.59	3.21	0.68
	2012	14.03	2.16	14.30	3.11	13.51	2.15	19.63	1.57	6.52	2.13
	2013	13.76	1.44	14.34	1.28	12.64	3.48	21.10	4.81	2.98	0.75
	2014	11.17	1.23	11.85	1.42	9.84	2.38	14.25	3.74	4.81	1.37
	2015	18.16	1.76	22.01	2.30	10.70	1.24	12.94	1.80	8.14	1.14
Floristic Quality Assessment Metrics											
Native Mean C	2009	3.01	0.10	2.74	0.10	3.53	0.18	2.95	0.07	4.18	0.16
	2010	2.94	0.12	2.66	0.13	3.49	0.20	2.86	0.08	4.21	0.14
	2011	2.71	0.14	2.51	0.12	3.08	0.31	2.23	0.35	4.05	0.14
	2012	2.87	0.12	2.62	0.12	3.37	0.22	2.72	0.15	4.12	0.19
	2013	2.99	0.12	2.73	0.13	3.49	0.19	2.88	0.09	4.18	0.16
	2014	2.98	0.12	2.70	0.13	3.52	0.19	2.92	0.08	4.21	0.16
	2015	3.15	0.11	2.92	0.12	3.59	0.18	3.00	0.08	4.26	0.11
Mean C	2009	2.33	0.11	2.09	0.11	2.82	0.18	2.22	0.09	3.50	0.12
	2010	2.25	0.12	2.00	0.12	2.72	0.21	2.02	0.09	3.52	0.10
	2011	1.89	0.13	1.67	0.11	2.32	0.30	1.38	0.23	3.39	0.09
	2012	2.11	0.13	1.83	0.12	2.64	0.24	1.88	0.16	3.50	0.15
	2013	2.16	0.12	1.88	0.12	2.70	0.21	2.01	0.10	3.48	0.14
	2014	2.23	0.12	1.96	0.11	2.75	0.21	2.06	0.09	3.54	0.14
	2015	2.41	0.11	2.18	0.11	2.85	0.21	2.18	0.12	3.62	0.09
Native FQI	2009	12.61	0.85	10.06	0.73	17.53	1.35	13.16	0.47	22.52	1.03
	2010	12.26	0.83	9.77	0.71	17.06	1.33	12.61	0.61	22.14	0.48
	2011	10.92	0.95	8.90	0.74	14.82	2.10	8.14	1.42	22.46	1.04

		TOTAL (n = 132)		OLD FIELD (n = 87)		COMBINED PRAIRIE (n = 45)		TRANSECT PRAIRIE (n = 24)		REFERENCE PRAIRIE (n = 21)	
	YEAR	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**
	2012	11.59	0.84	9.79	0.78	15.08	1.62	9.99	0.93	20.89	1.18
	2013	12.02	0.79	10.00	0.75	15.91	1.36	11.79	0.87	20.63	1.11
	2014	12.72	0.84	10.63	0.77	16.78	1.52	12.02	0.73	22.22	1.27
	2015	13.38	0.76	11.61	0.70	16.81	1.43	12.48	0.78	21.75	1.33
FQI	2009	9.98	0.75	7.86	0.65	14.07	1.27	9.89	0.51	18.84	0.74
	2010	9.51	0.74	7.49	0.62	13.41	1.33	8.92	0.61	18.55	0.34
	2011	8.05	0.86	6.23	0.65	11.56	1.91	5.24	1.06	18.79	0.66
	2012	8.81	0.77	7.12	0.68	12.06	1.56	7.05	0.86	17.78	0.95
	2013	8.93	0.73	7.11	0.65	12.46	1.33	8.32	0.82	17.19	0.95
	2014	9.73	0.76	7.89	0.66	13.29	1.48	8.57	0.73	18.68	1.08
	2015	10.46	0.72	8.88	0.65	13.51	1.41	9.16	0.84	18.48	1.10
Shrub Density and Percent Cover Parameters											
Shrub Density	2009	58.48	5.05	55.55	6.03	64.13	9.25	90.00	8.18	34.57	8.09
	2010	14.50	3.64	11.62	3.51	20.07	8.25	1.38	0.63	41.43	14.04
	2011	0.84	0.26	0.69	0.30	1.13	0.49	1.00	0.87	1.29	0.42
	2012	2.70	0.80	2.72	1.08	2.67	1.16	1.50	1.24	2.72	1.08
	2013	2.84	0.88	2.79	1.19	2.93	1.21	0.88	0.64	5.29	2.24
	2014	2.91	1.22	3.07	1.72	2.60	1.34	4.13	2.41	0.86	0.59
	2015	2.95	0.87	2.86	1.11	3.13	1.41	4.38	2.44	1.71	1.19
% Canopy Cover	2009	67.63	3.08	76.03	1.78	51.38	6.67	69.05	6.40	31.19	6.38
	2010	33.04	3.79	38.41	4.97	22.66	4.76	12.09	2.90	34.74	7.50
	2011	15.95	2.71	15.59	3.44	16.64	4.52	17.28	7.20	15.91	5.72
	2012	12.09	2.25	15.63	3.19	5.25	1.10	7.60	1.62	15.63	3.19
	2013	8.76	2.01	10.76	2.91	4.91	1.41	7.94	2.10	1.45	0.62
	2014	13.09	2.45	16.20	3.52	7.07	1.51	10.01	2.33	3.69	0.80
	2015	15.46	2.51	18.88	3.54	8.83	1.88	13.63	2.39	3.36	0.82
Leaf Area Index (LAI)	2009	1.24	0.09	1.46	0.07	0.81	0.17	1.24	0.20	0.31	0.09
	2010	0.49	0.09	0.63	0.13	0.24	0.07	0.11	0.04	0.40	0.12
	2011	0.20	0.05	0.20	0.07	0.20	0.06	0.21	0.10	0.18	0.07
	2012	0.13	0.04	0.18	0.05	0.04	0.01	0.06	0.02	0.18	0.05
	2013	0.10	0.04	0.13	0.06	0.04	0.01	0.07	0.02	0.01	0.00
	2014	0.15	0.04	0.19	0.07	0.05	0.01	0.08	0.02	0.02	0.01
	2015	0.17	0.05	0.23	0.07	0.06	0.01	0.10	0.02	0.02	0.00

Table 2a. Species from old field habitat that in 2015 increased and decreased in frequency (> 15%) and in % cover (> 1%), compared to baseline (2009) levels at the North Chicago Wetland Mitigation Site, Lake County, Illinois.

----------OLD FIELD INCREASERS----------				----------OLD FIELD DECREASERS----------			
SPP INCREASING BY > 15% Frequency	Increase % Frequenc	SPP INCREASING BY > 1.0% COVER	Increase % Cover	SPP DECREASING BY > 15% Frequency	Decrease % Frequenc	SPP DECREASING BY > 1.0% COVER	Decrease % Cover
Andropogon gerardii	53.0	*Solidago canadensis*	11.2	*Cornus racemosa*	-48.1	*Rhamnus cathartica**	-25.1
Ratibida pinnata	49.1	*Andropogon gerardii*	10.1	*Vitis riparia*	-46.4	*Allium canadense*	-5.1
*Cirsium arvense**	48.4	*Sorghastrum nutans*	9.3	*Aster drummondii*	-33.7	*Cornus racemosa*	-4.5
Sorghastrum nutans	48.3	*Dactylus glomerata**	6.4	*Rhamnus cathartica**	-32.7	*Lonicera × bella**	-1.2
Solidago canadensis	37.4	*Poa pratensis**	5.5	*Anemone virginiana*	-24.9	*Circaea lutetiana*	-1.1
Euthamia graminifolia	36.2	*Fragaria virginiana*	4.4	*Lonicera × bella**	-23.5	*Aster drummondii*	-1.1
Helianthus grosseserratus	34.0	*Helianthus grosseserratus*	4.2	*Sanicula canadensis*	-22.0		
*Dactylus glomerata**	24.1	*Ratibida pinnata*	4.2	*Allium canadense*	-20.8		
*Phalaris arundinacea**	21.9	*Poa compressa**	3.8	*Hypericum punctatum*	-20.0		
Zizia aurea	21.1	*Euthamia graminifolia*	2.8	*Circaea lutetiana*	-17.7		
Aster pilosus	21.0	*Phalaris arundinacea**	2.5	*Rhamnus frangula**	-16.9		
Lactuca canadensis	20.7	*Dichanthelium praecocius*	1.8				
*Poa compressa**	20.4	*Aster praealtus*	1.5				
Dichanthelium praecocius	19.4	*Cirsium arvense**	1.3				
Oxalis stricta	18.9	*Zizia aurea*	1.3				
Ambrosia artemisiifolia	18.6	*Carex granularis*	1.2				
Schizachyrium scoparium	18.5	*Schizachyrium scoparium*	1.1				
Echinacea pallida	18.4						
Allium cernuum	17.2						
Rudbeckia hirta	17.2						
*Daucus carota**	17.1						

Table 2b. Species from prairie habitat that in 2015 increased and decreased in frequency (> 15%) and in % cover (> 1%), compared to baseline (2009) levels at the North Chicago Wetland Mitigation Site, Lake County, Illinois.

----------PRAIRIE INCREASERS----------			
SPP INCREASING BY > 15% Frequency	Increase % Freq.	SPP INCREASING BY > 1.0% COVER	Increase % Cover
Andropogon gerardii	38.4	*Carex stricta*	6.2
Sorghastrum nutans	33.8	*Poa compressa**	5.2
Carex granularis	24.7	*Spartina pectinata*	3.1
Liatris sp. (seedling)	24.4	*Poa pratensis**	3.1
Crataegus coccinea	22.2	*Euthamia graminifolia*	2.4
*Achillea millefolium**	16.4	*Solidago canadensis*	2.3
Zizia aurea	16.4	*Fragaria virginiana*	2.1
*Poa pratensis**	15.8	*Lonicera × bella**	1.3
Krigia biflora	15.6		

----------PRAIRIE DECREASERS----------			
SPP DECREASING BY > 15% Frequency	Decrease % Freq.	SPP DECREASING BY > 1.0% COVER	Decrease % Cover
Solidago juncea	-30.4	*Solidago juncea*	-15.8
Lobelia spicata	-27.1	*Cornus racemosa*	-9.3
*Hieracium caespitosum**	-25.8	*Schizachyrium scoparium*	-7.7
Vitis riparia	-24.4	*Rhamnus cathartica**	-7.4
Liatris spicata	-22.0	*Carex pellita*	-6.3
*Cerastium vulgatum**	-20.2	*Daucus carota**	-4.7
Anemone virginiana	-20.0	*Antennaria neglecta*	-3.5
Antennaria neglecta	-20.0	*Agrostis alba*	-3.3
Rosa carolina	-20.0	*Agrostis alba* v. *palustris*	-3.2
Aster drummondii	-17.8	*Silphium terebinthinaceum*	-3.0
Aster ericoides	-17.8	*Carex buxbaumii*	-2.5
Rudbeckia hirta	-17.8	*Solidago gigantea*	-2.3
Rubus pensilvanicus	-17.3	*Zanthoxylum americanum*	-2.2
Cornus racemosa	-17.1	*Allium cernuum*	-2.1
Erigeron strigosus	-16.4	*Rosa carolina*	-2.0
Aster simplex	-16.0	*Hieracium caespitosum**	-1.6
Potentilla simplex	-15.1	*Potentilla simplex*	-1.6
		Aster drummondii	-1.6
		Solidago rigida	-1.5
		Zizia aurea	-1.5
		Rubus pensilvanicus	-1.2
		Liatris spicata	-1.1
		Zizia aptera	-1.0

Table 3. One way analysis of variance results for test of between subjects differences (vegetation types) for vegetation parameters (dependent variables) based on 2015 sample data from the North Chicago Wetland Mitigation Site. Post-hoc test results examine individual paired comparisons to identify where differences among independent variables occur. Different letters indicate significant pairwise comparisons. Tukey post hoc test applied except to the Welch ANOVA tests where Dunnett T3 post hoc test was applied.

2015 SAMPLE DATA	Reference Prairie		Transect Prairie		Old Field		1-Way Analysis of Variance			Reference Prairie	Transect Prairie	Old Field
PARAMETERS	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**df 1, df2**	**F stat**	***Prob.***	Post-Hoc Test Results		
Grd-Layer Spp Diversity												
Native Spp. Density/Quadrat	26.38	2.20	17.50	1.56	16.22	1.11	2, 41	8.91	**0.001**	*a*	*b*	*b*
Non-Native Sp Density/Quadrat	4.71	0.57	6.54	0.62	5.44	0.33	2, 41	2.14	0.131	-	-	-
Native Richness/Plot	42.00	3.21	31.38	2.16	30.14	1.81	2, 41	4.91	**0.012**	*a*	*ab*	*b*
Non-Native Richness/Plot	7.14	0.94	10.00	1.21	9.59	0.57	2, 41	2.10	0.136	-	-	-
Shannon-Wiener Diversity (natives)	2.74	0.14	2.64	0.07	2.32	0.07	2, 41	5.69	**0.007**	*a*	*ab*	*b*
Simpson's Dominance (all spp.)	0.10	0.01	0.10	0.01	0.14	0.01	2, 41	1.85	0.170	-	-	-
Vegetation Structure												
% Vegetation Cover	186.41	9.68	133.92	10.02	126.92	6.07	2, 41	10.44	**<0.001**	*a*	*b*	*b*
% Bare Ground	8.14	1.14	12.94	1.80	22.01	2.30	2, 41	6.10	**0.005**	*a*	*ab*	*b*
Florisitic Quality Assessment												
Mean C /quadrat (1-m^2)	3.62	0.09	2.18	0.12	2.18	0.11	2, 18.2	65.87*	**<0.001**	*a*	*b*	*b*
Mean Cn/quadrat	4.26	0.11	3.00	0.08	2.92	0.12	2, 18.2	46.8*	**<0.001**	*a*	*b*	*b*
FQI /quadrat	18.48	1.10	9.16	0.84	8.88	0.65	2, 41	25.36	**<0.001**	*a*	*b*	*b*
FQIn /quadrat	21.75	1.33	12.48	0.78	11.61	0.70	2, 41	23.95	**<0.001**	*a*	*b*	*b*
Shrub Stratum												
Shrub Density/ 25-m^2 plot	1.71	1.19	4.38	2.44	2.86	1.11	2	1.19**	0.552	-	-	-
% Canopy Cover	3.36	0.82	13.63	2.39	18.88	3.54	2	8.59**	**0.014**	*a*	*ab*	*b*
Leaf Area Index (LAI)	0.02	0.004	0.10	0.02	0.23	0.07	2	8.24**	**0.016**	*a*	*ab*	*b*

* Welch's test applied (asymptotically F distributed, used when equality of means test fails [Levene's test]).

** Kruskal-Wallis test (data do not meet normaility requirements of ANOVA)

Table 4. One-way repeat measures analysis of variance results and pairwise comparisons examining within subject (year [2015]) differences for each vegetation type among ground layer and shrub/sapling parameters at the North Chicago Wetland Mitigation Site. Different letters in post-hoc comparisons indicate significant pairwise differences. Woody stratum data were non-normal and analyzed with Friedman's test.

		spher-	Within Subject (Year)			Pairwise Comparisons[1]						
PARAMETER	Veg. Type	icity	*F*	*df*	*P*	2009	2010	2011	2012	2013	2014	2015
Ground Layer												
Native Spp. Density	Prairie	*	3.52	6, 36	**.008**	*a*	*ab*	*ab*	*b*	*ab*	*ab*	*ab*
	Trans Prairie	**	7.08	1.8, 12.7	**.010**	*ab*	*a*	*ab*	*b*	*a*	*a*	*ab*
	Old Field	**	2.99	2.4, 68.4	**.047**	*abc*	*abc*	*ab*	*ab*	*ab*	*abc*	*c*
Non-Native Spp. Density	Prairie	*	3.77	6, 36	**.005**	-	-	-	-	-	-	-
	Trans Prairie	*	1.97	6, 42	.091	-	-	-	-	-	-	-
	Old Field	**	5.93	3.9, 109.7	**< 0.001**	*ac*	*abc*	*ab*	*c*	*ab*	*ac*	*c*
Native Spp. Richness	Prairie	*	2.02	6, 36	.088	-	-	-	-	-	-	-
	Trans Prairie	**	5.83	1.6, 11.3	**.022**	*a*	*bc*	*ac*	*abc*	*b*	*abc*	*abc*
	Old Field	**	8.02	3.0, 85.2	**< 0.001**	*abde*	*acd*	*ac*	*bde*	*abd*	*de*	*e*
Non-Native Spp. Richness	Prairie	**	1.86	2.7, 16.5	.179	-	-	-	-	-	-	-
	Trans Prairie	*	1.55	6, 42	.186	-	-	-	-	-	-	-
	Old Field	**	13.25	3.8, 106.3	**< 0.001**	*ac*	*a*	*b*	*ac*	*ab*	*a*	*c*
Diversity	Prairie	*	0.43	6, 36	.856	-	-	-	-	-	-	-
	Trans Prairie	**	4.60	2.5, 17.5	**.019**	-	-	-	-	-	-	-
	Old Field	**	1.60	3.0, 84.9	.194	-	-	-	-	-	-	-
Dominance	Prairie	*	0.99	6, 36	.443	-	-	-	-	-	-	-
	Trans Prairie	**	3.06	1.7, 12.1	.089	-	-	-	-	-	-	-
	Old Field	**	9.73	3.2, 89.7	**< 0.001**	*a*	*ad*	*a*	*ad*	*b*	*bc*	*bcd*
% Ground Cover	Prairie	**	11.17	2.2, 13.4	**.001**	*a*	*ab*	*ab*	*b*	*b*	*ab*	*b*
	Trans Prairie	*	4.58	6, 42	**.001**	*ab*	*ab*	*a*	*ab*	*b*	*b*	*b*
	Old Field	**	36.74	4.2, 117.8	**< 0.001**	*ab*	*a*	*b*	*cd*	*c*	*d*	*bc*
% Bare Ground	Prairie	**	1.88	2.1, 12.8	.192	-	-	-	-	-	-	-
	Trans Prairie	**	2.86	2.4, 16.8	.077	-	-	-	-	-	-	-
	Old Field	**	22.27	2.9, 81.9	**< 0.001**	*a*	*b*	*cd*	*cd*	*cd*	*c*	*d*
Mean C	Prairie	*	1.12	6, 36	.369	-	-	-	-	-	-	-
	Trans Prairie	*	6.35	6, 42	**< 0.001**	-	-	-	-	-	-	-
	Old Field	**	10.21	3.5, 98.7	**< 0.001**	*ac*	*ac*	*b*	*ab*	*ab*	*a*	*c*
FQI	Prairie	*	1.16	6, 36	.351	-	-	-	-	-	-	-
	Trans Prairie	**	8.49	1.6, 11.5	**.007**	*ab*	*ab*	*a*	*ab*	*b*	*b*	*ab*
	Old Field	**	8.60	2.9, 80.2	**< 0.001**	*acd*	*abcd*	*b*	*bc*	*ab*	*c*	*d*
Shrub/Sapling Stratum			Chi-sq									
Shrub Density	Prairie	***	34.40	6.00	**< 0.0001**	-	-	-	-	-	-	-
	Trans Prairie	***	32.84	6.00	**< 0.0001**	*a*	*b*	*b*	*b*	*b*	*b*	*b*
	Old Field	***	96.97	6.00	**< 0.0001**	*a*	*b*	*b*	*b*	*b*	*b*	*b*
% Canopy Cover	Prairie	***	32.20	6.00	**< 0.0001**	-	-	-	-	-	-	-
	Trans Prairie	***	20.73	6.00	**0.002**	*a*	*b*	*b*	*b*	*b*	*b*	*b*
	Old Field	***	87.15	6.00	**< 0.0001**	*a*	*b*	*cd*	*cd*	*c*	*cd*	*d*
LAI	Prairie	***	29.40	6.00	**0.0001**	-	-	-	-	-	-	
	Trans Prairie	***	18.90	6.00	**0.004**	*a*	*b*	*b*	*b*	*b*	*b*	*b*
	Old Field	***	83.16	6.00	**< 0.0001**	*a*	*b*	*bc*	*bc*	*c*	*bc*	*b*

* = sphericity assumed, ** = Greenhouse-Geisser adjustment when sphericity not found; *** non-normal, uncorrected with transformation (Chi-square from Friedman's test)

[1] = Multiple comparison adjustment made with the Sidak multiple comparison test (possibly unreliable with the non-parametric data [***])

Table 5. Mixed model repeat measures analysis of variance comparing trends among vegetation parameters (dependent variables) and vegetation type (independent variables) from the North Chicago Wetland Mitigation Site from 2009 to 2015. Design is 3 x 7 mixed model analysis (3 vegetation types, 7 years) for each dependent variable.

	Between Subjects (Vegetation Types)		Within Subject (Year)		Vegetation Type x Year	
PARAMETER	*F*	*P*	*F*	*P*	*F*	*P*
Ground Layer						
Native Spp. Density	19.21	**<0.0001**	3.71	**0.016***	3.92	**0.002***
Non-Native Spp. Density	6.00	**.005**	2.14	0.074*	2.92	**0.004***
Native Spp. Richness	13.91	**< 0.0001**	3.02	**0.031***	3.61	**0.002***
Non-Native Spp. Richness	6.38	**.004**	3.41	**0.011***	3.22	**0.002***
Mean C	30.98	**< 0.0001**	10.78	**<0.0001***	1.60	0.138*
FQI	41.82	**< 0.0001**	8.49	**<0.0001***	2.79	**0.015***
% Cover	45.48	**< 0.0001**	6.79	**<0.0001**	16.23	**< 0.0001**
% BG	14.86	**< 0.0001**	2.73	**0.027^**	3.23	**0.001^**

*data lacking sphericity (variances not equal across within-subject variables; df adjusted with Greenhouse-Geisser adjustment.

^Pillai's Trace multivariate test (covariance matrices are not equal across groups)

	Between Subjects (Vegetation Types)[1]		Within Subject (Year)[2]		Vegetation Type x Year[3]	
	K-W test	*P*	Chi-square	*P*	*F*	*P*
Ground Layer						
Dominance	16.86	**<0.0001**	55.80	**<0.0001**	1.46^	.160
Diversity	20.83	**<0.0001**	14.13	**0.028**	1.37	.228
Shrub/Sapling Stratum						
Stem Density	4.22	0.121	143.73	**< 0.0001**	2.13^	**.024**
% Canopy Cover	11.27	**0.004**	128.54	**<0.0001**	3.67^	**< 0.001**
Leaf Area Index (LAI)	11.23	**0.004**	120.04	**<0.0001**	2.79^	**0.003**

[1] Kruskal-Wallis test (non-parametric 1-way anova)

[2] Friedman test (non-parametric alternative to the 1-way rm-anova)

[3] assumptions of normality for rm-anova not met; this statistic may be unreliable (no non-parametric statistic for mixed model interactions)

^Pillai's Trace multivariate test (covariance matrices are not equal across groups)

Table 6. Summary from 2015 sample data in shrub/sapling plots (25-m^2) with comparison to 2009 baseline data at the North Chicago Wetland Mitigation site, Lake County, Illinois. * indicates non-native species. Species with 0 values were present between 2010 and 2014.

	2015 Shrub/Sapling Data			Change in Stem Density from 2009	
Species	% Frequency	Total Density	IV 200	Total Change	% Change
Acer negundo	0.0	0	0.0	0	0.0
Amelanchier arborea	0.0	0	0.0	0	0.0
Amelanchier interior	2.3	2	4.4	-1	-33.3
Amelanchier sanguinea	0.0	0	0.0	0	0.0
Cornus obliqua	0.0	0	0.0	-5	-100.0
Cornus racemosa	9.1	9	18.2	-727	-98.8
Cornus stolonifera	0.0	0	0.0	-20	-100.0
Crataegus calpodendron	0.0	0	0.0	-6	-100.0
Crataegus mollis	0.0	0	0.0	-1	-100.0
Crataegus coccinea	2.3	1	3.6	-31	-96.9
Crataegus punctata	0.0	0	0.0	-2	-100.0
Crataegus spp.	0.0	0	0.0	-5	-100.0
*Elaeagnus umbellata**	0.0	0	0.0	0	0.0
Fraxinus lanceolata	0.0	0	0.0	-1	-100.0
*Lonicera × bella**	11.4	15	25.6	-149	-90.9
Malus ioensis	0.0	0	0.0	-4	-100.0
*Malus pumila**	0.0	0	0.0	-1	-100.0
Parthenocissus quinquefolia	0.0	0	0.0	0	0.0
Populus deltoides	0.0	0	0.0	0	0.0
Populus tremuloides	0.0	0	0.0	-13	-100.0
Prunus americana	0.0	0	0.0	-1	-100.0
Prunus serotina	0.0	0	0.0	0	0.0
Prunus virginiana	0.0	0	0.0	-9	-100.0
Quercus macrocarpa	0.0	0	0.0	0	0.0
*Rhamnus cathartica**	22.7	51	67.2	-1,308	-96.2
*Rhamnus frangula**	0.0	0	0.0	-25	-100.0
Rhus glabra	0.0	0	0.0	-2	-100.0
*Rosa multiflora**	0.0	0	0.0	0	0.0
Ulmus americana	0.0	0	0.0	0	0.0
Viburnum lentago	18.2	43	55.4	-94	-68.6
*Viburnum opulus**	0.0	0	0.0	-3	-100.0
*Viburnum recognitum**	2.3	1	3.6	0	0.0
Vitis riparia	9.1	9	18.2	2	28.6
Zanthoxylum americanum	2.3	1	3.6	-38	-97.4
TOTALS		132.0	200.0	-2,444	
Shrub/Sapling Density/Plot		3.0		-55.5	
Shrub/Sapling Density/ha		1,199.9		-22,218.3	-94.9%

Table 7. Summary of tree plot sample data from the 2009 baseline to 2012 and 2015 at the North Chicago Wetland Mitigation Site, Lake County, IL.
*Baseline data missed a few trees (e.g., *Ulmus americana*) due to density of shrub/sapling vegetation.

	2009			2012			2015			Change in Stem Density from 2009*		Change in Basal Area from 2009*	
	Basal Area (m^2/ha)	Density/ ha	IV200	Basal Area (m^2/ha)	Density/ ha	IV200	Basal Area (m^2/ha)	Density/ ha	IV200	Total Decline/Increase	% Change	Total Decline/ Increase	% Change
Acer negundo	0.07	3.42	21.61	0.00	0.00	0.00	0.00	0.00	0.00	-3.42	-100.0	-0.07	-100.0
Amelanchier arborea	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.14	3.31	1.14	new	0.02	new
Crataegus coccinea	0.05	4.57	24.27	0.10	10.23	45.25	0.27	22.83	63.28	18.26	400.0	0.22	462.5
Malus cf. *baccata**	0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.28	12.11	2.28	new	0.10	new
Populus deltoides	0.69	4.57	81.66	0.73	4.55	70.29	0.00	0.00	0.00	-4.57	-100.0	-0.69	-100.0
Prunus americana	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.14	3.05	1.14	new	0.01	new
Prunus serotina	0.06	1.14	10.40	0.16	6.82	37.19	0.28	10.27	40.51	9.13	800.0	0.22	370.3
Quercus macrocarpa	0.15	2.28	23.84	0.15	1.14	15.49	0.17	2.28	17.30	0.00	0.0	0.02	13.4
*Rhamnus cathartica**	0.09	6.85	38.22	0.09	3.41	19.42	0.00	0.00	0.00	-6.85	-100.0	-0.09	-100.0
Salix sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.14	11.26	1.14	new	0.12	new
Ulmus americana	0.00	0.00	0.00	0.11	1.14	12.36	0.35	9.13	43.23	9.13	new	0.35	new
Viburnum lentago	0.00	0.00	0.00	0.00	0.00	0.00	0.02	2.28	5.94	2.28	new	0.02	new
sum	1.11	22.83	200.00	1.35	27.28	200.00	1.35	52.51	200.00	29.68		0.24	

Table 8. Results from paired samples tests (paired t tests and for non-normal data that could not be successfully transformed the Wilcoxon paired samples test) comparing the results for a variety of parameters from the 2009 baseline to the 2015 final sample at the North Chicago mitigation site in Lake County, IL. In all cases, the Wilcoxon Related Samples Signed Rank Test agreed with the paired t test results.

OVERALL (n = 44)

PARAMETERS	2009	SE	2015	SE	t stat	df	*P*	Wilcoxon	*P*
Grd-Layer Spp Diversity									
Native Spp. Density/Quadrat	17.28	1.23	18.07	1.01	-0.84	43	0.406		
Non-Native Sp Density/Quadrat	4.75	0.34	5.52	0.27	-2.18	43	**0.035**		
Native Richness/Plot	29.39	1.82	32.25	1.48	-1.99	43	0.053		
Non-Native Richness/Plot	6.86	0.54	9.27	0.47	-4.03	43	**<0.001**		
Shannon-Wiener Diversity (native)	2.43	0.09	2.45	0.06	-0.26	43	0.799	490.00	0.953
Simpson's Dominance (all spp.)	0.21	0.03	0.12	0.01	3.35	43	**0.002**	197.00	**0.001**
Vegetation Structure									
% Vegetation Cover	131.26	12.84	137.66	5.61	-0.62	43	0.537		
% Bare Ground	25.91	2.90	18.16	1.76	3.09	43	**0.004**		
Florisitic Quality Assessment									
Mean C /quadrat (1-m^2)	2.33	0.11	2.41	0.11	-1.49	43	0.144		
Mean Cn/quadrat	3.01	0.10	3.15	0.11	-2.50	43	**0.016**		
FQI /quadrat	9.98	0.75	10.46	0.72	-1.27	43	0.210		
FQIn /quadrat	12.61	0.85	13.38	0.76	-1.74	43	0.090		
Shrub Stratum									
Shrub Density/ 25-m^2 plot	58.48	5.05	2.95	0.87	11.37	43	**<0.001**	0.00	**<0.001**
% Canopy Cover	67.63	3.08	15.46	2.51	16.68	43	**<0.001**	0.00	**<0.001**
Leaf Area Index (LAI)	1.24	0.09	0.17	0.05	12.97	43	**<0.001**	0.00	**<0.001**

REFERENCE PRAIRIE

PARAMETERS	2009	SE	2015	SE	t stat	df	*P*	Wilcoxon	*P*
Grd-Layer Spp Diversity									
Native Spp. Density/Quadrat	28.95	0.58	26.38	2.20	1.30	6	0.242		
Non-Native Sp Density/Quadrat	5.71	0.74	4.71	0.57	2.17	6	0.073		
Native Richness/Plot	44.43	1.45	42.00	3.21	0.75	6	0.484	11.50	0.672
Non-Native Richness/Plot	7.00	1.21	7.14	0.94	-0.18	6	0.864		
Shannon-Wiener Diversity (native)	2.78	0.06	2.74	0.14	0.28	6	0.790	17.00	0.612
Simpson's Dominance (all spp.)	0.09	0.00	0.10	0.01	-0.54	6	0.607	11.00	0.612
Vegetation Structure									
% Vegetation Cover	292.67	7.96	186.40	9.68	7.25	6	**<0.001**		
% Bare Ground	5.26	1.21	8.14	1.14	-1.42	6	0.205		
Florisitic Quality Assessment									
Mean C /quadrat (1-m^2)	3.50	0.12	3.62	0.09	-1.39	6	0.214		
Mean Cn/quadrat	4.18	0.16	4.26	0.11	-1.13	6	0.303		
FQI /quadrat	18.84	0.74	18.48	1.10	0.34	6	0.748		
FQIn /quadrat	22.52	1.03	21.75	1.33	0.75	6	0.479		
Shrub Stratum									
Shrub Density/ 25-m^2 plot	34.57	8.09	1.71	1.19	4.32	6	**0.005**	0.00	**0.018**
% Canopy Cover	31.19	6.38	3.36	0.82	4.58	6	**0.004**	0.00	**0.018**
Leaf Area Index (LAI)	0.31	0.09	0.02	0.00	3.46	6	**0.014**	0.00	**0.018**

TRANSECT PRAIRIE

PARAMETERS	2009	SE	2015	SE	t stat	df	*P*	Wilcoxon	*P*
Grd-Layer Spp Diversity									
Native Spp. Density/Quadrat	20.18	1.07	17.50	1.56	1.44	7	0.194		
Non-Native Sp Density/Quadrat	6.88	0.80	6.54	0.62	0.40	7	0.704		
Native Richness/Plot	33.25	1.47	31.38	2.16	0.69	7	0.514		
Non-Native Richness/Plot	10.88	0.90	10.00	1.21	0.94	7	0.380		
Shannon-Wiener Diversity (native)	2.56	0.09	2.64	0.07	-0.61	7	0.562		
Simpson's Dominance (all spp.)	0.11	0.02	0.10	0.01	0.64	7	0.541	16.00	0.779
Vegetation Structure									
% Vegetation Cover	154.96	20.87	133.92	10.02	1.03	7	0.337		
% Bare Ground	13.39	3.56	12.94	1.80	0.10	7	0.923		
Florisitic Quality Assessment									
Mean C /quadrat (1-m^2)	2.22	0.09	2.18	0.12	0.34	7	0.745		
Mean Cn/quadrat	2.95	0.07	3.00	0.08	-0.74	7	0.481		
FQI /quadrat	9.89	0.51	9.16	0.84	0.89	7	0.403		
FQIn /quadrat	13.16	0.47	12.48	0.78	0.84	7	0.429		
Shrub Stratum									
Shrub Density/ 25-m^2 plot	90.00	8.18	4.38	2.44	12.25	7	**<0.001**		
% Canopy Cover	69.05	6.40	13.63	2.39	7.72	7	**<0.001**		
Leaf Area Index (LAI)	1.24	0.20	0.10	0.02	5.76	7	**<0.001**		

OLD FIELD

PARAMETERS	2009	SE	2015	SE	t stat	df	*P*	Wilcoxon	*P*
Grd-Layer Spp Diversity									
Native Spp. Density/Quadrat	13.66	1.31	16.22	1.11	-2.27	28	**0.031**		
Non-Native Sp Density/Quadrat	3.93	0.34	5.44	0.33	-3.60	28	**0.001**		
Native Richness/Plot	24.69	2.13	30.14	1.81	-3.11	28	**0.004**		
Non-Native Richness/Plot	5.72	0.58	9.59	0.57	-5.39	28	**<0.001**		
Shannon-Wiener Diversity (native)	2.30	0.12	2.32	0.07	-0.17	28	0.867	205.00	0.787
Simpson's Dominance (all spp.)	0.27	0.03	0.14	0.01	3.57	28	**0.001**	57.00	**0.001**
Vegetation Structure									
% Vegetation Cover	85.76	6.85	126.92	6.07	-6.08	28	**<0.001**		
% Bare Ground	34.34	3.30	22.01	2.30	3.75	28	**0.001**	57.50	**0.001**
Florisitic Quality Assessment									
Mean C /quadrat (1-m^2)	2.09	0.11	2.18	0.11	-1.46	28	0.156	282.00	0.163
Mean Cn/quadrat	2.74	0.10	2.92	0.12	-2.22	28	**0.035**		
FQI /quadrat	7.86	0.65	8.88	0.65	-2.29	28	**0.030**		
FQIn /quadrat	10.06	0.73	11.61	0.70	-2.82	28	**0.009**		
Shrub Stratum									
Shrub Density/ 25-m^2 plot	55.55	6.03	2.86	1.11	8.83	28	**<0.001**	0.00	**<0.001**
% Canopy Cover	76.03	1.78	18.88	3.54	17.05	28	**<0.001**	0.00	**<0.001**
Leaf Area Index (LAI)	1.46	0.07	0.23	0.07	15.28	28	**<0.001**	0.00	**<0.001**

Table 9. Results from sequential step-wise analysis of the fit, using distance-based linear models, between vegetation parameters of conservation interest and species assemblages between vegetation types and baseline and final sample periods.

Variable	Adj R^2	SS(trace)	Pseudo-F	P	Prop.	Cumul.	res.df
+% Canopy Cover	0.107	26514.0	11.46	**0.0002**	0.118	0.118	86
+Mean C	0.143	10163.0	4.58	**0.0002**	0.045	0.163	85
+% Cover	0.151	3866.8	1.76	**0.0128**	0.017	0.180	84
+C dom (allspp)	0.159	4044.2	1.86	**0.0124**	0.018	0.198	83
+X Rich	0.165	3485.5	1.61	**0.0314**	0.015	0.213	82
+Shrub Density	0.171	3359.3	1.56	**0.0462**	0.015	0.228	81
+N Rich	0.172	2328.1	1.08	0.3328	0.010	0.238	80
+N Den	0.187	5165.0	2.45	0.0008	0.023	0.261	79
+Hn	0.187	2287.7	1.09	0.3324	0.010	0.272	78

Table 10. Pairwise comparisons of centroid distances from Principal Coordinates Anslysis between vegetation type and baseline (T1 = 2009) and final sample (T2 = 2015) intervals. The greatest and least distances are shown in **bold** outline.

	Ref Pr T1	**OF T1**	**Trans P T1**	**Ref Pr T2**	**OF T2**	**Trans P T2**
Ref Pr T1	X					
OF T1	**51.27**	X				
Trans P T1	42.36	39.69	X			
Ref Pr T2	27.19	48.90	46.17	X		
OF T2	47.30	45.19	45.45	42.50	X	
Trans P T2	44.57	49.86	39.38	43.38	**24.68**	X

Ref Pr T1 =Reference Prairie (2009)
OF T1 =Old Field (2009)
Trans P T1 =Transect Prairie (2009)
Ref Pr T2 =Reference Prairie (2015)
OF T2 =Old Field (2015)
Trans P T2 =Transect Prairie (2015)

Table 11. Probabilities that differences in species composition are greater than would be expected by random chance based on the ANOSIM procedure and 999 permutations of the observed data. Significant differences ($P < 0.05$) shown in **bold**.

	Ref Pr T1	**OF T1**	**Trans P T1**	**Ref Pr T2**	**OF T2**	**Trans P T2**
Ref Pr T1	X					
OF T1	**0.001**	X				
Trans P T1	**0.001**	**0.005**	X			
Ref Pr T2	0.206	**0.001**	**0.001**	X		
OF T2	**0.003**	**0.001**	**0.001**	**0.002**	X	
Trans P T2	**0.029**	**0.001**	**0.001**	**0.019**	0.718	X

Ref Pr T1 =Reference Prairie (2009)
OF T1 =Old Field (2009)
Trans P T1 =Transect Prairie (2009)
Ref Pr T2 =Reference Prairie (2015)
OF T2 =Old Field (2015)
Trans P T2 =Transect Prairie (2015)

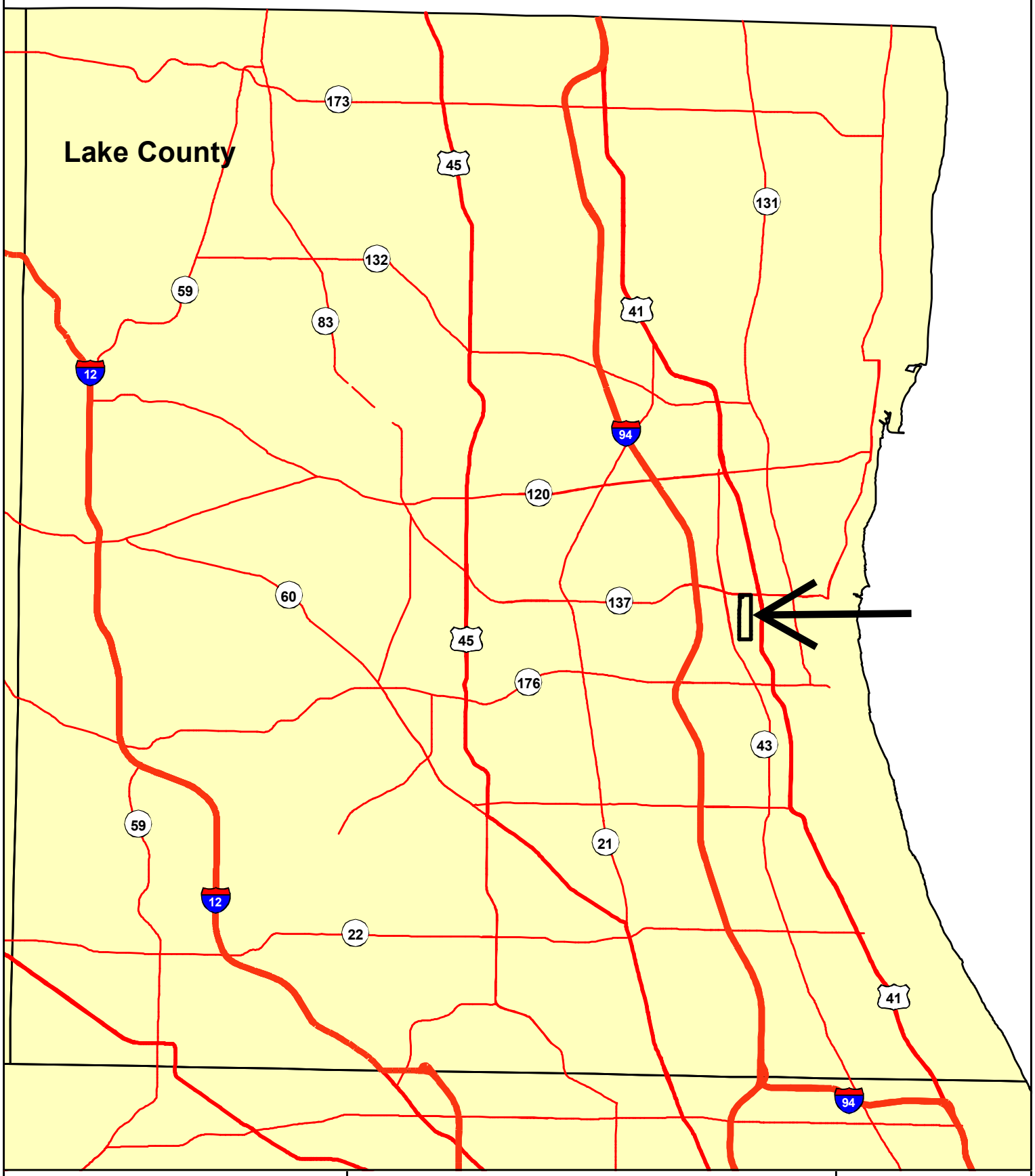

Figure 1. Location of the North Chicago Wetland Mitigation Site in Lake County, Illinois.

Figure 2. Stratified vegetation sampling grid in upland and wetland habitats with additional targeted prairie and wetland sampling locations at the North Chicago Wetland Mitigation Site in Lake County, Illinois.

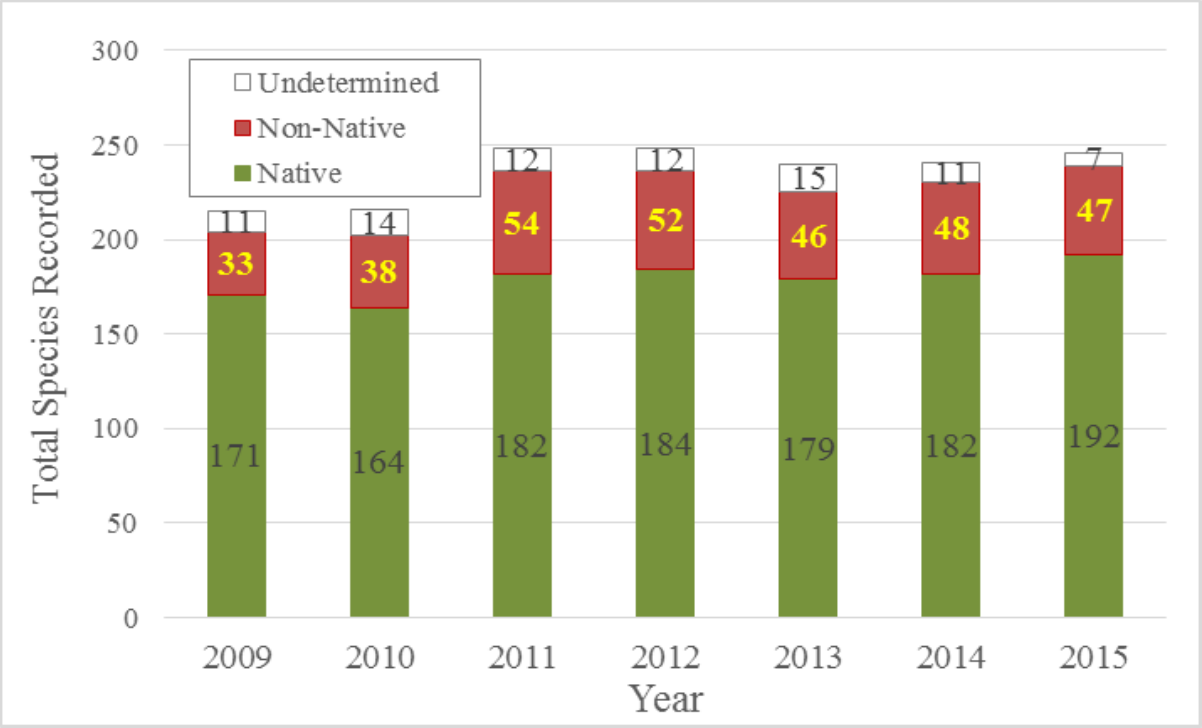

Figure 3. Total species richness recorded in sample plots at the North Chicago Wetland Mitigation Site including native, non-native, and undetermined species. Undetermined are vegetative specimens (e.g., *Carex, Geum, Muhlenbergia, Rubus*) that could not be determined to species; except for the Muhly grass, these are likely already represented in the flora.

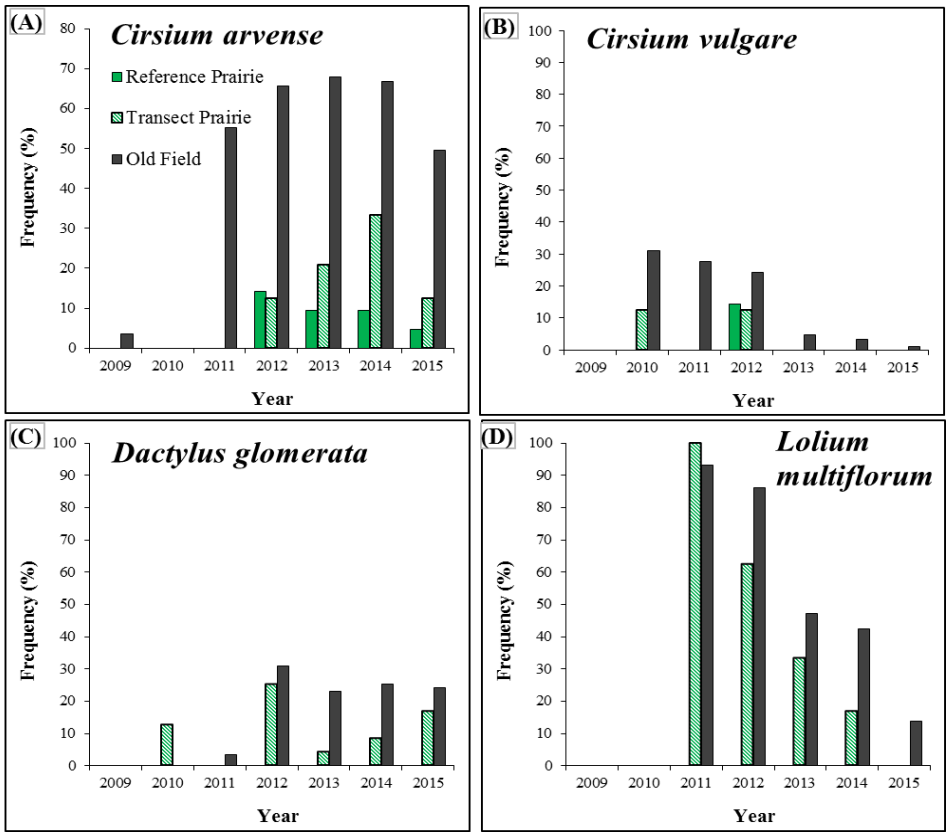

Figure 4a. Frequency trends for selected invasive species by vegetation types at the North Chicago Wetland Mitigation site, Lake County, Illinois.

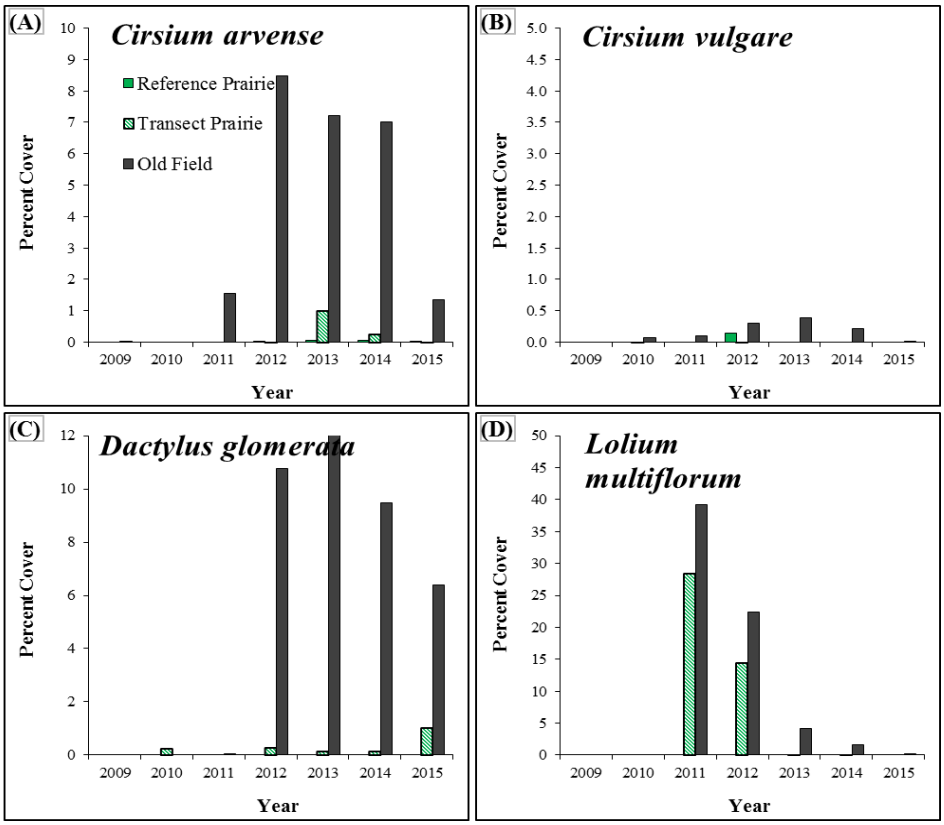

Figure 4b. Percent cover trends by vegetation type for selected invasive species at the North Chicago Wetland Mitigation site in Lake County, Illinois.

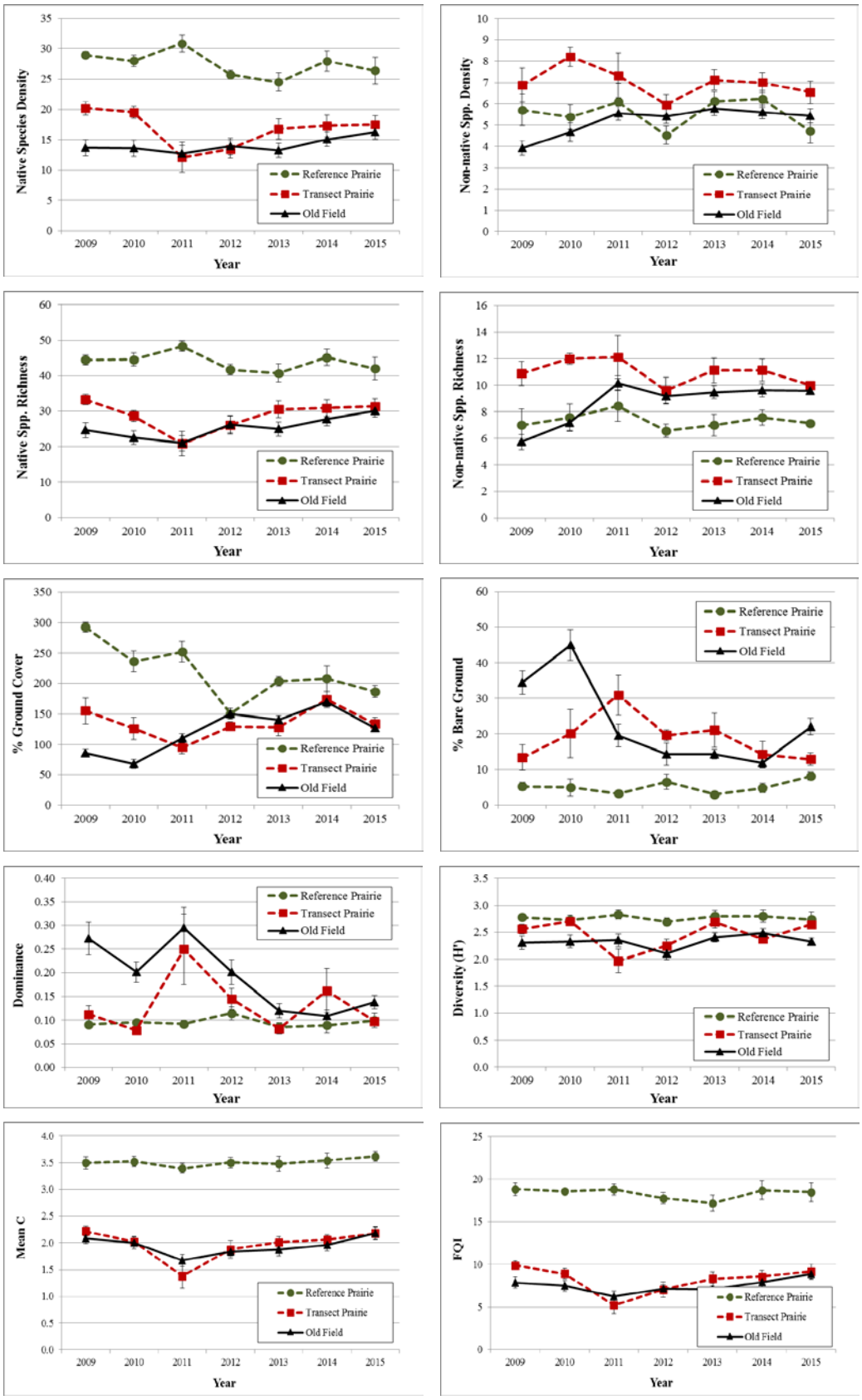

Figure 5. Trends for vegetation types from 2009 to 2015 for ground layer parameters. Test of time differences (within subject effect [flatness hypothesis]) for each vegetation type (flatness hypothesis) were made with repeated measures analysis of variance (see Table 4). The between subject x within subject interaction (vegetation type x year [parallelism hypothesis]) was tested with a mixed repeated measures analysis of variance design (see Table 5).

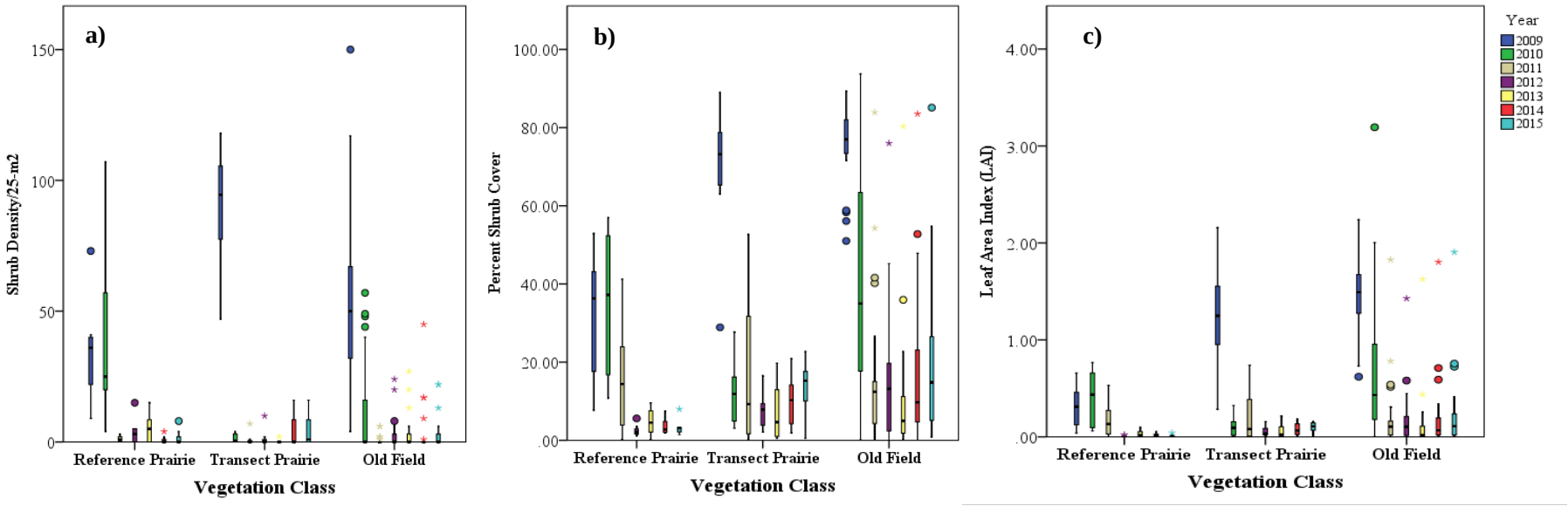

Figure 6. Line charts illustrating trends among vegetation types from 2009 to 2015 for a) shrub density, b) percent canopy cover, and c) leaf area index (LAI) across monitoring years.

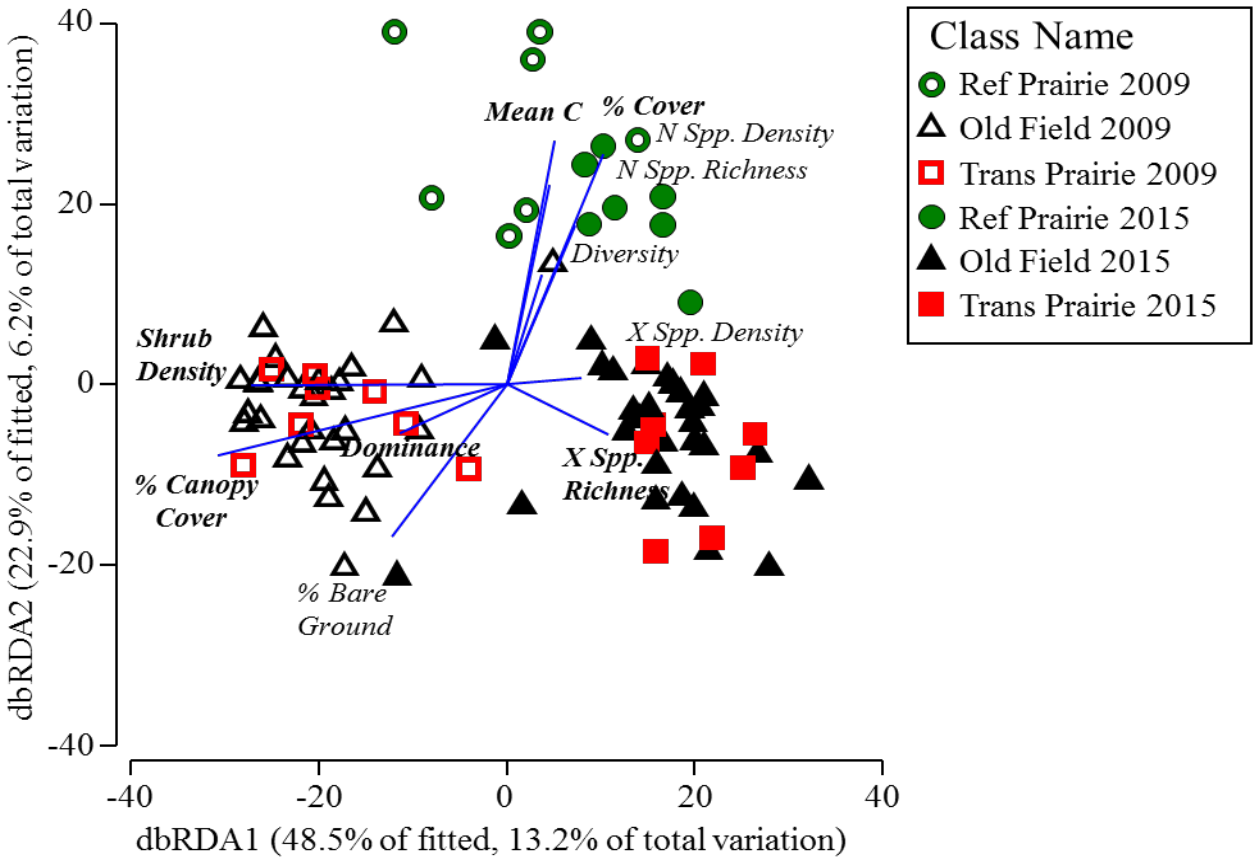

Figure 7. Ordination biplot based on species composition and abundance data showing plots in species ordination space using distance-based redundancy analysis (dbRDA) of the fitted distance linear model. Symbols represent plots and are coded by vegetation type and sample interval. Ref = Reference, Trans = Transect.

Appendix 1. Summary list of species recorded at the North Chicago Wetland Site, Lake County, IL showing 2015 data. n = quadrat number; CC = coefficient of conservatism (* = non-native species); WC = wetness coefficient; A = annual, B = biennial, P = perennial. IV200 is sum of relative frequency and relative cover. Species presented in descending rank-order of overall abundance (IV 200).

	OVERALL			OLD FIELD			PRAIRIE								
	% Freq. (n = 132)	% Cover	IV 200	% Freq. (n = 87)	% Cover	IV 200	% Freq. (n = 45)	% Cover	IV 200	CC	CW	Wetness	Physiog- nomy	Mohlenbrock (2014)	
*Rhamnus cathartica**	68.94	10.330	10.458	62.07	7.540	8.844	82.22	15.722	12.94	*	3	FACU	Shrub	*Rhamnus cathartica*	
Solidago canadensis	65.91	9.848	9.978	68.97	12.023	12.715	60.00	5.644	5.76	1	3	FACU	P-Forb	*Solidago canadensis*	
Andropogon gerardii	56.82	10.167	9.824	52.87	9.420	9.908	64.44	11.611	9.69	5	1	FAC-	P-Grass C4	*Andropogon gerardii*	
Sorghastrum nutans	51.52	9.148	8.856	48.28	9.253	9.564	57.78	8.944	7.77	4	2	FACU+	P-Grass C4	*Sorghastrum nutans*	
Fragaria virginiana	69.70	6.064	7.380	68.97	6.213	8.111	71.11	5.778	6.26	2	1	FAC-	P-Forb	*Fragaria virginiana*	
*Poa pratensis**	44.70	6.841	6.885	37.93	6.466	6.877	57.78	7.567	6.90	*	1	FAC-	P-Grass C3	*Poa pratensis*	
*Poa compressa**	53.79	5.845	6.545	55.17	5.609	6.995	51.11	6.300	5.85	*	2	FACU+	P-Grass C3	*Poa compressa*	
Ratibida pinnata	71.21	4.231	6.108	70.11	4.603	6.889	73.33	3.511	4.91	4	5	UPL	P-Forb	*Ratibida pinnata*	
Helianthus grosseserratus	34.85	3.648	4.139	41.38	4.437	5.429	22.22	2.122	2.15	2	-2	FACW-	P-Forb	*Helianthus grosseserratus*	
*Dactylus glomerata**	18.94	4.398	4.010	24.14	6.397	6.185	8.89	0.533	0.66	*	3	FACU	P-Grass C3	*Dactylus glomerata*	
Dichanthelium praecocius	56.82	2.121	3.959	55.17	2.276	4.354	60.00	1.822	3.35	5	7	UPL	P-Grass C3	*Dichanthelium praecocius*	
Carex granularis	50.76	2.163	3.732	42.53	1.839	3.423	66.67	2.789	4.21	2	-4	FACW+	P-Sedge	*Carex granularis*	
Euthamia graminifolia	37.88	2.898	3.721	42.53	2.891	4.257	28.89	2.911	2.90	3	-2	FACW-	P-Forb	*Euthamia graminifolia*	
Cornus racemosa	42.42	2.159	3.375	28.74	1.747	2.713	68.89	2.956	4.39	2	-2	FACW-	Shrub	*Cornus racemosa*	
Potentilla simplex	37.12	2.087	3.098	41.38	2.782	4.117	28.89	0.744	1.53	3	4	FACU-	P-Forb	*Potentilla simplex*	
Schizachyrium scoparium	28.03	2.515	3.024	19.54	1.109	1.782	44.44	5.233	4.93	5	4	FACU-	P-Grass C4	*Schizachyrium scoparium*	
Carex stricta	7.58	2.886	2.426	4.60	1.190	1.155	13.33	6.167	4.38	5	-5	OBL	P-Sedge	*Carex stricta*	
Viola pratincola	45.45	0.625	2.386	39.08	0.540	2.235	57.78	0.789	2.62	1	0	FAC	P-Forb	*Viola pratincola*	
Monarda fistulosa	38.64	1.011	2.378	26.44	0.471	1.596	62.22	2.056	3.58	4	3	FACU	P-Forb	*Monarda fistulosa*	
*Lonicera × bella**	19.70	2.114	2.377	20.69	1.983	2.528	17.78	2.367	2.15	*	3	FACU	Shrub	*Lonicera × bella*	
Solidago juncea	26.52	1.670	2.344	11.49	0.989	1.315	55.56	2.989	3.92	4	5	UPL	P-Forb	*Solidago juncea*	
*Daucus carota**	44.70	0.523	2.279	40.23	0.626	2.356	53.33	0.322	2.16	*	4	FACU-	B-Forb	*Daucus carota*	
*Phalaris arundinacea**	17.42	1.996	2.195	22.99	2.529	3.067	6.67	0.967	0.85	*	-4	FACW+	P-Grass C3	*Phalaris arundinacea*	
Rudbeckia hirta	41.67	0.580	2.192	41.38	0.460	2.277	42.22	0.811	2.06	2	3	FACU	P-Forb	*Rudbeckia hirta*	
Oxalis stricta	40.15	0.648	2.177	49.43	0.925	3.018	22.22	0.111	0.89	0	3	FACU	P-Forb	*Oxalis fontana*	
*Cirsium arvense**	35.61	0.898	2.166	49.43	1.339	3.346	8.89	0.044	0.35	*	3	FACU	P-Forb	*Cirsium arvense*	
Prunella vulgaris v. elongata	37.88	0.606	2.050	37.93	0.534	2.177	37.78	0.744	1.86	1	0	FAC	P-Forb	*Prunella vulgaris v. elongata*	
Parthenium integrifolium	12.12	2.106	2.050	0.00	0.000	0.000	35.56	6.178	5.20	8	5	UPL	P-Forb	*Parthenium integrifolium*	
*Achillea millefolium**	32.58	0.833	1.991	16.09	0.109	0.830	64.44	2.233	3.77	*	3	FACU	P-Forb	*Achillea millefolium*	
*Leucanthemum vulgare**	35.61	0.629	1.970	24.14	0.546	1.548	57.78	0.789	2.62	*	5	UPL	P-Forb	*Leucanthemum vulgare*	
Aster praealtus	18.94	1.595	1.967	14.94	1.644	1.993	26.67	1.500	1.93	4	-5	OBL	P-Forb	*Symphyotrichum praealtum*	
Zizia aurea	25.00	1.174	1.918	25.29	1.328	2.221	24.44	0.878	1.45	6	-1	FAC+	P-Forb	*Zizia aurea*	
Aster drummondii	24.24	0.754	1.579	25.29	0.914	1.893	22.22	0.444	1.10	3	3	FACU	P-Forb	*Symphyotrichum drummondii*	
Allium cernuum	23.48	0.792	1.574	17.24	0.764	1.403	35.56	0.844	1.84	7	5	UPL	P-Forb	*Allium cernuum*	
Rubus pensilvanicus	17.42	1.110	1.549	12.64	0.747	1.177	26.67	1.811	2.12	2	1	FAC-	Shrub	*Rubus pensilvanicus*	
Agrostis alba	27.27	0.527	1.542	22.99	0.316	1.313	35.56	0.933	1.89	0	-3	FACW	P-Grass C3	*Agrostis gigantea*	
Spartina pectinata	6.82	1.712	1.538	3.45	0.241	0.351	13.33	4.556	3.37	4	-4	FACW+	P-Grass C4	*Spartina pectinata*	
Erigeron annuus	28.79	0.352	1.479	26.44	0.218	1.395	33.33	0.611	1.61	1	1	FAC-	B-Forb	*Erigeron annuus*	
Silphium terebinthinaceum	9.85	1.455	1.479	0.00	0.000	0.000	28.89	4.267	3.75	4	1	FAC-	P-Forb	*Silphium terebinthinaceum*	
*Taraxicum officinale**	28.03	0.345	1.441	29.89	0.460	1.746	24.44	0.122	0.97	*	3	FACU	P-Forb	*Taraxicum officinale*	
Anemone virginiana	24.24	0.530	1.416	17.24	0.397	1.111	37.78	0.789	1.88	4	5	UPL	P-Forb	*Anemone virginiana*	
Viburnum lentago	14.39	0.973	1.321	16.09	1.224	1.714	11.11	0.489	0.72	4	-1	FAC+	Shrub	*Viburnum lentago*	
Aster ericoides	18.94	0.708	1.321	6.90	0.121	0.414	42.22	1.844	2.71	4	4	FACU-	P-Forb	*Symphyotrichum ericoides*	
Pycnanthemum virginianum	12.88	1.057	1.317	10.34	0.776	1.093	17.78	1.600	1.66	5	-4	FACW+	P-Forb	*Pycnanthemum virginianum*	
Erigeron strigosus	16.67	0.746	1.252	17.24	0.230	0.979	15.56	1.744	1.67	2	1	FAC-	P-Forb	*Erigeron strigosus*	
Solidago nemoralis	19.70	0.527	1.220	5.75	0.086	0.334	46.67	1.378	2.58	3	5	UPL	P-Forb	*Solidago nemoralis*	
Carex pellita	15.15	0.742	1.185	17.24	1.011	1.599	11.11	0.222	0.55	4	-5	OBL	P-Sedge	*Carex pellita*	
Aster lateriflorus	20.45	0.402	1.161	25.29	0.523	1.583	11.11	0.167	0.51	2	-2	FACW-	P-Forb	*Symphyotrichum lateriflorum*	
Helianthus rigidus	12.12	0.761	1.070	2.30	0.040	0.138	31.11	2.156	2.50	6	5	UPL	P-Forb	*Helianthus subrhomboideus*	
Solidago missouriensis	13.64	0.659	1.059	5.75	0.282	0.489	28.89	1.389	1.94	4	5	UPL	P-Forb	*Solidago glaberrima*	
Aster pilosus	20.45	0.159	0.984	24.14	0.178	1.257	13.33	0.122	0.57	0	4	FACU-	P-Forb	*Symphyotrichum pilosum*	
*Rhamnus frangula**	17.42	0.239	0.914	11.49	0.201	0.691	28.89	0.311	1.26	*	-1	FAC+	Shrub	*Frangula alnus*	
Vitis riparia	12.88	0.500	0.911	11.49	0.523	0.946	15.56	0.456	0.86	2	-2	FACW-	W-Vine	*Vitis riparia*	
Ambrosia artemisiifolia	18.94	0.114	0.887	20.69	0.132	1.061	15.56	0.078	0.62	0	3	FACU	A-Forb	*Ambrosia artemisiifolia*	
Lactuca canadensis	13.64	0.420	0.885	20.69	0.638	1.462	0.00	0.000	0.00	1	2	FACU+	B-Forb	*Lactuca canadensis*	
Crataegus coccinea	16.67	0.216	0.865	13.79	0.155	0.761	22.22	0.333	1.03	5	5	UPL	Tree	*Crataegus coccinea*	
Solidago rigida	12.12	0.432	0.829	4.60	0.052	0.254	26.67	1.167	1.71	4	4	FACU-	P-Forb	*Oligoneuron rigidum*	
Gentiana alba	9.09	0.561	0.795	8.05	0.264	0.581	11.11	1.133	1.12	9	3	FACU	P-Forb	*Gentiana alba*	
*Hieracium caespitosum**	13.64	0.254	0.764	9.20	0.103	0.507	22.22	0.544	1.16	*	5	UPL	P-Forb	*Hieracium caespitosum*	
Solidago gigantea	7.58	0.591	0.752	11.49	0.897	1.242	0.00	0.000	0.00	3	-3	FACW	P-Forb	*Solidago gigantea*	
Echinacea pallida	15.15	0.133	0.740	18.39	0.149	0.969	8.89	0.100	0.39	7	5	UPL	P-Forb	*Echinacea pallida*	
Viola peditifida	14.39	0.167	0.733	8.05	0.098	0.449	26.67	0.300	1.17	9	4	FACU-	P-Forb	*Viola peditifida*	
Bidens frondosa	11.36	0.333	0.725	14.94	0.494	1.082	4.44	0.022	0.18	1	-3	FACW	A-Forb	*Bidens frondosa*	
Allium canadense	11.36	0.246	0.662	14.94	0.333	0.955	4.44	0.078	0.21	2	3	FACU	P-Forb	*Allium canadense*	
*Cerastium vulgatum**	13.64	0.068	0.629	11.49	0.057	0.577	17.78	0.089	0.71	*	3	FACU	P-Forb	*Cerastium fontanum*	
Rosa carolina	10.61	0.205	0.599	5.75	0.086	0.334	20.00	0.433	1.01	4	4	FACU-	Shrub	*Rosa carolina*	
Rubus flagellaris	5.30	0.492	0.584	3.45	0.075	0.219	8.89	1.300	1.15	2	4	FACU-	Shrub	*Rubus flagellaris*	
Aster azureus	8.33	0.303	0.575	0.00	0.000	0.000	24.44	0.889	1.46	7	5	UPL	P-Forb	*Symphyotrichum oolentangiense*	
Aster sagittifolius	9.85	0.197	0.562	11.49	0.282	0.755	6.67	0.033	0.27	4	5	UPL	P-Forb	*Symphyotrichum urophyllum*	
Vicia americana	10.61	0.129	0.544	2.30	0.011	0.115	26.67	0.356	1.20	6	5	UPL	P-Forb	*Vicia americana*	
Equisetum arvense	9.85	0.163	0.537	11.49	0.172	0.668	6.67	0.144	0.34	0	0	FAC	Fern	*Equisetum arvense*	
Sphenopholis intermedia	9.85	0.144	0.523	12.64	0.207	0.748	4.44	0.022	0.18	5	0	FAC	P-Grass C3	*Sphenopholis intermedia*	x
*Dipsacus laciniatus**	5.30	0.394	0.512	8.05	0.598	0.846	0.00	0.000	0.00	*	5	UPL	B-Forb	*Dipsacus laciniatus*	
*Trifolium hybridum**	5.30	0.394	0.512	8.05	0.598	0.846	0.00	0.000	0.00	*	1	FAC-	P-Forb N2	*Trifolium hybridum*	
Antennaria neglecta	8.33	0.208	0.506	2.30	0.011	0.115	20.00	0.589	1.11	4	5	UPL	P-Forb	*Antennaria neglecta*	
Galium triflorum	7.58	0.242	0.498	8.05	0.322	0.627	6.67	0.089	0.30	4	2	FACU+	P-Forb	*Galium triflorum*	
*Lotus corniculatus**	3.79	0.447	0.487	5.75	0.678	0.803	0.00	0.000	0.00	*	1	FAC-	P-Forb	*Lotus corniculatus*	
*Medicago lupulina**	9.85	0.068	0.468	9.20	0.046	0.462	11.11	0.111	0.48	*	1	FAC-	A-Forb N2	*Medicago lupulina*	
Geum aleppicum	8.33	0.155	0.467	5.75	0.086	0.334	13.33	0.289	0.67	6	-1	FAC+	P-Forb	*Geum aleppicum*	
*Melilotus alba/officianale**	9.09	0.102	0.461	9.20	0.132	0.530	8.89	0.044	0.35	*	3	FACU	B-Forb N2	*Melilotus alba/officianale*	
*Typha angustifolia**	3.03	0.443	0.452	3.45	0.241	0.351	2.22	0.833	0.61	*	-5	OBL	P-Forb	*Typha angustifolia*	
*Hypericum perforatum**	9.09	0.083	0.447	10.34	0.109	0.565	6.67	0.033	0.27	*	5	UPL	P-Forb	*Hypericum perforatum*	
Comandra umbellata	8.33	0.117	0.439	1.15	0.034	0.080	22.22	0.278	0.99	6	3	FACU	P-Forb, Hemi-par	*Comandra umbellata*	
*Lythrum salicaria**	6.82	0.201	0.436	6.90	0.259	0.524	6.67	0.089	0.30	*	-5	OBL	P-Forb	*Lythrum salicaria*	

	OVERALL			OLD FIELD			PRAIRIE							
	% Freq. (n = 132)	% Cover	IV 200	% Freq. (n = 87)	% Cover	IV 200	% Freq. (n = 45)	% Cover	IV 200	CC	CW	Wetness	Physiog- nomy	Mohlenbrock (2014)
Prunus americana	6.82	0.201	0.436	3.45	0.017	0.173	13.33	0.556	0.84	3	5	UPL	Tree	*Prunus americana*
Liatris sp.	9.09	0.064	0.433	2.30	0.040	0.138	22.22	0.111	0.89	6	1	FAC-	P-Forb	*Liatris sp. (seedling)*
*Lolium multiflorum**	9.09	0.064	0.433	13.79	0.098	0.715	0.00	0.000	0.00	*	5	UPL	A-Grass	*Lolium multiflorum*
Eryngium yuccifolium	8.33	0.080	0.412	12.64	0.121	0.680	0.00	0.000	0.00	7	-1	FAC+	P-Forb	*Eryngium yuccifolium*
Tradescantia ohiensis	6.82	0.167	0.411	4.60	0.109	0.299	11.11	0.278	0.58	3	2	FACU+	P-Forb	*Tradescantia ohiensis*
Carex tenera	5.30	0.231	0.394	5.75	0.310	0.512	4.44	0.078	0.21	5	-1	FAC+	P-Sedge	*Carex tenera*
Juncus interior	7.58	0.095	0.391	6.90	0.092	0.392	8.89	0.100	0.39	3	-1	FAC+	P-Forb	*Juncus interior*
Senicio aureus	7.58	0.095	0.391	11.49	0.144	0.645	0.00	0.000	0.00	4	-3	FACW	P-Forb	*Senecio aureus*
Plantago rugelii	6.06	0.178	0.387	6.90	0.230	0.501	4.44	0.078	0.21	0	0	FAC	A-Forb	*Plantago rugelii*
Corylus americana	0.76	0.473	0.377	0.00	0.000	0.000	2.22	1.389	0.96	4	0	FAC	Shrub	*Corylus americana*
Viola sororia	7.58	0.076	0.377	11.49	0.115	0.622	0.00	0.000	0.00	3	1	FAC-	P-Forb	*Viola sororia*
*Alliaria petiolata**	3.79	0.258	0.349	5.75	0.391	0.575	0.00	0.000	0.00	*	0	FAC	B-Forb	*Alliaria petiolata*
Lithospermum canescens	6.06	0.125	0.348	0.00	0.000	0.000	17.78	0.367	0.88	6	5	UPL	P-Forb	*Lithospermum canescens*
Carex umbellata	4.55	0.208	0.345	4.60	0.247	0.408	4.44	0.133	0.25	6	5	UPL	P-Sedge	*Carex umbellata*
Juncus tenuis	6.82	0.072	0.342	2.30	0.011	0.115	15.56	0.189	0.69	0	0	FAC	P-Forb	*Juncus tenuis*
*Setaria faberi**	2.27	0.330	0.337	3.45	0.500	0.556	0.00	0.000	0.00	*	2	FACU+	A-Grass C4	*Setaria faberi*
Lespedeza capitata	6.06	0.106	0.335	2.30	0.011	0.115	13.33	0.289	0.67	4	3	FACU	P-Forb N2	*Lespedeza capitata*
Scirpus pendulus	4.55	0.189	0.331	3.45	0.075	0.219	6.67	0.411	0.50	3	-5	OBL	P-Sedge	*Scirpus pendulus*
Lobelia spicata	6.82	0.053	0.328	5.75	0.029	0.288	8.89	0.100	0.39	4	0	FAC	P-Forb	*Lobelia spicata*
Rhus glabra	3.03	0.273	0.327	2.30	0.207	0.270	4.44	0.400	0.42	1	5	UPL	Shrub	*Rhus glabra*
Toxicodendron radicans	3.03	0.254	0.314	4.60	0.385	0.518	0.00	0.000	0.00	1	3	FACU	W-Vine	*Toxicodendron radicans*
Eupatorium maculatum	2.27	0.292	0.309	3.45	0.443	0.510	0.00	0.000	0.00	5	-5	OBL	P-Forb	*Eupatoriadelphus maculatus*
Aster puniceus	4.55	0.152	0.303	5.75	0.057	0.311	2.22	0.333	0.29	7	-5	OBL	P-Forb	*Aster puniceus*
Sisyrinchium albidum	6.06	0.049	0.293	3.45	0.017	0.173	11.11	0.111	0.48	4	3	FACU	P-Forb	*Sisyrinchium albidum*
Krigia biflora	5.30	0.083	0.286	0.00	0.000	0.000	15.56	0.244	0.72	5	3	FACU	P-Forb	*Krigia biflora*
Helianthus strumosus	1.52	0.288	0.274	2.30	0.437	0.452	0.00	0.000	0.00	3	5	UPL	P-Forb	*Helianthus strumosus*
Lycopus americanus	5.30	0.064	0.272	8.05	0.098	0.449	0.00	0.000	0.00	3	-5	OBL	P-Forb	*Lycopus americanus*
Prunus serotina	5.30	0.064	0.272	4.60	0.052	0.254	6.67	0.089	0.30	1	3	FACU	Tree	*Prunus serotina*
Rubus sp. (R. penn./R. flag.)	5.30	0.064	0.272	4.60	0.080	0.276	6.67	0.033	0.27	2	2	FACU+	Shrub	*Rubus sp (pen or flag)*
Silphium integrifolium	5.30	0.064	0.272	2.30	0.040	0.138	11.11	0.111	0.48	5	5	UPL	P-Forb	*Silphium integrifolium*
*Bromus inermis**	3.03	0.182	0.261	3.45	0.241	0.351	2.22	0.067	0.12	*	5	UPL	P-Grass	*Bromus inermis*
Hypoxis hirsuta	5.30	0.045	0.258	1.15	0.006	0.058	13.33	0.122	0.57	6	0	FAC	P-Forb	*Hypoxis hirsuta*
Sanicula odorata	3.79	0.129	0.255	4.60	0.190	0.363	2.22	0.011	0.09	2	-1	FAC+	P-Forb	*Sanicula odorata*
Eupatorium altissimum	4.55	0.080	0.251	4.60	0.052	0.254	4.44	0.133	0.25	2	3	FACU	P-Forb	*Eupatorium altissimum*
Zizia aptera	4.55	0.080	0.251	1.15	0.006	0.058	11.11	0.222	0.55	9	3	FACU	P-Forb	*Zizia aptera*
Lythrum alatum	3.03	0.163	0.247	3.45	0.241	0.351	2.22	0.011	0.09	5	-5	OBL	P-Forb	*Lythrum alatum*
*Phleum pratense**	3.03	0.163	0.247	2.30	0.207	0.270	4.44	0.078	0.21	*	3	FACU	P-Grass C3	*Phleum pratense*
Thalictrum revolutum	3.03	0.163	0.247	0.00	0.000	0.000	8.89	0.478	0.63	5	0	FAC	P-Forb	*Thalictrum revolutum*
Chenopodium sp.*	4.55	0.061	0.237	6.90	0.092	0.392	0.00	0.000	0.00	*				*Chenopodium sp*
Juncus dudleyi	4.55	0.061	0.237	3.45	0.017	0.173	6.67	0.144	0.34	4	0	FAC	P-Forb	*Juncus dudleyi*
Parthenocissus quinquefolia	4.55	0.061	0.237	6.90	0.092	0.392	0.00	0.000	0.00	2	1	FAC-	W-Vine	*Parthenocissus quinquefolia*
Carex hirsutella	3.03	0.144	0.234	1.15	0.172	0.190	6.67	0.089	0.30	5	4	FACU-	P-Sedge	*Carex hirsutella*
Pycnanthemum tenuifolia	3.03	0.144	0.234	4.60	0.218	0.386	0.00	0.000	0.00	4	0	FAC	P-Forb	*Pycnanthemum tenuifolia*
Carex pensylvanica	3.79	0.095	0.230	4.60	0.109	0.299	2.22	0.067	0.12	5	5	UPL	P-Sedge	*Carex pensylvanica*
Scutellaria leonardii	4.55	0.042	0.223	3.45	0.046	0.196	6.67	0.033	0.27	5	3	FACU	P-Forb	*Scutellaria leonardii*
Carex blanda	2.27	0.159	0.212	3.45	0.241	0.351	0.00	0.000	0.00	2	0	FAC	P-Sedge	*Carex blanda*
Acer negundo	4.55	0.023	0.210	6.90	0.034	0.346	0.00	0.000	0.00	1	-2	FACW-	Tree	*Acer negundo*
Verbena hastata	4.55	0.023	0.210	5.75	0.029	0.288	2.22	0.011	0.09	3	-4	FACW+	P-Forb	*Verbena hastata*
Penstemon digitalis	3.79	0.057	0.202	3.45	0.046	0.196	4.44	0.078	0.21	4	1	FAC-	P-Forb	*Penstemon digitalis*
Crataegus crus-galli	3.79	0.038	0.188	4.60	0.023	0.231	2.22	0.067	0.12	2	0	FAC	Tree	*Crataegus crus-galli*
Geum sp. (rosette)	3.79	0.038	0.188	4.60	0.052	0.254	2.22	0.011	0.09	2	0	FAC	P-Forb	*Geum sp (rosette)*
Oenothera perennis	2.27	0.121	0.185	0.00	0.000	0.000	6.67	0.356	0.47	8	0	FAC	P-Forb	*Oenothera perennis*
Populous deltoides	2.27	0.121	0.185	2.30	0.178	0.247	2.22	0.011	0.09	2	-1	FAC+	Tree	*Populus deltoides*
Agrimonia gryposepala	3.03	0.072	0.181	4.60	0.109	0.299	0.00	0.000	0.00	3	2	FACU+	P-Forb	*Agrimonia gryposepala*
Asclepias syriaca	3.03	0.072	0.181	2.30	0.040	0.138	4.44	0.133	0.25	0	5	UPL	P-Forb	*Asclepias syriaca*
*Festuca pratense**	3.03	0.072	0.181	2.30	0.040	0.138	4.44	0.133	0.25	*	4	FACU-	P-Grass	*Festuca pratensis*
Lycopus uniflorus	3.79	0.019	0.175	4.60	0.023	0.231	2.22	0.011	0.09	7	-5	OBL	P-Forb	*Lycopus uniflorus*
Viburnum recognitum	3.03	0.053	0.167	0.00	0.000	0.000	8.89	0.156	0.42	6	-2	FACW-	Shrub	*Viburnum recognitum*
*Euphorbia escula**	1.52	0.136	0.164	0.00	0.000	0.000	4.44	0.400	0.42	*	5	UPL	P-Forb	*Euphorbia escula*
Stachys pilosa var. *homotricha*	1.52	0.136	0.164	2.30	0.207	0.270	0.00	0.000	0.00	5	-5	OBL	P-Forb	*Stachys pilosa var. homotricha*
Elymus trachycaulus	3.03	0.034	0.154	0.00	0.000	0.000	8.89	0.100	0.39	8	3	FACU	P-Grass C3	*Elymus trachycaulus*
*Festuca trachyphylla**	2.27	0.068	0.146	0.00	0.000	0.000	6.67	0.200	0.37	*	5	UPL	P-Grass C3	*Festuca trachyphylla*
Anemone cylindrica	3.03	0.015	0.140	2.30	0.011	0.115	4.44	0.022	0.18	8	5	UPL	P-Forb	*Anemone cylindrica*
Aster simplex	3.03	0.015	0.140	4.60	0.023	0.231	0.00	0.000	0.00	3	-5	OBL	P-Forb	*Aster lanceolatus*
*Barbarea vulgaris**	3.03	0.015	0.140	4.60	0.023	0.231	0.00	0.000	0.00	*	0	FAC	B-Forb	*Barbarea vulgaris*
Erechtites hieracifolia	3.03	0.015	0.140	4.60	0.023	0.231	0.00	0.000	0.00	2	3	FACU	A-Forb	*Erechtites hieracifolia*
*Rubus idaeus**	2.27	0.049	0.132	3.45	0.075	0.219	0.00	0.000	0.00	*	2	FACU+	Shrub	*Rubus idaeus*
*Trifolium pratense**	2.27	0.049	0.132	2.30	0.040	0.138	2.22	0.067	0.12	*	2	FACU+	P-Forb N2	*Trifolium pratense*
Asclepias purpurascens	2.27	0.030	0.119	1.15	0.006	0.058	4.44	0.078	0.21	7	3	FACU	P-Forb	*Asclepias purpurascens*
Aster novae-angliae	2.27	0.030	0.119	1.15	0.034	0.080	4.44	0.022	0.18	4	-3	FACW	P-Forb	*Aster novae-angliae*
*Bromus commutatus**	2.27	0.030	0.119	3.45	0.046	0.196	0.00	0.000	0.00	*	5	UPL	A-Grass	*Bromus commutatus*
Bromus kalmii	2.27	0.030	0.119	1.15	0.006	0.058	4.44	0.078	0.21	10	0	FAC	P-Grass	*Bromus kalmii*
Carex sp.	2.27	0.030	0.119	3.45	0.046	0.196	0.00	0.000	0.00				P-Sedge	*Carex* sp. 1
Phlox glaberrima	2.27	0.030	0.119	3.45	0.046	0.196	0.00	0.000	0.00	6	-3	FACW	P-Forb	*Phlox glaberrima* ssp. *interior*
Poaceae	2.27	0.030	0.119	3.45	0.046	0.196	0.00	0.000	0.00					Poaceae
Smilacina stellata	2.27	0.030	0.119	2.30	0.011	0.115	2.22	0.067	0.12	5	1	FAC-	P-Forb	*Smilacina stellata*
Calystegia arvensis	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	0	5	UPL	P-Forb	*Convolvulus arvensis*
Carex brevior	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	4	0	FAC	P-Sedge	*Carex cf brevior*
Carex cristatella	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	3	-4	FACW+	P-Sedge	*Carex cristatella*
Chenopodium albidum	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	*	1	FAC-	A-Forb	*Chenopodium albidum*
Muhlenbergia sp.	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00				P-GrassC4	*Muhlenbergia* sp.
Populus tremuloides	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	3	0	FAC	Tree	*Populus tremuloides*
*Rosa multiflora**	0.76	0.114	0.115	1.15	0.172	0.190	0.00	0.000	0.00	*	3	FACU	Shrub	*Rosa multiflora*
Apocynum cannabinum	2.27	0.011	0.105	3.45	0.017	0.173	0.00	0.000	0.00	2	0	FAC	P-Forb	*Apocynum cannabinum*
Asclepias incarnata	2.27	0.011	0.105	3.45	0.017	0.173	0.00	0.000	0.00	4	-5	OBL	P-Forb	*Asclepias incarnata*
Celtis occidentalis	2.27	0.011	0.105	3.45	0.017	0.173	0.00	0.000	0.00	3	1	FAC-	Tree	*Celtis occidentalis*
Fraxinus lanceolata	2.27	0.011	0.105	3.45	0.017	0.173	0.00	0.000	0.00	2	-3	FACW	Tree	*Fraxinus lanceolata*

	OVERALL			OLD FIELD			PRAIRIE							
	% Freq. (n = 132)	% Cover	IV 200	% Freq. (n = 87)	% Cover	IV 200	% Freq. (n = 45)	% Cover	IV 200	CC	CW	Wetness	Physiog- nomy	Mohlenbrock (2014)
*Rumex crispus**	2.27	0.011	0.105	2.30	0.011	0.115	2.22	0.011	0.09	*	-1	FAC+	P-Forb	*Rumex crispus*
*Trifolium repens**	2.27	0.011	0.105	2.30	0.011	0.115	2.22	0.011	0.09	*	2	FACU+	P-Forb N2	*Trifolium repens*
Ulmus americana	2.27	0.011	0.105	0.00	0.000	0.000	6.67	0.033	0.27	5	-2	FACW-	Tree	*Ulmus americana*
Glyceria striata	1.52	0.045	0.097	2.30	0.069	0.161	0.00	0.000	0.00	4	-5	OBL	P-Grass C3	*Glyceria striata*
Prunus virginiana	1.52	0.045	0.097	1.15	0.034	0.080	2.22	0.067	0.12	3	1	FAC-	Shrub	*Prunus virginiana*
Ambrosia trifida	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	0	-1	FAC+	A-Forb	*Ambrosia trifida*
Geranium maculatum	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	4	3	FACU	P-Forb	*Geranium maculatum*
Hieracium canadense	1.52	0.027	0.084	1.15	0.006	0.058	2.22	0.067	0.12	5	5	UPL	P-Forb	*Hieracium canadense*
Lilium michiganense	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	6	-1	FAC+	P-Forb	*Lilium michiganense*
Liparis liliifolium	1.52	0.027	0.084	1.15	0.006	0.058	2.22	0.067	0.12	4	4	FACU-	P-Forb	*Liparis liliifolium*
Scirpus atrovirens	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	4	-5	OBL	P-Sedge	*Scirpus atrovirens*
Smilax ecirrhata	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	5	5	UPL	P-Forb	*Smilax ecirrhata*
*Solanum dulcamara**	1.52	0.027	0.084	2.30	0.040	0.138	0.00	0.000	0.00	*	0	FAC	W-Vine	*Solanum dulcamara*
Viburnum prunifolium	1.52	0.027	0.084	0.00	0.000	0.000	4.44	0.078	0.21	4	3	FACU	Shrub	*Viburnum prunifolium*
Cacalia tuberosa	1.52	0.008	0.070	0.00	0.000	0.000	4.44	0.022	0.18	10	0	FAC	P-Forb	*Arnoglossum plantaginea*
Circaea lutetiana canadensis	1.52	0.008	0.070	2.30	0.011	0.115	0.00	0.000	0.00	2	3	FACU	P-Forb	*Circaea lutetiana ssp. canadensis*
*Dianthus armeria**	1.52	0.008	0.070	1.15	0.006	0.058	2.22	0.011	0.09	*	5	UPL	A-Forb	*Dianthus armeria*
Eupatorium rugosum	1.52	0.008	0.070	2.30	0.011	0.115	0.00	0.000	0.00	2	3	FACU	P-Forb	*Ageratina altissima*
Liatris spicata	1.52	0.008	0.070	1.15	0.006	0.058	2.22	0.011	0.09	7	0	FAC	P-Forb	*Liatris spicata*
Physalis subglabrata	1.52	0.008	0.070	2.30	0.011	0.115	0.00	0.000	0.00	0	5	UPL	P-Forb	*Physalis subglabrata*
Quercus palustris	1.52	0.008	0.070	2.30	0.011	0.115	0.00	0.000	0.00	4	-3	FACW	Tree	*Quercus palustris*
Ranunculus recurvatus	1.52	0.008	0.070	2.30	0.011	0.115	0.00	0.000	0.00	5	-3	FACW	A-Forb	*Ranunculus recurvatus*
Spiranthes cernua	1.52	0.008	0.070	0.00	0.000	0.000	4.44	0.022	0.18	4	-2	FACW-	P-Forb	*Spiranthes cernua*
Calamagrostis canadensis	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	3	-5	OBL	P-Grass C3	*Calamagrostis canadensis*
Carex sp.	0.76	0.023	0.049	0.00	0.000	0.000	2.22	0.067	0.12				P-Sedge	*Carex sp. leaves 3mm*
Carex stipata	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	2	-5	OBL	P-Sedge	*Carex stipata*
Carex vulpinoidea	0.76	0.023	0.049	0.00	0.000	0.000	2.22	0.067	0.12	3	-5	OBL	P-Sedge	*Carex vulpinoidea*
Gentiana andrewsii	0.76	0.023	0.049	0.00	0.000	0.000	2.22	0.067	0.12	7	-3	FACW	P-Forb	*Gentiana andrewsii*
Geum canadense	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	2	0	FAC	P-Forb	*Geum canadense*
Guara biennis	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	2	4	FACU-	B-Forb	*Gaura biennis*
Hackelia virginiana	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	1	1	FAC-	P-Forb	*Hackelia virginiana*
Oenothera biennis	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	1	3	FACU	B-Forb	*Oenothera biennis*
Quercus macrocarpa	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	5	1	FAC-	Tree	*Quercus macrocarpa*
Rubus occidentalis	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	2	3	FACU	Shrub	*Rubus occidentalis*
Salix rigida	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	5	-4	FACW+	Shrub	*Salix rigida*
Silphium laciniatum	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	5	4	FACU-	P-Forb	*Silphium laciniatum*
Solidago speciosa	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	7	5	UPL	P-Forb	*Solidago speciosa*
Veronicastrum virginicum	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	6	0	FAC	P-Forb	*Veronicastrum virginicum*
*Viburnum opulus**	0.76	0.023	0.049	1.15	0.034	0.080	0.00	0.000	0.00	*	0	FAC	Shrub	*Viburnum opulus*
Zanthoxylum americanum	0.76	0.023	0.049	0.00	0.000	0.000	2.22	0.067	0.12	4	5	UPL	Shrub	*Zanthoxylum americanum*
Carex tetanica	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	5	-3	FACW	P-Sedge	*Carex tetanica*
Castilleja coccinea	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	8	0	FAC	A-Forb	*Castilleja coccinea*
*Cirsium vulgare**	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	*	4	FACU-	B-Forb	*Cirsium vulgare*
Cryptotaenia canadensis	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	1	0	FAC	P-Forb	*Cryptotaenia canadensis*
Danthonia spicata	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	3	5	UPL	P-Grass C3	*Danthonia spicata*
Dichanthelium implicatum	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	2	0	FAC	P-Grass C3	*Dichanthelium acuminatum var. implicatum*
Erigeron philadelphicus	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	3	-3	FACW	P-Forb	*Erigeron philadelphicus*
Eupatorium serotinum	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	1	-1	FAC+	P-Forb	*Eupatorium serotinum*
Galium obtusum	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	5	-4	FACW+	P-Forb	*Galium obtusum*
Gentianella quinquefolia	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	7	0	FAC	A-Forb	*Gentianella quinquefolia ssp. occidentalis*
Hypericum punctatum	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	3	-1	FAC+	P-Forb	*Hypericum punctatum*
Juniperis virginiana	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	1	3	FACU	Tree	*Juniperis virginiana*
*Lactuca serriola**	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	*	0	FAC	B-Forb	*Lactuca serriola*
Liparis loeselii	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	8	-4	FACW+	P-Forb	*Liparis loeselii*
Mentha sp.*	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	*				*Mentha sp (non-native?)*
*Morus alba**	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	*	0	FAC	Tree	*Morus alba*
Oxalis violacea	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	5	5	UPL	P-Forb	*Oxalis violacea*
Phragmites australis	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	1	-4	FACW+	P-Grass	*Phragmites australis*
Physalis heterophylla	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	2	5	UPL	P-Forb	*Physalis heterophylla*
Poaceae	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09				P-Grass C3	*Poaceae # 2 like poa/glyceria*
Polygonatum commutatum	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	4	3	FACU	P-Forb	*Polygonatum commutatum*
Prenanthes aspera	0.76	0.004	0.035	0.00	0.000	0.000	2.22	0.011	0.09	8	5	UPL	P-Forb	*Prenanthes aspera*
Ranunculus abortivus	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	1	-2	FACW-	A-Forb	*Ranunculus abortivus*
Rudbeckia subtomentosa	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	5	-3	FACW	P-Forb	*Rudbeckia subtomentosa*
Sambucus canadensis	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	2	4	FACU-	Shrub	*Sambucus canadensis*
Sanicula canadensis	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	4	2	FACU+	B-Forb	*Sanicula canadensis*
Senecio paperculus	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	3	-1	FAC+	P-Forb	*Senecio paperculus*
Spiraea alba	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	6	-4	FACW+	Shrub	*Spiraea alba*
Thalictrum dasycarpum	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	5	-2	FACW-	P-Forb	*Thalictrum dasycarpum*
*Verbascum thapsus**	0.76	0.004	0.035	1.15	0.006	0.058	0.00	0.000	0.00	*	5	UPL	B-Forb	*Verbascum thapsus*

Appendix 2. Complete list of species recorded from the North Chicago Wetland Mitigation site since intensive botanical surveys began in 1996 including data from vegetation monitoring plots (2009-2015) and wetland habitats. CC = coefficient of conservatism (* = non-native species), CW = coefficient of wetness, A = annual, B = biennial, P = perennial. Botanical nomenclature follows Mohlenbrock (2002).

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Acalypha rhomboidea	Three-seeded Mercury	Euphorbiaceae	0	3	FACU	A-FORB
Acer ginnala	Amur Maple	Aceraceae	*	5	UPL	TREE
Acer negundo	Boxelder	Aceraceae	1	-2	FACW-	TREE
Acer saccharinum	Silver Maple	Aceraceae	1	-3	FACW	TREE
Achillea millefolium	Yarrow	Asteraceae	*	3	FACU	P-FORB
Ageratina altissima	White Snakeroot	Asteraceae	2	3	FACU	P-FORB
Agrimonia gryposepala	Tall Agrimony	Rosaceae	3	2	FACU+	P-FORB
Agrimonia parviflora	Swamp Agrimony	Rosaceae	5	-1	FAC+	P-FORB
Agrostis gigantea	Red Top	Poaceae	0	-3	FACW	P-GRASS
Agrostis hyemalis	Hair Grass	Poaceae	2	1	FAC-	P-GRASS
Agrostis stolonifera var. *palustris*	Creeping Bent Grass	Poaceae	8	-3	FACW	P-GRASS
Alisma subcordatum	Common Water Plantain	Alismataceae	2	-5	OBL	P-FORB
Alliaria petiolata	Garlic Mustard	Brassicaceae	*	0	FAC	B-FORB
Allium canadense	Wild Garlic	Liliaceae	2	3	FACU	P-FORB
Allium cernuum	Nodding Wild Onion	Liliaceae	7	5	UPL	P-FORB
Alnus glutinosa	Black Alder	Betulaceae	*	-2	FACW-	TREE
Amaranthus sp.	Amaranth	Amaranthaceae	~	~	~	FORB
Ambrosia artemisiifolia	Common Ragweed	Asteraceae	0	3	FACU	A-FORB
Ambrosia trifida	Giant Ragweed	Asteraceae	0	-1	FAC+	A-FORB
Amelanchier arborea	Serviceberry	Rosaceae	7	3	FACU	TREE
Amelanchier interior	Shadbush	Rosaceae	10	5	UPL	SHRUB
Andropogon gerardii	Big Bluestem	Poaceae	5	1	FAC-	P-GRASS
Anemone cylindrica	Thimbleweed	Ranunculaceae	8	5	UPL	P-FORB
Anemone virginiana	Tall Anemone	Ranunculaceae	4	5	UPL	P-FORB
Antennaria neglecta	Cat's Foot	Asteraceae	4	5	UPL	P-FORB
Apocynum androsaemifolium	Spreading Dogbane	Apocynaceae	6	5	UPL	P-FORB
Apocynum cannabinum	Dogbane	Apocynaceae	2	0	FAC	P-FORB
Apocynum sibiricum	Indian Hemp	Apocynaceae	2	-1	FAC+	P-FORB
Aquilegia canadensis	Columbine	Ranunculaceae	5	1	FAC-	P-FORB
Arctium minus	Common Burdock	Asteraceae	*	5	UPL	B-FORB
Arisaema triphyllum	Jack-in-the-pulpit	Araceae	4	-2	FACW-	P-FORB
Arnoglossum plantaginea	Prairie Indian Plantain	Asteraceae	10	0	FAC	P-FORB
Asclepias incarnata	Swamp Milkweed	Asclepiadaceae	4	-5	OBL	P-FORB
Asclepias purpurascens	Purple Milkweed	Asclepiadaceae	7	3	FACU	P-FORB
Asclepias sullivantii	Prairie Milkweed	Asclepiadaceae	7	5	UPL	P-FORB
Asclepias syriaca	Common Milkweed	Asclepiadaceae	0	5	UPL	P-FORB
Asclepias tuberosa ssp. *interior*	Butterflyweed	Asclepiadaceae	5	5	UPL	P-FORB
Asclepias verticillata	Whorled Milkweed	Asclepiadaceae	1	5	UPL	P-FORB
Aster cordifolius	Heart-leaved Aster	Asteraceae	6	5	UPL	P-FORB
Aster drummondii	Drummond's Aster	Asteraceae	3	3	FACU	P-FORB
Aster ericoides	Heath Aster	Asteraceae	4	4	FACU-	P-FORB
Aster firmus	Shining Aster	Asteraceae	5	-5	OBL	P-FORB
Aster lanceolatus	Panicled Aster	Asteraceae	3	-3	FACW	P-FORB
Aster lateriflorus	Side-flowering Aster	Asteraceae	2	-2	FACW-	P-FORB
Aster novae-angliae	New England Aster	Asteraceae	4	-3	FACW	P-FORB
Aster ontarionis	Ontario Aster	Asteraceae	4	0	FAC	P-FORB
Aster oolentangiensis	Sky-blue Aster	Asteraceae	7	5	UPL	P-FORB
Aster pilosus	Hairy Aster	Asteraceae	0	3	FACU+	P-FORB
Aster praealtus	Willow Aster	Asteraceae	4	-5	OBL	P-FORB
Aster puniceus	Swamp Aster	Asteraceae	7	-5	OBL	P-FORB

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Aster sagittifolius	Arrow-leaved Aster	Asteraceae	4	5	UPL	P-FORB
Atriplex patula	Spear Scale	Chenopodiaceae	*	2	FACU+	A-FORB
Avena sativa	Oats	Poaceae	*	5	UPL	A-GRASS
Baptisia alba	White Wild Indigo	Fabaceae	6	3	FACU	P-FORB
Baptisia bracteata	Cream Wild-indigo	Fabaceae	0	5	UPL	P-FORB
Barbarea vulgaris	Winter Cress	Brassicaceae	*	0	FAC	B-FORB
Bidens cernua	Nodding Bur Marigold	Asteraceae	2	-5	OBL	A-FORB
Bidens connata	Purple-stemmed Tickseed	Asteraceae	2	-5	OBL	A-FORB
Bidens frondosa	Common Beggar's Ticks	Asteraceae	1	-3	FACW	A-FORB
Boehmeria cylindrica	False Nettle	Urticaceae	3	-5	OBL	P-FORB
Bolboschoenus fluviatilis	River Bulrush	Cyperaceae	3	-5	OBL	P-SEDGE
Botrychium dissectum	Cut-leaved Grape Fern	Ophioglossaceae	6	0	FAC	FERN
Botrychium virginianum	Rattlesnake Fern	Ophioglossaceae	4	3	FACU	FERN
Brassica sp.	Brassica	Brassicaceae	*	5	UPL	A-FORB
Bromus commutatus	Brome	Poaceae	*	5	UPL	A-GRASS
Bromus inermis	Awnless Brome Grass	Poaceae	*	5	UPL	P-GRASS
Bromus japonicus	Japanese chess	Poaceae	*	3	FACU	A-GRASS
Bromus kalmii	Prairie Brome	Poaceae	10	0	FAC	P-GRASS
Calamagrostis canadensis	Bluejoint Grass	Poaceae	3	-5	OBL	P-GRASS
Caltha palustris	Marsh Marigold	Ranunculaceae	7	-5	OBL	P-FORB
Calystegia sepium	Hedge Bindweed	Convolvulaceae	1	0	FAC	P-FORB
Carduus nutans	Nodding Thistle	Asteraceae	*	5	UPL	B-FORB
Carex atherodes	Hairy-leaved Lake Sedge	Cyperaceae	6	-5	OBL	P-SEDGE
Carex blanda	Common Wood Sedge	Cyperaceae	2	0	FAC	P-SEDGE
Carex brachyglossa	Small Yellow Fox Sedge	Cyperaceae	3	-3	FACW	P-SEDGE
Carex brevior	Plains Oval Sedge	Cyperaceae	4	0	FAC	P-SEDGE
Carex buxbaumii	Buxbaum's Sedge	Cyperaceae	9	-5	OBL	P-SEDGE
Carex comosa	Bristly Sedge	Cyperaceae	6	-5	OBL	P-SEDGE
Carex cristatella	Crested Oval Sedge	Cyperaceae	3	-4	FACW+	P-SEDGE
Carex granularis	Pale Sedge	Cyperaceae	2	-4	FACW+	P-SEDGE
Carex grisea	Wood Gray Sedge	Cyperaceae	3	5	UPL	P-SEDGE
Carex haydenii	Long-scaled Tussock Sedge	Cyperaceae	7	-5	OBL	P-SEDGE
Carex hirsutella	Hairy Green Sedge	Cyperaceae	5	4	FACU-	P-SEDGE
Carex lacustris	Common Lake Sedge	Cyperaceae	6	-5	OBL	P-SEDGE
Carex lasiocarpa var. *americana*	Narrow-leaved Woolly Sedge	Cyperaceae	10	-5	OBL	P-SEDGE
Carex laxiflora	Beech Wood Sedge	Cyperaceae	10	0	FAC	P-SEDGE
Carex molesta	Field Oval Sedge	Cyperaceae	2	0	FAC	P-SEDGE
Carex normalis	Spreading Oval Sedge	Cyperaceae				
Carex pellita	Wooly Sedge	Cyperaceae	4	-5	OBL	P-SEDGE
Carex pensylvanica	Pennsylvania Oak Sedge	Cyperaceae	5	5	UPL	P-SEDGE
Carex radiata	Star Sedge	Cyperaceae	5	5	UPL	P-SEDGE
Carex sartwellii	Running Marsh Sedge	Cyperaceae	5	-5	OBL	P-SEDGE
Carex stipata	Common Fox Sedge	Cyperaceae	2	-5	OBL	P-SEDGE
Carex stricta	Common Tussock Sedge	Cyperaceae	5	-5	OBL	P-SEDGE
Carex tenera	Narrow-leaved Oval Sedge	Cyperaceae	5	-1	FAC+	P-SEDGE
Carex tetanica	Common Stiff Sedge	Cyperaceae	5	-3	FACW	P-SEDGE
Carex umbellata	Early Oak Sedge	Cyperaceae	6	5	UPL	P-SEDGE
Carex vulpinoidea	Brown Fox Sedge	Cyperaceae				
Castilleja coccinea	Indian Paintbrush	Scrophulariaceae	8	0	FAC	A-FORB
Celtis occidentalis	Hackberry	Ulmaceae	3	1	FAC	TREE
Centaurium pulchellum	Showy Centaury	Gentianaceae	*	4	FACU-	A-FORB
Cephalanthus occidentalis	Buttonbush	Rubiaceae	4	-5	OBL	SHRUB
Cerastium fontanum	Common Mouse-ear Chickwee	Caryophyllaceae	*	3	FACU	P-FORB
Ceratophyllum demersum	Coontail	Ceratophyllaceae	3	-5	OBL	P-FORB
Chenopodium album	Lamb's Quarters	Chenopodiaceae	*	1	FAC-	A-FORB

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Cichorium intybus	Chickory	Asteraceae	*	5	UPL	P-FORB
Cicuta maculata	Water Hemlock	Apiaceae	4	-5	OBL	B-FORB
Cinna arundinacea	Common Wood Reed	Poaceae	5	-3	FACW	P-GRASS
Circaea lutetiana	Enchanter's Nightshade	Onagraceae	2	3	FACU	P-FORB
Cirsium arvense	Field Thistle	Asteraceae	*	3	FACU	P-FORB
Cirsium discolor	Pasture Thistle	Asteraceae	3	5	UPL	B-FORB
Cirsium vulgare	Bull Thistle	Asteraceae	*	4	FACU-	B-FORB
Comandra umbellata	Bastard Toad-flax	Santalaceae	6	3	FACU	P-FORB
Convolvulus arvensis	Field Bindweed	Convolvulaceae	*	5	UPL	P-FORB
Conyza canadensis	Horseweed	Asteraceae	0	1	FAC-	A-FORB
Coreopsis palmata	Prairie Coreopsis	Asteraceae	6	5	UPL	P-FORB
Cornus alternifolia	Alternate-leaved Dogwood	Cornaceae	7	5	UPL	TREE
Cornus obliqua	Pale Dogwood	Cornaceae	4	-4	FACW+	SHRUB
Cornus racemosa	Gray Dogwood	Cornaceae	2	-2	FACW-	SHRUB
Cornus sericea	Red Osier Dogwood	Cornaceae	4	-3	FACW	SHRUB
Corylus americana	Hazelnut	Corylaceae	4	4	FACU-	SHRUB
Crataegus calpodendron	Sugar Hawthorn	Rosaceae	5	5	UPL	TREE
Crataegus coccinea	scarlet hawthorn	Rosaceae	5	5	UPL	TREE
Crataegus coccinioides	False Scarlet Hawthorn	Rosaceae	5	5	UPL	TREE
Crataegus crus-galli	Cock-spur Hawthorn	Rosaceae	2	0	FAC	TREE
Crataegus flabellata	Hawthorn	Rosaceae	5	5	UPL	TREE
Crataegus mollis	Downy Hawthorn	Rosaceae	2	-2	FACW-	TREE
Crataegus pruinosa	Frosted Hawthorn	Rosaceae	3	5	UPL	TREE
Crataegus punctata	Dotted Hawthorn	Rosaceae	2	5	UPL	TREE
Crataegus succulenta	Fleshy Hawthorn	Rosaceae	5	5	UPL	TREE
Cryptotaenia canadensis	Honewort	Apiaceae	1	0	FAC	P-FORB
Cuscuta sp.	Dodder	Cuscutaceae	~	-3	FACW	A-FORB
Dactylis glomerata	Orchard Grass	Poaceae	*	3	FACU	P-GRASS
Dalea purpurea	Purple Prairie Clover	Fabaceae	8	5	UPL	P-FORB
Danthonia spicata	Poverty Oat Grass	Poaceae	3	5	UPL	P-GRASS
Daucus carota	Queen Anne's Lace	Apiaceae	*	5	UPL	B-FORB
Desmodium canadense	Showy Tick Trefoil	Fabaceae	5	1	FAC-	P-FORB
Dianthus armeria	Deptford Pink	Caryophyllaceae	*	5	UPL	A-FORB
Dichanthelium leibergii	Leiberg's Panic Grass	Poaceae	7	2	FACU+	P-GRASS
Dichanthelium praecocius	Early White-haired Panic Gras	Poaceae	5	5	UPL	P-GRASS
Digitaria ischaemum	Smooth Crab Grass	Poaceae	*	3	FACU	A-GRASS
Dipsacus laciniatus	Cut-leaved Teasel	Dipsacaceae	*	5	UPL	B-FORB
Dodecatheon meadia	Shooting Star	Primulaceae	6	3	FACU	P-FORB
Echinacea pallida	Pale Purple Coneflower	Asteraceae	7	5	UPL	P-FORB
Echinochloa crus-galli	Barnyard Grass	Poaceae	*	-3	FACW	A-GRASS
Elaeagnus angustifolia	Russian Olive	Elaeagnaceae	*	4	FACU-	SHRUB
Elaeagnus umbellata	Autumn Olive	Elaeagnaceae	*	5	UPL	SHRUB
Eleocharis erythropoda	Red-rooted Spike Rush	Cyperaceae	3	-5	OBL	P-SEDGE
Eleusine indica	Crowfoot Grass	Poaceae	*	3	FACU	A-GRASS
Elymus trachycaulus	Bearded Wheat Grass	Poaceae	8	0	FAC	P-GRASS
Elymus virginicus	Virginia Wild Rye	Poaceae	4	-2	FACW-	P-GRASS
Elytrigia repens	Quack Grass	Poaceae	*	3	FACU	P-GRASS
Epilobium coloratum	Cinnamon Willow Herb	Onagraceae	3	-5	OBL	P-FORB
Epilobium leptophyllum	Fen Willow Herb	Onagraceae	9	-5	OBL	P-FORB
Equisetum arvense	Common Horsetail	Equisetaceae	0	0	FAC	FERN
Equisetum x ferrissii	Joliet Horsetail	Equisetaceae	2	-3	FACW	FERN
Eragrostis pectinacea	Small Love Grass	Poaceae	0	0	FAC	A-GRASS
Erechtites hieracifolia	Fireweed	Asteraceae	2	3	FACU	A-FORB
Erigeron annuus	Annual Fleabane	Asteraceae	1	1	FAC-	B-FORB
Erigeron philadelphicus	Marsh Fleabane	Asteraceae	3	-3	FACW	P-FORB

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Erigeron strigosus	Daisy Fleabane	Asteraceae	2	1	FAC-	P-FORB
Eryngium yuccifolium	Rattlesnake Master	Apiaceae	7	-1	FAC+	P-FORB
Eupatoriadelphus maculatus	Spotted Joe Pye Weed	Asteraceae	5	-5	OBL	P-FORB
Eupatorium altissimum	Tall Boneset	Asteraceae	2	3	FACU	P-FORB
Eupatorium perfoliatum	Common Boneset	Asteraceae	4	-4	FACW+	P-FORB
Eupatorium serotinum	Late Boneset	Asteraceae	1	-1	FAC+	P-FORB
Euphorbia corollata	Flowering Spurge	Euphorbiaceae	0	5	UPL	P-FORB
Euphorbia esula	Leafy Spurge	Euphorbiaceae	*	5	UPL	P-FORB
Euthamia graminifolia	Grass-leaved Goldenrod	Asteraceae	3	-2	FACW-	P-FORB
Festuca pratensis	Meadow Fescue	Poaceae	*	4	FACU-	P-GRASS
Festuca trachyphylla	Sheep Fescue	Poaceae	*	5	UPL	P-GRASS
Fragaria virginiana	Wild Strawberry	Rosaceae	2	1	FAC-	P-FORB
Frangula alnus	Glossy Buckthorn	Rhamnaceae	*	-1	FAC+	SHRUB
Fraxinus lanceolata	Green Ash	Oleaceae	2	-3	FACW	TREE
Galium obtusum	Wild Madder	Rubiaceae	5	-4	FACW+	P-FORB
Galium tinctorium	Stiff Bedstraw	Rubiaceae	6	-5	OBL	P-FORB
Galium triflorum	Sweet-scented Bedstraw	Rubiaceae	4	2	FACU+	P-FORB
Gaura biennis	Biennial Gaura	Onagraceae	2	4	FACU-	B-FORB
Gentiana alba	Pale Gentian	Gentianaceae	9	3	FACU	P-FORB
Gentiana andrewsii	Closed Gentian	Gentianaceae	7	-3	FACW	P-FORB
Gentianella quinquefolia	Stiff Gentian	Gentianaceae	0	0	FAC	A-FORB
Geranium maculatum	Wild Geranium	Geraniaceae	4	3	FACU	P-FORB
Geum aleppicum	Yellow Avens	Rosaceae	6	-1	FAC+	P-FORB
Geum canadense	White Avens	Rosaceae	2	0	FAC	P-FORB
Geum laciniatum	Rough Avens	Rosaceae	2	-3	FACW	P-FORB
Glechoma hederacea	Ground Ivy	Lamiaceae	*	3	FACU	P-FORB
Glyceria septentrionalis	Floating Manna Grass	Poaceae	6	-5	OBL	P-GRASS
Glyceria striata	Fowl Manna Grass	Poaceae	4	-5	OBL	P-GRASS
Hackelia virginiana	Stickseed	Boraginaceae	1	1	FAC-	P-FORB
Helenium autumnale	Sneezeweed	Asteraceae	3	-4	FACW+	P-FORB
Helianthus grosseserratus	Sawtooth Sunflower	Asteraceae	2	-2	FACW-	P-FORB
Helianthus hirsutus	Bristly Sunflower	Asteraceae	5	5	UPL	P-FORB
Helianthus strumosus	Pale-leaved Sunflower	Asteraceae	3	5	UPL	P-FORB
Helianthus subrhomboideus	Prairie Sunflower	Asteraceae	6	5	UPL	P-FORB
Heuchera richardsonii	Richardson Alumroot	Saxifragaceae	7	1	FAC-	P-FORB
Hieracium aurantiacum	Orange Hawkweed	Asteraceae	*	5	UPL	P-FORB
Hieracium caespitosum	Field Hawkweed	Asteraceae	*	5	UPL	P-FORB
Hieracium canadense	Canada Hawkweed	Asteraceae	5	5	UPL	P-FORB
Hieracium scabrum	Rough Hawkweed	Asteraceae	5	5	UPL	P-FORB
Hierochloe odorata	Sweet Grass	Poaceae	7	-3	FACW	P-GRASS
Hypericum perforatum	Common St. John's-wort	Hypericaceae	*	5	UPL	P-FORB
Hypericum punctatum	Spotted St. John's-wort	Hypericaceae	3	-1	FAC+	P-FORB
Hypoxis hirsuta	Yellow Star Grass	Liliaceae	6	0	FAC	P-FORB
Impatiens capensis	Spotted Touch-me-not	Balsaminaceae	2	-3	FACW	A-FORB
Ipomoea pandurata	Wild Sweet Potato	Convolvulaceae	2	3	FACU	P-FORB
Iris shrevei	Southern Blue Flag	Iridaceae	5	-5	OBL	P-FORB
Juncus dudleyi	Dudley's Rush	Juncaceae	4	0	FAC	P-FORB
Juncus interior	Inland Rush	Juncaceae	3	-1	FAC+	P-FORB
Juncus nodosus	Joint Rush	Juncaceae	6	-5	OBL	P-FORB
Juncus tenuis	Path Rush	Juncaceae	0	0	FAC	P-FORB
Juncus torreyi	Torrey's Rush	Juncaceae	3	-3	FACW	P-FORB
Juniperus virginiana	Eastern Red Cedar	Cupressaceae	1	3	FACU	TREE
Koeleria macrantha	June Grass	Poaceae	7	5	UPL	P-GRASS
Krigia biflora	False Dandelion	Asteraceae	5	3	FACU	P-FORB
Lactuca canadensis	Wild Lettuce	Asteraceae	1	2	FACU+	B-FORB

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Lactuca serriola	Prickly Lettuce	Asteraceae	*	0	FAC	B-FORB
Lathyrus palustris var. *myrtifolius*	Marsh Vetchling	Fabaceae	6	-5	OBL	P-FORB
Leersia oryzoides	Rice Cut Grass	Poaceae	3	-5	OBL	P-GRASS
Lemna minor	Small Duckweed	Lemnaceae	3	-5	OBL	A-FORB
Lemna trisulca	Forked Duckweed	Lemnaceae	8	-5	OBL	A-FORB
Lespedeza capitata	Round-headed Bush Clover	Fabaceae	4	3	FACU	P-FORB
Leucanthemum vulgare	Ox-eye Daisy	Asteraceae	*	5	UPL	P-FORB
Liatris aspera	Rough Blazing Star	Asteraceae	7	5	UPL	P-FORB
Liatris pycnostachya	Prairie Blazine Star	Asteraceae	6	1	FAC-	P-FORB
Liatris spicata	Marsh Blazing Star	Asteraceae	7	0	FAC	P-FORB
Lilium michiganense	Michigan Lily	Liliaceae	6	-1	FAC+	P-FORB
Liparis liliifolia	Purple Twayblade	Orchidaceae	4	4	FACU-	P-FORB
Liparis loeselii	Green Twayblade	Orchidaceae	4	-4	FACW+	P-FORB
Lithospermum canescens	Hoary Puccoon	Boraginaceae	6	5	UPL	P-FORB
Lobelia siphilitica	Great Blue Lobelia	Campanulaceae	4	-4	FACW+	P-FORB
Lobelia spicata	Pale Spiked Lobelia	Campanulaceae	4	0	FAC	P-FORB
Lolium multiflorum	Italian Rye Grass	Poaceae	*	5	UPL	A-GRASS
Lolium perenne	Perennial Rye Grass	Poaceae	*	3	FACU	P-GRASS
Lonicera X *bella*	Showy Fly Honeysuckle	Caprifoliaceae	*	3	FACU	SHRUB
Lotus corniculatus	Birdsfoot Trefoil	Fabaceae	*	1	FAC-	P-FORB
Ludwigia palustris var. *americana*	Marsh Purslane	Onagraceae	4	-5	OBL	P-FORB
Ludwigia polycarpa	False Loosestrife	Onagraceae	5	-5	OBL	P-FORB
Luzula multiflora	Common Wood Rush	Juncaceae	5	3	FACU	P-FORB
Lycopus americanus	Common Water Horehound	Lamiaceae	3	-5	OBL	P-FORB
Lycopus uniflorus	Nothern Bugle Weed	Lamiaceae	7	-5	OBL	P-FORB
Lysimachia quadriflora	Narrow-leaved Loosestrife	Primulaceae	8	-5	OBL	P-FORB
Lysimachia thyrsiflora	Tufted Loosestrife	Primulaceae	7	-5	OBL	P-FORB
Lythrum alatum	Winged Loosestrife	Lythraceae	5	-5	OBL	P-FORB
Lythrum salicaria	Purple Loosestrife	Lythraceae	*	-5	OBL	P-FORB
Malus ioensis	Iowa Crab	Rosaceae	3	5	UPL	TREE
Malus pumila	Apple	Rosaceae	*	5	UPL	TREE
Medicago lupulina	Black Medic	Fabaceae	*	1	FAC-	A-FORB
Melilotus albus	White Sweet Clover	Fabaceae	*	3	FACU	B-FORB
Melilotus officinalis	Yellow Sweet Clover	Fabaceae	*	3	FACU	B-FORB
Mentha arvensis var. *villosa*	Wild Mint	Lamiaceae	4	-3	FACW	P-FORB
Mimulus ringens	Monkey Flower	Scrophulariaceae	5	-5	OBL	P-FORB
Monarda fistulosa	Wild Bergamot	Lamiaceae	4	3	FACU	P-FORB
Morus alba	White Mulberry	Moraceae	*	0	FAC	TREE
Muhlenbergia frondosa	Common Satin Grass	Poaceae	3	-3	FACW	P-GRASS
Muhlenbergia mexicana	Leafy Satin Grass	Poaceae	4	-3	FACW	P-GRASS
Myriophyllum heterophyllum	Various-leaved Water Milfoil	Haloragidaceae	10	-5	OBL	P-FORB
Oenothera biennis	Common Evening Primrose	Onagraceae	1	3	FACU	B-FORB
Oenothera perennis	Small Sundrops	Onagraceae	8	0	FAC	P-FORB
Oenothera pilosella	Prairie Sundrops	Onagraceae	6	1	FAC-	P-FORB
Oligoneuron riddellii	Riddell's Goldenrod	Asteraceae	7	-5	OBL	P-FORB
Oligoneuron rigidum	Rigid Goldenrod	Asteraceae	4	4	FACU-	P-FORB
Onoclea sensibilis	Sensitive Fern	Aspleniaceae	5	-3	FACW	FERN
Osmorhiza claytonii	Hairy Sweet Cicely	Apiaceae	3	4	FACU-	P-FORB
Oxalis fontana	Common Wood Sorrel	Oxalidaceae	0	3	FACU	P-FORB
Oxalis violacea	Violet Wood Sorrel	Oxalidaceae	5	5	UPL	P-FORB
Oxypolis rigidior	Cowbane	Apiaceae	7	-5	OBL	P-FORB
Panicum capillare	Old Witch Grass	Poaceae	0	0	FAC	A-GRASS
Panicum virgatum	Prairie Switch Grass	Poaceae	4	-1	FAC+	P-GRASS

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Parthenium integrifolium	Wild Quinine	Asteraceae	8	5	UPL	P-FORB
Parthenocissus quinquefolia	Virginia Creeper	Vitaceae	2	1	FAC-	W-VINE
Pedicularis canadensis	Wood Betony	Scrophulariaceae	7	2	FACU+	P-FORB
Pedicularis lanceolata	Fen Betony	Scrophulariaceae	9	-4	FACW+	P-FORB
Penstemon calycosus	Smooth Beard Tongue	Scrophulariaceae	3	3	FACU	P-FORB
Penstemon digitalis	Foxglove Beard Tongue	Scrophulariaceae	4	1	FAC-	P-FORB
Penthorum sedoides	Ditch Stonecrop	Saxifragaceae	2	-5	OBL	P-FORB
Persicaria amphibium	Water Knotweed	Polygonaceae	3	-5	OBL	P-FORB
Persicaria cespitosa	Creeping Smartweed	Polygonaceae	*	5	UPL	A-FORB
Persicaria hydropiperoides	Mild Water Pepper	Polygonaceae	4	-5	OBL	P-FORB
Persicaria punctata	Smartweed	Polygonaceae	3	-5	OBL	A-FORB
Persicaria vulgaris	Lady's Thumb	Polygonaceae	*	-3	FACW	A-FORB
Phalaris arundinacea	Reed Canary Grass	Poaceae	*	-4	FACW+	P-GRASS
Phleum pratense	Timothy	Poaceae	*	3	FACU	P-GRASS
Phlox glaberrima ssp. *interior*	Smooth Phlox	Polemoniaceae	6	-3	FACW	P-FORB
Phlox pilosa	Prairie Phlox	Polemoniaceae	7	1	FAC-	P-FORB
Phragmites australis	Common Reed	Poaceae	*	-4	FACW+	P-GRASS
Phryma leptostachya	Lopseed	Phrymaceae	4	5	UPL	P-FORB
Physalis heterophylla	Clammy Ground Cherry	Solanaceae	2	5	UPL	P-FORB
Physalis pubescens	Hairy Ground Cherry	Solanaceae	3	5	UPL	A-FORB
Physalis subglabrata	Smooth Ground Cherry	Solanaceae	0	5	UPL	P-FORB
Plantago rugelii	Red-stalked Plantain	Plantaginaceae	0	0	FAC	A-FORB
Platanthera sp.	Orchid	Orchidaceae	native	~	~	P-FORB
Poa bulbosa	Bulbous Blue Grass	Poaceae	*	5	UPL	P-GRASS
Poa compressa	Canadian Blue Grass	Poaceae	*	2	FACU+	P-GRASS
Poa palustris	Fowl Blue Grass	Poaceae	7	-4	FACW	P-GRASS
Poa pratensis	Kentucky Blue Grass	Poaceae	*	1	FAC-	P-GRASS
Poa trivialis	Meadow Grass	Poaceae	*	-3	FACW	P-GRASS
Podophyllum peltatum	Mayapple	Berberidaceae	4	3	FACU	P-FORB
Polygala verticillata	Whorled Milkwort	Polygalaceae	9	5	UPL	A-FORB
Polygonatum commutatum	Great Solomon Seal	Liliaceae	4	3	FACU	P-FORB
Polygonum arenastrum	Prostrate Knotweed	Polygonaceae	*	5	UPL	A-FORB
Populus deltoides	Eastern Cottonwood	Salicaceae	2	-1	FAC+	TREE
Populus tremuloides	Quaking Aspen	Salicaceae	3	0	FAC	TREE
Portulaca oleracea	Purslane	Portulacaceae	*	1	FAC-	A-FORB
Potamogeton foliosus	Leafy Pondweed	Potamogetonacea	5	-5	OBL	P-FORB
Potentilla arguta	Prairie Cinquefoil	Rosaceae	10	4	FACU-	P-FORB
Potentilla norvegica	Rough Cinquefoil	Rosaceae	0	0	FAC	A-FORB
Potentilla recta	Sulfur Cinquefoil	Rosaceae	*	5	UPL	P-FORB
Potentilla simplex	Common Cinquefoil	Rosaceae	3	4	FACU-	P-FORB
Prenanthes aspera	Rough White Lettuce	Asteraceae	8	5	UPL	P-FORB
Prenanthes racemosa	Glaucous White Lettuce	Asteraceae	8	-3	FACW	P-FORB
Proserpinaca palustris	Mermaid Weed	Haloragidaceae	5	-5	OBL	P-FORB
Prunella vulgaris var. *elongata*	Self-heal	Lamiaceae	1	0	FAC	P-FORB
Prunus americana	Wild Plum	Rosaceae	3	5	UPL	TREE
Prunus serotina	Wild Black Cherry	Rosaceae	1	3	FACU	TREE
Prunus virginiana	Common Chokecherry	Rosaceae	3	1	FAC-	SHRUB
Pycnanthemum pilosum	Hairy Mountain Mint	Lamiaceae	6	5	UPL	P-FORB
Pycnanthemum tenuifolium	Slender Mountain Mint	Lamiaceae	4	0	FAC	P-FORB
Pycnanthemum virginianum	Common Mountain Mint	Lamiaceae	5	-4	FACW+	P-FORB
Pyrus calleryana	Ornamental Pear	Rosaceae	*	5	UPL	TREE
Quercus macrocarpa	Bur Oak	Fagaceae	5	1	FAC-	TREE
Quercus palustris	Pin Oak	Fagaceae	4	-3	FACW	TREE
Quercus rubra	Northern Red Oak	Fagaceae	5	3	FACU	TREE
Quercus velutina	Black Oak	Fagaceae	5	5	UPL	TREE

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Ranunculus abortivus	Little-leaf Buttercup	Ranunculaceae	1	-2	FACW-	A-FORB
Ranunculus flabellaris	Yellow Water Buttercup	Ranunculaceae	6	-5	OBL	P-FORB
Ranunculus longirostris	White Water Crowfoot	Ranunculaceae	6	-5	OBL	P-FORB
Ranunculus recurvatus	Hooked Buttercup	Ranunculaceae	5	-3	FACW	A-FORB
Ranunculus sceleratus	Cursed Crowfoot	Ranunculaceae	3	-5	OBL	A-FORB
Ratibida pinnata	Yellow Coneflower	Asteraceae	4	5	UPL	P-FORB
Rhamnus cathartica	Common Buckthorn	Rhamnaceae	*	3	FACU	SHRUB
Rhus copallina	Winged Sumac	Anacardiaceae	3	5	UPL	SHRUB
Rhus glabra	Smooth Sumac	Anacardiaceae	1	5	UPL	SHRUB
Rhus hirta	Staghorn Sumac	Anacardiaceae	2	5	UPL	SHRUB
Ribes americanum	Wild Black Current	Grossulariaceae	5	-3	FACW	SHRUB
Rorippa palustris var. *fernaldiana*	Marsh Yellow Cress	Brassicaceae	4	-5	OBL	A-FORB
Rosa blanda	Early Wild Rose	Rosaceae	4	3	FACU	SHRUB
Rosa carolina	Pasture Rose	Rosaceae	4	4	FACU-	SHRUB
Rosa multiflora	Multiflora Rose	Rosaceae	*	3	FACU	SHRUB
Rosa setigera	Prairie Rose	Rosaceae	5	2	FACU+	SHRUB
Rubus flagellaris	Common Dewberry	Rosaceae	2	4	FACU-	SHRUB
Rubus idaeus	Cultivated Raspberry	Rosaceae	*	2	FACU	SHRUB
Rubus occidentalis	Black Raspberry	Rosaceae	2	5	UPL	SHRUB
Rubus pensilvanicus	Yankee Blackberry	Rosaceae	2	1	FAC-	SHRUB
Rubus strigosus	Red Raspberry	Rosaceae	6	-2	FACW-	P-FORB
Rudbeckia hirta	Black-eyed Susan	Asteraceae	2	3	FACU	P-FORB
Rudbeckia subtomentosa	Sweet Black-eyed Susan	Asteraceae	5	-3	FACW	P-FORB
Rumex altissimus	Pale Dock	Polygonaceae	2	-2	FACW-	P-FORB
Rumex crispus	Curly Dock	Polygonaceae	*	-1	FAC+	P-FORB
Rumex sp. (*vert./orbiculatus*)	Dock	Polygonaceae	native	~	~	P-FORB
Sagittaria latifolia	Common Arrowleaf	Alismataceae	4	-5	OBL	P-FORB
Salix alba	White Willow	Salicaceae	*	-3	FACW	TREE
Salix discolor	Pussy Willow	Salicaceae	4	-3	FACW	SHRUB
Salix fragilis	Crack Willow	Salicaceae	*	-1	FAC+	TREE
Salix interior	Sandbar Willow	Salicaceae	1	-5	OBL	SHRUB
Salix petiolaris	Meadow Willow	Salicaceae	6	-5	OBL	SHRUB
Salix rigida	Heart-leaved Willow	Salicaceae	5	-4	FACW+	SHRUB
Salix x rubens	Hybrid Crack Willow	Salicaceae	*	5	UPL	TREE
Sambucus canadensis	Common Elderberry	Caprifoliaceae	2	-2	FACW	SHRUB
Sanicula canadensis	Canadian Black Snakeroot	Apiaceae	4	2	FACU+	B-FORB
Sanicula marilandica	Black Snakeroot	Apiaceae	6	5	UPL	P-FORB
Sanicula odorata	Clustered Snakeroot	Apiaceae	2	-1	FAC+	P-FORB
Schizachyrium scoparium	Little Bluestem	Poaceae	5	4	FACU-	P-GRASS
Schoenoplectus acutus	Hard-stemmed Bulrush	Cyperaceae	6	-5	OBL	P-SEDGE
Schoenoplectus tabernaemontani	Soft-stem Bulrush	Cyperaceae	4	-5	OBL	P-SEDGE
Scirpus atrovirens	Dark Green Rush	Cyperaceae	4	-5	OBL	P-SEDGE
Scirpus cyperinus	Wool Grass	Cyperaceae	5	-5	OBL	P-SEDGE
Scirpus pendulus	Red Bulrush	Cyperaceae	3	-5	OBL	P-SEDGE
Scutellaria galericulata	Marsh Skullcap	Lamiaceae	6	-5	OBL	P-FORB
Scutellaria lateriflora	Mad-dog Skullcap	Lamiaceae	4	-5	OBL	P-FORB
Scutellaria leonardii	Small Skullcap	Lamiaceae	5	3	FACU	P-FORB
Senecio aureus	Golden Ragwort	Asteraceae	4	-3	FACW	P-FORB
Senecio pauperculus	Balsam Ragwort	Asteraceae	3	-1	FAC+	P-FORB
Senecio vulgaris	Common Groundsel	Asteraceae	*	5	UPL	A-FORB
Setaria faberi	Giant Foxtail	Poaceae	*	2	FACU+	A-GRASS
Setaria glauca	Yellow Foxtail	Poaceae	*	0	FAC	A-GRASS
Silene pratensis	White Campion	Caryophyllaceae	*	5	UPL	A-FORB
Silphium integrifolium	Rosin Weed	Asteraceae	5	5	UPL	P-FORB

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Silphium laciniatum	Compass Plant	Asteraceae	5	4	FACU-	P-FORB
Silphium terebinthinaceum	Prairie Dock	Asteraceae	4	1	FAC-	P-FORB
Sisymbrium officinale	Hedge Mustard	Brassicaceae	*	5	UPL	A-FORB
Sisyrinchium albidum	Common Blue-eyed Grass	Iridaceae	4	3	FACU	P-FORB
Sisyrinchium campestre	Prairie Blue-eyed Grass	Iridaceae	6	5	UPL	P-FORB
Sium suave	Water Parsnip	Apiaceae	5	-5	OBL	P-FORB
Smilacina stellata	Starry False Solomon Seal	Liliaceae	5	1	FAC-	P-FORB
Smilax ecirrhata	Upright Carrion Flower	Smilacaceae	5	5	UPL	P-FORB
Smilax lasioneuron	Common Carrion Flower	Smilacaceae	4	5	UPL	H-VINE
Solanum dulcamara	Bittersweet Nightshade	Solanaceae	*	0	FAC	W-VINE
Solanum ptychanthum	Black Nightshade	Solanaceae	0	4	FACU-	A-FORB
Solidago canadensis	Canada Goldenrod	Asteraceae	1	3	FACU	P-FORB
Solidago gigantea	Late Goldenrod	Asteraceae	3	-3	FACW	P-FORB
Solidago juncea	Early Goldenrod	Asteraceae	4	5	UPL	P-FORB
Solidago missouriensis	Missouri Goldenrod	Asteraceae	4	5	UPL	P-FORB
Solidago nemoralis	Old Field Goldenrod	Asteraceae	3	5	UPL	P-FORB
Sonchus arvensis	Field Sow Thistle	Asteraceae	*	1	FAC-	P-FORB
Sonchus asper	Prickly Sow Thistle	Asteraceae	*	0	FAC	A-FORB
Sonchus oleraceus	Common Sow Thistle	Asteraceae	*	3	FACU	A-FORB
Sorghastrum nutans	Indian Grass	Poaceae	4	2	FACU+	P-GRASS
Sparganium eurycarpum	Common Bur Reed	Sparganiaceae	5	-5	OBL	P-FORB
Spartina pectinata	Prairie Cord Grass	Poaceae	4	-4	FACW+	P-GRASS
Sphenopholis intermedia	Slender Wedge Grass	Poaceae	5	0	FAC	P-GRASS
Spiraea alba	Meadowsweet	Rosaceae	6	-4	FACW+	SHRUB
Spiranthes cernua	Nodding Ladies' Tresses	Orchidaceae	4	-2	FACW-	P-FORB
Spiranthes magnicamporum	Great Plaines Ladies' Tresses	Orchidaceae	9	-3	FACW	P-FORB
Sporobolus compositus	Rough Dropseed	Poaceae	3	5	UPL	P-GRASS
Sporobolus heterolepis	Northern Drop Seed	Poaceae	9	4	FACU-	P-GRASS
Stachys hispida	Marsh Hedge Nettle	Lamiaceae	5	-5	OBL	P-FORB
Stachys pilosa var. *homotricha*	Woundwort	Lamiaceae	5	-5	OBL	P-FORB
Stellaria media	Common Chickweed	Caryophyllaceae	*	3	FACU	A-FORB
Taraxacum officinale	Common Dandelion	Asteraceae	*	3	FACU	P-FORB
Thalictrum dasycarpum	Purple Meadow Rue	Ranunculaceae	5	-2	FACW-	P-FORB
Thalictrum revolutum	Waxy Meadow Rue	Ranunculaceae	5	0	FAC	P-FORB
Thelypteris palustris	Marsh Fern	Thelypteridaceae	0	-4	FACW+	FERN
Toxicodendron radicans	Poison Ivy	Anacardiaceae	1	-1	FAC+	W-VINE
Tradescantia ohiensis	Common Spiderwort	Commelinaceae	3	2	FACU+	P-FORB
Tridens flavus	Common Purpletop	Poaceae	1	5	UPL	P-GRASS
Trifolium hybridum	Alsike Clover	Fabaceae	*	1	FAC-	P-FORB
Trifolium pratense	Red Clover	Fabaceae	*	2	FACU+	P-FORB
Trifolium repens	White Clover	Fabaceae	*	2	FACU+	P-FORB
Trillium recurvatum	Red Trillium	Liliaceae	5	4	FACU-	P-FORB
Triosteum aurantiacum	Early Horse Gentian	Caprifoliaceae	5	5	UPL	P-FORB
Triosteum perfoliatum	Late Horse Gentian	Caprifoliaceae	5	5	UPL	P-FORB
Triticum aestivum	Wheat	Poaceae	*	5	UPL	A-GRASS
Typha angustifolia	Narrow-leaved Cattail	Typhaceae	*	-5	OBL	P-FORB
Typha latifolia	Broad-leaved Cattail	Typhaceae	1	-5	OBL	P-FORB
Ulmus americana	American Elm	Ulmaceae	5	-2	FACW-	TREE
Ulmus rubra	Slippery Elm	Ulmaceae	3	0	FAC	TREE
Urtica gracilis	Stinging Nettle	Urticaceae	2	-1	FAC+	P-FORB
Utricularia gibba	Humped Bladderwort	Lentibulariaceae	7	-5	OBL	P-FORB
Utricularia macrorhiza	Common Bladderwort	Lentibulariaceae	6	-5	OBL	P-FORB
Valeriana officinalis	Garden Heliotrope	Valerianaceae	*	-4	FACW+	P-FORB
Verbascum thapsus	Woolly Mullein	Scrophulariaceae	*	5	UPL	B-FORB
Verbena hastata	Blue Vervain	Verbenaceae	3	-4	FACW+	P-FORB

Scientific Name	Common Name	Family	CC	CW	Wetness	Physiognomy
Vernonia fasciculata	Common Ironweed	Asteraceae	5	-3	FACW	P-FORB
Veronica scutellata	Marsh Speedwell	Scrophulariaceae	9	-5	OBL	P-FORB
Veronica serpyllifolia	Thyme-leaved Speedwell	Scrophulariaceae	*	-3	FACW	P-FORB
Veronicastrum virginicum	Culver's Root	Scrophulariaceae	6	0	FAC	P-FORB
Viburnum lantana	Wayfaring Tree	Caprifoliaceae	*	5	UPL	SHRUB
Viburnum lentago	Nannyberry	Caprifoliaceae	4	-1	FAC+	SHRUB
Viburnum opulus	European High-bush Cranberry	Caprifoliaceae	*	5	UPL	SHRUB
Viburnum prunifolium	Black Haw	Caprifoliaceae	4	3	FACU	SHRUB
Viburnum recognitum	Smooth Arrowwood	Caprifoliaceae	6	-2	FACW-	SHRUB
Vicia americana	American Vetch	Fabaceae	6	0	NI	P-FORB
Viola affinis	Woodland Blue Violet	Violaceae	2	0	FAC	P-FORB
Viola missouriensis	Missouri Violet	Violaceae	4	-3	FACW	P-FORB
Viola pedatifida	Prairie Violet	Violaceae	9	4	FACU-	P-FORB
Viola pratincola	Common Blue Violet	Violaceae	1	0	FAC	P-FORB
Viola sororia	Woolly Blue Violet	Violaceae	3	1	FAC-	P-FORB
Vitis riparia	Riverbank Grape	Vitaceae	2	-2	FACW-	W-VINE
Zanthoxylum americanum	Prickly Ash	Rutaceae	4	5	UPL	SHRUB
Zizia aptera	Heart-leaved Meadow Parsnip	Apiaceae	9	3	FACU	P-FORB
Zizia aurea	Golden Alexanders	Apiaceae	6	-1	FAC+	P-FORB

Native Species # - 356
Non-Native Species # - 95
Total Species - 451