Title: **A Comparison of Extant Vegetation to the Soil Seed Bank in the Natural Lands Section of the Morris Arboretum**

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Abstract:

Current management goals of the natural lands section of the Morris Arboretum revolve heavily around invasive species control. One of the most prolific invaders is reed canarygrass (*Phalaris arundinacea*), a cool season perennial grass. Reed canarygrass has formed a dense stand in a section of the meadow that experiences seasonal inundation of Wissahickon Creek flood waters and is occurring in adjacent areas within the floodplain meadow. Heavy seeding and planting with natives is recommended following removal of *P. arundinacea* to prevent re-establishment through competition (Wisconsin Reed Canary Grass Management Working Group, 2009).

This project seeks to quantify and compare the species composition of the extant vegetation and the soil seed bank to assess environmental sources of native viable propagules for restoration. Species richness and relative percent cover were measured in plots placed in both the reed canarygrass dominated and adjacent uninvaded areas in the floodplain as well as the sloping upland section of meadow. Associated soil cores were collected at 5-cm depth increments to 15-cm, cold stratified, and assayed for viable seed in a controlled greenhouse. Viable seed reduced with depth in the soil column. Seed samples from the reed canarygrass section of the meadow exhibited higher species richness than the associated extant vegetation and canarygrass seedling abundance reduced with depth. This data on the composition of the soil seed bank are integral to developing appropriate management actions designed to promote target restoration species while controlling invasives.

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INTRODUCTION

An overarching ecological goal of the natural lands section west of Northwestern Avenue at the Morris Arboretum is to increase biodiversity of flora and fauna. Current management strategies geared to meeting this goal revolve heavily around invasive species control. *Phragmites australis, Typha spp., Phalaris arundinacea,Gallega officinalis,* and *Cirsium arvense* are the predominant invaders in the meadows, where they out compete native plants and alter wildlife habitat. Roughly 2.5-acres of the floodplain meadow are invaded by *P. arundinacea*. This cool season perennial grass invades using "phalanx strategy, where tillers mass into an impenetrable clone expanding over short distances, [and]…a guerilla strategy, where the parent plant forms long rhizomes and new tillers emerge at a distance from the parent clone (Wisconsin Reed Canary Grass Management Working Group, 2009)." These strategies are successful at competing with native and non-native species, which leads to reduced floral biodiversity; the result is a dense stand of *P. arundinacea* with very few associated species. Decrease in plant species diversity is generally acknowledged to result in decreased habitat diversity for wildlife.

Heavy seeding and planting with natives is recommended following removal of *P. arundinacea* to prevent re-establishment through competition (Wisconsin Reed Canary Grass Management Working Group, 2009). Seeding is not currently employed in the natural lands section due to budgetary and resource limitations, leaving the seed bank as the source of regeneration controlled areas (T. Beerly, 2012). Because the invaded areas have been dominated by *P. arundinacea* for an extended period, it is difficult to infer the species composition of the seed bank. Determining the contents of the soil seed bank could inform management decisions intended to promote germination and establishment of target species (Bossuyt & Honnay, 2008).

There is little documented information on the plant species currently inhabiting the natural lands section. A thorough species inventory will provide a baseline of the current status of the plant community, giving managers insight into the vegetative resources the area possesses. This project provides a list of extant and seed bank species occurring in three areas of the natural lands section and their associated seed bank—comparing areas heavily dominated by invasive *P. arundinacea* with those in which a more diverse assemblage of species occurs. These areas, mapped in Appendix A, are defined as the upland sheep meadow, the floodplain entrance meadow (south-west of the entry driveway), and the floodplain grass meadow (dominated by *P. arundinacea*). In addition, I compiled a specimen reference collection and a photo documentation file of seedlings from each species in the seed bank. These resources will be available at the Morris Arboretum herbarium and on the staff shared drive, respectively, with the intended goal that target species will be more easily identifiable at an early developmental stage by Arboretum section leaders.

A.G. van der Valk and R.L. Pederson state "Vegetation management, based on the exploitation of seed banks, will be successful only when (1) the seeds of the required or preferred species are present in the seed bank, (2) the seeds of unwanted species are not present or, at least, are uncommon, and (3) conditions suitable for the germination of the seeds of preferred species can be established and maintained (Leck et. Al, 1989). When these conditions are met, using knowledge of germination requirements, managers have been able to successfully create conditions selecting for target species or against undesirables. The data produced in this paper is aimed to establish the composition of the soil seed bank, and associated extant propagule sources, for use by current and future managers. I designed this project to answer three primary research questions: 1) is species composition of the soil seed bank similar to that of the respective extant vegetation? 2) does species richness in the soil seed bank change with depth? 3) is there a source of native plant propagules in the *Phalaris* dominated area of the natural lands section?

METHODS

Site Description

Three areas of the meadow were selected, based on an informal survey, for apparent diversity of vegetation with the intent of selecting for the highest species richness and a more inclusive species inventory. Two sites were selected within the floodplain of the Wissahickon Creek and one was selected on an adjacent upland slope. Both of the floodplain sites receive annual floodwater inundation that provides a source of flood dispersed seed and vegetative propagules. The floodplain grass meadow (FG) plots lie nearest to Wissahickon Creek, between the wetland pond to the west and Papermill Run to the east. This section is dominated by a relatively homogenous stand of *Phalaris arundinacea* and *Urtica dioica*. The floodplain entrance meadow plots (FH) are located south of the Arboretum's entrance driveway and west of Papermill Run. The plots were placed deliberately with the intent of including both the lowest cover of *P. arundinacea* and highest number of patches of differing dominant species, suggesting a comparable reference condition of a meadow not receiving *P. arundinacea* seed rain. One plot is dominated by *Solidago spp* and *Rubus pennsylvanica*, another by *Carex spp* and *Juncus tenuis*, and another by *Artemesia vulgaris* and *Apocynum canabinum*. To include further species composition comparison, the upland sheep meadow (UH) plots were placed on the north-west facing slope above the floodplain, north of the section of driveway directly below the magnolia slope.

Survey of Extant Vegetation

The respective areas of the natural lands section were surveyed within 3 100-m^2 square plots delineated with flagged fence posts. The plots were gridded into 100 quadrats of which 12 were randomly selected for data collection. The northern most quadrat was noted as the origin with a value of 1-A. Each quadrat was sampled once in July and August of 2012 and again in May 2013 for species richness, composition, and total percent canopy cover of each species. Species identification and verification assistance was provided by Arboretum senior botanist Ann Rhoads. Vegetative propagules of *Rununculus ficaria,* which does not reproduce by seed, were not measured for canopy cover but were surveyed as present or absent in the summer and propagule abundance was measured during the seed bank assay. A specimen of each identified species growing with the plots was pressed, mounted, entered into the Flora of Pennsylvania database, and will be filed in the Morris Arboretum herbarium as a reference collection of the natural lands section flora.

Soil Seed Bank Assay

Species richness, composition, and abundance of the soil seed bank was quantified by performing a soil seed bank assay. Soil cores were collected from each extant vegetation survey plot following late season seed dispersal in October, 2012. I extracted the cores using a 6-cm diameter tulip bulb planter to a depth of 15-cm. Each core was separated into 3 depth increments of 0-5cm, 5-10cm, and 10-15cm from the soil surface to yield three ~150-cm^3 soil samples per quadrat. Roughly 10-mg of water was added to each soil sample before placing them into a growth chamber at 2-5°C for 72 days of cold stratification to break dormancy. The stratification period was designed to meet the dormancy breaking requirements of the greatest number of species within the time limitations (Baskin and Baskin, 1998).

Vegetative propagules were removed from the samples using a .25-cm gauge sieve. Rhizomes and *Ranunculus ficaria* tubers were counted and discarded. Each soil sample was distributed into a 4-cm by 6-cm potting tray atop 2-in of 3B potting media. The collected soil volume was pre-determined to insure no more than 1-cm of sample soil was placed in a tray so seeds would receive enough light to meet their germination requirements (Adams & Steigerwalt, 2008). Soil was watered daily and nematodes were added to manage for expected thrip larvae. Emerging seedlings were identified to most specific taxonomic level possible, photographed, vouchered as herbarium specimens, counted, recorded, and removed. Particularly prolific species were assigned a code if not identifiable; an individual was then transplanted for further development and later identification while the remaining individuals were counted and removed to reduce competition within samples. Photodocumentation of natural land section species seedlings will be compiled and deposited on the Morris Arboretum shared drive for the use and knowledge of section leaders. Standard formatting of the file name of each photograph is as follows: SPECIESCODE_ECW_DATEPHOTOGRAPHED. Species codes are consistent with the USDA plants database. Specimen vouchers of seedlings will be deposited into the Morris Arboretum herbarium as a reference collection of the natural lands section flora.

Data Analysis

Similarity of species composition between the soil and extant flora was quantified using Jaccard's Index of Similarity. The index yields a proportional value with an output of one representing the occurrence of all species in both the seed bank and extant vegetation and a value of zero signifying no species in common. The presence of species was pooled within each plot for comparison before pooling the plots into a meadow area comparison.

RESULTS

In the late winter months, the upland sheep meadow plot markers were removed during a mowing event. I replaced where I believed to be the remnant post holes with markers and based my spring extant vegetation survey on these markers. In the spring, markers in one of the floodplain entrance plots were removed and I remarked the plot using a mix of recollection, plot photographs, and the location of extant perennials recorded during the summer vegetation survey.

The potential for mis-marking the replacement plots creates additional uncertainty in the data. Total species richness, the number of species present, of the soil seed bank in the floodplain grass (FG) plots exceeded that of its extant vegetation while the seed bank richness values of the FH and UH plots were lower than their extant richness. The FH meadow area contained the greatest species richness in both the combined spring and summer extant vegetation and the soil seed bank (Figure 1).

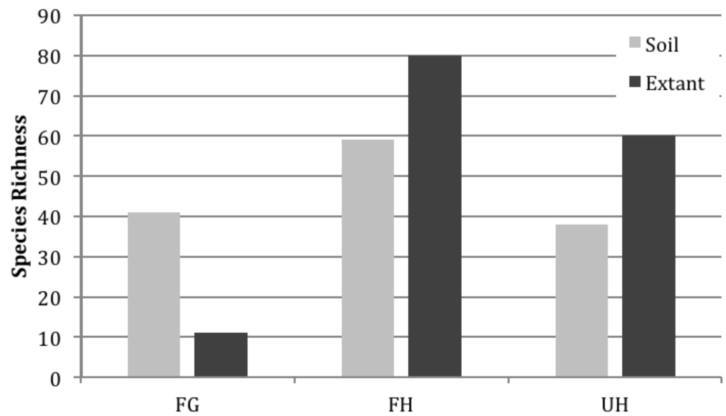

Figure1: Total Species Richness of Extant Vegetation and Seed Bank

Mean species richness of the FG seed bank was lower at each depth increment with a negative difference of one species from the surface sample to the 10-cm depth.

The FH plots yielded the highest number of total species with richness decreasing by two species with each 5-cm depth increment from the surface. The UH area seed bank richness also decreased with depth, by 3 and 2.3 species from the surface to 5-cm and 5-cm to 10-cm depths, respectively (Figure 2). Average density of germinable seed per soil sample decreased with depth in all areas of the meadow. The UH samples contained the greatest number of viable seed at the surface depth, but, germination declined at the 10-cm depth to an abundance even with that of the FH plot. The FG samples contained relatively fewer seedlings at each depth than the other two meadow areas. Each sampled community contained high variability in germinable seed abundance (Figure 3).

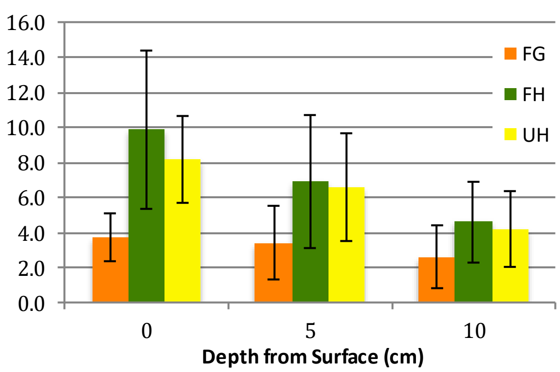

Figure 2: Mean Species Richness of Seed Bank

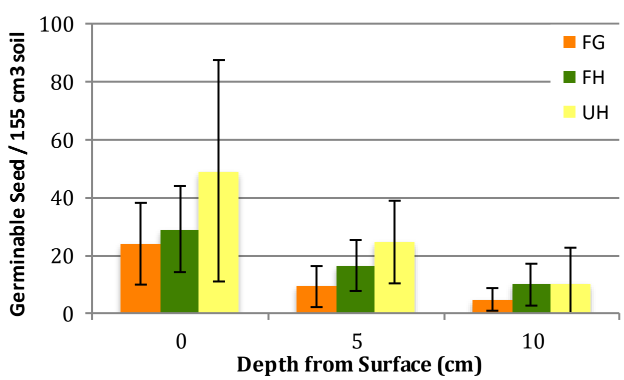

Figure 3: Mean Seed Density of Seed Bank

The effort to remove vegetative propagules through sieving the soil samples was assumed to incidentally remove large seeded species. Species producing a mean seed diameter greater than 3-mm were withheld from Jaccard's similarity comparison to reduce bias of false negative absences; in addition, *Rubus pennsylvanicus* was withheld due to unmet germination requirements. The similarity of species composition of the soil seed bank compared to the extant vegetation was lowest in in the FG plots (Figure 4). The similarity indices of the FH and UH plots were close to each other at each depth. Jaccard's similarity coefficient decreased with depth in the FH and UH sample while remaining constant in the FG sample.

Total species abundance of

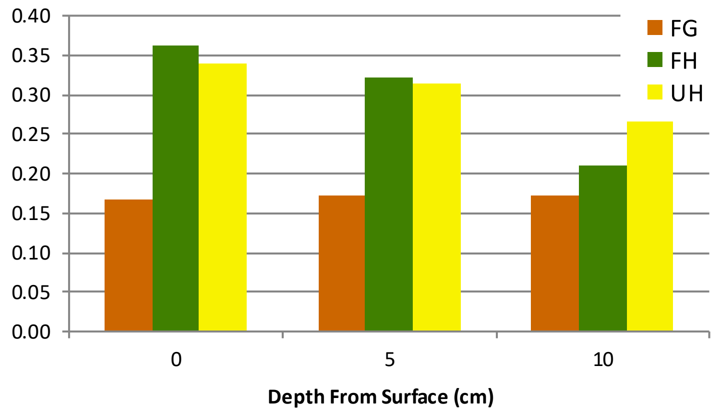

Figure 4: Jaccard's Similarity Index of Seed Bank to Extant

Sample Area	Total Germinable Seed
FG	1362
FH	1821
UH	2921

germinated seed is charted in Appendix B. Of the total 6,104 seedlings germinating from the soil seed bank samples, the UH plots contained the greatest proportion while the FG contained the fewest (Table 1). *Phalaris arundinacea*, *Oxalis stricta*, and *Solidago sp* were the most abundant taxa germinating in the FG, FH, and UH soil samples, respectively. The mean abundance of *Phalaris arundinacea* in the seed bank strongly decreased from the surface to 5-cm depth (Figure 5).

Table 1: Total Abundance of Germinable Seed

Total	6104

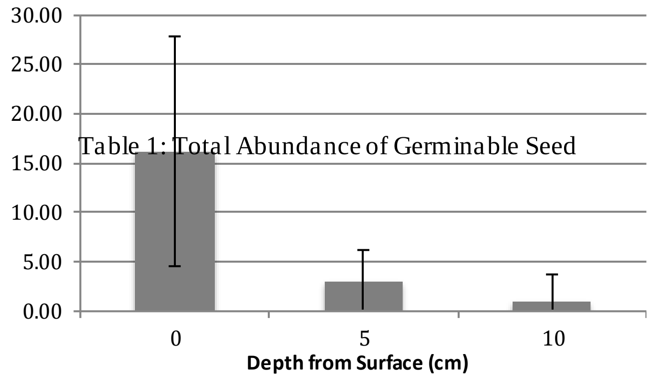

Figure 5: Mean *P. arundinacea* abundance in FG

DISCUSSION

Review of seed bank studies across European habitats has indicated that seed banks may be a tool for restorations in plant communities undergoing disturbance (Bossuy & Honnay, 2008). The Morris Arboretum natural lands section currently employs an annual mowing regime. The standing biomass, once cut, is left as duff—leaving the associated reproductive structures on site. By determining the composition and relative abundance of the soil seed bank, in comparison to the extant vegetation, one can infer the potential future composition and begin to determine whether target species are becoming established from the seed bank or if alternative management strategies are needed (Adams & Steigerwalt, 2008; Leck, 1989).

The low Jaccard similarity value for the FG plots is a result of a majority of species present in the seed bank not being present in the extant vegetation. A plant canopy and standing or fallen litter can reduce significantly, or prevent completely, the recruitment of species from the seed bank (Leck, 1989). In the FG area of the meadow, the dense canopy cover *of Phalaris arundinacea* may be contributing to the relatively low species richness expressed in the extant vegetation while a greater richness of viable seed rests in the soil. The Jaccard similarity values for the FH at depths 0-cm (.36) and 5-cm (.32) and the UH at depths 0-cm (.34) and 5-cm (.31) were comparable to earlier studies of European grasslands (Bossuyt & Honnay, 2008). The Bossuyt and Honnay study found that the Jaccard similarity values for grasslands were higher than forests.

Seeds that remain viable in the soil for one or more years are defined as comprising the persistent seed bank, while those remaining viable for less than a year comprise the transient seed bank (Baskin & Baskin, 1998). In this study, the transient seed bank is captured only in the top 5-cm of soil. The reduction in species richness with depth may be due to the loss in viability of persistent seeded species with relatively low seed longevity and species of the transient seed bank. This may also account for higher seed bank to extant similarity values near the surface.

High variability in seedling abundance was largely due to relatively few samples containing a large sum of seedlings of an individual annual species. For example, one surface sample in the UH section contained 164 individuals of *Cardamine hirsuita*.

CONCLUSIONS

The knowledge of botanical resources in a meadow can assist in projecting the trajectory of secondary succession (Bossuyt et. al., 2008). The differences between the species present in the soil seed bank to those present in the extant vegetation prohibits a manager from being able to accurately infer the composition of one based on knowledge of the other. Plots placed in the area dominated by *Phalaris arundinacea* were found to contain comparable species richness to those on the upland slope. The overwhelming abundance of this species in the seed bank allows managers to infer that there is high potential for reoccurring recruitment of *P. arundinacea* with low potential for other species. When the invader of a system has reached a saturation point, *as P. arundinacea* apparently has in this area, eradication is generally not the most feasible alternative (Callaham, 2006). While the evident decrease in biodiversity of the natural lands section in the FG reduces both the educational value for native plant identification and wildlife habitat diversity, the immense resources required to remove the *P. arundinacea* may be counter productive at this time. Energies focused on monitoring and treating patches of the grass in the FH area of the meadow may promote increased and sustained diversity of flora. If control of *P. arundinacea* is pursued in the FG area, I recommend integrating an aggressive seeding and planting strategy to promote rapid establishment of target vegetation.

Due to the effort required to provide complete and consistent results while conducting the soil seed bank assay, I was unable to spend the time necessary in the spring to conduct a complete species inventory of the natural land section. The species listed in Appendix C can augment current inventory efforts and can help to focus future surveys. A comprehensive species list is an important tool for management of an area and also provides opportunities for education. Currently, there is little information available to visitors on the contents of the natural areas meadow. Making the survey list available to the public would encourage more critical engagement with and a wider understanding of Pennsylvania’s flora.

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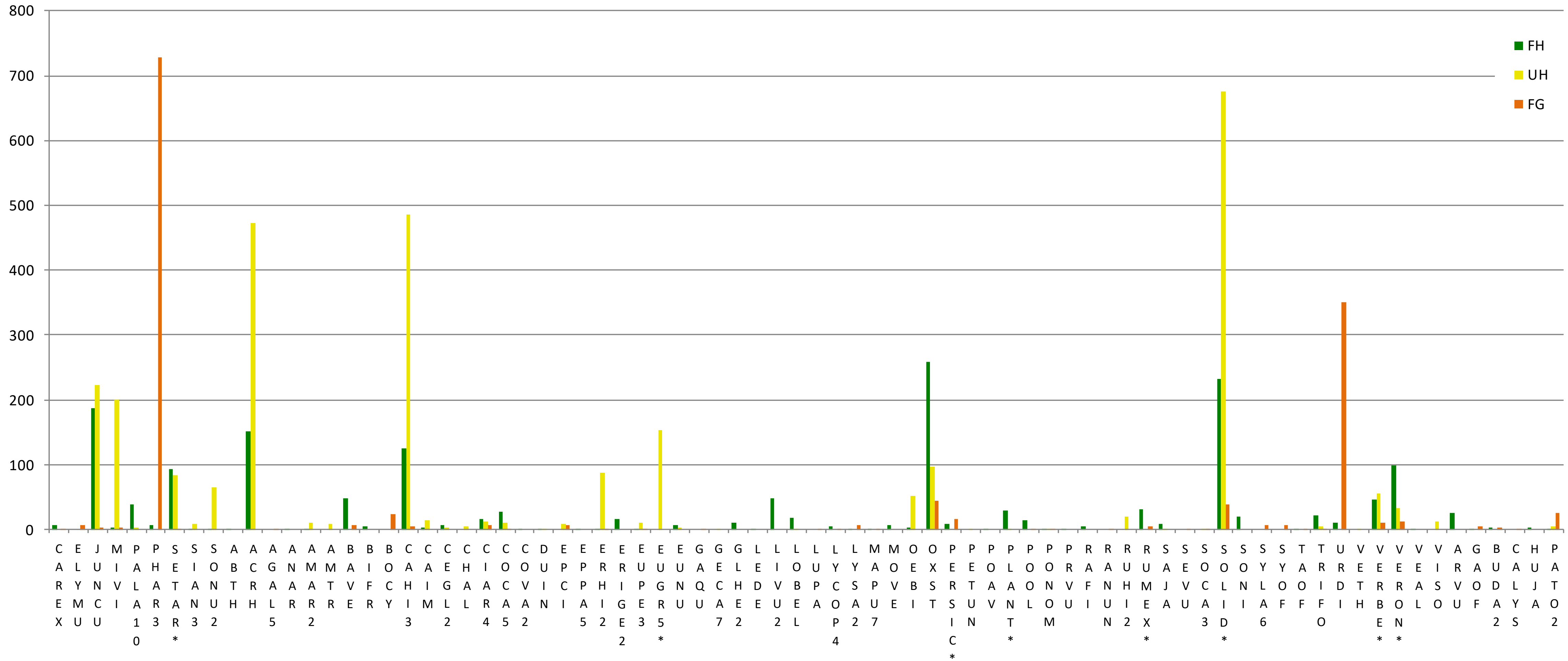
APPENDIX A:

Map of Study Sites

APPENDIX B: Species Abundance in Soil Seed Bank



APPENDIX C:
Species Compendium of Extant Vegetation

Forbs	
Symbol	**Latin Name**
ACRH	*Acalypha rhomboidea*
AGERA2	*Ageratina*
AGAL5	*Ageratina altissima*
AGGR2	*Agrimonia gryposepala*
ALPE4	*Alliaria petiolata*
ALLIU	*Allium sp*
AMAR2	*Ambrosia artemisiifolia*
AMTR	*Ambrosia trifida*
APCA	*Apocynum cannabinum*
ASINI	*Asclepias incarnata ssp. incarnata*
BAVE	*Barbarea verna*
BIFR	*Bidens frondosa*
BOCY	*Boehmeria cylindrica*
CAHI3	*Cardamine hirsuta*
CAIM	*Cardamine impatiens*
CEJA	*Centaurea jaceae*
CEGL2	*Cerastium glomeratum*
CIIN	*Cichorium intybus*
CILUC	*Circaea canadensis ssp. canadensis*
CIAR4	*Cirsium arvense*
CIDI	*Cirsium discolor*
COCO13	*Conoclinium coelestinum*
COCA5	*Conyza canadensis*
COVA2	*Coronilla varia*
DACA6	*Daucus carota*
DUIN	*Duchesnea indica*
ECLO	*Echinocystis lobata*
EPCI	*Epilobium ciliatum*
ERHI2	*Erechtites hieraciifolia*
ERST3	*Erigeron strigosus*
EUPE3	*Eupatorium perfoliatum*
EUST23	*Euphorbia serrulata*
EUGR5	*Euthamia graminifolia*
EUFI14	*Eutrochium fistulosum*
FASC	*Fallopia scandens*
GECA7	*Geum canadense Jacq.*
GLHE2	*Glechoma hederacea*
HELA	*Helianthus laetiflorus*
HEMA2	*Helianthus maximiliani*
HEHEH	*Heliopsis helianthoides var. helianthoides*
HYPU	*Hypericum punctatum*
IMCA	*Impatiens capensis*
IRPS2	*Iris pseudacorus*
LIVU2	*Linaria vulgaris*
LOIN	*Lobelia inflata*
LOSI	*Lobelia siphilitica*
LUAL2	*Ludwigia alternifolia*
LYEU	*Lycopus europeaus*
LYNU	*Lysimachia nummularia*
LYSA2	*Lythrum salicaria*
MAMO2	*Malva moschata*
MELU	*Medicago lupulina*

Forbs	
Symbol	**Latin Name**
MEOF	*Melilotus officinalis*
NAPS	*Narcissus pseudonarcissus*
OEBI	*Oenothera biennis*
OXST	*Oxalis stricta*
PELO10	*Persicaria longsetum*
POPE2	*Persicaria pensylvanica*
PEPU18	*Persicaria punctata*
PLLA	*Plantago lanceolata*
PLMA2	*Plantago major*
PLRU	*Plantago rugelii*
POAV	*Polygonum aviculare*
PRVU	*Prunella vulgaris*
RAFI	*Ranunculus ficaria var. bulbifera*
RUHI2	*Rudbeckia hirta*
RULA3	*Rudbeckia laciniata*
RUCR	*Rumex crispus*
RUSA	*Rumex salicifolius*
SIPE2	*Silphium perfoliatum*
SIAN3	*Sisyrinchium angustifolium*
SOCA3	*Solanum carolinense*
SOAL6	*Solidago altissima*
SOCA6	*Solidago canadensis*
SOGI	*Solidago gigantea*
SOLID	*Solidago sp*
SYLA6	*Symphyotrichum lanceolatum*
SYLA4	*Symphyotrichum lateriflorum*
SYNO2	*Symphyotrichum novae-angliae*
SYPU	*Symphyotrichum puniceum*
SYRA5	*Symphyotrichum racemosum*
SYOF	*Symphytum officinale*
URDI	*Urtica dioica*
VETH	*Verbascum thapsus*
VEUR	*Verbena urticifolia*
VEAL	*Verbesina alternifolia*
VENO	*Vernonia noveboracensis*
VEOF2	*Veronica officinale*
VEVI4	*Veronicastrum virginicum*
VISO	*Viola sororia*
XAST	*Xanthium strumarium*

Graminoids	
Symbol	**Latin Name**
AGGI2	*Agrostis gigantea*
ANGE	*Andropogon gerardii*
CAREX	*Carex sp*
CALU3	*Carex lupuliformis*
CAST5	*Carex stipata*
CYST	*Cyperus strigosus*
ECCH	*Echinochloa cruzgalli*
ELRE4	*Elymus repens*
ELVI3	*Elymus virginicus*
JUTE	*Juncus tenuis*
LEVI2	*Leersia virginica*
MIVI	*Microstegium vimineum*
MIVI	*Microstigium vineum*
MUSC	*Muhlenbergia schreberi*
PHAR3	*Phalaris arundinacea*
PHPR3	*Phleum pratense*
SCSCS	*Schizachyrium scoparium var. scoparium*
SCGE2	*Scirpus georgianus*
SEFA	*Setaria faberi Herrm.*
SEPU8	*Setaria pumila*
SONU2	*Sorghastrum nutans*
SONU2	*Sorghastrum nutans*
TRFL2	*Tridens flavus*

Sub-Shrubs / Shrubs	
Symbol	**Latin Name**
AMFR	*Amorpha fruticosa*
ROPA	*Rosa palustris*
TORA2	*Toxicodendron radicans*
ARVU	*Artemisia vulgaris*
GAOF	*Galega officinalis*
RUPH2	*Rubus pennsylvanicus*

Trees	
Symbol	**Latin Name**
ACSA2	*Acer saccharinum*
JUGLA	*Juglans sp.*
MALUS	*Malus sp.*
ULPA	*Ulmus parvifolia*

Vines	
Symbol	**Lantin Name**
AMBR7	*Ampelopsis brevipedunculata*
CASE13	*Calystegia sepium*
CEOR7	*Celastrus orbiculatus*
Fallopia	*Fallopia sp.*
HUJA	*Humulus japonicus*
LOJA	*Lonicera japonica*
VITIS	*Vitis vulpina*

Appendix D:
List of Species in the Soil Seed Bank

Upland Sheep Meadow
Acalypha rhomboidea
Ambrosia artemisiifolia
Ambrosia trifida
Cardamine hirsuta
Cardamine imaptiens
Cerastium glomeratum
Chenopodium album
Cirsium arvense
Conyza canadensis
Duchesnea indica
Epilobium ciliatum
Erechtites hieraciifolia
Eupatorium perfoliatum
Euphorbia nutans
Euthamia graminifolia
Geum canadense
Juncus sp
Lobelia sp.
Microstegium vimineum
Oenothera biennis
Oxalis stricta
Paspalum laeve
Paulownia tomentosa
Petunia
Plantago sp.
Potentilla norvegica
Rudbeckia hirta
Sagina japonica
Setaria sp.
Sisyrinchium angustifolium
Solanum carolinense
Solidago gigantea
Sorghastrum nutans
Trifolium
Verbascum thapsus
Verbena urticifolia L.
Veronica spp.
Viola sororia

Floodplain Entrance Meadow
Abutilon theophrasti
Acalypha rhomboidea
Ambrosia artemisiifolia
Anagallis arvensis
Artemisia vulgaris
Barbarea verna
Bidens frondosa
Buddleja davidii
Cardamine hirsuta
Cardamine imaptiens
Carex sp.
Cerastium glomeratum
Cirsium arvense
Conyza canadensis
Coronilla varia L.
Duchesnea indica
Epilobium parviflorum
Erechtites hieraciifolia
Erigeron sp
Eupatorium perfoliatum
Euphorbia nutans
Galega officinalis
Glechoma hederacea
Humulus japonicus
Juncus sp
Lepidium
Linaria vulgaris
Lobelia spp.
Lycopus sp
Lythrum salicaria
Mazus pumilus
Microstegium vimineum
Mollugo verticillata
Oenothera biennis
Oxalis stricta
Paspalum laeve
Paulownia tomentosa
Persicaria longsetum
Phalaris arundinacea
Plantago sp.
Polygonum aviculare
Portulaca oleracea
Potentilla norvegica
Prunella vulgaris
Ranunculus ficaria
Rumex spp.
Sagina japonica
Setaria sp.
Sisyrinchium angustifolium
Solanum nigrum
Solidago sp.
Sorghastrum nutans
Taraxacum officinale
Trifolium spp.
Urtica dioica
Verbena simplex
Verbena urticifolia L.
Verbesina alternifolia
Veronica spp.

Floodplain Grass Meadow
Ageratina altissima
Barbarea verna
Boehmeria cylindrica
Buddleja davidii
Cardamine hirsuta
Carex sp.
Cirsium arvense
Conyza canadensis
Epilobium ciliatum
Erechtites hieraciifolia
Eupatorium perfoliatum
Eylmus sp
Fallopia
Galega officinalis
Galinsoga quadriradiata
Juncus sp
Ludwigia palustris
Lycopus sp
Lythrum salicaria
Mazus pumilus
Microstegium vimineum
Oxalis stricta
Paulownia tomentosa
Persicaria
Persicaria longsetum
Phalaris arundinacea
Portulaca oleracea
Potentilla norvegica
Ranunculus sp
Rumex sp
Senecio vulgaris
Setaria sp.
Solanum carolinense
Solidago gigantea
Symphytum officinale
Taraxacum officinale
Trifolium
Urtica dioica
Verbena urticifolia
Veronica peregrina ssp. peregrina