



# **BIODIVERSITY BASELINE STUDY AND ASSESSMENT**

FIELD REPORT SUBMITTED TO:

**UNIVERSITY OF MANITOBA  
OFFICE OF SUSTAINABILITY**

January 29, 2018

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visionary urban design + landscapes



# TRADITIONAL TERRITORIES ACKNOWLEDGEMENT



The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.



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# EXECUTIVE SUMMARY

The following report entitled 'University of Manitoba Biodiversity Baseline Study – Field Report' describes the findings of a terrestrial investigation characterizing the riverbottom forests owned by the University of Manitoba (U of M). The study includes four assessment areas, these are: (1) U of M Fort Garry Campus – Point Lands, (2) U of M Fort Garry Campus – Southwood Lands, (3) Glenlea Research Station, and (4) Ian N. Morrison Research Farm. Across all assessment areas, surveys were undertaken to assess the overall biodiversity of the forest environments with a focus on the vegetative communities and the habitat that they provide. Findings from the current field investigation were used to develop a series of landscape management recommendations relating to the riverbottom forests; these are provided in the companion document – 'University of Manitoba Biodiversity Baseline Study – Final Report'.

Detailed survey data has been summarized and presented within the current report. Some of the main findings with implications for forest management include:

- > The urban riverbottom forests (Fort Garry Campus Point Lands and Southwood Lands) are characterized by a greater proportion of non-native and invasive plant species as compared to the riverbottom forests in rural settings (Glenlea Research Station and Ian N. Morrison Research Farm).
- > Green ash is a major component of the mature forest canopy as well as the shrub and ground levels in the floodplain zones of the riverbottom forests. A shift in canopy dominance from primarily American elm to green ash over the past two decades can be attributed to elm tree loss due to Dutch elm disease.
- > Riverbottom forests in three of the four assessment areas (Point Lands, Southwood Lands, and Ian N. Morrison) tend to be narrow and are dominated by edge habitat.
- > River channel shelves, forest edges, and areas within the forest where the mature canopy has opened up due to tree mortality or removal are very often dominated by non-native and invasive plants, such as Canada thistle.
- > The Glenlea Research Station riverbottom forest is characterized by high plant biodiversity and relatively low levels of non-native plant establishment. One plant species of conservation concern was documented during the study; this was false-indigo bush (*Amorpha fruticosa*) located within the Glenlea riverbottom forest.



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# 1.0 INTRODUCTION



*Riverbottom forest at the Glenlea Research Station assessment area.*

## 1.0 Background

In support of the University of Manitoba's dedication to sustainable operations, the Office of Sustainability (OOS) initiated a biodiversity baseline study and assessment of the river bottom forests situated within University lands (the Study). The study aims to enhance the University of Manitoba's capacity to achieve a key goal and objective in its Sustainability Strategy 2016 – 2018, to 'plan for biodiversity; prevent, manage, or remediate damage to natural habitat and sensitive areas.' Further, the Study will enable the University to activate and track a new sustainability indicator; Ecology and Land Management, within the Sustainability Tracking Assessment and Rating System (STARS). The Study will also position the University, 'to develop a conservation and biodiversity plan' as one of six strategies under the 'Ecology and Environment' theme within the University's Sustainability Strategy (U of M, 2016).

## 1.1 Project Overview

The focus of the biodiversity baseline study is to characterize riverbottom forest vegetation and habitat on four main sites owned by the University of Manitoba, these are: (1) Fort Garry Campus - Point Lands, (2) Fort Garry Campus - Southwood Lands, (3) Glenlea Research Station and (4) Ian N. Morrison Research Farm (the Assessment Areas). The University seeks to preserve the integrity of their riverbottom forests across these assessment areas as important natural features and sources of natural biodiversity. The University aims to ensure the riverbottom forests are adequately integrated into the sustainability of future campus planning and operations. To meet these goals, the Study will realize the following tasks:

- > Refine and implement a baseline field study to characterize the existing vegetative communities, document forest health, and describe the habitat value these environments provide to local fauna;
- > Document ecological factors influencing the health of the riparian forests;
- > Document non-native and invasive species;
- > Document indigenous vegetation and habitat traditionally used for medicine, subsistence and cultural purposes;
- > Provide recommendations for naturalization plantings and management;
- > Contribute to the identification and implementation of environmental protection measures to avoid or minimize negative effects to vegetation and overall forest health.

The Study shall provide the OOS with three main deliverables, these are:

**(1) Field Investigation Report**

- > Describes the findings of the field investigation at each assessment area complete with discussion on the implications of observed trends on overall forest health and habitat value.

**(2) Geo-referenced GIS Database**

- > Amalgamation of pertinent field investigation data and observations geo-referenced and provided as shapefile.

**(3) Final Report**

- > Discuss the prevailing threats to the health of the riverbottom forests surveyed in the Study,
- > Outline general recommendations on maintenance and management of the riverbottom forests surveyed. These include considerations for:
  - > Monitoring and maintenance,
  - > Establishing areas for conservation, remedial activities, as well as forest enhancement or expansion, and
  - > Environmental protection measures relating to future development in proximity to these forests.
- > Provide recommendations for plant species selection and general considerations for prioritization of efforts.

## 2.0 STUDY AREA

The assessment areas of the current Study are situated within the Winnipeg Ecodistrict at the southeast boundary of the Lake Manitoba Plains Ecoregion within the Prairies Ecozone. The Winnipeg Ecodistrict falls within the native range of the tallgrass prairie that once dominated the landscape of the Red River basin (Smith *et al.*, 1998). Today, the landscape has been largely converted to agricultural land use. Native forests within the region are largely confined to riparian corridors where they form gallery forests occupying alluvial floodplain deposits as well as the more well-drained terraces above the floodplain. Throughout much of southern Manitoba, the conversion of land to agricultural land use has resulted in significant loss and degradation of riparian forest habitat.

The current study focusses on characterizing vegetation communities and associated habitat in the riparian forests found on four parcels of land owned by the University of Manitoba. Brief overviews of the assessment areas are provided below;

### (1) FORT GARRY CAMPUS - POINT LANDS

The Point Lands assessment area is located on the University of Manitoba's Fort Garry campus in Winnipeg, Manitoba (49°48'33.84"N; 97° 7'59.71"W). The Point Lands assessment area surrounds a 43 ha peninsula that was formed as an ancient oxbow of the Red River (Figure 1). The Point Lands peninsula is largely under agricultural land use and is regularly utilized by the faculties of Plant Science, Entomology as well as Environmental Sciences for various research interests. The Point Lands assessment area is characterized as an approximately 15 ha mixed-hardwood riparian forest dominated by a green ash (*Fraxinus pensylvannica*) canopy. Soils in this assessment area are alluvial in nature and described by the Riverdale soil type (silty clay texture) (MSS, 1954).

### (2) FORT GARRY CAMPUS - SOUTHWOOD LANDS

The Southwood Lands assessment area is located north of the Point Lands assessment area along the Red River, in Winnipeg, Manitoba (49°48'46.72"N; 97° 8'25.81"W). This site is located within the former Southwood Golf Course, which was purchased by the University of Manitoba in 2011. The assessment area borders the Fort Garry Campus on its south end and is described as approximately 2.16 ha of mixed-hardwood riparian forest dominated by a green ash canopy (Figure 2). Soils in this assessment area are described as lacustrine fine clay (Red River Association) and are characterized by the St. Norbert soil type (clay textured) (MSS, 1954).



Riverbottom forest showing rich understory plant growth.

### (3) GLENLEA RESEARCH STATION

The University of Manitoba's Glenlea Research Station is located just east of Highway 75 (Lord Selkirk Highway) approximately 15 km south of Winnipeg, Manitoba in the RM of Richot (49°39'1.52"N; 97° 7'4.95"W). The research station is used by the Faculties of Agriculture and Food Sciences, Animal Science, Soil Science and Entomology to conduct field scale research. The Glenlea Research Station is also home to the Bruce D. Campbell Food and Farm Discovery Centre, an interactive learning facility that teaches visitors about every aspect of food production, from farming practices to retail sales. In total, the research station occupies approximately 400 ha of land and is bordered by the Red River to the east and agricultural land on all other sides (Figure 3).

The project assessment area includes the approximate 24.9 ha woodland adjacent the Red River. The woodland contains two distinct forest types; a riparian forest on the floodplain and terraces as well as a more well-drained interior forest. The riparian forest is characterized by a green ash-Manitoba maple (*Acer negundo*) dominated floodplain and a bur oak (*Quercus macrocarpus*) dominated terrace. The interior forest is dominated by a bur oak overstory with co-dominant stands of basswood (*Tilia americana*) and trembling aspen (*Populus tremuloides*) also present. Soils in close proximity to the river are characterized as alluvial in nature and are described by the Riverdale soil series (silty clay), while those soils within the forest interior are described by the St. Norbert (clay) soil series (MAFRI, 2011).

#### (4) IAN N. MORRISON RESEARCH FARM

The University of Manitoba's Ian N. Morrison Research Farm is located just south of Highway 245 approximately 70 km southwest of Winnipeg, Manitoba in the RM of Dufferin, near the town of Carman, Manitoba (49°30'5.20"N; 98° 1'40.38"W). The 164 ha facility is operated by the Faculty of Plant Science to support various field scale crop production research projects.

The Ian N. Morrison assessment area includes an approximately 11ha riparian forest along the southern side of the Boyne River (Figure 4). The assessment area is bordered to the south by the farm facilities crop land and varies considerably in forest width as the river meanders through the facility's lands. The fringe of riparian forest is characterized as mixed-hardwood forest dominated by oak on the terraces and Manitoba maple-green ash canopies on the floodplain. Soils within the assessment area are alluvial in nature; bordering the assessment area to the south, soils have been mapped and classified and include LaSalle, Reinfeld, Denham and Eigenhof soil series (Mills & Haluschak, 1993).



A dense cover of ostrich fern (*Matteuccia struthiopteris*) established near the river bank at the Glenlea Research Station assessment area.



Figure 1. Point Lands assessment area and survey plot locations.



Figure 2. Southwood Lands assessment area and survey plot locations.

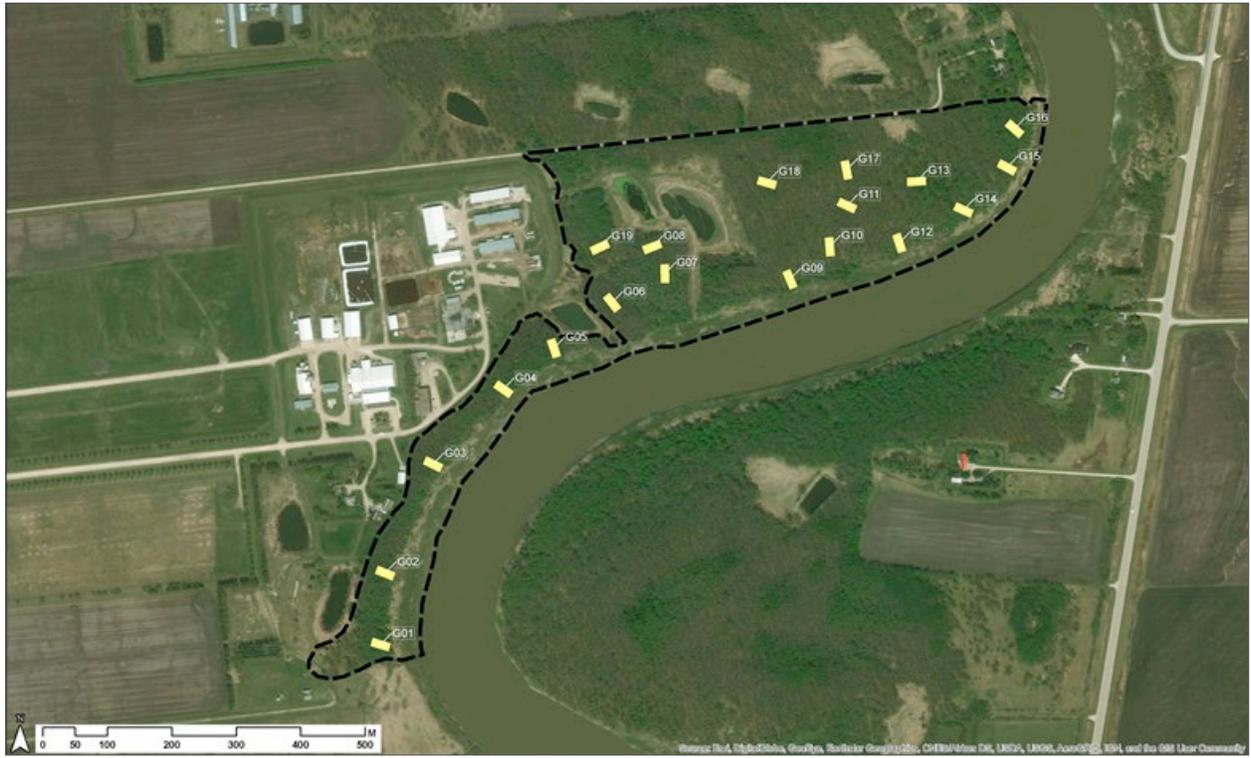


Figure 3. Glenlea Research Station assessment area and survey plot locations.



Figure 4. Ian N. Morrison Research Farm assessment area and survey plot locations.



## 3.0 METHODS

### 3.0 Desktop Analysis

Desktop analysis was conducted prior to field work to assist the project team in planning the field study. Aerial photography of each assessment area was reviewed to determine average riparian forest widths in each assessment area which helped inform survey plot configuration and distribution. Survey plots were proportionally distributed across all assessment areas and their geo-referenced locations were transferred to handheld GPS units that facilitated locating survey plots in the field.

During desktop analysis, the project team conducted a review of plant and animal species of conservation concern known to occupy the environments characteristic of the assessment areas. The Manitoba Conservation Data Centre (MB CDC) tracked species database was reviewed in addition to Schedule 1 of the Species at Risk Act, the Threatened, Endangered and Extirpated Species Regulation of the Endangered Species and Ecosystem Act (MESEA) and the Committee on Status of Endangered Wildlife in Canada (COSEWIC) registry to determine if any rare or endangered plant species were known to occur within the study assessment areas. Search results and a location based inquiry with MB CDC indicated that no species of conservation concern were known to occur in these areas (reply from MB CDC provided as Appendix A).

Several documents relevant to this study were reviewed during desktop analysis providing further understanding of project objectives. Reports reviewed include:

- > University of Manitoba Visionary (re)Generation Master Plan 2016 [http://umanitoba.ca/admin/campus\\_planning\\_office/media/160520\\_WEB\\_Master\\_Plan .pdf](http://umanitoba.ca/admin/campus_planning_office/media/160520_WEB_Master_Plan.pdf)
- > Sustainability Strategy 2016-2018 [https://umanitoba.ca/campus/sustainability/media/Sustainability\\_Strategy\\_2016-2018\\_WEB.pdf](https://umanitoba.ca/campus/sustainability/media/Sustainability_Strategy_2016-2018_WEB.pdf)
- > Indigenous Planning and Design Principles [http://umanitoba.ca/admin/campus\\_planning\\_office/5937.html](http://umanitoba.ca/admin/campus_planning_office/5937.html)
- > University of Manitoba Riparian Forest Inventory, 2000
- > University of Manitoba Fort Garry Campus Tree Inventory, 2000

In addition to these documents, the project team used the Canadian Forest Service publication 'River bottom forest assessment: Forest ecosystem classification and management recommendations' (Marr & Synthen, 1995), as a guide for characterizing the river bottom forests in this study. Marr & Synthen (1995) summarizes the finding of a thorough field study documenting riverbottom forest types throughout southern Manitoba. This reference establishes the riverbottom forest classification system that is used to describe forest vegetation types throughout the current study (Appendix B).

Based on desktop analysis, a field study plan was prepared and submitted for approval to the OOS (Biodiversity Baseline Study and Assessment: Field Study Plan) (Appendix C).



*420m<sup>2</sup> survey plots were laid out perpendicular to the rivers' edge.*

## 3.1 Field Study

### 3.1.1 PLOT SIZE AND CONFIGURATION

The amount of survey plots as well as their individual sample area was defined at the onset of the Study by the OOS. The Study intended to survey a minimum of 42 vegetation plots, each with an area of 420m<sup>2</sup>, proportionally dispersed across the four assessment areas.

Survey plots were distributed throughout the Study area as follows:

- > Fort Garry Campus – Point Lands – 12 survey plots (Figure 1)
- > Fort Garry Campus – Southwood Lands – 2 survey plots (Figure 2)
- > Glenlea Research Station – 19 survey plots (Figure 3)
- > Ian N. Morrison Research Farm – 7 survey plots\* (Figure 4)

*\*Note – Nine (9) survey plots were originally planned for this site, however two plots were removed from the Study because of a change to the assessment area as defined by the OOS.*

In order to fully capture the composition of the forest vegetation across each assessment area, the vegetation plots were configured as 30m long by 14m wide (420m<sup>2</sup>) (Figure 5). Each survey plot was divided into thirds according to their position on the riparian gradient, when present (i.e. upper, middle, lower position). This configuration was selected in order to capture changes in vegetation that may occur along the landscape gradient away from the river.

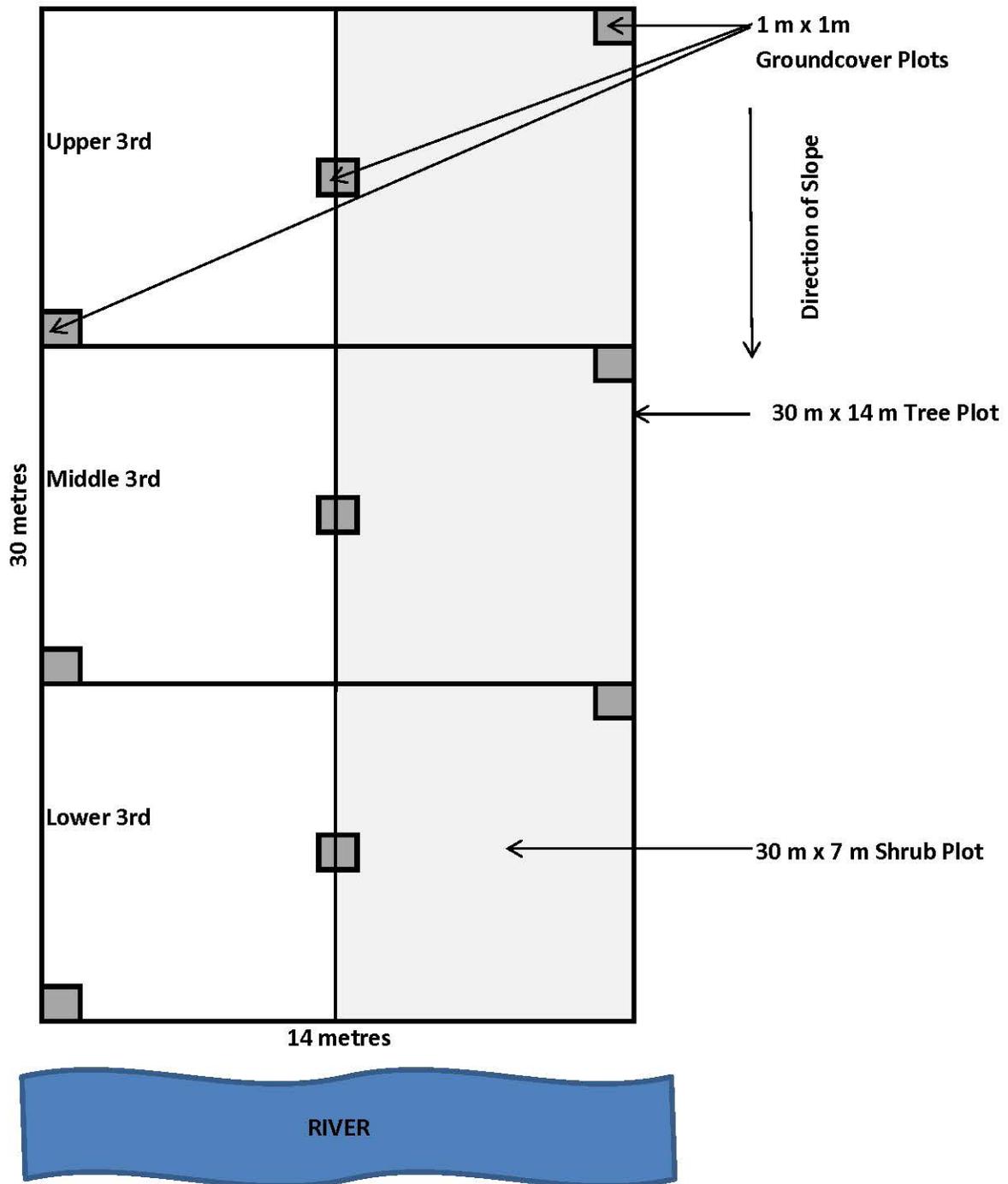


Figure 5. Survey plot configuration and layout used throughout the Study.

### 3.1.2 SAMPLING METHOD

Tree overstory data was sampled across the entire 30 m x 14 m survey plot. Stem counts for all trees (>5 m in height) within the vegetation plot were recorded for each species present. To aid in aging the tree canopy, tree cores were collected from representative dominant, co-dominant and sub-dominant canopy species using an increment borer. For each of the representative trees that were cored, height was determined using the variable height method (utilizing a clinometer), diameter at breast height (DBH) was recorded and the general health and spread of the sampled tree was noted. Tree cores that were determined to be unreadable were assigned an approximate age class estimated based on the DBH, height and the typical growth rate of the species. Tree health was assessed and each cored tree specimen was assigned a 'Good', 'Fair', or 'Poor' condition. Trees deemed to be in 'Good' condition lacked dead branches, showed no obvious signs of disease, and had a uniformly healthy canopy. Trees that were characterized as in 'Fair' condition had moderate amounts of deadwood and those in 'Poor' condition were noticeably unhealthy, showing signs disease or significant limb die-off.

Shrub understory data was sampled in vegetation sub-plots measuring 30 m x 7 m (half of the survey plot) (Figure 5). All shrub species between 1m and 5m were documented and stem counts were noted for each species. Shrub canopy cover over the sub-plot was visually estimated and the general health and condition of each shrub was recorded.

Groundcover vegetation was characterized by sampling nine 1 m x 1 m quadrats per survey plot. Three groundcover quadrats were surveyed nested within each plot third (upper, middle, lower thirds) (Figure 5). Species present were identified and given a surface cover value according to the Daubenmire classification system.

Soil pits were dug adjacent to each vegetation plot to help field crews identify existing soil types. Soil pits were dug to 1m in depth and distinct soil horizons were described and texture was characterized in the field using the hand-texture method. Once the soils were adequately described, the soil pits were backfilled and the soil was tamped down.



*University of Manitoba student field assistant collecting a tree core to determine tree age.*

In addition to the fixed survey plots, field investigators conducted ocular meander surveys between survey plots to further capture the full-range of biodiversity within the assessment area riverbottom forests. All species noted have been amalgamated into complete species lists, presented in Appendix D.

## 3.2 Data Summary and Presentation

Following the field investigation phase of the Study, survey data sheets were transcribed into Microsoft Excel and later updated to include tree age information. Forest types were classified according to Marr & Synthen (1995) based on the characteristics of the established canopy as well as the common ground level vegetation. Tree overstory data (forest type, canopy dominance, canopy height, stem counts and tree health) as well as shrub layer data (species present, stem counts and canopy cover as well as shrub health) were summarized and presented at the survey plot level for each assessment area of the Study. Summarized survey plot data from the field investigation is presented within the results section of the Field Report as well as hyperlinked to the geo-referenced plot location within the Geo-database.

In order to summarize the groundcover data, Daubenmire classification ranks for each observed species were converted to their median value before being averaged across the survey plot. As with tree and shrub data, the average groundcover values were summarized for each survey plot and presented in the results section and hyperlinked to the geo-referenced plot location within the geo-database. In addition to summarizing the data at the plot level, groundcover data was summarized and presented at the assessment area level. Complete species lists were generated for each of the four assessment areas, and the information is presented in two tables, one sorting the species based on the frequency of their occurrence within the survey plots, and one sorting the species based on their average groundcover (%) averaged across the entire assessment area.

Once the survey data was summarized, a comprehensive species list was generated documenting the full diversity of plants, birds and animals encountered. The species lists generated for groundcover summarization of each assessment area were amalgamated and any additional species observed during the field study (i.e. incidental observations or species that occurred only in the tree or shrub layers) were added to the comprehensive species list. Wildlife observations were made throughout the field study and these observations were combined into a single species table summarizing the findings (Appendix D).



*Riverbottom forests are characterized by variable levels of vegetation, bare earth, and fallen woody debris at the ground level. The amount of light reaching the ground strongly influences plant establishment and growth.*

## 4.0 FIELD INVESTIGATION RESULTS

### 4.0 Fort Garry Campus – Point Lands Assessment Area

#### OVERSTORY

The University of Manitoba Fort Garry Campus Point Lands assessment area (15.3 ha) is represented by three distinct riverbottom forest (RBF) ecosystem classes, (1) Green ash / Basswood (RBF 2), (2) Green ash / Manitoba maple (RBF 4) and (3) Bur oak / Green ash / Manitoba maple (RBF 5). The dominant forest class throughout much of this assessment area is the RBF 4 forest type, characterizing 7/12 (58%) of the survey plot locations. The RBF 2 class described 1/12 survey plots (8%) and the RBF 5 class described 3/12 survey plots (25%). Finally, one survey plot did not fall into any conventional river bottom forest classification type; it was dominated by planted tree species including paper birch (*Betula papyrifera*), pine (*Pinus* sp.), spruce (*Picea* sp.) and fir (*Abies* sp.) as well as green ash (*Fraxinus pennsylvanica*) (Table 1). Across all forest classes surveyed, dominant tree health was graded as 'Fair', 'Fair-Good' or 'Good'.

Age classes observed within the Point Lands assessment area varied considerably more than those of the Glenlea and Ian N. Morrison assessment areas. Within the RBF 4 forest class, the dominant green ash canopy ranged in age from approximately 70 years old to approximately 120 years old, with the exception of one survey plot where the ash canopy age class was 50-70 years old. Within this river bottom forest type, Manitoba maple (*Acer negundo*) trees present ranged from 40 – 100 years old, while American elm (*Ulmus americana*) ranged from 40 – 120 years old (Table 1). Within the RBF 5 forest class, the dominant bur oak (*Quercus macrocarpa*) trees ranged in age from 70 to 120 years old and ash trees present in the canopy ranged from 50-120 years old. Maple was present in the canopy of one of the three RBF 5 survey plots and fell within the 70-90 year old age class. The single RBF 2 forest type was characterized by an ash/basswood co-dominant overstory, with the ash component aged between 100-120 years old and the basswood (*Tilia americana*) being considerably younger, falling within the 40-60 year old age class. Ash trees present within the planted survey plot was aged to between 40-60 years old (Table 1).

Across the majority of the assessment area, the upper forest canopy is described as relatively even and is described by a crown height ranging from a low of 16 m up to a maximum of 29 m. The mean and median canopy height within the Point Lands assessment area is approximately 20 m. The density of trees within each survey plot varied considerably across the assessment area, from a low of 14 stems per plot up to a high of 64 stems per plot. The median tree stem count is 31 per plot and the overall average is approximately 34 stems per plot (Table 1).



**TABLE 1.** SURVEY PLOT CHARACTERIZATION FOR THE POINT LANDS ASSESSMENT AREA.

Point Lands Assessment Area	PL01	PL02	PL03	PL04	PL05	PL06	PL07
<b>Overstory</b>							
<i>Vegetation type</i>	RBF 5	RBF 2	RBF 5	Planted	RBF 4	RBF 4	RBF 4
<i>Canopy dominance</i>	Oak / Ash	Ash / Basswood	Oak / Ash / Maple	Pine / Birch / Ash	Ash / Elm / Maple	Ash / Maple	Ash / Elm / Maple
<i>Canopy age class (yrs)</i>	Oak (100-120) / Ash (100-120)	Ash (100-120) / Basswood (40-60)	Oak (70-90) / Ash (50-70)	Ash (40-60)	Ash (80-100) / Elm (80-100) / Maple (60-80)	Ash (50 - 70) / Maple (40 - 60)	Ash (100-120) / Elm (80-100) / Maple (50-70)
<i>Canopy height (m)</i>	Oak (22) / Ash (20)	Ash (17) / Basswood (15)	Oak (16) / Ash (16) / Maple (12)	Pine (17) / Birch (14) / Ash (15)	Ash (27) / Elm (29) / Maple (24)	Ash (26) / Maple (21)	Ash (19) / Elm (16) / Maple (13)
<i>Stem density (stems / 420m<sup>2</sup>)</i>	Oak (2) / Ash (5) / Maple (12)	Ash (13) / Basswood (14) / Maple (2) / Elm (1)	Oak (2) / Ash (7) / Maple (7)	Pine (4) / Birch (7) / Ash (3)	Ash (25) / Elm (10) / Maple (16)	Ash (11) / Maple (18)	Ash (17) / Elm (8) / Maple (7)
<i>Tree health</i>	Fair - Good	Good	Fair - Good	Overall Good; Pine Poor	Fair	Fair - Good	Fair - Good
<b>Shrub Layer</b>							
<i>Species</i>	Maple / Elm / Willow sp.	Maple / Elm / Ash / Dogwood / Indian hemp	Maple / Ash / Elm / Dogwood	Ash / Chokecherry	Buckthorn	Buckthorn	Chokecherry / Elderberry
<i>Average shrub cover</i>	13%	35%	13%	8%	30%	65%	25%
<i>Stem density (stems / 210m<sup>2</sup>)</i>	Maple (20) / Elm (10) / Willow (2)	Maple (22) / Elm (2) / Ash (2) / Dogwood (4) / Indian hemp	Maple (2) / Ash (5) / Elm (1) / Dogwood (12)	Ash (2) / Chokecherry (17)	Buckthorn (41)	Buckthorn (42)	Chokecherry (32) / Elderberry (1)
<i>Shrub health</i>	Fair - Good	Fair - Good	Fair - Good	Good	Buckthorn infestation	Buckthorn infestation	Good
<b>Ground cover</b>							
<i>Primary species (% ground cover)</i>	Maple (8)	Indian hemp (19), Virginia wildrye (9), Elm (9), Beaked	Dogwood (11), Henbit (9), Maple (8), Virginia wildrye (6)	Wood nettle (4)	Chokecherry (17), Virginia wildrye (11), Hog peanut (5)	Wood nettle (12), Assiniboia sedge (7), Maple (7), grape (5)	Assiniboia sedge (7)
<i>Secondary species (% ground cover)</i>	Absinth (4), Wood nettle (4), Wild cucumber (4), Elm (2)	Ground ivy (4), Maple (3), Sm. hedge nettle (3)	Sm. hedge nettle (5), Wood nettle (4), Elm (2)	Stinging nettle (2), Absinth (2), SF Solomon's seal (2)	Assiniboia sedge (4), Wood nettle (3)	Ash (1), Virginia wildrye (1)	Virginia wildrye (3), Elm (3)
<i>Non-native and invasive species (% ground cover)</i>	Canada thistle (14), Reed canary grass (11), Sm. brome	Canada thistle (3)	Smooth brome (19), Reed canary grass (3)	Canada thistle (13), Kent. Bluegrass (11), , Burdock (4),	Reed canary grass (7), Bluebur (2), Buckthorn (1)	Buckthorn (10), Reed canary grass (1)	Bluebur (13), Buckthorn (2)
<i>Bare earth / logs / litter</i>	24%	26%	18%	40%	31%	50%	67%
<b>Soils</b>							
<i>Soil Texture</i>	Silty clay	Silty clay	Silty clay	Silty clay	Silty clay	Silty clay	Silty clay

**TABLE 1. (CONT.) SURVEY PLOT CHARACTERIZATION FOR THE POINT LANDS ASSESSMENT AREA**

Point Lands Assessment Area	PL08	PL09	PL10	PL11	PL12
<b>Overstory</b>					
Vegetation type	RBF 4	RBF 4	RBF 4	RBF 4	RBF 5
Canopy dominance	Ash / Maple	Ash / Elm / Maple	Ash / Elm	Ash / Elm	Oak / Ash / Maple
Canopy age class (yrs)	Ash (100-120) / Maple (70-90)	Ash (90-110) / Elm (70-90) / Maple (80-100)	Ash (70-90) / Elm (100-120)	Ash (70-90) / Elm (40-60)	Oak (110-130) / Ash (60-80) / Maple (70-90)
Canopy height (m)	Ash (20) / Maple (17)	Ash (18) / Elm (18) / Maple (15)	Ash (17) / Elm (21)	Ash (22) / Elm (20)	Oak (15) / Ash (17) / Maple (13)
Stem density (stems / 420m <sup>2</sup> )	Ash (7) / Maple (14) / Elm (3) / Willow (2)	Ash (5) / Elm (23) / Maple (18)	Ash (24) / Elm (8) / Maple (7)	Ash (25) / Elm (29) / Maple (10)	Oak (4) / Ash (30) / Maple (9)
Tree health	Fair - Good	Good	Fair - Good	Fair - Good	Fair - Good
<b>Shrub Layer</b>					
Species	Ash	Maple / Elm	Maple / Elm / Chokecherry	Maple / Oak / Ash / Buckthorn / Chokecherry /	Maple / Chokecherry / Caragana
Average shrub cover	5%	33%	7%	17%	15%
Stem density (stems / 210m <sup>2</sup> )	Ash (2)	Maple (4) / Elm (9)	Maple (1) / Elm (1) / Chokecherry (25)	Maple (2) / Oak (1) / Ash (1) / Buckthorn (2) / Chokecherry	Maple (6) / Chokecherry (24) / Caragana (7)
Shrub health	Good	Good	Generally Good; Chokecherry Poor	Fair - Good	Fair - Good
<b>Ground cover</b>					
Primary species (% ground cover)	Virginia wildrye (9), Maple (8)	Maple (8)	Hog peanut (7)	Grape (13), Virginia creeper (7)	Chokecherry (10), Cocklebur (10), Virginia creeper (4)
Secondary species (% ground cover)	Mint (4), Stinging nettle (2)	Bluebur (3), Virginia wildrye (3), meadowrue (2)	Meadowrue (2), Ash (2), grape (2)	Snowberry (2), Wood nettle (2), Virginia wildrye (1)	Beaked sedge (2), S.F. Solomon's seal (1), Elm (1)
Non-native and invasive species (% ground cover)	Bluebur (6), Canada thistle (4), Absinth (3)	Dandelion (1), Plantain (1)	Buckthorn (5), Bluebur (4), ground ivy (3)	Smooth brome (>1)	Plantain (2), Kentucky bluegrass (2)
Bare earth / logs / litter	46%	70%	59%	58%	62%
<b>Soils</b>					
Soil Texture	Silty clay	Silty clay	Silty clay	Silty clay	Silty clay



European buckthorn (*Rhamnus cathartica*) present at the Point Lands assessment area.

## SHRUB LAYER

Overall, the shrub layer across the University of Manitoba Fort Garry Campus assessment areas (including the Point Lands as well as the Southwood Lands) exhibited low species diversity relative to the study's other assessment areas. Twelve different species of trees and shrubs were observed at the shrub layer within the survey plots (four tree and eight shrub species). An additional five shrub species were observed within the Point Lands assessment area during groundcover surveys as well as meander surveys between plots, giving a total of 13 shrub species (Table 1). Shrub cover within the Point Lands survey plots varied from 5% up to 65%, with an average shrub cover of approximately 22% across the surveyed area. Likewise, stem density fluctuated widely between the survey plots, from a minimum count of two stems per 210 m<sup>2</sup> to a maximum count of over 130 per 210 m<sup>2</sup>. An average stem count of approximately 34 stems per 210 m<sup>2</sup> was found across the assessment area (Table 1).

The overall health of the shrubs within the sampled shrub layers was noted as 'Fair to Good' to 'Good', however many of the survey plots were experiencing conditions that could negatively affect the development of the shrub layer over time. Of primary concern is the presence of European buckthorn (*Rhamnus cathartica*) within the assessment area. This highly invasive woody plant was documented in the shrub layer for 25% of the survey plots, and in places it has had the opportunity to develop into a dense infestation (with over 40 stems per 210 m<sup>2</sup> in two survey plots) (Table 1). Additionally, where chokecherry (*Prunus virginiana*) was present within the shrub layer, evidence of black knot disease was often observed.

## GROUNDCOVER

The University of Manitoba - Point Lands assessment area is characterized by a moderate to high overall diversity of groundcover plant species (61 total unique species) with a high number of non-native species (19 species) (Table 2). At the survey plot level, species diversity ranged from a low of 10 species to a maximum of 23 species and an average of 17 unique species per plot was noted.

A total of 14 plant species were documented within the groundcover layer in more than half of the Point Lands survey plots. Of these common species, three were dominant overstory tree species (Manitoba maple, American elm and green ash) and five are non-native plant species Canada thistle (*Cirsium arvense*), bluebur (*Lappula squarrosa*), Absinth (*Artemisia absinthium*), reed canary grass (*Phalaris arundinacea*) and smooth brome (*Bromus enermis*). The remaining common herbaceous plants at the ground level of the survey plots include Virginia wildrye (*Elymus virginicum*), wood nettle (*Laportea canadensis*), stinging nettle (*Urtica dioica*), star-flowered solomon's seal (*Smilacina stellata*), tall meadow rue (*Thalictrum dasycarpum*), and Virginia creeper (*Parthenocissus quinquefolia*) (Table 2). The composition of the ground level plant community varied considerably between survey plots with 24 species occupying >5% cover within at least one survey plot. This survey plot level variability is reflected by overall cover values averaged across the assessment area, where no individual species exhibits a cover value greater than approximately 5%. Of the 24 species that occupied >5% of groundcover in at least one survey plot, 8 are non-native plants and 16 are native plants (Table 3).

Non-native plant species were noted in all survey plots, ranging in cover (%) from as little as 1% up to a maximum of 32% (average of approximately 10% non-native groundcover per survey plot) (Table 1). Of the non-native plants present, Canada thistle, reed canary grass, smooth brome, Kentucky bluegrass (*Poa pratensis*) and European buckthorn were the most common.

The ground level within the assessment area is characterized by variable levels of bare earth (including areas of leaf litter and fallen woody debris) ranging from as little as 18% to a maximum of 70% (average bare earth cover of 46% across all survey plots).

**TABLE 2.** POINT LANDS ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (61 SPECIES).

Common name	Scientific name	Count	Count (%)
bare earth/logs/leaf litter		12	100%
Virginia wildrye	<i>Elymus virginicus</i>	11	92%
Canada thistle	<i>Cirsium arvense</i>	10	83%
Manitoba maple	<i>Acer negundo</i>	10	83%
wood nettle	<i>Laportea canadensis</i>	10	83%
American elm	<i>Ulmus americana</i>	9	75%
bluebur	<i>Lappula squarrosa</i>	9	75%
stinging nettle	<i>Urtica dioica</i>	8	67%
green ash	<i>Fraxinus pennsylvannica</i>	7	58%
absinth	<i>Artemisia absinthium</i>	6	50%
reed canary grass	<i>Phalaris arundinacea</i>	6	50%
smooth brome	<i>Bromus inermis</i>	6	50%
star-flowered Solomon's seal	<i>Smilacina stellata</i>	6	50%
tall meadowrue	<i>Thalictrum dasycarpum</i>	6	50%
Virginia creeper	<i>Parthenocissus quinquefolia</i>	6	50%
dandelion	<i>Taraxacum officinale</i>	5	42%
European buckthorn	<i>Rhamnus cathartica</i>	5	42%
ground ivy	<i>Glechoma hederacea</i>	5	42%
red-osier dogwood	<i>Cornus sericea</i> ssp. <i>sericea</i>	5	42%
common plantain	<i>Plantago major</i>	4	33%
fragrant bedstraw	<i>Galium triflorum</i>	4	33%
hog peanut	<i>Amphicarpaea bracteata</i>	4	33%
riverbank grape	<i>Vitis riparia</i>	4	33%
assiniboine sedge	<i>Carex assiniboensis</i>	3	25%
aster	<i>Symphiotrichium</i> sp.	3	25%
carrionflower	<i>Smilax herbacea</i>	3	25%
chokecherry	<i>Prunus virginiana</i>	3	25%
common burdock	<i>Arctium minus</i>	3	25%
Kentucky bluegrass	<i>Poa pratensis</i>	3	25%
beaked sedge	<i>Carex rostrata</i>	2	17%
cocklebur	<i>Xanthium strumarium</i>	2	17%
smooth hedge nettle	<i>Stachys tenuifolia</i>	2	17%
wild black currant	<i>Ribes americanum</i>	2	17%
wild mint	<i>Mentha arvensis</i>	2	17%
wild vetch	<i>Vicia americana</i>	2	17%

**TABLE 2. (CONT.)** POINT LANDS ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (61 SPECIES).

Common name	Scientific name	Count	Count (%)
yellow wood-sorrel	<i>Oxalis stricta</i>	2	17%
basswood	<i>Tilia americana</i>	1	8%
bur oak	<i>Quercus macrocarpa</i>	1	8%
common milkweed	<i>Asclepias syriaca</i>	1	8%
common snowberry	<i>Symphoricarpos albus</i>	1	8%
devil's beggarstick	<i>Bidens frondosa</i>	1	8%
fleabane	<i>Erigeron sp.</i>	1	8%
goldenrod	<i>Solidago sp.</i>	1	8%
henbit	<i>Lamium amplexicaule</i>	1	8%
honeysuckle	<i>Diervilla lonicera</i>	1	8%
horehound	<i>Lycopus sp.</i>	1	8%
indian hemp	<i>Apocynum cannabinum</i>	1	8%
mustard	<i>Brassica sp.</i>	1	8%
prickly lettuce	<i>Lactuca serriola</i>	1	8%
prickly rose	<i>Rosa acicularis</i>	1	8%
quack grass	<i>Elymus repens</i>	1	8%
sedge	<i>Carex sp.</i>	1	8%
smooth sweet cicely	<i>Osmorhiza longistylis</i>	1	8%
wild cucumber	<i>Echinocystis lobata</i>	1	8%
wild red raspberry	<i>Rubus idaeus</i>	1	8%
yellow avens	<i>Geum aleppicum</i>	1	8%
lamb's-quarters	<i>Chenopodium album</i>	0	0%
stinging nettle	<i>Urtica dioica</i>	0	0%
wild vetch	<i>Vicia americana</i>	0	0%
riverbank grape	<i>Vitis riparia</i>	0	0%
cocklebur	<i>Xanthium strumarium</i>	0	0%
caragana	<i>Caragana arborescens</i>	0	0%

**TABLE 3.** POINT LANDS ASSESSMENT AREA GROUNDCOVER DATA SORTED DESCENDING BY AVERAGE COVER (61 SPECIES).

Common name	Scientific name	Average when present	Average across 12 plots
bare earth/logs/leaf litter		45.76	45.76
Manitoba maple	<i>Acer negundo</i>	4.53	3.77
Virginia wildrye	<i>Elymus virginicus</i>	4.09	3.75
Canada thistle	<i>Cirsium arvense</i>	3.47	2.89
bluebur	<i>Lappula squarrosa</i>	3.49	2.62
wood nettle	<i>Laportea canadensis</i>	3.00	2.50
smooth brome	<i>Bromus inermis</i>	4.81	2.41
chokecherry	<i>Prunus virginiana</i>	9.54	2.38
reed canary grass	<i>Phalaris arundinacea</i>	4.40	2.20
riverbank grape	<i>Vitis riparia</i>	4.93	1.64
indian hemp	<i>Apocynum cannabinum</i>	19.44	1.62
American elm	<i>Ulmus americana</i>	2.10	1.57
assiniboine sedge	<i>Carex assiniboensis</i>	6.20	1.55
Virginia creeper	<i>Parthenocissus quinquefolia</i>	3.10	1.55
European buckthorn	<i>Rhamnus cathartica</i>	3.67	1.53
red-osier dogwood	<i>Cornus sericea ssp. sericea</i>	2.83	1.18
hog peanut	<i>Amphicarpaea bracteata</i>	3.40	1.13
Kentucky bluegrass	<i>Poa pratensis</i>	4.26	1.06
absinth	<i>Artemisia absinthium</i>	1.81	0.90
cocklebur	<i>Xanthium strumarium</i>	5.00	0.83
beaked sedge	<i>Carex rostrata</i>	4.72	0.79
ground ivy	<i>Glechoma hederacea</i>	1.78	0.74
henbit	<i>Lamium amplexicaule</i>	8.89	0.74
stinging nettle	<i>Urtica dioica</i>	0.97	0.65
tall meadowrue	<i>Thalictrum dasycarpum</i>	1.30	0.65
smooth hedge nettle	<i>Stachys tenuifolia</i>	3.75	0.63
green ash	<i>Fraxinus pensylvannica</i>	0.87	0.51
common burdock	<i>Arctium minus</i>	1.67	0.42
star-flowered Solomon's seal	<i>Smilacina stellata</i>	0.83	0.42
wild mint	<i>Mentha arvensis</i>	2.22	0.37
wild cucumber	<i>Echinocystis lobata</i>	3.61	0.30
common plantain	<i>Plantago major</i>	0.76	0.25
dandelion	<i>Taraxacum officinale</i>	0.56	0.23
common snowberry	<i>Symphoricarpos albus</i>	1.94	0.16

**TABLE 3. (CONT.)** POINT LANDS ASSESSMENT AREA GROUND COVER  
DATA SORTED DESCENDING BY AVERAGE COVER (61 SPECIES).

Common name	Scientific name	Average when present	Average across 12 plots
common milkweed	<i>Asclepias syriaca</i>	1.67	0.14
carrionflower	<i>Smilax herbacea</i>	0.46	0.12
fragrant bedstraw	<i>Galium triflorum</i>	0.35	0.12
aster	<i>Symphiotrichium</i> sp.	0.28	0.07
wild vetch	<i>Vicia americana</i>	0.42	0.07
bur oak	<i>Quercus macrocarpa</i>	0.56	0.05
devil's beggarstick	<i>Bidens frondosa</i>	0.56	0.05
smooth sweet cicely	<i>Osmorhiza longistylis</i>	0.56	0.05
wild black currant	<i>Ribes americanum</i>	0.28	0.05
yellow wood-sorrel	<i>Oxalis stricta</i>	0.28	0.05
basswood	<i>Tilia americana</i>	0.28	0.02
fleabane	<i>Erigeron</i> sp.	0.28	0.02
goldenrod	<i>Solidago</i> sp.	0.28	0.02
honeysuckle	<i>Diervilla lonicera</i>	0.28	0.02
horehound	<i>Lycopus</i> sp.	0.28	0.02
mustard	<i>Brassica</i> sp.	0.28	0.02
prickly lettuce	<i>Lactuca serriola</i>	0.28	0.02
prickly rose	<i>Rosa acicularis</i>	0.28	0.02
quack grass	<i>Elymus repens</i>	0.28	0.02
sedge	<i>Carex</i> sp.	0.28	0.02
wild red raspberry	<i>Rubus idaeus</i>	0.28	0.02
yellow avens	<i>Geum aleppicum</i>	0.28	0.02
lamb's-quarters	<i>Chenopodium album</i>	0.00	0.00
stinging nettle	<i>Urtica dioica</i>	0.00	0.00
wild vetch	<i>Vicia americana</i>	0.00	0.00
riverbank grape	<i>Vitis riparia</i>	0.00	0.00
cocklebur	<i>Xanthium strumarium</i>	0.00	0.00
caragana	<i>Caragana arborescens</i>	0.00	0.00

## SOILS

Soils within the Point Lands assessment area were characterized as silty clay and exhibited a consistent soil profile to one metre in depth. No distinct soil horizon differentiation was observed. Root growth was regularly noted throughout the one metre soil pits, with varying amounts of root growth between plots.

## BANK CONDITIONS

Riverbank conditions throughout the Point Lands assessment area are typically characterized by a steep drop from the forest habitat down to a very short, alluvial river bank. In certain places, perennial vegetation was able to establish and the plant community was dominated by reed canary grass, beaked sedge (*Carex rostrata*), water smartweed (*Polygonum aquaticum*), Canada thistle as well as sandbar willow (*Salix exigua*). The riverbank at one survey plot was characterized by dense growth of Indian hemp (*Apocynum cannabinum*) from the forest edge towards the channel shelf. In other portions of the site, the riverbank showed signs of recent siltation and was vegetated only by annual and biennial plant species.



Animal burrows were commonly encountered at all assessment areas.

## HABITAT USAGE

The riparian forest at the Point Lands supports a variety of mammalian and avian wildlife. During the field study, white-tailed deer were found to be the most abundant mammal encountered in the assessment area. Deer game trails were noted throughout the forest and sightings were common. In addition to deer, sightings of red and gray squirrels were frequent. Tracks of racoon and recent beaver activity were also noted. A red fox den was documented in the periphery dyke at the edge of the riparian forest near plot PL10.

The presence of various bird species was also noted. A bald eagle was observed flying overhead and a nest was documented on-site (see geo-database for location). Additional bird sightings included downy woodpecker, hairy woodpecker, pileated woodpecker, black-capped chickadee, white-breasted nuthatch, red-eyed vireo, American goldfinch and great crested flycatcher.

## 4.2 Fort Garry Campus – Southwood Lands Assessment Area

### OVERSTORY

The University of Manitoba Fort Garry Campus - Southwood Lands assessment area (2.16 ha) is represented by two distinct river bottom forest ecosystem classes, (1) Green ash / Manitoba maple (RBF 4) and (2) Bur oak / Green ash / Manitoba maple (RBF 5). Each of these forest classes characterized one of the two survey plots situated within the assessment area. Within both of the survey plots, dominant tree health was graded as 'Good'.

Within the RBF 4 forest class, the ash and maple codominant canopy falls within the 30-50 year old age class. Within the RBF 5 forest type survey plot, the dominant oak canopy fell within the 100-120 year old age class, while ash trees present within the canopy ranged from 30-50 years old. Basswood was also present as a subdominant component of the forest canopy of the RBF 5 survey plot and falls within the 20-40 year old age class (Table 4).

The forest canopy of the survey plots within the assessment area is characterized as relatively even with a crown height ranging between 11 – 13 m. The mean and median canopy height within the Southwood Lands assessment area is approximately 12 m. The density of trees within each survey plot in the assessment area ranged from 16 stems per plot to 21 stems per plot and the average stem count observed was approximately 19 stems per plot (Table 4).

### SHRUB LAYER

The shrub layer surveyed within the Southwood Lands assessment area exhibited a low level of diversity and varied in terms of canopy coverage and stem density. Four different species of trees and shrubs were observed at the shrub layer within the survey plots (one tree and three shrub species). An additional five shrub species were observed within the assessment area during groundcover surveys as well as meander surveys between plots, for a total of eight shrub species within this assessment area (Table 4). Shrub cover within the survey plots varied from 23% to 32%, with an average shrub cover of approximately 28% across the surveyed area. Stem density fluctuated widely between the two survey plots, from a low of 70 stems per 210m<sup>2</sup> to a maximum count of 253 stems per 210 m<sup>2</sup>. The overall health of the shrubs within the sampled shrub layers was noted as 'Good'.

## GROUNDCOVER

The Southwood Lands assessment area is characterized by a low overall diversity of groundcover plant species, with only 30 unique species being identified of which six were non-native plant species (Table 5). At the survey plot level, species diversity ranged from a low of 16 species to a maximum of 22 species with an average of 14 unique species per plot.



Weedy plant species including Canada thistle commonly invade and dominate areas with full light conditions.

The most common groundcover plants documented within the survey plots were predominantly weedy non-native species. Of the eight species that occurred in both survey plots, five were the non-native species: Canada thistle, dandelion (*Taraxacum officinale*), Kentucky bluegrass, reed canary grass and smooth brome. Besides these non-native plant species, cocklebur (*Xanthium strumarium*), star-flowered Solomon's seal and Virginia creeper occurred in both survey plots (Table 5). Similarly, of the five plant species that exhibited an average groundcover value of approximately 5% or greater, three were the non-native species Canada thistle (13%), Kentucky bluegrass (11%) and reed canary grass (6%). Chokecherry (9%) and cocklebur (5%) were the two native plant species that exhibited the highest average groundcover within this assessment area (Table 6). At the survey plot level, non-native plant cover ranged from 26% to 35%, with Canada thistle and Kentucky bluegrass being the dominant species noted (Table 4). The ground level within the assessment area showed variable levels of bare earth (including areas of leaf litter and fallen woody debris) ranging from 12% to 51% (average bare earth cover of 32% across all survey plots) (Table 4).

**TABLE 4.** SURVEY PLOT CHARACTERIZATION FOR THE SOUTHWOOD LANDS ASSESSMENT AREA

Southwoods Lands Assessment Area		SL01	SL02
<b>Overstory</b>			
	<i>Vegetation type</i>	RBF 5	RBF 4
	<i>Canopy dominance</i>	Oak / Ash / Basswood	Ash / Maple
	<i>Canopy age class (yrs)</i>	Oak (100-120) / Ash (70-90) / Basswood (20-40)	Ash (30-50) / Maple (30-50)
	<i>Canopy height (m)</i>	Oak (12) / Ash (13) / Basswood (11)	Ash (10) / Maple (11)
	<i>Stem density (stems / 420m<sup>2</sup>)</i>	Oak (2) / Ash (8) / Basswood (1) / Elm (5) / Maple (5)	Ash (5) / Maple (11)
	<i>Health</i>	Good	Good
<b>Shrub Layer</b>			
	<i>Species</i>	Maple / Chokecherry	Maple / Chokecherry / Honeysuckle / Rose
	<i>Average shrub cover</i>	23%	32%
	<i>Stem density (stems / 210m<sup>2</sup>)</i>	Maple (10) / Chokecherry (60)	Maple (8) / Chokecherry (241) / Honeysuckle (3) / Rose (1)
	<i>Health</i>	Good	Good
<b>Ground cover</b>			
	<i>Primary species (% ground cover)</i>	Cocklebur (9), Sm. sweet cicely (6), Impatiens (4)	Chokecherry (17)
	<i>Secondary species (% ground cover)</i>	Raspberry (4), Snowberry (2), Beaked sedge (2)	Honeysuckle (2), SF solomon's seal (1)
	<i>Non-native and invasive species (% ground cover)</i>	Canada thistle (26), Reed canary grass (9)	Kentucky bluegrass (22), Reed canary grass (4)
	<i>Bare earth / logs / litter</i>	12%	51%
<b>Soils</b>			
	<i>Soil Texture</i>	Clay	Silty clay

## SOILS

Soils within the Southwood Lands assessment area were characterized as silty clay and exhibited a consistent soil profile to one metre in depth. No distinct soil horizon differentiation was observed. Root growth was regularly noted throughout the one metre soil pits, with varying amounts of root growth between plots.

## BANK CONDITIONS

Riverbank conditions throughout the Southwood Lands assessment area are typically characterized by a steep drop from the forest habitat down to a very short, alluvial river bank. The riverbank showed signs of recent siltation and was vegetated only by annual and biennial plant species.

## HABITAT USAGE

No mammals were observed during the field study at Southwood Lands though white-tailed deer activity was evident with frequent occurrences of scat and tracks along the forest buffer. Birds noted in the assessment area included blue jay, downy woodpecker, white-breasted nuthatch, black-capped chickadee and American goldfinch.

**TABLE 5.** SOUTHWOOD LANDS ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (30 SPECIES).

Common Name	Scientific Name	Count	Count (%)
bare earth/logs/leaf litter		2	100%
Canada thistle	<i>Cirsium arvense</i>	2	100%
cocklebur	<i>Xanthium strumarium</i>	2	100%
dandelion	<i>Taraxacum officinale</i>	2	100%
Kentucky bluegrass	<i>Poa pratensis</i>	2	100%
reed canary grass	<i>Phalaris arundinacea</i>	2	100%
smooth brome	<i>Bromus inermis</i>	2	100%
star-flowered Solomon's seal	<i>Smilacina stellata</i>	2	100%
Virginia creeper	<i>Parthenocissus quinquefolia</i>	2	100%
American elm	<i>Ulmus americana</i>	1	50%
saltbrush	<i>Atriplex</i> sp.	1	50%
bluebur	<i>Lappula squarrosa</i>	1	50%
beaked sedge	<i>Carex rostrata</i>	1	50%
Canada goldenrod	<i>Solidago canadensis</i>	1	50%
green ash	<i>Fraxinus pensylvannica</i>	1	50%
hawthorn	<i>Crataegus chrysoarpa</i>	1	50%
honeysuckle	<i>Diervilla lonicera</i>	1	50%
horehound	<i>Lycopus</i> sp.	1	50%
impatien	<i>Impatiens</i> sp.	1	50%
tall meadowrue	<i>Thalictrum dasycarpum</i>	1	50%
chokecherry	<i>Prunus virginiana</i>	1	50%
wild red raspberry	<i>Rubus idaeus</i>	1	50%
poison ivy	<i>Toxicodendron radicans</i>	1	50%
saskatoon	<i>Amelanchier alnifolia</i>	1	50%
smooth sweet cicely	<i>Osmorhiza longistylis</i>	1	50%
American bittersweet	<i>Celastrus scandens</i>	1	50%
Virginia wildrye	<i>Elymus virginicus</i>	1	50%
western snowberry	<i>Symphoricarpos occidentalis</i>	1	50%
sedge	<i>Carex</i> sp.	1	50%
prickly rose	<i>Rosa acicularis</i>	0	0%

**TABLE 6.** SOUTHWOOD LANDS ASSESSMENT AREA GROUNDCOVER DATA SORTED DESCENDING BY AVERAGE COVER (30 SPECIES).

Common Name	Scientific Name	Average when present	Average across 2 plots
bare earth/logs/leaf litter		31.39	31.39
Canada thistle	<i>Cirsium arvense</i>	13.19	13.19
Kentucky bluegrass	<i>Poa pratensis</i>	10.97	10.97
chokecherry	<i>Prunus virginiana</i>	17.22	8.61
reed canary grass	<i>Phalaris arundinacea</i>	6.38	6.38
cocklebur	<i>Xanthium strumarium</i>	4.58	4.58
smooth sweet cicely	<i>Osmorhiza longistylis</i>	6.39	3.19
impatien	<i>Impatiens</i> sp.	4.44	2.22
wild red raspberry	<i>Rubus idaeus</i>	3.61	1.81
western snowberry	<i>Symphoricarpos occidentalis</i>	1.94	0.97
beaked sedge	<i>Carex rostrata</i>	1.67	0.83
honeysuckle	<i>Diervilla lonicera</i>	1.67	0.83
dandelion	<i>Taraxacum officinale</i>	0.56	0.56
smooth brome	<i>Bromus inermis</i>	0.56	0.56
star-flowered Solomon's seal	<i>Smilacina stellata</i>	0.56	0.56
Virginia creeper	<i>Parthenocissus quinquefolia</i>	0.56	0.56
horehound	<i>Lycopus</i> sp.	0.56	0.28
poison ivy	<i>Toxicodendron radicans</i>	0.56	0.28
Virginia wildrye	<i>Elymus virginicus</i>	0.56	0.28
American elm	<i>Ulmus americana</i>	0.28	0.14
saltbrush	<i>Atriplex</i> sp.	0.28	0.14
bluebur	<i>Lappula squarrosa</i>	0.28	0.14
Canada goldenrod	<i>Solidago canadensis</i>	0.28	0.14
green ash	<i>Fraxinus pennsylvannica</i>	0.28	0.14
hawthorn	<i>Crataegus chrysocarpa</i>	0.28	0.14
tall meadowrue	<i>Thalictrum dasycarpum</i>	0.28	0.14
saskatoon	<i>Amelanchier alnifolia</i>	0.28	0.14
American bittersweet	<i>Celastrus scandens</i>	0.28	0.14
sedge	<i>Carex</i> sp.	0.28	0.14
prickly rose	<i>Rosa acicularis</i>	0.00	0.00

## 4.3 Glenlea Research Station Assessment Area

### OVERSTORY

The Glenlea Research Station assessment area (24.9 ha) is represented by three distinct river bottom forest ecosystem classes, (1) Green ash / Basswood (RBF 2), (2) Green ash / Manitoba maple (RBF 4) and (3) Bur oak / Green ash / Manitoba maple (RBF 5). The dominant forest class throughout much of this assessment area is the RBF 5 forest type, characterizing 15/19 (79%) of the survey plot locations (Table 7). Across all forest classes surveyed, dominant tree health was graded as 'Fair-Good' or 'Good' and occurrence of tree mortality was within normal expectations for a healthy riverbottom forest system.

Within the RBF 5 forest class, the dominant oak canopy ranged in age from approximately 90 years old to approximately 140 years old. The most common age class for oak dominant canopies within the Glenlea assessment area was 110 – 130 years old and was noted for 8/15 (53%) of the RBF 5 survey plots. When green ash was present within the canopy of the RBF 5 forest types, their age ranged from approximately 60 years old to approximately 120 years old. Manitoba maple was present within the upper canopy of only one RBF 5 forest type survey plot and fell within the 60-80 year age class (Table 7). Within the RBF 4 forest type survey plots, the dominant ash canopy typically ranged in age from 60-80 years old, while maple trees present within the canopy ranged more widely from 30-80 years old. In the one RBF 2 forest type, the basswood dominant canopy was aged between 70-90 years old while the codominant ash present within the canopy fell within the 40-60 year old age class (Table 7).



*The Glenlea assessment area is characterized by a large amount of riverbottom terrace habitat (approx. 2/3 of the site).*

Across the majority of the assessment area, the forest canopy is described as relatively even with a crown height ranging from a low of 18 m up to a maximum of 30 m. The mean and median canopy height within the Glenlea assessment area is approximately 22 m. While the tallest tree documented during the study was a 120 year old oak (30 m tall), when ash was present as a codominant component of the canopy, they typically exceeded the height of the oak trees within the canopy. The density of trees within each survey plot varied considerably across the assessment area, from a low of 21 stems per plot up to a high of 60 stems per plot. The median tree stem count is 34 per plot and the overall average is approximately 36 stems per plot (Table 7).

**TABLE 7.** SURVEY PLOT CHARACTERIZATION FOR THE GLENLEA ASSESSMENT AREA.

Glenlea Research Station Assessment Area	GL01	GL02	GL03	GL04	GL05	GL06	GL07
<b>Overstory</b>							
Vegetation type	RB 3 / RB 4	RBF 5	RBF 5	RBF 3/4	RBF 5	RBF 5	RBF 5
Canopy dominance	Elm / Maple	Oak / Maple	Oak / Ash	Ash / Maple	Oak / Ash	Oak / Ash	Oak / Ash
Canopy age class (yrs)	Elm (20-40) / Maple (30-50)	Oak (90-110) / Maple (60-80)	Oak (110-130) / Ash (60-80)	Ash (60-80) / Maple (60-80)	Oak (120-140) / Ash (100-120)	Oak (110-130) / Ash (100-120)	Oak (100-120) / Ash (90-110)
Canopy height (m)	Elm (19) / Maple (16)	Oak (19) / Maple (22)	Oak (30) / Ash (18)	Ash (22) / Maple (20)	Oak (19) / Ash (18)	Oak (20) / Ash (21)	Oak (20) / Ash (23)
Stem density (stems / 420m <sup>2</sup> )	Elm (2) / Maple (30)	Oak (1) / Maple (37)	Oak (9) / Ash (10) / Maple (5)	Ash (7) / Maple (20)	Oak (11) / Ash (7) / Maple (5) / Elm (30)	Oak (21) / Ash (6) / Basswood (2) / Maple (5)	Oak (16) / Ash (7) / Elm (9) / Maple (3)
Health	Fair - Good	Fair - Good	Fair - Good	Fair - Good	Fair - Good	Good	Good
<b>Shrub Layer</b>							
Species	Elm / Ash / Maple	Maple / Elm / Ash	Maple / Chokecherry / Ash / Saskatoon / Downy	Ash / Elm / Maple / Oak	Ash / Elm / Maple / Chokecherry / Snowberry	Maple / Chokecherry / Saskatoon / Basswood / Elm	Ash / Elm / Chokecherry / Saskatoon
Average shrub cover	20%	10%	45%	15%	25%	30%	25%
Stem density (stems / 210m <sup>2</sup> )	Elm (5) / Ash (7) / Maple (4)	Maple (2) / Elm (2) / Ash (2)	Maple (14) / Chokecherry (60) / Ash (4) / Saskatoon (3) /	Ash (21) / Elm (6) / Maple (1) / Oak (1)	Ash (5) / Elm (5) / Maple (1) / Chokecherry (20+) /	Maple (3) / Chokecherry (15) / Saskatoon (13) / Basswood	Ash (3) / Elm (1) / Chokecherry (13) / Saskatoon (2)
Health	Good	Good	Good	Good	Good	Good	Good
<b>Ground cover</b>							
Primary species (% ground cover)	Virginia wildrye (14), Ash (14), Wood nettle (8)	Ash (19), Wood nettle (16), Elm (10)	Sedge (18), Virginia creeper (13), Ash (6)	Virginia wildrye (7), Sm. Hedge nettle (6)	Sedge (28), Virginia wildrye (8), S.F. Solomans seal (7)	Ash (10), Meadow rue (10), Saskatoon (6), Sedge (6)	Ash (19), Meadow rue (7)
Secondary species (% ground cover)	Elm (3), Maple (2), Fragrant bedstraw (2)	Hedge nettle (4), Maple (3)	Chokecherry (4), Snowberry (2), Elm (2)	Ash (4), Elm (4), Stinging nettle (4)	Elm (3), Fragrant bedstraw (2), Snowberry (2)	Chokecherry (6), Snowberry (3), Oak (3)	Sedge (3), Carrionflower (2), Fairy bells (2)
Non-native and invasive species (% ground cover)	Reed canary grass (5)	Smooth brome (13), Reed canary grass (2)	Smooth brome (4), Reed canary grass (2)	Smooth brome (2)	Reed canary grass (4), Canada thistle (3)	Kentucky bluegrass (2)	Dandelion (>1)
Bare earth / logs / litter	22%	23%	32%	25%	28%	38%	54%
<b>Soils</b>							
Soil Texture	Silty clay	Silty clay	Silty clay	Silty clay	Silty clay	Clay	Clay

**TABLE 7. (CONT.) SURVEY PLOT CHARACTERIZATION FOR THE GLENLEA ASSESSMENT AREA.**

Glenlea Research Station Assessment Area	GL08	GL09	GL10	GL11	GL12	GL13	GL14
<b>Overstory</b>							
Vegetation type	RBF 5	RBF 5	RBF 5	RBF 5	RBF 5	RBF 5	RBF 5
Canopy dominance	Oak / Ash	Oak / Ash / Basswood	Oak / Basswood	Oak / Ash / Basswood	Oak / Basswood	Oak / Basswood / Aspen	Basswood / Ash
Canopy age class (yrs)	Oak (90-110) / Ash (90 -110)	Oak (100-120) / Ash (70-90) / Basswood (90-110)	Oak (120-140) / Basswood (60-80)	Oak (110-130) / Ash (90-110) / Basswood (70-90)	Oak (110-130) / Basswood (90-110)	Oak (110) / Basswood (70-90) / Aspen (60-80)	Basswood (70-90) / Ash (40-60)
Canopy height (m)	Oak (18) / Ash (22)	Oak (24) / Ash (25) / Basswood (21)	Oak (22) / Basswood (19)	Oak (22) / Ash (21) / Basswood (20)	Oak (21) / Basswood (25)	Oak (19) / Basswood (20) / Aspen (20)	Basswood (19) / Ash (20)
Stem density (stems / 420m <sup>2</sup> )	Oak (9) / Ash (11) / Elm (1)	Oak (5) / Ash (1) / Basswood (10) / Elm (12)	Oak (12) / Basswood (20) / Elm (4) / Ash (1) / Maple (1)	Oak (9) / Ash (3) / Basswood (10) / Elm (3) / Maple (1)	Oak (3) / Basswood (22) / Maple (11) / Elm (7) / Ash (2)	Oak (4) / Basswood (3) / Aspen (6) / Elm (11) / Ash (2)	Basswood (3) / Ash (9) / Elm (12) / Oak (1) / Maple (7) /
Health	Fair - Good	Good	Good	Fair - Good	Fair - Good	Fair - Good	Fair - Good
<b>Shrub Layer</b>							
Species	Maple / Ash / Chokecherry	Elm / Maple / Saskatoon / Basswood	Maple / Elm / Basswood / Saskatoon	Basswood / Hawthorn / Maple / Elm	Maple / Elm / Ash / Downy arrowwood / Basswood /	Oak / Basswood / Elm / Chokecherry / Snowberry	Maple / Ash / Elm / Chokecherry / Saskatoon /
Average shrub cover	20%	45%	20%	15%	60%	5%	15%
Stem density (stems / 210m <sup>2</sup> )	Maple (22) / Ash (15) / Chokecherry (5)	Elm (25) / Maple (1) / Saskatoon (11) / Basswood (1)	Maple (3) / Elm (7) / Basswood (16) / Saskatoon (2)	Basswood (3) / Hawthorn (1) / Maple (1) / Elm (1)	Maple (12) / Elm (5) / Ash (2) / Downy arrowwood (4) /	Oak (1) / Basswood (1) / Elm (1) / Chokecherry (6) /	Maple (1) / Ash (6) / Elm (2) / Chokecherry (1) / Saskatoon
Health	Fair - Good	Good	Good	Good	Good	Good	Good
<b>Ground cover</b>							
Primary species (% ground cover)	Maple (18), Hog peanut (15), Ash (12)	Hog peanut (29), Ash (20), Meadow rue (12)	Hog peanut (52)	Hog peanut (53)	Hog peanut (56), Ash (17)	Ash (20), Basswood (8)	Hog peanut (23), Ash (9), Sedge (8), Basswood (7)
Secondary species (% ground cover)	Elm (4), Oak (2), R.O. Dogwood (2)	Hawthorn (6), Oak (4)	Ash (4), Honeysuckle (2)	Basswood (1), Oak (1)	Oak (5), Snowberry (4)	Raspberry (4), Maple (4), Fragrant bedstraw (3)	Oak (3), Meadow rue (2), Snowberry (2)
Non-native and invasive species (% ground cover)	----	Kentucky bluegrass (19)	----	----	Sow thistle (1), Smooth brome (>1)	Canada thistle (4), Kentucky bluegrass (2)	Kentucky bluegrass (4)
Bare earth / logs / litter	31%	21%	42%	36%	6%	38%	41%
<b>Soils</b>							
Soil Texture	Clay	Clay	Clay	Clay	Clay	Clay loam	Silty Clay

**TABLE 7. (CONT.) SURVEY PLOT CHARACTERIZATION FOR THE GLENLEA ASSESSMENT AREA.**

Glenlea Research Station Assessment Area	GL15	GL16	GL17	GL18	GL19
<b>Overstory</b>					
<i>Vegetation type</i>	RBF 5	RBF 4	RBF5	RBF 5	RBF 5
<i>Canopy dominance</i>	Oak / Ash / Basswood	Ash / Maple	Oak / Ash	Oak	Oak / Elm
<i>Canopy age class (yrs)</i>	Oak (110-130) / Ash (80-100) / Basswood (70-90)	Ash (70-90) / Maple (60-80)	Oak (110-130) / Ash (100-120)	Oak (110-130)	Oak (90-110) / Elm (50-70)
<i>Canopy height (m)</i>	Oak (22) / Ash (21) / Basswood (22)	Ash (25) / Maple (16)	Oak (19) / Ash (21)	Oak (21)	Oak (18) / Elm (17)
<i>Stem density (stems / 420m<sup>2</sup>)</i>	Oak (5) / Ash (3) / Basswood (6) / Elm (6) / Maple (29)	Ash (9) / Maple (32) / Elm (18) / Oak (1)	Oak (7) / Ash (4) / Elm (3) / Basswood (22)	Oak (7) / Basswood (16) / Ash (4) / Maple (7) / Elm (20)	Oak (9) / Elm (6) / Ash (1) / Maple (10) / Hawthorn (1)
<i>Health</i>	Good	Fair - Good	Fair - Good	Fair - Good	Fair - Good
<b>Shrub Layer</b>					
<i>Species</i>	Maple / Elm	Maple / Elm	Basswood / Elm / Ash / Nannyberry	Elm / Ash / Saskatoon / Hawthorn / Hazelnut	Maple / Ash / Hawthorn
<i>Average shrub cover</i>	10%	10%	25%	35%	30%
<i>Stem density (stems / 210m<sup>2</sup>)</i>	Maple (5) / Elm (4)	Maple (1) / Elm (4)	Basswood (3) / Elm (7) / Ash (3) / Nannyberry (1)	Elm (10) / Ash (1) / Saskatoon (5) / Hawthorn (4) / Hazelnut	Maple (20+) / Ash (5) / Hawthorn (8)
<i>Health</i>	Good	Good	Good	Good	Good
<b>Ground cover</b>					
<i>Primary species (% ground cover)</i>	Ash (16)	Ash (5)	Ash (23), Hog peanut (9)	Ash (11)	Maple (12)
<i>Secondary species (% ground cover)</i>	Virginia wildrye (4), Basswood (3), Sedge (2), Wood nettle (2)	Fragrant bedstraw (4), Carrion flower (1)	Meadow rue (2), Maple (2), Carrion flower (2), Poison Ivy	Elm (2), Maple (1)	Ash (4), Oak (3), Snowberry (3), Elm (3)
<i>Non-native and invasive species (% ground cover)</i>	Canada thistle (>1)	Bluebur (1), Sow thistle (>1), Dandelion (>1)	Reed canary grass (>1), Common plantain (>1)	Burdock (1), Kentucky bluegrass (>1)	Burdock (12), Kentucky bluegrass (4), Smooth brome
<i>Bare earth / logs / litter</i>	76%	92%	44%	71%	30%
<b>Soils</b>					
<i>Soil Texture</i>	Silty Clay	Silty Clay	Clay	Clay - Silty clay	Clay



## SHRUB LAYER

Overall, the shrub layer across the Glenlea assessment area exhibited a high level of diversity but varied considerably in terms of canopy coverage and stem density. Twelve different species of trees and shrubs were observed at the shrub layer within the survey plots (five tree and seven shrub species). An additional 11 shrub species were observed within the Glenlea assessment area during groundcover surveys as well as meander surveys between plots for a total of 18 shrub species encountered (Table 7). Shrub cover within the survey plots varied from a low of 5% up to 60%, with an average shrub cover of approximately 25% across the surveyed area. Likewise, stem density fluctuated widely between the survey plots, from a minimum count of 6 stems per 210m<sup>2</sup> to a maximum count of 82. An average stem count of approximately 32 stems per 210m<sup>2</sup> was found across the assessment area.



*Hog peanut (Amphicarpaea bracteata) growing densely at the ground level and climbing short, browsed shrubs.*

The overall health of the shrubs within the sampled shrub layers was noted as 'Good', however many of the survey plots were experiencing conditions that could negatively affect the development of the shrub layer over time. Heavy deer browse was observed throughout much of the assessment area, often resulting in a short shrub layer consistently browsed to a height of approximately one metre. While the loss of woody plant biomass to browse did not appear to lead to mortality in any of these shrubs, it has resulted in a stunted shrub layer that is often densely colonized by the vining plant hog peanut (*Amphicarpaea bracteata*). Additionally, where chokecherry was present within the shrub layer, evidence of black knot disease was often observed.

## GROUNDCOVER

The Glenlea assessment area is characterized by a high overall diversity of groundcover plant species, with 73 unique species being identified of which only 11 were non-native plant species (15%) (Table 8). At the survey plot level, species diversity ranged from a low of 13 species to a maximum of 26 species with an average of 20 unique species per plot.

The most common groundcover plants documented within the survey plots tended to be the dominant overstory species (ash, elm, oak and maple all occurring in more than 79% of plots) as well as chokecherry (present in 63% of plots). The most common herbaceous plants at the ground level of the survey plots include carrionflower (*Smilax herbacea*), fragrant bedstraw (*Galium triflorum*), Virginia wildrye, smooth hedge nettle (*Stachys tenuifolia*) and hog peanut (each occurring in more than 63% of plots). Looking at individual plant cover within the survey plots, again, the greatest plant cover was produced by the dominant tree species, graminoids (including sedges (*Carex* spp.), Virginia wildrye, smooth brome and reed canary grass), as well as smooth hedge nettle, wood nettle, stinging nettle, Virginia creeper, hog peanut and tall meadow rue. Notably, when hog peanut was present within the survey plot, it tended to dominate the groundcover, occupying up to of 56% of the ground level (Table 9).

The ground level within the assessment area is characterized by variable levels of bare earth (including areas of leaf litter and fallen woody debris) ranging from as little as 6% to a maximum of 92% (average bare earth cover of 40% across all survey plots). Non-native plant species were noted in the majority of survey plots (84% of plots); however they typically represented only a minor component of the ground cover plant community (not exceeding 20% cover in any plot). Of the non-native plants present, reed canary grass, smooth brome and Kentucky bluegrass were the most common (Table 7).

While surveying the Glenlea assessment area, one species of conservation concern was encountered, this was the native leguminous shrub False indigo (*Amorpha fruticosa*). This species is ranked as S1/S2 by the Manitoba Conservation Data Centre, but was not identified as a species likely to occur within the area. Only one specimen of this plant was observed during field investigation and it was picked up incidentally while travelling between survey plots (see geo-database for precise location).



*False indigo bush (Amorpha fruticosa) is a provincially rare plant observed at the Glenlea assessment area.*

**TABLE 8.** GLENLEA ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (73 SPECIES).

Common name	Scientific name	Count	Count (%)
bare earth/logs/leaf litter		19	100%
green ash	<i>Fraxinus pensylvannica</i>	19	100%
American elm	<i>Ulmus americana</i>	17	89%
bur oak	<i>Quercus macrocarpa</i>	16	84%
carrionflower	<i>Smilax herbacea</i>	16	84%
Manitoba Maple	<i>Acer negundo</i>	15	79%
fragrant bedstraw	<i>Galium triflorum</i>	15	79%
Virginia Wild Rye	<i>Elymus virginicus</i>	14	74%
smooth hedge nettle	<i>Stachys tenuifolia</i>	13	68%
hog peanut	<i>Amphicarpaea bracteata</i>	12	63%
chokecherry	<i>Prunus virginiana</i>	12	63%
bluebur	<i>Lappula squarrosa</i>	10	53%
saskatoon	<i>Amelanchier alnifolia</i>	9	47%
wood nettle	<i>Laportea canadensis</i>	9	47%
common snowberry	<i>Symphoricarpos albus</i>	9	47%
tall meadowrue	<i>Thalictrum dasycarpum</i>	9	47%
Virginia creeper	<i>Parthenocissus quinquefolia</i>	8	42%
star-flowered Solomon's seal	<i>Smilacina stellata</i>	8	42%
basswood	<i>Tilia americana</i>	8	42%
reed canary grass	<i>Phalaris arundinacea</i>	7	37%
Kentucky bluegrass	<i>Poa pratensis</i>	7	37%
smooth brome	<i>Bromus inermis</i>	6	32%
Canada thistle	<i>Cirsium arvense</i>	6	32%
perennial sow thistle	<i>Sonchus arvensis</i>	6	32%
dandelion	<i>Taraxacum officinale</i>	6	32%
veiny meadowrue	<i>Thalictrum venulosum</i>	6	32%
assiniboine sedge	<i>Carex assiniboinensis</i>	5	26%
fairybells	<i>Disporum trachycarpum</i>	5	26%
wild cucumber	<i>Echinocystis lobata</i>	5	26%
northern bedstraw	<i>Galium borealis</i>	5	26%
prickly rose	<i>Rosa acicularis</i>	5	26%
wild red raspberry	<i>Rubus idaeus</i>	5	26%
stinging Nettle	<i>Urtica dioica</i>	5	26%
devil's beggarstick	<i>Bidens frondosa</i>	4	21%
long-beaked sedge	<i>Carex spengelii</i>	4	21%
hawthorn	<i>Crataegus chrysoarpa</i>	4	21%
Canada violet	<i>Viola canadensis</i>	4	21%
riverbank grape	<i>Vitis riparia</i>	4	21%
Canada anemone	<i>Anemone canadensis</i>	3	16%
common burdock	<i>Arctium minus</i>	3	16%
maximilian sunflower	<i>Helianthus maximiliani</i>	3	16%

**TABLE 8. (CONT.)** GLENLEA ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (73 SPECIES).

Common name	Scientific name	Count	Count (%)
Canadian moonseed	<i>Menispermum moonseed</i>	3	16%
yellow wood-sorrel	<i>Oxalis stricta</i>	3	16%
common plantain	<i>Plantago major</i>	3	16%
fringed aster	<i>Symphiotrichium ciliolatum</i>	3	16%
poison ivy	<i>Toxicodendron radicans</i>	3	16%
cocklebur	<i>Xanthium strumarium</i>	3	16%
red-osier dogwood	<i>Cornus sericea ssp sericea</i>	2	11%
beaked hazelnut	<i>Corylus cornuta</i>	2	11%
marsh skullcap	<i>Scutellaria galericulata</i>	2	11%
smooth aster	<i>Symphiotrichium laeve</i>	2	11%
western snowberry	<i>Symphoricarpos occidentalis</i>	2	11%
downy arrowwood	<i>Viburnum rafinesqueanum</i>	2	11%
wild vetch	<i>Vicia americana</i>	2	11%
spreading dogbane	<i>Apocynum androsaemifolium</i>	1	5%
lamb's-quarters	<i>Chenopodium album</i>	1	5%
flat-top goldenrod	<i>Euthamia graminifolia</i>	1	5%
wild strawberry	<i>Fragaria virginiana</i>	1	5%
yellow avens	<i>Geum aleppicum</i>	1	5%
veiny pea	<i>Lathyrus venosus</i>	1	5%
twining honeysuckle	<i>Lonicera dioica</i>	1	5%
cow parsnip	<i>Heracleum maximum</i>	1	5%
smooth sweet cicely	<i>Osmorhiza longistylis</i>	1	5%
water smartweed	<i>Polygonum aquaticum</i>	1	5%
eastern cottonwood	<i>Populus deltoides</i>	1	5%
woods' rose	<i>Rosa woodsii</i>	1	5%
nannyberry	<i>Viburnum lentago</i>	1	5%
false indigo	<i>Amorpha fruticosa</i>	0	0%
caragana	<i>Caragana arborescens</i>	0	0%
beaked sedge	<i>Carex rostrata</i>	0	0%
quill sedge	<i>Carex tenera</i>	0	0%
ostrich fern	<i>Matteuccia struthiopteris</i>	0	0%
red currant	<i>Ribes triste</i>	0	0%
sandbar willow	<i>Salix exigua</i>	0	0%

## SOILS

Two predominant soil types were identified within the Glenlea assessment area. Survey plots that were located near the Red River tended to be characterized as silty clay, while those further recessed from the river, within the forest interior, tended to be moderately heavier in texture, typically being characterized as clay soils (Table 7). In those survey plots located within the forest interior, a more prominent organic surface horizon was typically present but the remaining one meter soil profile tended to be consistent and relatively undifferentiated. In those survey plots situated adjacent the Red River, the soil conditions were consistent from surface down to one metre with no observable horizon development or differentiation.



*The riverbank at the Glenlea assessment area was characterized by a gently sloped shelf at the river's edge.*

## BANK CONDITIONS

The riverbank throughout the Glenlea assessment area is characterized by a moderate to steep drop-off from the forested area to a gently sloping alluvial shelf occupied predominantly by perennial vegetation. The gently sloped shelf along the river bank ranges in length from approximately 20m to 40m. Plant species that typically occupied this area include reed canary grass, water smartweed, beaked sedge, sow thistle and sandbar willow. Areas further away from the river's edge occasionally had young maple saplings establishing within the herbaceous perennial vegetation.

## HABITAT USAGE

The large woodland at the Glenlea research station provides an important refuge for various wildlife species. White-tailed were sighted in numerous locations and an abundance of scat, browse, tracks, and bones further confirmed the habitat usage. Small mammal habitat usage was documented for beaver, red fox, racoon, as well as red and gray squirrels.

Several bird species were noted in the assessment area. Raptor sightings included the red-tailed hawk, Cooper's hawk, bald eagle and one broad-winged hawk noted as a transient individual using the forest as a hunting grounds or stop-over refuge during migration. Other bird sightings included the American goldfinch, blue jay, song sparrow, black-capped chickadee, mourning dove, rose-breasted grosbeak, eastern wood-peewee, white-breasted nuthatch, warbling vireo, downy woodpecker, pileated woodpecker, belted kingfisher and mallard.

**TABLE 9.** GLENLEA ASSESSMENT AREA GROUND COVER DATA SORTED DESCENDING BY AVERAGE COVER (73 SPECIES).

Common name	Scientific name	Average when present	Average across 19 plots
bare earth/logs/leaf litter		39.44	39.46
hog peanut	<i>Amphicarpaea bracteata</i>	20.90	12.76
green ash	<i>Fraxinus pennsylvannica</i>	11.51	11.18
assiniboine sedge	<i>Carex assiniboensis</i>	11.28	2.97
Manitoba maple	<i>Acer negundo</i>	3.28	2.68
Virginia wild rye	<i>Elymus virginicus</i>	1.88	2.02
American elm	<i>Ulmus americana</i>	1.93	1.84
Kentucky bluegrass	<i>Poa pratensis</i>	6.18	1.61
wood nettle	<i>Laportea canadensis</i>	2.81	1.58
bur oak	<i>Quercus macrocarpa</i>	2.03	1.52
Virginia creeper	<i>Parthenocissus quinquefolia</i>	2.78	1.17
smooth brome	<i>Bromus inermis</i>	4.22	1.13
basswood	<i>Tilia americana</i>	2.41	1.10
fragrant bedstraw	<i>Galium triflorum</i>	1.19	1.01
veiny meadowrue	<i>Thalictrum venulosum</i>	3.06	0.96
tall meadowrue	<i>Thalictrum dasycarpum</i>	2.89	0.92
chokecherry	<i>Prunus virginiana</i>	1.28	0.86
common snowberry	<i>Symphoricarpos albus</i>	1.64	0.85
reed canary grass	<i>Phalaris arundinacea</i>	1.76	0.80
smooth hedge nettle	<i>Stachys tenuifolia</i>	1.23	0.79
star-flowered Solomon's seal	<i>Smilacina stellata</i>	1.87	0.70
common burdock	<i>Arctium minus</i>	4.44	0.70
saskatoon	<i>Amelanchier alnifolia</i>	1.45	0.69
carriionflower	<i>Smilax herbacea</i>	0.77	0.66
long-beaked sedge	<i>Carex sprengeii</i>	2.85	0.60
bluebur	<i>Lappula squarrosa</i>	1.03	0.54
Canada thistle	<i>Cirsium arvense</i>	1.67	0.45
stinging nettle	<i>Urtica dioica</i>	1.60	0.39
hawthorn	<i>Crataegus chrysocarpa</i>	2.67	0.38
wild red raspberry	<i>Rubus idaeus</i>	1.16	0.35
riverbank grape	<i>Vitis riparia</i>	1.37	0.29
western snowberry	<i>Symphoricarpos occidentalis</i>	2.36	0.25
Canada anemone	<i>Anemone canadensis</i>	0.97	0.19
fairybells	<i>Disporum trachycarpum</i>	0.83	0.19
poison ivy	<i>Toxicodendron radicans</i>	1.20	0.19
wild cucumber	<i>Echinocystis lobata</i>	0.67	0.18
prickly rose	<i>Rosa acicularis</i>	0.56	0.15
Canadian moonseed	<i>Menispermum canadense</i>	0.74	0.12
wild strawberry	<i>Fragaria virginiana</i>	1.94	0.10
water smartweed	<i>Polygonum aquaticum</i>	1.94	0.10
northern bedstraw	<i>Galium borealis</i>	0.46	0.10
perennial sow thistle	<i>Sonchus arvensis</i>	0.32	0.10
spreading dogbane	<i>Apocynum androsaemifolium</i>	1.67	0.09

**TABLE 9. (CONT.)** GLENLEA ASSESSMENT AREA GROUNDCOVER DATA SORTED DESCENDING BY AVERAGE COVER (73 SPECIES).

Common name	Scientific name	Average when present	Average across 19 plots
red-osier dogwood	<i>Cornus sericea</i> ssp <i>sericea</i>	0.83	0.09
twining honeysuckle	<i>Lonicera dioica</i>	1.67	0.09
dandelion	<i>Taraxacum officinale</i>	0.28	0.09
Canada violet	<i>Viola canadensis</i>	0.40	0.07
devil's beggarstick	<i>Bidens frondosa</i>	0.28	0.06
maximilian sunflower	<i>Helianthus maximiliani</i>	0.37	0.06
smooth aster	<i>Symphiotrichium laeve</i>	0.33	0.05
beaked hazelnut	<i>Corylus cornuta</i>	0.42	0.04
yellow wood-sorrel	<i>Oxalis stricta</i>	0.28	0.04
common plantain	<i>Plantago major</i>	0.28	0.04
marsh skullcap	<i>Scutellaria galericulata</i>	0.28	0.04
fringed aster	<i>Symphiotrichium ciliolatum</i>	0.28	0.04
cocklebur	<i>Xanthium strumarium</i>	0.28	0.04
wild vetch	<i>Vicia americana</i>	0.28	0.03
cow parsnip	<i>Heracleum maximum</i>	0.56	0.03
eastern cottonwood	<i>Populus deltoides</i>	0.56	0.03
downy arrowwood	<i>Viburnum rafinesqueanum</i>	0.28	0.03
flat-top goldenrod	<i>Euthamia graminifolia</i>	0.28	0.01
lamb's-quarters	<i>Chenopodium album</i>	0.28	0.01
yellow avens	<i>Geum aleppicum</i>	0.28	0.01
veiny pea	<i>Lathyrus venosus</i>	0.28	0.01
smooth sweet cicely	<i>Osmorhiza longistylis</i>	0.28	0.01
woods' rose	<i>Rosa woodsii</i>	0.28	0.01
nannyberry	<i>Viburnum lentago</i>	0.28	0.01
false indigo	<i>Amorpha fruticosa</i>	0.00	0.00
caragana	<i>Caragana arborescens</i>	0.00	0.00
beaked sedge	<i>Carex rostrata</i>	0.00	0.00
quill sedge	<i>Carex tenera</i>	0.00	0.00
ostrich fern	<i>Matteuccia struthiopteris</i>	0.00	0.00
red currant	<i>Ribes triste</i>	0.00	0.00
sandbar willow	<i>Salix exigua</i>	0.00	0.00

## 4.4 Ian N. Morrison Research Farm Assessment Area

### OVERSTORY

The Ian N. Morrison assessment area (11.0 ha) is represented by two distinct river bottom forest ecosystem classes, (1) Green ash / Basswood (RBF 2) and (2) Green ash / Manitoba maple (RBF 4). The dominant forest class throughout much of this assessment area is the RBF 2 forest type, characterizing 5/7 (71%) of the survey plot locations (Table 10). Across all forest classes surveyed, dominant tree health was graded as 'Fair-Good' or 'Good' and occurrence of tree mortality was within normal expectations for a healthy riverbottom forest system.

Within the RBF 2 forest class, the dominant ash canopy ranged in age from approximately 60 years old to approximately 90 years old. The most common age class for oak dominant canopies within the Ian N. Morrison assessment area was 60 – 80 years old and was noted for three of the five RBF 2 survey plots. When basswood was present within the canopy of the RBF 2 forest types, their age ranged from approximately 30 years old to approximately 90 years old. Manitoba maple was present within the upper canopy of two RBF 2 forest type survey plots and ranged in age from 30-80 years old (Table 10). Within the RBF 4 forest type survey plots, the ash canopy ranged in age from 70-100 years old, while maple trees present within the canopy ranged from 80-110 years old. Elm present in the canopy of one RBF 2 survey plot fell within the 70-90 year old age class.

Across the entire assessment area, forest canopies are described as uneven with a maximal crown height ranging from 20 m up to 27 m. The mean and median maximal crown canopy height within the Ian N. Morrison assessment area is approximately 24 m. The density of trees within each survey plot varied across the assessment area, from a low of 14 stems per plot up to a high of 36 stems per plot. The median tree stem count is 20 per plot and the overall average is approximately 24 stems per plot (Table 10).

### SHRUB LAYER

The shrub layer within the Ian N. Morrison assessment area exhibited comparable species richness relative to the Glenlea assessment area but is characterized by lower overall shrub cover and stem density. Thirteen different species of trees and shrubs were observed at the shrub layer within the survey plots (five tree and eight shrub species). An additional seven shrub species were observed within the Ian N. Morrison assessment area during groundcover surveys as well as meander surveys between plots for a total of 15 shrub species (Table 10). Shrub cover within the survey plots varied from a low of 8% up to 28%, with an average shrub cover of approximately 19% across the surveyed area. Shrub stem density fluctuated widely between the survey plots, from a minimum count of 8 stems per 210 m<sup>2</sup> to a maximum count of 41 stems per 210 m<sup>2</sup>. An average stem count of approximately 24 stems per 210 m<sup>2</sup> was found across this assessment area.



Black knot fungus was found on chokecherry shrubs in several locations at the Ian N. Morrison assessment area.

The overall health of the shrubs within the sampled survey plots was noted as 'Fair' or 'Good'. That being said, conditions were noted throughout the assessment area that has the potential to negatively affect overall shrub layer health. Most notably, European buckthorn, a highly invasive shrub/tree, was documented in more than half of the survey plots (4 of 7 plots), and was also noted in many locations between survey locations. Several large shrubs and trees were noted, including one individual that was aged to approximately 30 years old and was 11 m tall (noted in survey plot IM02, see geodatabase). In addition to the occurrence of buckthorn, black knot fungus was noted on numerous chokecherry shrubs, both within and between survey plot locations.

## GROUNDCOVER

The Ian N. Morrison assessment area is characterized by a high overall diversity of groundcover plant species, with 71 unique species being identified of which 14 were non-native plant species (20%) (Table 11). At the survey plot level, species diversity ranged from a low of 12 species to a maximum of 29 species with an average of 23 unique species per plot.

The composition of the groundcover plant community within each survey plot varied considerably, and unlike the Glenlea assessment area, the most common species documented were not the overstory trees. Only 14 groundcover plant species were observed in more than half the survey plots, and of those, green ash was the only tree. Chokecherry and European buckthorn were the only tall shrubs, and common snowberry (*Symphoricarpos albus*) was the only short shrub present in more than half the survey plots. Additional native groundcover plant species present in the majority of survey plots included Virginia creeper, tall meadow rue, wood nettle, cocklebur, Canada violet (*Viola canadensis*), Canada wildrye (*Elymus canadensis*), Cut-leaf coneflower (*Rudbeckia laciniata*) and Canada goldenrod (*Solidago canadensis*) (Table 11). Of these common groundcover plant species found in the assessment area, Cut-leaf coneflower was the only species that is unique to this site, having not been encountered at any other survey site.



Cut-leaf coneflower (*Rudbeckia laciniata*) was unique to the Ian N. Morrison assessment area.

Average cover data for the groundcover species reflects the variability of the plant community composition, with no species reaching greater than 9% coverage across the assessment area. In fact, average cover across the assessment area reached 5% or greater for only four species, of which only Virginia creeper also occurred in more than half the survey plots. The remaining species exhibiting the greatest cover values include: smooth brome (8%), wild sarsaparilla (*Aralia nudicaulis*) (6%), and Assiniboia sedge (*Carex assiniboinensis*) (5%) (Table 12).

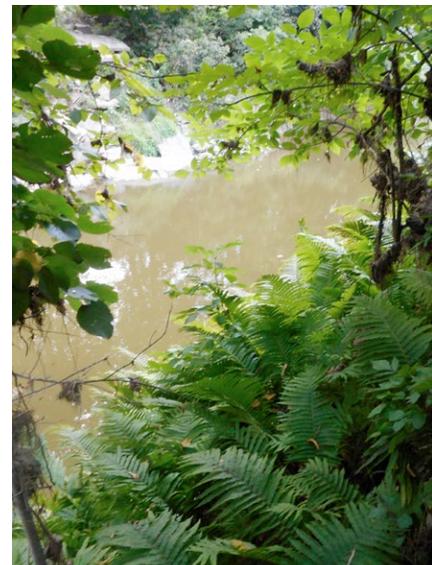
The ground level within the assessment area is characterized by variable levels of bare earth (including areas of leaf litter and fallen woody debris) ranging from as little as 6% to a maximum of 64% (average bare earth cover of 30% across all survey plots). Non-native plant species were noted in the majority of survey plots (86% of plots) and when present, they occupied between 1% - 32% groundcover. Of the non-native plants present, smooth brome, European buckthorn, and Kentucky bluegrass were the most common (Table 10). It is worth noting that leafy spurge (*Euphorbia esula*), a highly invasive noxious weed was observed within the assessment area; this species was not noted at any of the other survey sites.

## SOILS

Soils within the Ian N. Morrison assessment area varied in texture more widely than the other three assessment areas, ranging from silty clay to loam (Table 10). This assessment area was the only one surveyed during the current study where the soil contained a notable sand component. While the soils varied somewhat between plots, soil texture tended to be consistent with depth in the soil profile, with minimal soil horizon differentiation noted. Root growth was observed to varying degrees between plots, but when present, root growth appeared to be unrestricted within the one metre soil pit.

## BANK CONDITIONS

The riverbank conditions at the Ian N. Morrison assessment area differed from those observed at the assessment areas that bordered the Red River. The banks at the Ian N. Morrison assessment area were characterized by a very steep drop-off from the riparian forest down to the edge of the Boyne River. Very little evidence of siltation was observed along the bank of the river, and at the time of the field investigation the water level on the Boyne River was quite low. Very little vegetation was present on the steep slope between the forest terrace and the riverbank, and what was present was predominantly herbaceous.



*The riverbottom forests at the Ian N. Morrison assessment area typically dropped off abruptly adjacent the Boyne River.*

**TABLE 10.** SURVEY PLOT CHARACTERIZATION FOR THE IAN N. MORRISON ASSESSMENT AREA.

Ian N. Morrison Assessment Area		IM01	IM02	IM05	IM06	IM07	IM08	IM09
<b>Overstory</b>								
	<i>Vegetation type</i>	RBF 2	RBF 2	RBF 2	RBF 2	RBF 2	RBF 4	RBF 4
	<i>Canopy dominance</i>	Ash / Maple / Basswood	Ash / Maple / Basswood	Ash / Elm / Basswood	Ash / Basswood	Ash / Basswood	Maple / Ash	Ash / Elm / Maple
	<i>Canopy age class (yrs)</i>	Ash (60-80) / Maple (60-80) / Basswood (30-50)	Ash (60-80) / Maple (30-50) / Basswood (30-50)	Ash (60-80) / Elm (30-50) / Basswood (30-50)	Ash (70-90) / Basswood (40-60)	Ash (70-90) / Basswood (70-90)	Maple (90-110) / Ash (70-90)	Ash (80-100) / Elm (70-90) / Maple (80-100)
	<i>Canopy height (m)</i>	Ash (23) / Maple (14) / Basswood (10)	Ash (27) / Maple (15) / Basswood (16)	Ash (26) / Elm (16) / Basswood (9)	Ash (20) / Basswood (15)	Ash (18) / Basswood (24)	Maple (20) / Ash (6)	Ash (27) / Elm (17) / Maple (17)
	<i>Stem density (stems / 420m<sup>2</sup>)</i>	Ash (4) / Maple (13) / Basswood (1) / Elm (1) /	Ash (4) / Maple (11) / Basswood (11) / Elm (1) /	Ash (2) / Elm (3) / Basswood (7) / Maple (6)	Ash (6) / Basswood (1) / Maple (25) / Oak (2)	Ash (3) / Basswood (8) / Maple (2) / Oak (1)	Maple (13) / Ash (4)	Ash (6) / Elm (5) / Maple (17) / Basswood (8)
	<i>Health</i>	Good	Good	Good	Fair - Good	Fair - Good	Fair - Good	Generally Good; Ash Poor
<b>Shrub Layer</b>								
	<i>Species</i>	Elm / Ash / Saskatoon / Maple / Hazelnut	Ash / Basswood / Maple / Chokecherry	Elm / Maple / Basswood / Chokecherry	Maple / Snowberry	Ash / Chokecherry / Dogwood / Snowberry / Raspberry	Ash / Maple / Chokecherry / Honeysuckle / Buckthorn	Oak / Elm / Basswood / Chokecherry / Snowberry /
	<i>Average shrub cover</i>	28%	27%	27%	8%	15%	19%	8%
	<i>Stem density (stems / 210m<sup>2</sup>)</i>	Elm (1) / Ash (7) / Saskatoon (2) / Maple (15) / Hazelnut (2)	Ash (2) / Basswood (4) / Maple (3) / Chokecherry (6)	Elm (2) / Maple (2) / Basswood (1) / Chokecherry	Maple (6) / Snowberry (2)	Ash (4) / Chokecherry (6) / Dogwood (2) / Snowberry (16)	Ash (25) / Maple (4) / Chokecherry (8) /	Oak (1) / Elm (1) / Basswood (1) / Chokecherry (6) /
	<i>Health</i>	Good	Good	Good	Fair	Good	Good	Fair
<b>Ground cover</b>								
	<i>Primary species (% ground cover)</i>	Sarsaparilla (16), Assiniboia sedge (13), Wood nettle (9)	Sarsaparilla (23), Assiniboia sedge (21)	Canada violet (12), Am. lopseed (4), Chokecherry (4),	Thimbleweed (4), Virginia creeper (4)	Virginia creeper (12), Black currant (9), raspberry (6)	Snowberry (9), Virginia creeper (8), Poison ivy (8),	Sedge (10), Virginia creeper (8), Ground ivy (7)
	<i>Secondary species (% ground cover)</i>	Coneflower (4), Ash (3)	Chokecherry (4), Currant (3), Ash (3)	Virginia creeper (3), Coneflower (2), Maple (2)	Snowberry (3), Elm (2), Maple (1)	Snowberry (4), Coneflower (3), Milkweed (3)	Ground ivy (6), Ash (6), Cocklebur (6), Sedge (5)	Canada violet (4), Honeysuckle (3), Snowberry
	<i>Non-native and invasive species (% ground cover)</i>	Canada thistle (9), Buckthorn (4), Ground ivy (3)	Buckthorn (>1)	None observed	Smooth brome (26), Kentucky bluegrass (6)	Smooth brome (22), Kentucky bluegrass (4), Leafy spurge (1)	Buckthorn (2)	Buckthorn (11), Smooth brome (11)
	<i>Bare earth / logs / litter</i>	28%	39%	64%	46%	13%	13%	6%
<b>Soils</b>								
	<i>Soil Texture</i>	Silty clay loam	Silty clay loam	Fine sandy loam	Silty clay	Silty clay	Loam	Loam



## HABITAT USAGE

Two mammals were documented in the Ian M. Morrison research farm riparian forest. White-tailed deer were sighted and evidence was abundant. Raccoon sign was also very common with many tracks located near the water's edge as well as claw marks on large standing snags.

Birds noted in this forest included American robin, least flycatcher, blue jay, pileated woodpecker, white-breasted nuthatch, Cooper's hawk, hairy woodpecker, downy woodpecker, eastern wood-peewee, house wren, northern flicker, rose-breasted grosbeak, American goldfinch and red-eyed vireo.

**TABLE 11.** IAN N. MORRISON ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (71 SPECIES).

Common name	Scientific name	Count	Count (%)
bare earth/logs/leaf litter		7.00	100%
green ash	<i>Fraxinus pennsylvannica</i>	7.00	100%
Virginia creeper	<i>Parthenocissus quinquefolia</i>	7.00	100%
chokecherry	<i>Prunus virginiana</i>	7.00	100%
ground ivy	<i>Glechoma hederacea</i>	6.00	86%
tall meadowrue	<i>Thalictrum dasycarpum</i>	6.00	86%
wood nettle	<i>Laportea canadensis</i>	5.00	71%
common snowberry	<i>Symphoricarpos albus</i>	5.00	71%
Canada violet	<i>Viola canadensis</i>	5.00	71%
cocklebur	<i>Xanthium strumarium</i>	5.00	71%
Canada wildrye	<i>Elymus canadensis</i>	4.00	57%
yellow wood-sorrel	<i>Oxalis stricta</i>	4.00	57%
European buckthorn	<i>Rhamnus cathartica</i>	4.00	57%
cut-leaf coneflower	<i>Rudbeckia laciniata</i>	4.00	57%
Canada goldenrod	<i>Solidago canadensis</i>	4.00	57%
hog peanut	<i>Amphicarpaea bracteata</i>	3.00	43%
smooth brome	<i>Bromus inermis</i>	3.00	43%
assiniboine sedge	<i>Carex assiniboensis</i>	3.00	43%
fragrant bedstraw	<i>Galium triflorum</i>	3.00	43%
common hop	<i>Humulus lupulus</i>	3.00	43%
common motherwort	<i>Leonurus cardiaca</i>	3.00	43%
wild black currant	<i>Ribes americanum</i>	3.00	43%
veiny meadowrue	<i>Thalictrum venulosum</i>	3.00	43%
poison ivy	<i>Toxicodendron radicans</i>	3.00	43%
American elm	<i>Ulmus americana</i>	3.00	43%
Manitoba maple	<i>Acer negundo</i>	2.00	29%
wild sarsaparilla	<i>Aralia nudicaulis</i>	2.00	29%
showy milkweed	<i>Asclepias speciosa</i>	2.00	29%
sedge	<i>Carex</i> sp.	2.00	29%
Canada thistle	<i>Cirsium arvense</i>	2.00	29%
honeysuckle	<i>Diervilla lonicera</i>	2.00	29%
meadow horsetail	<i>Equisetum pratense</i>	2.00	29%
Jerusalem artichoke	<i>Helianthus tuberosus</i>	2.00	29%
smooth sweet cicely	<i>Osmorhiza longistylis</i>	2.00	29%
American lopseed	<i>Phryma leptostachya</i>	2.00	29%
Kentucky bluegrass	<i>Poa pratensis</i>	2.00	29%
bur oak	<i>Quercus macrocarpa</i>	2.00	29%
wild red raspberry	<i>Rubus idaeus</i>	2.00	29%
carrionflower	<i>Smilax herbacea</i>	2.00	29%
basswood	<i>Tilia americana</i>	2.00	29%
Canada anemone	<i>Anemone canadensis</i>	1.00	14%

**TABLE 11. (CONT.)** IAN N. MORRISON ASSESSMENT AREA GROUNDCOVER  
DATA SORTED DESCENDING BY COUNT (PRESENCE IN A SURVEY PLOT) (71 SPECIES).

Common name	Scientific name	Count	Count (%)
tall thimbleweed	<i>Anemone virginiana</i>	1.00	14%
spreading dogbane	<i>Apocynum androsaemifolium</i>	1.00	14%
absinth	<i>Artemisia absinthium</i>	1.00	14%
red-osier dogwood	<i>Cornus sericea</i> ssp. <i>sericea</i>	1.00	14%
Virginia wildrye	<i>Elymus virginicus</i>	1.00	14%
common scouring rush	<i>Equisetum hyemale</i>	1.00	14%
leafy spurge	<i>Euphorbia esula</i>	1.00	14%
wild strawberry	<i>Fragaria virginiana</i>	1.00	14%
false sunflower	<i>Heliopsis helianthoides</i>	1.00	14%
cow parsnip	<i>Heracleum maximum</i>	1.00	14%
common plantain	<i>Plantago major</i>	1.00	14%
willow aster	<i>Symphiotrichum lanceolatum</i>	1.00	14%
smooth hedge nettle	<i>Stachys tenuifolia</i>	1.00	14%
stinging nettle	<i>Urtica dioica</i>	1.00	14%
riverbank grape	<i>Vitis riparia</i>	1.00	14%
red baneberry	<i>Actaea rubra</i>	0.00	0%
Canada columbine	<i>Aquilegia canadensis</i>	0.00	0%
wild cucumber	<i>Echinocystis lobata</i>	0.00	0%
ostrich fern	<i>Matteuccia struthioperis</i>	0.00	0%
dandelion	<i>Taraxacum officinale</i>	0.00	0%
rattlesnake fern	<i>Botrychium virginianum</i>	0.00	0%
showy mountain ash	<i>Sorbus decora</i>	0.00	0%
Japanese lilac	<i>Syringa reticulata</i>	0.00	0%
nodding trillium	<i>Trillium cernuum</i>	0.00	0%
maximilian sunflower	<i>Helianthus maximiliani</i>	0.00	0%
sandbar willow	<i>Salix exigua</i>	0.00	0%
star-flowered Solomon's seal	<i>Smilacina stellata</i>	0.00	0%
saskatoon	<i>Amelanchier alnifolia</i>	0.00	0%
beaked hazelnut	<i>Corylus cornuta</i>	0.00	0%
common burdock	<i>Arctium minus</i>	0.00	0%
chinkapin oak	<i>Quercus muehlenbergii</i>	0.00	0%

**TABLE 12.** IAN N. MORRISON ASSESSMENT AREA GROUNDCOVER DATA SORTED DESCENDING BY AVERAGE COVER (%) (71 SPECIES).

Common name	Scientific name	Average when present	Average across 12 plots
bare earth/logs/leaf litter		29.80	29.80
smooth brome	<i>Bromus inermis</i>	19.44	8.33
wild sarsaparilla	<i>Aralia nudicaulis</i>	19.58	5.60
assiniboine sedge	<i>Carex assiniboinensis</i>	12.04	5.16
Virginia creeper	<i>Parthenocissus quinquefolia</i>	4.96	4.96
Canada violet	<i>Viola canadensis</i>	3.78	2.70
common snowberry	<i>Symphoricarpos albus</i>	3.72	2.66
wood nettle	<i>Laportea canadensis</i>	3.67	2.62
European buckthorn	<i>Rhamnus cathartica</i>	4.31	2.46
ground ivy	<i>Glechoma hederacea</i>	2.73	2.34
sedge	<i>Carex</i> sp.	7.78	2.22
wild black currant	<i>Ribes americanum</i>	4.91	2.10
green ash	<i>Fraxinus pennsylvannica</i>	1.98	1.98
chokecherry	<i>Prunus virginiana</i>	1.94	1.94
Kentucky bluegrass	<i>Poa pratensis</i>	5.14	1.47
cut-leaf coneflower	<i>Rudbeckia laciniata</i>	2.57	1.47
Canada thistle	<i>Cirsium arvense</i>	4.86	1.39
Jerusalem artichoke	<i>Helianthus tuberosus</i>	4.86	1.39
poison ivy	<i>Toxicodendron radicans</i>	2.69	1.15
cocklebur	<i>Xanthium strumarium</i>	1.44	1.03
wild red raspberry	<i>Rubus idaeus</i>	3.33	0.95
American elm	<i>Ulmus americana</i>	1.85	0.79
Canada wildrye	<i>Elymus canadensis</i>	1.25	0.71
American lopseed	<i>Phryma leptostachya</i>	2.36	0.67
tall thimbleweed	<i>Anemone virginiana</i>	4.44	0.63
showy milkweed	<i>Asclepias speciosa</i>	1.81	0.52
honeysuckle	<i>Diervilla lonicera</i>	1.81	0.52
hog peanut	<i>Amphicarpaea bracteata</i>	1.02	0.44
Manitoba maple	<i>Acer negundo</i>	1.39	0.40
common scouring rush	<i>Equisetum hyemale</i>	2.50	0.36
meadow horsetail	<i>Equisetum pratense</i>	1.25	0.36
Virginia wildrye	<i>Elymus virginicus</i>	2.22	0.32
bur oak	<i>Quercus macrocarpa</i>	1.11	0.32
Canada goldenrod	<i>Solidago canadensis</i>	0.56	0.32
riverbank grape	<i>Vitis riparia</i>	1.67	0.24
tall meadowrue	<i>Thalictrum dasycarpum</i>	0.28	0.24
common motherwort	<i>Leonurus cardiaca</i>	0.46	0.20
veiny meadowrue	<i>Thalictrum venulosum</i>	0.46	0.20
common hop	<i>Humulus lupulus</i>	0.37	0.16

**TABLE 12. (CONT.)** IAN N. MORRISON ASSESSMENT AREA GROUNDCOVER DATA SORTED DESCENDING BY AVERAGE COVER (%) (71 SPECIES).

Common name	Scientific name	Average when present	Average across 12 plots
yellow wood-sorrel	<i>Oxalis stricta</i>	0.28	0.16
leafy spurge	<i>Euphorbia esula</i>	0.83	0.12
fragrant bedstraw	<i>Galium triflorum</i>	0.28	0.12
smooth sweet cicely	<i>Osmorhiza longistylis</i>	0.42	0.12
carriionflower	<i>Smilax herbacea</i>	0.42	0.12
Canada anemone	<i>Anemone canadensis</i>	0.56	0.08
red-osier dogwood	<i>Cornus sericea</i> ssp. <i>sericea</i>	0.56	0.08
false sunflower	<i>Heliopsis helianthoides</i>	0.56	0.08
basswood	<i>Tilia americana</i>	0.28	0.08
spreading dogbane	<i>Apocynum androsaemifolium</i>	0.28	0.04
absinth	<i>Artemisia absinthium</i>	0.28	0.04
wild strawberry	<i>Fragaria virginiana</i>	0.28	0.04
cow parsnip	<i>Heracleum maximum</i>	0.28	0.04
common plantain	<i>Plantago major</i>	0.28	0.04
willow aster	<i>Symphiotrichium lanceolatum</i>	0.28	0.04
smooth hedge nettle	<i>Stachys tenuifolia</i>	0.28	0.04
stinging nettle	<i>Urtica dioica</i>	0.28	0.04
red baneberry	<i>Actaea rubra</i>	0.00	0.00
Canada columbine	<i>Aquilegia canadensis</i>	0.00	0.00
wild cucumber	<i>Echinocystis lobata</i>	0.00	0.00
ostrich fern	<i>Matteuccia struthiopteris</i>	0.00	0.00
dandelion	<i>Taraxacum officinale</i>	0.00	0.00
rattlesnake fern	<i>Botrychium virginianum</i>	0.00	0.00
showy mountain ash	<i>Sorbus decora</i>	0.00	0.00
Japanese lilac	<i>Syringa reticulata</i>	0.00	0.00
nodding trillium	<i>Trillium cernuum</i>	0.00	0.00
maximilian sunflower	<i>Helianthus maximiliani</i>	0.00	0.00
sandbar willow	<i>Salix exigua</i>	0.00	0.00
star-flowered Solomon's seal	<i>Smilacina stellata</i>	0.00	0.00
saskatoon	<i>Amelanchier alnifolia</i>	0.00	0.00
beaked hazelnut	<i>Corylus cornuta</i>	0.00	0.00
common burdock	<i>Arctium minus</i>	0.00	0.00
chinkapin oak	<i>Quercus muehlenbergii</i>	0.00	0.00



# 5.0 DISCUSSION

The intrinsic variability of the four assessment areas restricts the value of making direct comparisons between the four separate assessment areas surveyed during the Study. Therefore the following section is intended primarily as an interpretation of noticeable trends and a discussion on the implication of these trends on overall riverbottom forest health on University lands.

## Forest Characteristics

### 1. OVERSTORY

While forest vegetation types and observations on growth and overall health varied between assessment areas, all conditions documented were consistent with riverbottom forest characterizations previously described for southern Manitoba (Marr & Synthen, 1995; Moffat, 2002). Dominant and sub-dominant tree species present in the floodplain of the assessment areas are well suited to periodic flooding and silt deposition common in this riparian forest zone. These include Manitoba maple, green ash, American elm and willow. Plains (eastern) cottonwood (*Populus deltoides*), a fast growing pioneer species typically associated with this zone was not common in any of the assessment areas. This species is not especially shade tolerant, and does not tend to regenerate under forested canopies. The general absence of this species suggests that trees which had occupied this position in the forest have been lost over time to natural tree mortality, and have been replaced by tree species better suited to the current site conditions. Further, the absence of this species from its traditional position along the riverbottom forest gradient (i.e. on the channel shelf) suggests that prevailing site conditions do not favor its establishment. Reasons for this could include changes in natural flood dynamics (changes in frequency or duration of flood conditions) or loss of suitable channel shelf area.

At the Glenlea assessment area, bur oak dominated forests (RBF 5 vegetation class) characterized much of the riverbottom forest. This trend in forest classification is a clear reflection of the large contiguous riparian forest terrace zone that occupied approximately two thirds of the assessment area. Bur oak is generally less tolerant of prolonged flooding as compared to the tree species that commonly occupy lower landscape positions along the typical riverbottom forest gradient. As a result, oak forests tend to hold a higher position in the landscape when situated along rivers and lakes. The transition from ash and maple dominated forest types towards bur oak dominated forest types with increasing distance from the water's edge was readily apparent based on survey data collected at the Glenlea assessment area. The riverbottom forests at the Point lands, Southwood Lands and the Ian Morrison Research Farm assessment areas were narrow bands (less than 50m wide) and did not include typical upland terrace zones. That being the case, these sites were dominated by green ash and Manitoba maple which are better suited to the environmental conditions within these narrow buffers.

Throughout much of the surveyed forests, and particularly within the riparian floodplain forest zone, green ash was the most common dominant species and frequently a co-dominant species. Green ash also represented a major component of the forest understory, both in the shrub layers as well as at the ground level. The abundance of ash throughout the surveyed forests likely reflects the continued loss of American elm trees that has resulted from the spread of dutch elm disease (DED) throughout southern Manitoba. In addition to trees directly lost to the disease, the City of Winnipeg has an active diseased tree removal program that has removed many mature elm trees from the riverbottom forests on the Point Lands and Southwood Lands assessment areas. Likewise, the Province of Manitoba Forestry Branch has a DED Management Program that undertakes diseased tree removals for the town of Carman (Ian N. Morrison assessment area) and the RM of Ritchot (Glenlea assessment area). Tree removal was evident throughout all assessment areas during the field investigation, with many mature tree stumps present at each site.

While the majority of the trees assessed during the Study were characterized as in 'Fair' to 'Good' health, the prevalence of ash trees throughout many of the assessment areas presents a potential risk to sustained forest health. Municipalities as near as Thunder Bay, Ontario and Minneapolis, Minnesota are experiencing the distressing effects of the emerald ash borer beetle, and many agree that it is only a matter of time before the beetle is observed in southern Manitoba. It is important to begin considering and planning for the arrival of this forest pest with the understanding that over the next decades the composition of our riverbottom forests will likely shift significantly away from a canopy dominated by green ash. Further discussion on the emerald ash borer beetle as well as considerations for planting approaches and forest management are provided in the Final Report.

## 2. UNDERSTORY

A healthy and robust understory composed of a mix of native shrub and tree species is a highly desirable feature of forested habitat. Migrating and resident songbirds, for instance, seek forests with developed understory and complex habitat structure for protection, cover and feeding opportunities. Young tree specimens, as they emerge from the ground layer and pass through the shrub layer, serve a similar function in terms of wildlife habitat. In addition, these trees present within the forest shrub layer impart resilience and regenerative capacity to the forest, persisting below the established upper canopy until such time that an opening develops or they are capable of breaking into the forest canopy.

The shrub layers characterized during the Study across the four assessment areas were consistently variable in terms of their species composition and overall structure. The Glenlea assessment area exhibits the most diverse and productive shrub layer surveyed during the Study. However, the shrub cover values at Glenlea varied just as widely between survey plots as did the remaining three assessment areas (from a minimum of 5% to a maximum of 60%). This structural variability observed throughout all assessment areas suggests some degree of consistency in the way shrubs are distributed within these forest types.



*Vining plants are well suited to colonizing fallen woody debris in riverbottom forests.*

***Note: As of November 30th, 2017, the City of Winnipeg and the Canadian Food Inspection Agency have confirmed the presence of the Emerald Ash Borer beetle in Winnipeg (first found in the neighbourhood of St. Boniface).***

Tree presence within the shrub layer varied between the four assessment areas, with the Glenlea site showing the greatest average number of trees (15.6 per 210 m<sup>2</sup>), followed by Ian N. Morrison (11.3 per 210 m<sup>2</sup>), Southwood Lands (9.0 per 210 m<sup>2</sup>) and finally Point Lands (7.9 per 210 m<sup>2</sup>). The high degree of variability exhibited between plots throughout all assessment areas limits our ability to draw meaningful conclusions regarding the regenerative capabilities of these forests based on their shrub layers. Furthermore, shrub and tree regeneration and rate of growth in the shrub layer under closed forest canopies tends to be patchy in nature reflecting many environmental factors, most notably light availability. Closed overstory canopies limit light penetration to the understory and tend to slow and suppress the growth of ground and shrub layer plant species. When a gap in the overstory canopy emerges, shrub and ground level plants take advantage of the light penetration and typically respond with an increased growth rate. In reality, hardwood forests including those in riparian areas are typically a patchwork of older, mature forest and younger regenerating areas where heavier shrub and tree sapling cover is observed.

### 3. GROUND LAYER VEGETATION

Across all assessment areas, plant species in the groundcover layer were characteristic of the riverbottom forest environment and consistent with those documented in other southern Manitoba field investigations (Marr & Synthen, 1995; Moffat, 2002). Groundcover throughout the Study area consisted of a mix of native and non-native forbs, grasses and sedges, vining plants and tree and shrub seedlings. Bare earth, woody debris and forest litter are significant components of the ground layer throughout all assessment areas, varying widely between survey plots, but averaging about a third of the total area.

The assessment areas within the City of Winnipeg, the Point Lands and Southwood Lands, had a higher proportion of their groundcover occupied by weedy, non-native plant species. In contrast, those sites situated outside of Winnipeg, the Glenlea and Ian N. Morrison assessment areas, exhibited not only the highest diversity of native species, but also the lowest occurrence of non-native species. Two of the main factors that drive the establishment of weedy, non-native vegetation are soil disturbance and availability of weed seeds and propagules. Considering the four assessment areas, the Point Lands and Southwood Lands sites both show the most signs of historic and on-going soil disturbance. For example, along bike and walking paths, where riverbank construction work has taken place, and where disturbance related to the operation of the Southwood golf course occurred. Additionally, much of the riverbanks and adjacent natural areas throughout Winnipeg are characterized by high levels of weedy vegetation (including Canada thistle, common burdock, European buckthorn, sow thistle species (*Sonchus* spp.), reed canary grass and smooth brome. The proximity and connectivity to these landscapes puts the riverbottom forests on University lands within Winnipeg at a greater risk for weed establishment, and helps to explain the plant community documented in the Study. A more detailed discussion on the effects of problematic non-native weeds and general management recommendations are presented in the Final Report.

The Glenlea assessment area was characterized by a higher occurrence of shrubs and trees at the ground layer as compared to the Southwood Lands, Point Lands or the Ian N. Morrison Research Farm. This observation suggests that the surveyed area at Glenlea present favorable conditions for the establishment of tree seedlings, and may impart a relatively high capacity for forest regeneration following disturbance or tree mortality. At the seedling stage, many trees are not tolerant of prolonged flooding or siltation that follows flood events. Given the high proportion of the Glenlea assessment area that was located above the floodplain, establishing seedlings at this site are unlikely to experience flooding and siltation. Furthermore, high levels of organic material at the soil surface, such as fallen leaves and woody debris, supports seedling establishment by creating favorable environmental microsites by sheltering the surface and maintaining soil moisture levels.

Several notable groundcover species were encountered at the edge or outside of their normal documented distribution during the Study. At the Ian N. Morrison assessment area, American lopseed (*Phryma leptostachya*) and mountain honeysuckle (*Lonicera villosa*) were observed, occurring near the northern and western edges of their respective distributions.



American lopseed (*Phryma leptostachya*)  
observed at the Ian N. Morrison assessment area.



Chinkapin oak (*Quercus muehlenbergii*) sapling observed at the Ian N. Morrison assessment area.

Likewise at the Ian N. Morrison site, a Chinkapin oak (*Quercus muehlenbergii*) sapling, was encountered, occurring nearly 800 km northwest of its natural range. Any comment as to the origin of this specimen is highly speculative, however Chinkapin oak was one of numerous tree species tested between 2006 and 2016 (WNGG, 2017) for northern hardiness. It is possible that this history of testing or other similar experimental planting may explain the presence of Chinkapin oak at Ian N. Morrison.

Finally, one plant species of conservation concern was documented at the Glenlea assessment area, the provincially tracked plant species false indigo-bush (*Amorpha fruticosa*). This native leguminous shrub is ranked S1S2 in Manitoba and S1 in Ontario (only other Canadian jurisdiction within its distribution). This plant is most commonly found in riparian habitats including moist woods and along streambanks; the loss of riparian habitat to urbanization, agricultural development and other disturbance may limit population sizes (Hamel & Foster, 2004). This plant was observed within the mature oak forest that dominates the terrace zone of this assessment area. The presence of this species within the Glenlea riverbottom forest may reflect a relatively stable forest environment free from significant disturbance and land use change.

#### 4. PLANT SPECIES OF CULTURAL IMPORTANCE

Indigenous peoples have a long history of living sustainably in close connection with nature and making use of natural resources to facilitate their way of life. Traditional knowledge accrued over many centuries has been orally communicated from generation to generation and represents the cumulative experience of living sustainably within the natural world.

People have always depended on plants for their survival. Plants have been used as food sources, for food preparation, clothing, medicine, shelter and as part of First Nation spirituality. The relationship between indigenous people and the environment is woven into their history and culture.

Numerous plant species identified within the project assessment areas are well-documented species of cultural importance for local indigenous peoples. Some examples of plant species and traditional uses are outlined in the table below. The list is non-exhaustive and has been developed, in part, by referencing Edible and Medicinal Plants of Canada (MacKinnon *et al*, 2009), as well as Plants of the Western Boreal Forest and Aspen Parkland (Johnson *et al*, 1995).

## 5. BANK CONDITIONS

Bank conditions varied significantly within assessment areas. As is typical of naturally meandering rivers (like the Red and Boyne Rivers) banks were found in some areas to be steep, nearly vertical cutbanks, often occurring on the outside of a curve. In other areas the riverbanks were characterized by a channel shelf zone of variable length and typically gradual slope up to the forested floodplain. Some incidences were noted where the riverbank appeared to have slumped towards the river. The Point Lands and Southwood Lands assessment areas were characterized by a higher amount of steep cutbank riverbanks, whereas the Glenlea assessment area has large channel shelf habitat throughout the site.

Cutbanks are a harsh environment for perennial vegetation to establish due to unpredictable extremes of seasonal water level fluctuation, scour caused by ice and debris as well as erosion. As a result, these types of riverbanks tend to exhibit only sparse perennial vegetation, while annual or bi-annual species which can complete their life cycle on a steep, seasonally flooded area are more common. These annual and biennial species lack extensive or permanent root systems and therefore do little to stabilize soils against erosion.

On more gradual channel shelves, like those present at the Glenlea assessment area the dominant vegetation shifted depending on proximity to the river. Where the channel shelf approaches and enters the normal water level of the river, wet-meadow or shallow marsh perennial vegetation including beaked sedge, sandbar willow, and water smartweed were the most common native plant assemblage. Non-native plants including reed canary grass, Canada thistle and sow thistle are also prevalent throughout this zone. Of these common species, sandbar willow was the only woody plant that was regularly present. These perennial plant species are well adapted to experience periods of regular flooding and are best suited to soil conditions with abundant soil moisture. This vegetation type forms a dense mat of herbaceous biomass that serves to protect soil against erosion while also providing important habitat for songbirds, small mammals and some aquatic species (Marr & Synthen, 1995). Moving away from the river's edge, these native and non-native plant communities transitioned to more upland forested vegetation types discussed in earlier sections.



*Steep cutbanks at the river's edge are typically colonized by annual and biennial vegetation.*

**TABLE 13.** SELECT PLANT SPECIES WITH KNOWN TRADITIONAL INDIGENOUS USE DOCUMENTED WITHIN THE ASSESSMENT AREAS.

Common Name	Scientific Name	Tree	Shrub	Forb	Vine	Pteridophyte	Food	Medicine
American bittersweet	<i>Celastrus scandens</i>				•		•	•
basswood	<i>Tilia americana</i>	•					•	•
beaked hazel	<i>Corylus cornuta</i>		•				•	•
bur oak	<i>Quercus macrocarpa</i>	•					•	•
bush honeysuckle	<i>Diervilla lonicera</i>		•				•	•
currants	<i>Ribes spp.</i>		•				•	•
cutleaf coneflower	<i>Rudbeckia lanciniata</i>			•			•	•
fragrant bedstraw	<i>Galium triflorum</i>			•			•	•
goldenrod	<i>Solidago canadensis</i>			•			•	•
horsetails	<i>Equisetum spp.</i>					•	•	•
lopseed	<i>Phryma leptostachya</i>			•			•	•
Manitoba maple	<i>Acer negundo</i>	•					•	•
red-osier dogwood	<i>Cornus sericea ssp. sericea</i>		•				•	•
riverbank grape	<i>Vitis riparia</i>				•		•	•
roses	<i>Rosa spp.</i>		•				•	•
smooth hedge nettle	<i>Stachys tenuifolia</i>			•			•	•
spreading dogbane	<i>Apocynum androsaemifolium</i>		•				•	•
wild red raspberry	<i>Rubus idaeus</i>		•				•	•
wild sarsaparilla	<i>Aralia nudicaulis</i>			•			•	•
wood nettle	<i>Laportea canadensis</i>		•				•	•

As noted, riverbank erosion is a natural process that influences river morphology and riparian habitat, over time. While the presence of perennial vegetation along riverbanks serves to limit soil erosion, hard structures or a combination of hard structures and bioengineering solutions are typically required to establish a more static bank condition. Woody native vegetation as well as other site appropriate plant communities are well suited for use in soft-engineering approaches to riverbank stabilization. The combination of trees, shrubs and grasses can form a deep, extensive and complicated root matrix that functions to hold soil in place against erosive forces. Non-native herbaceous plant species including smooth brome, quackgrass (*Elymus repens*), and Canada thistle are commonly present on riverbanks in southern Manitoba and particularly in the City of Winnipeg. These species are far less effective than a diverse native plant community due to their limited root structure and their ability to outcompete desirable vegetation and form monocultures.



*Gradual channel shelves allow for the establishment of perennial vegetation including some woody species such as sandbar willow.*

## 6. HABITAT VALUE AND USAGE

Riverbottom forests are complex terrestrial habitats with a diverse assemblage of trees, shrubs, vining plants as well as herbaceous vegetation including forbs and graminoids. Perennial plant species with a tolerance for flooding as well as annual/biennial plants occupy alluvial deposits nearest the watercourse and as the distance from the water increases, a shift in vegetation communities along this gradient occurs. This shift in vegetation is most easily visualized by the shift in forest canopy dominance. In the channel shelf zone (nearest the river) the canopy tends to be dominated by pioneering species such as willows and cottonwoods. As you move away from the river along the riparian gradient, the floodplain zone is typified by elm, ash, maple and basswood trees, and further still from the river, in the terrace zone, forest canopies are typically dominated by oaks (and to a lesser degree other species) (Marr & Synthen, 1995). The structure of these forests provides a wide range of forage and nesting opportunities for resident and transient wildlife that preferentially occupy site specific habitats within the forest buffer.

The upper canopy of riparian forests are dominated by mature deciduous tree species that help shelter the understory and ground level by dissipating the impact of rainfall, and screening solar radiation. These overstory effects contribute to the creation of unique microclimates that are favoured by many birds and mammals. Bird species including northern oriole, rose-breasted grosbeak and great-crested flycatcher preferentially nest and forage in forest upper canopies. As mature trees die, standing snags develop and become important habitat for nesting, roosting and foraging birds and mammals. Pileated woodpeckers, hairy woodpeckers, downy woodpeckers and wood ducks are examples of bird species that preferentially feed and/or roost in snags.

Mammals like racoons nest in standing or fallen snags with a hollow cavity for them to occupy. Fallen trees, logs and branches provide shelter and food sources for a range of wildlife including white-tailed deer, dark-eyed junco and sparrows. When logs fall in the water, fish, reptiles and amphibians benefit from the structural addition to the watercourse.

The diversity of the shrub layer in a riparian forest also plays an important role for feeding and nesting opportunities for birds and mammals. Shrubs provide herbivores like white-tailed deer with browse, security and shelter while providing nesting and foraging opportunities for birds inhabiting the forest. Typical riverbottom forest shrubs such as chokecherry, dogwood, snowberry and Saskatoon, as well as trees such as maple, basswood and elm present at the shrub layer provide important food sources throughout the growing season and into the winter for resident and migrating birds and small mammals. Vireos and least flycatcher are examples of shrub layer residents in riparian forests.

The linear nature of riparian forests results in a high ratio of edge habitat where the forest borders the adjacent landscape or watercourse. Edge habitat tends to be among the most structurally and biologically diverse habitat as it represents the interface between the forest interior and the adjacent, non-forested environment. Forest edges are favoured by many mammals and bird species that feed along the forest periphery, and given its high relative diversity and productivity. Edge species include song sparrows, great-horned owls and belted kingfishers that forage, travel and roost along the forest edge. Mammals such as red fox and white-tailed deer commonly forage in this zone.

In addition to being important habitat for resident wildlife, riparian forests represent important wildlife corridors of continuous habitat linking forests and other habitats. Within the highly fragmented and largely disturbed natural landscapes in southern Manitoba, these river corridors are critical elements in preserving connectivity between preferred wildlife habitats. This connectivity not only allows for migration and movement of wildlife across large tracts of land, but it also serves to minimize negative outcomes during interactions with humans (e.g. crop damage, vehicle collisions, etc). The ability of wildlife to move throughout their distribution is an important element in species conservation and population dynamics.

## 7. BIODIVERSITY

Riverbottom forests have the capacity to exhibit high levels of biological diversity, particularly as it concerns plant species, due in part to environmental gradients functioning over a relatively narrow area. A typical riverbottom forest is characterized by channel shelf, floodplain, and terrace zones each of which are influenced uniquely by normal river hydrological effects, most notably frequency and duration of flooding. This environmental variation favors the establishment and development of differing vegetation types in each of these zones, leading to a high level of local biodiversity. The dominant vegetation described in the current study throughout these three typical zones is generally consistent with available descriptions of similar riparian habitats throughout southeastern Manitoba (Marr & Synthen, 1995; Moffat, 2002). As wildlife

depends upon the various vegetation types as habitat, a high degree of diversity in terms of these plant communities should correlate to a higher diversity of fauna.

Plant species diversity and distribution within a given zone is further influenced by biotic and abiotic factors such as competitive interactions, herbivory, soil type, and resource availability (i.e. access to light, soil moisture and nutrients). Over time, disturbance and natural successional dynamics further influence plant species diversity and distribution throughout forest zones. Generally, plant species diversity is highest in the earlier stages of forest succession following disturbance (secondary succession) as a result of increased access to resources, most importantly sunlight. As the forest canopy closes and the resources made available by the disturbance event are re-allocated, species diversity may decrease even as forest productivity increases. Disturbance may be widespread in extent (e.g. after a significant flood event or pest/pathogen outbreak) or it may be more localized and patchy as a result of branch breakage, wind-throw or natural die off due to aging. Floristic diversity throughout the four assessment areas reflect past and ongoing natural processes characteristic of forested riparian areas, but are also heavily influenced by human factors such as disturbance, alterations to normal flood patterns, and changes in adjacent land use.

The Glenlea and Ian N. Morrison assessment areas had higher overall native plant diversity and the lowest overall non-native plant cover. The higher native biodiversity exhibited by the Glenlea and Ian N. Morrison sites may be a function of both the size and shape of these sites. These sites were characterized by larger amounts of contiguous interior forest as compared to the Southlands and Pointe Lands sites, which were more fragmented, narrow and linear in nature. While the riparian forests at Ian N. Morrison assessment area were very narrow in places, the river meandered significantly throughout the site which may have obscured the forest's linear shape, taking on a functionally contiguous configuration. Furthermore, it stands to reason that with a larger assessment area, more opportunities exist for the development of environmental microsites that favor the establishment of a wider diversity of species. Given the size of the Glenlea assessment area relative to the remaining sites, there is an expectation that a higher total number of species would be documented.

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# APPENDIX A **MANITOBA CONSERVATION DATA CENTRE RARE SPECIES DATABASE CHECK**

## SMM Projects

---

**From:** Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca>  
**Sent:** September-25-17 10:35 AM  
**To:** 'Ian Young'  
**Subject:** RE: University of Manitoba Biodiversity Study

Ian

Thank you for your information request. I completed a search of the Manitoba Conservation Data Centre's rare species database and found no occurrences at this time for your area of interest.

The information provided in this letter is based on existing data known to the Manitoba Conservation Data Centre at the time of the request. These data are dependent on the research and observations of CDC staff and others who have shared their data, and reflect our current state of knowledge. An absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present; in many areas, comprehensive surveys have never been completed. Therefore, this information should be regarded neither as a final statement on the occurrence of any species of concern, nor as a substitute for on-site surveys for species as part of environmental assessments.

Because the Manitoba CDC's Biotics database is continually updated and because information requests are evaluated by type of action, any given response is only appropriate for its respective request. Please contact the Manitoba CDC for an update on this natural heritage information if more than six months pass before it is utilized.

Third party requests for products wholly or partially derived from Biotics must be approved by the Manitoba CDC before information is released. Once approved, the primary user will identify the Manitoba CDC as data contributors on any map or publication using Biotics data, as follows as: Data developed by the Manitoba Conservation Data Centre; Wildlife & Fisheries Branch, Manitoba Sustainable Development.

This letter is for information purposes only - it does not constitute consent or approval of the proposed project or activity, nor does it negate the need for any permits or approvals required by the Province of Manitoba.

We would be interested in receiving a copy of the results of any field surveys that you may undertake, to update our database with the most current knowledge of the area.

If you have any questions or require further information please contact me directly at (204) 945-7747.

Chris Friesen  
Coordinator  
Manitoba Conservation Data Centre  
204-945-7747  
chris.friesen@gov.mb.ca  
<http://www.manitoba.ca/conservation/cdc/>

-----Original Message-----

From: Ian Young [mailto:iyoung@scatliff.ca]  
Sent: September-25-17 10:29 AM  
To: Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca>  
Subject: RE: University of Manitoba Biodiversity Study

Hi Chris,

Please find the attached google maps showing the locations of our survey plots. Let me know if any other site information would be useful.

Thank you,

Ian Young

-----Original Message-----

From: Friesen, Chris (SD) [mailto:Chris.Friesen@gov.mb.ca]

Sent: September-25-17 9:09 AM

To: 'iyoung@scatliff.ca'

Subject: University of Manitoba Biodiversity Study

Ian

Can you please provide maps showing the locations of the Glenlea and Carman research farms?

Thanks.

Chris Friesen

Coordinator

Manitoba Conservation Data Centre

204-945-7747

chris.friesen@gov.mb.ca

<http://www.manitoba.ca/conservation/cdc/>

-----Original Message-----

From:

Sent: September-14-17 11:28 AM

To: Friesen, Chris (SD) <Chris.Friesen@gov.mb.ca>

Subject: Spam: WWW Form Submission

Below is the result of your feedback form. It was submitted by WWW Information Request ( ) on Thursday, September 14, 2017 at 11:28:15

-----  
DocumentID: Manitoba\_Conservation

Project Title: University of Manitoba Biodiversity Study

Date Needed: 2017/09/30

Name: Ian Young

Company/Organization: Scatliff+Miller+Murray

Address: 1120-201 Portage Ave

City: Winnipeg

Province/State: Manitoba

Phone: 204-927-3444

Email: iyoung@scatliff.ca

**Project Description:** A vegetation study is being performed on university of Manitoba river bottom forests. Assessment areas include the U of M Fort Garry Campus, the Glenlea Research Station, and the Ian N. Morrison Research Farm (located in Carman). Information gathered will serve to support University land management initiatives and provide baseline characterization of these areas.

**Information Requested:** Tracked species (plants, animals, etc) with known occurrence within this region, and if possible, within river bottom forest habitat. S1 and S2 species are of primary interest to the study.

**Format Requested:** Any format acceptable; sent via email is preferred.

**Location:** Site 1 - University of Manitoba Fort Garry Campus (south Winnipeg); river bottom forest situated between the Red River and the ring dyke that circles the campus.

Site 2 - Glenlea Research Station, Glenlea Manitoba (~25km south of Winnipeg, just off HWY 75); riverbottom forest that extends from the Red River to the ring dyke that surrounds the research station.

Site 3 - Ian N. Morrison Research Farm, Carman MB; Riverbottom forest habitat that extends from the Boyne River up to the agricultural land that occupies the majority of the site.

action: Submit

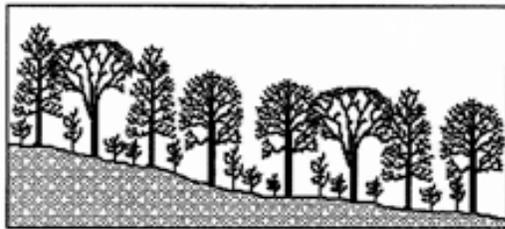
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# APPENDIX B **FOREST ECOSYSTEM CLASSIFICATION FOR RIVERBOTTOM FORESTS IN SOUTHERN MANITOBA**



# Forest Ecosystem Classification for Riverbottom Forests in Southern Manitoba

## RBF 2 = Green Ash (American Elm) / Basswood



### General Description (n=2)

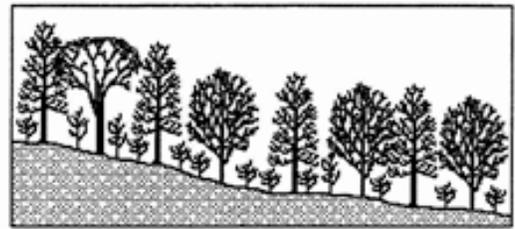
This forest type is located on the floodplain. The canopy may include green ash, American elm and Manitoba maple but it also includes basswood. In some stands, basswood may dominate the canopy. These stands are only located east of the Manitoba Escarpment, as the range for basswood does not extend farther west. The shrub and herb layers are well developed. Sites are typically well-drained and site moisture is fresh to moist.

### Common Understorey Plants

**Shrubs:** chokecherry, American and beaked hazel, snowberry, poison ivy and wild rose.

**Herbs:** moonseed, virginia creeper, meadow rue, sweet-scented bedstraw, cream-coloured vetchling, sarsaparilla, carrionflower.

## RBF 3 = Green Ash (American Elm) / Manitoba Maple / Shrub and Herb Rich



### General Description (n=3)

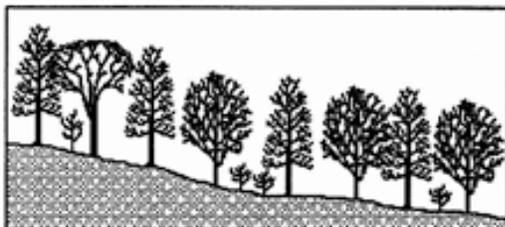
Located on the floodplain, the canopy in this forest type includes green ash, American elm and Manitoba maple. It differs from other forest types on the floodplain due to the richness and diversity of species in the shrub and herb layers. These stands are found on the most productive riverbottom forest sites, in areas which typically have the best climatic conditions for growth. Sites are generally well-drained and moist.

### Common Understorey Plants

**Shrubs:** poison ivy, wild raspberry, chokecherry, downy arrowwood, beaked hazel, snowberry, red-osier dogwood, wild rose, wild black currant.

**Herbs:** sweet-scented bedstraw, wild grape, sweet cicely, moonseed, hog peanut, stinging nettle, virginia creeper, late goldenrod, sarsaparilla, hedge-nettle, star-flowered Solomon's seal, two-leaved Solomon's seal.

## RBF 4 = Green Ash (American Elm) / Manitoba Maple



### General Description (n=7)

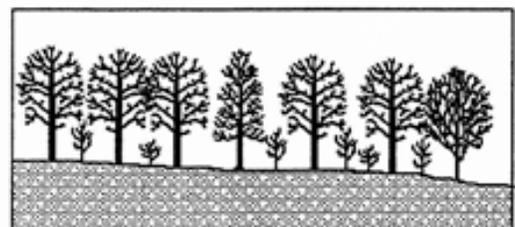
This forest type is located on the floodplain within riverbottom forest stands. The main canopy species are the same as those found in the RBF - 3 forest type: green ash, American elm and Manitoba maple. However RBF - 4 stands generally are located in areas where climatic conditions are less favourable for growth and the shrub and herb layers are not as rich. Sites are well-drained with site moisture ranging from fresh to moist.

### Common Understorey Plants

**Shrubs:** snowberry, wild black currant, chokecherry, poison ivy, wild rose, wild raspberry.

**Herbs:** meadow rue, northern bedstraw, sweet-scented bedstraw, carrionflower, wood nettle, fringed loosestrife, sarsaparilla, hedge-nettle.

## RBF 5 = Bur Oak / Green Ash / Manitoba Maple



### General Description (n=8)

This forest type is located on the terrace level farthest away from the water course. The tree canopy is generally dominated by bur oak, but green ash and Manitoba maple are often present. Some variation in species diversity exists across the stands, with those sites associated with RBF - 2 and RBF - 3 floodplain stands generally containing a greater variety of species. Sites are well to rapidly-drained and fresh.

### Common Understorey Plants

**Shrubs:** hawthorn, American hazel, downy arrowwood, snowberry, poison ivy, wild rose, wild black currant, chokecherry, saskatoon.

**Herbs:** meadow rue, sarsaparilla, northern bedstraw, sweet-scented bedstraw, two-leaved Solomon's seal, star-flowered Solomon's seal, wild peavine, black snakeroot, western Canada violet.



# APPENDIX C **BIODIVERSITY BASELINE STUDY AND ASSESSMENT FIELD STUDY PLAN**



**BIODIVERSITY BASELINE STUDY AND ASSESSMENT:  
FIELD STUDY PLAN (DRAFT)**

Submitted to:

**UNIVERSITY OF MANITOBA OFFICE OF SUSTAINABILITY**

Submitted By:

**SCATLIFF + MILLER + MURRAY**

visionary urban design + landscapes

## Table of Contents

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# 1. Background and Objectives

The following is the field Study Plan for the *'Biodiversity Baseline Study and Assessment'* to be undertaken by Scatliff + Miller + Murray Inc. biological staff for the University of Manitoba Office of Sustainability.

The Study will provide information on the flora and fauna of 4 Assessment Areas on University lands (Appendix A). The completion of The Study will also provide baseline information for sustainability initiatives and strategies that the University of Manitoba (U of M) is currently pursuing. The 4 Assessment Areas and survey coverage areas are as follows;

Assessment Area	Area (km <sup>2</sup> )
University of Manitoba Fort Garry campus Point Lands	0.153
Southwood Land	0.0216
Glenlea Research Station	0.249
Ian N. Morrison Research Farm (near Carman Manitoba)	0.11

Specific objectives of this work include;

- Document baseline conditions of the riparian forest. Identify vegetative communities, habitat suitability and the fauna supported,
- Document non-native and invasive species,
- Document ecological factors influencing the health of the riparian forest;
- Document vegetation traditionally used for medicine, subsistence and cultural purposes by First Nation peoples,
- Contribute recommendations for maintenance and (phased) naturalization and plantings; and,
- Contribute to the identification and implementation of environmental protection measures to avoid or minimize effects to vegetation, particularly to federally and provincially listed plant species of conservation concern.

The total number of vegetation survey plots shall be 42 distributed roughly as follows:

Assessment Area	# of Survey Plots
Fort Garry Campus Point Lands (0.153 km <sup>2</sup> )	12
South Wood Lands (0.0216 km <sup>2</sup> )	2
Glenlea Research Station (0.249 km <sup>2</sup> )	19
Ian N. Morrison Research Farm (0.110 km <sup>2</sup> )	9

The specific location of any plot may be adjusted if appropriate once the Assessment Areas are visited on the first day of the terrestrial survey work. Any adjustments will be geo-referenced and amended within the geo-database.

## 2. Personnel

Survey crews will undertake the Field Investigation accompanied by a participating student assistant from the University of Manitoba. The student assistant will receive training on survey methods used in this Study as well as basic plant identification prior to, and throughout terrestrial survey work.

## 3. Scheduling

Surveys shall be undertaken in July and August 2017. Field work at the Ian Morrison assessment area must start after August 10 to accommodate on-going activities at this site. Appropriate U of M personnel will be notified of upcoming field activity and field activity will be undertaken during daylight hours and appropriate weather conditions.

## 4. Surveys

Two types of surveys will be undertaken in this study. Formal 'nested quadrat' sample plots as well as ocular surveys while in transit between formal plots will be used. Vegetation and wildlife data will be recorded during both types of surveys.

### 4.1 Formal Nested Quadrat Sample Plot

Sampling plots will be laid out in the form of nested quadrats as seen in Appendix B. The plots will be 30.0 meters X 14.0 meters (420 m<sup>2</sup>) oriented lengthwise along the topographical gradient of the riverbank area to allow for better coverage of the riparian environment within any one plot. In the case of the Glenlea assessment area, not all plots will be arranged in immediate close proximity to the river due to the

comparatively large forest interior to be investigated. Some plots will be positioned within the interior where the topographical gradient is not as apparent as areas closer to the river. Where an environmental gradient is apparent in these interior areas, the plots will be arranged perpendicular to the gradient.

The 30.0 meter length of the plot represents trade-off between adequate riparian coverage within a plot and the need to work within spatial limitations and variability within the assessment areas to achieve the required number of plots. Spatial variability includes narrow areas in the width of the Point Lands riparian forest 'buffer' and numerous constricting river bends at the Ian Morrison site.

Each plot will be divided equally along its length into lower, middle and upper sections along the topographical gradient to provide a means of identifying changes in species distribution along different positions of the slope.

## 4.2 Plant Data Collection

The nested quadrat plots are designed to efficiently describe vegetation types and composition, overstory and understory species and forest resource information including but not limited to, forest conditions, stand types, age and health.

- Tree survey plot (30m x 14m)
  - Number of stems per species encountered within plot,
  - tree DBH, height, spread, canopy status, age (representative sample of each story and/or species)
  - All stems counted in the surveys must be within the plot/quadrat.
  
- Shrub and sapling survey plot (30m x 7m) nested in tree survey plot;
  - Number of stems per species encountered within nested plots
  - Stem counts and line intercept measurement techniques to record species, number of stems/crowns, and average canopy cover within the understory.
  - All stems counted in the surveys must be within the plot/quadrat.
  
- Ground vegetation plot
  - Nine 1 m x 1 m quadrats
  - Three Quadrats shall be placed in each of the lower, middle and upper slope sections of the nested quadrat

- Quadrats shall be placed in a diagonal fashion as seen in Appendix B,
  - This regular configuration of ground quadrats will eliminate quadrat placement bias and will provide efficient coverage of the sample areas.
- Ground cover shall be documented using the Daubenmire Index for plant coverage.
- All stems counted in the surveys must be within the plot/quadrat.

Data collection sheets used for surveys in the Assessment Areas are situated in (Appendix C).

Unknown specimens will be collected and transported back to the office for identification using peer-reviewed and accepted plant identification keys such as Budd's Flora (1979). In the event that a plant may be a rare/or endangered species and cannot be identified in the field, the specimen will only be removed if there are greater than 15 specimens present in the immediate area. Otherwise, a thorough description of the plant, habitat and associated species will be noted. Photos will be taken of the plant and its location. The location of the specimen will be geo-referenced using waypoints taken on a hand-held GPS unit.

#### 4.3 Positioning the Nested Quadrat Sampling Plot

The lower slope end of the plot will be placed within forest canopy habitat and will not extend into shoreline sedge or willow communities if present. Sedge, grasses and willows commonly occupy alluvial deposits often associated with the inside of a river bend or areas otherwise less exposed to the majority of riverbank erosion processes. Shoreline erosion and plant community characteristics immediately adjacent to a plot will nonetheless be documented in data sheets and in project reporting.

In the Glenlea Assessment Area there is significant interior forest cover and the forest generally extends out to greater distances from the water's edge. To capture variation in vegetation throughout the Assessment Area some plots will be positioned in a 'staggered' fashion upslope and downslope along the shoreline and also throughout the interior of the Assessment Area (Appendix A).

#### 4.4 In-Transit Ocular and Auditory Observations Survey

Sites determined or thought to contain unique or unusual plant species and not surveyed by the above plot method will be surveyed by foot. These sites may

potentially be identified ahead of time during desktop review. Ocular surveys will increase the chances of locating and documenting;

- The presence/absence of rare plants and Plant Species of Interest such as those traditionally used by First Nations people for a variety of purposes,
- The presence/absence of old, dying and dead trees, snags and unique vegetation habitat required for birds that need nesting cavities and/or stick nests,
- Visual sweeps will also enable surveyors to record potentially active raptor nests, songbird activity and other wildlife activity using visual cues including tracks and scat,
- Auditory cues will be used to identify birds in the assessment areas and potentially characterize nesting status,
- Throughout the Field Investigation, SMM Biologists will be observing and documenting any evidence of wildlife species, including protected species and species of interest, as well as the habitat that they are utilizing.

#### 4.5 Soil Data and Characterisation

Soil pits will be dug immediately adjacent to each survey plot (approximately 0.6 m in width and deep enough to reach either C horizon or clay sub-soils. Pits shall be no greater than 1.0 m in depth. The soil profile will be documented and characterized in each case. Soil texture and coloration, if present, will be noted for all distinct soil layers. Soils will be classified using the Manitoba Forest Ecosystem Classification Guide (1995). Measurements and data will be supplemented with photographs and hand illustrations.

#### 4.6 Transportation and Parking

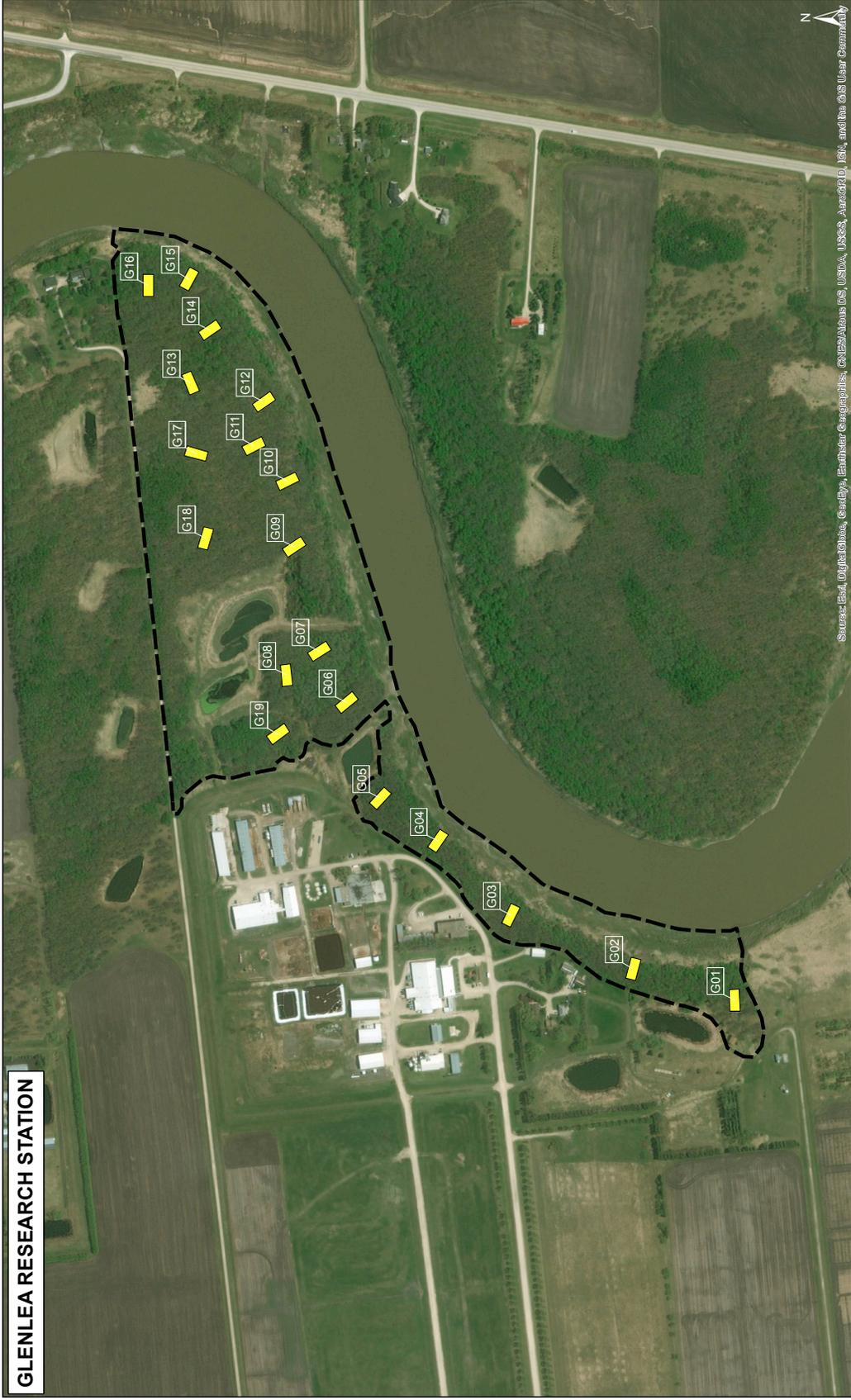
Travel to and from the Assessment Areas will be by car. Any vehicle used by the survey team(s) will be parked on-site in a location approved by local site contacts and/or SMM's primary contact with the Office of Sustainability.

## REFERENCES

A. C. Budd. 1979. Budd's flora of the Canadian prairie provinces. Rev. and enl. / by J. Looman and K.F. Best. Published by Research Branch, Agriculture Canada in [Ottawa]. 863 p.

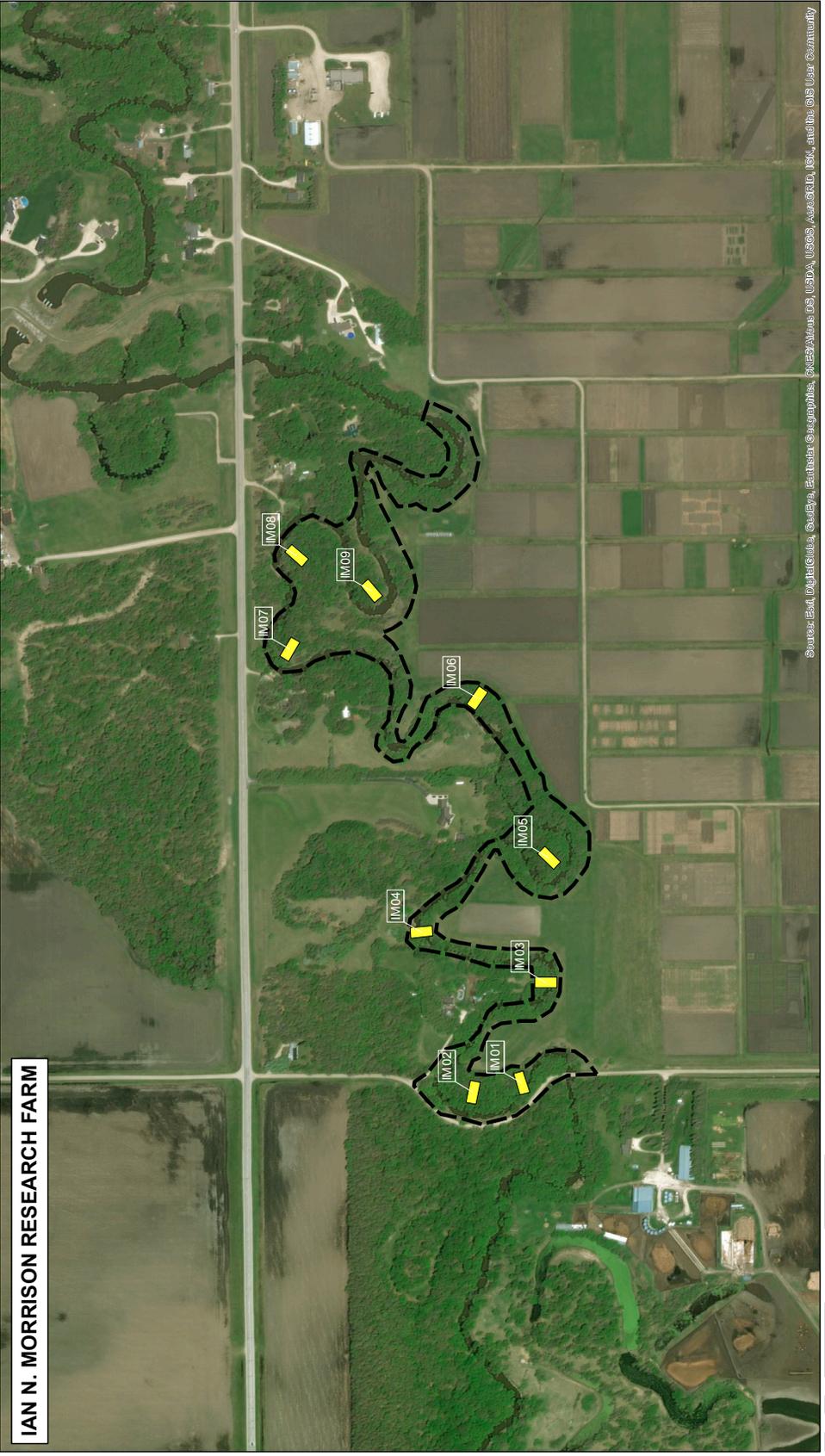
Forest ecosystem classification for Manitoba: field guide. 1995. Zoladeski, C.A.; Wickware, G.M.; Delorme, R.J.; Sims, R.A.; Corns, I.G.W. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta. Special Report 2. 205 p.

## **APPENDIX A**

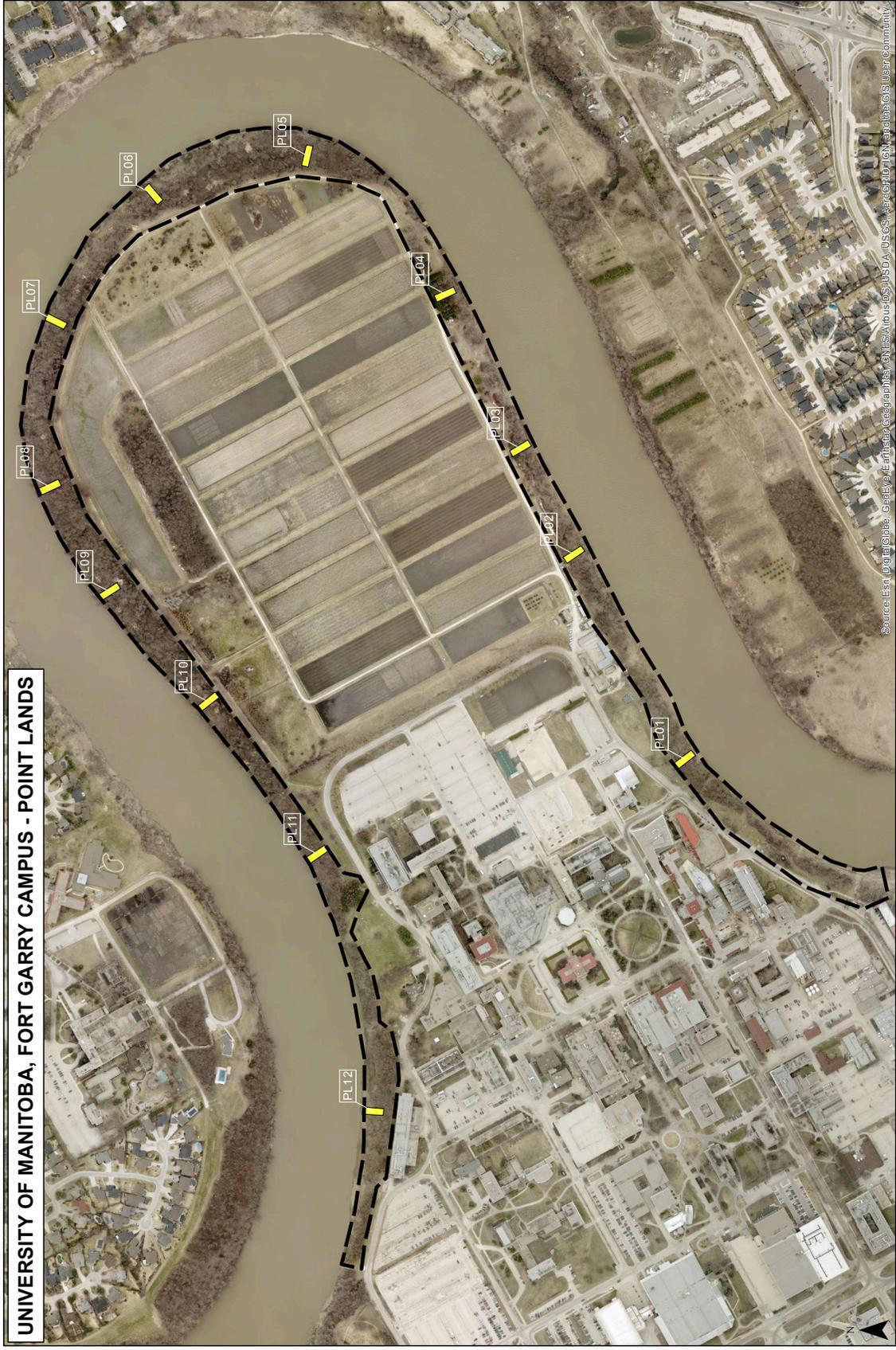


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community

**IAN N. MORRISON RESEARCH FARM**



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



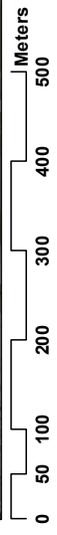
**UNIVERSITY OF MANITOBA, FORT GARRY CAMPUS - POINT LANDS**

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

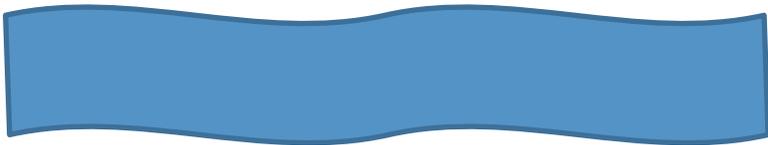
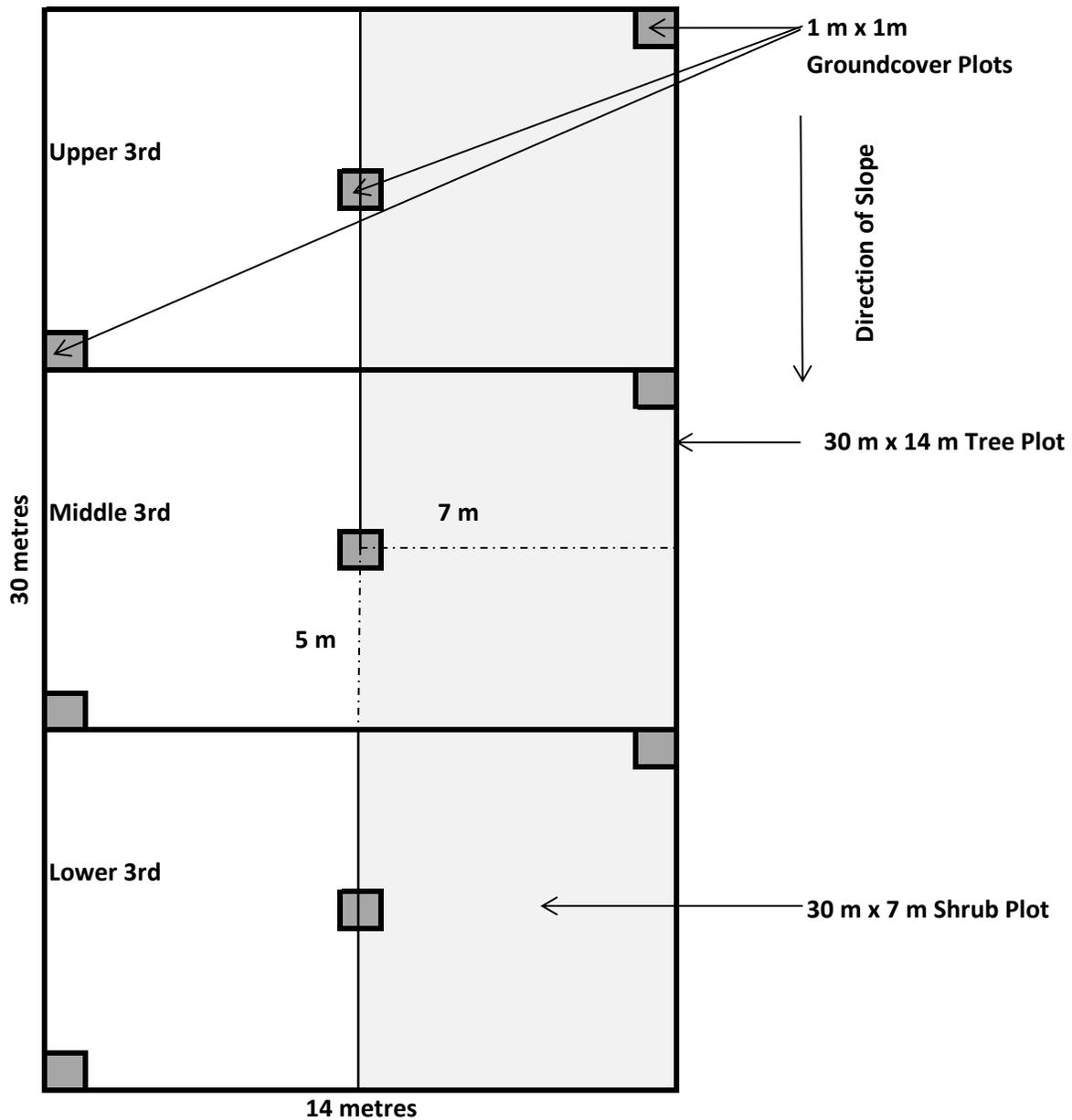
**UNIVERSITY OF MANITOBA, FORT GARRY CAMPUS - SOUTH LANDS**



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



## **APPENDIX B**



RIVER

U of M Biodiversity Study Vegetation Plot Layout

## APPENDIX C





Plot #:		U OF M BIODIVERSITY STUDY							Date:	
Surveyors:		TREE OVERSTORY DATA (30 m x 14 m)							Time:	
Species composition	Canopy Status	Health	Height (m)	Spread (m)	Upper	Middle	Lower	Stem Count	DBH (cm)	Core #
<i>Fraxinus pennsylvanica</i>										
<i>Acer negundo</i>										
<i>Ulmus americana</i>										
<i>Quercus macrocarpa</i>										
<i>Populus deltoides</i>										
<i>Populus tremuloides</i>										
<i>Tilia americana</i>										
<i>Fraxinus nigra</i>										
Other										
<b>Short-hand key:</b>		<b>Canopy Status</b>	<b>Health</b>							
	D - Dominant		G - Good							
	C - Co-dominant		F - Fair							
	S - Sub-dominant		P - Poor							



## APPENDIX D **COMPLETE SPECIES LISTS FOR THE STUDY**

Scientific Name	Common Name	Typical Growth Form						
		Native (n) Introduced (i)	Tree	Shrub	Graminoid	Forb	Pteridophyte	Vine
<i>Acer negundo</i>	Manitoba maple	n	•	•				
<i>Actaea rubra</i>	red baneberry	n				•		
<i>Ambrosia trifida</i>	giant ragweed	i				•		
<i>Amelanchier alnifolia</i>	saskatoon	n		•				
<i>Amorpha fruticosa</i>	false indigo	n				•		
<i>Amphicarpaea bracteata</i>	hog peanut	n						•
<i>Anemone canadensis</i>	Canada anemone	n				•		
<i>A. virginiana</i>	tall thimbleweed	n				•		
<i>Apocynum androsaemifolium</i>	spreading dogbane	n		•				
<i>A. cannabinum</i>	indian hemp	n		•				
<i>Aquilegia canadensis</i>	Canada columbine	n				•		
<i>Aralia nudicaulis</i>	wild sarsaparilla	n				•		
<i>Arctium minus</i>	common burdock	i				•		
<i>Artemisia absinthium</i>	absinth	i				•		
<i>Asclepias speciosa</i>	showy milkweed	n				•		
<i>A. syriaca</i>	common milkweed	n				•		
<i>Astragalus cicer</i>	cicer milkvetch	i				•		
<i>Atriplex</i> sp.	saltbrush sp.	n		•				
<i>Betula occidentalis</i>	water birch	n		•				
<i>B. papyrifera</i> var. <i>papyrifera</i>	white birch	n	•	•				
<i>Bidens frondosa</i>	devil's beggarstick	n				•		
<i>Botrychium virginianum</i>	rattlesnake fern	n					•	
<i>Brassica</i> sp.	mustard	n				•		
<i>Bromus inermis</i>	smooth brome	i			•			
<i>Caragana arborescens</i>	caragana	i		•				
<i>Carex</i> sp.	sedge	n			•			
<i>C. assiniboinensis</i>	assiniboine sedge	n			•			
<i>C. rostrata</i>	beaked sedge	n			•			
<i>C. sprengelii</i>	long-beaked sedge	n			•			
<i>C. tenera</i>	quill sedge	n			•			
<i>Celastrus scandens</i>	American bittersweet	n						•
<i>Chenopodium album</i>	lamb's-quarters	i				•		
<i>Cirsium arvense</i>	Canada thistle	i				•		
<i>Cornus sericea</i> ssp. <i>sericea</i>	red-osier dogwood	n		•				
<i>Corylus cornuta</i>	beaked hazelnut	n		•				
<i>Crataegus chrysoarpa</i>	hawthorn	n	•	•				
<i>Diervilla lonicera</i>	honeysuckle	n		•				
<i>Disporum trachycarpum</i>	fairybells	n				•		
<i>Echinocystis lobata</i>	wild cucumber	n						•
<i>Elymus canadensis</i>	Canada wildrye	n			•			
<i>E. repens</i>	quack grass	i			•			
<i>E. virginicus</i>	Virginia wildrye	n			•			
<i>Equisetum arvense</i>	horsetail	n					•	
<i>E. hyemale</i>	common scouring rush	n					•	
<i>E. pratense</i>	meadow horsetail	n					•	
<i>Erigeron</i> sp.	fleabane	n				•		
<i>Euphorbia esula</i>	leafy spurge	i				•		
<i>Euthamia graminifolia</i>	flat-top goldenrod	n				•		
<i>Fragaria virginiana</i>	wild strawberry	n				•		
<i>Fraxinus pennsylvannica</i>	green ash	n	•	•				
<i>Galium borealis</i>	northern bedstraw	n				•		
<i>G. triflorum</i>	fragrant bedstraw	n				•		
<i>Geum aleppicum</i>	yellow avens	n				•		
<i>Glechoma hederacea</i>	ground ivy	i				•		
<i>Helianthus maximiliani</i>	maximilian sunflower	n				•		
<i>H. tuberosus</i>	Jerusalem artichoke	n				•		
<i>Heliopsis helianthoides</i>	false sunflower	n				•		
<i>Heracleum maximum</i>	cow parsnip	n				•		
<i>Humulus lupulus</i>	common hop	n						•
<i>Impatiens</i> sp.	impatien	n				•		
<i>Lactuca serriola</i>	prickly lettuce	n				•		
<i>Lamium amplexicaule</i>	henbit	i				•		
<i>Laportea canadensis</i>	wood nettle	n				•		
<i>Lappula squarrosa</i>	bluebur	i				•		
<i>Lathyrus venosus</i>	veiny pea	n				•		
<i>Leonurus cardiaca</i>	common motherwort	i				•		
<i>Lonicera dioica</i>	twining honeysuckle	n		•				
<i>L. villosa</i>	mountain fly-honeysuckle	n		•				
<i>Lycopus</i> sp.	horehound	n				•		
<i>Maianthemum canadense</i>	wild lily of the valley	n				•		
<i>Malus</i> sp.	crabapple	i	•	•				
<i>Matteuccia struthiopteris</i>	ostrich fern	n					•	
<i>Menispermum canadense</i>	Canadian moonseed	n						•
<i>Mentha arvensis</i>	wild mint	n				•		

Scientific Name	Common Name	Typical Growth Form						
		Native (n) Introduced (i)	Tree	Shrub	Graminoid	Forb	Pteridophyte	Vine
<i>Osmorhiza longistylis</i>	smooth sweet cicely	n				•		
<i>Oxalis stricta</i>	yellow wood-sorrel	i				•		
<i>Parthenocissus quinquefolia</i>	Virginia creeper	n						•
<i>Phalaris arundinacea</i>	reed canary grass	i			•			
<i>Phryma leptostachya</i>	American lopseed	n				•		
<i>Picea glauca</i>	white spruce	n	•	•				
<i>Plantago major</i>	common plantain	i				•		
<i>Poa pratensis</i>	Kentucky bluegrass	i			•			
<i>Polygonum aquaticum</i>	water smartweed	n				•		
<i>Populus deltoides</i>	eastern cottonwood	n	•	•				
<i>P. tremuloides</i>	trembling aspen	n	•	•				
<i>Prunus virginiana</i>	chokecherry	n	•	•				
<i>Quercus macrocarpa</i>	bur oak	n	•	•				
<i>Rhamnus cathartica</i>	European buckthorn	i	•	•				
<i>Ribes americanum</i>	wild black currant	n				•		
<i>R. triste</i>	red currant	n				•		
<i>Rosa acicularis</i>	prickly rose	n			•			
<i>R. woodsii</i>	woods' rose	n			•			
<i>Rubus idaeus</i>	wild red raspberry	n			•			
<i>Rudbeckia laciniata</i>	cut-leaf coneflower	n				•		
<i>Salix alba</i> var. <i>sericea</i>	silver willow	i	•	•				
<i>S. exigua</i>	sandbar willow	n		•				
<i>Salix</i> sp.	willow	n		•				
<i>Sambucus nigra</i> ssp. <i>canadensis</i>	Canada elderberry	n		•				
<i>Scutellaria galericulata</i>	marsh skullcap	n				•		
<i>Smilacina stellata</i>	star-flowered Solomon's seal	n				•		
<i>S. trifolia</i>	three-leaved false Solomon's seal	n				•		
<i>Smilax herbacea</i>	carriionflower	n				•		
<i>Solidago canadensis</i>	Canada goldenrod	n				•		
<i>Solidago</i> sp.	goldenrod	n				•		
<i>Sonchus arvensis</i>	perennial sow thistle	i				•		
<i>Sorbus decora</i>	showy mountain ash	n	•	•				
<i>Stachys tenuifolia</i>	smooth hedge nettle	n				•		
<i>Symphiotrichium ciliolatum</i>	fringed aster	n				•		
<i>S. laeve</i>	smooth aster	n				•		
<i>S. lanceolatum</i>	panicled aster	n				•		
<i>S. sagittifolium</i>	narrow leaved aster	n				•		
<i>Symphiotrichium</i> sp.	aster	n				•		
<i>Symphoricarpos albus</i>	common snowberry	n		•				
<i>S. occidentalis</i>	western snowberry	n		•				
<i>Syringa reticulata</i>	japanese lilac	i	•	•				
<i>Taraxacum officinale</i>	dandelion	i				•		
<i>Thalictrum dasycarpum</i>	tall meadowrue	n				•		
<i>T. venulosum</i>	veiny meadowrue	n				•		
<i>Tilia americana</i>	basswood	n	•	•				
<i>Toxicodendron radicans</i>	poison ivy	n				•		
<i>Trillium cernuum</i> var. <i>marcranthum</i>	nodding trillium	n				•		
<i>Ulmus americana</i>	American elm	n	•	•				
<i>Urtica dioica</i>	stinging nettle	n				•		
<i>Viburnum lentago</i>	nannyberry	n		•				
<i>V. rafinesqueanum</i>	downy arrowwood	n		•				
<i>Vicia americana</i>	wild vetch	n				•		
<i>Viola canadensis</i>	Canada violet	n				•		
<i>Vitis riparia</i>	riverbank grape	n						•
<i>Xanthium strumarium</i>	cocklebur	n				•		

AVIAN	
Scientific Name	Common Name
<i>Accipiter cooperii</i>	cooper's hawk
<i>Accipiter striatus</i>	sharp-shinned hawk
<i>Anas platyrhynchos</i>	mallard
<i>Buteo platypterus</i>	broad-winged hawk
<i>Buteo jamaicensis</i>	red-tailed hawk
<i>Contopus virens</i>	eastern wood-peewee
<i>Corvus brachyrhynchos</i>	American crow
<i>Corvus corax</i>	common raven
<i>Cyanocitta cristata</i>	bluejay
<i>Dryobates pubescens</i>	downy woodpecker
<i>Dryocopus pileatus</i>	pileated woodpecker
<i>Empidonax minimus</i>	least flycatcher
<i>Haliaeetus leucocephalus</i>	bald eagle
<i>Leuconotopicus villosus</i>	hairy woodpecker
<i>Megaceryle alcyon</i>	belted kingfisher
<i>Melospiza melodia</i>	song sparrow
<i>Myiarchus crinitus</i>	great crested flycatcher
<i>Pheucticus ludovicianus</i>	rose-breasted grosbeak
<i>Poecile atricapillus</i>	black-capped chickadee
<i>Sitta carolinensis</i>	white-breasted nuthatch
<i>Spinus tristis</i>	American goldfinch
<i>Troglodytes aedon</i>	house wren
<i>Turdus migratorius</i>	American robin
<i>Vireo gilvus</i>	warbling vireo
<i>Vireo olivaceus</i>	red-eyed vireo
<i>Zenaidura macroura</i>	mourning dove

MAMMALIAN	
Scientific Name	Common Name
<i>Castor canadensis</i>	beaver
<i>Marmota monax</i>	groundhog
<i>Odocoileus virginianus</i>	white-tailed deer
<i>Ondatra zibethicus</i>	muskrat
<i>Procyon lotor</i>	raccoon
<i>Sciurus carolinensis</i>	eastern gray squirrel
<i>Tamiasciurus hudsonicus</i>	red squirrel
<i>Vulpes vulpes</i>	red fox