

NATURAL AREAS INVENTORY

2006-2009

Volume 1



NIAGARA PENINSULA
CONSERVATION
AUTHORITY

A sincere thank you to all of our project partners!



Great Lakes Sustainability Fund /
Le Fonds de durabilité des
Grands Lacs



Niagara Falls
Nature Club



Natural Heritage Areas Inventory
-Niagara Peninsula Conservation Authority Watershed-

Abstract

The Natural Heritage Areas Inventory of Niagara and Haldimand is a project conducted between April 2006 and December 2009 for the purpose of identifying, classifying and mapping natural heritage areas in our watershed (NPCA's jurisdiction). The goal of the project was to use industry standard, scientifically-defensible protocols to inventory all of the natural areas in our community.

Those who have spent time in the natural areas in and around Niagara know that this part of the province, with its Carolinian heritage and proximity to the Great Lakes, is a treasure trove of natural wonders. These areas support a rich diversity of natural features including rare plants and animals, significant habitats and geological formations, and important wildlife corridors. A comprehensive biological inventory to document the vegetative communities of our watershed and their inhabitants has never been completed.

As data was collected, the project built on existing information ultimately confirming the significance of known sites and filling information gaps. The result is a solid resource of information, which includes accurate natural heritage mapping, a list of local rarity, and site specific species information that will be of tremendous benefit to all watershed residents.

The data collected through the project has helped to foster the development of greater environmental awareness within the community, prioritize restoration opportunities and, will serve as baseline for planning decisions and policy development.

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Natural Heritage Areas Inventory
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Acknowledgements

The Niagara Peninsula Conservation Authority (NPCA) wishes to acknowledge the collaborative effort of all of our project partners. What began as a NPCA initiative quickly gathered the support of first the Regional Municipality of Niagara and the Peninsula Field Naturalists, then several other agencies and funding partners. All 12 lower tier Niagara municipalities lent their support through funding by way of the Niagara Water Quality Protection Strategy, and in some instances by supplying data. The County of Haldimand supplied the NAI team with data as well as three years of funding for the work in their portion of the watershed.

The Hamilton and Halton NAI teams gave valuable advice during the planning stages of this project and whenever the Niagara Team called with a question. Ontario Ministry of Natural Resources ELC Team lead by Harold Lee was generous with both their time and knowledge in the planning of the project, and in the field. Your guidance throughout this process was greatly appreciated.

The NPCA Management Team of Suzanne McInnes, Watershed Planning Coordinator; Deanna Lindblad, Natural Areas Inventory Project Coordinator; and Geoffrey Verkade, GIS Coordinator also wish to acknowledge the hard work and dedication of our staff. Field Technicians, Albert Garofalo, Tom Staton, Ryan Kitchen, and Kasondra White; Field Assistants, Rosalie Ng, Barry Porter, Said Mohamed, Kerry Royer, and Katleya Young-Chin; and GIS Technicians, Jeff Lee and Piper McKinnon. We would also like to thank Brianne Wilson for coordinating the project in its second year. You often went above and beyond what was required of you in order to produce a product we can all be proud of. Thank you!

The Steering Committee members were responsible for helping to guide the project and offer advice for adaptive management along the way. The Steering Committee included: Chairman-Roman Olszewski (PFN), Barbara Mugabe/Eric Lalande (Haldimand County), Debbie Whitehouse/Robert Ritchie/Mark Buma (NPC), Don Campbell/Ken Forgeron (Region of Niagara), Henry Swierenga (OFA), John Potter (PFN), Brenda Axon (Conservation Halton), Cathy Plosz (City of Hamilton), Joad Durst (MNR), Dan McDonell/Sandra Kok (Environment Canada). Your support and guidance were instrumental in the success of this project.

Technical Committee members spent many hours reviewing reports and offering technical advice to the project team. The Technical Committee members included: Michael Oldham (NHIC/MNR), Anthony Goodban (Rare Vegetation Types Report), Bob Curry (Lepidoptera and Odonata Report), John Black and Kayo Roy (Birds of the Niagara Region Report), Roman Olszewski (Lichens and Bryophytes Report), Bert Murphy (Geologic Descriptions), Lisa Grbinicek (NEC), Kevin Rich (Ducks Unlimited), Donald Kirk (MNR), Robert Ritchie/ Mark Buma (NPC), Rob Tervo (MNR – SAR), Anne Yagi (MNR), Amy Brant (MNR-SAR), Karine Beriault (MNR-SAR), Naturalist Club Representatives: Rick Young, Joyce Sankey, Jim Grassie (Niagara Falls Nature Club); John Potter, Roman Olszewski (Peninsula Field Naturalists); Dawn Pierrynowski, Rick Stockton, Tim Seburn (Bert Miller Nature Club). Thank you for your patience, and for graciously offering your limited time and vast knowledge.

Two volunteer teams made up of members from the three area naturalists' clubs (Niagara Falls Nature Club, Peninsula Field Naturalists and the Bert Miller Nature Club) participated in the project both as expert volunteers in the field, and as Steering and Technical Committee members. They spent more than 1500 hours in the field over the three years of the project. Your level of dedication to our efforts was unmatched in this process. You are truly the heroes of this endeavour. A special thank you goes out to Joyce Sankey, Jim Grassie, Rick Young and John Potter for their expert leadership of these teams in the field.

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And, to the hundreds of private landowners that allowed our inventory teams unprecedented access to their properties, thank you! Without your overwhelmingly positive support of our efforts, this project simply would not have been possible. All of our expectations when it came to the support of landowners were far exceeded proving that this watershed is full of individuals that truly care about the natural environment, and are doing their part to protect it.

The dedication of all of the project partners helped us to exceed our goals. It is our hope that the data collected and shared through this work will lead to not only a deeper understanding of the ecosystems of our watershed, but also help us to better plan for the future. We want these systems to not just continue to exist on the landscape, but rather thrive. We view this document not as the end but as the beginning of a more concentrated effort to document, monitor and protect the natural areas of our watershed.

Mrs. Deanna L. Lindblad
Natural Areas Inventory
Project Coordinator

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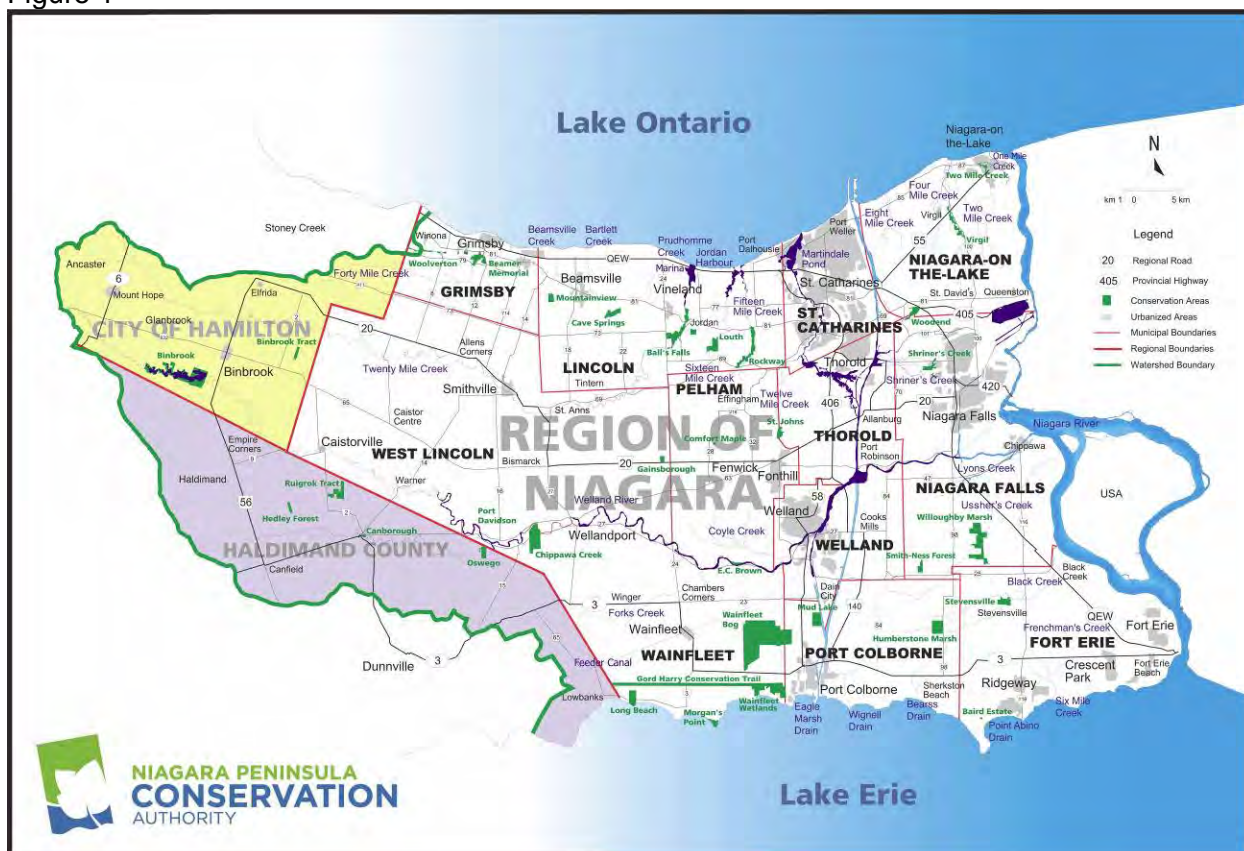
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1.0 Executive Summary

The Niagara Peninsula Conservation Authority watershed jurisdiction covers an area of 2,424 square kilometres encompassing the entire Niagara Region, 21% of the City of Hamilton, and 25% of Haldimand County (see Figure1).

Figure 1



The Niagara watershed is approximately 15% urban, based on municipal planning urban area boundary data. The Places to Grow Built Boundary estimates that 11% of the watershed is built, and the Southern Ontario Land Resources Information System (SOLRIS) identifies 11.9% of the landscape as 'built up' area but includes land uses such as rural residential areas as well.

1.1 The Need

Those who have spent time in the natural areas in and around Niagara, Hamilton and Haldimand know that this part of the Province, with its Carolinian heritage and proximity to the Great Lakes, is a treasure trove of natural wonders. However, a comprehensive inventory of these natural areas was lacking. The only formal documentation for planning purposes in Niagara prior to this NAI dates back to 1980 (a joint project of the Region of Niagara and Brock University).

A Natural Areas Inventory for Haldimand–Norfolk was completed by the Norfolk Field Naturalists and their partners in 1987.

The Hamilton area of the watershed was inventoried on two separate occasions by the Hamilton Naturalists Club and their partners. The first inventory was completed in 1993 and the second known as the Nature Counts Project was completed in 2003. They are currently planning their third inventory for the Hamilton area.

In an attempt to increase community awareness and build a database for use by government agencies, consultants, the naturalist community, and the general public; local naturalist clubs and municipalities teamed up with the NPCA to undertake this Natural Heritage Areas Inventory.

As will be further described in the following Physical Characterization Reports, the study area is home to plentiful natural resources and interesting ecological communities. The watershed is one of the most complex in the province. It includes land drained by major tributaries such as the Niagara River, Twenty Mile Creek, and the Welland River. Further drainage by the Welland Canal creates unique challenges. With our proximity to both Lake Erie and Lake Ontario, the Niagara Peninsula has truly exceptional climatic and biotic zones that are unlike anywhere else in North America.

1.2 Natural Areas in the Study Area

Based on the current status of the Community Series Fabric, 27.6% of the Niagara Watershed is mapped as natural area. A breakdown of these areas by common features such as wetland, wooded and successional area is detailed in the ELC Community Series Fabric mapping high level analysis and accompanying Community Series Analysis report.

The Community Series mapping covers the entire watershed jurisdiction of the Niagara Peninsula Conservation Authority. The field verification covers most of the watershed with the exception of; Hamilton which was inventoried through the previous work of the Hamilton Naturalists Club, and the Town of Fort Erie which was covered under their Official Plan update in 2005. The Niagara Escarpment Area has had extensive inventory work in recent years and thus was not a focus of the field verification of this NAI.



1.3 Project Design

1.3.1 Goal – The purpose of the project was to use industry standard, scientifically-defensible protocols to inventory all of the natural areas in our watershed.

The data collected through the NAI has provided a solid resource of information that will be of tremendous benefit in the development of greater environmental awareness; will help prioritize restoration opportunities; and serve as a critical baseline for use in future planning decisions, and policy development.

The data collected has built on existing information using a team of professional biologists and expertly trained volunteer teams, ultimately confirming the significance of known sites and filling information gaps where inventory work was outdated or lacking.

Our strategy for data collection involved the classification of vegetation communities through aerial photo interpretation and field verification. In addition, specialized consultants were employed to study sites of higher diversity in greater detail including the faunal components of those sites (birds, butterflies, and herptiles).

1.3.2 Objectives

- 1 – The first objective involved the completion of Community Series (ELC) mapping for the entire watershed jurisdiction.
- 2 – The second objective was to field verify the Community Series Classification and refine the data on the vegetative communities to Vegetation Type (ELC).
- 3 – The third objective was collection of data on specific flora and fauna of the study site. These inventories included birds, lepidoptera and odonata, herpetofauna, lichens and the reports can be found in the second volume of the final report.
- 4 – The fourth objective was to educate the project partners and public about the findings of the NAI.

1.3.3 Our strategy for data collection was three fold:

- 1- Desktop Analysis: using 2006 colour, digital air photos with 10cm resolution, the project team classified the entire watershed to Ecological Land Classification (ELC) – Community Series. The Ontario Wetland Evaluation System protocol (OWES) was also employed through a partnership with the Ministry of Natural Resources (MNR) to delineate and evaluate all core wetlands within the study area.
- 2- Ground Truthing: a field crew trained in both Ecological Land Classification (ELC) and Wetland Evaluation (OWES) performed assessments on all natural areas where access was permitted by the landowner. ELC was taken to the most detailed level of Vegetation Type. Where Species at Risk were encountered, data was collected and shared with the Natural Heritage Information Centre and local MNR staff. Data collected on wetlands was shared with the MNR for their evaluation.
- 3- “Bio Blitz” Events: using specialized consultants, select areas of high diversity were inventoried in greater detail. This includes fauna such as: birds, butterflies, and herptiles.



1.4 End Products

The end products for this project are Community Series mapping for the entire watershed jurisdiction; a two volume report similar to the Nature Counts Project (Hamilton NAI) where the first volume is made up of the technical summaries for each site visited and ground truthed; and the second volume contains the species checklists, and a master plant list including, a list of local rarity compiled by the Natural Heritage Information Centre of the Ministry of Natural Resources.

Our field teams along with a group of Geographic Information System (GIS) Specialists have inputted the data collected into the project database (more than 92,000 data points).

Brock University has provided in-kind support for the project by developing the project bibliography.

The Royal Botanical Gardens has been extremely helpful in flora identification, and the housing of thousands of specimens generated by the project.

1.5 Project Implementation

The project began with a Terms of Reference presented to the Conservation Authority Board of Directors in late 2005. With Board approval the General Manager of the NPCA approached the Region of Niagara for funding. Building on the Official Plan Review of the Region of Niagara, the NPCA hoped to update the baseline data for use in future reviews, and in the planning process.

The Peninsula Field Naturalists (PFN) joined the project as the collaborative partner of the NPCA for fund raising and project design. A representative of the PFN sits as the Chairman of the Steering Committee.

Work began in April of 2006 with the hiring of the Project Coordinator, initiation of the landowner contact process, development of project committees, and the hiring of field staff. The GIS team of the NPCA began the Community Series mapping in the summer of 2006, a process that continued throughout the three and a half years of the project. The QA/QC (quality

assurance/quality control process of this deliverable carried on after publication of this document.

The Ecological Land Classification (ELC) field teams began collecting data in July of 2006 along with an expert volunteer team. Additional teams were added in the two subsequent years in an effort to cover the volume of positive landowner responses received.

Consultants with expertise in the fields of Botany, Entomology, Lichenology, Ornithology, Herpetology, Geology, and Ecology were hired with the bulk of the inventory work taking place in the summer of 2007.

Data entry began in late 2007 and carried on until the spring of 2009 at which time the Project Coordinator began writing the 107 technical summaries, and editing the contributors papers for the final report.

1.5.1 Management Team

Coordinator of Watershed Planning for the NPCA – Suzanne McInnes
Project Coordinator, NPCA- Deanna Lindblad (2006, 2008, 2009), Brianne Wilson (2007)
Coordinator of GIS Services, NPCA – Geoff Verkade
Chairman of the Steering Committee – Roman Olszewski, Peninsula Field Naturalists.

1.5.2 Field Crew

ELC Technician/Crew Leaders- Albert Garofalo,
Tom Staton, Ryan Kitchen, Kasondra White

Field Technicians: Roselei Ng, Barry Porter, Said
Mohamed, Katleya Young-Chin

Specialized consultants in the fields of botany,
ornithology, herpetology and entomology.

1.5.3 Project Committees:

Steering Committee – This committee helped to guide the program and ensure that the interests and concerns of all project partners and funders were met. Their responsibility was to oversee the communications aspect of the project and monitor progress. This committee was made up of representatives of project funding partners and concerned agencies.

Technical Committee – This committee was responsible for overseeing the collection, management, and dissemination of data. This committee was made up of representatives from local naturalist clubs, government agencies, and the academic community.

Implementation Committee – The purpose of this committee was to comment on the implementation of the project and identify any new areas of interest. This committee consisted of a vast cross-section of watershed stakeholders. They were consulted throughout the process and updated at project milestones.



1.6 METHODOLOGY

1.6.1 Site Selection – Landowner Contact

The goal of site selection was to document a representative sample of as many communities as possible throughout the study area. For this reason, an effort was made to not narrow the scope of the landowner contact process knowing full well that response from the landowners would be the greatest constraint (see landowner letter in Appendix).

In the first year of the project, a workshop was held with possible project partners and stakeholders to brainstorm ideas around project design, site selection, and a communications strategy for the project. Workbooks were handed out to the nearly 60 participants. 24 of these were returned and a summary was produced to capture all of the comments submitted (see Workshop Summary Report in Appendix).

The landowner contact program was designed to inform landowners about the project and solicit consent to access their properties for the purpose of the Ecological Land Classification Vegetation Type assessment.

In the first year, 2006, the municipalities of Port Colborne and Wainfleet were targeted. These areas were chosen first due to the fact that the Ministry of Natural Resources had completed the updates to the draft wetland mapping for these municipalities.

There was no scoping for site selection in this first year. 2200 letters representing 2700 properties were sent to landowners that had natural area or wetland on their properties regardless of size, based on a desktop GIS exercise.

Of the 2200 letters sent, 590 (27%) responses were received. 536 (24%) were positive and 54 (3%) were negative. 81 were returned unopened.

With one field crew and one team of volunteers, 62 sites were visited in this first year.

In the second year of the project, 2007, the portion of Haldimand County that falls within the study area was targeted along with South Niagara Falls. The Steering Committee decided that further scoping was required due to the large volume of properties. 3475 letters representing 4385 properties were sent to landowners with natural area greater than two hectares, or draft MNR wetland based on a desktop GIS exercise.

Of the 3475 letters, 870 (25%) responses were received. 792 (23%) were positive, and 78 (2%) were negative. 111 were returned unopened.

With two field crews and two volunteer teams in this second year, 268 sites were visited.

In the third year of the project, 2008, the municipalities of Pelham, Thorold, Welland, North Niagara Falls, and West Lincoln were targeted for landowner contact. 2829 letters representing 7135 properties were sent to landowners with natural area greater than two hectares in size, or wetland.

Of the 2829 letters sent, 1233 (44%) responses were received. 1036 (37%) were positive and 197 (7%) were negative. 145 were returned unopened.

With three field crews and two teams of volunteers, 197 sites were visited.

During the course of the project, a total of 8504 letters were sent to landowners representing 14,220 properties throughout the study area. 2693 (32%) responses were received. Of those, 2364 (28%) were positive and 329 (4%) were negative.

A total of 337 letters were returned unopened.

Field crews and volunteer teams visited a total of 527 sites representing 22% of the sites that were available to us through positive landowner responses.

It is obvious to the project management team that the citizens of our watershed are very supportive of our efforts to document the natural spaces of their properties. Further study of the privately-owned natural areas is recommended.

1.6.2 Wonderful Volunteers

Committed volunteers spent more than 180 hours over the course of the nearly four years of the project in Committee meetings. Their input has been essential in developing the program and adapting the project design to meet the changing needs of implementing a project of this size.

In the field, teams of expert volunteers comprised of members of the three local naturalist clubs spent more than 1500 hours collecting data on 70 sites to add to the ever growing body of knowledge about the natural areas of our watershed. Without their expertise and dedication, we would not have been able to cover as much ground as we did, or reach as many willing landowners. They were diligent in their data collection and record keeping, and wonderful ambassadors for the program with the landowners.



1.7 Methodologies

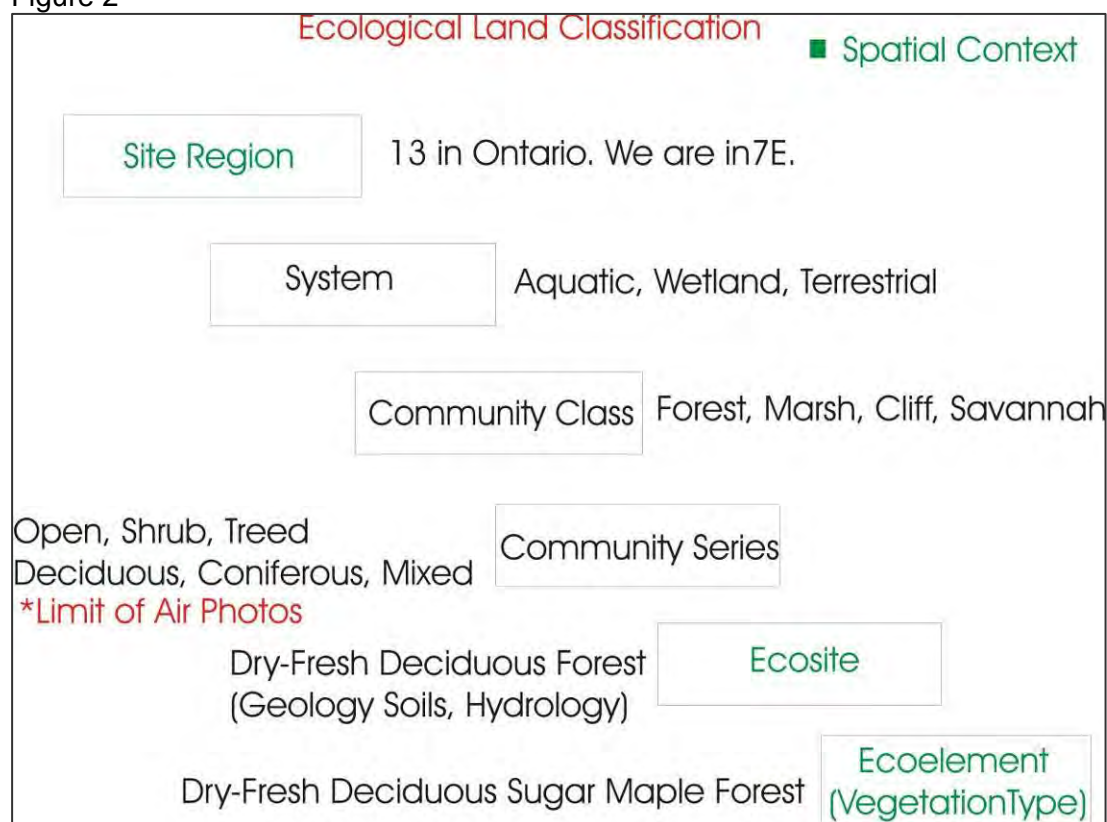
1.7.1 Ecological Land Classification (ELC)

Ecological Land Classification (ELC) is an integrated approach to surveying and classifying land and resources in order to “identify recurring ecological patterns on the landscape to reduce complex natural variation to a reasonable number of meaningful ecosystem units” (Bailey et al. 1978 in Lee et al, 1998). Provincially, the goal has been to “establish a comprehensive and consistent province-wide approach for ecosystem description, inventory and interpretation” (Lee et al.,1998).

The key focus of ELC is to improve our ability to manage both natural resources and the information about those resources. The ELC provides community descriptions and sampling methodologies for identifying and mapping valuable natural heritage features and areas at varying scales.

The six nested approach of the ELC for Southern Ontario blends the ability to put landscape units into a spatial context with the ability to understand their community-related organization. The nested levels range from the Site Region to the System to the Community Class, the Community Series, the Ecosite, and the Vegetation Type (see Figure 2).

Figure 2



1.7.2 Data Entry and Compilation

All data collected through this project was entered into a copy of the MNR ELC Data Management System (v 4.0) Microsoft Access database (ELC database). This database was one of two freely available that the team was aware of in the province to store, catalogue, and report on ELC data. The MNR database was chosen due to a number of reasons highlighted by the facts that it appeared to possess more robust reporting capabilities, and was tightly associated (commissioned by) the Southern Ontario ELC protocol First Approximation author, Harold Lee.

The primary data elements collected to support ELC are not unique and exist in support of a variety of field collection methods. For example, most natural area field survey work, whether ELC or not, will generally provide plant and wildlife species lists, some kind of stand description, and some form of soils information. As a result, this project also endeavoured to use the NAI

ELC database as a repository for other local field data collected under other protocols and initiatives in order to start to centralize all natural area information for Niagara in one enduring information system.

Generally this worked very well, as most data elements from the inventory work conducted by the NAI and other methods translated into the database reasonably well. The main advantage of this is that now, unique plant lists and other reports for each natural area can be generated based on all information collected for that geography, whether it was ELC through the NAI, or for example, a supplemental plant list based on a recent EIS. This is also important in the instance that plant lists will slightly differ with the timing of site visits.

Supplemental information entered into the project database included:

- select Environmental Impact Statements from the Niagara Peninsula Conservation Authority and the Region of Niagara between 2000 and 2006,
- Ontario Power Generation Biodiversity Study Reports including DeCew Generating Station, Sir Adam Beck Complex, and Welland River and Power Canal Natural Areas Studies,
- Ontario Ministry of Natural Resources select Area of Natural and Scientific Interest Reports,
- incidental flora and fauna data collected by consultants during the Natural Areas Inventory,
- plant lists and incidental wildlife observations collected by project volunteer teams during the Natural Areas Inventory,
- Environmentally Sensitive Areas information from the Region of Niagara.

1.7.3 Natural Area Sites and the Organization of Management Units

In order to organize, report on, and catalogue all of the field survey data in the tabular ELC database, the natural areas on the landscape had to be broken down and grouped into a standard framework of management units. The survey data within the ELC database had to be organized with some sense of geography as well, and hence standard management units or 'study sites', were established to catalogue surveys with geographic reference based on the criteria detailed below.

Study Sites were first delineated based on the occurrence of ANSI, ESA and/or Evaluated Wetlands that constituted a core area of natural cover. Remaining natural areas that were adjacent and proximal were added as determined by;

- surface water connections (riparian corridors, headwater areas, subwatershed membership),
- coincide with physiographic and topographic features (beach ridges, dunes, escarpments, moraines);
- and natural occurrence of corridors that connect core areas (hedge rows, successional areas between cores).

Arbitrary breaks used to further delineate a site were agricultural fields, rail lines, roadways, urban or industrial areas, and on occasion successional natural areas as the natural breaks between cores (when natural area connectivity spanned large areas, i.e. riparian habitat along the Welland River which can be contiguous from West Lincoln all the way to Niagara Falls).

Due to the robust reporting capabilities of the ELC database, where sites could be nested within other sites, and where unique plant lists and other reports could be produced at all of these different site levels, a standard hierarchy or organized framework of sites was developed. The site at the top of the hierarchy tree is referred to as the 'primary' site which is synonymous with the natural area 'site' terminology and the reporting unit for this project.

Sites were broken down into their contiguous core areas or 'Tracts' which form the next level of detail and geographic reference for field survey data. From there, tracts could be conceptually divided into blocks (units that share boundaries with each other within a tract) which could be based on any number of requirements, such as different communities, and survey method types. Different ELC Vegetation Type communities discerned through the ELC field survey data were stored at the Block level, as were the extents and associated field data for other surveys such as communities identified through an EIS, or the boundaries within a tract that a volunteer team had produced species lists for.

The entire NAI Primary Site hierarchy framework is conceptualized below and uses the following coding convention:

Primary Site – Natural Area 'Site' – PC-01

Sub-Site Level 1 – Natural Area 'Tract' – PC-01-01

Conceptual Sub-Site Level 2 – Natural Area 'Block' - PC-01-01-01-XX-XX

Specific Sub-Site Level 2 – Natural Area ELC Veg Site - PC-01-01-xx-xx-01

1.7.4 GIS Methodology for Delineation of the Community Series Polygons

The Community Series polygons which form the new natural areas base mapping and form a spatial framework for the NAI, were predominantly mapped through the interpretation of digitally captured colour aerial photography technically referred to as orthoimagery. Niagara Region and Haldimand County air photos were both produced in 2006, with 10 and 30 cm ground pixel resolutions respectively, while the City of Hamilton was from 2007 at 20 cm resolution. The digital capture technology used for these datasets, as opposed to the traditional film based approach, produces better quality photography in terms of clarity, colour and crispness which has been of tremendous value to the natural area identification and classification process. With Niagara constituting 77% of the study area, the majority of the watershed mapping was also able to benefit from the added detail afforded by the very fine 10 cm resolution imagery which was the first of its kind within the province.

The Community Series polygon 'fabric' is therefore a large scale mapping product with an intended mapping scale of 1:2000. It was designed to meet a number of business drivers and application needs that require natural area information to be reasonably representative of what is on the ground, or on site when looking at the information in the context of a collection of several, or even a single parcel. This would also facilitate the production and integration of the detailed Vegetation Type mapping coming from the field survey efforts by providing a detailed spatial framework.

Geometry for the Community Series polygons was digitized with linework generalized to the target scale of 1:2000. This was accomplished by ensuring that natural area features were captured at operating scales on average of 1:500 and of no greater than 1:1000. In addition, when digitization was performed in 'streaming' mode a stream tolerance of 2 m was used to ensure a coordinate pair or 'vertice' spacing that would support the desired map generalization. Stream digitizing is similar in concept to using the mouse pointer like a pen as opposed to capturing a single vertice at a time with each click.

A minimum mapping unit of 0.1 hectare was implemented as a guideline for the capture of natural area features. This value was established by assuming the difference in the order of magnitude from 1:2000 to traditional medium 1:10000 scale data like the OWES wetlands which generally uses a larger 0.5 hectare threshold.

As a result, areas greater than or equal to 0.1 ha of homogeneous cover or highly variable cover consisting of a relatively even distribution of multiple individual representative communities functioning as a 'complex' were mapped as individual Community Series polygon mapping units. There are polygons within the fabric that are smaller than the minimum mapping unit guideline and these were generally a result of capturing forest and successional areas around OWES wetlands where controlling the size of that remaining natural area to be captured could not be avoided (i.e. a wetland that does not persist to the edge of the woodlot leaving a 5 m wide sliver which then extends into a small hedgerow).

The wetland polygon mapping from the MNR OWES was integrated to reduce the need to interpret a duplicate set of wetland extents within the Community Series fabric through ELC. This was accomplished by simply building around and off of the delineated wetland polygons (geometry was never edited) as alluded to in the previous paragraph, as the province made them available. Although traditionally more of a 1:5000 or 1:10,000 scale dataset, the new draft and evaluated wetland extents provided by the MNR were also being delineated with a higher degree of spatial resolution and detail due to the high quality of the orthoimagery. As a result, the MNR wetlands were readily incorporated and although mapped with courser criteria in terms of minimum mapping unit than the rest of the Community Series polygons, it produced a consistent fabric.

In the case of most forest and woodland community types, the vector SOLRIS Phase 1 wooded area data was used as starting geometry to save excessive and unnecessary digitizing. This mapping was corrected, reshaped, refined, and split to meet the large scale mapping requirement, and to apply the Community Series classification or complexing as it was worked into the fabric.



The NAI site hierarchy is also conceptualized in the fabric. Each community series polygon is tagged with its site and tract codes. Displaying the data thematically by these attributes visualizes the framework used to organize the ELC database.

All data in the final polygon fabric has gone through an initial capture phase and several rounds of QA/QC to ensure attribute completeness and correct topology. These measures will ensure that use of this mapping information in analysis is highly reliable.

1.7.5 Wetland Evaluation Methodology of the Ministry of Natural Resources

A clear understanding of what is required at each site should be established prior to going into the field. This understanding is achieved primarily through interpretation of aerial photographs. The following is the methodology followed by MNR to evaluate wetlands.

- Step 1: Identify Priority Areas (Data Gaps, SAR)**
- Step 2: Air Photo Interpretation - Initial mapping**
- Step 3: Background Checks**

All wetland boundaries and complexes are established prior to the wetland field visit using 2006 colour ortho-photography. The areas are compared to older black and white aerial photography as well as the Ministry of Natural Resources GIS digital elevation contour layer to distinguish wetlands from non-wetlands.

1. Field photos and maps are produced showing the wetland boundaries within each property
2. Preliminary routes are then established to maximize time and efficiency in viewing the vegetation and boundaries of the wetland polygons.

3. Wetland Boundaries

One of the most important tasks in the entire evaluation is the accurate location and mapping of wetland boundaries. Evaluators must develop a full understanding of both the criteria for distinguishing wetlands from non-wetlands and also the methods of mapping and measurement. Where boundaries are not obvious, all decisions regarding boundary location should be justifiable and fully documented. The outer boundary of a wetland (which determines its size) is the one which will be used in several key aspects of the evaluation. However, several internal boundary lines must also be drawn although the degree of accuracy is not as critical. Internal boundaries are those between the four wetland types and between vegetation communities. The evaluation team will often find that wetland boundaries have to be drawn across a zone of gradual ecological change. The general rule for locating the boundary in such cases relies on the species composition of the plant community. It is absolutely essential that the evaluator be able to distinguish wetland from upland plants. **The wetland boundary is drawn where 50% of the plant community consists of upland species.**

Step 4: Initial evaluation (desktop)

Step 5: Field Check

4. Field Evaluation

During the site visit the following information will be collected or refined:

1. Wetland outer boundaries;
2. Boundaries between wetland types;
3. Vegetation forms/communities;
4. Ascertain directions of drainage;
5. Check quality and authenticity of existing information;
6. Search for rare plant and animal species;
7. Detect signs of presence of furbearers, wild rice, etc.
8. Note evidence of disturbances, hunting, fishing, nature appreciation, etc.
9. Record fisheries habitat information;
10. Check soil types;
11. Search for seeps and marl deposits.

Boundary refinements will be noted on field photos to update mapping in the office and where possible GPS coordinates will be taken for specific plant/animal and community locations.

5. Timing of Field Visits

The timing of visits to each wetland will depend upon the season, type, size and complexity of the wetland and the amount of information that is already available. If the wetland contains permanent open water, then one or more visits will be essential during the summer or early fall to obtain data on the extent and nature of submergent and floating vegetation as well as on the hydrological characteristics. All palustrine wetlands will have to be visited during the low water stage to determine surface inflow and outflow. The characteristics of a wetland at any particular time of year are often governed by seasonal rainfall. Some wetlands are so complex that the evaluation team will need to exercise considerable judgement in determining the timing and the date(s) of field visits. The aim in all cases is to ensure that the Wetland Data Record is as accurate, objective and complete as possible so that the conclusions drawn in the evaluation will stand up to independent verification.

Step 6: Review Mapping and Complete Scoring

The evaluation is conducted at a point in time. Hence, it is the conditions described and facts noted at that time that are assessed within the context of all available information.

Where information is not available, this should be noted; the data record should be updated as information becomes available, making certain that all copies of the evaluation are simultaneously updated as well.



Step 6a: Regional/Municipal review

Step 7: Final Review and Check (Area Biologist Signs off)

Step 8: Update NRVIS layer and Mapping (District Level)

Step 9: Update Land Information Ontario (LIO), Update Conservation Land Tax Incentive Program (CLTIP)

Step 10: Send letter (notification of wetland update completion and status) to Regional Municipality. Region to provide lower municipality with current information

Step 11: Final Product Delivered to Niagara Peninsula Conservation Authority

The evaluation always remains as an open file, subject to change as more information becomes available or as a consequence of changes to the wetland itself.

1.8 Project Funding

The project was funded by the Regional Municipality of Niagara, Haldimand County, Ontario Trillium Foundation, EJLB Foundation, Niagara Community Foundation, Great Lakes Sustainability Fund, Ministry of Training Colleges and Universities, and the Peninsula Field Naturalists.

| Funding Partners | |
|--|-------------------|
| Cash Donations | TOTAL |
| Region of Niagara | \$ 480,000 |
| County of Haldimand | \$ 15,000 |
| Ontario Trillium Foundation | \$ 100,000 |
| Great Lakes Sustainability Fund | \$ 210,000 |
| Niagara Community Foundation | \$ 5,000 |
| ECO Canada | \$ 7,710 |
| The Maclean Foundation | \$ 5,000 |
| Ontario Ministry of Natural Resources – CFWIP | \$ 2,500 |
| EJLB Foundation | \$ 30,000 |
| Species at Risk Stewardship Fund | \$ 22,170 |
| Ontario Ministry of Training Colleges and Universities | \$ 49,723 |
| ELC training revenue | \$ 1,487 |
| Total | \$ 928,590 |

| In-Kind Donations |
|---|
| Ministry of Natural Resources |
| Ministry of Environment |
| Peninsula Field Naturalists |
| Haldimand County |
| LandCare Niagara |
| <i>Volunteers</i> |
| Naturalist Clubs Inventory Group (Niagara Falls Nature Club, Peninsula Field Naturalists, Bert Miller Nature Club) |
| |

1.9 Project Results and Recommendations

- 31 different Community Series under Ecological Land Classification were documented through this project (See full list of Community Series found in Appendix);
- approximately 687 sq km of natural areas were mapped at a large 1:2000 scale;
- 240 different Vegetation Types under Ecological Land Classification were documented through this project (See full list of Vegetation Types found in Appendix);

- Species at Risk and Provincially Rare Species of flora have been documented by study site and element occurrences shared with Natural Heritage Information Centre and the local MNR SAR Biologist;
- the most common Vegetation Type documented for the watershed was Red Maple Mineral Deciduous Swamp;
- over 92,000 data points can be found in the project database;
- established a preliminary information management framework for natural area data within Niagara that has tremendous potential for future improvement into an enduring information system with better technology solutions as resources permit further study required of areas with high biodiversity;
- depending on specific objectives, future inventory work should consider different ELC sampling scales (polygon, or plot) and different levels of effort (reconnaissance, survey, and research) to maximize use of resources;
- future inventory work should also consider performing a portion of Vegetation Sampling Protocol strategically across the study area to support the predictive modelling of vegetation mapping where landowner access and traditional field data collection can not be performed en route to eventually having vegetation level mapping across the watershed;
- further study is recommended in areas where there was positive response from landowners but teams were unable to visit due to time constraints;
- manual data entry costs are exorbitant, both financial and in the context of time, and future inventory work should collect data through the use of hand held mobile devices, scannable forms or some other digital solution that integrates well or even interfaces through the web directly with the database so that project dollars can be maximized on data collection;
- while this inventory is a tremendous update on the current status of natural areas in Niagara, spatial information about the landscape's reference condition is still largely inferred and measures such as spatial pre-settlement vegetation mapping with which to compare and understand this existing state of the current natural environment should be pursued;
- an information strategy for the project's data should be completed and geared towards delivery of the information via the web so that the project partners and the public can fully appreciate its value, benefit from its use, and potentially continue to contribute to the information base;
- the ELC database has sufficed for the information compilation needs of this project but is not a long term solution for future access to the data as there is no way of controlling which users can and cannot edit the values within. An information management strategy and an alternative solution for all of the NAI data products, particularly the field data stored in the database is highly recommended. Any potential solution should also

investigate integrating the spatial mapping and tabular ELC data into the same environment.

1.10 Significant Species

The project Technical Committee chose to report of significant species with the highest status ranking that would be consistently applied to private property. The best resource is the Ontario Ministry of Natural Resources, Species at Risk Section, Species at Risk in Ontario list.

In addition to provincially designated Species at Risk that were found, those floral species that are provincially rare or regionally rare were also documented. (See list of Regionally Rare Species in Appendix).



1.11 Final Report Format

The final report for this project follows quite closely the format of both the Nature Counts Project of the Hamilton Naturalists Club, and the Halton Natural Areas Inventory. Two volumes have been produced.

Volume 1 contains:

- Physical Characterization
 - geology (B. Murphy),
 - hydrology/ hydrogeology (J. Campbell),
 - soils
 - Community Series Analysis (NPCA)
- Significant Communities Report (A. Goodban)
- Vascular Plant List (NHIC)
- List of Locally Rare Vascular Plants (NHIC)
- Technical Summaries (107)

Outline of Technical Summaries Format

Municipality

Lists the municipality in which the majority of the study site is located. Many study sites straddle the borders of two or more municipalities.

Formerly

Where appropriate, the study site codes and names found in this report are the same as those used in the 1980 Brady, et al. report name, or ANSI reports, or EIS reports.

Approximate Area

Refers to the approximate area of the study site in hectares.

Watershed

Refers to the watershed in which the majority of the study site is located. Many study sites straddle two or more subwatersheds.

Ownership

Differentiates the majority of the ownership of a study site excluding road and utility easements.

General Summary

General description of where the study site is located including the north, south, east and west boundaries (usually roads).

Physical Description

Outlines the basic physiographic and geologic features of the study site.

Soils

Soil types are listed alphabetically and percentages are given for the overall study site based on the 1989 OMAF, regional soils report.

Ecological Land Classification

Summary

Describes the dominant ELC Community Series and Vegetation Types including the dominant species in each vegetation layer.

Vegetation Communities

Lists alphabetically the ELC Community Series and Vegetation Types documented for the study site.

Significant Flora

Lists alphabetically the significant species of vascular plants noted for the study site. Each species is listed only once based on its highest ranking i.e. Species at Risk Provincially, or Provincially Rare Species.

Points of Interest

Highlights any interesting field finds within the study site.

Faunal Records

Lists number of records noted (not necessarily unique) for the study site for each of the listed taxa groups.

Recommendations

Outlines any study site specific recommendations made by the NAI team based on field noted or local knowledge.

Site Visits

Lists all site visits with data entered into the project database. Includes date of site visit and name of observer(s).

% of site visited

Gives an approximate percentage of the overall study site visited by NAI teams from 2006-2009.

References Cited

Lists any references used to develop the study site technical summary.

Mapping

A visual representation of the study site depicting the general location, study site boundaries and tract codes.

Volume 2 contains:

Species Checklists:

- Birds of the Niagara Region, J. Black, K. Roy,
- Reptile and Amphibian Study 2006-2008, Ontario Ministry of Natural Resources, (A. Yagi, R. Tervo, A. Brant), Land Care Niagara
- Lichens and Bryophytes of Niagara, R. Olszewski
- A Preliminary List of the Butterflies (Lepidoptera) of Niagara Region, Ontario, R. Curry
- A Preliminary List of the Dragonflies and Damselflies (Odonata) of Niagara Region, Ontario, R. Curry

References Cited

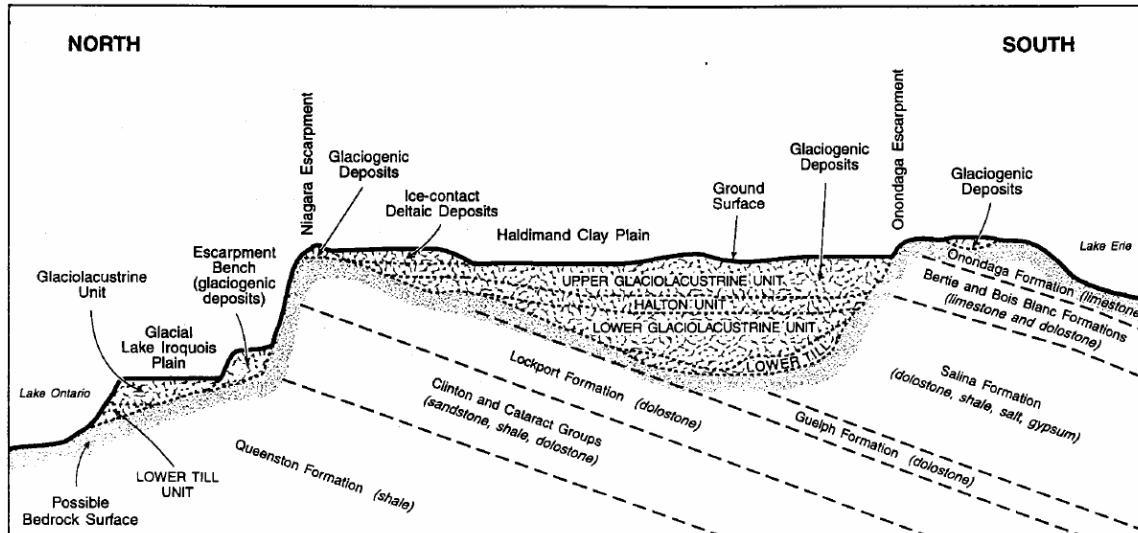
Lee, H. T., W. D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, South Central Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.



2.0 Watershed Geologic Characterization

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The following is an overview of the Bedrock and Surface Geology of the study area.



Cross-section of surface geology in Niagara Region (Menzies, J. and Taylor, E.M., 1998)

2.1 Southern Portion of the Study Area

2.1.1 BEDROCK GEOLOGY

The southern portion of the study area is underlain by sedimentary rocks laid down in shallow seas during the Silurian and Devonian Periods (440 to 350 million years ago). These are in turn overlain by glacial and post-glacial deposits that will be described later. South of the Welland River the Upper Silurian Salina Formation forms a belt 9.5 to 26 kilometres in width. The Salina Formation consists of grey and red shale, grey-brown dolomite, minor limestone and, in places, evaporates of salt, anhydrite and gypsum.

These are in turn overlain by a narrow band of the Bertie Formation that extends from a point approximately 8 kilometres north of Lake Erie southward to outcrops of the Onondaga Escarpment. This escarpment, approximately 4 kilometres north of Lake Erie, forms a discontinuous feature running from Fort Erie to beyond Dunnville. The Bertie Formation consists of massive bedded brown dolostone with minor thin-bedded shaley dolomite.

The Middle Devonian Bois Blanc Formation rests unconformably on the Bertie Formation and forms a band 5 to 16 kilometres wide ultimately dipping southward beneath the waters of Lake Erie. It consists of medium brownish grey, medium crystalline, medium to thin-bedded cherty limestone. The Bois Blanc Formation forms the cap-rock of the Onondaga Escarpment. It is highly fossiliferous and is exposed as rock beaches along many stretches of Lake Erie.

The exposed portions of the Onondaga Escarpment form local features of note. These include the exposures just north of Port Colborne on the West Side Road that marks the boundary of the Wainfleet Bog, and Highway 140 at Chippawa Road. Further east it provides the route of the scenic Ridge Road north of Ridgeway and the Battle of Ridgeway exposure on Highway 3. Where the escarpment is exposed the overburden is thin to absent but thickens southward in the direction the rocks dip.

The Bois Blanc Formation is quarried for crushed stone in operations on both the east and west sides of Port Colborne. Along with the active operations there are many abandoned quarries along the escarpment.

The bedrock formations have a general northeast to southwest dip of 3.75 to 9 metres per kilometer towards a low point known as the Michigan Basin.

2.1.2 SURFACE GEOLOGY

The surface geology consists of glacial and post-glacial deposits. During the retreat of the last continental ice sheet the study area was inundated by a series of post glacial lakes beginning 12,900 years ago with the formation of post-glacial Lake Warren. It had a height of 204 metres a.s.l. (above sea level). It was followed by two lower phases known as Lakes Grassmere and Lundy at 195 and 189 metres a.s.l.

With the retreat of the ice into the Lake Ontario Basin about 12,500 years ago Lake Warren and its lower levels drained northward over the Niagara Escarpment via a short lived lake known as Lake Tonawanda. Below and north of the Niagara Escarpment the basin was filled by Lake Iroquois that reached a height of 102 metres a.s.l.

When Lake Warren drained away to become early Lake Erie some remnants of its waters were trapped between the land rising to the Niagara Escarpment in the north and the face of the Onondaga Escarpment to the south. These entrapments became the present day Wainfleet Bog, Humberstone Marsh, Willoughby Marsh and numerous other small wetlands. Prior to the construction of the Welland Canals drainage from these wetlands was eastward toward the Niagara River.

Once the Welland Canals and the Feeder Canal were constructed drainage out of the Wainfleet Bog was accelerated and rerouted into the canals. Drainage projects to facilitate agriculture further reduced the extent of the wetlands. Today, only areas east of the canal now drain to the Niagara River. Those west of the canal drain either into it or down the power canal in Niagara Falls via the Welland River. South of the Onondaga Escarpment a few short streams drain into Lake Erie.

Today, those areas of the former bed of Lake Warren that completely drained away several thousand years ago are covered with deep clay deposits characteristic of a lake bottom. They are referred to as the Haldimand Clay plain.

In the north portions of the Haldimand Clay Plain the soils are described as Pedalfer (formerly Grey Brown Podzols).

Those areas that were the remnant wetlands of Lake Warren are covered by organic soils derived from deposits of peat and other vegetation characteristic of bogs and marshes. The post-glacial clay deposits are buried beneath them. The depths of the

deposits vary in thickness but in general are deepest just north of the Onondaga Escarpment, thinning as they extend northward.

The soils that developed on the poorly drained areas in the southeast portion of the study area are Humic Gleysols.

West of the Wainfleet Bog is an extensive sand plain extending all the way to the Grand River.

Along stretches of the Lake Erie shore are sand dunes, notably in the areas east and west of the entrance to the Welland Canal and at Point Abino. The sand dunes are a result of materials blowing out of the exposed bed of a smaller early phase of Lake Erie. These dunes have migrated inland ahead of the expanding lake. They have been stabilized by vegetation and their highest point today is known as Sugarloaf Hill.

Beaches along the Lake Erie shoreline consist of sand in some areas and exposed bedrock in others. Generally the sand beaches are located in the bays while the intervening headlands are bedrock. This is the result of wave action by the lake waters. Numerous large boulders can often be found sitting on the surface of the bedrock beaches. These are glacial erratics left behind by the retreating glacier. The surface of the exposed bedrock shows long linear scratches extending from northeast to southwest. These are the result of gouging by rocks frozen into the ice as the glacier advanced.

In all areas the present day soils sit unconformably on the bedrock surface. They are derived from transported materials and do not exhibit the C horizon gradation from bedrock to regolith characteristic of soils which have developed "in situ". Instead the C horizon is derived from glacial till.

2.2 Northern Portion of the Study Area

2.2.1 BEDROCK GEOLOGY

The northern portion of the peninsula is underlain by sedimentary rocks laid down in shallow seas during the Ordovician and Silurian periods (505 to 409 million years ago). The lowest formation is known as the Queenston Shale and underlies the portion of the peninsula from the base of the Niagara Escarpment northward to Lake Ontario. It is a red shale with thin limestone interbeds which forms the uppermost Ordovician strata in the area. The width of the outcrop, now buried under post glacial deposits, varies from 3.2 to 19.3 kilometres. At the Niagara River the strata is approximately 260 metres thick, thinning to 180 metres thick at Hamilton.

The Niagara Escarpment is formed from Silurian strata which overly the Queenston Shale. The strata are composed of sandstone, shale, limestone and dolostone formations. At the Niagara River these layers can best be observed and consist of, from bottom to top, the Whirlpool Sandstone, Power Glen Shales and Sandstones, Grimsby Shales and Sandstones, Thorold Sandstone, Neahga Shale, Reynales Dolostone, Irondequoit Limestone, Rochester Shale, Decew Dolostone and Lockport Dolostone.

It is the hardness of the Lockport and Decew strata overlying softer shales and the Irondequoit and Reynales strata overlying softer shales and sandstones that resulted in the erosional feature known as the Niagara Escarpment. Because the backslope dips at an angle less than the face of the escarpment this feature is sometimes identified as the Niagara Questa. The escarpment is a continuous feature running in Ontario from Queenston to the tip of the Bruce Peninsula at Tobermory. In some places there are deep indentations which represent the sites of former river valleys now mantled by post glacial deposits, particularly in the St. David's and Short Hills areas. In most sections the upper layer of Lockport Dolostone forms a cliff face that gives way to a scree slope beginning at the top of the Rochester Shale.

South of the brow of the escarpment the Guelph Formation overlies the Lockport Formation. It appears in the wall of the Niagara Gorge about the site of the Rainbow Bridge and forms the upper rapids above the waterfall. The Guelph Formation is between 30 and 60 metres thick but does not outcrop anywhere else in the peninsula, being buried beneath post glacial deposits.

2.2.2 SURFACE GEOLOGY

Except for the Niagara Escarpment the bedrock geology of the area is hidden beneath post glacial deposits. A layer of basal till was deposited directly on the bedrock as the last phase of continental glaciation waned. The till was then buried beneath lacustrine deposits of a series of post glacial lakes. The most pronounced and longest lasting of these was post glacial Lake Iroquois which existed from 12,400 to 11,900 years ago. This lake, at a height of 102 metres a.s.l., occupied what is now the Lake Ontario basin to a southern limit that varied between a few hundred metres and several kilometres from the escarpment. The beach thus formed exists now as a well-defined feature along which runs Regional Road 81 (formerly Hwy 8). Between the beach and present day Lake Ontario deposits of silt were laid down over the 500 - 600 year life of the lake. In some areas sand deposits were laid down.

Rivers entering into Lake Iroquois flowed from south to north and cut through the beach deposits. At present day Homer (South east St. Catharines), a large baymouth bar was developed.

When Lake Iroquois drained away with the opening of the St. Lawrence River the water level dropped, exposing the flat lying silts of the lake bed and is referred to by some as The Fruit Belt. The positioning of lacustrine silt over the basal till can best be seen in the bluffs that now form the southern shoreline of Lake Ontario. The existing rivers began to downcut again to reach the new lower level of the lake. Twelve Mile Creek is an example of this. Where the rivers enter into Lake Ontario baymouth bars have developed with lagoons such as Martindale Pond trapped behind them.

Above the escarpment is evidence of an older post glacial lake called Lake Warren which had a height of 204 metres a.s.l. It existed while the ice still topped the escarpment and drained southward to the Mississippi River. Its bed is known today as the Haldimand Clay Plain. Running parallel to the escarpment and just to the south is a ridge of unconsolidated material known as the Vinemount Moraine. It is best seen as one travels northward on Regional Road 24.

One feature of note is the Fonthill Kame Delta which was developed in Lake Warren by a river running off the ice. The delta has its highest point at Lookout Point where the river exited the ice. It grades southwest to a point near Fenwick where the edge can be determined by the sandy nature of the soil.

The post glacial clays of the Haldimand Clay Plain deepen southward toward the Wainfleet Bog and Onondaga Escarpment. An appreciation of their depth can be felt as one descends into the tunnel that passes under the Welland Canal on Townline Road. Here the sharp contact between the bedrock of the Salina Formation and the overlying till can be seen.

2.3 A DESCRIPTION OF GEOLOGIC FEATURES WITHIN THE STUDY AREA

As was described in the geologic overview of the Niagara Peninsula, there are a number of features that are locally significant. These will be described in more detail here.

2.3.1 THE ONONDAGA ESCARPMENT

The first of these features, the Onondaga Escarpment, is described both in detail of present day form and origin because the geologic events described here are important to understanding the formation of other features as well.

Although not nearly as evident or striking as the Niagara Escarpment, the Onondaga Escarpment is the most obvious geologic feature in the southern portion of the peninsula. The escarpment is composed of two rock layers; the lower is the Bertie Formation (of Silurian age) and the upper the Bois Blanc Formation (of Devonian Age).

The rocks are sedimentary in origin and represent periods of time between 410 and 350 million years ago when this area was covered by warm, shallow seas. The Bertie Formation, consisting of thick beds of brown dolostone and minor beds of shaley dolomite, rests on top of the Salina Formation which forms a buried band of rock 9.5 to 26 kilometres wide south of the Welland River. (The importance of the Salina Formation in the development of the present day Onondaga Escarpment will be seen shortly)

The Bois Blanc Formation is a highly fossiliferous limestone with inclusion of chert (also called flint) and represents the formation of reefs during the Devonian period about 350 million years ago. At that time, because of continental drift, our area was located about 20 degrees south of the equator.

All of the above bedrock layers have a dip of 3.75 to 9 metres per kilometre down to the southwest.

With the retreat of the seas the area was subjected to a long period of erosion. During this time the resistant beds of the Bertie and Bois Blanc formation formed a low escarpment with a north face and a gentle southern back slope. Soils evolved from the bedrock and a drainage system was created.

The major river through the area flowed eastward in what is now the Lake Erie bed and eventually found a way northward through a low spot in the Onondaga Escarpment at

present day Lowbanks. This river continued northward cutting its valley into the Salina Formation and out through the Niagara Escarpment at present day Short Hills Park.

About two million years ago this area was overridden by the first of four major continental glaciers. The advancing ice (coming from the northeast to the southwest) acted like a bulldozer, scraping away the soils, gouging into the bedrock and modifying the shape of river valleys. This process was repeated three more times and in our area only evidence of the last glacial period, the Wisconsin, is found. Evidence of the direction of ice movement is preserved in scratches on the surface of the Bois Blanc Formation and can be clearly seen in the old Cement Plant Quarry at Quarry Road in Wainfleet.

The softer beds of the Salina Formation were deeply eroded but the harder Bertie and Bois Blanc Formations resisted the impact of the ice. About 25 thousand years ago the ice reached its maximum extent and began to melt away. Large amounts of meltwater were released to form a series of post-glacial lakes south of the ice front. As the ice thinned it also lost its ability to erode deeply into the bedrock and began to deposit material beneath the ice as a mixture of clay to boulders called a basal till. The entire southern portion of the Niagara Peninsula is covered by such a till known as the Wentworth Till, underlying the Haldimand Clay Plain, which is thinnest near the top of the Niagara Escarpment and thickest just north of the Onondaga Escarpment where it reaches depths of 30 to 45 metres (100 to 150 feet). On top of the Onondaga Escarpment the till is again thin near the edge and deepens to the south.

As the ice front retreated to a point near the brow of the Niagara Escarpment 12,900 years ago, the entire area to the south, including the Onondaga Escarpment, was covered by the waters of a post-glacial lake named Lake Warren. It was bounded on the south by the Portage Escarpment in New York and Pennsylvania and reached an elevation of 200 metres above present sea level. The waters of Lake Warren drained away westward to the Mississippi River. Layers of sand and clay were deposited in the lake covering the underlying till in most places. As the ice retreated in stages ridges of material called recessional moraines were deposited at the ice front but beneath the waters of the lake. One of these is seen along Bertie Street, Fort Erie in the area of the Douglas Memorial Hospital today. The largest is the Vinemount Moraine south of the crest of the Niagara Escarpment.

About 12,500 years ago the ice finally retreated into the present day Lake Ontario Basin. Lake Warren drained away over the Niagara Escarpment and the waters eventually reached the Atlantic Ocean via the Mohawk and Hudson River valleys. A remnant of the lake was retained in the shallow depression south of the Onondaga Escarpment. This lake, which reached a height of 140 metres above sea level, was early Lake Erie. Its waters drained northward into another remnant of Lake Warren called Lake Tonawanda. From Lake Tonawanda the waters escaped over the Niagara Escarpment by way of six outlets. The largest of these was called the Lewiston Outlet and it is today known as the Niagara River.

Small remnants of the lake were also trapped directly in front of and to the north of the Onondaga Escarpment. The rise of the land to the north and the escarpment face to the south forced the drainage from these areas to move from west to east. The areas became waterlogged and marshy. Deposits of peat accumulated on top of the lake deposits thus developed the Wainfleet and Humberstone Marshes.

Over time the size of Lake Erie expanded to its present extent. The bedrock of the escarpment now forms the headlands that extend out into the lake as such features as Morgan's Point. The shallow dip of the rocks means that the water deepens very slowly in this lake. In the bays wind and current have caused the accumulation of sand beaches.

Today the Onondaga Escarpment forms a discontinuous feature a few metres in height from Fort Erie to beyond Dunnville. In many places it is buried beneath glacial or post-glacial lake deposits. In others it forms local features of note. The most obvious of these is the outcrop along the West Side Road as it nears Port Colborne from Welland. Other notable sites are "the ridge" at Ridgeway where the escarpment is followed northeast by Ridge Road to Bowen Road and as the outcrop now designated the Shagbark Trail.

The presence of the escarpment is also identified by the numerous active and abandoned quarries along its length. These include those west of Port Colborne along Highway 3 near Cement Plant and Quarry Roads, east of Port Colborne along Chippawa Road and East Main Street (Hwy 3), and in Fort Erie at Ridgemount Road. The escarpment rocks are also seen at Fort Erie in the railroad cut at the intersection of Bowen and Thompson Roads.

Where the Onondaga Escarpment is prominent the bedrock surface tends to be exposed or thinly covered by soil near its edge. The soil deepens to the south reaching depths of up to 15 metres before the shore of Lake Erie is reached. In some areas deep deposits of sand in the form of dunes cover the bedrock near the shore.

A few short streams flow north to south above the Onondaga Escarpment to enter Lake Erie. As a result there are no waterfalls of note flowing over the Onondaga Escarpment as there are with the Niagara Escarpment. Most rivers in the peninsula north of the escarpment flow west to east. One exception is the Grand River which crosses the rocks of the Onondaga Escarpment from north to south at a low point near Dunnville.

2.3.2 THE WAINFLEET BOG AND HUMBERSTONE MARSH

The bulldozing effect of the Wisconsin Glacier cut deeply into the soft rocks of the Salina Formation which underlie the southern portion of the Niagara Peninsula. Directly in front of the Onondaga Escarpment and east of the Welland Canal this depth to bedrock reached 15 to 20 metres below the present soil surface. To the west of the Welland Canal, the depth is even greater, averaging 30 to 45 metres directly north of the escarpment. In the area of Lowbanks the action of the ice deepened and smoothed the pre-glacial river valley known today as the Erigan Canyon.

As the ice melted away, still moving from northeast to southwest, it lost its erosive power and began to deposit materials on the bedrock in what is known as a basal till. Then, as the area was freed from the ice it flooded beneath the water of Lake Warren and further deposits of layered sands and clays, known as lacustrine deposits, were laid down over the till. These deposits show stratification (layering). The waters finally drained away, first through two lower lake levels and then completely about 12,500 years ago when the retreat of the ice opened drainage channels over the Niagara Escarpment. The result was essentially a flat plain with deep deposits of clay and a few localized features such

as gravel or sand bars. Some of these features show beach lines where they had emerged as islands in the draining lake.

In the areas immediately north of the Onondaga Escarpment remnants of the lake were trapped between the escarpment to the south and the gentle rise of the landscape to the north. The climate was much colder immediately after the retreat of the ice and these remnants of the lake became extensive bogs with the growth of sphagnum moss. Over the centuries dead organic materials accumulated in parts of the bogs to form thick layers of peat. In some places ponds of water persisted, and as the climate warmed there was a succession of plant types in the area. Water that did escape the area flowed slowly from west to east in a series of streams that eventually entered the Niagara River.

Had man not interfered this would still be the situation today. However, the construction of a series of Welland Ship Canals beginning in the mid 19th century, including the ill-fated Feeder Canal, disrupted the natural drainage pattern. The area west of the canals now drained into them. The canals were deeper than the bogs and so the water table was lowered. Many of the ponds began to dry up. Clearing of large areas of the bog for agriculture with subsequent drainage ditches accelerated the process. During the mid 20th century these areas became so dry in many summers that smoldering peat fires would burn for months, being extinguished only by the winter snows. East of the Welland Canal the areas of bog and marsh are known as the Humberstone Marsh. They continue to drain eastward via shallow streams to the Niagara River.

2.3.3 THE HALDIMAND CLAY PLAIN

In general the entire area of the Niagara Peninsula south of the Niagara Escarpment is referred to as part of the Haldimand Clay plain. It is composed of glacial till and overlying lacustrine deposits from post-glacial Lake Warren. The depth of material is generally less than 15 metres near the lip of the Niagara Escarpment and thickens southward to maximum depths of about 45 metres just in front of the Onondaga Escarpment. South of the Onondaga the clays again increase southward in depth from less than a metre to about 3 to 15 metres along the Lake Erie shoreline.

Like the Wainfleet Bog and Humberstone Marsh (which are part of this clay plain) the remainder of the study area is poorly drained due to the heavy nature of the clays. Drainage moves from west to east in a few large streams, including the Welland River, Grand River and Twenty Mile Creek. This is a result of the downward dip of the bedrock to a structural low occupied by the Niagara River.

The plain is very level with only a few local features to break the topography. The most notable of these is the Fonthill Kame Delta Complex. In the southern part of the plain local features such as Doan's Ridge or the Fort Erie Moraine rise only a few metres above the general landscape.

In the north portions of the Haldimand Clay Plain the soils are described as Pedalfer (formerly Grey Brown Podzols). They are characterized by a dark surface layer grading down to a light lower A horizon. The B horizon contains materials leached from the A horizon and are usually brown to reddish from the accumulation of iron oxides and or clays. Both horizons are slightly acidic in their pH. The C horizon is partially decomposed parent material and may be partially cemented by calcium carbonate which

has dissolved out of the upper horizons. The material of the C horizon is derived from unaltered till below.

The soils that developed on the poorly drained areas in the southeast portion of the study area are Humic Gleysols. The A horizon is dark coloured due to the humus present. The B horizon is mottled in colour. Leaching may or may not have occurred from the A horizon due to a high water table.

2.3.4 THE LAKE ERIE SHORELINE

Due to the gentle southerly dip of the rocks of the Onondaga Escarpment Lake Erie exhibits relatively wide beaches and extensive shallows along its north shore. The lake came into being about 12,500 years ago with the draining away of the much larger post-glacial Lake Warren. Due to the weight of thousands of years of glacial ice the entire area had been depressed. When early Lake Erie formed it was much smaller than it is today.

Slowly the land rose through a process called isostatic rebound. This process continues even today with the brow of the Niagara Escarpment rising at a rate of 20 cm/century. However, in the center of Lake Erie the rise is now 0 cm/century. As a result the level of the lake must rise 20 cm/century to continue flowing at the same rate into the Niagara River.

The present shoreline of Lake Erie is a result of the thousands of years of isostatic rebound. Prevailing winds and currents move sand from west to east in the lake. In some areas this creates long hooked spits such as Turkey Point. In other areas the sand is removed from points of land into the intervening bays. Here it is also piled into dunes by the wind.

Early in its history, Lake Erie was actively growing in size. As a result the shoreline kept moving northward. Since vegetation could not get a permanent hold on the shore the beaches moved inland just ahead of the water and the sand dunes migrated ahead of the beaches. Over time the isostatic rebound decreased until the lake almost stabilized at its present size. This allowed vegetation to gain a foothold on the sand dunes, stabilizing them and preventing further movement by the wind. For the most part the tops of the sand dunes appear to be at a constant elevation but some are locally higher. The highest sand dune in the area is Sugarloaf Hill just west of Port Colborne.

Sand dunes form long sections of the Lake Erie shoreline. They have been extensively built on for summer cottages and year round homes. Unfortunately these areas represent the very edge of the active zone of the lake. In rare but severe storms with high waves the dunes can be attacked and severely damaged. Remedial action such as the building of breakwalls, groynes or rip rapping can slow the action of erosion. However, the lake is continuing to refill and eventually will overpower these structures.

One area where large sand dunes are conspicuously absent is at Lowbanks. This is the opening into the Eriean Canyon, the pre glacial river valley. The valley runs northward across the Haldimand Clay Plain, beneath the Fonthill Kame and out through the Short Hills. It is filled with post-glacial debris and shows itself on the surface only as a slight depression in the landscape, visible only from a distance by observing the treelines that cross it.

On the headlands wave action eats away at the cover of glacial till exposing the bedrock. The layers are highly fossiliferous and also show numerous chert nodules. There is a joint pattern in the rocks that divides the surface into large blocks. Wave action attacks these areas of weakness and wears the bedrock layers into a stepped pattern at the water's edge.

There were numerous rounded pieces of rock trapped in the glacial till, ranging in size from pebbles to boulders. As the finer clay and sand particles were winnowed out by wave action the rocks, called glacial erratics, were left behind. In some places they, and the broken pieces from the Onondaga, form pebble beaches. Larger erratics sit stranded upon the surface of the bedrock, conspicuous by their colour and shape. The accumulation of pebble beaches is most likely to develop on the eastern side of headlands.

2.3.5 THE ERIGAN CHANNEL

The Onondaga Escarpment forms a discontinuous feature running east-west across the southern portion of the Haldimand Clay Plain. In the area of Lowbanks the escarpment is absent. This site is the beginning of a pre-glacial channel known as the Erigan Channel. The channel, completely buried by glacial till and the lacustrine deposits of Lake Warren, is a pre-Niagara drainage channel.

The channel was first identified in 1907 by J.W. Spencer. It begins just east of Lowbanks and runs northward across the peninsula to a point west of Fonthill, exiting through the Niagara Escarpment in the area of the Short Hills. North of the escarpment there is no present evidence of the channel. Several side channels have been identified, including one possibly beginning at Dunnville, another running east to west beneath the Wainfleet Bog and a third called the Falls-Chippawa Valley that begins at the site of the present Niagara Falls and enters the Erigan Channel beneath Fonthill. It has been suggested that this channel was active several times as the outlet for water from melting glacial ice prior to the last advance of the continental ice sheet.

Other than the absence of the Onondaga Escarpment at its source and the Short Hills at its terminus the only physical evidence of the channel on the landscape is a slight dip in the topography that can best be seen looking southwest from a vantage point near the intersection of Hwy #20 and Effingham Road on the Fonthill Kame. Where the channel exists there can be observed a slight dip in the treelines. This indicates a shallow depression in the landscape.

At Lowbanks the channel is about three kilometers wide and it maintains this width throughout most of its length. At St. Johns West it narrows to about two kilometers in width.

Since the channel predates the present great lakes there must have been an extension north of the Niagara Escarpment into a river that flowed in what is the present day Lake Ontario Basin. However no evidence of this northerly extension across the present day Lake Iroquois bench or plain is indicated on maps produced by current researchers.

2.3.6 POST GLACIAL LAKE WAINFLEET

Approximately 13,000 years ago the southern portion of the peninsula was covered by the waters of Lake Warren. Since the Lake Ontario basin was filled by glacial ice which extended up over the Niagara Escarpment the waters of Lake Warren drained away west and southward to the Mississippi River. When the ice cleared, the escarpment Lake Warren drained northward via the Niagara River and Lake Tonawanda (as described in the section titled "The Niagara River"). Two phases in the reduction of Lake Warren are identified as Lakes Grassmere and Lundy. A beach line for Lake Lundy is evident on the Niagara Falls Moraine.

For several thousand years thereafter the amount of water discharged through the Niagara River was controlled largely by the melting of glacial ice in the Lake Huron and Superior Basins. Several phases of this melting produced large volumes of water that can be identified by the width of sections of the Niagara Gorge. High water volumes between 11,000 and 10,500 years ago inundated southern portions of the peninsula in a phase referred to by some authors as Lake Wainfleet. This lake would have expanded and waned in size dependent upon the outflow from the upper lake basins. This lake persisted until about 10,200 years ago.

Evidence of these late phase floodings, including Lake Wainfleet have been identified as strand lines or beaches evident on other features within the area. For example, there is a strand line evident on the long sand bar between Ridgeway and Sherkston. At Doan's Ridge there is a faint beach line on a gravel bar. Another faint beach line is seen near Lodba's Corners in Wainfleet.

When water volumes were high there were probably several channels from Lake Erie into Lake Wainfleet across the Onondaga Escarpment. The old Eriean Channel would have been one. Ultimately the waters would have escaped northward via the Welland and Niagara Rivers.

During low levels the area north of the Onondaga Escarpment would have contained a series of connected ponds. As isostatic rebound raised the land the ponds would have drained eastward back into the Niagara. Today the remnants of some of these are represented by the poorly drained areas of the Wainfleet Bog, Humberstone Marsh and Willoughby Marsh as well as many smaller sites.

2.3.7 THE DUNNVILLE SAND PLAIN

A late stage of Lake Warren called Lake Lundy saw water levels drop to expose most of the peninsula south of the Niagara Escarpment. Drainage from this lake was northward through the present day St. Clair River into an early stage of Lake Huron called Early Lake Algonquin. At one point in time the area immediately to the east of Dunnville was flooded. The Grand River built a sandy delta into this embayment at a height of about 180 metres a.s.l.

Eventually the ice cleared the Niagara Escarpment allowing Lake Iroquois to form and causing the drainage to now flow from the Lake Erie basin northward through the Lewiston Spillway. The drop in water level was enough to change the outlet of the Grand River to its present position. The sandy delta was abandoned and exists today as a sand plain extending from the Grand River as far eastward as the Wainfleet Bog. It

terminates to the south at Lake Erie and along a northern perimeter that begins at the Grand River about twelve kilometers from the lake.

In all the sand plain covers an area of over 300 square kilometers.

The two main branches of Big Forks Creek arise from this sand area.

2.3.8 DRAINAGE ON THE HALDIMAND CLAY PLAIN

The three largest streams that drain the Haldimand Clay Plain are the Grand River, Welland River and Twenty Mile Creek. They meander west to east across the plain.

The Grand River enters Lake Erie at Port Maitland having been controlled by the location of the Onondaga Escarpment and ultimately finding a low notch through which it enters the lake.

The Welland River (also known as the Chippawa Creek) enters the Niagara River at Chippawa. In fact it once did this but now the last 6 kilometres has been reversed to provide the intake for the Chippawa-Queenston power canal. In addition the river has been diverted under the Welland Ship Canal via large siphons at Welland and Port Robinson.

The Twenty Mile Creek enters Lake Ontario via a notch in the Niagara Escarpment at Ball's Falls.

The topography of the clay plain is very flat and the rivers meander sluggishly across it. The Welland River only drops seventy-three metres in one hundred and sixteen kilometers from its source to its mouth. Of this drop sixty metres occurs in the first twenty-four kilometres of its length. As a result the gradient for the remainder is less than fifteen centimeters per kilometre. The river has few large tributaries, notably Lyons Creek and Big Forks Creek. It carries a high sediment load derived from the lacustrine deposits of the plain. The slip-off slopes on the inside of meanders are low and broad and during spring runoff considerable inundations of the flood plain can occur. Natural levees are very faint. Several cut off meanders can be observed from aerial photographs and on the ground are observed as shallow sloughs.

The major control for the west east flow of this river is the slight drop in elevation from west to east caused by the bedrock topography which dips down to the low of the Niagara River channel. Other local controls are subtle features such as beaches formed by the various levels of Lake Warren and poorly defined recessional moraines.

The Twenty Mile Creek is similar to the Welland River in that it flows from west to east across a very low gradient. However a major control to the north is the long low Vinemount Moraine that occurs just south of the crest of the Niagara Escarpment. This moraine was deposited by the retreating glaciers in the waters of Lake Warren. The river parallels it and finally finds a way to break through to the north via the channel at Ball's Falls. This creek drains an area of only 300 square kilometers. The remainder of the clay plain is drained primarily by the Welland and Grand Rivers.

The Onondaga Escarpment controls the southern limit of drainage into the Welland River. Just north of the escarpment the drainage is poor, creating a series of wet areas

including the Wainfleet Bog, Humberstone Marsh and Willoughby Marsh. A few short streams such as Baker's Creek and Frenchman's Creek drain eastward to the Niagara River. Above the escarpment the dip down to Lake Erie creates a series of short streams flowing to the south.

2.3.9 THE NIAGARA RIVER

Approximately 12,500 years ago the retreat of glacial ice reached the present day Lake Ontario Basin. With the freeing of the Niagara Escarpment from the ice post-glacial Lake Warren drained away to the north, leaving a small remnant behind called Early Lake Erie. The flow of glacial meltwater from this lake northward created a channel that began between present day Fort Erie and Buffalo. Before reaching the escarpment the waters filled a long east-west depression to form a narrow lake in the location of present day Tonawanda Creek. This lake, approximately 100 kilometres long, was known as Lake Tonawanda. It had six outlets over the escarpment into a new post-glacial lake known as Lake Iroquois. From east to west they are known as the Holley, Medina, Gasport, Lockport, Devil's Hole and Lewiston Outlets.

Over time isostatic rebound caused the land to slowly rise and gradually each outlet dried up as Lake Tonawanda shrank toward the low of the Lewiston Outlet. Each outlet produced a gorge extending back from the lip of the escarpment and since the Lewiston existed for the longest period of time and had the major flow of water over it, that gorge became the largest. Its original waterfall was at Queenston.

The retreat of the waterfall was at a rate of about a metre a year. It was also controlled by a series of joints in the caprock of the Niagara Escarpment known as the Lockport Dolostone. Today, that gorge is approximately eleven kilometers long and its waterfalls are now known as the Horseshoe and American Falls. The outlet is now more commonly known by a different name – the Niagara River.

With the melting away of the continental glaciers the flow of water in the Lewiston Outlet fluctuated over time. During periods of high water the gorge width was wide, and at other times it was narrow. Eventually the flow of water decreased to reflect only the volume supplied by the annual water cycle. The channel above the waterfall reflected this decrease by becoming more narrow, abandoning its original banks. These abandoned banks can be observed in many places such as in Fort Erie where a conspicuous drop occurs on all east west streets approaching the river. It is also very noticeable parallel to the present day Niagara Gorge on both sides of the river.

It might be argued that the Niagara River should still be referred to as the Lewiston Spillway because it lacks many of the features associated with a river. There is little change in volume between its source and its mouth. It has few tributaries, the Welland River being the only one of significance. Its change in yearly volume is only by a factor of two, whereas most rivers show a marked increase and decrease in volume related to the seasons. It does not meander across the Haldimand Clay Plain in a fashion seen by most rivers. It is also very short, joining two lakes over a distance of only about 45 kilometres.

2.3.10 THE FORT ERIE MORaine

The process of freeing the peninsula from the grip of the continental glacier was not measured in a constant number of metres per year. Variations in the climate resulted in some periods when the ice retreated, some periods when there were minor advances and others where the ice front remained static for some time. During periods when the front remained static summer meltwater would deposit materials released from the ice as a long ridge along its margin. These features are called recessional moraines. Three such features are recognized within the peninsula. They are the Vinemount, Niagara Falls and Fort Erie moraines.

The Fort Erie moraine is located on the back slope of the Onondaga Escarpment. Some authors suggest that the moraine extended across what is now the course of the Niagara River about 12,500 years ago. When the waters of Lake Warren drained over the escarpment to expose the peninsula as dry land and create early Lake Erie the moraine would have acted as a dam. This would have caused early Lake Erie to rise several metres in order to overcome this obstacle to its outflow. Only when the moraine had been eroded did the lake drop to its current level.

Being the furthest south, the Fort Erie moraine is the oldest but also one of the most poorly defined. It is best seen as a low ridge running westward from the Niagara River along Bertie Street in Fort Erie. Since the moraine was deposited in the waters of Lake Warren its surface features are smooth and do not exhibit the hummocky features of moraines deposited above water. The north face of the moraine is more pronounced than the south face. This can be best seen on Bertie Street in the area of the Douglas Memorial Hospital. The moraine creates a rise in the landscape a few metres high and up to a kilometre in width. Moraine materials are poorly sorted and contain all particle sizes from clay to glacial erratics. The moraine terminates at a western point about eight kilometers from the Niagara River.

The Fort Erie moraine has been extensively built upon and the initial section of the Queen Elizabeth Way crosses it.

Attempts have been made to correlate this moraine with an east west moraine feature about fifteen kilometres long south of Hamilton. In their publication "The Physiography of Southern Ontario, Third Edition, Chapman and Putman identify both these features as parts of the Fort Erie moraine. However there is a complete absence of the moraine between Ridgeway and Binbrook.

2.3.11 THE VINEMOUNT, FORT ERIE AND NIAGARA FALLS MORAINES

Three east west trending moraines are found on the Haldimand Clay Plain above the Niagara Escarpment. These are recessional moraines resulting from times when the ice front stabilized for a period. The rate of advance equaled the rate of melt and as a result materials being transported by the ice were released and accumulated along the static ice front. Of the other two, the most prominent is the Vinemount Moraine. It is located just south of the brow of the escarpment and is recognized as a low ridge of clayey till. This moraine was deposited into the waters of a late stage of Lake Warren. As a result it is a low, linear feature recognizable at a distance, but without sharp contrast to the surrounding landscape. Its northern limit extends almost to the brow of the escarpment. Directly to the south of the moraine are lacustrine deposits overlying the glacial till.

The Vinemount Moraine can be traced westward beyond Waterdown and in this area it is a distinct ridge of silty, stony till. It extends eastward as far as the Niagara River and then into New York State. In some places it is interrupted by local features such as the Short Hills and St. David's Buried Gorge.

The Niagara Falls Moraine, further south, is a much more subdued feature, a mere swell in the clay plain east of the Welland Canal. Only in the area of Lundy's Lane where it is topped by a gravel bar is it truly distinct.

The most southerly of the three, the Fort Erie Moraine has already been described for that section near Fort Erie itself. South of Hamilton a low ridge of clayey material extends for several kilometers south of the Twenty Mile Creek. Binbrook and Mount Hope are both set on its crest. Eight kilometers east of Binbrook it becomes indistinct but still has enough relief to serve as the drainage divide between the Welland River and the Twenty Mile Creek. Although this has been identified as an extension of the Fort Erie Moraine by authors such as Chapman and Putnam, there is a large gap of over forty kilometers between the east and west sections.

In the area around Smithville, along Hwy 20 the landscape shows low hills, ridges and indented stream valley, uncharacteristic of the flat landscape further east. This is the area where the Niagara Falls Moraine to the north and the Fort Erie Moraine to the south created a narrow zone through which flows the Twenty Mile Creek.

The Vinemount Moraine also has an influence on the flow of area streams, particularly the Twenty Mile Creek. This feature and the eastward slope of the landscape causes the Twenty Mile Creek to flow sluggishly across the clay plain south of the moraine from west to east. In the area of Vineland the stream finally finds a point where it cuts northward through the moraine, crossing the escarpment at Ball's Falls. The stream then enters Lake Ontario via the lagoon at Jordan Harbour.

2.3.12 THE FONTHILL KAME-DELTA

The most noticeable feature found on the Haldimand Clay Plain is the Fonthill Kame-Delta. It is a northeast to southwest trending structure with its highest elevation in the north and sloping southward to a terminus near Fenwick. The highest point is near the intersection of Effingham and Tice Roads at an elevation of 260 metres a.s.l.

The kame-delta is an ice front feature that resulted from meltwater pouring off the ice and depositing material into the waters of Lake Warren. As the lake level rose over several years the kame-delta also rose keeping its upper surface at about the level of the lake. The deposits are primarily of sand and gravel and there are evidences of distributaries near its upper level. Generally speaking the materials are sorted with the largest particles, boulders to gravel, at the north end grading down to sand farther south. Intermingled beds of sand and gravel would indicate yearly changes in outflow from the melting ice. Localized deposits with unique characteristics are also seen. For example, at the northern tip of the feature, just west of North Pelham Street was a deposit of fine sand that was mined out in the early 1900's for molding sand.

The northern terminus of the kame-delta was supported by the ice and when the glacier finally receded the north side collapsed creating the steep slope seen at Lookout Point.

The Fonthill Kame-Delta is the catchment area for rainwater that ultimately enters into tributaries of both the Twelve Mile Creek, the Welland River, Fifteen, Sixteen and Eighteen Mile Creeks, and Singers Drain. Rainwater exits from the north side of the kame-delta via a series of springs that create streams to cut deeply into the landscape ultimately flowing through the Short Hills area to the Twelve Mile Creek. On the south side of the kame-delta the springs create marshy areas in the clays of the Haldimand Clay Plain and ultimately reach the Welland River. It is these springs that gave Fonthill its original name (from "Fountain Hill").

Beach lines of two lower levels of Lake Warren, Lakes Grassmere (195 m. a.s.l.) and Lundy (189 m. a.s.l.) are found on the sides of the kame-delta. The kame-delta sits at the upper end of the portion of the Eriqan Channel that is now occupied by the Short Hills.

In its higher elevations the kame-delta has been extensively mined in the past for deposits of sand and gravel. Numerous small pits are still in evidence. Larger operations have been rehabilitated such as the one that now encompasses Peninsula Lakes Golf Course. One pit is still in production. These operations plus the removal of the original forest cover has had an impact on the water regimen of the area. Spring runoff is high but many streams still do flow in the drier summer months.

The town of Fonthill occupies the northeast section of the kame-delta. Extensive tender fruit farming once occurred over much of the remaining surface, but is now replaced by urban development. The limit of the sand deposits of the kame-delta to the south can be determined largely by the limit of tender fruit cultivation.

2.3.13 THE SHORT HILLS

The Short Hills occupy the notch (called a re-entrant) in the Niagara Escarpment created by the Eriqan Channel. They are bounded by the Fonthill Kame-Delta to the south. More than half of the area is now within the boundary of Short Hills Provincial Park. Contrary to their name, the Short Hills do not rise up above the surrounding Haldimand Clay Plain but rather sit down within the escarpment re-entrant.

During the last period of glacial advance the re-entrant was scoured and modified by the ice. As the ice retreated glacial till was deposited in the re-entrant and then covered by a layer of lacustrine material released from the ice and deposited in the waters of a late stage of Lake Warren. When the lake drained away a dendritic drainage pattern was established on these deposits and cut deeply into the unconsolidated materials. The ultimate direction of flow was northward into the channel of the Twelve Mile Creek. This process continues today. The Short Hills are the remnants of the original surface now deeply dissected by ravines and valleys.

Where streams entered into the feature from the east or west, they ultimately had to cross over the Niagara Escarpment. Waterfalls were created which then began to erode back into the escarpment creating gorges. The largest of these waterfalls is Swayze Falls which drains a western branch of the stream system into the valley. A similar, but somewhat less impressive, waterfall known as Terrace Creek Falls drains a major stream from the east. Throughout the short hills there are numerous other small

cataracts which form where bedrock is exposed along the rim of the surrounding escarpment.

Today the area is largely forested except on the remnants of the upper surface where farming has continued until the present. Some of these farm fields have been replanted in reforestation projects beginning in the late 1970's and 80's. There is ample evidence of farming in the short hills even in areas that have now returned to forest. This includes abandoned farm lanes, old farm machinery and old orchards.

The original settlers to the area in the early 19th century capitalized on the year round flow of streams and the steep stream gradients by setting up mills utilizing waterpower. On the east side of the short hills the historic community of St. Johns West once had twelve mills utilizing the stream. Remnants of mill-races and dams to create millponds can still be seen. Similar remnants can be seen on the west side of the short hills in the area of Effingham.

Many of the streams in the Short Hills are ephemeral today, that is to say they flow only after a rainfall or at the time of the spring thaw. During these times the streams are still actively eroding the post-glacial deposits. Major streams run year round, in some cases augmented by springs such as one just north of the St. Johns Outdoor Studies Centre. The most active scene of erosion today is an area known as the land-slip which is located about a kilometre south of the Pelham Road parking lot of the Provincial Park. This huge slump probably began to develop in the 1940's or 50's when the meander of the stream began to undercut the slope. It continues today and is more than a hundred metres wide.

2.3.14 THE LAKE IROQUOIS PLAIN AND BENCH

Lake Iroquois was perhaps the most famous of the post-glacial lakes to cover parts of the peninsula. It covered all of the present day Lake Ontario basin and rose to a height of 102 metres a.s.l before finding an outlet by way of the Mohawk Valley at present day Rome, New York. Lake Iroquois formed about 12,500 years ago when the glacial retreat reached a line north of Toronto. The lake received water from above the escarpment via six outlets, the most westerly of which was called the Lewiston Outlet and is today known as the Niagara River. Ice still plugged the St. Lawrence and for this reason the lake rose to a high level.

Lake Iroquois existed for a period of 500 to 600 years. During that time thick deposits of lacustrine silt were laid down over the glacial till forming the lake bottom. The settling out of silty material on the lake bottom created a flat landscape with little relief. Here and there are large boulders called glacial erratics that were released from the melting ice, or from ice chunks that broke off and floated out into the lake. These exposed lake deposits, up to five metres thick, are known today as the Niagara Fruit Belt.

The till in turn sits unconformably on the Queenston Shale.

The lake developed a prominent beach that now runs across the peninsula from the Niagara River, right around Lake Ontario to Trenton. In the Peninsula the beach lies 3 to 12 kilometres from the present lake. Between St. Catharines and Hamilton much of Regional Road 81 follows the beach.

Between the beach and the Niagara Escarpment the landform is known as the Lake Iroquois Bench. It is predominantly glacial till. Streams entering Lake Iroquois from the north cut valleys into the bench and created baymouth bars across the beach openings. The largest of these bars is the Homer Bar now covered by residences and cemeteries in St. Catharines.

When Lake Iroquois drained with the opening of the St. Lawrence 11,800 years ago the lake bottom was laid bare. The initial phase of Lake Ontario was only slightly above sea level (8 metres a.s.l.). The streams entering this lake reactivated their downward erosion. As a result the valleys crossing the bench were extensively deepened. When these streams reached the bed of Lake Iroquois they began downcutting to reach the new base level of Early Lake Ontario. At present Regional Road 81 (formerly Hwy 8) descends into some of the larger stream valleys that have cut through the Lake Iroquois Bench via a steep gradient to accommodate the depth of the valley. This is particularly true of the valley of the Twenty Mile Creek.

2.3.15 THE LAKE ONTARIO BLUFFS

Unlike Lake Erie the shoreline of Lake Ontario has no well-developed, wide beaches. Instead, the edge of the lake has a gravel beach only a few metres wide which ends at a bluff consisting of unconsolidated till overlain by lacustrine deposits of predominantly fine silt. The bluff varies in height up to 10 metres in some places.

The cause of this feature is essentially isostatic rebound in the Lake Ontario Basin and St. Lawrence River. When Lake Iroquois drained away with the opening of the St. Lawrence about 11,800 years ago the continent had been depressed by the mass of the ice which once reached a thickness in our area of up to two kilometers. As a result the earliest stage of Lake Ontario (called the Admiralty Phase) was only 8 metres above sea level and filled only about three quarters of its present basin. The western end of this early lake was approximately even with present day St. Catharines. The entire St. Lawrence Valley was inundated by the ocean to form the Champlain Sea. The land then began to "bounce back" and the rise of the bed of the St. Lawrence in the area of the Thousand Islands caused water to pond in the Lake Ontario Basin. This process continues today with isostatic rebound in the St. Lawrence rising at 40 cm/century while the Lake Ontario Basin is rising at 20 cm/century.

The deposits forming the bed of Lake Iroquois once extended further to the north. But as the lake basin refilled the water wave action began to attack the deposits. The unconsolidated materials were easily eroded and continue to do so today.

Over time the area of the lake expanded to eventually encompass its present size by 9,000 years ago.

The rate at which these bluffs are being destroyed varies from year to year. When lake levels are low the small beach that is formed is enough to protect the bluffs. During periods of high water the erosion is much greater. In 1972, during a period of high water, some areas of the bluffs were eroded back by tens of metres.

Evidence of erosion can be seen in the area of Charles Daley Park where there are remnants of concrete abutments out in the lake. These are the remains of a bridge which crossed the Fifteen Mile Creek at a time when there was an east west road

running along the top of the bluff. The entire structure and road are now gone as a result of the retreat of the bluffs.

The Lake Ontario Basin continues to fill at a rate of 20 centimetres/century. Add to this the projection that the Great Lakes Basin could receive 25% more precipitation as a result of climate change. The result is that the Lake Ontario bluffs will continue to be destroyed by the lake.

2.3.16 THE LAKE ONTARIO BAYMOUTH BARS AND LAGOONS

With the exception of the Niagara River all other streams entering Lake Ontario have at their mouth a lagoon which is separated from the lake by a baymouth bar. This is a low structure consisting primarily of gravel with some sand that extends from the west side of the lagoon toward the east. There is an opening on the east side of the bar which allows water to drain into the lake.

These features are a result of two actions. The first of these is the rise in the level of Lake Ontario. When the lake first formed at its level of 8 metres a.s.l. the streams flowing into the former Lake Iroquois were forced to begin downcutting through the lacustrine and till deposits to reach the new lake. Over time the rise in the lake level drowned these river mouths.

The second action is called the longshore drift. The movement of water along the south side of Lake Ontario in the area west of the Niagara River is from west to east. This water can move fine materials. At the same time wave action is primarily perpendicular to the shoreline. As a result a wave will drive material up the narrow beach and the returning water, influenced by the longshore drift will drag the materials slightly to the east.

When a river mouth is encountered the longshore drift will begin to deposit material at the extreme western edge of the stream. Over time the action of wave and longshore drift will extend this material eastward to form a baymouth bar. Water will pond behind this obstruction to form a lagoon. If the stream has little flow the water will escape from the lagoon by infiltrating through the bar. However if there is enough flow the stream will escape from the eastern extreme of the bar by cutting a channel.

This diversion of water to the eastern side of the lagoon increases the rate of erosion of the bluff on this side. The lagoon begins to extend itself eastward and the baymouth bar keeps pace.

The reason there is no baymouth bar at the mouth of the Niagara River is because of the high rate of flow of this body. There is too much force in the current of the river as it enters the lake for a bar to form. Instead the materials are swept away.

Periodically the baymouth bars have been destroyed by high lake levels and wave action. In 1972 the baymouth bar across the Fifteen Mile Creek was almost entirely destroyed and the western section that remained was overtopped by the waves. Within two years time the lake had completely rebuilt the baymouth bar.

2.3.17 THE ST. DAVID'S BURIED GORGE

The most recent period of glaciation, known as the Wisconsin Period, actually overrode the Niagara region more than once. A major advance that began over 100,000 years ago went through a period of retreat that saw the region ice-free again about 70,000 years ago. At that time a river formed where the upper Niagara River flows today. However its outlet over the escarpment was at a point above the village of St. David's.

The retreat of the waterfall created a gorge from that point southward to about where the Lower Rapids Bridge is today. Then, about 50,000 years ago the ice returned.

When the final melting of the ice 12,000 years ago reached this area the pre-existing gorge had been completely filled with glacial debris. The river, now reformed, as the Lewiston Spillway flowed over the top of this debris to a point where the Niagara Whirlpool is today. Then, for some reason, it turned ninety degrees eastward and flowed ultimately over the escarpment at Queenston.

For the next several thousand years the waterfall retreated upstream, reaching the site of the previous gorge about 6 – 7,000 years ago. When the erosion of the escarpment caprock broke through into the pre-existing gorge the force of the river began to flush out the sands and gravels it contained. The section from the whirlpool to the upper Rapids Bridge may have been completely flushed out of debris in a matter of a few weeks.

For some reason the river did not flush out the debris north of the whirlpool. Instead, when the waters entered this area they swirled around counter-clockwise and then continued downstream to exit at Queenston. The whirlpool had been formed.

What remained of the unopened old gorge is called the St. David's Buried Gorge. Early settlers recognized the area as a valuable deposit of sand and gravel. A sand pit was opened and a road (St. Paul Ave.) built down through the notch in the escarpment. Numerous glacial erratics were uncovered during the excavation of the sands. One in particular, the size of a bus, had clear evidence of glacial erosion on its upper surface.

The existence of the buried gorge caused problems with the building of both H.E.P.C. canals in that the absence of bedrock in the area forced the builders to use concrete rip rapping to prevent the canal walls from collapsing.

When the sand pit was finally exhausted of its material it was converted into a golf course and residential housing.

2.3.18 THE NIAGARA GORGE AND GLEN

The present Niagara River formed about 12,500 years ago when the retreating glacier finally cleared the Niagara Escarpment. A waterfall that was originally about 10 metres high formed at what is now Queenston. Over time the erosive power of the water cut into the bedrock creating a gorge that retreated upstream at a rate of about a metre a year.

Since the amount of water coming through the system varied at different times depending upon the melting of the ice and the various other channels that allowed water to flow from other post-glacial lakes this gorge also varied in width.

An observer today would note that the present Niagara Gorge that is about eleven kilometers long is actually composed of a number of linear sections with sharp angular turns that lead into the next one. Near Queenston the gorge is referred to as the First Gorge and it becomes the Old Narrow Gorge as one moves upstream. The next section is called the Devil's Hole Gorge and it is located just south of the Sir Adam Beck Hydro Plants. The notch in the American side of the gorge called the Devil's Hole is one of the other spillways that drained water from post-glacial Lake Tonawanda. Here there is a change in direction to a southeasterly lineation.

Above this point the gorge becomes quite wide until it reaches the Niagara Glen. The Glen is a unique feature. The waterfall had reached this point about 8,000 years ago. It was a wide torrent as indicated by the width of the gorge. Erosion of the waterfall began to create a U-shaped structure with the major flow of water now directed toward the American side of the river. Over time less water flowed over the western side and as a result blocks of Lockport Dolostone eroded from the gorge wall fell into the river here but were not swept away by the current. These blocks created a talus slope which reached as high as the contact between the dolostone and the underlying softer Rochester Shale.

Soon the flow was unable to cut through both the Lockport Dolostone and the Irondequoit Limestone layer beneath the shale with the same intensity. As a result the waterfall began to assume a stepped appearance falling first from the upper level of the river to the top of the Irondequoit and then over this sill to the gorge below. Eventually the accelerated retreat of the main waterfall caused the crest on the Canadian side to intersect the river channel and the whole of the west side of the waterfall went dry. The talus pile is what is known as the Niagara Glen today. A plunge pool at the upper end of the Glen is known as Cripp's Eddy.

Erosion continued upstream until the retreat of the waterfall intersected the older buried gorge at what is now the whirlpool (previously described) and for a period of perhaps a few weeks the waterfall disappeared, replaced by a raging torrent filled with sands and gravel. The waterfall reformed as soon as the debris had been flushed out of the old channel. The gorge had also taken another sharp turn and was retreating almost south again.

The retreat continued until about 900 years ago when the waterfall was at the location of the present day American Falls. At this point the river flowed almost due west and went around Goat Island in two channels. The majority of the water went south of the island and the increased rate of erosion caused the water to separate into two cataracts at this point. The larger one, now known as the Horseshoe or Canadian Falls, continued its retreat upstream. The other was to suffer the same fate as had occurred thousands of years before at the Glen. Not enough water flowed over the crest to wash out the broken rock. It piled up to cover the shale and erosion ceased. It has been estimated that the Canadian Falls will reach the upper end of Goat Island in about 1,500 years and when this happens the American Falls will go dry.

The cataract has now encountered another formation of hard limestone called the Guelph Formation that sits atop the Lockport Dolostone. This formation is about seventeen metres thick. The water cascading over the various layers in the Guelph Formation caused the upper rapids above the waterfall.

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3.0 WATERSHED HYDROLOGIC CHARACTERIZATION

NPCA -Jayme Campbell, Annie Michaud, Lee-Ann Hamilton, Deanna Lindblad

The project study area is the watershed under the jurisdiction of the Niagara Peninsula Conservation Authority (NPCA) with a total area of 2,424 km².

3.1 Climate

The climate of Southern Ontario is characterized as having warm summers, mild winters, a long growing season, and usually reliable rainfall. The climate within southern Ontario differs somewhat from one location to another and from one year to the next. Spatial variations are generally caused by the topography and varying exposure to the prevailing winds in relation to the Great Lakes (Schroeter et al, 1998). According to Brown et al. (1980), the NPCA watershed is located in the Niagara Fruit Belt climatic region.

Average annual precipitation is least along the shore of Lake Ontario (less than 850 mm) and greatest (more than 1,000 mm) in the Fort Erie area on the shore of Lake Erie (NPCA, Aqua Resource Inc, 2009). Average annual snow water equivalent shows large differences: greater than 175 mm in Fort Erie and Grimsby, to less than 125 mm in the Niagara-on-the-Lake (NOTL), Haldimand and Pelham areas. Snow water equivalent is the amount of water contained within a snow pack (i.e. the depth of water that would result if a snowpack was melted instantaneously).

The mean annual temperature ranged from 8°C at Hamilton Airport to 9.5°C at Vineland and Port Dalhousie. Mean temperatures are generally warmer moving from the west towards the center of the NPCA's watershed and lower elevations.

Other general observations include, 14-17% of precipitation is generally snow, the month with the lowest monthly precipitation is February and the greatest monthly precipitation occurs in September.

3.2 Topography

The topography in the Niagara Peninsula ranges from its highest elevation of 260 metres above sea level (m ASL) at the Fonthill Kame-Delta Complex to its lowest at Lake Ontario at 75 m ASL.

Escarpments play a large role in drainage boundaries. For example, the Niagara Escarpment forms the east-west topographic northern boundary of Twenty Mile Creek, as well as the southern boundary of Niagara-on-the-Lake creeks. The Niagara Escarpment decreases in elevation from about 210 m ASL in Hamilton to the west, and 200 m ASL in Niagara Falls in the east, towards Twelve Mile Creek at about 160 m ASL. The much less prominent, but also east-west trending, Onondaga Escarpment, at about 180-190 m ASL, largely defines the northern boundary of Lake Erie Northern Shore creeks.

Many of the other major drainage boundaries are much less distinct because of the relatively flat central area associated with the Haldimand Clay Plain.

The three (3) main drainage basins are Lake Ontario, the Niagara River, and Lake Erie.

There are 146 subwatersheds with a total of 4,898 kilometres of stream length, which drain to these primary outlets.

3.2.1 Lake Ontario Drainage Basin

Lands in the northern portion of the watershed drain into Lake Ontario.

The drainage to Lake Ontario generally starts above the Niagara Escarpment and flows easterly before turning north, flowing over the Escarpment, and into the lake.

The most significant drainage to Lake Ontario comes from Twenty Mile Creek with a total drainage area of 291 km², Twelve Mile Creek with a total drainage area of 178 km², and Forty Mile Creek with a total drainage area of 64.8 km² (Niagara Peninsula Conservation Authority, 2007, 29)

The total length of Lake Ontario shoreline within the NPCA jurisdiction is 50 kilometres. (Regional Municipality of Niagara, 2003, 4-8)

3.2.2 Niagara River Drainage Basin

Lands in the central portion of the watershed drain to the Niagara River.

The two largest tributaries of the Niagara River are the Welland River and Black Creek. The headwaters of the Welland River are located in the City of Hamilton and it has a drainage area of approximately 1,050 km². Black Creek has a total drainage area of approximately 70.3 km². (Niagara Peninsula Conservation Authority, 2007, 33)

The total length of shoreline within the NPCA jurisdiction is 60 kilometres. (Regional Municipality of Niagara, 2003, 4-8)

3.2.3 Lake Erie Drainage Basin

Lands in the southern portion of the watershed drain to Lake Erie.

The drainage to Lake Erie is by small streams or tile drains that have been dredged and straightened to drain the Haldimand Clay Plain. These watersheds have less than 20 km² total area and generally flow south from the Onondaga Escarpment to the lake. The largest of these systems include Six Mile Creek, Wignell Drain and Lowbanks Drain. (Niagara Peninsula Conservation Authority, 2007, 33)

The total length of shoreline within the NPCA jurisdiction is 60 kilometres. (Regional Municipality of Niagara, 2003, 4-8)

Within the watershed, the two largest drainage areas occur in the Welland River and Twenty Mile Creek. The Welland River falls approximately 82 metres in elevation over its entire course. The most significant vertical drop is a 78 metres drop which occurs over the first 55 kilometres with only a 4 metre drop on the lower 80 kilometers of the River. This slight gradient results in a meandering, sluggish river from Port Davidson downstream (approximate intersection of the Welland River and Haldimand County boundary).

Twenty Mile Creek begins adjacent to the Welland River with rolling topography and fairly steep slopes in the headwaters. The middle and lower portions of the Twenty Mile Creek watershed have a gently rolling to flat topography before the creek bed drops almost 100 metres at the Niagara Escarpment. Most of Twenty Mile Creek above the Escarpment flows over bedrock, or is controlled by bedrock ridges.

3.3 Streamflow

An analysis of baseflow separation and streamflow recession was completed for six (6) stations (shown below) in the NPCA watershed (AquaResource Inc., 2007). Four (4) of the stations had extensive records, while two (2), 02HA030 and 02HA031, had very limited records, presenting a limitation of the streamflow data for these two (2) stations which may have affected the results.

Table - Streamflow Gauges

| WSC ID | Description | Drainage Area (km ²) | Data Start Date | Data End Date |
|---------|-------------------------------------|----------------------------------|-----------------|---------------|
| 02HA006 | Twenty Mile Creek At Balls Falls | 293 | 3/1/1957 | 12/31/2005 |
| 02HA007 | Welland River Below Caistor Corners | 230 | 7/1/1957 | 12/31/2005 |
| 02HA020 | Twenty Mile Creek Above Smithville | 168 | 1/1/1987 | 12/31/2005 |
| 02HA024 | Oswego Creek At Canboro | 81 | 9/1/1988 | 12/31/2005 |
| 02HA030 | Four Mile Creek Near Virgil | 13 | 4/1/2006 | 10/2/2007 |
| 02HA031 | Twelve Mile Creek Near Power Glen | 47 | 4/1/2006 | 10/2/2007 |

3.3.1 Twenty Mile Creek, the Welland River and Oswego Creek

The flow regime observed at these four (4) stations is typical of Southern Ontario. Due to spring freshet, annual peak flows are observed during the month of March. The flows quickly decline through the months of April, May and June, reaching summer low flows by July. Low to no flow remains until mid to late fall, where lower evaporation and more regional rainfall allow streamflow to recover.

There is a significant difference between median flows and 10th percentile flows during the spring months. The 10th percentile flows are on average approximately five times the median flow for the month of March. This suggests the flow regime is extremely flashy, as peak flows are not sustained for large periods of time. Soon after a precipitation event, flows quickly return to baseflow conditions. This is indicative of a well-drained watershed dominated by tight surficial materials. There does not seem to be any evidence of significant depression storage on the landscape.

Summer low flows are lower than in many other regions of Southern Ontario.

- Welland River below Caistor Corners has monthly median summer flows below $0.1 \text{ m}^3/\text{s}$ indicating that there are no areas with significant groundwater discharge within the catchment.
- Ball's Falls has monthly median summer flows (July – August) below $0.1 \text{ m}^3/\text{s}$ indicating that there are no areas with significant groundwater discharge within the gauged catchment.

The 90th percentiles, or low flows, shows that Oswego Creek at Canboro, Ball's Falls and Smithville have had past occurrences of no flow. For a watershed of 293 km^2 , such as Ball's Falls, or a watershed of 81 km^2 , such as Oswego Creek, to have zero flow provides more evidence there is very little surface/groundwater interactions for catchments located within the Haldimand Clay Plain, a runoff driven system.

3.3.2 Twelve Mile Creek

The overall flow regime observed for Twelve Mile Creek is not typical of Southern Ontario. While peak flows were observed during the March spring freshet and did decline through April and May, flows were relatively constant through June, July and August. The extremely constant rate of flow throughout the year is most often seen in watersheds with some form of reservoir regulation, or significant groundwater discharge. Due to the lack of any reservoirs or significant control structures on Twelve Mile Creek, the steady flow is most likely caused by a very significant groundwater discharge.

The 10th percentile flows are on average approximately four times the median flow for the month of March. This suggests the spring flow regime was flashy, as the peak flows were not sustained for a large period of time.

Summer low flows are relatively constant indicating significant groundwater discharge within the gauged catchment.

3.3.3 Four Mile Creek

The flow regime observed is not entirely typical of Southern Ontario. Due to spring freshet, annual peak flows are observed during the month of March. Flows decline through the months of April, May and June, but did not exhibit summer low flows. This is likely due to the flow of irrigation water that was directed into the system from July until September. More natural/ambient conditions are interpreted to occur after mid-September when lower evaporation and more regional rainfall allow streamflow to recover.

The 10th percentile flows are on average approximately four times the median flow for the month of March. This suggests the flow regime is extremely flashy, as peak flows are not sustained for large periods of time. Soon after a precipitation event, flows quickly return to baseflow conditions. This is indicative of a well-drained watershed dominated by tight surficial materials.

3.4 Baseflow Characterization

A baseflow separation exercise was also carried out. Baseflow is the release of water from storage contained within the upstream drainage area that drains to a particular

gauge. This water released from storage could originate in aquifers, and hence is termed groundwater discharge, but also could originate from wetlands or reservoirs.

In general, baseflow follows the same seasonal trends as streamflow for Twenty Mile Creek, the Welland River, Oswego Creek, and Four Mile Creek. While Twelve Mile Creek shows almost identical streamflow and baseflow, mean monthly estimates for low flow periods (summer months) indicating a reliable source of baseflow from the Fonthill Kame-Delta Complex; however this may be affected by the lack of long term data.

3.5 Additional Streamflow Comments

3.5.1 Niagara-on-the-Lake Watershed Planning Area

In Niagara-on-the-Lake (NOTL) an extensive network of municipal drains and field tile drains provide for conveyance of runoff from the flat topography in the middle portions of the subwatersheds, and as a result flow is flashy overall. In some respects NOTL is more typical of an urban than a rural watershed (Aquafor Beech, 2008).

The Town of NOTL has its own local drainage legislation allowing the municipality to regulate irrigation within its jurisdiction. Irrigation water to supply agriculture is currently taken from several Great Lakes sources, i.e. Ontario Power Generation (OPG) Sir Adam Beck Generating Station reservoir, the Chippawa Power Canal, the Welland Canal, and the Niagara River. Generally the irrigation system is in operation from May 15 – September 15; however the season may be extended a couple weeks on either side of these target dates to meet local needs.

3.5.2 Lake Erie North Shore Watershed Planning Area

In Lake Erie North Shore the outflow from Eagle Marsh Drain and Wignell Drain can be reduced during elevated lake levels as control structures prevent backflow from Lake Erie. Outflows are pumped to Lake Erie when the control structures are in place.

3.5.3 Central Welland River Watershed Planning Area

Three notable man-made modifications to the Welland River are the (i) Old Welland Canal, (ii) New Welland Canal and (iii) Ontario Power Generation operations at the Niagara River. Two inverted siphons were built to convey the flow of Welland River water beneath the Old and New Welland Ship Canals. These structures flow full under pressure and create backwater pools during floods in a manner similar to dams (NPCA, 1999).

Originally, the Welland River drained directly into the Niagara River at Niagara Falls. However, its flow is now diverted entirely into the Queenston-Chippawa Power Canal. Since 1953, the lower portion of the Welland River flows in reverse, drawing Niagara River water to the Power Canal. This regulated diversion of water in the lower Welland River creates a pattern of regular diurnal fluctuations in water levels that extend approximately 60 km upstream of the diversion (Philips Engineering Ltd., 2004).

Also under normal conditions, the Old Welland Canal provides additional flow to the Welland River at, and immediately downstream of the old siphon. Flow enters the Welland River from the Old Welland Canal through two pathways. First are a series of ports in the roof of the old siphon which allow 14.2 m³/s of Lake Erie water to dilute the

Welland River water. Second is a bypass flow at the Welland Water Treatment Plant which allows 4.5 m³/s of flow (Stantec, 2008).

3.6 Hydrogeology

3.6.1 Aquifer Units

Bedrock aquifers are typically those shallower units containing limestones and dolostones such as the Guelph-Lockport, Bois Blanc and Onondaga Formations. The Salina Formation also has a good water yielding capacity but the water quality is usually not suitable for drinking due to the presence of naturally occurring elevated concentrations of salts, minerals and sulphate along with the presence of hydrogen sulphide gas. The Queenston Formation may also provide marginal supplies for domestic demands but may have naturally occurring poor water quality. Other bedrock formations, i.e. Cataract and Clinton, are not generally considered significant sources of groundwater and may have natural poor water quality.

Overburden aquifers are generally of two (2) main types: (i) unconfined near-surface coarse-grained deposits, e.g. Fonthill Kame-Delta Complex and (ii) confined contact zone aquifers at the bedrock surface consisting of granular overburden and fractured bedrock overlain by clay. Singer et al (2003) listed some of these confined “contact zone” aquifers (e.g. Wainfleet, Port Colborne, St. Catharines and Niagara-on-the-Lake aquifers). Waterloo Hydrogeologic Incorporated (WHI) in a study published in 2005, mapped “Sand and Gravel” thickness above bedrock which indicated that these “contact zone” aquifers may be quite extensive as an available source of groundwater in our area.

3.6.2 Water Table Aquifers

Water table aquifers include flow in both the overburden and bedrock. WHI (2005) indicated these aquifers would include the Onondaga Escarpment, the upper portion of the Fonthill Kame-Delta Complex, part of the Niagara Escarpment (i.e. Lockport Formation), and at times, the contact zone aquifer at depth. Groundwater flow may be to and from the water table to deeper aquifers and back again.

3.6.3 Deeper Aquifers

Our deeper aquifers include flow in both overburden and bedrock. WHI (2005) indicated that these deeper aquifers, greater than 15 metres below ground surface, could include portions of the contact zone aquifer, the Fonthill Kame-Delta Complex, the Lockport Formation, and other bedrock formations.

3.6.4 Surface Water and Groundwater Interactions

The soils of the Haldimand Clay Plain limit the interactions between surface water and groundwater in much of our area. Interaction does occur at the Niagara Escarpment (particularly in karst locations), along the Escarpment face as diffuse seeps, and as discharge to numerous creeks and streams originating at the foot of the Escarpment (both seasonal and perennial). Significant groundwater discharge, on a local scale, occurs where various watercourses cut into the more permeable overburden and fractured bedrock. Examples of groundwater discharge to surface water include Twelve Mile and Four Mile Creeks.

Another more ephemeral source of groundwater discharge may be lateral groundwater flow and discharge to low lying depressions through fractured surficial clay.

3.7 Wetlands

Wetlands consist of land that is seasonally or permanently covered by shallow water or have a water table close to or at its surface, resulting in hydric soils which support vegetation dominated by hydrophyllic or water tolerant plants. They are often thought of as a transition zone between terrestrial and aquatic ecosystems, and as such are the most biologically diverse of all ecosystems.

Wetlands provide very important ecological functions such as supporting biodiversity by providing food, water and shelter for a variety of wildlife during all or part of their life cycles, for specialized or rare plant and animal species that depend on wetlands exclusively as their habitat, and by providing cover for species moving to and from aquatic and terrestrial ecosystems.

Wetlands also provide very important hydrological functions such as natural filtration of nutrients, contaminants and sediments thereby improving water quality, cycling nutrients up the food chain, and retention of water to decrease peak flows. Water retention reduces flooding, increases groundwater infiltration, increases watercourse baseflows, and minimizes erosion.

There are five main types of wetlands; marsh, fen, bog, swamp, and open water. The NPCA watershed contains all types of wetlands. By area, Niagara is covered by more swamp wetlands than any other type. A swamp is a wetland which has temporary or permanent inundation of large areas of land by shallow water. Swamps generally consist of scattered dry hummocks containing terrestrial vegetation, surrounded by aquatic vegetation, and are therefore characterized by rich biodiversity.

In Niagara, our swamps are mostly made up of a particular type of swamp referred to as a slough forest. Slough forests are forested areas with undulating land that contain both seasonally ponded areas, referred to as sloughs or vernal pools; and ridges of higher land. These interspersed high and low points result in forests containing both water-tolerant tree species such as Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and Silver Maple (*Acer saccharinum*) in the wetter areas of hydric soils; and can contain rare vegetation types such as Pin Oak (*Quercus palustris*) swamp and Buttonbush (*Cephalanthus occidentalis*) shrub swamp. These communities may also contain drier species such as Sugar Maple (*Acer saccharum* ssp. *saccharum*), White Oak (*Quercus alba*), Shagbark Hickory (*Carya ovata*), and American Beech (*Fagus grandifolia*) in the drier ridges that run through the wetland.

Even small isolated seasonal pools which contain standing water for only a short period in the spring and summer can provide vital habitat for rare and specialized species such as frogs and salamanders which rely on fish-free sources of water to survive, and are often found in no other habitats.

Slough forests are located in abundance over large areas of the southern portion of the watershed due to the flat topography containing undulating wetland forests. This adds

significantly to the flood storage capacity of the watershed. The tree cover and leaf litter intercept rain and slow and lower the amount of water reaching the ground, and natural groundcover helps to take up water, and slow its movement across the landscape. The sloughs hold back water during peak flow periods such as the spring freshet, and contribute to local groundwater and watercourse baseflows as water slowly soaks into the ground over a period of weeks or months.

Historically, the study area would have been almost completely forested. The Haldimand Clay Plain would have been dominated by lowland forests and slough wetlands. By studying old aerial photography it is easy to see the dark slough patterning across the southern landscape, even in some areas which had recently been converted to agriculture.

The largest wetlands in the study area are Wainfleet Bog and Humberstone Marsh.

The largest continuous forest in the study area is the Caistor-Canborough Slough Forest located in the Haldimand portion of the watershed. Other significant slough forests within the study area are: Willoughby Marsh, Attercliffe Station Slough Forest, and North Cayuga Slough Forest.

The main threats to wetlands historically in Niagara have been drainage for agriculture and human settlement. Wetlands were often viewed as being of low economic value as they required drainage and clearing to be agriculturally productive, and held little value except for hunting and some recreational uses. Now that the importance of wetlands for flood control, water quality protection, groundwater infiltration and habitat are better understood, development is regulated by municipalities, the regional governments and the NPCA, to ensure their benefits remain on the landscape over the long term.

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4.0 Soils of the Niagara Region

The soils information collected through the Natural Areas Inventory was limited to in-situ soil texture and moisture levels as they pertain to Ecological Land Classification protocol.

Ontario Ministry of Agriculture and Food in 1989 produced a report entitled The Soils of The Regional Municipality of Niagara in which detailed classification of soils within the study area were documented. This report accurately represents the soils of the study area and therefore the NAI utilized this data.

The following provides general information from the 1989 report.

“Soils in the Niagara Region have developed in soil parent materials ranging in texture from heavy clays to coarse gravels. Most soil differences are related to these textural differences. Variations in drainage also cause differences between soils developed on the same parent materials. Other soil forming factors such as topography, time, climate and vegetation have also contributed to soil differences”. (OMAF, 1989, p.17)

“Most of the original soil parent materials in the Niagara Region are highly calcareous and alkaline. The soils developed on such materials are less calcareous because of the leaching action of water on soil bases, especially calcium. The leaching action, along with associated soil weathering, causes the development of soil horizons near the soil surface. These horizons differ from each other on properties such as colour, texture, thickness, structure and consistency”. (OMAF, 1989, p. 17)

Explanation of soil horizons (OMAF, 1989, p. 17-18)

The soil descriptions can be found in the report between pages 23-40. The descriptions are arranged in alphabetical order and include information on soil moisture characteristics, general soil characteristics, soil variability, and land use and management. (OMAF, 1989, p.23-40)

Figure illustrating the important geological and physiographical features in the region (OMAF, 1989, p. 9)

Chart depicting correlation of soils with surficial geology and physiography in the region (OMAF, 1989, p. 10-12)

Chart of drainage conditions and names on similar parent material (OMAF, 1989, p.15)

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5.0 Natural Heritage System

NPCA- Suzanne McInnes, Coordinator of Watershed Planning

5.1 *Planning for Natural Heritage*

Within Canada, the provinces have authority over natural resources and municipal institutions. All provinces, including Ontario, have a Planning Act that establishes the rules for the operation of a municipal land use system. Each municipality is required to have an overall policy plan (Official Plan) and detailed zoning by-laws that complement the general policies. In Ontario and the rest of Canada, protecting natural areas was not part of the policy concerns of local municipalities prior to 1970 (Eagles, 1984).

In the early 1970's several studies were done in a variety of municipalities (e.g. Haldimand-Norfolk, Waterloo Region, Ottawa Carleton) that identified the possibility of municipalities becoming involved in the protection of local natural areas. This was taking place at the same time as the Province was reorganizing municipal government into a system of regional and local governments. Many of these early environmental studies identified criteria for determining Environmentally Sensitive Areas (ESAs) and mapped the natural features that were later included in Official Plans for the newly created Regional governments (e.g. Haldimand-Norfolk, Hamilton-Wentworth, Waterloo, Halton, Ottawa-Carleton). An Environmentally Sensitive Area Study for Niagara was published in 1980, although policies and detailed mapping were not included in the Region of Niagara's Official Plan at that time.

In 1983, the Province substantially reformed the Planning Act by introducing provisions for provincial policy to guide municipal planning and mandated that decision makers "have regard" to such policy. At the same time, the Province introduced "natural environment" as a provincial interest requiring protection.

The Province became involved in land use planning for the natural environment with Niagara Escarpment Plan. The Niagara Escarpment has long been recognized as an important part on Ontario's natural history. Public concern about its importance increased through the 1960's and in 1973 became governed by the Niagara Escarpment Planning and Development Act (NEPDA). The NEPDA was the first piece of provincial planning legislation with an explicit environmental purpose (Riley, J.L. et al, 1996, p. 8). The Niagara Escarpment Plan in the first large scale environmental land use plan in Canada. The Niagara Escarpment Plan was originally approved on June 12, 1985 and a revised plan signed by the Lieutenant Governor in Council on June 1, 2005.

Between 1994 and 2005, the Province had differing views on the appropriate role of the Province in land use planning, reflecting the government in power at the time. In 1995, the Province renewed their interest in Provincial Planning and consolidated policies into a single Provincial Policy Statement (PPS). Natural Environment was included in the category of "Natural Heritage" and speaks to an ecosystem approach to the protection of natural heritage features and areas. The Planning Act was also amended to reflect the Provinces interest in "the protection of ecological systems, including natural areas, features and functions". The change in Provincial interest from "natural environment" in 1983 to "protection of ecological systems" in 1995 is reflective of the changes in science of conservation biology.

The landscape in the NPCA watershed today is a result of its natural characteristics and the changes influenced by human activities. The landscape of Southern Ontario was influenced by human progress and technical innovations. Niagara is unique for several reasons: it is surrounded by water on 3 sides; transportation needs associated with movement of goods and people, via road, rail and shipping between Canada and the United States; a centre for hydroelectric power generation in Ontario; and its physical location as one of the southern most parts of Canada. The climate allows for growing tender fruit on prime agricultural lands of national and provincial significance. Niagara is home to many plants and animals that are not found in other parts of the country.

The products from this Natural Areas Inventory (NAI) will provide the watershed municipalities with up to date mapping of natural areas to enable them to establish natural heritage systems that will be designed to protect natural heritage features and functions for present and future generations.

5.2 Land Use

The Niagara Region with its proximity to the Great Lakes and its strategic position as an industrial centre and border region leads to the demands of competing land uses. The combination of climate, physiography, soils and location make Niagara one of the most productive agricultural areas in Canada. The physical distinctiveness of the region is what has enabled a unique agricultural industry to develop. (RMN, 2003, p.2.1) For those same reasons the Niagara Peninsula is one of the most ecologically rich areas in Canada. The Niagara Peninsula is located within the northern most range of the deciduous forest region in North America (also referred to as the Carolinian Canada zone). It has the warmest average annual temperatures, the longest frost-free growing season and the mildest winters in Canada. This zone represents 1% of Canada's land area and it has more species of plants and animals than any other ecosystem in Canada (Carolinian Canada website).

5.2.1 Settlement

Settlement tended to follow routes such as old Indian trails. Clearing of the land and timber extraction began for agricultural purposes throughout the region and a string of villages grew up as service centers and early industrial developments. Some of the early settlements were Newark (Niagara-on-the-Lake), Queenston, Chippawa, St. David's, St. Catharines, Jordan, Beamsville, Grimsby, Beaverdams and St. Johns. (Gayler, 1994, p. 243)

Niagara's early settlement, its strategic location in terms of access to the United States and the development of hydroelectric generation lead to the growth of several cities and associated heavy industry. Hamilton, St. Catharines, Thorold, Welland, Niagara Falls and the US cities of Niagara Falls and Buffalo became factory towns for iron, steel, metal fabrication, heavy engineering, abrasive products, pulp and paper, chemicals and auto manufacturing. (Gayler, 1994, p. 6)

5.2.2 Hydro-electric Generation

The value of the Niagara River as a source of industrial power has been recognized since the time of the early settlers. The swiftness of the current above the falls made it ideal for the generation of power, and as a source of fast moving water for mills. The

first small hydro-electric generating unit replacing mechanical water power was built on the American side of the Niagara River in 1882.

The switch to hydroelectricity from fossil fuels was accelerated in part by the strikes of 1902 in Pennsylvania which halted all shipments of coal to Ontario. Canada's dependence on American sources of energy was emphasized and Canadian funded hydroelectric projects began in earnest.

One of the oldest hydroelectric power plants in Ontario, The De Cew Falls Generating Station was built by the Cataract Power Company to supply electricity to Hamilton. Ground was broken on October 5, 1897 and the first transmission was sent from DeCew Falls to Hamilton on August 25, 1898 just over 10 months after construction began.

Sir Adam Beck led the campaign to persuade the provincial government on the Canadian side of the Niagara River to invest in hydro power eventually leading to the creation of the Hydro-Electric Power Commission of Ontario (later known as Ontario Hydro) in 1906. In 1917, the Power Commission started construction on the Queenston Chippawa Development.

The most hydrologically significant aspect of this development was the 13 kilometre long feeder canal from the Welland River transecting the urban area of Niagara Falls to the generating station at Queenston. This supply channel was constructed using the lower 6 kilometres of the Welland River that had originally flowed into the Niagara River. The Welland River underwent extensive dredging and profiling in order to accommodate the reversal of flow and its rerouting into the feeder canal. The water from the Niagara River now flows upstream in the historic Welland River channel to the Chippawa Power Canal where water from both rivers is allowed to mix. This development was completed in 1922 and is still in operation today under the name Sir Adam Beck 1 Generating Station. (Nicholson, 1997, p. 62)

The Second World War increased the demand for electricity and additional diversions of water were required to enable the plant at Queenston to generate the maximum amount of power. A weir was constructed half way across the river just upstream of the falls for the purpose of directing flow of the Niagara River towards the intakes of the feeder canal.

A change in agreements between the American and Canadian regulators of the resources at Niagara Falls paved the way for the construction of a second power generation facility on the River. The construction of Sir Adam Beck 2 Generating Station began in January of 1951. The new facility located beside the Sir Adam Beck 1 station consisted of an intake structure in the upper River, twin 9 kilometre long feeder tunnels built under the City of Niagara Falls, an open cut channel 4 kilometres in length, and a state-of-the-art pumping station.

Currently 1,800 cubic metres of water per second is diverted from the existing twin tunnels and hydro canal. Once the third tunnel (anticipated in 2012) is completed an additional 500 cubic metres of water per second will be diverted for the purpose of generating hydro electric power to an additional 160,000 homes (www.niagarafontier.com).

5.2.3 Transportation

In the early days of European settlement, it was the rivers of North America that provided the access to its interior. Pioneers and trappers alike used the rivers for transportation and trading. In some cases, long stretches were traveled without hindrance while other areas contained series of rapids and narrow passages that had to be negotiated. Regular portages were established at such places. The Niagara River was one such place where a triple hazard existed of rapids, falls and a narrow gorge. (Nicholson, 1997, p. 40)

5.2.3.1 Shipping

The true importance of this region as a trade and communications route was realized during the War of 1812. It became obvious that a more formal transportation route needed to be built. The building of the Erie Canal on the American side of the border was seen as a threat to gain control over the Great Lakes. The development of new technology and the rising concern over safety of the settlement led to a re-emergence of the canal concept championed by William Hamilton Merritt, a miller in the Region in 1818. (Hadfield in Nicholson, 1997, p. 42)

The first Welland Canal opened in 1829. Construction of the second Welland Canal began in 1842. The third canal was completed in 1881. Each time, many changes took place to accommodate larger shipping vessels. Despite the enlargement of the canal, by the end of the nineteenth century, the ever increasing size of ships necessitated another rebuilding. Construction of the fourth canal began in 1913. The ever-increasing size of the ships travelling the canals system meant that a deeper channel was required to accommodate them. By the 1920's a new solution to the aqueducts had to be found. It was decided that the Welland River would be re-routed under the Canal through a siphon structure (Public Works Canada in Nicholson, 1997, 48). It took nearly twenty years to build this fourth canal because of the interruption of the First World War. The fourth canal opened on August 8, 1932. In 1973 a new section was constructed to bypass Welland. A second syphon structure was constructed on this canal.

5.2.3.2 Railway

Railways developed after the mid-1830s and again after the mid 1860s to link communities on both sides of the Niagara River. Significant hubs were created where bridges crossed the Niagara River at Niagara Falls and Fort Erie. Hubs were also created where railways converged in Niagara Falls, Buffalo and to a lesser extent in Welland. (Jackson, 2003, p. 164)

Railway connections across the Niagara River were important because it allowed a shorter connection between Detroit and Niagara, and diverted western rail traffic from the longer route in the United States south of Lake Erie.

The railway was also important for tourists travelling from Buffalo to Niagara Falls or Fort Erie (e.g. Crystal Beach and Erie Beach). The connection to Erie Beach was short lived (1885-1910) because a pier was built at Erie Beach for steamer traffic from Buffalo. (Jackson, 2003, p. 167)

During the railway era, 3 bridges were built to cross the Niagara River. The Niagara Suspension bridge was completed in 1855 and was located north of the falls in the City of Niagara Falls. This bridge was replaced after twenty-six years of service in the same location and was renamed the Niagara Steel Arch Bridge. It was later modernized in 1919. The second bridge, the International Bridge, was completed in 1873 and crossed the Niagara River between Fort Erie and Black Rock. The third railway bridge was constructed across the Niagara gorge in 1883 and it was the world's longest double-track truss span. It was replaced in 1925 by the Michigan Central bridge located north of the original structure. Other crossings of the Niagara River were considered but never materialized. The railway bridges played significant roles in the urban development of both Niagara Falls and Fort Erie.

At its peak in the 1950s, the CN yard in Fort Erie was the third largest railyard in Canada. The railroad industry began to decline in the late 1970s in Fort Erie when all eastbound and westbound marshalling was moved to Buffalo. The yard is currently considered a "minor switching yard" for servicing local customers and staging of trains traveling to the United States. (Town of Fort Erie, 2008)

Some railways in Niagara continue to be used today and others have been abandoned in favour of truck transportation. As railways were abandoned, opportunities arose to purchase the rights of way for public multi-use trail purposes (e.g. Friendship Trail in Fort Erie, and the Gord Harry Trail in Wainfleet).

5.2.4 Agriculture

The combination of climate, physiography, soils and location make Niagara one of the most productive agricultural areas in Canada. The Niagara Peninsula is not a true peninsula; it is a narrow feature of land stretching to the Niagara River between Lake Erie and Lake Ontario. Its positioning between two of the largest fresh water lakes in the world gives it a natural advantage for agriculture not only because of the moderating influence of the lakes, but because of the availability of fresh water. (RMN, 2003, p.2.1)

The majority of the Niagara land base (both above and below the Niagara Escarpment) qualifies as prime agricultural land in Canada. In addition to the Class 1, 2 and 3 lands, there are large areas of specialty crop production lying between the Escarpment and Lake Ontario. Other areas of special crop production are the Fonthill Kame and portions of the Wainfleet Marsh, west of Port Colborne. Soil resources and agricultural infrastructure provide the necessary conditions for special crop production. Given that only 5% of the Canadian land base qualifies as prime land, the high incidence of prime land in Niagara is extremely significant.

In Ontario, clay plains like the Haldimand Clay Plain making up much of the study area of the NAI are usually used for farming with emphasis on livestock due to the heavy soils. In the study area, this is not always the case as many of the farms are subsistence in nature and much of the land on this clay plain remains idle. Dairy farming is more prevalent closer to the escarpment in the Haldimand area on better-drained soils. (Chapman and Putnam, 1984, p. 158) The most important crops on the clay plain are hay, corn, oats, wheat and barley with an emphasis in recent years on soya beans.

In 2001, Niagara generated \$511.13 million in gross farm receipts. On a national basis,

Niagara generates higher gross farm receipts than any of the Maritime Provinces. The average gross farm receipts, in Ontario is \$674 per acre, in southern Ontario \$995 per acre and in Niagara \$2,195 per acre. (RMN, 2003, p.9.5)

5.2.5 Aggregate Extraction

The Niagara Escarpment is an enormous and continuous outcrop of useful rock. Huge quantities of limestone and dolostone are essential to the heavy industry in the Hamilton region since they are used as flux in the smelting of iron ore in the process of steel production. The escarpment rock has been used historically and in present day as one of the primary supplies of building stone to the major cities in Canada. One of the most famous examples is the use of the rose-coloured sandstone in the construction of the Legislative Buildings of Queen's Park in Toronto. (Chapman and Putnam, 1984, p. 120) The shales of the escarpment are used in the making of brick, tile and other ceramic products. The sand and gravel deposits are also extremely important to the production of construction materials such as concrete and asphalt.

5.2.6 Recreation and Tourism

Niagara Falls has long been a tourist attraction however, over time and with changes in available methods of transportation from rail to ship to car to airplane, the tourist has changed from local to international visitors; from those seeking a wilderness adventure to those with more refined tastes. At present, between 12 and 14 million visitors annually make Niagara Falls one of the premier destinations in North America. (Gayler, 1994, p.2)

In addition to the tourist venues immediately surrounding the Falls, there are other amenities that have drawn tourists to the area over the years. The Niagara Parks Commission owns parkland running the length of the Niagara River Parkway from Fort Erie to Niagara-on-the-Lake where they offer various tourist services. The Town of Niagara-on-the-Lake with its rich heritage and theatre has become a destination in and of itself.

The Greater Niagara Circle Route Trails System is over 140 km of mostly off-road, paved trails suitable for walking, cycling or rollerblading. Motorized vehicles are not permitted. The paved trail passes through urban centres, downtowns, the Niagara Escarpment, waterfronts, and rural/agricultural areas. The system includes the Welland Canals Trail which passes alongside parts of the existing and previous canals from St. Catharines on Lake Ontario (north end) through Thorold and Welland to Port Colborne on Lake Erie (south end). The Friendship Trail runs between Port Colborne and Fort Erie (east end). From Fort Erie the Niagara River Recreation Trail follows the Niagara River, through the city of Niagara Falls, to Niagara-on-the-Lake (north end). The Waterfront Trail follows Lakeshore Road from Niagara-on-the-Lake to St. Catharines (west end).

As of 2008, there are more than 45 golf courses in Niagara and another seven in the Haldimand area. They attract additional tourists to the area during the summer months.

5.3 Changes to the Landscape as a Result of Major Infrastructure

5.3.1 Surface Water

As a result of the construction of the Welland Canal, there have been many modifications to the natural environment. For example, several watercourses that originally flowed into the Niagara River that were bisected by the Welland Canal (e.g. Lyons Creek, 10 Mile Creek). There are other areas that have naturalized as a result of the placement of spoils from the excavation of the canal (e.g. the wetland created at Mud Lake in Port Colborne).

The International Joint Commission undertook a study to determine the remedial works necessary to preserve Niagara Falls in 1950. The recommendations of that study were approved July 22, 1953, calling for the construction of a Hydro Control Dam. The subsequent Niagara Diversion Treaty, between Canada and the USA, outlined the priorities for allocation of water for, firstly, the Falls flow, and then for other uses. Once the higher priority uses are fulfilled, water that remains could be diverted from the Niagara River for hydro-generation. The Treaty stated that a minimum of 100,000 cubic feet per second would flow over Niagara Falls during the day (8:00 a.m. to 10:00 p.m.), while at night the flow could be reduced to a minimum of 50,000 cubic feet per second.

The Hydro Control Dam is located just upstream of Niagara Falls and has 18 sluice gates which are used to adjust water levels within allowable tolerances to meet the Treaty principles with respect to supplying the Falls flow. Through the International Niagara Board of Control 1993 Directive, water levels in the Niagara River Grass Island Pool (the pool formed in the Niagara River immediately upstream of the Hydro Control Dam) can vary in any given day by as much as 0.46 m over an operating range of 0.91 m from 170.70 m to 171.61 m (Ontario Hydro, 1991).

The lower portion of the Welland River has been modified for major infrastructure including the Old and New Siphons (which allowed construction of the 3rd and 4th Welland Shipping Canals) and Ontario Power Generation (OPG) facilities along the Niagara River. The lower reach of the Welland River (also referred to as Chippawa Creek) flows from the Niagara River upstream into the Queenston-Chippawa Power Canal. Since 1953, water has been diverted from the Niagara River, up the Welland River, and into the Power Canal. The regulated diversion of water in the lower Welland River creates a pattern of regular diurnal fluctuations in water levels that extends approximately 60 km upstream of the diversion.

Due to the very flat gradient of the Welland River, and as a result of the Hydro Control Dam diverting vast quantities of water from the Niagara River into the Welland River, the water levels within the Welland River are completely controlled by the operating range of the Hydro Control Dam. In essence, the Welland River acts like a linear 60km long reservoir where the water levels are tightly controlled. (Steve Miller, 2009)

While hydro electricity is produced at Niagara Falls, utility corridors are also necessary to distribute the power to other locations in Ontario. As a result, many natural areas are fragmented by hydro right-of-ways. For example, Short Hills Provincial Park has three hydro corridors through it. (Riley, J.L, et al.,1996, p. 49)

5.3.2 Woodlands

Most of the original woodlands in Ontario (south and east of the Canadian Shield) have been removed since European settlement. Around 1920, the availability of coal and electricity began to relieve the pressure for fuel wood consumption in urban and rural areas of Ontario. Over the last 60 years agriculture has become more focussed on the best quality farmlands, allowing marginal farmland to return to a natural state.

In Niagara, the NPCA watershed was almost completely forested prior to European Settlement. "Wet lowland forest prevailed in the lower Welland River, upper Niagara River and Lake Erie watersheds. Moist maple-beech dominant forest occurred for much of the remainder of the area." (RMN, 2003, p.4-12) Given the huge extent of prime agricultural lands in the Niagara Peninsula, particularly north of the Niagara Escarpment there are few remaining woodlands with the exception of those found in valley corridors.

Within the Niagara Escarpment Plan Area, the Niagara Peninsula section is the least forested section. The forested slopes and valleys play a critical role in maintaining linkages between natural habitats on the fragmented landscape. Many of the Escarpment Natural Areas on the escarpment slopes in Niagara are covered in forests that are over 100 years old, originating from stands that were clearcut or heavily logged in the mid-to-late 1800s. There are also some old-growth forests, with trees in excess of 150-200 years old, in the St. John's-Fonthill valley, North Pelham Valley, Niagara Gorge and Beamer Valley. Very few of the forested areas in the Niagara Peninsula Section of the Niagara Escarpment Plan provide large forested interiors because of the fragmentation from roads and hydro lines (Riley et al, 1996, p.48-50).

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6.0 Community Series Analysis

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Goal number one of this Natural Areas Inventory (NAI) was to complete 'Community Series' mapping for the NAI study area. This level of Ecological Land Classification (ELC) mapping, which is the limit to what can be defined through air photo interpretation, has never been available across the entire Niagara Peninsula watershed. It was achieved by first incorporating wetland extents delineated through the Ontario Wetland Evaluation System (Southern Ontario Edition) by the Ministry of Natural Resources (MNR) and NPCA building the linework for the remaining communities through ortho-imagery analysis.

Community Series is defined under the Ecological Land Classification (ELC) as "units that are normally visible and consistently recognizable on air-photos or from a combination of maps, air-photo interpretation and other remote sensing techniques. Community Series are distinguished based on the type of vegetation cover or the plant form that characterizes the community. For the most part, Community Series are identified based on whether the community has open, shrub or treed vegetation cover, as well as whether the plant form is deciduous, coniferous or mixed. These differences in vegetation cover typically reflect differences in disturbance levels, light levels and various other environmental gradients" (Lee, et al., 1998, p. 18).

At the time of this analysis, the mapping was at varying stages of development based on the availability of finalized wetland lines and the ability to do a final quality check of the mapping fabric. Every best effort was made to use the most current information at the time of calculation; however results are subject to change as the mapping receives final quality assurance. The values presented here should be qualified as current 'estimates'. With that said, the results of this analysis provide insight into trends that the new mapping is capturing about actual phenomena on the landscape being examined for the first time (i.e. estimations of successional coverage). This analysis is presented by municipality.

Status of available mapping for Community Series Analysis:

PC (Port Colborne)- complete wetland and community series lines
WF (Wainfleet)- complete wetland and community series lines
FE (Fort Erie)- complete wetland lines, requires QAQC for CS
NF (Niagara Falls)- complete wetland lines, requires QAQC for CS
WE (Welland)- complete wetland lines, requires QAQC for CS
TH (Thorold)- very close to final wetland lines, complete CS
PL (Pelham)- very close to final wetland lines, requires QAQC for CS
WL (West Lincoln)- very close to final wetland lines, requires QAQC for CS
HAL (Haldimand)- all linework in draft
HAM (Hamilton)- existing wetland evaluations, community series interpretation to be initiated

The codes used for this analysis are from the ELC protocol of the MNR. They are part of a list of interim codes developed from the First Approximation of the ELC.

The code used for the analysis is based on the dominant percentage of cover within a given polygon. For example, if the polygon has an ELC Community Series label that reads, FOD/THD/SWX, it would be analyzed as a FOD polygon since the first code listed is the dominant cover type.

The landscape for the purpose of this discussion will be classified as Wooded, Wetland, Successional or Unique. Each will be quantified using historical percentages where available as comparison.

It should be noted that the Community Series fabric is a large scale mapping product with line generalization to support a target scale of 1:2000. As a result of smaller minimum mapping units, the community series polygons can be much finer than traditional 1:10,000 scale natural heritage inventory mapping depending on the landscape (i.e. there is no point in mapping smaller sized polygons if you have a large homogenous tract of a single community). Ultimately this leads to a more spatially accurate inventory as the mapping guidelines dictate more precision with how mapped features are represented and do not eliminate any of the smaller isolated patches that exist.

All percentages calculated and presented in this analysis are either percent of the entire Niagara Watershed study area or percent of the municipality unless otherwise indicated. Values for the City of Hamilton have been included to serve as placeholders, and are underestimates due to the fact the Community Series mapping process has not yet commenced within this municipality.

6.1 Wooded Communities

The Region Municipality of Niagara in Amendment 187 of the Official Plan defines Woodlands as “treed area that provides environmental and economic benefits to both the private landowner and the general public”. These benefits are defined as “erosion prevention, hydrologic and nutrient cycling, provision of clean air and long term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities and the sustainable harvest of woodland products”. It does not however include “cultivated fruit or nut orchard or a plantation used for the purpose of producing Christmas trees”(RMN, 2008, p. 41).

A Forest under ELC refers to a treed community with “greater than 60% canopy cover”, and a Woodland within the ELC protocol means very specifically a treed community with between “35% and 60 % canopy cover” (Lee et al., 1998, p.122).

6.1.1 Wooded Community Series Codes

All of the above definitions include aspects that are difficult to interpret from aerial photography and thus, it was decided that the following ELC-Community Series codes would be considered “Wooded” for the purpose of this landscape level analysis:

FOD – Deciduous Forest
FOC - Coniferous Forest
FOM – Mixed Forest
WOD – Deciduous Woodland
WOC – Coniferous Woodland

WOM – Mixed Woodland
 WOX – Unidentified Woodland Community Class
 SVD – Deciduous Savanna
 SVC – Coniferous Savanna
 SVM – Mixed Savanna
 SVX – Unidentified Savanna Community Class
 SHT – Treed Shoreline
 *SAG – Shrub Agriculture
 *TAG – Treed Agriculture
 *XAG – Unidentified Agriculture Community Class
 *ELC does not break down the plantation types at the Community Series level. This conflicts with the Region of Niagara's definition of woodland.
 **HOD – Deciduous Hedgerows
 **HOC – Coniferous Hedgerows
 **HOM – Mixed Hedgerows
 ** Hedgerows were given their own code not consistent with updated ELC codes so that they could be isolated from forests for the purpose of future analysis (i.e. connectivity studies).
 ***SWD – Deciduous Swamp
 ***Deciduous Swamps are a very special case in the study area since they need to be included as not just wooded area but, also as wetlands. This of course can skew the percentages for each. Further discussion will follow.

6.1.2 Wooded Communities Analysis

For the purpose of this discussion, it was decided that these communities would be referred to as Wooded Areas rather than Woodlands, or Forest to avoid confusion. We could not conform to either of the above definitions since the percent cover is sometimes difficult to accurately define and also, there are possibly some plantations included in the cover percentages.

The 'Wooded Area' coverage for the watershed based on the NAI ELC Community Series fabric (no exhaustive upland community mapping in the City of Hamilton yet) is 17.79 %.

The oldest and most suitable wooded areas data available for comparison were those identified on the 1:10,000 scale Ontario Base Mapping (OBM) Series of base maps as areas of vegetation. This information became the legacy wooded area layer in the MNR's Natural Resources Values Information System (NRVIS) dataset. According to this source, wooded area percentage for the study area was 14.24% when these maps were produced in the late '70's and early '80's.

In 2002, NPCA, MNR, and the Niagara Region partnered to update the 1:10,000 scale wooded area mapping based on 2000, 30 cm black and white ortho imagery analysis. Using mapping criteria based on the definition of a wooded area in the National Topographic Mapping Series of base maps, 16.63 % of the watershed was covered by 'wooded areas'. The increase in wooded area from the OBM can likely be attributed to the temporal difference in the datasets reflecting true changes on the landscape, and to a lesser degree the slightly different definitions of what constituted a wooded area and how they came to be mapped.

The SOLRIS (Southern Ontario Land Resource Information System) project resulted in several types of wooded areas being classified such as Tallgrass Woodland, Forest, Deciduous Forest, Coniferous Forest, Mixed Forest and Swamp. These distinctions were a result of remote sensing classification techniques that were applied to a general wooded area dataset discretely captured (digitized) using ortho interpretation on 2002, 20 cm colour imagery. (MNR, 2007, p. 4-6). This SOLRIS 'Phase One' general wooded area product produced the watershed statistic of 17.65 % Wooded Area.

The analysis for the Natural Areas Inventory thus shows an increase when compared to the historic data. This change is largely based on the improvements to the accuracy and detail with which we are able to map these communities and also to the quality of the field verification.

In older datasets, there were often misclassifications and differing definitions of what constituted a wooded area. Thickets and other successional communities were often confused with and interpreted as "wooded". These communities now have been separated out. As data and mapping have been updated, the ability to more accurately discern the communities has also developed.

The Natural Areas Inventory utilized 2006, colour ortho imagery with 10 cm resolution that was digitally captured (as opposed to traditional film based photography). The added clarity in combination with the resolution at which it was captured has allowed the ability to confidently distinguish other terrestrial natural communities from wooded areas, and to readily decipher between the different early successional communities like meadows and thickets.

Another thing to consider when discussing wooded areas is the ratio of Deciduous Swamp communities. Of the total landscape, 9.14% is identified as swamp, which constitutes 51% of the overall wooded cover. Historically, swamps were considered both wooded areas and the wetlands.

| Municipality | Wooded Area Percent | Swamps Percent |
|---------------------|----------------------------|-----------------------|
| Fort Erie | 25.12 | 14.86 |
| Niagara Falls | 25.07 | 13.40 |
| Wainfleet | 24.41 | 18.84 |
| Pelham | 24.24 | 8.06 |
| Port Colborne | 24.22 | 16.17 |
| West Lincoln | 20.09 | 13.60 |
| Thorold | 19.49 | 6.21 |
| Grimsby | 16.23 | 4.84 |
| Lincoln | 15.92 | 4.12 |
| Haldimand | 15.84 | 5.10 |
| Welland | 14.93 | 6.98 |
| St. Catharines | 9.54 | 0.00 |
| Niagara-on-the-Lake | 8.46 | 0.12 |
| Hamilton* | 2.99 | 2.91 |
| Total NPCA | 17.79 | 9.14 |

Wooded area percentages are largest in the southern municipalities of Niagara, above the escarpment where coverage ranges from one fifth to a quarter of the landscape. In most of these municipalities, save Pelham, with its well drained soils, well over half of that wooded area is comprised of swamp communities. This is not surprising considering the heavy clay soils.

6.2 Wetland Communities

Under the ELC protocol, a wetland is defined as “water table seasonally or permanently at or above the substrate surface; flooded bedrock or hydric mineral or organic (organics > 40cm) substrates; standing water, pools of water or vernal pooling > 20% of the ground cover; wetland plant species cover > 50% of total plant species cover; mean wetness of a site for native species ≤ 0 ; moisture regime ≥ 5 ” (Lee et al., 1998, p. 28).

Under the Ontario Wetland Evaluation System, wetlands are “lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface; in either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants” (MNR, 1993). The OWES of the MNR differs from the ELC protocol in that its primary purpose is not for identifying and delineating wetlands but rather evaluating them. In the absence of exhaustive and adequate wetland inventories, OWES has incorporated a wetland mapping methodology to accompany its evaluation protocol.

The Region of Niagara under their Official Plan Amendment 187 used the OWES definition of wetlands. (RMN, 2008 p. 41)

The Generic Regulations of the Niagara Peninsula Conservation Authority (NPCA) under the Conservation Authorities Act, R.S.O. 1990, c. C.27 defines a wetland as:

- is seasonally or permanently covered by shallow water or has a water table close to or at the surface;
- directly contributes to the hydrological function of a watershed through connection with a surface watercourse;
- has hydric soils, the formation of which has been caused by the presence of abundant water; and
- has vegetation dominated by hydrophytic plants and water tolerant plants, the dominance of which has been favoured by the presence of abundant water

Given that the above definitions generally align with the OWES definition, it was felt that it was most efficient to integrate the OWES wetlands into the ELC Community Series fabric and to not duplicate delineation efforts despite the subtle differences in their actual mapping approaches. This was accomplished by building the fabric initially off of the most current OWES wetland linework from the MNR as it became available.

At the start of the NAI in 2006, MNR had already begun the process of updating the evaluated wetland mapping for 20 Mile creek, Fort Erie and some other areas to coincide with the Watershed Plans of the CA.

The CA and MNR partnered to accelerate the process of the OWES updates and to complete the draft linework for the NAI study area ahead of the field work.

The MNR protocol for evaluating wetlands includes a desktop exercise of interpreting air photos followed by field work, much like the Community Series mapping process. The MNR through the partnership with the CA under the NAI was able to capitalize on the data gathered in the field for the purpose of their evaluation. The CA in turn built the upland Community Series fabric off of the MNR wetland lines to help target field efforts and speed up the gathering of data.

Overall, the partnership ensured consistency in the core identification of wetlands on the landscape. There will be future site specific variation particularly where fieldwork was not completed.

In addition, the OWES minimum mapping unit criteria and the ELC “complexing” rules lead to some unevaluated wetlands throughout the study area that have been identified through the Community Series interpretation of the NAI.

6.2.1 Wetland Community Series Codes

The following ELC-Community Series codes were considered “Wetlands” for the purpose of this landscape level analysis:

MAM – Meadow Marsh

MAS – Shallow Marsh

MAX – Unidentified Marsh Community Class

*SWD – Deciduous Swamp

SWT – Thicket Swamp

SWX – Unidentified Swamp Community Class

SAS – Submerged Shallow Aquatic

SAF – Floating-leaved Shallow Aquatic

OAO – Open Aquatic

OAW – Open Water

**WET – wetland placeholder

*Deciduous Swamps are a very special case in the study area since they need to be included as not just wooded areas, but also as wetlands. This of course can skew the percentages for each. Further discussion will follow.

**WET – is a placeholder for a wetland that is awaiting final wetland evaluation linework that has not yet been classified by community type.

6.2.2 Wetland Communities Analysis

The ‘Wetland’ coverage for the watershed based on the NAI ELC Community Series fabric is 12.15 %.

Most would not realize that until now, wetlands in Niagara have never been thoroughly inventoried. This is likely in part due to their complicated ecological definition which is not the basis for the mapping criteria in traditional base mapping products. These particular datasets tend to discern wetlands in a general land cover context and therefore identify only the obvious wetlands on the landscape like the large marshes at the mouths of significant watercourses, or massive features like the Wainfleet Bog. Another contributing factor would be that despite there being a persistent need for complete wetland mapping for resource inventory purposes, the priority has only relatively recently escalated with the use for regulatory purposes.

The Ontario Base Mapping (OBM) Series identified 0.1 % of the Niagara watershed as wetland. A later product, the 1990 Ontario Land Cover suggested wetland coverage of 1%. The best wetland mapping available prior to the MNR's most recent mapping efforts has been the legacy OWES wetland extents from the province's NRVIS system. This data was openly never a complete inventory effort and tallied wetlands at 3.73% of the watershed.

Recently MNR's SOLRIS product, incorporated these legacy OWES wetlands along with unevaluated features identified through remote sensing techniques, and estimated wetland coverage at 9.79%. Although better, SOLRIS still is a wetland 'indicator' product at best, as the extents for new unevaluated wetland identified through the automated remote sensing process could not be relied upon as appropriate boundaries for most wetland mapping uses.

Based on the MNR's current OWES remapping efforts (with the Lake Ontario Niagara municipalities, and parts of Hamilton yet to be completed), the percentage of evaluated wetland across the Niagara watershed has risen to 10.30%, already surpassing the SOLRIS estimates. When you add the unevaluated dominant wetland communities identified through the Community Series interpretation, wetland coverage in Niagara stands at 12.15%.

It should be noted that there is approximately 2.85% of the remaining landscape that is consider dominant wooded or successional areas in this analysis that are complexed with wetland communities functioning in sub-dominate roles. Combine this with what has yet to be added by finishing the MNR OWES remapping efforts in the remaining municipalities, and Niagara could be approaching a landscape with close to 15% of natural area coverage containing some degree of wetland function.

There is obviously a huge increase in the wetland percentage across the study area. This is a function of an inventory being near completed for the first time consistently across the watershed, but also partly due to the significant changes in how Deciduous Swamps and their associated sloughs in particular are mapped through the Ontario Wetland Evaluation System. This is important as swamps account for 75% of the wetlands currently identified.

In the older OWES data, sloughs were mapped individually within a larger wooded area and only the sloughs were counted as wetlands. Under the new approach to identification of wetlands under the OWES, where soils and species composition supports a wetland designation, an area much larger than the slough is now identified as wetland. These transitional wetland areas between individual sloughs within slough forest woodlands are now contributing to the final wetland delineation, which is very similar to the ELC Community Series mapping approach of complexing highly variable natural areas which are too difficult to map as a single community (ie. SWD / FOD / MAS).

| Municipality | Wetlands Percent | Swamps Percent | OWES Percent |
|---------------------|-------------------------|-----------------------|---------------------|
| Wainfleet | 21.54 | 18.84 | 20.14 |
| Port Colborne | 19.10 | 16.17 | 17.07 |
| Fort Erie | 17.43 | 14.86 | 13.14 |
| Niagara Falls | 17.29 | 13.40 | 14.51 |
| West Lincoln | 15.95 | 13.60 | 14.09 |
| Thorold | 13.60 | 6.21 | 7.60 |
| Haldimand | 12.51 | 5.10 | 10.72 |
| Pelham | 9.91 | 8.06 | 8.79 |
| Welland | 8.52 | 6.98 | 7.28 |
| Grimsby | 7.59 | 4.84 | 5.44 |
| Lincoln | 5.08 | 4.12 | 4.24 |
| Hamilton* | 3.41 | 2.91 | 3.41 |
| Niagara-on-the-Lake | 2.17 | 0.12 | 0.37 |
| St. Catharines | 1.33 | 0.00 | 0.60 |
| Total NPCA | 12.15 | 9.14 | 10.30 |

Wetland communities are concentrated in the southern portion of Niagara above the escarpment with the highest percentages occurring within the three Lake Erie municipalities. Niagara Falls, south of the Welland River, and West Lincoln on the clay plain also have significant wetland totals.

Three quarter of all wetlands are swamp communities, indicating that a considerable portion of Niagara's natural areas contain both wetland and wooded area habitat functions. This also suggests that other wetland community types like marshes constitute just 25% of the total wetlands and therefore may be under represented on the landscape.

6.3 Successional Communities

Historically, successional communities were not explicitly defined. Thickets for example were lumped in with wooded areas based on perceived heights of vegetation. This of course was very difficult to decipher in old aerial photos. Meadows were generally not mapped unless then were wet and then happened to be included with an evaluated wetland.

6.3.1 Successional Community Series Codes

*MEM – Mixed Meadow

MEX – Unidentified Meadow Community Class

THD – Deciduous Thicket

THC – Coniferous Thicket

THM – Mixed Thicket

THX – Unidentified Thicket Community Class

*MEM – Under ELC Meadows are split into Forb or Graminoid dominated communities. At the Community Series level, it is very difficult to discern which it is so they are mostly listed as Mixed Meadows.

6.3.2 Successional Communities Analysis

Due to the fact that these communities were not historically mapped in this way, no historical percentages exist.

The overall percentage of successional communities for the watershed has been calculated as 6.73 %.

It is critically important to map these areas due to their habitat value for specialized species, and their role in supplying key ecological services associated with connectivity across the landscape.

These areas are under intense development pressure where they exist since they are often perceived as less valuable in the natural heritage sense than either wooded areas and wetlands. They are also by their very nature more easily cleared for development or agricultural uses making them vulnerable.

| Municipality | Successional Percent |
|---------------------|-----------------------------|
| Welland | 17.46 |
| Niagara Falls | 14.26 |
| Grimsby | 13.80 |
| Fort Erie | 12.35 |
| Port Colborne | 10.51 |
| Thorold | 9.59 |
| Niagara-on-the-Lake | 7.13 |
| St. Catharines | 5.41 |
| Wainfleet | 5.25 |
| Pelham | 5.13 |
| Lincoln | 4.66 |
| Haldimand | 4.43 |
| West Lincoln | 3.11 |
| Hamilton* | 0.02 |
| Total NPCA | 6.73 |

Successional areas seem to be most abundant in the south east portion of the watershed, with Welland leading the way due to spoil lands attributed with its industrial past (i.e. along canal). Niagara Falls, Fort Erie and Port Colborne also have significant tallies largely due to abandoned agricultural land. In the north, Grimsby also has a substantial tally for this community type.

One highlight in traditional agricultural areas of the watershed is an apparent increase in areas adjacent to watercourses being left as buffers. Where these are not classified as wetlands, they have never before been mapped. Under the NAI, they are now identified as natural area.

6.4 Unique Communities

Similar to successional communities, unique communities such as bluffs, rock barrens and shorelines were neither wetlands nor wooded areas and thus, were not historically mapped as natural areas.

Under the NAI these infrequent but unique communities are important habitat often with a compliment of rare species. They also provide other ecological services associated with connectivity due to their position in transitional areas.

6.4.1 Unique Community Series Codes

BLS – Shrub Bluff
 BLO – Open Bluff
 RBS – Shrub Rock Barren
 RBO – Open Rock Barren
 SHS – Shrub Shoreline
 SHO – Open Shoreline

Although many of these communities are dominated by shrubs generally associated with succession, they were excluded from the successional communities analysis. We are assuming that they are climax communities in this case due to the harsh conditions of bluff, rock barren and shoreline communities.

In addition, other unique communities such as sand barrens, taluses, and cliffs are by nature difficult to interpret from ortho imagery. For this reason, they have been grouped more generally into the communities listed above.

6.4.2 Unique Communities Analysis

Due to the fact that these communities were not historically mapped in this way, no historical percentages exist.

The overall percentage of unique communities for the watershed has been calculated as 0.80 %.

| Municipality | Unique Percent |
|---------------------|-----------------------|
| Fort Erie | 0.51 |
| Port Colborne | 0.38 |
| St. Catharines | 0.06 |
| Wainfleet | 0.06 |
| Haldimand | 0.05 |
| Lincoln | 0.03 |
| Niagara Falls | 0.03 |
| Grimsby | 0.02 |
| Niagara-on-the-Lake | 0.01 |
| Hamilton* | 0.00 |
| Pelham | 0.00 |
| Thorold | 0.00 |
| Welland | 0.00 |
| West Lincoln | 0.00 |
| Total NPCA | 0.08 |

Highest tallies for these natural areas occur within lake-front municipalities by and large due to their bluff and shore communities.

6.5 Conclusion

After applying the Community Series protocol at the landscape level we have developed mapping for a full compliment of natural heritage features on the landscape. They have been mapped at a 1:2000 scale allowing for site specific application of the extents. We can confidently use the mapped boundaries for a host of purposed including planning, policy development, restoration, and statistical analysis.

We have moved away from just looking at wetland and wooded communities when assessing the natural heritage of our watershed and have highlighted some of the more unique and specialized communities and in general, more accurately depicted the real world situation.

The depth of analysis and results presented here are a high level examination of what this mapping product as a complete and detailed inventory of Niagara's natural areas is capable of at the ELC class level. Once examination of the dataset is performed with account for both the dominant and subdominant communities codes for each polygon mapping unit, a more detailed landscape will emerge. Dry upland communities (FOC) will be able to be discerned from those that are mixed (FOD / SWD), climax communities (FOM) will be able to be separated from those that are more varied in maturity (WOD / THD / MEM), and insight into where true meadow communities and therefore potentially tallgrass prairie habitat exist (MEM). Once the dataset is finalized and analyzed to a higher level of scrutiny, it will be exciting to understand all that it is telling us, and its true value as an inventory will even be more apparent.

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Sample Mapping



(Complete Community Series Mapping on disc in back pocket)

7.0 RARE VEGETATION TYPES OF THE NIAGARA REGION, ONTARIO: A PRELIMINARY CHECKLIST

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7.1 INTRODUCTION

The Niagara Peninsula encompasses a variety of significant landforms and plant communities (Vegetation Types). Escarpment talus slopes and cliffs, alvars, prairies, Great Lakes shorelines, bogs and fens are all examples of rare plant communities that occur in the Regional Municipality of Niagara. Many of these rare plant communities provide habitats for conservative and specialized plant species that are rare in both Niagara and Ontario. Rare plant communities are of considerable conservation interest, often representing highly specialized habitats and the last remnants of formerly more widespread vegetation.

The main body of this report provides an overview of the rare Vegetation Types in the Regional Municipality of Niagara (Niagara Region), as well as the portion of Haldimand County which lies within the Niagara Peninsula Conservation Authority (NPCA) watershed. Table 1 presents a summary of rare plant communities and Table 2 is a checklist of all plant communities known from the Niagara Region.

7.2 ECOLOGICAL LAND CLASSIFICATION (ELC)

The goal of the provincial Ecological Land Classification (ELC) program is to develop a province-wide, comprehensive and consistent approach to ecosystem description, inventory and interpretation (Lee et al. 1998). The ELC program is intended to provide a uniform and consistent means to identify, describe, name and map important landscape patterns and plant communities (Riley and Mohr 1994). The *Ecological Land Classification in Southern Ontario* (Lee et al. 1998) applies to Site Regions 6E and 7E in southern Ontario.

The ELC comprises six nested levels. From the largest to the smallest scales, they are as follows: Site Region, System, Community Class, Community Series, Ecosite and Vegetation Type (Lee et al. 1998). The Ecosite and Vegetation Type are the main units mapped at the site-specific level. Bakowsky (1996) defined Ecosite and Vegetation Type as follows:

Ecosite is a mappable landscape unit defined by a relatively uniform parent material, soil and hydrology, and consequently supports a consistently recurring formation of plant species which develop over time (vegetation chronosequence). The Vegetation Type is part of an ecosite, and represents a specific assemblage of species which generally occur in a site with a more uniform parent material, soil and hydrology, and a more specific chronosequence.

The Vegetation Type is the basic plant community unit that is ranked in Ontario for conservation purposes (Bakowsky 1996). Provincial ranks are based on three factors: estimated number of occurrences, estimated community areal extent, and estimated range of the community within the province (Bakowsky 1996).

To the extent feasible, this report follows the plant community typology contained in the *Ecological Land Classification in Southern Ontario* (Lee et al. 1998) since this is the only published ELC document in wide circulation in southern Ontario. In some cases, more suitable Vegetation Types were used from “*Updates to the First Approximation Southern Ecological Land Classification*” (Lee 2003 [open document]). In a few cases, new Vegetation Types not contained in either ELC document were identified; these new types were reviewed and ranked in collaboration with W.D. Bakowsky (NHIC – Community Ecologist).

7.3 STATUS OF VEGETATION TYPES AND PLANT SPECIES (ONTARIO AND NIAGARA REGION)

Definitions are provided below for the provincial and regional status of Vegetation Types and vascular plant species used in the main body of this report which is an annotated rare plant community checklist. Scientific and common names of vascular plants generally follow Oldham (2010).

7.3.1 Ontario Rank (S-rank): Vegetation Types and Vascular Plant Species

Provincial (or subnational) conservation status ranks (S-ranks) are used by the Ontario Natural Heritage Information Centre (NHIC) to set conservation priorities for rare species and natural plant communities. These ranks are not legal designations, unlike COSEWIC and MNR species at risk statuses. The most important factors considered in assigning provincial ranks are the total number of known, extant sites in Ontario, and the degree to which they are potentially or actively threatened with destruction. Other criteria include the number of known populations considered to be securely protected, the size and population trends of provincial occurrences, and the ability of the taxon to persist at its known sites. Ontario ranks follow Bakowsky (1996) for plant communities and Oldham and Brinker (2009) for native plant species of provincial conservation concern and the NHIC database for all other plant species. See the NHIC web page (<http://nhic.mnr.gov.on.ca/nhic.cfm>) for updated ranks.

S1 = Critically Imperilled: Critically imperilled in Ontario because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.

S2 = Imperilled: Imperilled in Ontario because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.

S3 = Vulnerable: Vulnerable in Ontario due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 = Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 = Secure: Common, widespread, and abundant in Ontario.

7.3.2 Ontario Status (MNR) – Vascular Plant Species

Provincial species at risk (SAR) status assigned by the Committee on the Status of Species at Risk in Ontario (COSSARO), following the most recent Species At Risk in Ontario (SARO) list (Ontario Ministry of Natural Resources 2009). Endangered (END), Threatened (THR), and Extirpated (EXP) species are legally protected under the province's Endangered Species Act (ESA), 2007.

END = Endangered. A species facing imminent extinction or extirpation in Ontario.

THR = Threatened. A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC = Special Concern. A species with characteristics that make it sensitive to human activities or natural events.

7.3.3 Niagara Region Status – Ecosites and Vegetation Types

Regionally Rare = ELC Ecosites and Vegetation Types known from 10 or fewer sites in the Regional Municipality of Niagara (based on NAI database and partial literature review). A portion of the NAI study area, i.e. the NPCA watershed, extends into Haldimand County. Occurrences of rare communities from Haldimand are included in the checklist, but only Niagara Region occurrences were considered when assigning regional status.

7.3.4 Niagara Region Status – Vascular Plants

R = Regionally Rare. Rare in the Regional Municipality of Niagara; known from 10 or fewer recently verified (post-1980) locations (Oldham 2010)

U = Regionally Uncommon. Uncommon in the Regional Municipality of Niagara; known from 11 to 20 recently verified (post-1980) sites (Oldham 2010).

C = Common. Common in the Regional Municipality of Niagara; known from more than 20 recently verified (post-1980) sites (Oldham 2010).

7.4 RARE VEGETATION TYPES IN THE NIAGARA REGION: A PRELIMINARY CHECKLIST

An overview of the rare Vegetation Types in the Niagara Region is provided in the following preliminary annotated checklist. Notes are provided under Community Class, Ecosite and Vegetation Type headings, including: Beach/Bar, Sand Dune, Cliff, Talus, Alvar, Tallgrass Prairie, Deciduous Forest, Coniferous Swamp, Deciduous Swamp, Thicket Swamp, Bog, Fen and Marsh.

Rare plant communities in the Niagara Region are defined as ELC Ecosites and Vegetation Types that are rare in Ontario, i.e., ranked S1, S2 or S3 by Bakowsky (1996; pers. comm. 2010) and/or regionally rare Ecosites and Vegetation Types, i.e., those known from 10 or fewer sites in Niagara Region. Ecosites or Vegetation Types not listed in the published ELC manual (Lee et

al. 1998) or more recent working document (Lee 2003 [open document]) are denoted with an asterisk “*”. Ecosites and Vegetation Types listed in Lee (2003 [open document]) but not in the published 1998 ELC manual are denoted with a double-asterisk “**”.

In the plant community descriptions, examples of provincially and regionally significant/rare plant taxa are denoted in parentheses with their status in bold font (e.g. **END**, **THR**, **SC**, **S1**, **S2**, **S3**, **R**, **U**). Table 1 provides a summary of rare Ecosites and Vegetation Types documented in the Niagara Region. Table 2 provides a working checklist of ELC Ecosites and Vegetation Types reported from the region.

This is a working document, and it is expected that the list of Ecosites and Vegetation Types reported from the Niagara Region will grow considerably over time, as knowledge increases with further research and field work. Reports of new and/or rare plant communities should be forwarded to the staff ecologist at the Niagara Peninsula Conservation Authority (NPCA) as well as to the Natural Heritage Information Centre (<http://nhic.mnr.gov.on.ca/>). The Conservation Authority maintains a Natural Heritage Database that includes an ELC mapping component (GIS-based).

7.4.1 BEACH/BAR

Mineral Open Beach/Bar Ecosite (BBO1)

Sea Rocket Sand Open Beach Type (BBO1-1) S2S3, Regionally Rare

Open beach communities occur on unconsolidated sand substrates which are subject to active shoreline processes.

Scattered plants of Sea Rocket (*Cakile edentula* **R**) and occasionally Wormwood (*Artemisia campestris* ssp. *caudata* **R**) occur along the open sand beaches between the seasonal high water mark or waveline and the toe of the dune slope. Typically this community is sparsely vegetated and can support occasional woody species such as Sandbar Willow (*Salix interior* [*Salix exigua*]), Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*) and Black Locust (*Robinia pseudo-acacia*), as well as, trailing vines of Riverbank Grape (*Vitis riparia*). Other regionally rare and uncommon shoreline species include Beach Pea (*Lathyrus japonicus* **R**), Trailing Wild Bean (*Strophostyles helvula* **R**), Seaside spurge (*Euphorbia polygonifolia* [*Chamaesyce polygonifolia*] **R**), Clammy-weed (*Polanisia dodecandra* **U**), Sand Grass (*Triplasis purpurea* **R**) and Long-spined Sandbur (*Cenchrus longispinus* **R**); these species are more or less restricted to the shoreline areas of the Great Lakes (Riley 1989a, after Guire and Voss 1963). This community generally occurs along the shallow bays between intervening headlands of the Lake Erie shoreline, including NAI study area PC-10. Low-lying sections of beach in many locations are being invaded by European Common Reed (*Phragmites australis* ssp. *australis*), which displaces native plant species.

Bedrock Open Beach/Bar Ecosite (BBO2)

Calcareous Open Bedrock Shoreline Type (BBO2-?) S3?, Regionally Rare*

Open limestone bedrock shoreline occurs along the headlands of the Lake Erie coast, particularly along the eastern half of the lake. Large expanses of open limestone shoreline are criss-crossed by crevices and fractures (grykes) that contain a thin veneer of washed-in sands. This community varies in extent in response to the cycle of the lake levels. The variable flooding regime, along with ice scour, keeps these communities generally free of woody

vegetation. Occasionally however, weather-beaten trees persist, including Manitoba Maple (*Acer negundo*), Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*), Green Ash (*Fraxinus pennsylvanica*), and on rare occasions, Sycamore (*Platanus occidentalis* **U**). Occasional ice-shorn thickets of Sandbar Willow (*Salix interior* [*Salix exigua*]) can take hold in the bedrock crevices or on thin deposits of sands and broken/pulverized Zebra Mussel shells. Scattered low shrubs of Kalm's St. John's-wort (*Hypericum kalmianum* **R**) can also be found. In the open bedrock area, cracks and crevices lined with moist sands support a mix of species such as Grass-leaved Goldenrod (*Euthamia graminifolia*), Tufted Hairgrass (*Deschampsia cespitosa* ssp. *cespitosa* **R**), Purple Loosestrife (*Lythrum salicaria*), Little Bluestem (*Schizachyrium scoparium* **R**), Frank's Love Grass (*Eragrostis frankii* **R**), Fall Panic Grass (*Panicum dichotomiflorum*), Panic Grass (*Dichanthelium acuminatum* ssp. *implicatum*), Greenish Sedge (*Carex viridula* **U**), Elliptic Spike-rush (*Eleocharis elliptica* **R**), Common Three-square (*Schoenoplectus pungens* [*Scirpus pungens*] **U**), Shining Cyperus (*Cyperus bipartitus* **U**), rushes (e.g. *Juncus alpinoarticulatus* **R**, *J. articulatus* **U**, *J. nodosus* **R**), Pale Smartweed (*Persicaria lapathifolia* [*Polygonum lapathifolium*]), European Water-horehound (*Lycopus europaeus*), Slender Agalinis (*Agalinis tenuifolia* **R**), Kalm's Lobelia (*Lobelia kalmii* **R**), Prairie Loosestrife (*Lysimachia quadriflora* **R**) and Wild Savory (*Clinopodium arkansanum* [*Calamintha arkansana*] **R**) (Macdonald 1990). Most of these species are regionally rare and/or regionally restricted to coastal areas.

Mineral Shrub Beach/Bar Ecosite (BBS1)

Willow Gravel Shrub Beach Type (BBS1-2) S3? Regionally Rare

This community is restricted to the Lake Erie and Lake Ontario shorelines on unconsolidated mineral substrates (sands, gravels and weathered Zebra Mussel shells); similar communities occur on exposed limestone bedrock shorelines (typically rooting in bedrock cracks and fissures). Sandbar Willow (*Salix interior* [*Salix exigua*]) is the main species forming thickets which are subject to ice scour, fluctuating water levels, and wave energy. Trees are generally absent, although young Eastern Cottonwoods (*Populus deltoides* ssp. *deltoides*) temporarily can persist. Low thickets of Ninebark (*Physocarpus opulifolius*) and Kalm's St. John's-wort (*Hypericum kalmianum* **R**) can also be part of this community. Willow shrub beach communities occur along portions of the Lake Erie shoreline and on beach bars along Lake Ontario.

Mineral Treed Beach / Bar Ecosite (BBT1)

*Cottonwood Mineral Treed Shoreline Type (SHTM1-1**) Regionally Rare*

Open sand beaches along the Lake Erie shoreline which have not been recently scoured by ice or inundated by high water levels can support young stands of Eastern Cottonwoods (*Populus deltoides* ssp. *deltoides*), Black Locust (*Robinia pseudo-acacia*), Manitoba Maple (*Acer negundo*) and occasionally Tree-of-heaven (*Ailanthus altissima*). Often a dense layer of shrub willows (*Salix* spp.) and tangled vines of Riverbank Grape (*Vitis riparia*) occur in the shrub layer.

7.4.2 SAND DUNE

Open Sand Dune Ecosite (SDO1)

*Beach Grass – Wormwood Open Graminoid Sand Dune Type (SBOD1-4**) S2, Regionally Rare*

Active sand dunes that have not be negatively impacted by hardened shorelines (e.g. cement blocks, rip-rap or shorewalls) and invasive species support open and dynamic communities dominated by dense colonies of Beach Grass (*Ammophila breviligulata* **R**), and scattered clumps of Canada Wild-rye (*Elymus canadensis* **U**), Switchgrass (*Panicum virgatum* **U**), Wormwood (*Artemisia campestris* ssp. *caudata* **R**), and occasional patches of Starry False Solomon's-seal (*Maianthemum stellatum*) and Little Bluestem (*Schizachryium scoparium* **R**). Trailing vines of Riverbank Grape (*Vitis riparia*) and Poison-ivy (*Toxicodendron rydbergii* [*Rhus radicans* ssp. *rydbergii*]) are also very common. The lower slopes of the dunes also support shoreline species such as Cocklebur (*Xanthium strumarium*), Silverweed (*Potentilla anserina*), Sea-rocket (*Cakile edentula* **R**), Seaside Spurge (*Euphorbia polygonifolia* [*Chamaesyce polygonifolia*] **R**), Clammy-weed (*Polanisia dodecandra* **U**) and Grass-leaved Goldenrod (*Euthamia graminifolia*). Beach Grass – Wormwood Open Graminoid Sand Dune and similar communities occur on some sections of the Lake Erie coast, including NAI Study Area PC-04.

Shrub Sand Dune Ecosite (SDS1)

Hop-tree Shrub Dune Type (SDS1-2) S2, Regionally Rare

Along the tops or ridges of active sand dunes on the Lake Erie shoreline, thickets of Common Hop-tree (*Ptelea trifoliata* var. *trifoliata* **S3, THR, R**) are rarely encountered. Dense thickets of Common Hop-tree shrubs dominate this community, often with tangles of Riverbank Grape (*Vitis riparia*) and occasional clusters of Bladdernut (*Staphylea trifolia* **U**). Dune grasses such as Canada Wild-rye (*Elymus canadensis* **U**) and occasionally Beach Grass (*Ammophila breviligulata* **R**) can be found in the very open ground layer, sometimes occurring with Starry False Solomon's-seal (*Maianthemum stellatum*). Reported from NAI study area PC-06.

Treed Sand Dune Ecosite (SDT1)

Cottonwood Treed Dune Type (SDT1-1) S1, Regionally Rare

Active dunes along the Lake Erie shoreline occasionally support open-grown individuals and small groves of tall Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*). This very open stand mixes with expanses of open sand dunes and shares the same suite of species in the shrub and ground layer as open dune communities. Red Oak (*Quercus rubra*) can be an occasional associate. On more disturbed dunes, Manitoba Maple (*Acer negundo*), and non-native trees such as Lombardy Poplar (*Populus nigra*), Scots Pine (*Pinus sylvestris*), Black Locust (*Robinia pseudo-acacia*), White Poplar (*Populus alba*) and Tree-of-heaven (*Ailanthus altissima*) can also be persistent invaders.

7.4.3 NIAGARA ESCARPMENT – CLIFF AND TALUS

The cliff rims, cliffs, talus slopes, terraces and bedrock gorges associated with the Niagara Escarpment landform represent specialized habitats of limited extent in southern Ontario. A number of fern species are mainly restricted to the Niagara Escarpment and limestone river cliffs (Riley 1989a). Four of these 'Escarpment' species are present in the Niagara Region: Purple-stemmed Cliff-brake (*Pellaea atropurpurea* **S3, R**), Smooth Cliff-brake (*Pellaea glabella* **R**), Tetraploid Maidenhair Spleenwort (*Asplenium trichomanes* ssp. *quadrivalens* **R**) and Walking Fern (*Asplenium rhizophyllum* **R**). Within the Niagara Region, several other species exhibit a close association with the Niagara Escarpment, including Green Violet (*Hybanthus concolor* **S2, R**) and Small-flowered Leaf-cup (*Polymnia canadensis* **U**).

7.4.4 CLIFF

Carbonate Open Cliff Ecosite (CLO1)

Cliffbrake – Lichen Carbonate Open Cliff Type (CLO1-1) S2, Regionally Rare

Open cliffs with Smooth Cliff-brake (*Pellaea glabella* ssp. *glabella* **R**) and lichens are known from the Niagara Gorge along the open carbonate (dolostone/limestone) cliff face above the Niagara Glen, Fifteen and Sixteen Mile Valleys (including above the 15 Mile Creek Gorge at Rockway Conservation Area), Beamsville Escarpment and the Niagara Section Escarpment near the boundary with the City of Hamilton (Riley et al. 1996). Purple-stemmed Cliff-brake (*Pellaea atropurpurea* **S3, R**) also occurs on some of these cliffs.

Bulblet Fern – Herb Robert Carbonate Open Cliff Type (CLO1-2) S3, Regionally Rare

Bulblet Fern (*Cystopteris bulbifera*) and Herb Robert (*Geranium robertianum*) dominated open cliffs occur along the Niagara Escarpment; reported from eight Areas of Natural and Scientific Interest (ANSI) (Riley et al. 1996). A small example occurs on a cliff face of the Onondaga Escarpment along the Ridge Road area in Fort Erie.

Moist Open Carbonate Cliff Seepage Type (CLO1-4) S3, Regionally Rare

Open cliff seepage areas exist along the cliff face of the Niagara Gorge and are home to the rare Allegheny Mountain Dusky and Northern Dusky Salamanders. These moist open carbonate cliff seepage communities are dominated by Satin Grass (*Muhlenbergia mexicana*), White Snakeroot (*Ageratina altissima* [*Eupatorium rugosum*]), Bulblet Fern (*Cystopteris bulbifera*) and Ontario Aster (*Symphyotrichum ontarionis* var. *ontarionis* [*Aster ontarionis*]) (Riley et al. 1996). Pale Jewelweed (*Impatiens pallida* **U**) and Bulblet Fern are dominants at Short Hills Provincial Park (Riley et al. 1996).

Open Carbonate Cliff Rim Type (CLO-1-5) S2, Regionally Rare

Open cliff rim communities with Canada Blue Grass (*Poa compressa*) occur along the Niagara Gorge (Riley et al. 1996).

Carbonate Treed Cliff Ecosite (CLT1)

White Cedar Treed Carbonate Cliff Type (CLT1-1) S3, Regionally Rare

White Cedar (*Thuja occidentalis*) dominates the escarpment cliff at Beamer Memorial Conservation Area in the Niagara Escarpment Section ANSI (Riley et al. 1996).

7.4.5 TALUS

Carbonate Open Talus Ecosite (TAO1)

Dry – Fresh Carbonate Open Talus Type (TAO1-1) S2, Regionally Rare

Dry open talus dominated by Leaf-cup (*Polymnia canadensis* **U**) and Thicket Creeper (*Parthenocissus inserta*) occurs along the Niagara Gorge (Riley et al. 1996).

Fresh – Moist Carbonate Open Talus Type (TAO1-2) S2, Regionally Rare

Moist open talus communities occur along the Niagara Gorge, dominated either by White Snakeroot (*Ageratina altissima* [*Eupatorium rugosum*]) - Arrow-leaved Aster (*Symphyotrichum urophyllum* [*Aster urophyllus*] **U**) or Wild Yam (*Dioscorea villosa* [*Dioscorea quaternata*] **U**) – Big Bluestem (*Andropogon gerardii* **U**) – White Snakeroot. At DeCew Gorge, moist open talus is dominated by Zig-zag Goldenrod (*Solidago flexicaulis*) – White Snakeroot – Coltsfoot (*Tussilago farfara*) (Riley et al. 1996).

Carbonate Shrub Talus Ecosite (TAS1) S3

Limestone talus in Ontario is very restricted in its distribution, with the majority restricted to the Niagara Escarpment. In addition, limestone shrub talus occupies a relatively small area. At the ecosite level it can be ranked S3 (Wasyl Bakowsky, pers. comm.).

Mountain Maple Carbonate Shrub Talus Type (TAS1-2) S3, Regionally Rare

Mountain Maple (*Acer spicatum*) dominated shrub talus occurs at the Homer Escarpment ANSI (Riley et al. 1996). Mountain Maple – American Yew (*Taxus canadensis*) – Black Raspberry (*Rubus occidentalis*) shrub talus occurs at the Beamsville Escarpment ANSI (Riley et al. 1996).

Some limestone talus types listed by Riley et al. (1996) do not fit readily into the ELC, however they are ranked **S3** at the ecosite level (W.D Bakowsky, pers. comm.). These other examples of carbonate shrub talus reported by Riley et al. (1996) include:

Ninebark (*Physocarpus opulifolius*) – Niagara Gorge
Riverbank Grape (*Vitis riparia*) – Jordan Valley
Red-berried Elder (*Sambucus racemosa* ssp. *pubens*) - DeCew Gorge
Red-berried Elder – Round-leaved Dogwood (*Cornus rugosa*) – 15 and 16 Mile Creek Valleys
Red-berried Elder – Flowering Raspberry (*Rubus odoratus*) – Niagara Section Escarpment
Red-berried Elder – Riverbank Grape (*Vitis riparia*) – Niagara Section Escarpment
Staghorn Sumac (*Rhus typhina*) – Niagara Gorge; DeCew Gorge, Jordan Valley

Carbonate Treed Talus Ecosite (TAT1)

Dry-Fresh Chinquapin Oak Carbonate Treed Talus Type (TAT1-1) S1S2?, Regionally Rare

Semi-open Chinquapin Oak (*Quercus muhlenbergii* **U**) dominated talus slope woods occur in the Niagara Gorge (Riley et al. 1996).

Dry – Fresh White Birch Carbonate Treed Talus Type (TAT1-3) S3, Regionally Rare

White Birch (*Betula papyrifera*) treed talus communities are described from the Niagara Gorge and Niagara Section Escarpment ANSI (Riley et al. 1996).

Fresh-Moist Sugar Maple Carbonate Treed Talus Type (TAT1-4) S3

Sugar Maple (*Acer saccharum* ssp. *saccharum*) treed talus stands are common along the Niagara Escarpment (Riley et al. 1996) and also known from smaller talus slopes along the Onondaga Escarpment in Fort Erie.

Fresh-Moist Basswood – White Ash Carbonate Treed Talus Type (TAT1-5) S2, Regionally Rare

Basswood (*Tilia americana*) and White Ash (*Fraxinus americana*) treed talus communities are reported from the Niagara Gorge (Riley et al. 1996).

Fresh-Moist Hemlock – Sugar Maple Carbonate Treed Talus Type (TAT1-6) S2, Regionally Rare

Eastern Hemlock (*Tsuga canadensis*) and Sugar Maple (*Acer saccharum* ssp. *saccharum*) treed talus communities are described from the Niagara Gorge, Jordan Valley and Niagara Section Escarpment ANSI (Riley et al. 1996).

A number of other carbonate treed talus community associations that do not fit readily into the ELC are listed in Riley et al. (1996).

7.4.6 ALVAR

Open Alvar Ecosite (ALO1)

Dry Lichen – Moss Open Alvar Pavement Type (ALO1-1) S1, Regionally Rare

Treed Alvar Ecosite (ALT1)

Red Cedar – False Pennyroyal Treed Alvar Type (ALT1-?) S2?, Regionally Rare*

All natural alvar communities in Ontario are ranked between S1 and S3 (Bakowsky 1996, pers. comm.). In the Niagara Region, 'alvar' communities generally occur in more disturbed, cultural landscapes. Alvar habitats in the Niagara Region are disjunct by hundreds of kilometres from the nearest of the main alvar regions in Ontario (e.g., western Lake Erie, Bruce Peninsula, Carden Plain). Some alvar vegetation is found closer on the Flamborough Plain at Hayesland and elsewhere (Goodban 1995), on the Onondaga Escarpment at the Salem-Rockford Rocklands near Hagersville (Gartshore et al. 1987).

Some Red Cedar (*Juniperus virginiana*) communities occur on shallow soils over limestone near the Lake Erie shore near Morgan's Point; these areas were not visited during the NAI. Alvar sites that once existed along the Onondaga Escarpment between Fort Erie and Hagersville appear to have largely been destroyed (Catling et al. 1975; Catling and Brownell 1995).

Cultural alvar communities, or 'pseudo-alvars', have developed in some areas where overlying soils have been removed, exposing flat expanses of open limestone bedrock. Lichens and mosses have colonized the exposed bedrock and some alvar species like False Pennyroyal (*Trichostema brachiatum* **R**), Early Saxifrage (*Micranthes virginensis* [*Saxifraga virginensis*] **U**) and Hairy Beardtongue (*Penstemon digitalis* **U**) also occur. The regionally rare Ebony Spleenwort (*Asplenium platyneuron* **R**) has also colonized these areas. This community is known from two NAI study areas in Wainfleet (WF-22) and Fort Erie (FE-11).

Near Point Abino, there is a disturbed alvar that appears to have been artificially created through removal of topsoil to reveal exposed limestone bedrock. The presence of alvar species such as False Pennyroyal (*Trichostema brachiatum* **R**), suggests that there is or was some natural alvar in the general vicinity. This community is extensively disturbed and dominated by alien species, but it is one of very few examples of alvar vegetation in the Niagara Peninsula and was considered of regional conservation significance by Oldham (2000).

Alvar communities were also reported from east of Smithville in Lincoln Township (Colville Consulting 2006; Dougan and Associates 1999), classified as a "Red Cedar Cultural Alvar Savannah" community. This feature is on shallow soils (Farmington Loam) and there are some

dolostone bedrock outcrops. Some of the more open areas in the eastern portion of this unit show signs of soil disturbance on 1978 aerial photography. Red Cedar (*Juniperus virginiana*) is the main tree species, with Bur Oak (*Quercus macrocarpa*), Chinquapin Oak (*Quercus muhlenbergii* **U**), White Ash (*Fraxinus americana*) and thickets of Northern Prickly-ash (*Zanthoxylum americanum*) and Gray Dogwood (*Cornus foemina* ssp. *racemosa*) interspersed with openings dominated by Poverty Oat Grass (*Danthonia spicata*) and Pennsylvania Sedge (*Carex pensylvanica*). Other shrubs include, Chokecherry (*Prunus virginiana*), Downy Arrowwood (*Viburnum rafinesquianum*), Bladdernut (*Staphylea trifolia* **U**), hawthorns (*Crataegus* spp.), Staghorn Sumac (*Rhus typhina*) and Common Buckthorn (*Rhamnus cathartica*). Several species largely restricted to alvars in southern Ontario (Catling 1995) occur in this area, such as False Pennyroyal (*Trichostema brachiatum* **R**), Balsam Ragwort (*Packera paupercula* [*Senecio pauperculus*] **R**) and Dwarf Vervain (*Verbena simplex* **R**). Other native herbaceous species of open habitats include Hairy Beardtongue (*Penstemon hirsutus* **U**), Foxglove Beardtongue (*Penstemon digitalis* **U**), Wild Bergamot (*Monarda fistulosa*), Tower Mustard (*Turritis glabra* [*Arabis glabra*] **R**), Narrow-leaved Panic-grass (*Panicum linearifolium* **R**) and Ensheathed Dropseed (*Sporobolus neglectus* **R**).

7.4.7 CALCAREOUS SHALLOW SOIL SAVANNAH*

Dry Chinquapin Oak - Little Bluestem - Big Bluestem Calcareous Shallow Soil Savannah Type S1,*
Regionally Rare

Bakowsky (2007) classified the savannah communities along the rim of the Niagara Gorge downstream from Niagara Falls as *Chinquapin Oak – Little Bluestem – Big Bluestem Calcareous Shallow Soil Savannah**. This community type occurs on shallow soils over limestone or dolostone bedrock in southern Ontario. This type is related to alvar savannahs, but the soils in this Vegetation Type are deeper than those found on alvars (generally greater than 15 cm in depth) and Chinquapin Oak (*Quercus muhlenbergii* **U**) is one of the main canopy species. Several alvar plant species have been recorded from the Niagara Gorge, including Small Skullcap (*Scutellaria parvula* var. *parvula* **R**), Balsam Ragwort (*Packera paupercula* [*Senecio pauperculus*] **R**) and Upland Goldenrod (*Solidago ptarmicoides* **R**), although only the latter has been seen recently.

This type of vegetation was described previously by several authors (McIntosh and Catling 1979; Riley et al. 1996; Varga and Kor 1993). In a narrow band along the rim of the gorge downstream from Niagara Falls, five patches were mapped in total. The Niagara Parkway runs close to the rim of the gorge for several kilometers and open grown oaks (*Quercus* spp.) and hickories (*Carya* spp.) occur for several kilometers next to this road. Although much of this area contains manicured grounds and gardens, there are remaining areas of semi-natural vegetation. These trees occupy a band up to several hundred meters in width, which suggests this vegetation was originally fairly extensive along the edge of the Niagara Gorge. Varga (unpublished, NHIC Archives) mapped much of this area as savannah in his unpublished pre-European settlement savannah mapping for the Niagara Region.

At the rim of the Niagara Gorge on shallow soils over limestone bedrock, *Chinquapin Oak – Little Bluestem – Big Bluestem Calcareous Shallow Soil Savannah** is dominated by open grown Chinquapin Oak, White Oak (*Quercus alba*) and Black Oak (*Quercus velutina* **U**), with less frequent Pignut Hickory (*Carya glabra* **S3 U**) and Shagbark Hickory (*Carya ovata*). Between the trees, openings are dominated by a mix of prairie grass and forb species. Closer to the edge

of the cliff rim where soils are shallowest, groundcovers are dominated by Little Bluestem (*Schizachyrium scoparium* **R**) and Rough Dropseed (*Sporobolus compositus* [*Sporobolus asper*] **R**), where there are some areas of exposed bedrock. The soils become deeper further from the cliff, where Little Bluestem becomes mixed with Big Bluestem (*Andropogon gerardii* **U**) and occasionally Indian Grass (*Sorghastrum nutans* **R**), as well as a greater diversity of forb species. Other prairie or woodland species present are Butterfly Weed (*Asclepias tuberosa* **R**), Hairy Beardtongue (*Penstemon hirsutus* **U**), Sky-blue Aster (*Symphyotrichum oolentangiense* [*Aster azureus*, *A. oolentangiensis*] **R**), Smooth Aster (*S. laeve* [*Aster laevis*] **U**), Fragrant Sumac (*Rhus aromatica* **R**), Intermediate Tick-trefoil (*Lespedeza violacea* [*L. intermedia*] **R**), Seneca Snakeroot (*Polygala senega* **R**) and Wild Bergamot (*Monarda fistulosa*) (Bakowsky 2007).

The greatest threat to this Vegetation Type at the Niagara Gorge is encroachment by woody species, including invasive species such as Common Buckthorn (*Rhamnus cathartica*). Many significant plant species formerly known from this area have not been recorded for some time. Careful management, including the controlled use of fire, needs to be continued to restore this vegetation (Bakowsky 2007).

Chinquapin Oak is also dominant along a section of the cliff rim on dolostone pavement above the talus slope at Louth Conservation Area in Lincoln (A. Thompson, pers. comm.).

7.4.8 TALLGRASS PRAIRIE, SAVANNAH AND WOODLAND

Dry Tallgrass Prairie Ecosite (TPO1)

Dry Tallgrass Prairie Type (TPO1-1) S1, Regionally Rare

Small, disturbed prairie remnants occur on the sands and gravels of the St. David's Buried Gorge. Extensive aggregate extraction in this area has impacted most of the original plant communities; however, small patches of prairie grasses occur on the fringes of active aggregate operations and along sections of the railroad which bisects the geologic feature. 'Prairie' species found here include Big Bluestem (*Andropogon gerardii* **U**), Little Bluestem (*Schizachyrium scoparium* **R**), Indian Grass (*Sorghastrum nutans* **R**), Butterfly Weed (*Asclepias tuberosa* **R**) and Showy Tick-trefoil (*Desmodium canadense* **U**).

Historically, prairie, tallgrass oak savannah and woodland likely existed over the section of the Fonthill Kame-Delta, near Lookout Street in Pelham, where the highest elevations of this feature exist. However, extensive and early agricultural and horticultural nursery activities have disturbed much of the original plant communities. During colonization, this area was also sought out as a military base owing to the vantage point of this height of land and the open nature of the woodlands which naturally occurred here. Most likely these were oak woodlands and savannahs mixed with open prairie areas. Southwest of Lookout Street and Highway 20, an extremely mature remnant Black Oak woodland remains. Massive, open grown Black Oak (*Quercus velutina* **U**) and White Oak (*Quercus alba*) trees form an open woodland canopy with Pignut Hickory (*Carya glabra* **S3, U**) as an occasional associate. In the very sparse and open understorey, Flowering Dogwood (*Cornus florida* **END, U**) can also be found.

Small patches of open Tallgrass Prairie (TPO) occur as part of a mosaic of dune and coastal marsh habitats at Windmill Point and Erie Beach on the Lake Erie shore. Dominant prairie and shoreline grass species include Big Bluestem (*Andropogon gerardii* **U**), Switch Grass (*Panicum virgatum* **U**), Little Bluestem (*Schizachyrium scoparium* **R**), Indian Grass (*Sorghastrum nutans* **R**) and Canada Wild-rye (*Elymus canadensis* **U**). Scattered trees include Eastern Cottonwood

(*Populus deltoides* ssp. *deltoides*), Sycamore (*Platanus occidentalis* **U**) and Black Oak (*Quercus velutina* **U**). These patches occur on shallow sands (15-40 cm deep) over limestone bedrock and are apparently maintained by shoreline dynamics.

Prairie, oak savannah and tallgrass oak woodland communities typically need an ongoing program of monitoring and active management (e.g., prescribed burns, woody plant control, seeding/planting of conservative species) if their ecological integrity is to be maintained over the long term.

7.4.9 DECIDUOUS FOREST

*Dry-Fresh Sugar Maple – Hardwood Calcareous Shallow Deciduous Forest Type (FODR1-1**) – Regionally Rare (on the Onondaga Escarpment)*

Dry–Fresh Sugar Maple–Hardwood Calcareous Shallow Deciduous Forest Type occurs along the Onondaga Escarpment. This Sugar Maple – Hardwood forest is very similar to the Niagara Escarpment types and supports a diverse ground layer over shallow soils with exposed bedrock, fissures and crevices. Sugar Maple (*Acer saccharum* ssp. *saccharum*) dominates the closed canopy with White Ash (*Fraxinus americana*), Red Oak (*Quercus rubra*) and Black Cherry (*Prunus serotina*) as lesser associates. Sugar Maple and occasionally Ironwood (*Ostrya virginiana*) form the subcanopy. The understorey is fairly open and the ground cover is rich, including Wild Leek (*Allium tricoccum*), Cleavers (*Gallium aparine*), Narrow-leaved Spring-beauty (*Claytonia virginiana*), Common Blue Violet (*Viola sororia*), Bloodroot (*Sanguinaria canadensis*), Mayapple (*Podophyllum peltatum*), Zig-zag Goldenrod (*Solidago flexicaulis*), Wild Geranium (*Geranium maculatum*), Early Meadow-rue (*Thalictrum dioicum*) and Cut-leaf Toothwort (*Cardamine concatenata*). The alien Garlic Mustard (*Alliaria petiolata*) also occurs in some parts of this community. Rare/uncommon species include Sharp-scaled Oak Sedge (*Carex albicans* var. *albicans* **S2, U**), Giant Yellow Hyssop (*Agastache nepetoides* **R**), Canada Waterleaf (*Hydrophyllum canadense* **U**), James' Sedge (*Carex jamesii* **R**), Pubescent Sedge (*Carex hirtifolia* **U**), Common Juniper (*Juniperus communis* var. *depressa* **U**) and Bladdernut (*Staphylea trifolia* **U**).

This community was documented at one NAI study site in Wainfleet Township (WF-13). Larger examples occur in Ridgeway on the Onondaga Escarpment. This type of forest is common along the Niagara Peninsula Section of the Niagara Escarpment.

Dry-Fresh Oak Deciduous Forest Ecosite (FOD1)

*Dry-Fresh Black Oak Deciduous Forest Type (FOD1-3) **S3, Regionally Rare***

This Vegetation Type is found on well drained sands. Black Oak (*Quercus velutina* **U**) dominated forests are generally confined to the driest sand ridges, upper slopes and valley rims on the Fonthill Kame-Delta and Dunnville Sand Plain, where the original vegetation would have been much more open. In these drought-tolerant communities, Black Oak dominates the canopy, with White Oak (*Quercus alba*), and to a lesser extent, Red Oak (*Quercus rubra*) occurring as associates. Black Cherry (*Prunus serotina*), Pignut Hickory (*Carya glabra* **S3**), Red Maple (*Acer rubrum*) and White Pine (*Pinus strobus*) also occur occasionally in these Black Oak forests. Beneath the canopy, in the understorey and shrub/sapling layers, there is a mix of Black Cherry (*Prunus serotina*), maples (*Acer saccharum* ssp. *saccharum*, *A. rubrum*) and Beech (*Fagus grandifolia*), Witch-hazel (*Hamamelis virginiana*), Downy Serviceberry (*Amelanchier arborea*) and Sassafras (*Sassafras albidum*). Trailing vines of Summer Grape (*Vitis aestivalis*) reach the semi-open canopy. Groundcovers include Canada Mayflower

(*Maianthemum canadense*), Garlic Mustard (*Alliaria petiolata*), Pennsylvania Sedge (*Carex pensylvanica*), Blue-stem Goldenrod (*Solidago caesia*), Large-leaf Wood-aster (*Eurybia macrophylla* [*Aster macrophyllus*]), Heart-leaf Aster (*Symphyotrichum cordifolium* [*Aster cordifolius*]), False Solomon's-seal (*Maianthemum racemosum* ssp. *racemosum*) and Hairy Solomon's-seal (*Polygonatum pubescens*), along with low shrubs of Maple-leaved Viburnum (*Viburnum acerifolium*). Along lower slopes there are provincially rare tree species including American Chestnut (*Castanea dentata* **S3, END, U**), Eastern Flowering Dogwood (*Cornus florida* **S2?, END, U**), Cucumber Tree (*Magnolia acuminata* **S2, END, R**) and Butternut (*Juglans cinerea* **S3?, END, U**).

Black Oak Forest (FOD1-3) is known from 4 NAI study areas: NL-01, PL-01, PL-02 and PL-03. All of the Pelham (PL) sites are on the sandy ridges or upper ravine slopes on the Fonthill Kame-Delta and the Niagara-on-the-Lake site (NL-01) is at Fireman's Park on the St. David's Buried Gorge.

Dry-Fresh Oak – Maple – Hickory Deciduous Forest Ecosite (FOD2)

*Dry-Fresh Oak – Hickory Deciduous Forest Type (FOD2-2) **S3S4, Regionally Rare***

This community typically occurs on upper to middle slopes on silty clays and silty very fine sands. Three examples were noted during the NAI, one along the 15 Mile Creek Valley in Pelham (PL-07), another following the rim and upper banks of Ussher's Creek (NF-01) and the last example was found along the rolling hills and valleys of Fireman's Park in Niagara Falls (NL-12). In places along the 15 Mile Creek Valley, an open canopy of Red Oak (*Quercus rubra*) dominates with Shagbark Hickory (*Carya ovata*) as a frequent associate. Sugar Maple (*Acer saccharum* ssp. *saccharum*), Shagbark Hickory and Red Oak form a sparse subcanopy while Chokecherry (*Prunus virginiana*) and White Ash (*Fraxinus americana*) dominate the shrub/sapling layer. Zig-zag Goldenrod (*Solidago flexicaulis*) and Herb Robert (*Geranium robertianum*) occur in the ground layer with about 30% cover. Along Ussher's Creek, Red Oak, White Oak (*Quercus alba*), Shagbark Hickory and White Ash form the canopy. At Fireman's Park, oaks co-dominate the canopy with Bitternut Hickory (*Carya cordiformis*), and the subcanopy is mainly Sassafras (*Sassafras albidum*), with Bitternut Hickory, Shagbark Hickory and Black Cherry (*Prunus serotina*) as associates.

Provincially rare plant species at Fireman's Park include American Chestnut (*Castanea dentata* **S2, END, U**), Eastern Flowering Dogwood (*Cornus florida* **S2?, END, U**) and Butternut (*Juglans cinerea* **S3?, END, U**), as well as regionally rare species like Hairy Bush-clover (*Lespedeza hirta* **R**) and Butterfly Milkweed (*Asclepias tuberosa* **R**), which are indicators of open prairie and savannah habitat.

Fresh-Moist Sugar Maple Deciduous Forest Ecosite (FOD6)

*Fresh-Moist Sugar Maple – Black Maple Deciduous Forest Type (FOD6-2) **S3? Regionally Rare***

Fresh-Moist Lowland Deciduous Forest Ecosite (FOD7)

*Fresh-Moist Black Maple Lowland Deciduous Forest Type (FOD7-5) **S3, Regionally Rare***

Sugar Maple-Black Maple Deciduous Forest and Black Maple Lowland Deciduous Forest occur on moist, well drained sites along the bottomlands and terraces of the Twelve Mile Creek Headwaters (PL-01) on silty sands, silty very fine sands and silty clays. Sugar Maple (*Acer saccharum* ssp. *saccharum*) and Black Maple (*Acer saccharum* ssp. *nigrum* **U**) are co-dominant, forming a tall canopy. Associates include Blue-beech (*Carpinus caroliniana*), Basswood (*Tilia americana*), Ironwood (*Ostrya virginiana*), White Ash (*Fraxinus americana*), and

Green Ash (*Fraxinus pennsylvanica*). Rarely Hemlock (*Tsuga canadensis*) occurs in the bottomlands but it is more typical along adjacent north-facing valley slopes. The ground layer contains species such as Wild-ginger (*Asarum canadense*), Early Meadow-rue (*Thalictrum dioicum*), Blue Cohosh (*Caulophyllum thalictroides*) and Jack-in-the-pulpit (*Arisaema triphyllum* ssp. *triphyllum*). This community was not surveyed as part of the NAI. It is known to occur at Twelve Mile Creek Headwaters (PL-01) and is reported from the Short Hills Provincial Park (Gould 1989), Fifteen and Sixteen Mile Valleys and Jordan Valley. (Riley et al. 1996). The regionally rare Twinleaf (*Jeffersonia diphylla* **R**), an indicator of rich soils, occurs in this community.

Fresh-Moist Lowland Deciduous Forest Ecosite (FOD7)

Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FOD7-4) **S2S3, Regionally Rare**

This Vegetation Type occurs on alluvial silts and clays, and rarely on sands, along floodplains. Large Black Walnut (*Juglans nigra*) trees with spreading crowns dominate these semi-open canopied floodplain communities. Associates include Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*), Shagbark Hickory (*Carya ovata*), Basswood (*Tilia americana*) and oaks (*Quercus* spp.). Non-native grasses such as Orchard Grass (*Dactylis glomerata*), Timothy (*Phleum pratense*) and Kentucky Blue Grass (*Poa pratensis*), along with brambles (*Rubus* spp.) and vines such as Thicket Creeper (*Parthenocissus inserta*), Riverbank Grape (*Vitis riparia*) and Western Poison-ivy (*Toxicodendron rydbergii* [*Rhus radicans* ssp. *rydbergii*]) dominate the ground layer. Goldenrods (*Solidago canadensis* var. *canadensis*, *S. rugosa*) and Garlic Mustard (*Alliaria petiolata*) are also common. Hawthorns (*Crataegus* spp.), dogwoods (*Cornus foemina* ssp. *racemosa*, *Cornus amomum* ssp. *obliqua*), Chokecherry (*Prunus virginiana*) and occasionally Spicebush (*Lindera benzoin*) form the understory and shrub layer. Lowland stands of Black Walnut were recorded from five NAI study sites: PL-01, PL-05, NF-23, WF-07 and WF-29. Some stands may have been planted or have originated from planted trees, especially in non-lowland situations.

Fresh-Moist Poplar-Sassafras Deciduous Forest Ecosite (FOD8)

Fresh-Moist Sassafras Deciduous Forest Type (FOD8-2) **S3, Regionally Rare**

Only a handful of Sassafras (*Sassafras albidum*) stands were documented from three NAI study areas (PL-01, PL-03 and NL-01). Most are small inclusions within larger Red Maple-Oak stands (FOD2-1), or Black Oak forests (FOD1-3) on the sandy Fonthill Kame-Delta, with one occurrence on the St. David's Buried Gorge at Fireman's Park. This is a successional community, often forming pure stands on steep dry sandy slopes. Typically, pure stands or mixed stands of Sassafras occur on mid to upper valley slopes, especially in disturbed areas, including hydro cuts, road cuts, large tip-ups, blow downs and other canopy gaps in Black Oak (*Quercus velutina* **U**) forests (FOD1-3), abandoned farmland, and along disturbed ridge tops.

Open stands of Sassafras often occur with tangles of Summer Grape (*Vitis aestivalis*) in the canopy, subcanopy and shrub layers. Red Maple (*Acer rubrum*), Sugar Maple (*Acer saccharum* spp. *saccharum*), Black Walnut (*Juglans nigra*) and Bigtooth Aspen (*Populus grandidentata*) are occasional associates in the subcanopy and, to a lesser extent, in the open canopy layer. In the shrub layer, young Sassafras trees and Summer Grape occasionally mix with Staghorn Sumac (*Rhus typhina*), brambles (*Rubus* spp.) and Multiflora Rose (*Rosa multiflora*). Garlic Mustard (*Alliaria petiolata*), old field grasses, Canada Goldenrod (*Solidago canadensis*) and Eastern Bracken (*Pteridium aquilinum*) dominate the ground layer. Provincially and regionally rare/uncommon species associated with these communities include Cucumber Tree (*Magnolia*

acuminata **S2, END, R**), and species of open habitats such as Pignut Hickory (*Carya glabra* **S3, U**), Big Bluestem (*Andropogon gerardii* **U**), Hairy Bush-clover (*Lespedeza hirta* **R**), and Butterfly Milkweed (*Asclepias tuberosa* **R**).

7.4.10 CONIFEROUS SWAMP

White Pine – Hemlock Mineral Coniferous Swamp Ecosite (SWC2)

White Pine Mineral Coniferous Swamp Type (SWC2-1) **Regionally Rare**

This rare White Pine (*Pinus strobus*) swamp community occurs on mineral soils of silty very fine sands and silty sands in seepage areas with organic accumulations up to 20cm+ and deeper pockets of organic substrates up to, or greater than 100cm. Massive, widely-spaced White Pines form a sparse cover and arise from large hummocks surrounded by open water or deep organics. Black Ash (*Fraxinus nigra*) and Red Maple (*Acer rubrum*) are occasional in the subcanopy. There is a dense shrub layer of Spicebush (*Lindera benzoin*) and Speckled Alder (*Alnus incana* ssp. *rugosa* **U**) with Red-osier Dogwood (*Cornus sericea* ssp. *sericea* [*Cornus stolonifera*]), Silky Dogwood (*Cornus amomum* ssp. *obliqua*) and Bebb's Willow (*Salix bebbiana*) also occurring less frequently. The ground layer is often dominated by Lake-bank Sedge (*Carex lacustris*), other sedges and Spotted Touch-me-not (*Impatiens capensis*), with Spotted Joe-pye-weed (*Eutrochium maculatum* var. *maculatum* [*Eupatorium maculatum*]) and Rough-leaved Goldenrod (*Solidago patula* **U**) as more occasional associates. This community was encountered only once during the NAI from study area PL-01.

7.4.11 DECIDUOUS SWAMP

Oak Mineral Deciduous Swamp Ecosite (SWD1)

Swamp White Oak Mineral Deciduous Swamp Type (SWD1-1) **S2S3**

Swamp White Oak dominated swamps occur on silty clays, clays and silts. These sites usually support semi-open stands of Swamp White Oak (*Quercus bicolor*) and Swamp White Oak-Bur Oak (*Quercus macrocarpa*) hybrids. Occasional associates include Pin Oak (*Quercus palustris* **U**), Green Ash (*Fraxinus pennsylvanica*) and White Elm (*Ulmus americana*). The ground layer often supports a dense cover of Lake-bank Sedge (*Carex lacustris*) or more occasionally, Canada Blue-joint (*Calamagrostis canadensis*). Hop Sedge (*Carex lupulina*), Fringed Sedge (*Carex crinita*) and Bladder Sedge (*Carex intumescens*) often dominate a narrow band around the wetland-upland fringe. Other associates include Fowl Manna Grass (*Glyceria striata*), Stout Woodreed (*Cinna arundinacea*), One-sided Aster (*Symphyotrichum lateriflorum* [*Aster lateriflorus*]), Rough Goldenrod (*Solidago rugosa*) and Spotted Touch-me-not (*Impatiens capensis*). Seventeen (17) occurrences from 14 NAI study areas were documented: HAL-40, NF-04, 11, PC-02, PL-04, WE-03, 08, WF-01, WL-05, 06, 15, 20, 23 and 26.

Bur Oak Mineral Deciduous Swamp Type (SWD1-2) **S3, Regionally Rare**

This is a rare swamp type on silty clay soils, dominated by Bur Oak (*Quercus macrocarpa*), Swamp White Oak (*Quercus bicolor*) and their hybrids, as well as Pin Oak (*Quercus palustris* **U**). Frequent associates include Shagbark Hickory (*Carya ovata*), Green Ash (*Fraxinus pennsylvanica*), Swamp Hybrid Maple (*Acer X freemanii*) and Red Maple (*Acer rubrum*). The ground layer supports Lake-bank Sedge (*Carex lacustris*) and other sedge species, Spotted Touch-me-not (*Impatiens capensis*), Rough Goldenrod (*Solidago rugosa*), Sensitive Fern (*Onoclea sensibilis*), Jumpseed (*Persicaria virginiana* [*Polygonum virginianum*]) and Western

Poison-ivy (*Toxicodendron rydbergii* [*Rhus radicans* ssp. *rydbergii*]). Pure Bur Oak appears to be rare on the clay plain. Only three occurrences were documented from three NAI study sites: PC-05, WF-22 and WL-08.

Pin Oak Mineral Deciduous Swamp Type (SWD1-3) S2S3

Pin Oak (*Quercus palustris* **U**) swamps are common to locally abundant in the eastern half of the Niagara Peninsula. This swamp type covers or often encircles seasonally inundated slough ponds, usually within larger stands of maple swamps (SWD3). Pin Oak dominates the canopy almost exclusively, with Green Ash (*Fraxinus pennsylvanica*) and White Elm (*Ulmus americana*) as rare canopy associates or occasionally in the subcanopy. Typically, the understorey is fairly open to absent, their development hampered by extended periods of standing water. Often the groundcovers are sparse, including a mix of Hop Sedge (*Carex lupulina*), Fringed Sedge (*Carex crinita*), Bladder Sedge (*Carex intumescens*), Fowl Manna Grass (*Glyceria striata*) and Stout Woodreed (*Cinna arundinacea*). Pin Oak swamps were documented from 42 patches within 19 NAI study sites.

7.4.12 THICKET SWAMP

Mineral Thicket Swamp Ecosite (SWT2)

Alder Mineral Thicket Swamp Type (SWT2-1) Regionally Rare

Speckled Alder (*Alnus incana* ssp. *rugosa* **U**) dominated thicket swamps occur on silty very fine sands and silty sands at six patches within two NAI study sites (PL-01 and HAL-40). The largest example of this community type can be found in an expansive bottomland seepage marsh on the Fonthill Kame-Delta near the headwaters of Twelve Mile Creek (PL-01). Smaller examples are found interspersed in slough ponds and depressions on the Dunnville Sand Plain in Haldimand (HAL-40). In the Twelve Mile Creek watershed, tall shrubs of Speckled Alder dominate with a lower shrub layer of Spicebush (*Lindera benzoin*), and occasionally Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*). A dense ground cover of Spotted Touch-me-not (*Impatiens capensis*), Skunk Cabbage (*Symplocarpus foetidus*) and Spring Clearweed (*Pilea fontana*) carpet the thin layer of organic accumulations and open water pockets. Rare/uncommon species include Weak Stellate Sedge (*Carex seorsa* **S2, U**), Groundnut (*Apios americana* **U**), Spring Clearweed (*Pilea fontana* **U**), Rough-leaved Goldenrod (*Solidago patula* **U**) and Poison Sumac (*Toxicodendron vernix* [*Rhus vernix*] **R**).

Buttonbush Mineral Thicket Swamp Type (SWT2-4) S3

Low tangled Buttonbush (*Cephalanthus occidentalis*) shrubs solely dominate this type of thicket swamp. Buttonbush thicket swamps are common on the Haldimand Clay Plain and occur throughout slough forests in the deeper slough ponds with a longer hydroperiod. The extent to which these pools dry up depends on precipitation patterns (i.e. wet versus dry years). The few associates most often encountered include Bittersweet Nightshade (*Solanum dulcamara*), Water-parsnip (*Sium suave*), Three-lobed Beggarticks (*Bidens tripartita*), Devil's Beggarticks (*Bidens frondosa*), Common Duckweed (*Lemna minor*), Star Duckweed (*Lemna trisulca* **U**) and a liverwort (*Riccia fluitans*). The regionally rare Swamp Beggarticks (*Bidens discoidea* **R**) is found in Buttonbush slough ponds; this species has a peculiar habit of rooting on old, furrowed or textured Buttonbush stems at the elevations of the waterline at the time of seed dispersal. Buttonbush thicket swamps were documented from 70 patches within 33 NAI study sites.

Silky Dogwood Mineral Thicket Swamp Type (SWT2-8) S3S4

Silky Dogwood (*Cornus amomum* ssp. *obliqua*) thicket swamps are common in wet depressions throughout slough forests, swamps and along riparian areas, typically occurring on clays, silty clays and silty clay loams. Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*), Red Maple (*Acer rubrum*) and Swamp Hybrid Maple (*Acer X freemanii*) are common tree associates forming a sparse cover and grade into the adjacent swamp forest. Typical shrubs associated with Silky Dogwood thicket swamps include: Buttonbush (*Cephalanthus occidentalis*), shrub willows (*Salix* spp.), Common Elder (*Sambucus canadensis*), Swamp Rose (*Rosa palustris*), Winterberry (*Ilex verticillata*) and Highbush Blueberry (*Vaccinium corymbosum*). The ground layer often supports a dense cover of forbs including Spotted Touch-me-not (*Impatiens capensis*), False Nettle (*Boehmeria cylindrica*), Rough Goldenrod (*Solidago rugosa*), Dotted Smartweed (*Persicaria punctata* [*Polygonum punctatum*]), Fringed Loosestrife (*Lysimachia ciliata*), Moneywort (*Lysimachia nummularia*), Common Clearweed (*Pilea pumila*) and Swamp Aster (*Symphotrichum puniceum* [*Aster puniceus* var. *puniceus*]). Typical graminoids include Hop Sedge (*Carex lupulina*), Fringed Sedge (*Carex crinita*), Fowl Manna Grass (*Glyceria striata*), Eastern Manna Grass (*Glyceria septentrionalis*), Stout Woodreed (*Cinna arundinacea*), Canada Blue-joint (*Calamagrostis canadensis*) and Reed Canary Grass (*Phalaris arundinacea*). Silky Dogwood thicket swamps were recorded from 18 study sites during the NAI.

Gray Dogwood Mineral Thicket Swamp Type (SWT2-9) S3S4

Gray Dogwood (*Cornus foemina* ssp. *racemosa*) dominated thicket swamps occur on silty clays, clays and silts; this Vegetation Type is often replaced by the widespread Meadowsweet Mineral Thicket Swamp Type (SWT2-6) in wetter areas. However, an ecotone or grading of the very common, upland/cultural Grey Dogwood Shrub Thicket Type (CUT1-4) into a wetter Grey Dogwood Thicket Swamp can often be found; many of these Grey Dogwood thicket swamps are of cultural origin, developing on former agricultural land. Associates in the shrub layer include Glossy Buckthorn (*Frangula alnus* [*Rhamnus frangula*]), Meadowsweet (*Spiraea alba*), and to a lesser extent, Southern Arrow-wood (*Viburnum dentatum* var. *lucidum* [*V. recognitum*]). Young, successional trees can often be common throughout forming a regeneration layer of Red Maple (*Acer rubrum*), White Elm (*Ulmus americana*) and Green Ash (*Fraxinus pennsylvanica*). Rough Goldenrod (*Solidago rugosa*) dominates the ground layer, frequently accompanied by Redtop (*Agrostis gigantea*), Creeping Bent Grass (*Agrostis stolonifera*) and sedges (*Carex* spp.). Swamp Aster (*Symphotrichum puniceum* [*Aster puniceus* var. *puniceus*]), Canada Goldenrod (*Solidago canadensis*) and Reed Canary Grass (*Phalaris arundinacea*) occur to a lesser extent. Rare/uncommon species include Small-flowered Agrimony (*Agrimonia parviflora* **R**), Foxglove Beard-tongue (*Penstemon digitalis* **U**) and Virginia Mountain-mint (*Pycnanthemum virginianum* **R**). Gray Dogwood thicket swamps were documented in twenty-eight (28) patches from 19 NAI study sites.

Southern Arrow-wood Mineral Thicket Swamp Type (SWT2-11) S3, Regionally Rare

Southern Arrow-wood (*Viburnum dentatum* var. *lucidum* [*V. recognitum*]) thicket swamps occur on silty clays and shallow organic soils at two sites (Point Abino, FE-11 and WF-18). Although Southern Arrow-wood occurs widely on the Haldimand Clay Plain as a low shrub associate in thicket swamps and wet, regenerating old field meadows, it rarely dominates the shrub layer in a community. Often the leaves of Southern Arrow-wood become skeletonised due to insect pests and the shrubs show severe dieback.

Tall thickets of Southern Arrow-wood occur in a backdune swamp forest in the Point Abino area. A smaller example of this community (WF-18), showed signs of leaf die-back, NAI study area WF-18. Regenerating Green Ash (*Fraxinus pennsylvanica*) and Red Maple (*Acer rubrum*) occur as associates, with a lower shrub layer of Meadowsweet (*Spiraea alba*).

Paw-paw Mineral Thicket Swamp Type (SWT2-12) S1, Regionally Rare

Few patches of Paw-paw (*Asimina triloba* **S3**) thickets remain in the Niagara Region (Bowden and Miller 1951). Paw-paw usually forms a dense subcanopy beneath a taller canopy of floodplain or swamp forest. Examples usually occur in riparian areas on terraced floodplains. Historically it was recorded from several sites along the Niagara River, below the Niagara Escarpment in Lincoln and elsewhere in the Region (Bowden and Miller 1951), but recent records are few (e.g. M.J. Oldham, Navy Island in 2006; A. Goodban, east of Homer Escarpment ANSI in floodplain next to QEW in 1996; W.D. Bakowsky, St. David's in 1998).

Organic Thicket Swamp Ecosite (SWT3)

Alder Organic Thicket Swamp Type (SWT3-1) – Regionally Rare

The largest example of *Alder Organic Thicket Swamp* occurs in an expansive bottomland seepage marsh on the Fonthill Kame Delta, near the headwaters of Twelve Mile Creek (PL-01), where organics/peat depths exceed 100 cm in some areas. The vegetation is described above, under Alder Mineral Thicket Swamp (SWT2-1), since they share the same dominant species and occur together as a mosaic of Vegetation Types.

Elsewhere, small examples of Alder Organic Thicket Swamps are found interspersed throughout forested areas in slough ponds and depressions on the Dunnville Sand Plain in Haldimand, and to a lesser extent in Wainfleet Township. Here, Speckled Alder (*Alnus incana* ssp. *rugosa* **U**) dominates the tall shrub layer with Highbush Blueberry (*Vaccinium corymbosum*), Winterberry (*Ilex verticillata*) and Buttonbush (*Cephalanthus occidentalis*) as associates. Often Highbush Blueberry forms a dense ring around the open wetlands and grades into a narrow band of Swamp Hybrid Maple (*Acer X freemanii*) further encircling the community. The ground layer includes Spotted Touch-me-not (*Impatiens capensis*), Royal Fern (*Osmunda regalis*), Cinnamon Fern (*Osmunda cinnamomea*), Lake-bank Sedge (*Carex lacustris*), smartweeds (*Persicaria* spp. [*Polygonum* spp.]), beggarticks (*Bidens* spp.), Water-hemlock (*Cicuta maculata*) and free floating plants of Common Duckweed (*Lemna minor*) and a liverwort (*Riccia fluitans*). Regionally uncommon species include Poison Sumac (*Toxicodendron vernix* [*Rhus vernix*] **R**), and Wild Calla (*Calla palustris* **U**). Alder Organic Thicket Swamps were documented during the NAI from 7 study sites (21 occurrences): HAL-22, HAL-24, HAL-40, PL-01, WF-01, WF-02 and WF-25.

Buttonbush Organic Thicket Swamp Type (SWT3-4) S3

Buttonbush (*Cephalanthus occidentalis*) Organic Thicket Swamps typically occur within slough forests and forested swamps; they occur in deepwater slough ponds and vernal pools which hold water for most of the year, drying only for short durations or occasionally during very dry years. This moisture regime allows organic accumulations to develop and supports open water ponds dominated by a tangled shrub cover of Buttonbush. Common Duckweed (*Lemna minor*) is abundant. Ringing the upland edges, shrubs such as Highbush Blueberry (*Vaccinium corymbosum*), Winterberry (*Ilex verticillata*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*) grow from mossy hummocks. Trailing vines of Bittersweet Nightshade (*Solanum dulcamara*) are common, as are forbs such as Three-lobed Beggarticks (*Bidens tripartita*), Marsh Fern

(*Thelypteris palustris*), Cinnamon Fern (*Osmunda cinnamomea*), Royal Fern (*Osmunda regalis*) and Sensitive Fern (*Onoclea sensibilis*). A variety of sedges (*Carex* spp.) and Fowl Manna Grass (*Glyceria striata*) are also common throughout on mossy hummocks around the thicket swamp margins. Buttonbush Organic Thicket Swamps were recorded from 21 NAI study areas.

Winterberry Organic Thicket Swamp Type (SWT3-7) S3S4, Regionally Rare

Winterberry (*Ilex verticillata*) Organic Thicket Swamps are very similar in species composition to Poison Sumac (*Toxicodendron vernix* [*Rhus vernix*] **R**) Thicket Swamps (SWT3-13, described below). In either Vegetation Type, both species are codominant. Poison Sumac usually forms a sparse cover of tall shrubs above a dense lower shrub layer dominated by Winterberry. Other frequent associates include Highbush Blueberry (*Vaccinium corymbosum*), Speckled Alder (*Alnus incana* ssp. *rugosa* **U**), and low shrubs of Buttonbush (*Cephalanthus occidentalis*) and Black Chokeberry (*Aronia melanocarpa* **U**). Young Red Maples (*Acer rubrum*) are often scattered throughout. Abundant forbs include Devil's Beggarticks (*Bidens frondosa*), Spotted Touch-me-not (*Impatiens capensis*), Wild Calla (*Calla palustris* **U**), Royal Fern (*Osmunda regalis*), Cinnamon Fern (*Osmunda cinnamomea*) and Marsh Fern (*Thelypteris palustris*). Halberd-leaved Tear-thumb (*Persicaria arifolia* [*Polygonum arifolium*] **S3, U**) occurs in some of these Winterberry thickets. Known from five NAI study sites: HAL-23, 24, 28, 40 and WL-06.

Spicebush Organic Thicket Swamp Type (SWT3-11) S3, Regionally Rare

This thicket swamp type occurs in organic seepage areas underlain by sands, muck and peat. Spicebush thickets typically support a dense ground layer of Skunk Cabbage (*Symplocarpus foetidus*), Marsh Marigold (*Caltha palustris*), Spotted Joe-pye-weed (*Eutrochium maculatum* var. *maculatum* [*Eupatorium maculatum*]), Spotted Touch-me-not (*Impatiens capensis*), and occasional stunted trees of Red Maple (*Acer rubrum*) and Yellow Birch (*Betula alleghaniensis*). Poison Sumac (*Toxicodendron vernix* [*Rhus vernix*] **R**) and Butternut (*Juglans cinerea* **S3?**, **END, U**) can occur rarely in these communities. Reported from NAI study sites PL-01 and PL-04.

Poison Sumac Organic Thicket Swamp Type (SWT3-13) S3, Regionally Rare

Organic Thicket Swamps dominated by Poison Sumac (*Toxicodendron vernix* [*Rhus vernix*] **R**) are confined to open slough ponds with deep organic accumulations (50 to >120 cm) and are interspersed within surrounding slough forests or forested swamps. Winterberry (*Ilex verticillata*) is often co-dominant with Poison Sumac. Other shrub associates include Highbush Blueberry (*Vaccinium corymbosum*), Speckled Alder (*Alnus incana* ssp. *rugosa* **U**), and low shrubs of Buttonbush (*Cephalanthus occidentalis*), Black Chokeberry (*Aronia melanocarpa* **U**), Swamp Rose (*Rosa palustris*) and Meadowsweet (*Spiraea alba*). Sparse willow (*Salix* spp.) shrubs, young Red Maple (*Acer rubrum*) and Yellow Birch (*Betula alleghaniensis*) trees are often scattered throughout. Abundant forbs include Devil's Beggarticks (*Bidens frondosa*), smartweeds (*Persicaria* spp. [*Polygonum* spp.]), Spotted Touch-me-not (*Impatiens capensis*), Wild Calla (*Calla palustris* **U**), Royal Fern (*Osmunda regalis*), Cinnamon Fern (*Osmunda cinnamomea*) and Marsh Fern (*Thelypteris palustris*). Graminoids include Lake-bank Sedge (*Carex lacustris*), Rice Cut Grass (*Leersia oryzoides*) and Canada Blue-joint (*Calamagrostis canadensis*). Halberd-leaved Tear-thumb (*Persicaria arifolia* [*Polygonum arifolium*] **S3, U**) occurs in some of these Winterberry thickets. Known from six NAI study sites: HAL-24, 28, 40, WF-01, 29 and WL-06.

7.4.13 BOG

Shrub Bog Ecosite (BOS1)

Leatherleaf Shrub Bog Type (BOS1-1) S2S3?, Regionally Rare

Highbush Blueberry Shrub Bog Type (BOS1-?) S2S3?, Regionally Rare

Bogs and fens are of restricted distribution in Ontario south of the Canadian Shield (Riley 1989b) and in south-western Ontario, deep, extensive organic deposits are rare (Macdonald 1992). The larger sites, like the Wainfleet Bog are associated with rolling till and clay plain landforms. The Wainfleet Bog is a raised bog feature that formed in a shallow basin on the Haldimand Clay Plain, with the low Onondaga Escarpment at the southerly boundary. In contrast, most of the bogs in south-central and south-western Ontario are smaller features associated with kettle basins and valleys associated with various moraines.

Until the late 1930's, the Wainfleet Bog basin supported extensive low and tall shrub bog communities with local Black Spruce (*Picea mariana* **R**) and Tamarack (*Larix laricina* **R**) patches. Much of the peatland has since been extensively disturbed by peat extraction, drainage 'improvements' and agricultural activities; large areas have been invaded by European White Birch (*Betula pendula*) and Trembling Aspen (*Populus tremuloides*). The best remaining components, including Macdonald's (1992) "Open Low Shrub Bog" and "Open Tall Shrub Bog" are encompassed within the Wainfleet Bog ANSI. In 1996, the Niagara Peninsula Conservation Authority (NPCA) purchased the 801 ha Wainfleet Bog Conservation Area. Since then, restoration efforts have been underway, aimed at restoring site hydrology and the dependent bog plant communities and wildlife, and controlling European White Birch and other successional tree species. Recent Beaver activity may also improve site hydrology by blocking drainage ditches and raising water levels. Numerous regionally rare plant species are known from the Wainfleet Bog; many are only known from this one site in the Niagara Region.

Leatherleaf Shrub Bog Type (BOS1-1) S2S3?, Regionally Rare (Open Low Shrub Bog [Macdonald 1992])

Larger patches of this bog type cover approximately 1.5 ha of the ANSI and this type more commonly forms a mosaic with the *Open Low Shrub Bog – Hummock Phase* and *Open Tall Shrub Bog* communities (described below). Tree cover is sparse, limited mainly to saplings of European White Birch. Shrubs form a carpet of normally tall shrubs, here only 30 cm tall, of Black Chokeberry (*Aronia melanocarpa* **U**) with less frequent Highbush Blueberry (*Vaccinium corymbosum*) and Mountain-holly (*Ilex mucronata* [*Nemopanthus mucronatus*] **R**). Low shrubs include Leatherleaf (*Chamaedaphne calyculata* **R**), Velvet-leaved Blueberry (*Vaccinium myrtilloides* **R**), Sheep-laurel (*Kalmia angustifolia* **R**), Labrador-tea (*Rhododendron groenlandicum* [*Ledum groenlandicum*] **R**) and others.

Groundcovers include Hair-cap Moss (*Polytrichum strictum*), sphagnum (*Sphagnum* spp.), Billing's Three-fruited Sedge (*Carex billingsii* **R**), Tawny Cotton-grass (*Eriophorum virginicum* **R**), Canada Blue-joint (*Calamagrostis canadensis*), Beaked Sedge (*Carex utriculata* **R**), Swamp Dewberry (*Rubus hispidus*), Small Cranberry (*Vaccinium oxycoccus* **R**) and Rough Goldenrod (*Solidago rugosa*).

Other regionally rare species listed by Macdonald (1992) from the "Open Low Shrub Bog" include Virginia Chain Fern (*Woodwardia virginica* **R**), Few-flowered Sedge (*Carex oligosperma* **R**), Nodding Cotton-grass (*Eriophorum viridi-carinatum* **R**), Bunch Cotton-grass (*Eriophorum vaginatum* ssp. *spissum* **R**) and Pitcher-plant (*Sarracenia purpurea* **R**).

Leatherleaf Shrub Bog Type (BOS1-1) S2S3?, Regionally Rare (Open Low Shrub Bog – Hummock Phase [Macdonald 1992])

This 'hummock phase' of the *Open Low Shrub Bog* was differentiated by Macdonald (1992) based on the presence of 0.5 to 1.0 m tall hummocks with well-defined channels in between them, covering some 3.5 ha of the ANSI. The tall shrub layer forms thickets on the mounds, providing structural support. Dominants are Highbush Blueberry (*Vaccinium corymbosum*), Mountain-holly (*Ilex mucronata* [*Nemopanthus mucronatus*] **R**) and European White Birch (*Betula pendula*) saplings. Low shrub cover is dominated by Leatherleaf (*Chamaedaphne calyculata* **R**) and Black Chokeberry (*Aronia melanocarpa* **U**), with Labrador-tea (*Rhododendron groenlandicum* [*Ledum groenlandicum*] **R**), Sheep-laurel (*Kalmia angustifolia* **R**), and occasional Bog-laurel (*Kalmia polifolia* **R**). Groundcovers include Hair-cap Moss (*Polytrichum strictum*), sphagnum (*Sphagnum* spp.) and lichens (*Cladonia* spp.). Typical bog plant species include Tawny Cotton-grass (*Eriophorum virginicum* **R**), Billing's Three-fruited Sedge (*Carex billingsii* **R**), Brownish Sedge (*Carex brunnescens* **U**), Round-leaved Sundew (*Drosera rotundifolia* **R**), Three-flowered False Solomon's-seal (*Maianthemum trifolium* **R**) and Small Cranberry (*Vaccinium oxycoccus* **R**).

Highbush Blueberry Shrub Bog Type (BOS1-?) S2S3?, Regionally Rare (Open Tall Shrub Bog [Macdonald 1992])

Now restricted to the ANSI, *Highbush Blueberry Shrub Bog Type* was formerly the main natural vegetation cover in the basin of the Wainfleet Bog. This is still the most extensive sparsely treed wetland community within the ANSI; Macdonald (1992) mapped 74 ha of this community type within the Wainfleet Bog. Tree cover is very open, with scattered 4 m to 8 m tall European White Birch (*Betula pendula*) and Trembling Aspen (*Populus tremuloides*). A mosaic pattern of tall and low bog shrubs occurs in this community. Black Chokeberry (*Aronia melanocarpa* **U**) and Highbush Blueberry (*Vaccinium corymbosum*) are the dominant tall shrubs, with Mountain-holly (*Ilex mucronata* [*Nemopanthus mucronatus*] **R**) which dominates localized areas. The low shrub layer is dominated by Leatherleaf (*Chamaedaphne calyculata* **R**), Sheep-laurel (*Kalmia angustifolia* **R**), Velvet-leaved Blueberry (*Vaccinium myrtilloides* **R**) and Labrador-tea (*Rhododendron groenlandicum* [*Ledum groenlandicum*] **R**).

The ground layer is very open to semi-open and dominated by a moss cover of Hair-cap Moss (*Polytrichum strictum*), sphagnum (*Sphagnum* spp.) and occasional lichens (*Cladonia* spp.). The main herbs are Eastern Bracken (*Pteridium aquilinum*), Tawny Cotton-grass (*Eriophorum virginicum* **R**), Woolly Bulrush (*Scirpus cyperinus*), Billing's Three-fruited Sedge (*Carex billingsii* **R**), Swamp Dewberry (*Rubus hispidus*) and Rough Goldenrod (*Solidago rugosa*).

Other regionally rare species include Virginia Bartonian (*Bartonia virginica* **S2, R**), Bristly Raspberry (*Rubus setosus* **R**), Bristly Sarsaparilla (*Aralia hispida* **R**), Sheep-laurel (*Kalmia angustifolia* **R**), Few-flowered Sedge (*Carex oligosperma* **R**), Stunted Sedge (*Carex magellanica* ssp. *irrigua* **R**) and Bog-laurel (*Kalmia polifolia* **R**).

7.4.14 MARSH

Mineral Meadow Marsh Ecosite (MAM2)

Prairie Slough Grass Mineral Meadow Marsh Type (MAM2-8) S3, Regionally Rare

At the northwest tip of Navy Island, at the base of a bluff along the shoreline of the Niagara River, is a rare example of a Prairie Slough Grass Mineral Meadow Marsh on alluvial deposits. Prairie Slough Grass (*Spartina pectinata* **R**) dominates the meadow marsh, along with other graminoids such as Canada Blue-joint (*Calamagrostis canadensis*) and more occasionally Water Sedge (*Carex aquatilis* **R**). This community forms a narrow band of marsh along the waterline and river flats below the bluff; it extends out into the river to the contact line with a Three-square Mineral Shallow Marsh Type (MAS2-6). Other regionally rare/uncommon species include Hard-stemmed Bulrush (*Schoenoplectus acutus* [*Scirpus acutus*] **R**) and Virginia Mountain-mint (*Pycnanthemum virginianum* **U**). The Navy Island site (NF-06) was the only location for Prairie Slough Grass meadow marsh recorded during the NAI.

Mineral Fen Meadow Marsh Ecosite (MAM5)

Mineral Fen Meadow Marsh Type (MAM5-1) Regionally Rare

Riley et al. (1996) described a graminoid fen from the North Pelham Valley ANSI, on thin peats overlying calcareous gravels. This 'noteworthy graminoid fen' is dominated by Sterile Sedge (*Carex sterilis* **R**), Golden-fruit Sedge (*Carex aurea* **U**), and Bristle-stalked Sedge (*Carex leptalea* ssp. *leptalea* **R**) with scattered Inland Sedge (*Carex interior* **U**), Tall Meadow-rue (*Thalictrum pubescens*), Nodding Cotton-grass (*Eriophorum viridi-carinatum* **R**), Golden Ragwort (*Packera aurea* [*Senecio aureus*] **R**), Field Horsetail (*Equisetum arvense*), Marsh Violet (*Viola cucullata* **U**), Rough-leaved Goldenrod (*Solidago patula* **U**), and scattered Indian Paintbrush (*Castilleja coccinea* **R**). This seep is fringed with stunted Tamarack (*Larix laricina* **R**), and occasional Alder-leaved Buckthorn (*Rhamnus alnifolia* **U**), Spicebush (*Lindera benzoin*) and Black Chokeberry (*Aronia melanocarpa* **U**).

Mineral Shallow Marsh Ecosite (MAS2)

Lizard's-tail - Arrow-arum Mineral Shallow Marsh Type (MAS2-?) S2?, Regionally Rare*

Narrow bands of mineral shallow marsh dominated by Lizard's-tail (*Saururus cernuus* **S3, R**) and Arrow Arum (*Peltandra virginica* **S2, R**) occur along the margins of the slow-moving Ussher's Creek, near its confluence with the Niagara River. Dense beds of the emergent Lizard's-tail line the shoreline, with robust colonies of Arrow Arum interspersed in pockets throughout the shallow marsh. Occasionally, low arching shrubs of Water-willow (*Decodon verticillatus* **R**) also occur, with tangles of Common Dodder (*Cuscuta gronovii*). Grading into the deeper water and mixed throughout are floating beds of Fragrant Water-lily (*Nymphaea odorata* **U**). The Lizard's-tail – Arrow Arum community grades into a submergent aquatic community dominated by Wild Celery (*Vallisneria americana* **U**) with occasional pondweeds (*Potamogeton* spp.). This community was only documented from Ussher's Creek in NAI study area NF-12.

Organic Shallow Marsh Ecosite (MAS3)

Water Willow Organic Shallow Marsh Type (MAS3-12) Regionally Rare

This community was documented from three patches within NAI study area NF-01, along Lyons Creek. Stems of Water-willow (*Decodon verticillatus* **R**) arch over the open water channel of the creek, strongly dominating the edge of the shallow marsh where it grades into open water. Common Duckweed (*Lemna minor*) is often the only associate with Water-willow. In another example of this rare community, Dotted Smartweed (*Persicaria punctata* [*Polygonum punctatum*]) and Water Smartweed (*Persicaria amphibia* [*Polygonum amphibium*] **U**) are codominant with Water-willow, and Giant Bur-reed (*Sparganium eurycarpum*) is an occasional associate. Other rare/uncommon species include Arrow Arum (*Peltandra virginica* **S2, R**), Mosquito Fern (*Azolla caroliniana* **S1?, R**) and Star Duckweed (*Lemna trisulca* **U**).

Great Lakes Coastal Meadow Marsh Ecosite (MAM4)
Graminoid Coastal Meadow Marsh Type (MAM4-1) S2, Regionally Rare

Along the east shore of the Point Abino peninsula, on Abino Bay, there is a dynamic coastal meadow marsh which often changes structure and species composition from year to year due to shifting sands, fluctuating lake levels and ice scour. This coastal meadow marsh occupies the sand flats along the shoreline of Lake Erie.

The upland edge, adjacent to Point Abino Road, is marked by a thin band of Sandbar Willow (*Salix interior* [*Salix exigua*]) thicket. This grades into a rich open meadow marsh dominated by taller plants like Spotted Joe-pye-weed (*Eutrochium maculatum* var. *maculatum* [*Eupatorium maculatum*]), Canada Goldenrod (*Solidago canadensis*), Boneset (*Eupatorium perfoliatum*), Purple Loosestrife (*Lythrum salicaria*) and Canada Blue-joint (*Calamagrostis canadensis*). Abundant shorter plants include Sneezeweed (*Helenium autumnale* **R**), Silverweed (*Potentilla anserina*), Spotted Touch-me-not (*Impatiens capensis*), Cocklebur (*Xanthium strumarium*) and Wild Blue-flag (*Iris versicolor*). The meadow marsh grades into shallow water emergent marsh with Common Three-square (*Schoenoplectus pungens* [*Scirpus pungens*] **U**), Soft-stem Bulrush (*Schoenoplectus tabernaemontani* [*Scirpus validus*]), Soft Rush (*Juncus effusus*), Baltic Rush (*Juncus balticus* **U**), Flat-stemmed Pondweed (*Potamogeton zosteriformis* **R**), Bushy Naiad (*Najas flexilis* **R**) and European Water-milfoil (*Myriophyllum spicatum*) (Macdonald 1990). A narrow strip at the waterline is lined with Red-based Spike-rush (*Eleocharis erythropoda* **U**), Blunt Spike-rush (*Eleocharis obtusa*), Common Three-square, Baltic Rush, Marsh Yellow Cress (*Rorippa palustris* **U**) and Silverweed (*Potentilla anserina*). Other regionally rare/uncommon species include Ribbon-leaved Pondweed (*Potamogeton epihydrus* **R**), Narrow-leaved Waterplantain (*Alisma gramineum* **R**), Red-rooted Cyperus (*Cyperus erythrorhizos* **U**), Coarse Cyperus (*Cyperus odoratus* var. *engelmannii* **U**), Tuckerman's Witch Grass (*Panicum tuckermanii* **R**), Low Cyperus (*Cyperus diandrus* **R**), Spring Clearweed (*Pilea fontana* **U**), Olive-fruited Spike-rush (*Eleocharis flavescens* var. *olivacea* **R**), and Fragrant Cyperus (*Cyperus odoratus* var. *odoratus* **U**).

7.5 SUMMARY AND RECOMMENDATIONS

As described above, the natural heritage of the Niagara Region includes a diverse mix of rare Vegetation Types. Great Lakes shorelines (Lakes Erie and Ontario), talus slopes and cliffs along the Niagara Escarpment, alvars, prairies and bogs all support examples of provincially and regionally rare Vegetation Types occurring in the Niagara Region. They are of considerable conservation interest, often representing highly specialized habitats and the last remnants of formerly more widespread Vegetation Types.

The protection and conservation of rare plant communities as part of the Niagara Region's natural heritage requires:

- ongoing research and inventory efforts (e.g., further literature reviews, ELC mapping/descriptions, scoped/focused searches for particular types, etc.);
- planning tools to ensure protection (e.g., Official Plan policies, Provincial Policy Statement, etc.);
- management of plant communities on public land or in partnership with private landowners (e.g., prescribed burns, restoring site hydrology, forest management, restoration plantings, etc.);
- long term monitoring of protected sites (to provide feedback to management plans);

- private land stewardship and support programs (e.g., landowner contact, stewardship awards/recognition); and,
- programs to promote public awareness and encourage participation/support for conservation efforts.

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Table 1: Summary of Significant Vegetation Types in the Niagara Region, Ontario

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|--|-----------|----------|---|
| <u>TERRESTRIAL</u> | | | |
| BEACH/BAR | BB | | |
| <i>Mineral Open Beach/Bar Ecosite</i> | BBO1 | | |
| Sea Rocket Sand Open Beach Type | BBO1-1 | S2S3, RR | Lake Erie shoreline, including NAI study area PC-10. |
| <i>Bedrock Open Beach/Bar Ecosite</i> | BBO2 | | |
| Calcareous Open Bedrock Shoreline Type* | BBO2-?* | S3?, RR | Open bedrock shoreline occurs along the Lake Erie coast. |
| <i>Mineral Shrub Beach/Bar Ecosite</i> | BBS1 | | |
| Willow Gravel Shrub Beach Type | BBS1-2 | RR | Scattered locations along the Lake Erie shoreline and on beach bars along the Lake Ontario shore. |
| <i>Mineral Treed Beach / Bar Ecosite</i> | BBT1 | | |
| Cottonwood Mineral Treed Shoreline Type** | SHTM1-1** | RR | Known from Lake Erie shoreline. |
| SAND DUNE | SD | | |
| <i>Open Sand Dune Ecosite</i> | SDO1 | | |
| Beach Grass - Wormwood Open Graminoid Sand Dune Type** | SBOD1-4** | S2, RR | Known from the Lake Erie coast (NAI study area PC-04). |
| <i>Shrub Sand Dune Ecosite</i> | SDS1 | | |
| Hop-tree Shrub Dune Type | SDS1-2 | S1, RR | Known from the Lake Erie coast (NAI study area PC-06). |
| <i>Treed Sand Dune Ecosite</i> | SDT1 | | |
| Cottonwood Treed Dune Type | SDT1-1 | S1, RR | Known from the Lake Erie shoreline. |
| CLIFF | CL | | |
| <i>Carbonate Open Cliff Ecosite</i> | CLO1 | | |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|---|----------|-----------|---|
| Cliffbrake – Lichen Carbonate Open Cliff Type | CLO1-1 | S3, RR | Niagara Gorge, Niagara Glen, Fifteen and Sixteen Mile Valleys, Beamsville Escarpment and Niagara Section Escarpment ANSI (Riley et al. 1996). |
| Bulblet Fern - Herb Robert Carbonate Open Cliff Type | CLO1-2 | S3, RR | Fairly common on cliffs along the Niagara Escarpment; reported from 8 ANSI (Riley et al. 1996). A small example occurs on a cliff face of the Onondaga Escarpment along the Ridge Road area in Fort Erie. |
| Moist Open Carbonate Cliff Seepage Type | CLO1-4 | S3, RR | Niagara Gorge and Short Hills Provincial Park (Riley et al. 1996). |
| Open Carbonate Cliff Rim Type | CLO1-5 | S2, RR | Niagara Gorge (Riley et al. 1996). |
| <i>Carbonate Treed Cliff Ecosite</i> | CLT1 | | |
| White Cedar Treed Carbonate Cliff Type | CLT1-1 | S3, RR | Beamer Memorial Conservation Area (Riley et al. 1996). |
| TALUS | TA | | |
| <i>Carbonate Open Talus Ecosite</i> | TAO1 | | |
| Dry – Fresh Carbonate Open Talus Type | TAO1-1 | S2, RR | Niagara Gorge (Riley et al. 1996). |
| Fresh – Moist Carbonate Open Talus Type | TAO1-2 | S2, RR | Niagara Gorge (Riley et al. 1996). |
| <i>Carbonate Shrub Talus Ecosite</i> | TAS1 | S3 | |
| Mountain Maple Carbonate Shrub Talus Type | TAS1-2 | S3, RR | Homer Escarpment and Beamer Escarpment ANSI (Riley et al. 1996). |
| <i>Carbonate Treed Talus Ecosite</i> | TAT1 | | |
| Dry - Fresh Chinquapin Oak Carbonate Treed Talus Type | TAT1-1 | S1S2?, RR | Niagara Gorge (Riley et al. 1996). |
| Dry – Fresh White Birch Carbonate Treed Talus Type | TAT1-3 | S3, RR | Niagara Gorge and Niagara Section Escarpment ANSI (Riley et al. 1996). |
| Fresh - Moist Sugar Maple Carbonate Treed Talus Type | TAT1-4 | S3 | Common along the Niagara Escarpment (Riley et al. 1996); also occurs along the Onondaga Escarpment in Fort Erie. |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|--|-----------|---------|--|
| Fresh - Moist Basswood - White Ash Carbonate Treed Talus Type | TAT1-5 | S2, RR | Niagara Gorge (Riley et al. 1996). |
| Fresh - Moist Hemlock - Sugar Maple Carbonate Treed Talus Type | TAT1-6 | S2, RR | Niagara Gorge, Jordan Valley and Niagara Section Escarpment ANSI (Riley et al. 1996). |
| ALVAR | AL | | |
| <i>Open Alvar Ecosite</i> | ALO1 | | |
| Dry Lichen – Moss Open Alvar Pavement Type | ALO1-1 | S1, RR | Wainfleet (WF-22) and Fort Erie (FE-11); Point Abino. |
| <i>Treed Alvar Ecosite</i> | ALT1 | | |
| Red Cedar – False Pennyroyal Treed Alvar Type* | ALT1-?* | S2?, RR | East of Smithville, Lincoln (Colville Consulting 2006; Dougan and Associates 1999). |
| CALCAREOUS SHALLOW SOIL SAVANNAH* | | | |
| <i>Calcareous Shallow Soil Savannah Ecosite*</i> | | | |
| Dry Chinquapin Oak - Little Bluestem - Big Bluestem Calcareous Shallow Soil Savannah Type* | | S1, RR | Rim of Niagara Gorge downstream of Niagara Falls (Bakowsky 2007); also at Louth Conservation Area in Lincoln. |
| TALLGRASS PRAIRIE, SAVANNAH AND WOODLAND | TP | | |
| <i>Dry Tallgrass Prairie Ecosite</i> | TPO1 | | |
| Dry Tallgrass Prairie Type | TPO1-1 | S1, RR | St. David's Buried Gorge; Lake Erie shore at Windmill Point and Erie Beach. |
| FOREST | FO | | |
| DECIDUOUS FOREST | FOD | | |
| <i>Calcareous Shallow Soil Deciduous Forest Ecosite**</i> | FODR1** | | |
| Dry-Fresh Sugar Maple – Hardwood Calcareous Shallow Deciduous Forest ** | FODR1-1** | RR | Common along the Niagara Escarpment; regionally rare on the Onondaga Escarpment. One NAI study site (WF-13); larger examples occur in Ridgeway on the Onondaga Escarpment. |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|---|----------|----------|--|
| <i>Dry-Fresh Oak Deciduous Forest Type</i> | FOD1 | | |
| Dry-Fresh Black Oak Deciduous Forest Type | FOD1-3 | S3, RR | Four NAI study areas: NL-01, PL-01, PL-02 and PL-03. |
| <i>Dry-Fresh Oak - Maple - Hickory Deciduous Forest Ecosite</i> | FOD2 | | |
| Dry - Fresh Oak - Hickory Deciduous Forest Type | FOD2-2 | S3S4, RR | Three NAI study areas: NL-01, NL-12 and PL-07. |
| <i>Fresh-Moist Sugar Maple Deciduous Forest Ecosite</i> | FOD6 | | |
| Fresh - Moist Sugar Maple - Black Maple Deciduous Forest Type | FOD6-2 | S3?, RR | Twelve Mile Creek Headwaters (PL-01), Short Hills Provincial Park (Gould 1989), Fifteen and Sixteen Mile Valleys and Jordan Valley ANSI (Riley et al. 1996). |
| <i>Fresh-Moist Lowland Deciduous Forest Ecosite</i> | FOD7 | | |
| Fresh - Moist Black Walnut Lowland Deciduous Forest Type | FOD7-4 | S2S3, RR | Five NAI study areas: PL-01, PL-05, NF-23, WF-07 and WF-29. |
| Fresh - Moist Black Maple Lowland Deciduous Forest Type | FOD7-5 | S3, RR | See notes for FOD6-2 above. |
| <i>Fresh-Moist Poplar-Sassafras Deciduous Forest Ecosite</i> | FOD8 | | |
| Fresh-Moist Sassafras Deciduous Forest Type | FOD8-2 | S3, RR | Three NAI study areas: PL-01, PL-03 and NL-01. |
| <u>WETLAND</u> | | | |
| SWAMP | SW | | |
| CONIFEROUS SWAMP | SWC | | |
| <i>White Pine – Hemlock Mineral Coniferous Swamp Ecosite</i> | SWC2 | | |
| White Pine Mineral Coniferous Swamp Type | SWC2-1 | RR | One NAI study area: PL-01. |
| DECIDUOUS SWAMP | SWD | | |
| <i>Oak Mineral Deciduous Swamp Ecosite</i> | SWD1 | | |
| Swamp White Oak Mineral Deciduous Swamp Type | SWD1-1 | S2S3 | Seventeen patches at 14 NAI study areas. |
| Bur Oak Mineral Deciduous Swamp Type | SWD1-2 | S3, RR | Three NAI study areas: PC-05, WF-22 and WL-08. |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|--|----------|--------------|---|
| Pin Oak Mineral Deciduous Swamp Type | SWD1-3 | S2S3 | Forty-two patches at 19 NAI study areas. |
| THICKET SWAMP | SWT | | |
| <i>Mineral Thicket Swamp Ecosite</i> | SWT2 | | |
| Alder Mineral Thicket Swamp Type | SWT2-1 | RR | Six patches at NAI study areas PL-01 and HAL-40. |
| Buttonbush Mineral Thicket Swamp Type | SWT2-4 | S3 | Seventy patches at 33 NAI study areas. |
| Silky Dogwood Mineral Thicket Swamp Type | SWT2-8 | S3S4 | Eighteen NAI study areas. |
| Grey Dogwood Mineral Thicket Swamp Type | SWT2-9 | S3S4 | Twenty-eight patches at 18 NAI study areas. |
| Southern Arrow-wood Mineral Thicket Swamp Type | SWT2-11 | S3, RR | Point Abino (FE-11) and NAI study area WF-18. |
| Paw-paw Mineral Thicket Swamp Type | SWT2-12 | S1, RR | Recorded historically from several sites along the Niagara River, below the Niagara Escarpment in Lincoln and elsewhere in Niagara Region, but recent records of Paw-paw are few. |
| <i>Organic Thicket Swamp Ecosite</i> | SWT3 | | |
| Alder Organic Thicket Swamp Type | SWT3-1 | RR | Twenty-one patches at 7 NAI study areas: HAL-22, 24, 40, PL-01, WF-01, 02 and WF-25. |
| Buttonbush Organic Thicket Swamp Type | SWT3-4 | S3 | Twenty-one NAI study areas. |
| Winterberry Organic Thicket Swamp Type | SWT3-7 | S3S4, RR | Five NAI study areas: HAL-23, 224, 28, 40 and WL-06. |
| Spicebush Organic Thicket Swamp Type | SWT3-11 | S3, RR | Two NAI study areas: PL-01 and 04. |
| Poison Sumac Organic Thicket Swamp Type | SWT3-13 | S3, RR | Six NAI study areas: HAL-24, 28, 40, WF-01, 29 and WL-06. |
| BOG | BO | | |
| <i>Shrub Bog Ecosite (BOS1)</i> | BOS1 | | |
| Leatherleaf Shrub Bog Type | BOS1-1 | S2S3?, RR | Wainfleet Bog (Macdonald 1992) in NAI study area WF-13. |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|---|----------|--------------|---|
| Highbush Blueberry Shrub Bog Type* | BOS1-?* | S2S3?, RR | Wainfleet Bog (Macdonald 1992) in NAI study area WF-13. |
| MARSH | MA | | |
| <i>Mineral Meadow Marsh Ecosite</i> | MAM2 | | |
| Prairie Slough Grass Mineral Meadow Marsh Type | MAM2-8 | S3, RR | Navy Island (NF-06). |
| <i>Great Lakes Coastal Meadow Marsh Ecosite</i> | MAM4 | | |
| Graminoid Coastal Meadow Marsh Type | MAM4-1 | S2, RR | Point Abino on Lake Erie in NAI study area FE-11. |
| <i>Mineral Fen Meadow Marsh Ecosite</i> | MAM5 | | |
| Mineral Fen Meadow Marsh Type | MAM5-1 | S3, RR | North Pelham Valley ANSI (Riley et al. 1996) in NAI study area PL-01. |
| <i>Mineral Shallow Marsh Ecosite</i> | MAS2 | | |
| Lizard's-tail - Arrow-arum Mineral Shallow Marsh* | MAS2-?* | S2? RR | Along Ussher's Creek in NAI study area NF-12. |
| <i>Organic Shallow Marsh Ecosite</i> | MAS3 | | |
| Water Willow Organic Shallow Marsh Type | MAS3-12 | RR | Three patches along Lyons Creek in NAI study area NF-01. |

| ELC UNIT | ELC CODE | STATUS | OCCURRENCE SUMMARY |
|--|----------|--------|--------------------|
| <p>ELC Ecosites and Vegetation Types:</p> <p>Plant community typology generally follows Lee et al. (1998). ‘New’ community types not listed in the ELC are denoted with a single-asterisk (*) under the ELC Unit and ELC Code columns. Plant community types listed in the subsequent <i>open document</i> draft version of ELC (Lee 2003), but not in Lee et al. (1998) are denoted with a double-asterisk (**)</p> <p>VEGETATION COMMUNITY STATUS (ONTARIO AND NIAGARA REGION)</p> <p>S-ranks for imperilled and vulnerable plant community types (i.e. S1, S2 and S3) are listed under the “Status” column (from Bakowsky 1996 or Bakowsky pers. comm.).</p> <p><u>Ontario Rank (S-rank):</u></p> <p>S1 = Critically Imperilled: Critically imperilled in Ontario because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.</p> <p>S2 = Imperilled: Imperilled in Ontario because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.</p> <p>S3 = Vulnerable: Vulnerable in Ontario due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.</p> <p>S4 = Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.</p> <p>S5 = Secure: Common, widespread, and abundant in Ontario.</p> <p><u>Niagara Region Status – Vegetation Communities</u></p> <p>RR = Regionally Rare: Vegetation communities (ELC Ecosite or Vegetation Type) known from 10 or fewer sites in Niagara Region (based on NAI database and partial literature review).</p> | | | |

**TABLE 2: PLANT COMMUNITY SUMMARY (ELC ECOSITES AND VEGETATION TYPES)
REGIONAL MUNICIPALITY OF NIAGARA, ONTARIO**

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-----------|
| <u>TERRESTRIAL</u> | |
| BEACH / BAR | BB |
| <i>Mineral Open Beach / Bar Ecosite</i> | BBO1 |
| Sea Rocket Sand Open Beach Type | BBO1-1 |
| <i>Bedrock Open Beach / Bar Ecosite</i> | BBO2 |
| Calcareous Open Bedrock Shoreline Type* | BBO2-?* |
| <i>Mineral Shrub Beach / Bar Ecosite</i> | BBS1 |
| Willow Gravel Shrub Beach Type | BBS1-2 |
| <i>Mineral Treed Beach / Bar Ecosite</i> | BBT1 |
| Cottonwood Mineral Treed Shoreline Type** | SHTM1-1** |
| <i>Bedrock Treed Beach / Bar Ecosite</i> | BBT2 |
| SAND DUNE | SD |
| <i>Open Sand Dune Ecosite</i> | SDO1 |
| Beachgrass – Wormwood Open Graminoid Sand Dune Type** | SBOD1-4** |
| <i>Shrub Sand Dune Ecosite</i> | SDS1 |
| Hop-tree Shrub Dune Type | SDS1-2 |
| <i>Treed Sand Dune Ecosite</i> | SDT1 |
| Cottonwood Treed Dune Type | SDT1-1 |
| BLUFF | BL |
| <i>Mineral Shrub Bluff Ecosite</i> | BLS1 |
| Raspberry Low Shrub Bluff Type** | BLSM1-5** |
| CLIFF | CL |
| <i>Carbonate Open Cliff Ecosite</i> | CLO1 |
| Cliffbrake – Lichen Carbonate Open Cliff Type | CLO1-1 |
| Bulblet Fern - Herb Robert Carbonate Open Cliff Type | CLO1-2 |
| Moist Open Carbonate Cliff Seepage Type | CLO1-4 |
| Open Carbonate Cliff Rim Type | CLO1-5 |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-------------|
| <i>Carbonate Treed Cliff Ecosite</i> | CLT1 |
| White Cedar Treed Carbonate Cliff Type | CLT1-1 |
| TALUS | TA |
| <i>Carbonate Open Talus Ecosite</i> | TAO1 |
| Dry-Fresh Carbonate Open Talus Type | TAO1-1 |
| Fresh-Moist Carbonate Open Talus Type | TAO1-2 |
| <i>Carbonate Shrub Talus Ecosite</i> | TAS1 |
| Mountain Maple Carbonate Shrub Talus Type | TAS1-2 |
| <i>Carbonate Treed Talus Ecosite</i> | TAT1 |
| Dry-Fresh Chinquapin Oak Carbonate Treed Talus Type | TAT1-1 |
| Dry-Fresh White Birch Carbonate Treed Talus Type | TAT1-3 |
| Fresh-Moist Sugar Maple Carbonate Treed Talus Type | TAT1-4 |
| Fresh-Moist Basswood - White Ash Carbonate Treed Talus Type | TAT1-5 |
| Fresh-Moist Hemlock - Sugar Maple Carbonate Treed Talus Type | TAT1-6 |
| CREVICE AND CAVE | CC |
| <i>Carbonate Crevice Ecosite**</i> | CCR1** |
| <i>Carbonate Cave Ecosite**</i> | CCA1** |
| ALVAR | AL |
| <i>Open Alvar Ecosite</i> | ALO1 |
| Dry Lichen - Moss Open Alvar Pavement Type | ALO1-1 |
| <i>Treed Alvar Ecosite</i> | ALT1 |
| Red Cedar – False Pennyroyal Treed Alvar Type* | ALT1-?* |
| CALCAREOUS SHALLOW SOIL SAVANNAH* | |
| <i>Calcareous Shallow Soil Savannah Type*</i> | |
| Dry Chinquapin Oak – Little Bluestem – Big Bluestem Calcareous Shallow Soil Savannah Type* | |
| TALLGRASS PRAIRIE, SAVANNAH AND WOODLAND | TP |
| <i>Dry Tallgrass Prairie Ecosite</i> | TPO1 |
| Dry Tallgrass Prairie Type | TPO1-1 |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-------------|
| FOREST | FO |
| CONIFEROUS FOREST | FOC |
| <i>Fresh-Moist Hemlock Coniferous Forest Ecosite</i> | FOC3 |
| Fresh-Moist Hemlock Coniferous Forest Type | FOC3-1 |
| Fresh-Moist Hemlock – White Pine Coniferous Forest Type** | FOCM3-2** |
| <i>Naturalized Coniferous Plantation Ecosite**</i> | FOCM6** |
| Dry - Fresh White Pine Naturalized Coniferous Plantation Type** | FOCM6-1** |
| Dry - Fresh Red Pine Naturalized Coniferous Plantation Type** | FOCM6-2** |
| Dry – Fresh Scotch Pine Naturalized Coniferous Plantation Type** | FOCM6-3** |
| MIXED FOREST | FOM |
| <i>Dry-Fresh Hardwood - Hemlock Mixed Forest Ecosite</i> | FOM3 |
| Dry-Fresh Hardwood - Hemlock Mixed Forest Type | FOM3-1 |
| Dry-Fresh Sugar Maple - Hemlock Mixed Forest Type | FOM3-2 |
| Dry-Fresh Hemlock – White Pine Mixed Forest Type** | FOMM3-3** |
| <i>Fresh-Moist Sugar Maple - Hemlock Mixed Forest Ecosite</i> | FOM6 |
| Fresh-Moist Sugar Maple - Hemlock Mixed Forest Type | FOM6-1 |
| Fresh-Moist Hemlock – Hardwood Mixed Forest Type | FOM6-2 |
| <i>Fresh-Moist Poplar – White Birch Mixed Forest Ecosite</i> | FOM8 |
| Fresh-Moist White Birch Mixed Forest Type | FOM8-2 |
| <i>Fresh-Moist White Pine – Hardwood Mixed Forest Ecosite**</i> | FOMM9** |
| Fresh-Moist White Pine - Sugar Maple Mixed Forest Type** | FOMM9-1** |
| DECIDUOUS FOREST | FOD |
| <i>Dry-Fresh Sugar Maple – Hardwood Calcareous Shallow Deciduous Forest Ecosite**</i> | FODR1** |
| Dry-Fresh Sugar Maple – Hardwood Calcareous Shallow Deciduous Forest Type** | FODR1-1** |
| <i>Dry-Fresh Oak Deciduous Forest Ecosite</i> | FOD1 |
| Dry-Fresh Red Oak Deciduous Forest Type | FOD1-1 |
| Dry-Fresh White Oak Deciduous Forest Type | FOD1-2 |
| Dry-Fresh Black Oak Deciduous Forest Type | FOD1-3 |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-------------|
| <i>Dry-Fresh Oak - Maple - Hickory Deciduous Forest Ecosite</i> | FOD2 |
| Dry-Fresh Oak - Red Maple Deciduous Forest Type | FOD2-1 |
| Dry-Fresh Oak - Hickory Deciduous Forest Type | FOD2-2 |
| Dry-Fresh Oak - Hardwood Deciduous Forest Type | FOD2-4 |
| <i>Dry-Fresh Poplar-White Birch Deciduous Forest Ecosite</i> | FOD3 |
| Dry-Fresh Poplar Deciduous Forest Type | FOD3-1 |
| Dry-Fresh White Birch Deciduous Forest Type | FOD3-2 |
| <i>Dry-Fresh Deciduous Forest Ecosite</i> | FOD4 |
| Dry-Fresh Beech Deciduous Forest Type | FOD4-1 |
| Dry-Fresh White Ash Deciduous Forest Type | FOD4-2 |
| Dry - Fresh Ironwood Deciduous Forest Type** | FODM4-4** |
| Dry - Fresh Manitoba Maple Deciduous Forest Type** | FODM4-5** |
| Dry - Fresh Norway Maple Deciduous Forest Type** | FODM4-6** |
| Dry - Fresh Red Maple Deciduous Forest Type** | FODM4-7** |
| Dry - Fresh Black Cherry Deciduous Forest Type** | FODM4-8** |
| Dry - Fresh Hawthorn - Apple Deciduous Forest Type** | FODM4-10** |
| Dry - Fresh Black Locust Deciduous Forest Type** | FODM4-11** |
| Dry - Fresh Exotic Deciduous Forest Type** | FODM4-12** |
| <i>Dry-Fresh Sugar Maple Deciduous Forest Ecosite</i> | FOD5 |
| Dry-Fresh Sugar Maple Deciduous Forest Type | FOD5-1 |
| Dry-Fresh Sugar Maple - Beech Deciduous Forest Type | FOD5-2 |
| Dry-Fresh Sugar Maple - Oak Deciduous Forest Type | FOD5-3 |
| Dry-Fresh Sugar Maple - Ironwood Deciduous Forest Type | FOD5-4 |
| Dry-Fresh Sugar Maple - Hickory Deciduous Forest Type | FOD5-5 |
| Dry-Fresh Sugar Maple - Basswood Deciduous Forest Type | FOD5-6 |
| Dry-Fresh Sugar Maple - White Ash Deciduous Forest Type | FOD5-8 |
| Dry-Fresh Sugar Maple - Red Maple Deciduous Forest Type | FOD5-9 |
| Dry-Fresh Sugar Maple – Hardwood Deciduous Forest Type** | FODM5-11** |
| <i>Fresh-Moist Sugar Maple Deciduous Forest Ecosite</i> | FOD6 |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-------------|
| Fresh-Moist Sugar Maple - Lowland Ash Deciduous Forest Type | FOD6-1 |
| Fresh-Moist Sugar Maple - Black Maple Deciduous Forest Type | FOD6-2 |
| Fresh-Moist Sugar Maple – Yellow Birch Deciduous Forest Type | FOD6-3 |
| Fresh-Moist Sugar Maple - Hardwood Deciduous Forest Type | FOD6-5 |
| <i>Fresh-Moist Lowland Deciduous Forest Ecosite</i> | FOD7 |
| Fresh-Moist White Elm Lowland Deciduous Forest Type | FOD7-1 |
| Fresh-Moist Ash Lowland Deciduous Forest Type | FOD7-2 |
| Fresh-Moist Willow Lowland Deciduous Forest Type | FOD7-3 |
| Fresh-Moist Black Walnut Lowland Deciduous Forest Type | FOD7-4 |
| Fresh-Moist Black Maple Lowland Deciduous Forest Type | FOD7-5 |
| Fresh-Moist Manitoba Maple Lowland Deciduous Forest Type** | FODM7-7** |
| Fresh-Moist Exotic Lowland Deciduous Forest Type** | FODM7-9** |
| <i>Fresh-Moist Poplar Deciduous Forest Ecosite</i> | FOD8 |
| Fresh-Moist Poplar Deciduous Forest Type | FOD8-1 |
| Fresh-Moist Sassafras Deciduous Forest Type | FOD8-2 |
| Fresh-Moist Cottonwood Deciduous Forest Type** | FODM8-3** |
| <i>Fresh-Moist Oak - Maple - Hickory Deciduous Forest Ecosite</i> | FOD9 |
| Fresh-Moist Oak - Sugar Maple Deciduous Forest Type | FOD9-1 |
| Fresh-Moist Oak - Maple Deciduous Forest Type | FOD9-2 |
| Fresh-Moist Shagbark Hickory Deciduous Forest Type | FOD9-4 |
| Fresh-Moist Bitternut Hickory Deciduous Forest Type | FOD9-5 |
| Fresh-Moist Oak – Hardwood Deciduous Forest Type** | FODM9-6** |
| <i>Fresh-Moist Carolinian Deciduous Forest Ecosite</i> | FODM10** |
| Fresh - Moist Sugar Maple - Beech Carolinian Deciduous Forest Type** | FODM10-1** |
| Fresh - Moist Oak Carolinian Deciduous Forest Type** | FODM10-2** |
| <i>Naturalized Deciduous Plantation Ecosite**</i> | FODM12** |
| CULTURAL | CU |
| PLANTATION | CUP |
| <i>Deciduous Plantation</i> | CUP1 |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-------------|
| Black Walnut Deciduous Plantation Type | CUP1-3 |
| Green Ash Deciduous Plantation Type | CUP1-7 |
| <i>Mixed Plantation</i> | CUP2 |
| Black Walnut – White Pine Mixed Plantation Type | CUP2-1 |
| <i>Coniferous Plantation</i> | CUP3 |
| Red Pine Coniferous Plantation Type | CUP3-1 |
| White Pine Coniferous Plantation Type | CUP3-2 |
| Scots Pine Coniferous Plantation Type | CUP3-3 |
| European Larch Coniferous Plantation Type | CUP3-6 |
| White Spruce - European Larch Coniferous Plantation Type | CUP3-8 |
| Norway Spruce – European Larch Coniferous Plantation Type | CUP3-9 |
| HEDGEROW | |
| <i>Naturalized Coniferous Hedgerow Ecosite**</i> | FOCM5** |
| <i>Naturalized Deciduous Hedgerow Ecosite**</i> | FODM11** |
| CULTURAL MEADOW | CUM |
| <i>Mineral Cultural Meadow Ecosite</i> | CUM1 |
| Dry-Moist Old Field Meadow Type | CUM1-1 |
| Poverty Oat Grass Graminoid Meadow Type** | MEGM3-1** |
| Kentucky Blue Grass Graminoid Meadow Type** | MEGM3-4** |
| Orchard Grass Graminoid Meadow Type** | MEGM3-6** |
| Timothy Grass Graminoid Meadow Type** | MEGM3-7** |
| Reed Canary Grass Graminoid Meadow Type** | MEGM3-8** |
| Fresh - Moist Open Graminoid Meadow Type** | MEGM4-1** |
| Goldenrod Forb Meadow Type** | MEFM1-1** |
| Aster Forb Meadow Type** | MEFM1-2** |
| <i>Fresh – Moist Open Forb Meadow Ecosite**</i> | MEFM4** |
| <i>Fresh – Moist Mixed Meadow Ecosite**</i> | MEMM4** |
| <i>Bedrock Cultural Meadow Ecosite</i> | CUM2 |
| CULTURAL THICKET | CUT |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-------------|
| <i>Mineral Cultural Thicket Ecosite</i> | CUT1 |
| Sumac Cultural Thicket Type | CUT1-1 |
| Gray Dogwood Cultural Thicket Type | CUT1-4 |
| Raspberry Cultural Thicket Type | CUT1-5 |
| Buckthorn Deciduous Shrub Thicket Type** | THDM2-6** |
| Hawthorn Deciduous Shrub Thicket Type** | THDM2-11** |
| Native Shrub Deciduous Hedgerow Thicket Type** | THDM3-2** |
| Native Deciduous Regeneration Thicket Type** | THDM4-1** |
| Fresh – Moist Gray Dogwood Deciduous Thicket Type** | THDM5-1** |
| <i>Bedrock Cultural Thicket Ecosite</i> | CUT2 |
| CULTURAL SAVANNAH | CUS |
| <i>Mineral Cultural Savannah Ecosite</i> | CUS1 |
| Hawthorn Cultural Savannah Type | CUS1-1 |
| Fresh – Moist Willow Deciduous Savannah Type** | SVDM4-1** |
| <i>Bedrock Cultural Savannah Ecosite</i> | CUS2 |
| CULTURAL WOODLAND | CUW |
| <i>Mineral Cultural Woodland Ecosite</i> | CUW1 |
| Dry – Fresh Hawthorn / Apple Deciduous Woodland Type** | WODM4-1** |
| Dry – Fresh White Ash Deciduous Woodland Type** | WODM4-2** |
| Dry – Fresh Black Walnut Deciduous Woodland Type** | WODM4-4** |
| Fresh – Moist Elm Deciduous Woodland Type** | WODM5-2** |
| Fresh – Moist Hawthorn / Apple Deciduous Woodland Type** | WODM5-4** |
| <i>Bedrock Cultural Woodland Ecosite</i> | CUW2 |
| <u>WETLAND</u> | |
| SWAMP | SW |
| CONIFEROUS SWAMP | SWC |
| <i>White Pine - Hemlock Mineral Coniferous Swamp Ecosite</i> | SWC2 |
| White Pine Mineral Coniferous Swamp Type | SWC2-1 |
| Hemlock Mineral Coniferous Swamp Type | SWC2-2 |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-----------|
| MIXED SWAMP | SWM |
| <i>Birch - Poplar Mineral Mixed Swamp Ecosite</i> | SWM3 |
| Yellow Birch – Conifer Mineral Mixed Swamp | SWM3-1 |
| <i>Birch - Poplar Organic Mixed Swamp Ecosite</i> | SWM6 |
| Yellow Birch – Conifer Organic Mixed Swamp | SWM6-1 |
| Hemlock – Hardwood Organic Mixed Swamp Type** | SWMO4-2** |
| DECIDUOUS SWAMP | SWD |
| <i>Oak Mineral Deciduous Swamp Ecosite</i> | SWD1 |
| Swamp White Oak Mineral Deciduous Swamp Type | SWD1-1 |
| Bur Oak Mineral Deciduous Swamp Type | SWD1-2 |
| Pin Oak Mineral Deciduous Swamp Type | SWD1-3 |
| <i>Ash Mineral Deciduous Swamp Ecosite</i> | SWD2 |
| Black Ash Mineral Deciduous Swamp Type | SWD2-1 |
| Green Ash Mineral Deciduous Swamp Type | SWD2-2 |
| <i>Maple Mineral Deciduous Swamp Ecosite</i> | SWD3 |
| Red Maple Mineral Deciduous Swamp Type | SWD3-1 |
| Silver Maple Mineral Deciduous Swamp Type | SWD3-2 |
| Swamp Maple Mineral Deciduous Swamp Type | SWD3-3 |
| Manitoba Maple Mineral Deciduous Swamp Type | SWD3-4 |
| <i>Mineral Deciduous Swamp Ecosite</i> | SWD4 |
| Willow Mineral Deciduous Swamp Type | SWD4-1 |
| White Elm Mineral Deciduous Swamp Type | SWD4-2 |
| Yellow Birch Mineral Deciduous Swamp Type | SWD4-4 |
| Poplar Mineral Deciduous Swamp Type** | SWDM4-5** |
| White Birch – Cottonwood Deciduous Swamp Type** | SWDM4-6** |
| <i>Ash Organic Deciduous Swamp Ecosite</i> | SWD5 |
| Green Ash Organic Deciduous Swamp Type** | SWDO1-2** |
| <i>Maple Organic Deciduous Swamp Ecosite</i> | SWD6 |
| Red Maple Organic Deciduous Swamp Type | SWD6-1 |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-----------|
| Silver Maple Organic Deciduous Swamp Type | SWD6-2 |
| Swamp Maple Organic Deciduous Swamp Type | SWD6-3 |
| <i>Birch - Poplar Organic Deciduous Swamp Ecosite</i> | SWD7 |
| Yellow Birch Organic Deciduous Swamp Type | SWD7-2 |
| Trembling Aspen Organic Swamp Type** | SWDO3-3** |
| THICKET SWAMP | SWT |
| <i>Mineral Thicket Swamp Ecosite</i> | SWT2 |
| Alder Mineral Thicket Swamp Type | SWT2-1 |
| Willow Mineral Thicket Swamp Type | SWT2-2 |
| Buttonbush Mineral Thicket Swamp Type | SWT2-4 |
| Meadowsweet Mineral Thicket Swamp Type | SWT2-6 |
| Silky Dogwood Mineral Thicket Swamp Type | SWT2-8 |
| Grey Dogwood Mineral Thicket Swamp Type | SWT2-9 |
| Southern Arrow-wood Mineral Thicket Swamp Type | SWT2-11 |
| Paw-paw Mineral Thicket Swamp Type | SWT2-12 |
| European Alder Mineral Deciduous Thicket Swamp Type** | SWTM1-2** |
| Missouri Willow Mineral Deciduous Thicket Swamp Type** | SWTM3-1** |
| Bebb's Willow Mineral Deciduous Thicket Swamp Type** | SWTM3-2** |
| Winterberry Mineral Deciduous Thicket Swamp Type** | SWTM5-6** |
| Non-native Mineral Deciduous Thicket Swamp Type** | SWTM5-8** |
| <i>Organic Thicket Swamp Ecosite</i> | SWT3 |
| Alder Organic Thicket Swamp Type | SWT3-1 |
| Willow Organic Thicket Swamp Type | SWT3-2 |
| Buttonbush Organic Thicket Swamp Type | SWT3-4 |
| Red-osier Organic Thicket Swamp Type | SWT3-5 |
| Winterberry Organic Thicket Swamp Type | SWT3-7 |
| Spicebush Organic Thicket Swamp Type | SWT3-11 |
| Poison Sumac Organic Thicket Swamp Type | SWT3-13 |
| Bebb's Willow Organic Deciduous Thicket Swamp Type** | SWTO2-2** |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-------------|
| Silky Dogwood Organic Thicket Deciduous Swamp Type** | SWTO4-3** |
| Meadowsweet Organic Thicket Deciduous Swamp Type** | SWTO5-11** |
| BOG | BO |
| <i>Shrub Bog Ecosite</i> | BOS1 |
| Leatherleaf Shrub Bog Type | BOS1-1 |
| Highbush Blueberry Shrub Bog Type* | BOS1-?* |
| MARSH | MA |
| MEADOW MARSH | MAM |
| <i>Bedrock Meadow Marsh Ecosite</i> | MAM1 |
| Reed-canary Grass Bedrock Meadow Marsh Type | MAM1-1 |
| <i>Mineral Meadow Marsh Ecosite</i> | MAM2 |
| Bluejoint Mineral Meadow Marsh Type | MAM2-1 |
| Reed-canary Grass Mineral Meadow Marsh Type | MAM2-2 |
| Red-top Mineral Meadow Marsh Type | MAM2-3 |
| Fowl Manna Grass Mineral Meadow Marsh Type | MAM2-4 |
| Narrow-leaved Sedge Mineral Meadow Marsh Type | MAM2-5 |
| Prairie Slough Grass Mineral Meadow Marsh Type | MAM2-8 |
| Jewelweed Mineral Meadow Marsh Type | MAM2-9 |
| Forb Mineral Meadow Marsh Type | MAM2-10 |
| Cattail Graminoid Mineral Meadow Marsh Type** | MAMM1-2** |
| Creeping Bent Grass Graminoid Mineral Meadow Marsh Type** | MAMM1-8** |
| Common Reed Graminoid Mineral Meadow Marsh Type** | MAMM1-12** |
| Rush Graminoid Mineral Meadow Marsh Type** | MAMM1-13** |
| Rice Cut-grass Graminoid Mineral Meadow Marsh Type** | MAMM1-14** |
| Bulrush Graminoid Mineral Meadow Marsh Type** | MAMM1-15** |
| Mixed Graminoid Mineral Meadow Marsh Type** | MAMM1-16** |
| Panicled Aster Mineral Meadow Marsh Type** | MAMM2-2** |
| Purple-stemmed Aster Mineral Meadow Marsh Type** | MAMM2-3** |
| Joe Pye Weed Forb Mineral Meadow Marsh Type** | MAMM2-6** |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-------------|
| Mixed Mineral Meadow Marsh Type** | MAMM3-1** |
| <i>Organic Meadow Marsh Ecosite</i> | MAM3 |
| Rice Cut-grass Organic Meadow Marsh Type | MAM3-3 |
| Narrow-leaved Sedge Organic Meadow Marsh Type | MAM3-5 |
| Jewelweed Organic Meadow Marsh Type | MAM3-8 |
| Forb Organic Meadow Marsh Type | MAM3-9 |
| Joe-pye-weed Forb Organic Meadow Marsh Type** | MAMO2-2** |
| <i>Great Lakes Coastal Meadow Marsh Ecosite</i> | MAM4 |
| Graminoid Coastal Meadow Marsh Type | MAM4-1 |
| <i>Mineral Fen Meadow Marsh Ecosite</i> | MAM5 |
| Mineral Fen Meadow Marsh Type | MAM5-1 |
| SHALLOW MARSH | MAS |
| <i>Bedrock Shallow Marsh Ecosite</i> | MAS1 |
| Graminoid Bedrock Shallow Marsh Type** | MASR1-1** |
| <i>Mineral Shallow Marsh Ecosite</i> | MAS2 |
| Cattail Mineral Shallow Marsh Type | MAS2-1 |
| Bulrush Mineral Shallow Marsh Type | MAS2-2 |
| Narrow-leaved Sedge Mineral Shallow Marsh Type | MAS2-3 |
| Broad-leaved Sedge Mineral Shallow Marsh Type | MAS2-4 |
| Three-square Mineral Shallow Marsh Type | MAS2-6 |
| Bur-reed Mineral Shallow Marsh Type | MAS2-7 |
| Rice Cut-grass Mineral Shallow Marsh Type | MAS2-8 |
| Forb Mineral Shallow Marsh Type | MAS2-9 |
| Lizard's-tail – Arrow-arum Mineral Shallow Marsh Type* | MAS2-?* |
| Canada Blue-joint Graminoid Mineral Shallow Marsh Type** | MASM1-9** |
| Spike Rush Mineral Shallow Marsh Type** | MASM1-11** |
| Common Reed Mineral Shallow Marsh Type** | MASM1-12** |
| Reed Canary Grass Mineral Shallow Marsh Type** | MASM1-14** |
| Manna Grass Mineral Shallow Marsh Type** | MASM1-17** |

| NESTED ELC COMMUNITY UNITS | CODE |
|--|-------------|
| Beggar-ticks Mineral Shallow Marsh Type** | MASM2-2** |
| Arrow-head Mineral Shallow Marsh Type** | MASM2-3** |
| Purple Loosestrife Mineral Shallow Marsh Type** | MASM2-4** |
| <i>Organic Shallow Marsh Ecosite</i> | MAS3 |
| Cattail Organic Shallow Marsh Type | MAS3-1 |
| Bulrush Organic Shallow Marsh Type | MAS3-2 |
| Broad-leaved Sedge Organic Shallow Marsh Type | MAS3-4 |
| Spike Rush Organic Shallow Marsh Type | MAS3-6 |
| Bur-reed Organic Shallow Marsh Type | MAS3-7 |
| Rice Cut-grass Organic Shallow Marsh Type | MAS3-8 |
| Forb Organic Shallow Marsh Type | MAS3-10 |
| Water Willow Organic Shallow Marsh Type | MAS3-12 |
| Canada Blue-joint Graminoid Organic Shallow Marsh Type** | MASO1-3** |
| Reed Canary Grass Organic Shallow Marsh Type** | MASO1-4** |
| Beggar-ticks Organic Shallow Marsh Type** | MASO2-4** |
| Water-parsnip Organic Shallow Marsh Type** | MASO2-5** |
| Smartweed Organic Shallow Marsh Type** | MASO2-6** |
| OPEN WATER | OA |
| OPEN AQUATIC | OAQ |
| SHALLOW WATER | SA |
| SUBMERGED SHALLOW AQUATIC | SAS |
| <i>Submerged Shallow Aquatic Ecosite</i> | SAS1 |
| Pondweed Submerged Shallow Aquatic Type | SAS1-1 |
| Waterweed Submerged Shallow Aquatic Type | SAS1-2 |
| Stonewort Submerged Shallow Aquatic Type | SAS1-3 |
| Water Milfoil Submerged Shallow Aquatic Type | SAS1-4 |
| Wild Celery Submerged Shallow Aquatic Type | SAS1-5 |
| MIXED SHALLOW AQUATIC | SAM |
| <i>Mixed Shallow Aquatic Ecosite</i> | SAM1 |

| NESTED ELC COMMUNITY UNITS | CODE |
|---|-------------|
| Duckweed Mixed Shallow Aquatic Type | SAM1-2 |
| Pondweed Mixed Shallow Aquatic Type | SAM1-4 |
| Bladderwort Mixed Shallow Aquatic Type | SAM1-6 |
| Water Milfoil Mixed Shallow Aquatic Type | SAM1-7 |
| Water Lily – Bullhead Lily Mixed Shallow Aquatic Type** | SAM1-8** |
| FLOATING-LEAVED SHALLOW AQUATIC | SAF |
| <i>Floating-leaved Shallow Aquatic Ecosite</i> | SAF1 |
| Water Lily - Bullhead Lily Floating-leaved Shallow Aquatic Type | SAF1-1 |
| Duckweed Floating-leaved Shallow Aquatic Type | SAF1-3 |
| Pondweed Floating-leaved Shallow Aquatic** | SAF1-4** |
| Notes: * ‘New’ ELC vegetation type – not listed in Lee et al. (1996) or more recent ELC <i>open document</i> (Lee 2003). ** Not listed in ELC manual (Lee et al. 1996); listed in more recent ELC <i>open document</i> (Lee 2003). | |

Study Site FE-03

Fox Street Wetlands

Municipality Town of Fort Erie

Formerly Fox Street Woodlot (Brady et al., 1980)

Approximate Area 475 hectares

Watershed This study site drains to the Black Creek subwatershed.

Ownership Private and Public with some area owned by Niagara Peninsula Conservation Authority.

General Summary

This study site is located mostly in Fort Erie however a portion is linked to continuous cover in the municipality of Port Colborne. The site is located between Eagle Street in the north and Bowen Road in the south. There is an area that extends along Black Creek to where Learn Road and Wilhelm Road meet in the west. In the east, the boundary is Winger Road.

Physical Description

This natural area is situated in the floodplain of Black Creek on the low lying, poorly drained Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 13.44 |
| CHINGUACOUSY - RED PHASE | 5.57 |
| HALDIMAND - LOAMY PHASE | 0.56 |
| JEDDO - RED PHASE | 0.27 |
| LINCOLN | 4.89 |
| LINCOLN - LOAMY PHASE | 0.56 |
| MALTON - HEAVY RED PHASE | 8.56 |
| NIAGARA | 9.43 |
| NIAGARA - LOAMY PHASE | 1.51 |
| ONEIDA - RED PHASE | 3.35 |
| ONTARIO | 0.58 |
| PEEL - HEAVY RED PHASE | 0.18 |
| WELLAND | 50.32 |
| WATER | 0.55 |
| NOT MAPPED | 0.22 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A Gray Dogwood (*Cornus foemina* ssp. *racemosa*) Deciduous Thicket community was

noted for this study site. The very driest of knolls were dominated by Gray Goldenrod (*Solidago nemoralis* ssp. *nemoralis*), Common Strawberry (*Fragaria virginiana* ssp. *virginiana*), Common Cinquefoil (*Potentilla simplex*), Sedges (*Carex* sp.), Poverty Oat Grass (*Danthonia spicata*), and Wild Carrot (*Daucus carota*). Occasionally scattered Eastern Red Cedar (*Juniperous virginiana*) trees can also be found.

A Narrow-leaved Meadowsweet (*Spirea alba*) Thicket Swamp community documented was characterized by Narrow-leaved Meadowsweet and associated Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), and Black Chokeberry (*Aronia melanocarpa*). On the edges of the Meadowsweet Swamp along the terrestrial/wetland interface, this community also includes wetter areas of Grey Dogwood Swamp with various patches of Green Ash (*Fraxinus pennsylvanica*), Pin Oak (*Quercus palustris*), Red Maple (*Acer rubrum*), White Elm (*Ulmus americana*), Glossy Buckthorn (*Rhamnus frangula*) and Common Buckthorn (*Rhamnus cathartica*) forming a savanna-like community that is succeeding to a Green Ash Swamp.

A very open Pin Oak Swamp was also noted with a ground cover of Fowl Manna Grass (*Glyceria striata*).

Although the stream was dry when NAI teams visited, they did note a very nice Green Ash Swamp with patches of Buttonbush (*Cephalanthus occidentalis*) Swamp in an abandoned channel. Also, a few patches of White Elm Swamp occur in disturbed areas at the upstream end of this community. In places, dense colonies of Grey Dogwood occur while in most other areas the shrub layer is open. There is evidence of Dutch Elm disease with some standing dead wood. Pale Smartweed (*Polygonum lapathifolium*) dominated in the stream bed and adjacent floodplain.

Vegetation Communities

There are a total of 174 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Savanna (SVD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Dry-Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Willow Deciduous Savanna Type (SVDM5-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Red-top Graminoid Mineral Meadow Marsh Type (MAMM1-4)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
White Elm Mineral Deciduous Swamp Type (SWDM4-2)

Significant Flora

Species at Risk- None noted

Provincially Rare Species- None noted.

Faunal Records:

43- Birds

8- Mammals

5- Reptiles & Amphibians

Site Visits

September 1, 1980

Brady, et al.

July 13, 2005

L. Campbell & Associates

April 16, 2006

A. Garofalo, K. White

August 29, 2006

A. Garofalo, K. White, T. Staton

% of site visited

2.19 % of the total study site was visited by NAI teams.

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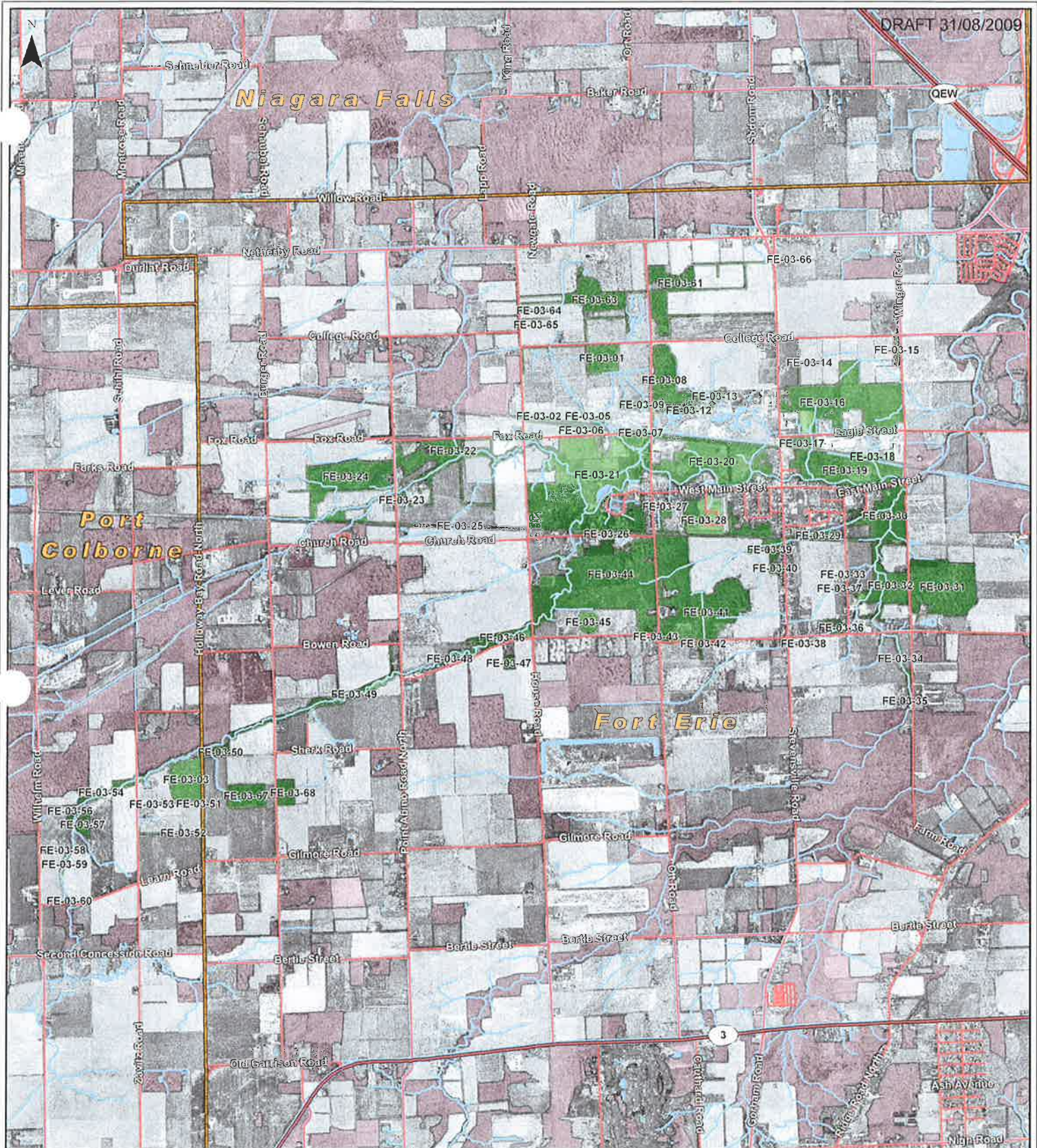
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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site FE-03

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



Natural Areas Inventory

Study Site FE-03

1:44,000

0 300 600 1,200 1,800 2,400 Meters

There are a total of 174 recorded taxa (unique plant records) for this study site
Community Series:
 Deciduous Swamp (SWD) Thicket Swamp (SWT)
 Meadow Marsh (MAM)
 Deciduous Thicket (THD)

Study Site FE-11

Point Abino

Municipality Town of Fort Erie

Formerly Point Abino (Brady, et al., 1980)

Approximate Area 639 hectares

Watershed The drainage from this study site is almost exclusively through the Point Abino Drain to Lake Erie. There is one small area that drains through the Lake Erie 3 tributary.

Ownership Mostly private

General Summary

This study site is dissected by the Port Colborne/ Fort Erie town line. It extends from Pleasant Beach Road in the west to Willowood Avenue in the east. The northern boundary is Sherkston Road and Michener Road and of course, the lake is the southern extent.

Physical Description

This natural area is situated primarily on the limestone plain of the Onondaga Formation. This is evident in the outcropping of bedrock at the surface, and shallow soils.

Nearer to the Lake Erie shore, the back dune communities are characterized by deep organic deposits that create bog-like conditions.

The unique dune communities found at the water's edge in this study site are supported by the sandy soils of the Sand Plain over limestone.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| BEACH | 0.42 |
| BRADY | 4.30 |
| BROOKE - SHALLOW PHASE | 1.75 |
| BROOKE - VERY SHALLOW PHASE | 11.56 |
| CHINGUACOUSY - LOAMY RED PHASE | 0.69 |
| CHINGUACOUSY - RED PHASE | 4.88 |
| FARMINGTON - VERY SHALLOW PHASE | 3.87 |
| FONTHILL | 0.18 |
| FRANKTOWN - SHALLOW PHASE | 0.29 |
| FRANKTOWN - VERY SHALLOW PHASE | 15.19 |
| GRANBY | 10.04 |
| HOLLY | 15.88 |
| JEDDO - RED PHASE | 3.08 |
| ONEIDA - RED WASHED PHASE | 0.43 |

| | |
|-------------------------|--------|
| PLAINFIELD - DUNE PHASE | 7.44 |
| SCARP | 0.42 |
| WALSINGHAM | 4.53 |
| WATER | 0.90 |
| NOT MAPPED | 14.17 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Along the lake there are high dunes with good drainage, while behind these dunes the area is very low and consists primarily of marsh and swamp communities.

The sand dunes at Point Abino support a mature virgin forest and are considered a unique geomorphological and biological feature in Ontario.

The rich Deciduous Forests occurring on the dunes are dominated by Sugar Maple (*Acer saccharum* ssp. *saccharum*) and Red Oak (*Quercus rubra*). Other associated species include American Beech (*Fagus grandifolia*) and old growth Black Maple (*Acer saccharum* ssp. *nigrum*) was noted repeatedly.

The understory was a mix of Spicebush (*Lindera benzoin*), Common Elderberry (*Sambucus canadensis*), and Bladdernut (*Staphylea trifolia*).

The groundcover was noted as Northern Blue-flag (*Iris versicolor*), Jack-in-the-Pulpit (*Arisaema triphyllum* ssp. *triphyllum*), Raspberries (*Rubus* sp.), and Nightshade (*Circaea* sp.).

The foredune and beach community adjacent to Lake Erie is also significant since it is one of only a few examples of a natural, relatively undisturbed beach at the eastern end of Lake Erie. A mature Silver Maple (*Acer saccharinum*) Deciduous Swamp lies north of the deciduous dune forest and is a high quality, mature and undisturbed forest community.

The Deciduous Swamp communities noted in the back dune areas were dominated by Freeman's Maple (*Acer fremanii*), Green Ash (*Fraxinus pennsylvanica*), and Red Maple (*Acer rubrum*).

The understory was largely a mix of Spicebush, Spotted Touch-me-nots (*Impatiens capensis*), False Nettle (*Boehmeria cylindrica*), Moneywort (*Lysimachia nummularia*), and Fowl Manna Grass (*Glyceria striata*).

The Shallow Marshes or backdune wetlands were characterized by Broad-leaved Sedges (*Carex* sp.) and deep organic soils. The associated canopy was usually a mix of Freeman's Maple and Red Maple with Silky Dogwood (*Cornus amomum* ssp. *obliqua*). Other noted species included Common Clearweed (*Pilea pumila*) and Broad-leaved Cattail (*Typha latifolia*).

The Point Abino Drain runs along the north and west of this study site and has lead to a drastic drying of the once dominant wetland communities and swamp forests. In places there are 120 cm of organics but they are now mostly dry.

The deep open water channel of the drain supports a continuous mat of Lesser Duckweed (*Lemna minor*). Tearthumb species (*Polygonum sp.*) emerge along both edges of the channel but often the middle of the water course is open with only floating leaved aquatics.

Vegetation Communities

There are a total of 448 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Shallow Marsh (MAS)

Vegetation Type

Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Open Graminoid Meadow Type (MEGM4-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) - Endangered
Eurybia divaricata (White Wood Aster) (Oldham, 1999) – Threatened
Juglans cinerea (Butternut) (Brady, et al., 1980; Oldham, 1999) – Endangered
Ptelea trifoliata (Common Hop-tree) (Brady, et al., 1980; Oldham, 1999) - Threatened

Provincially Rare Species

Carex albicans ssp. albicans (Sharp-scaled Oak Sedge) (Oldham, 1999) – S3
Carex appalachica (Appalachian Sedge) (Oldham, 1999) – S2, S3
Corispermum pallasii (Pallas Bugseed) (Oldham, 1999) – S1, S3
Prunus pumila var. pumila (Sand Cherry) (Oldham, 1999) – S3

Points of Interest

There has been a lot of inventory work undertaken within this study site in recent years due to a very public dispute over the sale of a piece of private property locally known as Marcy's Woods.

The NPCA database for the NAI contains a very extensive list of Fungi for Marcy's Woods.

Extensive bird surveys were also conducted at various times over the past decade.

Faunal Records:

103 – Birds
22 – Moths & Butterflies

9- Reptiles & Amphibians

8- Mammals

Site Visits

September 1, 1980

Brady, et al.

June 26, 1999

M. Oldham

July 25, 2006

A. Garofalo, K. White

% of site visited

0.32 % of the total study site was visited by NAI teams.

References Cited

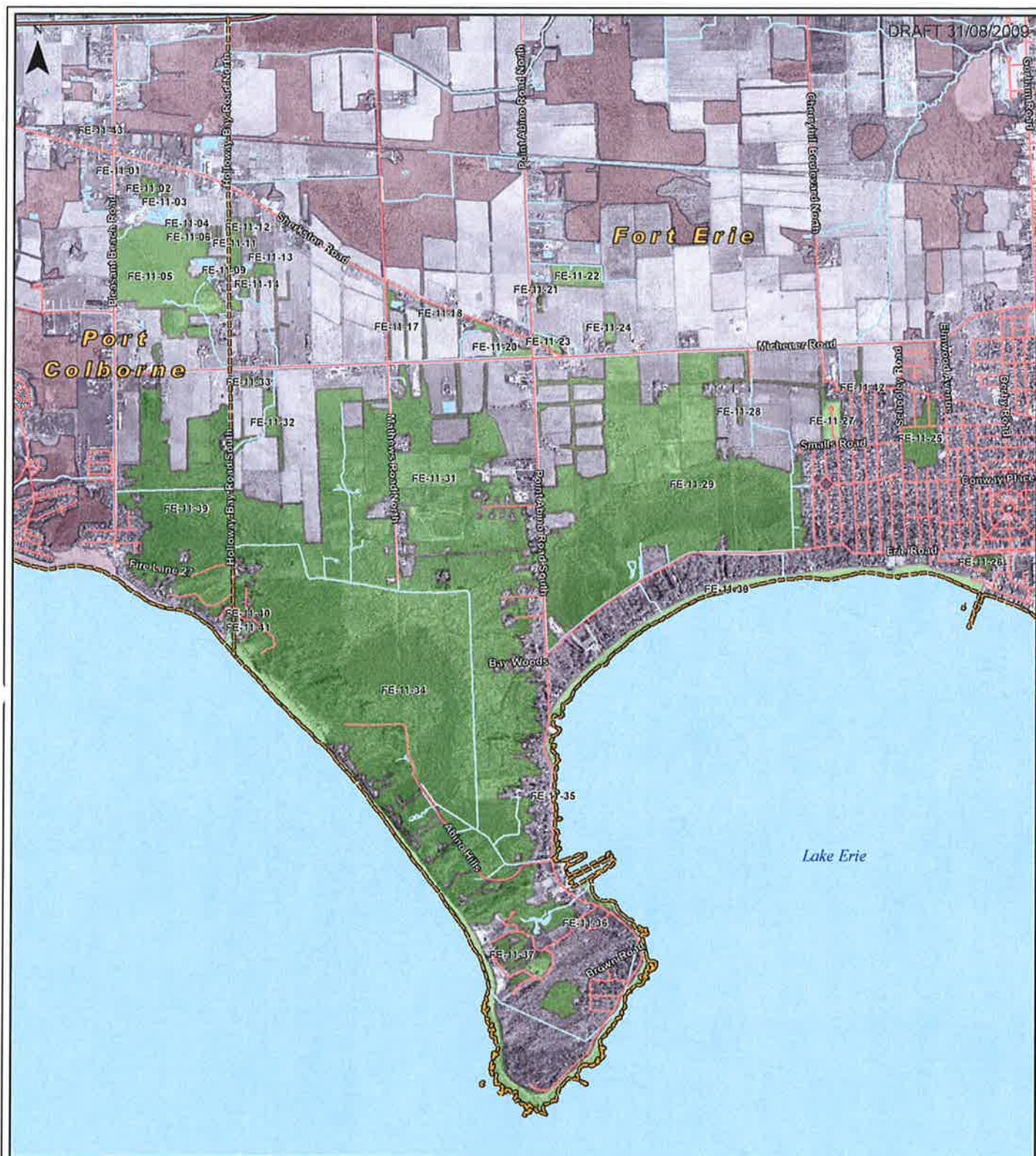
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site FE-11



Natural Areas Inventory

Study Site FE-11

1:30,000

0 200 400 800 1,200 1,600 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West.



There are a total of 448 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Shallow Marsh (MAS)

Study Site GR-06

Durham Oak Grove

Municipality Town of Grimsby

Formerly Durham Oak Grove

Approximate Area 112 hectares

Watershed This study site flows to the Spring Creek subwatershed.

Ownership Mostly private

General Summary

This study site is located on the border of Lincoln and Grimsby. It is south of Mud Street and north of Dobrindt Road. It is bordered on the west by South Grimsby Road 3 and on the east by Zimmerman Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|--------------------------|
| ALLUVIUM | 1.56 |
| BROOKE - VERY SHALLOW PHASE | 1.90 |
| CHINGUACOUSY | 17.64 |
| CHINGUACOUSY - LOAMY PHASE | 1.74 |
| CHINGUACOUSY - WASHED PHASE | 2.82 |
| FARMINGTON | 0.43 |
| FARMINGTON - SHALLOW PHASE | 0.11 |
| FARMINGTON - VERY SHALLOW PHASE | 0.44 |
| FRANKTOWN - VERY SHALLOW PHASE | 0.15 |
| JEDDO | 2.74 |
| MALTON | 0.09 |
| ONEIDA - WASHED PHASE | 1.32 |
| PEEL | 0.09 |
| TAVISTOCK | 0.04 |
| TOLEDO | 68.90 |
| TOLEDO - LOAMY PHASE | 0.04 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forest community noted for this site is dominated by Sugar Maple (*Acer saccharum* ssp. *saccharum*) with Bitternut Hickory (*Carya cordiformis*), Swamp White Oak (*Quercus bicolor*), and Basswood (*Tilia americana*).

The understory was largely the same as the canopy with Hop Hornbeam (*Ostrya virginiana*), Black Cherry (*Prunus serotina*), White Ash (*Fraxinus americana*), and Prickly Ash (*Zanthoxylum americanum*) as associates.

The herbaceous layer was a mix of Garlic Mustard (*Allaria petiolata*), Running Strawberry-bush (*Euonymus obovata*), Herb Robert (*Geranium robertianum*), and Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*).

A small marsh community dominated by Reed Canary Grass was noted for this site.

Vegetation Communities

There are a total of 76 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Shallow Marsh (MAS)

Vegetation Type

Dry-Fresh Sugar Maple-Hickory Deciduous Forest Type (FODM5-5)

Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

2 - Reptiles & Amphibians

2 - Mammals

Site Visits

September 1, 1980

Brady, et al

October 30, 2008

T. Staton, S. Mohamed

% of site visited

4.96 % of the total study site was visited by NAI teams.

References Cited

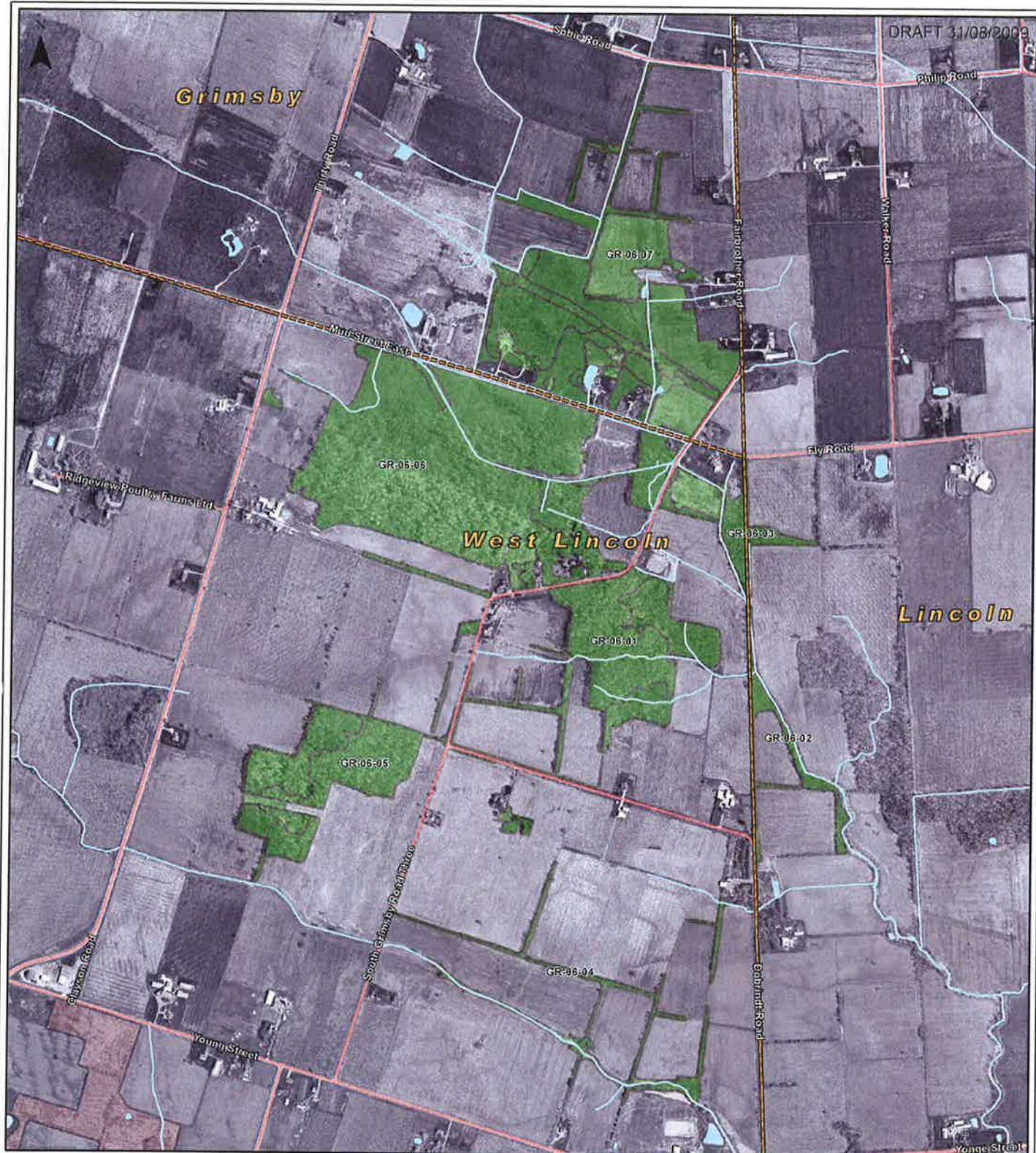
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. *Deciduous Forest Species at Risk in Ontario*. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario* (Fourth Edition ed.). Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60. Ontario Institute of Pedology, Guelph, Ontario.



Legend

- | | |
|-------------------|----------------------|
| Major Highways | Waterbodies |
| Regional Highways | Municipal Boundaries |
| Roads | Study Sites |
| Watercourses | Study Site GR-06 |



Natural Areas Inventory

Study Site GR-06

1:15,000

0 95 190 380 570 760 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 76 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)

Study Site HAL-01

Municipality Haldimand County

Formerly N/A

Approximate Area 50 hectares

Watershed The drainage for this study site is split nearly in half with the southern portion draining directly to Lake Erie while the northern portion drains to the lake via Lowbanks Drain.

Ownership Mostly private

General Summary

Study site HAL-01 is located along the Lake Erie shoreline in Haldimand County. It is bound on the south and the east by Lake Erie. The western boundary is Hoto Line and the northern boundary is Regional Road 3.

Physical Description

This western half of this natural area is situated on well drained, sand and gravel deposits associated with a remnant till moraine feature of the Mohawk Bay Moraine. The eastern half is characterized by flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain.

The majority of this study site is underlain by the limestone of the Onondaga Formation with a small section in the far north underlain by the limestone of the Bois Blanc Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| BEACH | 18.60 |
| HALDIMAND - COARSE PHASE | 3.87 |
| LINCOLN | 4.99 |
| LINCOLN - COARSE PHASE | 7.24 |
| NIAGARA | 25.14 |
| ONTARIO | 10.79 |
| SCARP | 18.60 |
| WELLAND | 10.78 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site was primarily made up of swamp and marsh communities. The swamp community was dominated by Green Ash (*Fraxinus pennsylvanica*) with associated White Elm (*Ulmus americana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

A mix of Spotted Touch-me-not (*Impatiens capensis*), Sedges (*Carex* sp.), and Reed Canary Grass (*Phalaris arundinacea*) made up the understory and ground layers.

The Broad-leaved Sedge marsh noted was largely made up of Lakebank Sedge (*Carex lacustris*), with Bittersweet Nightshade (*Solanum dulcamara*) and Beggar-ticks (*Bidens* sp.).

Vegetation Communities

There are a total of 72 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Shallow Marsh (MAS)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)

Significant Flora

Species at Risk – None noted

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

6 - Birds

2 - Mammals

Site Visits

May 27, 2008

R. Kitchen, B. Porter

% of site visited

6.18% of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. Rare Vascular Plants of Ontario (Fourth Edition ed.). Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 31/08/2009

Wainfleet

Concession 1 Road

Haldimand

Lake Erie



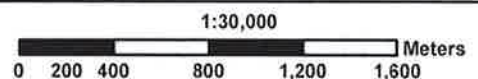
Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-01



Natural Areas Inventory

Study Site HAL-01



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 72 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Shallow Marsh (MAS)

Study Site HAL-07

Municipality Haldimand County

Formerly N/A

Approximate Area 266 hectares

Watershed This study site flows to the Mill Race Creek subwatershed.

Ownership Mostly private

General Summary

Study site HAL-07 is located in the southern tip of Haldimand County, along the western border of the Township of Wainfleet. It is bound to the north by Rattlesnake Road and Booker Road and to the south by Canal Bank Road. Crown Road lies to the west of the study site, while Townline Road lies to the east.

Physical Description

This natural area is situated on the well drained sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|---------------------------------|
| BERRIEN | 0.40 |
| LOWBANKS | 14.77 |
| PLAINFIELD - DUNE PHASE | 0.44 |
| SILVER HILL | 0.15 |
| TOLEDO - COARSE PHASE | 0.25 |
| WALSINGHAM | 12.58 |
| WAUSEON | 71.41 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site's dominant community was Swamp Maple (*Acer freemanii*) swamp with Red Maple (*Acer rubrum*), and Silver Maple (*Acer saccharinum*).

Green Ash (*Fraxinus pennsylvanica*) and White Elm (*Ulmus americana*) made up the understory along with Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Riverbank Grape (*Vitis riparia*), and Fowl Manna Grass (*Glyceria striata*).

Vernal pools were found in areas of deeper organic soils.

The drier knolls were largely Red Oak (*Quercus rubra*), with Red Maple and White Birch (*Betula papyrifera*). Black Cherry (*Prunus serotina*), and Maple-leaved Viburnum (*Viburnum acerifolium*) were found in the understory.

The herbaceous layer was a mix of Large-leaved Aster (*Aster macrophyllus*), Snakeroot (*Sanicula sp.*), and Wild Sarsaparilla (*Aralia nudicaulis*).

Another community within the study site was comprised of young Green Ash complexed with Gray Dogwood swamp. An older, successional thicket swamp community dominated by Gray Dogwood, with Alder sporadically occurred throughout.

There was also a small inclusion, which seemed to be a remnant stand of planted White Pines (*Pinus strobus*) that had naturalized.

Vegetation Communities

There are a total of 84 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Vegetation Type

Dry - Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh - Moist Oak - Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA 2006-2009) – Endangered

Provincially Rare Species – None noted

Points of Interest

Eastern Flowering Dogwood (*Cornus florida*) was found in this study site on two dry Oak knolls, which were surrounded by Swamp Maple swamp. There was a fairly large population with health levels ranging from dead to still flowering healthy individuals. The healthy individuals were larger trees that had more access to sunlight through the canopy than the smaller individuals that were generally being shaded by the larger Red Oaks found on the knolls.

Faunal Records:

8 - Birds
4 - Mammals
3 - Moths/Butterflies

Site Visits

May 28, 2008
R. Kitchen, B. Porter

% of site visited

14.62 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

Study Site HAL-10

Municipality Haldimand County

Formerly N/A

Approximate Area 426 hectares

Watershed Drainage from this study site flows to Chick Hartner Drain in the west and an unnamed creek in the central portion. Small portions flow south west to Michner Drain, and north west to Oswego Creek.

Ownership Mostly private

General Summary

Study site HAL-10 is located along the Haldimand - Wainfleet border and is bound by The east-west rail line in the north and bird Road to the south. It extends from Diltz Road in the west to Gore 'A' Road in the east.

Physical Description

This natural area is situated on the well drained, sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| BERRIEN | 13.16 |
| BEVERLY | 6.82 |
| BEVERLY - COARSE PHASE | 30.45 |
| BRANTFORD | 0.08 |
| HALDIMAND - COARSE PHASE | 0.00 |
| LINCOLN | 0.15 |
| LINCOLN - COARSE PHASE | 0.01 |
| LOWBANKS | 0.40 |
| MAPLEWOOD | 0.03 |
| TAVISTOCK | 0.57 |
| TOLEDO | 21.11 |
| TOLEDO - COARSE PHASE | 12.41 |
| URBAN LAND | 0.03 |
| WALSINGHAM | 0.14 |
| WAUSEON | 14.66 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is dominated by Swamp Maple (*Acer fremanii*), Red Maple (*Acer rubrum*), and Green Ash (*Fraxinus pennsylvanica*), with White Elm (*Ulmus americana*) and Spicebush (*Lindera benzoin*).

The understory was a mix of Black Raspberry (*Rubus occidentalis*), Thicket Creeper (*Parthenocissus inserta*), and Herb Robert (*Geranium robertianum*).

The more open water community was dominated by Broad-leaved Cattail (*Typha latifolia*), and Soft Rush (*Juncus effusus* ssp. *solutus*).

Vegetation Communities

There are a total of 93 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Floating-leaved Shallow Aquatic (SAF)

Vegetation Type

Swamp Maple Organic Deciduous Swamp Type (SWDO2-3)

Significant Flora

Species at Risk – None noted

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

1-Reptile/Amphibian

Site Visits

2007

K. White, R. Ng

% of site visited

0.19 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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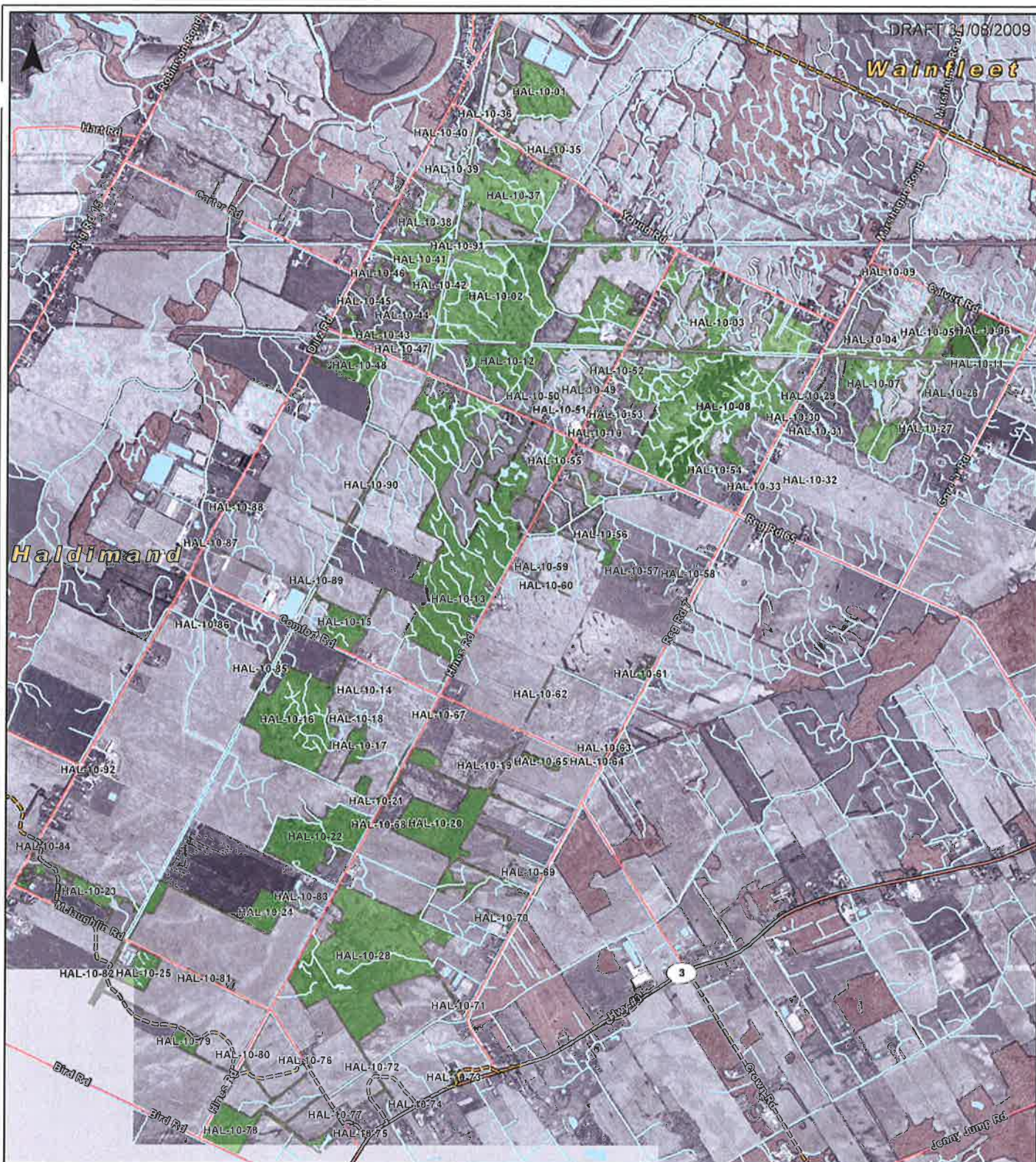
Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 01/08/2009

Wainfleet

Haldimand



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-10



Natural Areas Inventory

Study Site HAL-10

1:30,000

0 225 450 900 1,350 1,800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 93 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)

Study Site HAL-11

Municipality County of Haldimand

Formerly N/A

Approximate Area 107 hectares

Watershed This study site drains in a number of directions. It is located close to the watershed boundary that is the jurisdiction of the Niagara Peninsula Conservation Authority. It drains to Oswego Creek to the north, and moving from east to west, drains to a number of municipal drains. Michner Drain in the east, to Chick Hartner Drain to the east and central areas of the study site and, west to James Drain. This complicated drainage pattern may be partly responsible for the interesting micro topography and associated communities that characterize this study site.

Ownership Mostly private

General Summary

This study site is located between the east-west rail line in the north and Bird Road in the south. It extends from Regional Road 15 in the west to Diltz Road in the east.

Physical Description

This natural area is situated on the well drained, sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|----------------------------|---------------------------------|
| ALLUVIUM 1 | 1.08 |
| BERRIEN | 13.20 |
| BERRIEN - HEAVY CLAY PHASE | 1.80 |
| BEVERLY | 17.31 |
| BEVERLY - COARSE PHASE | 12.93 |
| BRANTFORD | 5.09 |
| BRANTFORD - COARSE PHASE | 0.81 |
| HALDIMAND - COARSE PHASE | 2.31 |
| LINCOLN | 0.54 |
| LINCOLN - COARSE PHASE | 6.90 |
| LOWBANKS | 1.30 |
| SMITHVILLE | 1.26 |
| TAVISTOCK | 0.01 |
| TOLEDO | 18.61 |
| TOLEDO - COARSE PHASE | 4.75 |
| TUSCOLA | 0.24 |
| URBAN LAND | 0.06 |
| WALSINGHAM | 5.61 |
| WAUSEON | 6.18 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This site had Deciduous Forest mixed with patches of Thicket Swamp communities. There was interesting microtopography alternating across the landscape. The Deciduous Forest communities contained Sugar Maple (*Acer saccharum*) and American Beech (*Fagus grandifolia*) as the dominants with associated White Ash (*Fraxinus americana*) and Red Oak (*Quercus rubra*).

The Thicket Swamps were largely Freeman's Maple (*Acer X freemanii*), Swamp White Oak (*Quercus bicolor*) and Willow species (*Salix sp.*). The lower layers contained Narrow-leaved Meadowsweet (*Spiraea alba*), Winterberry (*Ilex verticillata*), Reed-canary Grass (*Phalaris arundinacea*) and Rice Cut-Grass (*Leersia oryzoides*).

More uncommon for this study site were the Yellow Birch *Betula alleghaniensis*) and Green Ash (*Fraxinus pennsylvanica*) dominated or, Freeman's Maple and Willow dominated Meadow Marsh communities. Once again there was interesting topography that saw the drier knolls inhabited by Sugar Maple.

Vegetation Communities

There are a total of 96 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Vegetation Type

Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

None noted

Site Visits

Sept. 20, 2007
B. Wilson, R. Ng

% of site visited

13.30 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-11



Natural Areas Inventory

Study Site HAL-11

1:35,000

0 225 450 900 1,350 1,800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 96 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Study Site HAL-12

Municipality Haldimand County

Formerly N/A

Approximate Area 75 hectares

Watershed Drainage from this study site flows to Sugar Creek Drain

Ownership Mostly private

General Summary

Study site HAL-12 is located in Haldimand County and is bordered by Moote Road to the west and Regional Road 15 to the east. It extends from Swayze Road in the north to Stringer Road in the south.

Physical Description

This natural area is situated on the well drained, sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM 1 | 1.78 |
| BERRIEN | 3.46 |
| BEVERLY | 5.26 |
| BEVERLY - COARSE PHASE | 52.15 |
| BRANTFORD | 1.24 |
| BRANTFORD - COARSE PHASE | 0.37 |
| LINCOLN | 1.40 |
| PLAINFIELD | 0.02 |
| SMITHVILLE | 7.43 |
| TOLEDO | 12.69 |
| TOLEDO - COARSE PHASE | 14.20 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most dominant community noted for this study site was a Deciduous Swamp community largely made up of Green Ash (*Fraxinus pennsylvanica*), Red Maple (*Acer rubrum*), and Basswood (*Tilia americana*).

The understory was characterized by a mix of Spicebush (*Lindera benzoin*), Gray Dogwood (*Cornus foemina ssp. racemosa*), and regenerating Trembling Aspen (*Populus tremuloides*).

The ground layer was a mix of Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), Spotted Touch-me-not (*Impatiens capensis*), and Spotted Crane's-bill (*Geranium maculatum*).

The drier knolls were mostly Red Oak (*Quercus rubra*) and Sugar Maple (*Acer sachharum* ssp. *saccharum*), with a ground layer of Canada Mayflower (*Maianthemum canadense*), False Solomon's Seal (*Maianthemum racemosum* ssp. *racemosum*), Sedges (*Carex* sp.), and Mayapple (*Podophyllum peltatum*).

The Thicket Swamps noted were characterized by dense stands of Buttonbush (*Cephalanthus occidentalis*), with Beggar-ticks (*Bidens* sp.) and Lesser Duckweed (*Lemna minor*).

Vegetation Communities

There are a total of 86 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Deciduous Swamp (SWD)

Floating-leaved Shallow Aquatic (SAF)

Thicket Swamp (SWT)

Vegetation Type

Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)

Dry - Fresh Oak - Hardwood Deciduous Forest Type (FODM2-4)

Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)

Fresh - Moist Oak - Sugar Maple Deciduous Forest Type (FODM9-1)

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk - None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

1 - Reptile/Amphibian

Site Visits

June 24, 2008

R. Kitchen, B. Porter

% of site visited

15.51% of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

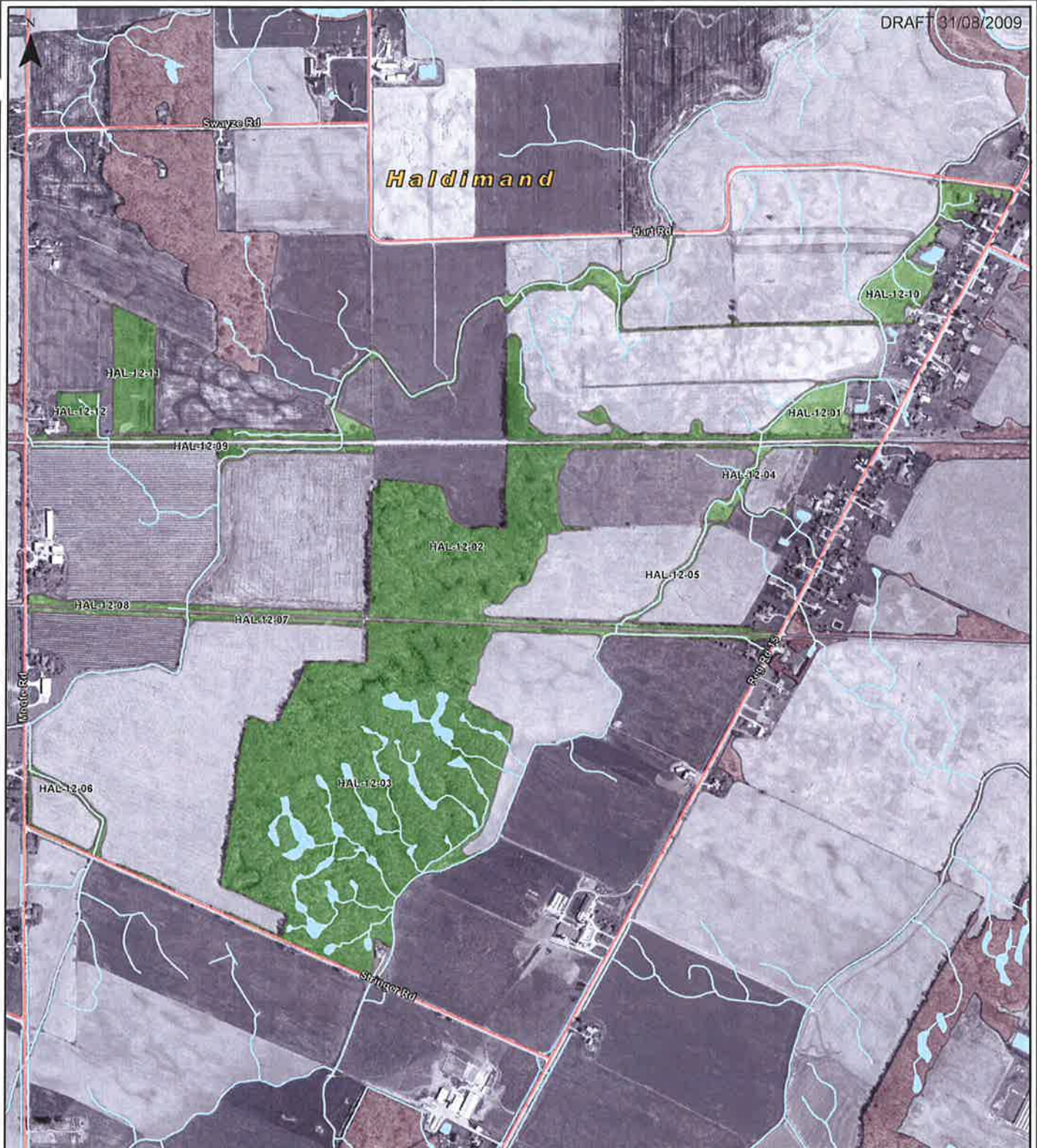
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DRAFT 31/03/2009



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-12



Natural Areas Inventory

Study Site HAL-12

1:12,500

0 75 150 300 450 600 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 85 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site HAL-14

Municipality County of Haldimand

Formerly N/A

Approximate Area 487 hectares

Watershed This study site drains to the Oswego Creek subwatershed.

Ownership Mostly private

General Summary

This study site is at the western most boundary of the Niagara Peninsula Conservation Authority's jurisdiction. It is bound on the west by the watershed boundary of Oswego Creek and Windecker Road. The eastern boundary is the Dunnville Haldimand Townline Road. The entirety of this study site is below Highway Number 3 and north of Concession One.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| BEVERLY | 7.47 |
| BRANTFORD | 0.16 |
| HALDIMAND | 47.82 |
| LINCOLN | 42.52 |
| SMITHVILLE | 1.83 |
| URBAN LAND | 0.16 |
| WATER | 0.05 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is a complex of wet and dry areas.

Overall, the area is dominated by Red Maple (*Acer rubrum*) Swamp with associated Freeman's Maple (*Acer freemanii*), Swamp White Oak (*Quercus bicolor*) and White Elm (*Ulmus americana*).

The understory is largely Red Maple (*Acer rubrum*), Freeman's Maple and Shagbark Hickory (*Carya ovata*) with Narrow-leaved Meadowsweet (*Spiraea alba*), Grey Dogwood (*Cornus foemina* ssp. *racemosa*), Sedges (*Carex* sp) and Swamp Dewberry (*Rubus hispida*).

Vegetation Communities

There are a total of 127 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Vegetation Type

Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest**Faunal Records:**

None noted

Site Visits

August 20, 2007

K. White, R. Ng (data entered by R. Kitchen)

% of site visited

3.01 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-14



Natural Areas Inventory

Study Site HAL-14

1:43,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 127 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site HAL-22

Municipality Haldimand County

Formerly N/A

Approximate Area 289 hectares

Watershed Elsie Creek and Oswego Creek

Ownership Mostly private

General Summary

Study site HAL-22 is located in the County of Haldimand and is bound on the north by Young Road and on the south by Regional Road 9. The western boundary is Sims Locks Drive and Moore Road is the eastern boundary.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 41.45 |
| BRANTFORD | 2.69 |
| HALDIMAND | 1.23 |
| LINCOLN | 4.77 |
| SMITHVILLE | 0.02 |
| TOLEDO | 49.84 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was the Meadow Marsh dominated by Spotted Touch-me-not (*Impatiens capensis*), Rice Cut-grass (*Leersia oryzoides*), Reed-canary Grass (*Phalaris aundinacea*), and Sedges (*Carex* sp.).

Common Clearweed (*Pilea pumila*), Fowl Manna Grass (*Glyceria striata*), and Sensitive Fern (*Onoclea sensibilis*) were found as associates.

The Deciduous Forests noted were characterized by Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Beech (*Fagus grandifolia*), Shagbark Hickory (*Carya ovata*), and Basswood (*Tilia americana*) in the canopy.

Understory species included regenerating canopy species with White Ash (*Fraxinus americana*), Black Raspberry (*Rubus occidentalis*), Canada Enchanter's Nightshade

(*Circaea lutetiana* ssp. *canadensis*), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

The ground layer was a mix of Spotted Crane's-bill (*Geranium maculatum*), Large-leaved Aster (*Aster macrophyllus*), Canada Mayflower (*Maianthemum canadense*), and Common Strawberry (*Fragaria virginiana* ssp. *virginiana*).

The Deciduous Swamps were mostly Red Maple (*Acer rubrum*) with Shagbark Hickory, and Swamp White Oak (*Quercus bicolor*) in the canopy and an understory of Sedges, Spotted Touch-me-not, Common Clearweed and Sensitive Fern.

The Shallow Aquatic community recorded for this study site was almost entirely covered with Lesser Duckweed (*Lemna minor*).

Vegetation Communities

There are a total of 156 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Vegetation Type

Dry - Fresh Sugar Maple - Beech Deciduous Forest Type (FODM5-2)
Dry - Fresh White Ash - Hardwood Deciduous Forest Type (FODM4-2)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fowl Manna Grass Graminoid Mineral Meadow Marsh Type (MAMM1-5)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Graminoid Organic Meadow Marsh Type (MAMO1-4)
Sedge Graminoid Organic Meadow Marsh Type (MAMO1-6)
Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)

Significant Flora

Species at Risk – None noted

Provincially Rare Species – None noted

Points of Interest

Every year, 4-10 owls stop here for several weeks. In 2001, the owls started coming, and up to 10 were seen in 2007. They have been identified as Barred Owls and Short-eared Owls. They usually come in December, January, February, and sometimes as late as March. In January 2003, there were 5 owls. From January/ February 2004, there were 6 owls. In February 2005, there were 5 owls, and they stayed until March 12. In 2006, 8-10 owls came in the last week of February until March 5th.

Faunal Records:

22 - Birds

6 - Mammals

1 - Reptile/Amphibian

Site Visits

June 26, 2007

K. White, R. Ng, R. Kitchen

July 3, 2007

K. White, R. Ng

% of site visited

9.77 % of the total study site was visited by NAI teams.

References Cited

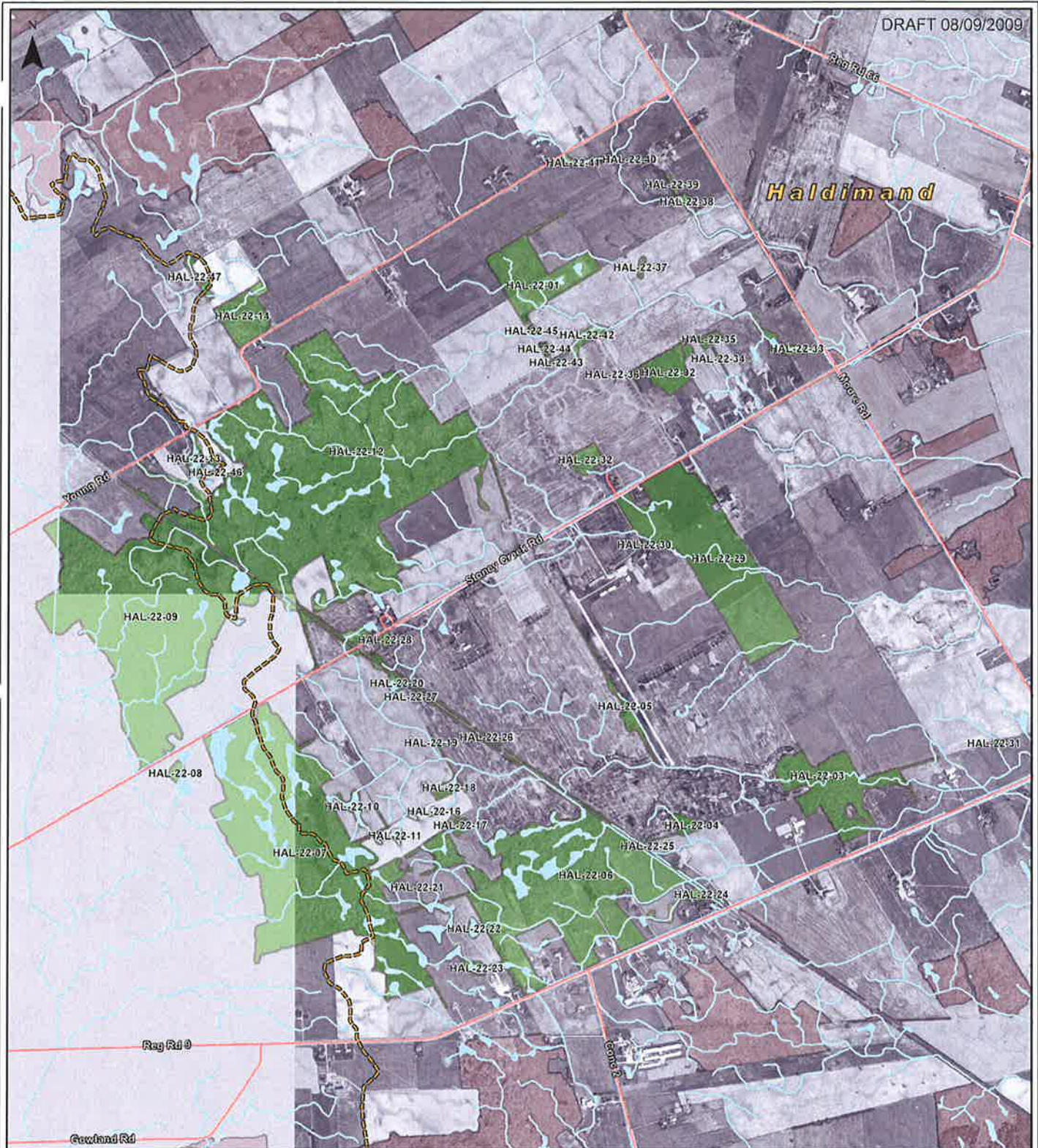
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-22



Natural Areas Inventory

Study Site HAL-22

1:22,000

0 150 300 600 900 1,200 Meters

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There are a total of 156 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)

Meadow Marsh (MAM)
Thicket Swamp (SWT)

Study Site HAL-23

Municipality Haldimand County

Formerly N/A

Approximate Area 371 hectares

Watershed This study sites drains to both the Elsie Creek and Oswego Creek subwatersheds.

Ownership Mostly private

General Summary

Study site HAL-23 is located south of Regional Road 9 and north of Concession 2. It extends from Indian line in the east to just west of the watershed boundary between the Welland River and the Grand River.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 12.88 |
| BRANTFORD | 3.38 |
| HALDIMAND | 35.26 |
| LINCOLN | 39.00 |
| SMITHVILLE | 4.30 |
| TOLEDO | 5.18 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common communities noted for this study site were the Meadow Marshes dominated by Buttonbush (*Cephalanthus occidentalis*), Reed-canary Grass (*Phalaris arundinacea*), Narrow-leaved Meadowsweet (*Spiraea alba*), and Highbush Blueberry (*Vaccinium corymbosum*). Associates included Speckled Alder (*Alnus incana* ssp. *rugosa*), Winterberry (*Ilex verticillata*), Green Ash (*Fraxinus pennsylvanica*), and Sedges such as, Lakebank Sedge (*Carex lucustris*) and Porcupine Sedge (*Carex hystericina*).

The herbaceous layer was a mix of Rice Cut-grass (*Leersia oryzoides*), Devil's Beggar-ticks (*Bidens frondosa*), Wool Grass (*Scirpus cyperinus*), and Bittersweet Nightshade (*Solanum dulcamara*). In wetter areas Broad-leaved Cattails (*Typha latifolia*) were prevalent.

The Thicket Swamps were dominated by Gray Dogwood (*Cornus foemina* ssp. *racemosa*), with Narrow-leaved Meadowsweet, Hawthorn (*Crataegus* sp.), Common Elderberry (*Sambucus canadensis*), Winterberry, Buttonbush, Poison Sumac (*Rhus vernix*), and Black Chokeberry (*Aronia melanocarpa*).

The herbaceous layer was a mix of Early Goldenrod (*Solidago juncea*), Cinnamon Fern (*Osmunda cinnamomea*), Sedges (*Carex* sp.), and Bittersweet Nightshade.

The Deciduous Forest communities noted for this study site were largely Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Beech (*Fagus grandifolia*), Red Oak (*Quercus rubra*), Shagbark Hickory (*Carya ovata*), and White Ash (*Fraxinus americana*), with Basswood (*Tilia americana*) and in some Mixed Forests, White Pine (*Pinus strobus*).

Shallow Marshes documented were mostly Narrow-leaved Cattails (*Typha angustifolia*), with Pale Smartweed (*Polygonum lapathifolium*), Common Boneset (*Eupatorium perfoliatum*), Beggar-ticks, and Pink Knotweed (*Polygonum pennsylvanicum*).

Vegetation Communities

There are a total of 225 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Mixed Forest (FOM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry - Fresh Beech Deciduous Forest Type (FODM4-1)
Dry - Fresh Oak - Hardwood Deciduous Forest Type (FODM2-4)
Dry - Fresh Sugar Maple - Oak Deciduous Forest Type (FODM5-3)
Fresh - Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Fresh - Moist White Pine - Hardwood Mixed Forest Type (FOMM9-2)
Fresh - Moist White Pine - Sugar Maple Mixed Forest Type (FOMM9-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Mixed Forb Organic Meadow Marsh Type (MAMO2-3)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Sedge Graminoid Organic Meadow Marsh Type (MAMO1-6)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

4 - Birds
4 - Mammals
1 – Reptile & Amphibian

Site Visits

August 2, 2007

K. White, R. Ng

August 14, 2007

K. White, R. Ng

August 17, 2007

K. White, R. Ng

August 17, 2007

K. White, B. Wilson

% of site visited

13.29% of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-23



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Natural Areas Inventory

Study Site HAL-23

1:44,000

0 300 600 1,200 1,800 2,400 Meters

There are a total of 225 recorded taxa (unique plant records) for this study site.

Community Series:

- Deciduous Forest (FOD)
- Deciduous Swamp (SWD)
- Deciduous Thicket (THD)
- Meadow Marsh (MAM)
- Mixed Forest (FOM)
- Shallow Marsh (MAS)
- Thicket Swamp (SWT)

Study Site HAL-24

North Cayuga Slough Forest

Municipality Haldimand County

Formerly North Cayuga Slough Forest (Norfolk Field Naturalists, 1987)

Approximate Area 1,391 hectares

Watershed Oswego Creek

Ownership Mostly private

General Summary

Study site HAL-24 is located within Haldimand County on the far west border between Regional Road 9 and Highway 3. It is bound by Regional Highway 54 to the west and Singer Road to the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| ALLUVIUM 1 | 0.01 |
| BEVERLY | 29.98 |
| BRANTFORD | 9.15 |
| HALDIMAND | 7.17 |
| LINCOLN | 15.06 |
| SENECA | 0.01 |
| SMITHVILLE | 5.10 |
| TOLEDO | 33.45 |
| WATER | 0.07 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common communities recorded for this study site were the Thicket Swamps characterized by Narrow-leaved Meadowsweet (*Spirea alba*), Buttonbush (*Cephalanthus occidentalis*), Winterberry (*Ilex verticillata*) or, Speckled Alder (*Alnus incana* ssp. *rugosa*) as the dominant with Red Maple (*Acer rubrum*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Highbush Blueberry (*Vaccinium corymbosum*) and, Willows (*Salix* sp.) as associates.

The herbaceous layer was generally a mix of Devil's Beggar-ticks (*Bidens frondosa*), Goldenrod (*Solidago* sp.) and, Spotted Touch-me-nots (*Impatiens capensis*).

Shallow Marsh communities were also found throughout this study site. They were

dominated by Rice Cut Grass (*Leersia virginica*), White Grass (*Leersia oryzoides*) and, Cattails (*Typha* sp.) with Bulrushes (*Scirpus* sp.) or Winterberry, Meadowsweet and Devil's Beggar-ticks.

A community that is uncommon to the area but was present in this study site was the Poison Sumac Swamp community. Poison Sumac was growing dominant in very organic soils in a Deciduous Swamp on the edge of a large Buttonbush slough.

Vegetation Communities

There are a total of 238 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (SWT)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Bulrush Organic Shallow Marsh Type (MASO1-2)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Dry - Fresh Oak - Hardwood Deciduous Forest Type (FODM2-4)
Dry - Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh - Moist Oak - Sugar Maple Deciduous Forest Type (FODM9-1)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Reed Canary Grass Organic Shallow Marsh Type (MASO1-4)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Sedge Graminoid Organic Meadow Marsh Type (MAMO1-6)
Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
Spirea Organic Deciduous Thicket Swamp Type (SWTO5-10)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species-None noted.

Points of Interest

Faunal Records:

2- Birds

1- Mammal

Site Visits

July 12, 2007

K. White, R. Ng

July 24, 2007

K. White, R. Ng

% of site visited

4.10 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from

<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-24



Natural Areas Inventory

Study Site HAL-24

1:35,000

0 250 500 1,000 1,500 2,000 Meters

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There are a total of 238 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)

Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site HAL-26

Hedley Forest

Municipality Haldimand County

Formerly N/A

Approximate Area 1034 hectares

Watershed This study site drains to the Oswego Creek subwatershed.

Ownership Mostly private with some area owned by Niagara Peninsula Conservation Authority

General Summary

This study site is one of the largest in Haldimand. It stretches from Caistorville Road/ Regional Road 2 in the east to the watershed boundary for the Niagara Peninsula Conservation Authority in the west (Oswego Creek). The northern boundary is just north of Concession One and the southern boundary is Highway Number 3.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM 1 | 6.92 |
| BEVERLY | 8.02 |
| BRANTFORD | 0.24 |
| HALDIMAND | 35.03 |
| LINCOLN | 36.52 |
| SENECA | 0.07 |
| SENECA - COARSE PHASE | 0.15 |
| SMITHVILLE | 12.92 |
| URBAN LAND | 0.14 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Given the location of this study site and the drainage pattern of the landscape, it would be expected that slough forests would dominate. However, the properties visited by the field crews were dominated by naturalized conifer plantations and shallow marshes.

The naturalized plantations communities were largely Eastern White Pine (*Pinus strobus*) and Norway Spruce (*Picea abies*) with associated Shagbark Hickory (*Carya*

ovata) and White Elm (*Ulmus americana*) that had obviously seeded itself over the years.

The Shallow Marsh community was found most often in the less successional areas. These open sedge marshes were saturated with water and had interspersed pockets of open water or open water aquatic communities. These communities were dominated by Fringed Sedge (*Carex crinita*), Wool Grass (*Scirpus cyperinus*) and Narrow-leaved Meadowsweet (*Spiraea alba*).

In the areas where slough forest communities were present, they were largely found to have the typical suite of canopy species including Red Maple (*Acer rubrum*), Swamp Maple (*Acer fremanii*), and Green Ash (*Fraxinus pennsylvanica*).

The understory contained regenerating canopy species with Buttonbush (*Cephalanthus occidentalis*), Narrow-leaved Meadowsweet (*Spiraea alba*), and Silky Dogwood (*Cornus amomum* ssp. *obliqua*).

The herbaceous layer was a mix of Asters (*Aster* sp.) and Sedges (*Carex* sp.).

On the drier knolls between sloughs, Shagbark Hickory was the dominate canopy species with Hop Hornbeam (*Ostrya virginiana*) and White Elm as the understory.

Grey Dogwood (*Cornus foemina* ssp. *racemosa*) and Hairy Aster (*Aster pilosis*) were common in the lower forest layers.

Vegetation Communities

There are a total of 111 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Savanna (SVD)
Deciduous Swamp (SWD)
Deciduous Woodland (WOD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Fresh-Moist Elm Deciduous Woodland Type (WODM5-2)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Hawthorn-Apple Deciduous Woodland Type (WODM4-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species-None noted.

Points of Interest

Faunal Records:

7 - Birds

3 - Mammals

1 - Reptile & Amphibian

Site Visits

August 1, 2007

K. White, R. Ng

October 21, 2008

R. Kitchen, B. Porter

% of site visited

3.56 % of the total study site was visited by NAI teams.

References Cited

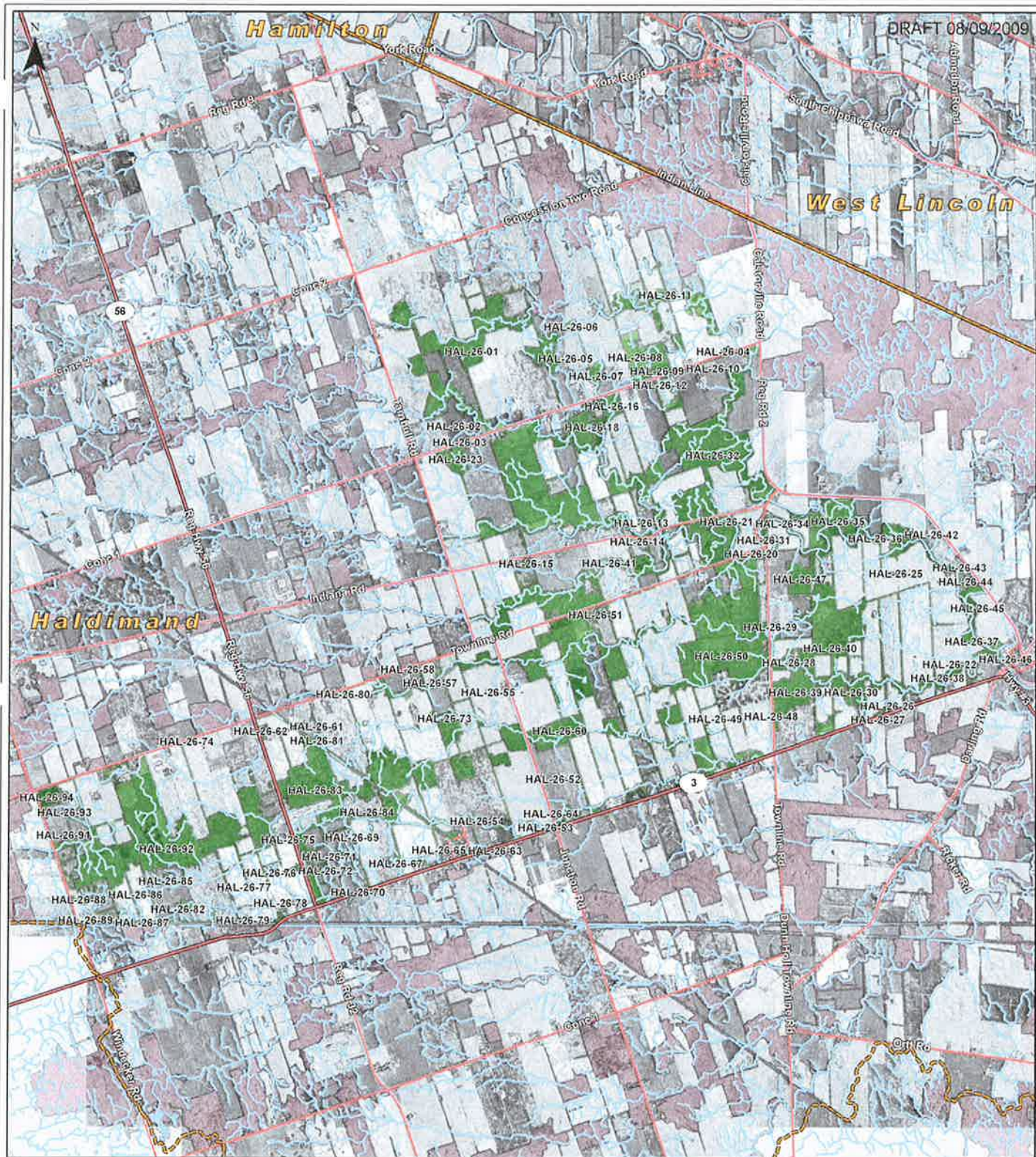
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-26



Natural Areas Inventory

Study Site HAL-26

1:55,000

0 400 800 1,600 2,400 3,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 111 recorded taxa (unique plant records) for this study site.

Community Series:

- | | |
|-------------------------|--------------------------|
| Coniferous Forest (FOC) | Deciduous Woodland (WOD) |
| Deciduous Forest (FOD) | Meadow Marsh (MAM) |
| Deciduous Savanna (SVD) | Shallow Marsh (MAS) |
| Deciduous Swamp (SWD) | Thicket Swamp (SWT) |

Study Site HAL-28

Municipality County of Haldimand

Formerly N/A

Approximate Area 245 hectares

Watershed This study site drains to Oswego Creek.

Ownership Mostly private

General Summary

Study Site HAL-28 is located within the County of Haldimand. The northern boundary is just north of Concession Road and the southern limit is Townline Road. It is bound on the west by Singer Road and on the east by Turnbull Road.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| BEVERLY | 6.88 |
| BRANTFORD | 0.29 |
| HALDIMAND | 40.11 |
| LINCOLN | 36.33 |
| SMITHVILLE | 15.99 |
| TOLEDO | 0.40 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The first community identified for this study site is dominated by Red Oak (*Quercus rubra*) with Swamp White Oak (*Quercus bicolor*) and Sugar Maple (*Acer saccharum* ssp. *Saccharum*) as associates. The understory was largely characterized by Amercian Beech (*Fagus grandifolia*), Sugar Maple, Bitternut Hickory (*Carya cordiformis*), Hop Hornbeam (*Ostrya virginiana*) and Basswood (*Tilia americana*). The herbaceous layer was made up of Large-leaved Aster (*Aster macrophyllus*), Spotted Crane's-bill (*Geranium maculatum*), Common Strawberry (*Fragaria virginiana* ssp. *virginiana*) and others.

Commonly, the Thicket Swamps were dominated by Red Maple (*Acer rubrum*) and White Elm (*Ulmus americana*). Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Narrow-leaved Meadowsweet (*Spiraea alba*).

An interesting Thicket Swamp community identified had Poison Sumac (*Rhus vernix*) as its dominant species with Willow (*Salix sp.*) and Red Maple. The understory was largely Black Chokeberry (*Aronia melanocarpa*) with Poison Sumac and Swamp Rose (*Rosa palustris*) and, the ground layer was a mix of Ferns (*Osmunda sp.*), Sedges (*Carex sp.*) and Spotted Touch-me-nots (*Impatiens capensis*).

The Meadow Marsh communities noted were dominated by Willow species with Sedges, Willows, Swamp Rose and Narrow-leaved Meadowsweet in the upper layers. The lower layers were mostly White Grass (*Leersia virginica*), Small's Spike-rush (*Eleocharis smallii*) and Devil's Beggar-ticks (*Bidens frondosa*).

Areas of Cattail Marsh and some Shallow Water communities were also identified.

The areas of Deciduous Forest identified were drier with Sugar Maple and Red Oak or Sugar Maple and American Beech as the dominants. The understory associates were largely Shagbark Hickory, Hop Hornbeam and White Ash (*Fraxinus americana*). The herbaceous layer was commonly Canada Enchanter's Nightshade (*Circaea lutetiana ssp. canadensis*) and Western Poison Ivy (*Rhus radicans ssp. rydbergii*) or, Large-leaved Aster, Spotted Touch-me-not, False Solomon's Seal (*Maianthemum racemosum ssp. racemosum*) and Common Cinquefoil (*Potentilla simplex*).

There were of course the more common Deciduous Swamp communities that are characteristic of the slough forests in the area. These communities were dominated by Red Maple, Green Ash (*Fraxinus pennsylvanica*), White Elm and Bur Oak (*Quercus macrocarpa*). Black Raspberry (*Rubus occidentalis*), Radiate Sedge (*Carex radiata*), Common Hop Sedge (*Carex lupulina*), Spotted Touch-me-not are common associates.

Vegetation Communities

There are a total of 233 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Cattail Organic Shallow Marsh Type (MASO1-1)
Dry-Fresh Sugar Maple-Basswood Deciduous Forest Type (FODM5-6)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fowl Manna Grass Graminoid Mineral Meadow Marsh Type (MAMM1-5)

Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Organic Shallow Marsh Type (MASO2-1)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-Grass Graminoid Mineral Meadow Marsh Type (MAMM1-14)
Rice Cut-Grass Mineral Shallow Marsh Type (MASM1-10)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut), (NPCA, 2006-2009) - Endangered

Provincially Rare Species-None noted.

Points of Interest

A huge Red Oak 150-175 dbh was found growing on the edge of the stream. Old growth bark found up to 3 ft in height. Gypsy moth damage was evident.

A very large Swamp White oak was found, approximately 110-130 cm dbh. Very tall and straight with old growth bark up to about 15 feet. Leaves are young looking despite it being recorded in August, suggesting they are in second growth. Probably due to gypsy moth defoliation as there was evidence of an infestation.

Faunal Records:

1 - Bird

1 - Reptile & Amphibian

Site Visits

July 18, 2007

K. White, R. Ng

July 24, 2007

K. White, R. Ng

July 25, 2007

K. White, R. Ng

August 21, 2007

K. White, R. Ng

% of site visited

17.08 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-28



Natural Areas Inventory

Study Site HAL-28

1:27,000

0 175 350 700 1,050 1,400 Meters

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There are a total of 233 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site HAL-32

Municipality County of Haldimand

Formerly N/A

Approximate Area 153 hectares

Watershed This study site drains to the Oswego Creek subwatershed.

Ownership Mostly private

General Summary

Study Site HAL-32 is located within the County of Haldimand in between Concession 1 to the south and Concession 2 to the north. The study site is bound on the east by Turnbull Road and on the west by Singer Road.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| BEVERLY | 0.27 |
| BRANTFORD | 0.02 |
| HALDIMAND | 36.73 |
| LINCOLN | 42.36 |
| SMITHVILLE | 20.59 |
| TOLEDO | 0.03 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forests of this Study Site are dominated by a canopy of Sugar Maple (*Acer saccharum* ssp. *saccharum*), Shagbark Hickory (*Carya ovata*) and Red Oak (*Quercus rubra*), and an understory of regenerating Sugar Maples and White Ash (*Fraxinus americana*).

The understory is dominated by Green Ash (*Fraxinus pennsylvanica*) with Common Blackberry (*Rubus allegheniensis*), Enchanter's Night Shade (*Circaea lutetiana* ssp. *canadensis*), Large-leaved Aster (*Aster macrophyllus*) and Spotted Crane's-bill (*Geranium maculatum*).

The Thicket Swamp areas are dominated by species of Hawthorn (*Crataegus*), Green Ash (*Fraxinus pennsylvanica*) and White Elm (*Ulmus americana*).

The understory in these communities is largely Meadowsweet (*Spirea alba*), Grey Dogwood (*Cornus foemina* ssp. *racemosa*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*) with Goldenrod species (*Solidago* sp.).

The meadows of this study site contain Silky Dogwood, Grey Dogwood, Meadowsweet and Hawthorns with patches of Goldenrod and Aster species.

The Meadow Marshes noted were dominated by Grey Dogwood and Meadowsweet with associated Broad-leaved Cattail (*Typha latifolia*) and Wool Grass (*Scirpus cyperinus*). The ground cover is largely Lakebank Sedge (*Carex lacustris*), Rice Cut Grass (*Leersia oryzoides*), Spotted Touch-me-nots (*Impatiens capensis*) and Common Clearweed (*Pilea pumila*).

The one Shallow Marsh community documented was characterized by Winterberry (*Ilex verticillata*) and Highbush Blueberry (*Vaccinium corymbosum*) with Broad-leaved Cattail and Rice Cut Grass.

Vegetation Communities

There are a total of 160 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Forb Meadow (MEF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)
Fowl Manna Grass Graminoid Mineral Meadow Marsh Type (MAMM1-5)
Goldenrod Forb Meadow Type (MEFM1-1)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) - S2

Points of Interest

Faunal Records:

None noted.

Site Visits

July 31, 2007

K. White, R. Ng

% of site visited

23.42 % of the total study site was visited by NAI teams.

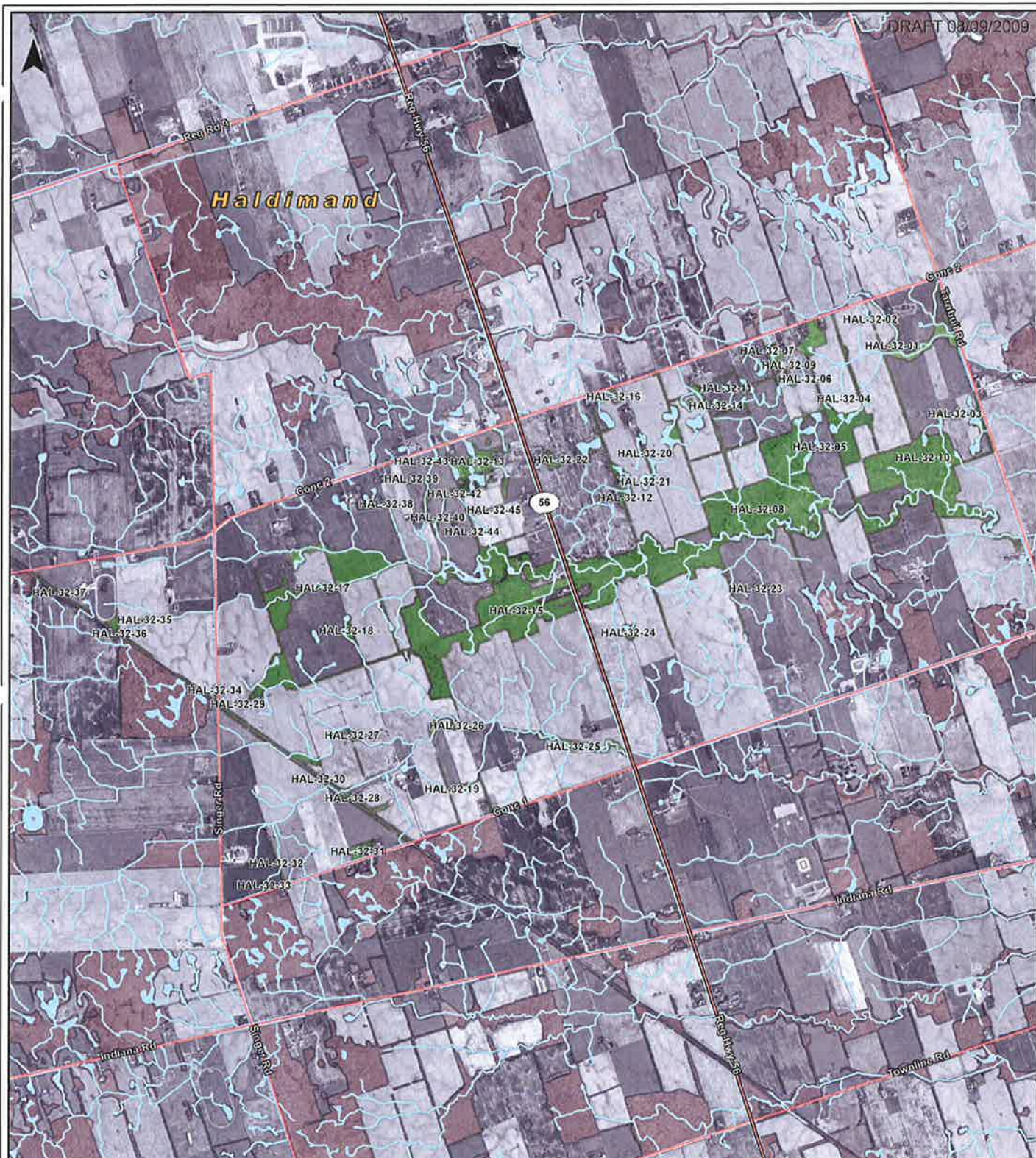
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- | | |
|-------------------|----------------------|
| Major Highways | Waterbodies |
| Regional Highways | Municipal Boundaries |
| Roads | Study Sites |
| Watercourses | Study Site HAL-32 |



Natural Areas Inventory

Study Site HAL-32

1:29,000

0 200 400 800 1,200 1,600 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 160 recorded taxa (unique plant records) for this study site.

Community Series:
Deciduous Forest (FOD)
Forb Meadow (MEF)
Meadow Marsh (MAM)

Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site HAL-33

Municipality County of Haldimand

Formerly N/A

Approximate Area 174 hectares

Watershed A very small portion of this study site drain east to the Welland River West subwatershed while the larger area is part of the Elsie Creek subwatershed of the Welland River.

Ownership Mostly private

General Summary

This study site extends from just west of Moore Road to Haldibrook Road in the east. It is north of Regional Road 9 and south of Stoney Creek Road/ Concession 4.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| ALLUVIUM 1 | 2.00 |
| BEVERLY | 9.46 |
| BRANTFORD | 2.22 |
| HALDIMAND | 24.51 |
| LINCOLN | 49.02 |
| SMITHVILLE | 11.75 |
| TOLEDO | 1.04 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forest communities of this study site are dominated by Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum* ssp. *saccharum*) and White Ash (*Fraxinus americana*), with an understory of Sugar Maple, American Beech (*Fagus grandifolia*), Hop Hornbeam (*Ostrya virginiana*) and Basswood (*Tilia americana*). The herbaceous layer was largely sedges (*Carex* sp) and Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*).

The Thicket Swamp communities were dominated by either Trembling Aspen (*Populus tremuloides*) or Hawthorns (*Crataegus* sp) with Grey Dogwood, and Narrow-leaved Meadowsweet (*Spiraea alba*) as associates. The herbaceous layer in these communities was a mix of Spotted Water-hemlock (*Cicuta maculata*), Common Strawberry (*Fragaria*

virginiana), Goldenrod Species (*Solidago sp.*), and Common Clearweed (*Pilea pumila*).

The Meadow Marshes of this study site are largely dominated by Reed Canary Grass (*Phalaris arundinacea*), Rice Cut Grass (*Leersia oryzoides*) and Pale Smartweed (*Polygonum lapathifolium*).

Vegetation Communities

There are a total of 116 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Meadow Marsh (MAM)

Thicket Swamp (SWT)

Vegetation Type

Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)

Dry-Fresh White Ash-Hardwood Deciduous Forest Type (FODM4-2)

Grey Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)

Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)

Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)

Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)

Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Rice Cut-Grass Graminoid Mineral Meadow Marsh Type (MAMM1-14)

Significant Flora

Species at Risk- None noted

Provincially Rare Species –None noted

Points of Interest

Faunal Records:

2 - Mammals

1 – Reptile & Amphibian

Site Visits

June 1, 2007

K. White, R. Ng

July 9, 2007

K. White, R. Ng

% of site visited

8.75% of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-33



Natural Areas Inventory

Study Site HAL-33

1:35,000

0 250 500 1,000 1,500 2,000 Meters

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There are a total of 116 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Forest (FOD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Study Site HAL-36

Dunnville East Forests

Municipality Haldimand County

Formerly Dunnville East Forests (Norfolk Field Naturalists, 1987)

Approximate Area 697 hectares

Watershed Drainage for this study site is split between South Forks Drain in the north, East Kelly Drain in the central portion, and Ellsworth Drain to the south.

Ownership Mostly private

General Summary

The study site area is located within Haldimand County along the Wainfleet border. Highway 3 lies to the north, and Poth Road is to the south. It is bordered by Inman Road to the west, and Townline Road to the east.

Physical Description

This natural area is situated on the well drained, sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM 1 | 2.00 |
| BEVERLY | 9.46 |
| BRANTFORD | 2.22 |
| HALDIMAND | 24.51 |
| LINCOLN | 49.02 |
| SMITHVILLE | 11.75 |
| TOLEDO | 1.04 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The dominant communities noted for this study site were Deciduous Swamps dominated by Swamp Maple (*Acer fremanii*) complexed with Deciduous Forests found on the drier knolls.

The Swamp Maple communities had associated Green Ash (*Fraxinus pennsylvanica*), Yellow Birch (*Betula alleghaniensis*), and Red Oak (*Quercus rubra*) in the canopy.

The understory was a mix of regenerating canopy species with Spicebush (*Lindera benzoin*), and Sensitive Fern (*Onoclea sensibilis*), Virginia Creeper (*Parthenocissus quinquefolia*), Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*), and Spotted Touch-me-nots (*Impatiens capensis*) in the ground layer.

The drier Deciduous Forests were largely Sugar Maple (*Acer saccharum* ssp. *saccharum*), with American Beech (*Fagus grandifolia*), and Red Oak (*Quercus rubrum*). The understory was Spicebush with regenerating canopy species and Blue Cohosh (*Caulophyllum thalictroides*) in the herbaceous layer.

A successional community dominated by Goldenrod (*Solidago* sp.) was found on the tailings / fill that came from the dredging of the drains that run through the study site. In addition to the Goldenrod, Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Staghorn Sumac (*Rhus typhina*), and Orchard Grass (*Dactalis glomerata*) were also noted for both the slopes as well as the top of bank.

Vegetation Communities

There are a total of 184 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Forb Meadow (MEF)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Dry - Fresh Sugar Maple - Beech Deciduous Forest Type (FODM5-2)
Dry - Fresh Sugar Maple - Hardwood Deciduous Forest Type (FODM5-11)
Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type (FODM6-5)
Goldenrod Forb Meadow Type (MEFM1-1)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Bob Curry noted that many tree species were completely stripped of leaves due to gypsy moths when he conducted his wildlife surveys.

Old growth Black Gum (*Nyssa sylvatica*) was found in this study site as well.

Faunal Records:

30 - Birds
22 - Moths & Butterflies
4 - Mammals
2 - Reptiles & Amphibians

Site Visits

June 21, 2007

B. Curry

June 30, 2007

B. Curry

August 27, 2007

K. White, R. Ng-Rozema, B. Wilson, A. Goodban

May 21, 2008

R. Kitchen, B. Porter, K. Young-Chin, S. Mohamed

May 22, 2008

R. Kitchen, B. Porter

May 26, 2008

R. Kitchen, B. Porter

% of site visited

6.60 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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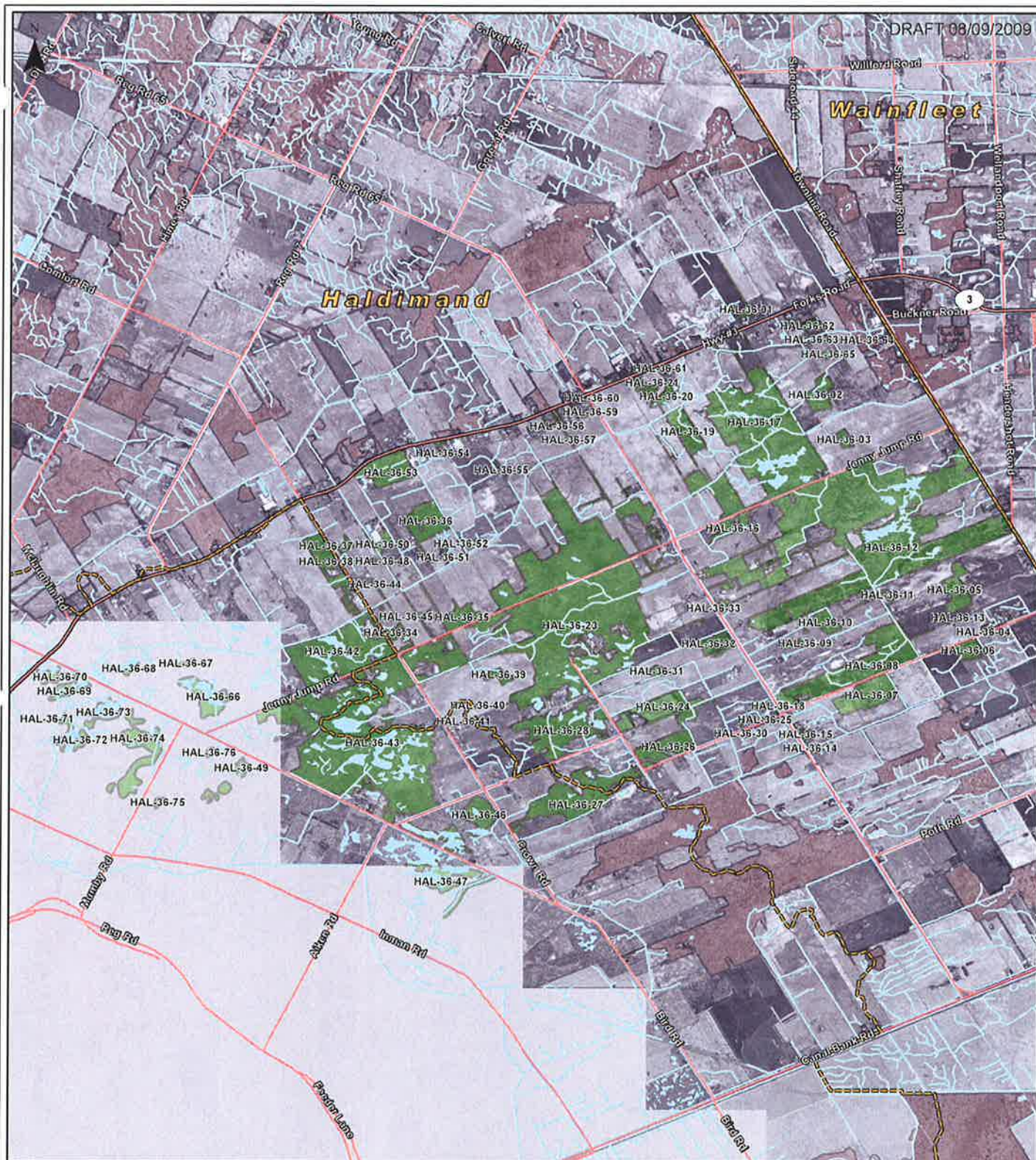
Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-36



Natural Areas Inventory

Study Site HAL-36

1:43,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames. North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 184 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD) Forb Meadow (MEF)
Deciduous Swamp (SWD) Thicket Swamp (SWT)

Study Site HAL-37

Dunnville Heronry Woods/Dunnville Northwest Forest

Municipality Haldimand County

Formerly Dunnville Heronry Woods/ Dunnville Northwest Woods (Norfolk Field Naturalists, 1987)

Approximate Area 526 hectares

Watershed This study sites drains to Sugar Creek Drain in the west and James Drain in the east.

Ownership Mostly private

General Summary

Study site HAL-37 is situated in Haldimand County between Highway 3 in the west and Regional Road 15 in the east. It is north of Kentucky Hill Road and south of James Road.

Physical Description

This natural area is situated on the well drained, sand and loamy sand soils of the Sand Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|----------------------------|---------------------------------|
| ALLUVIUM 1 | 0.33 |
| BERRIEN | 1.11 |
| BERRIEN - HEAVY CLAY PHASE | 23.03 |
| BEVERLY | 1.82 |
| BEVERLY - COARSE PHASE | 0.20 |
| COLWOOD | 0.10 |
| COLWOOD - COARSE PHASE | 0.64 |
| GRAVEL PIT | 0.27 |
| HALDIMAND | 2.56 |
| LINCOLN | 11.71 |
| LINCOLN - COARSE PHASE | 28.03 |
| LINCOLN - LOAMY PHASE | 1.26 |
| LOWBANKS | 2.48 |
| MARSH | 1.16 |
| PLAINFIELD - DUNE PHASE | 2.26 |
| SMITHVILLE | 0.14 |
| TOLEDO | 0.92 |
| TUSCOLA | 20.07 |
| TUSCOLA - COARSE PHASE | 0.20 |
| WALSINGHAM | 1.50 |
| WATER | 0.22 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Based on the location and information available for the area, study site HAL-37 was expected to be a slough forest. Much of the study site falls within the James Drain watershed and the drainage patterns on the landscape clearly show slough and ridge topography.

The properties visited by the field crew, however, had altered hydrology due to the municipal drains and as a result had only small wet areas and thus were not supporting the typical slough forest communities.

The most common species recorded for the site was Sugar Maple (*Acer saccharum* ssp. *saccharum*) with associates of Basswood (*Tilia americana*), American Beech (*Fagus grandifolia*) and White Ash (*Fraxinus americana*) more indicative of a drier Deciduous Forest community.

The understory was largely regenerating canopy species with Red Oak (*Quercus rubra*) and Thicket Creeper (*Parthenocissus inserta*).

In the Thicket Swamp communities noted, Buttonbush (*Cephalanthus occidentalis*) was the dominant species with Winterberry (*Ilex verticillata*) in the understory and Spotted Touch-me-not (*Impatiens capensis*) in the ground layer.

Vegetation Communities

There are a total of 73 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Thicket Swamp (SWT)

Vegetation Type

Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)

Dry - Fresh Sugar Maple - Beech Deciduous Forest Type (FODM5-2)

Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type (FODM6-5)

Significant Flora

Species at Risk – None noted

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

None noted

Site Visits

September 18, 2007

B. Wilson, R. Ng-Rozema

% of site visited

1.40 % of the total study site was visited by NAI teams.

References Cited

- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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Study Site HAL-38

Municipality County of Haldimand

Formerly N/A

Approximate Area 60 hectares

Watershed This study site drains to the Buckhorn Creek subwatershed.

Ownership Mostly private

General Summary

Study Site HAL-38 is located within the County of Haldimand. It is a small study site made up of several small woodlands. It is bound on the east by Regional Road 66/ Stoney Creek Road and on the west by Moore Road. It is located south of Haldibrook Road and north of Regional Road 66.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| BEVERLY | 19.78 |
| BRANTFORD | 27.47 |
| LINCOLN | 28.43 |
| SMITHVILLE | 11.66 |
| TOLEDO | 12.66 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The communities recorded for this study site are mostly upland dominated by Sugar Maple (*Acer saccharum* ssp. *saccharum*), Basswood (*Tilia americana*), and American Beech (*Fagus grandifolia*) with associated Spotted Crane's Bill (*Geranium maculatum*) and Jack-in-the-Pulpit (*Arisaema triphyllum* ssp. *triphyllum*).

The Shallow Marsh communities noted were small and scattered throughout the upland communities. They were dominated by stands of Spotted Touch-me-nots (*Impatiens capensis*).

Vegetation Communities

There are a total of 82 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Meadow Marsh (MAM)

Shallow Marsh (MAS)

Vegetation Type

Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)

Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)

Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest**Faunal Records:**

None noted

Site Visits

June 29, 2007

K. White, R. Ng

% of site visited

4.73 % of the total study site was visited by NAI teams.

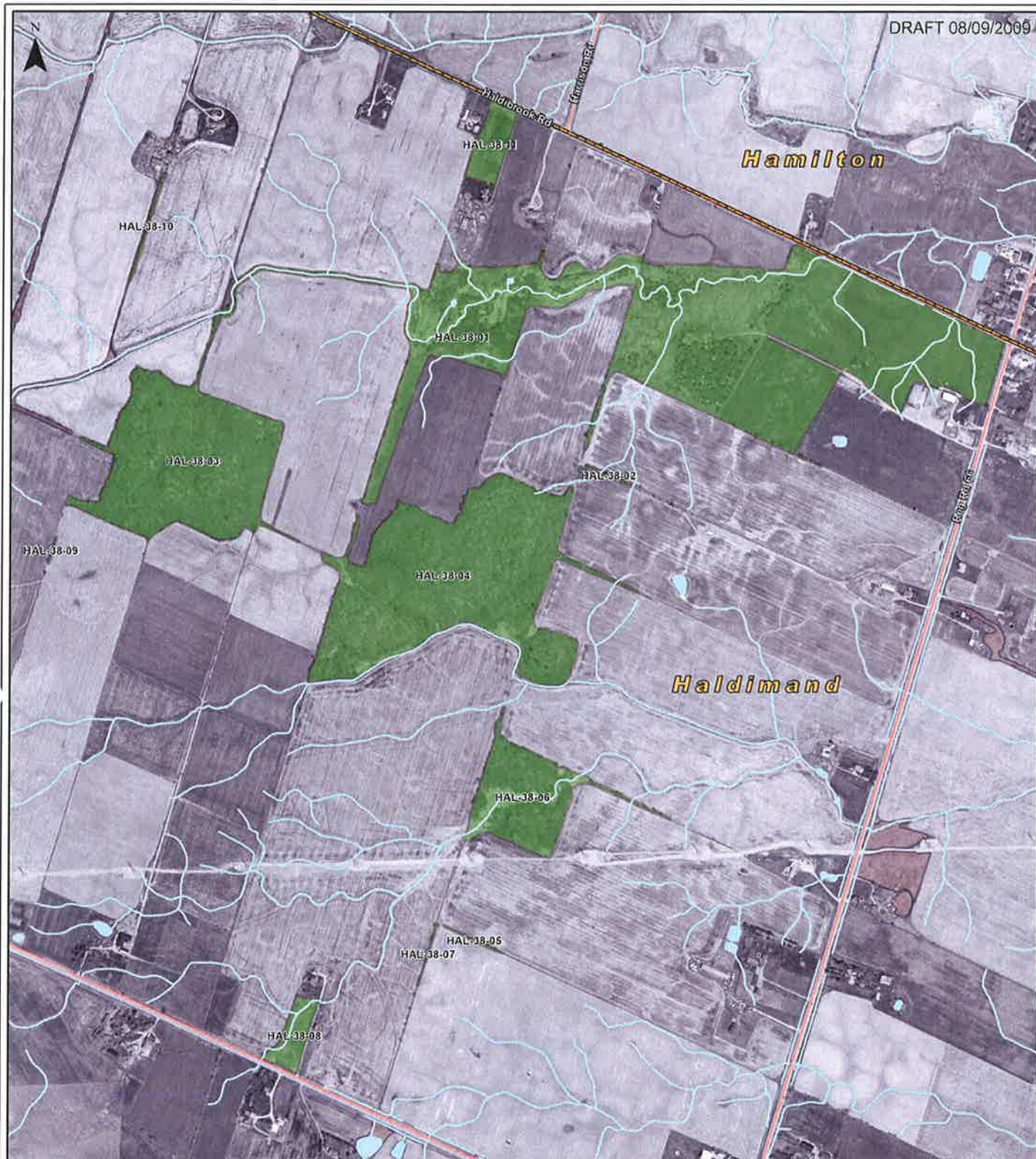
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-38



Natural Areas Inventory

Study Site HAL-38

1:11,000

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All Frames: North American Datum 1983, Universal Transverse Mercator 8° Projection, Zone 17N, Central Meridian 81° West



There are a total of 82 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Shallow Marsh (MAS)

Study Site HAL-39

Municipality County of Haldimand

Formerly N/A

Approximate Area 34 hectares

Watershed This study drains to the Buckhorn Creek subwatershed.

Ownership Mostly private.

General Summary

This study site is small containing only a few small woodlands. It is located south of Haldibrook Road and north of Regional Road 66. It is bound on the west by Stoneman Road and reaches to just east of Moore Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| BEVERLY | 10.49 |
| BRANTFORD | 60.76 |
| LINCOLN | 15.21 |
| TOLEDO | 13.54 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This Shallow Marsh community is dominated by Reed Canary Grass (*Phalaris arundinacea*) with associated Rice Cut-Grass (*Leersia oryzoides*), and Goldenrod species (*Solidago sp.*).

Vegetation Communities

There are a total of 25 recorded taxa (unique plant records) for this study site.

Community Series

Shallow Marsh (MAS)

Vegetation Type

Cattail Mineral Shallow Marsh Type (MASM1-1)

Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest**Faunal Records:**

None noted.

Site Visits

June 29, 2007

K. White, R. Ng

% of site visited

1.07 % of the total study site was visited by NAI teams.

References Cited

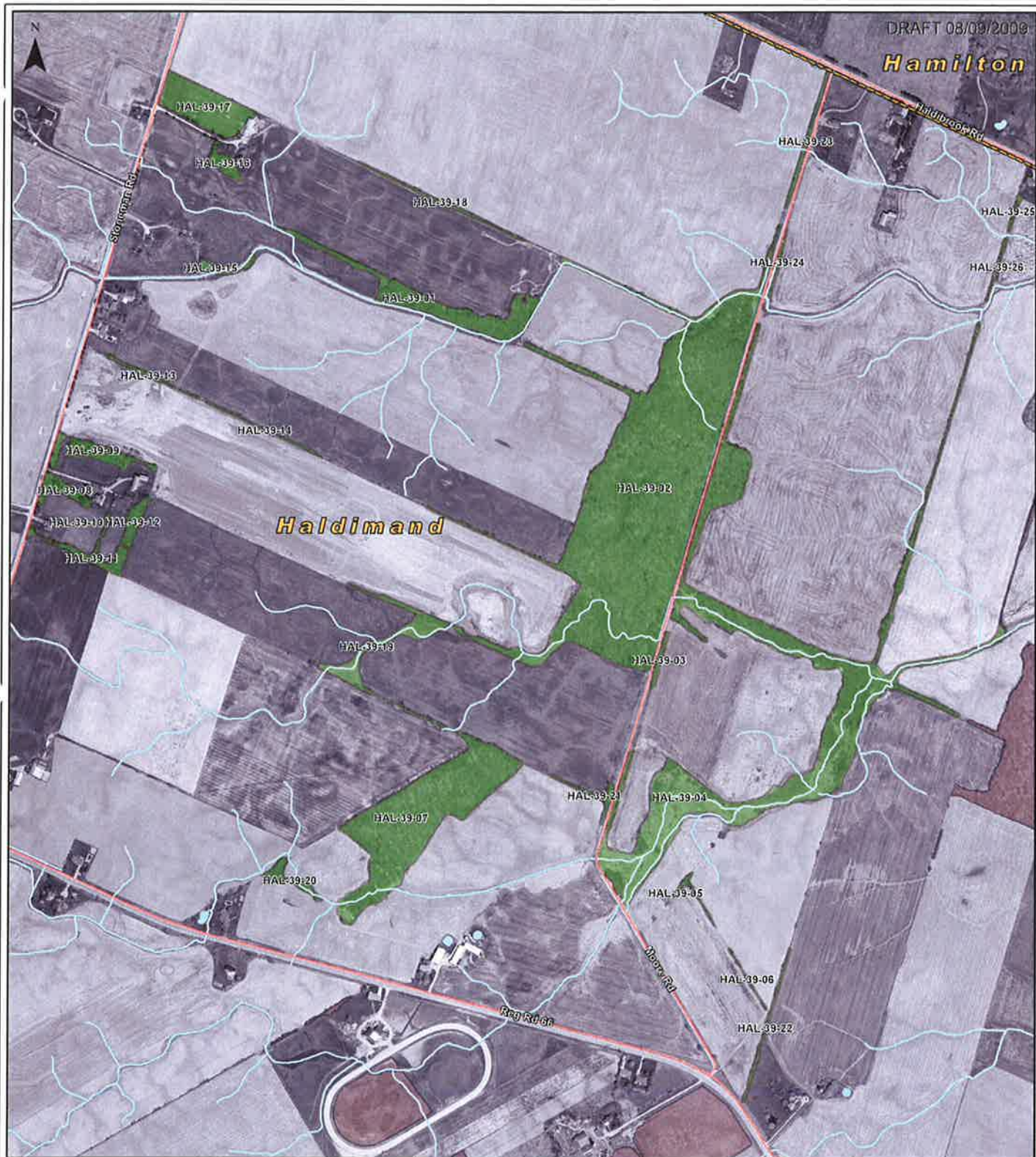
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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-39



Natural Areas Inventory

Study Site HAL-39

1:10,000



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 25 recorded taxa (unique plant records) for this study site.
Community Series:
Shallow Marsh (MAS)

Study Site HAL-40

Attercliffe Station Slough Forest

Municipality County of Haldimand

Formerly Attercliffe Station Slough Forest (Norfolk Field Naturalists, 1987)

Approximate Area 454 hectares

Watershed This study site is split nearly in half with the northern portion draining to Oswego Creek, and the southern portion flowing into Sugar Creek Drain.

Ownership Mostly private

General Summary

Study Site HAL-40 is located in the County of Haldimand and extends from Lane Road in the north to just south of James Road. Highway 3 is the western boundary and Hart Road is the eastern boundary.

Physical Description

This north western portion of this natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. The south eastern portion is located on the well drained, sand and loamy sand soils of the Sand Plain.

The entire study site is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|----------------------------|---------------------------------|
| BERRIEN | 21.30 |
| BERRIEN - HEAVY CLAY PHASE | 1.29 |
| BEVERLY | 16.84 |
| BRANTFORD | 1.85 |
| COLWOOD | 15.53 |
| LINCOLN | 17.78 |
| LINCOLN - COARSE PHASE | 2.14 |
| LINCOLN - LOAMY PHASE | 0.35 |
| PLAINFIELD | 0.06 |
| SMITHVILLE | 0.15 |
| TOLEDO | 2.57 |
| TOLEDO - COARSE PHASE | 0.25 |
| TUSCOLA | 19.85 |
| WATER | 0.04 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is a good representation of a typical slough forest community with a complex of features having Thicket Swamp and Deciduous Swamps as dominant followed by Deciduous Forests (found on the higher, drier knolls), and other Deciduous Forest and Deciduous Swamp communities found in the troughs.

The Thicket Swamp communities were noted most often in the study site. Swamp Maple (*Acer freemanii*), Speckled Alder (*Alnus incana* ssp. *rugosa*), Poison Sumac (*Rhus vernix*) and, Winterberry (*Ilex verticillata*) were often found together. Willow species (*Salix* sp), White Elm (*Ulmus americana*), and Yellow Birch (*Betula alleghaniensis*) were also noted several times.

The understory in these communities is largely Dogwood (*Cornus* sp) with a mix of Buttonbush (*Cephalanthus occidentalis*), Bittersweet Nightshade (*Solanum dulcamara*), and Highbush Blueberry (*Vaccinium corymbosum*).

The herbaceous layer was mostly Beggar Ticks (*Bidens* sp), Ferns (*Osmunda* sp) and Sedges (*Carex* sp). One particular area was characterized by the field crew as a "quaking mat of vegetation".

The Deciduous Forests of this study site are characterized by stands of Swamp Maple and Red Oak (*Quercus rubra*), with Sugar Maple (*Acer saccharinum* ssp. *saccharinum*) and White Ash (*Fraxinus americana*); Trembling Aspen (*Populus tremuloides*) with Sugar Maple and Green Ash (*Fraxinus pennsylvanica*); or, American Beech (*Fagus grandifolia*) with Sugar Maple and Green Ash.

The understory in these forests is largely made up of the same species as the canopy with Maple-leaved Viburnum (*Viburnum acerifolium*) and Raspberries (*Rubus* sp).

The herbaceous layer is a mix of Large-leaved Aster (*Aster macrophyllus*), Pennsylvania Sedge (*Carex pennsylvanica*), and Goldenrod species (*Solidago* sp).

Vegetation Communities

There are a total of 270 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Coniferous Woodland (WOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)

Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
 Cattail Mineral Shallow Marsh Type (MASM1-1)
 Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
 Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
 Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
 Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
 Fresh-Moist Popular Deciduous Forest Type (FODM8-1)
 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
 Gray Dogwood Deciduous Thicket Type (THDM5-1)
 Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
 Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
 Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
 Poplar Mineral Deciduous Swamp Type (SWDM4-5)
 Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
 Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
 Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
 Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
 Speckled Alder Mineral Deciduous Thicket Swamp Type (SWTM1-1)
 Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
 Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
 Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
 Willow Mineral Deciduous Swamp Type (SWDM4-1)
 Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)
 Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)
 Yellow Birch Mineral Deciduous Swamp Type (SWDM4-4)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

13 - Birds

9 - Reptiles & Amphibians

5 - Mammals

Site Visits

Summer 2007

K. White, R. Ng

Summer 2007

B. Wilson, R. Ng-Rozema

June 2, 2008

R. Kitchen, B. Porter

June 12, 2008
R. Kitchen, B. Porter, M. Nikitzuk

June 16, 2008
R. Kitchen, B. Porter (plant list only)

June 17, 2008
R. Kitchen, B. Porter, A. Smajda

June 17, 2008
R. Kitchen, B. Porter

% of site visited

18.06 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-40



Natural Areas Inventory

Study Site HAL-40

1:24,000

0 175 350 700 1,050 1,400 Meters

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There are a total of 270 recorded taxa (unique plant records) for this study site

Community Series:

Conifer Forest (FOC)
Conifer Woodland (WOC)
Deciduous Forest (FOD)

Deciduous Thicket (THD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site HAL-41

Municipality Haldimand County

Formerly N/A

Approximate Area 79 hectares

Watershed This study site drains to the Elsie Creek subwatershed.

Ownership Mostly private

General Summary

Study site HAL-41 is located within the County of Haldimand, along the Hamilton border.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 33.72 |
| BRANTFORD | 2.45 |
| HALDIMAND | 4.09 |
| LINCOLN | 6.96 |
| SENECA | 1.86 |
| TOLEDO | 50.62 |
| WATER | 0.30 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Study site HAL-41 was a very wet area dominated by Thicket Swamps, Deciduous Swamps and Meadow / Shallow Marsh communities.

The Thicket Swamps was dominated by Meadowsweet (*Spirea alba*) with associated (*Phalaris arundinacea*), and Spotted Touch-me-not (*Impatiens capensis*).

There were also Deciduous Forest and Woodland communities. The forest community was dominated by Red Maple (*Acer rubrum*), American Basswood (*Tilia americana*) and Oak species (*Quercus sp.*).

Vegetation Communities

There are a total of 107 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Cattail Mineral Shallow Marsh Type (MASM1-1)
Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type (FODM6-5)
Fresh - Moist Hawthorn / Apple Deciduous Woodland Type (WODM5-4)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Open Graminoid Meadow Type (MEGM4-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-Grass Graminoid Mineral Meadow Marsh Type (MAMM1-14)

Significant Flora

Species at Risk - None noted.

Provincially Rare Species – None noted.

Points of Interest**Faunal Records:**

1 - Bird

Site Visits

July 27, 2007

K. White, R. Ng-Rozema

July 28, 2007

K. White, R. Ng-Rozema

% of site visited

29.0% of the total study site was visited by NAI teams.

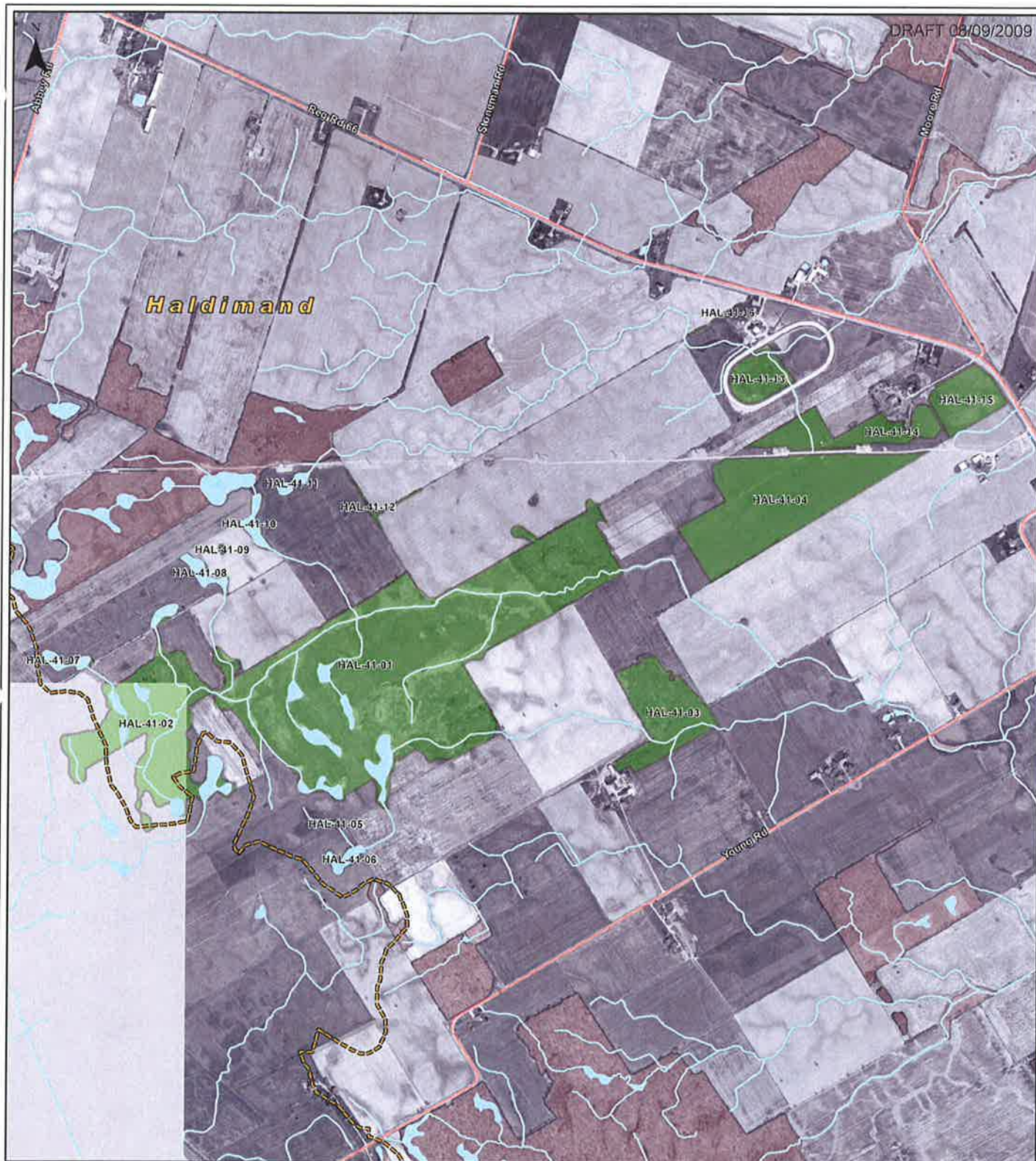
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site HAL-41



Natural Areas Inventory

Study Site HAL-41

1:15,000

0 100 200 400 600 800 Meters

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There are a total of 107 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
 Deciduous Woodland (WOD)
 Deciduous Swamp (SWD)

Meadow Marsh (MAM)
 Thicket Swamp (SWT)

Study Site LN-01

Moore Woodlot

Municipality Town of Lincoln

Formerly Moore Woodlot (Brady, et al., 1980)

Approximate Area 37 hectares

Watershed This study site drains to Twenty Mile Creek.

Ownership Mostly private

General Summary

This study site is located between Campden Road in the east and Mountain Road in the west. It is bound on the north by Spring Creek Road and on the south by Twenty Mile Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|--------------------------|
| BEVERLY | 2.94 |
| BEVERLY - LOAMY PHASE | 26.70 |
| HALDIMAND - LOAMY PHASE | 1.07 |
| LINCOLN | 2.51 |
| TOLEDO | 4.46 |
| TOLEDO - LOAMY PHASE | 62.31 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area is characterized by undulating terrain and is a headwater for four tributaries of the Twenty Mile Creek.

The most dominant species noted for the Deciduous Swamp community was Swamp Maple (*Acer fremanii*) with associated Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*), and Swamp White Oak (*Quercus bicolor*).

The drier knolls sustained stands of Sugar Maple (*Acer saccharum* ssp. *saccharum*), with Highbush Blueberry (*Vaccinium corymbosum*), Spicebush (*Lindera benzoin*) and Winterberry (*Ilex verticillata*) in the understory.

The ground layer was a mix of Asters (*Aster sp*), Avens (*Geum sp*), Spotted Touch-me-nots (*Impatiens capensis*), and Garlic Mustard (*Allaria petiolata*).

Vegetation Communities

There are a total of 88 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

A landowner in this study site reported that locals claim to have seen very large cats in the area with long tails very much like Eastern Cougar.

Faunal Records:

5 – Reptiles & Amphibians

4- Birds

2- Mammals

Site Visits

September 1, 1980

Brady, et al.

Summer 2008

J. Sankey, J. Grassie, R. Armstrong, H. Teare, B. Briant

October 6, 2008

T. Staton, S. Mohamed

% of site visited

9.36 % of the total study site was visited by NAI teams.

References Cited

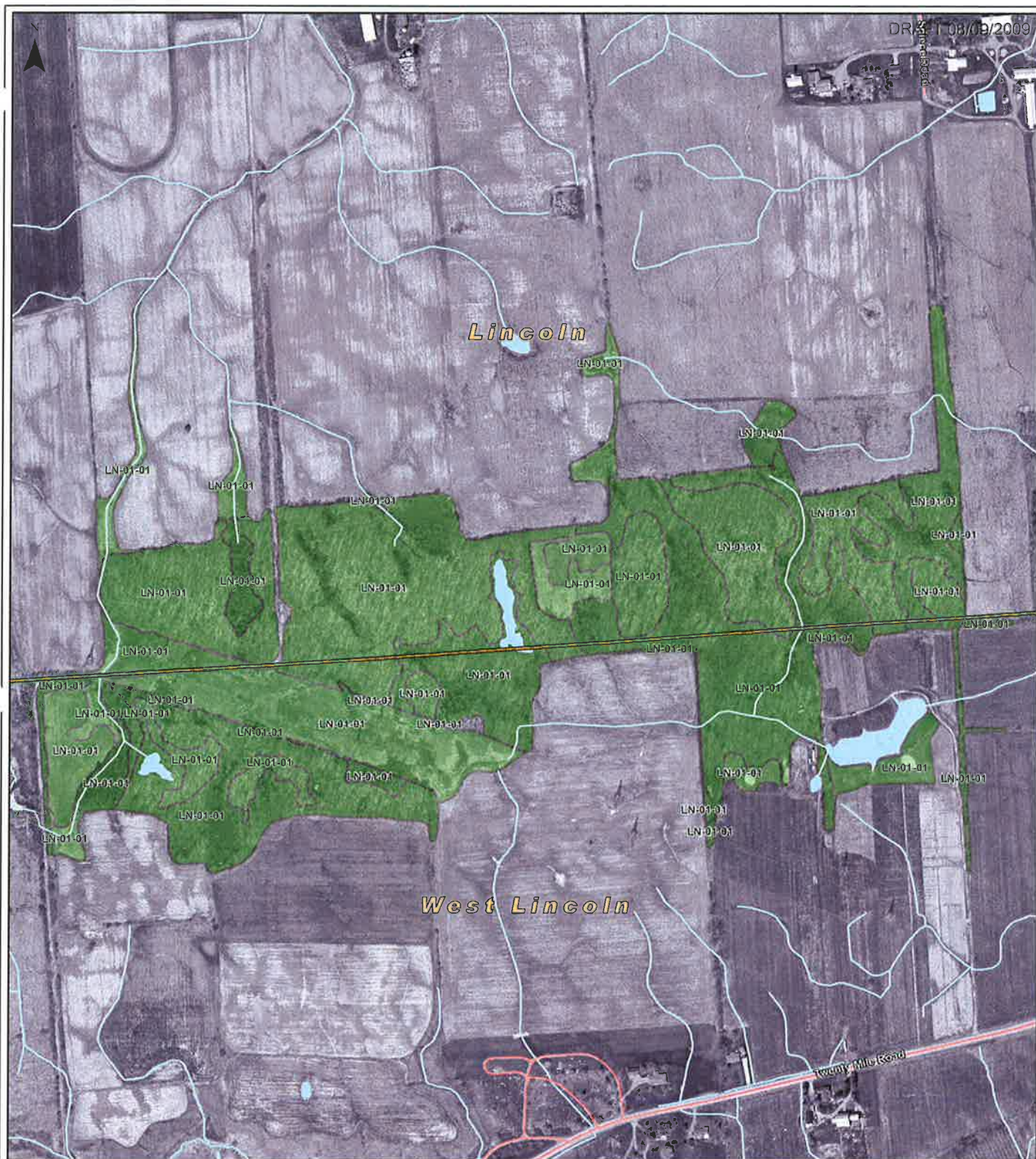
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Government of Ontario, Ministry of Natural Resources. 2009. *Deciduous Forest. Species at Risk in Ontario*. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

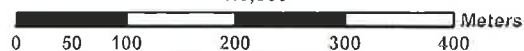
- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site LN-01



Natural Areas Inventory

Study Site LN-01

1:6,500



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 88 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site LN-03

Rockway Falls

Municipality Town of Lincoln

Formerly Rockway Falls

Approximate Area 256 hectares

Watershed This study site drains to Fifteen Mile Creek.

Ownership Mostly private

General Summary

This study site is located between Centre Street in the east and Cream Street in the west. It is bound on the north by Sawmill Road and on the south by Roland Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------------|--------------------------|
| ALLUVIUM | 17.96 |
| ALLUVIUM - VERY SHALLOW PHASE | 9.59 |
| BEVERLY | 6.35 |
| BEVERLY - LOAMY PHASE | 1.94 |
| BRANTFORD | 6.36 |
| BROOKE - VERY SHALLOW PHASE | 0.14 |
| CASHEL | 19.70 |
| CHINGUACOUSY | 1.15 |
| ESCARPMENT | 10.42 |
| FRANKTOWN - SHALLOW PHASE | 0.34 |
| HALDIMAND | 3.11 |
| LINCOLN | 3.67 |
| ONEIDA | 14.75 |
| PEEL | 0.26 |
| SMITHVILLE | 0.38 |
| TOLEDO | 2.53 |
| TOLEDO - LOAMY PHASE | 0.19 |
| WATER | 0.00 |
| NOT MAPPED | 1.15 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The areas of this Study Site visited by NAI teams were largely Deciduous Forest communities dominated by Red Oak (*Quercus rubra*) and White Oak (*Quercus alba*).

Understory associates included Shagbark Hickory (*Carya ovata*), American Beech (*Fagus grandifolia*), and Hop Hornbeam (*Ostrya virginiana*).

The herbaceous layer was a mix of Asters such as, New England Aster (*Aster novae-anglais*), Purple-stem Aster (*Aster puniceus* var. *puniceus*), and Panicked Aster (*Aster lanceolatus* ssp. *lanceolatus*), with Grass-leaved Goldenrod (*Euthamia graminifolia*).

There were some interesting communities included such as the Open Calcareous Cliff Rim Type, and a Meadow Marsh community found on Bedrock and dominated by Reed Canary Grass (*Phalaris arundinacea*).

Vegetation Communities

There are a total of 107 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Open Cliff and Talus (CTO)

Vegetation Type

Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Open Calcareous Cliff Rim Type (CTOC1-5)
Open Graminoid Meadow Type (MEGM4-1)
Reed Canary Grass Bedrock Meadow Marsh type (MAMR3-1)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered
Juglans cinerea (Butternut) (Brady, et al., 1980) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3

Points of Interest

A landowner in this study site informed surveyors that they had encountered a Black Rat Snake on more than one occasion.

Faunal Records:

7 – Birds
3 - Reptiles & Amphibians
3 - Mammals
2 – Moths & Butterflies

Site Visits

September 1, 1980
Brady et al.

August 15, 2008

J. Sankey, J. Grassie, R. Armstrong, H. Teare, B. Briant

October 31, 2008

A. Garofalo

% of site visited

2.36 % of the total study site was visited by NAI teams.

References Cited

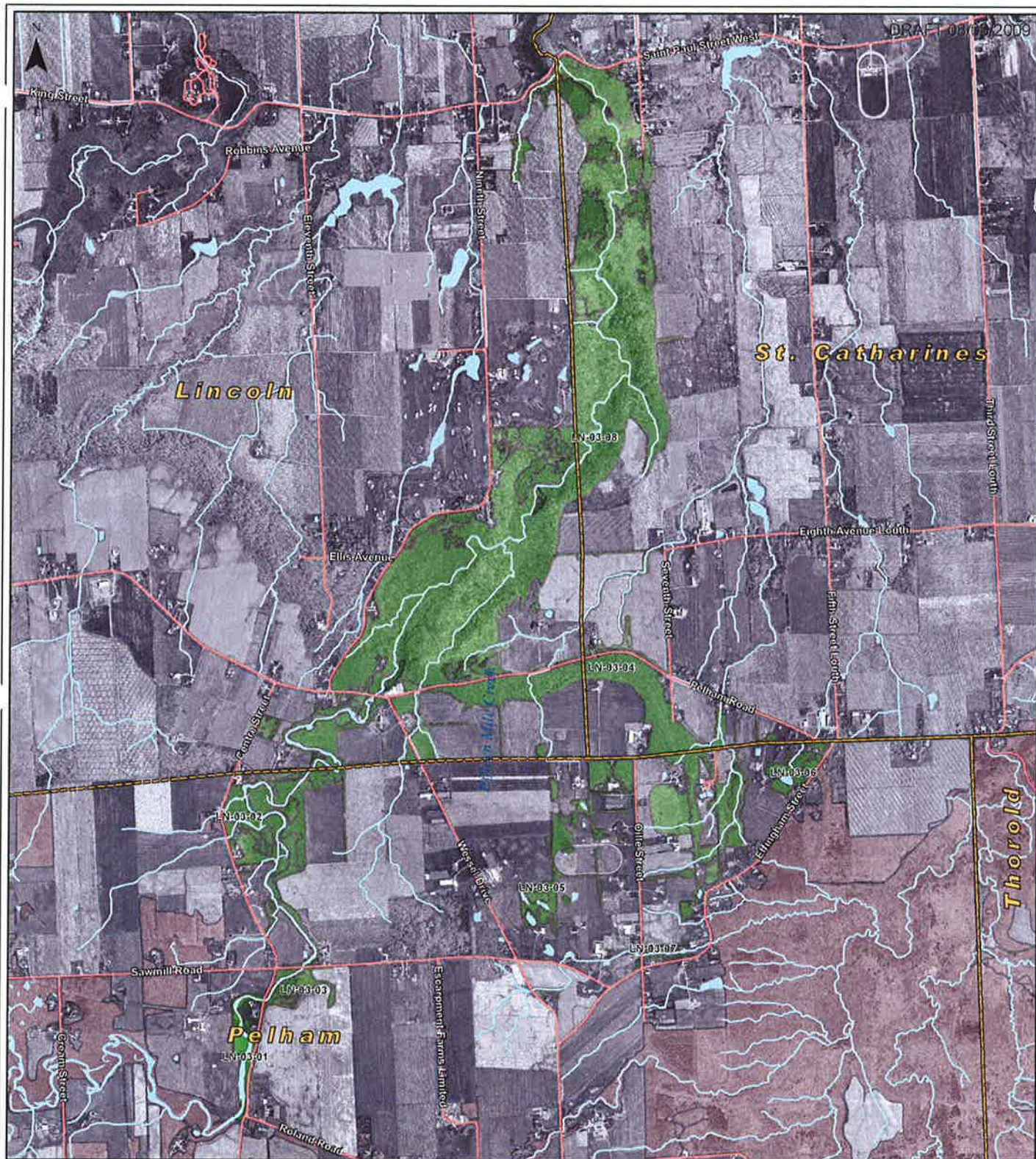
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. *Deciduous Forest. Species at Risk in Ontario*. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site LN-03



Natural Areas Inventory

Study Site LN-03

1:26,000

0 187.5 375 750 1,125 1,500 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 107 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)

Study Site NF-01

Lyons Creek

Municipality City of Welland, City of Niagara Falls

Formerly Waverly Woodlot (Brady, et al., 1980)

Approximate Area 349 hectares

Watershed This study site drains to the Lyons Creek subwatershed.

Ownership Mostly private

General Summary

This study site follows Lyons Creek from the Welland Canal to the Welland River at Chippawa. It consists of the floodplain areas and closely associated woodlands.

Physical Description

This natural area includes the Lyon's Creek channel and associated floodplain. It is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 29.35 |
| CASHEL - HEAVY RED PHASE | 3.85 |
| CHINGUACOUSY - RED PHASE | 1.83 |
| JEDDO - RED PHASE | 1.43 |
| MALTON - HEAVY RED PHASE | 0.74 |
| MARSH | 3.20 |
| NIAGARA | 12.79 |
| NIAGARA - LOAMY PHASE | 3.16 |
| ONEIDA - RED PHASE | 6.74 |
| ONTARIO | 5.27 |
| PEEL - HEAVY RED PHASE | 4.08 |
| WELLAND | 12.66 |
| WATER | 10.73 |
| NOT MAPPED | 4.16 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is unique in that it is basically limited to the floodplain communities and closely associated woodlands. Therefore, the majority of the communities noted were either, Shallow Marsh, Thicket Swamp, or Deciduous Swamp.

The Shallow Marsh communities were characterized by Narrow-leaved Cattail (*Typha latifolia*), Broad-leaved Cattail (*Typha angustifolia*), Common Reed (*Phragmites*

australis), and Dotted Smartweed (*Polygonum punctatum*), with floating communities of Lesser Duckweed (*Lemna minor*), and Star Duckweed (*Lemna trisulca*).

The Bur-reed (*Sparganium* sp.) marshes were a frequent component in areas with slightly deeper water, typically just beyond the limits of cattails. Buttonbush (*Cephaanthus occidentalis*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*) were common on the banks.

The Thicket Swamp communities noted were dominated by Buttonbush and Dogwood with some Green Ash trees scattered around.

The herbaceous layer was mostly Canada Blue-joint (*Calamagrostis canadensis*), Fringed Loosestrife (*Lysimachia ciliata*), Arrow-leaved Tearthumb (*Polygonum sagittatum*), and Clearweed (*Pilea* sp.).

The Deciduous Swamps were largely Dogwood and Willow (*Salix* sp.) with patches of Green Ash (*Fraxinus pennsylvanica*), Red Maple (*Acer rubrum*), Pin Oak (*Quercus palustris*), and White Swamp Oak (*Quercus bicolor*).

The understory was usually a mix of Buttonbush and Dogwood with a herbaceous layer of Sedges (*Carex* sp.), Avens (*Geum* sp.) and Moneywort (*Lysimachia nummularia*).

In the more upland areas of the floodplain, there were Deciduous Forest communities dominated by Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), Shagbark Hickory (*Carya ovata*) and Hop Hornbeam (*Ostrya virginiana*).

Vegetation Communities

There are a total of 418 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)
Treed Cultivated (CUT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Canada Blue-joint Graminoid Mineral Shallow Marsh Type (MASM1-9)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Common Reed Mineral Shallow Marsh Type (MASM1-12)

Dry Mixed Graminoid Tallgrass Prairie Type (MEGM1-4)
 Forb Mineral Shallow Marsh Type (MASM2-1)
 Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
 Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
 Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
 Gray Dogwood Deciduous Thicket Type (THDM5-1)
 Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
 Manna Grass Mineral Shallow Marsh Type (MASM1-17)
 Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
 Mixed Mineral Meadow Marsh Type (MAMM3-1)
 Narrow-leaved Sedge Mineral Shallow Marsh Type (MASM1-4)
 Non-native Mineral Deciduous Thicket Swamp Type (SWTM5-8)
 Pondweed Floating-leaved Shallow Aquatic Type (SAF_1-4)
 Pondweed Submerged Shallow Aquatic Type (SAS_1-1)
 Poverty Oat Grass Graminoid Meadow Type (MEGM3-1)
 Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
 Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
 Water Milfoil Mixed Shallow Aquatic Type (SAM_1-7)
 Water Milfoil Submerged Shallow Aquatic Type (SAS_1-4)
 Waterweed Submerged Shallow Aquatic Type (SAS_1-2)
 Water Willow Organic Shallow Marsh Type (MASO2-3)

Significant Flora

Species at Risk

Hibiscus moscheutos ssp. *moscheutos* (Swamp Rose-mallow) (Gregory, 2003) – Special Concern

Justicia americana (Water Willow) (Gregory, 2003) – Threatened

Provincially Rare Species

Azolla caroliniana (Mosquito Fern) (NPCA, 2006-2009) – S1

Nyssa sylvatica (Black Gum) (NAI, volunteer crew) – S3

Peltandra virginica ssp. *virginica* (Green Arrow-arum) (Gregory, 2003) – S2

Spiranthes magnicamporum (Great Plains Ladies' Tresses) (Gregory, 2003) - S3

Zizania aquatica (Southern Wild Rice) introduced by landowner (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

26 – Birds

9 – Mammals

4 – Reptiles & Amphibians

2 – Moths & Butterflies

Site Visits

May 4, 2004

D. Gregory

June 25, 2007

B. Curry

July 13, 2007

J. Sankey, J. Grassie, F. Fohr, R. Armstrong, W. Laar, B. Briant

July 31, 2007

J. Sankey, J. Grassie, B. Briant, S. Istok, F. Fohr

August 31, 2007

J. Sankey, J. Grassie, B. Briant, H. Teare, R. Armstrong

September 12, 19, 26, 2007

A. Garofalo, K. Young-Chin

September 25, 2007

A. Garofalo

October 4, 2007

A. Garofalo, K. Young-Chin, K. Frohlich, R. VanRiezen

October 31, 2007

A. Garofalo, K. Young-Chin

November 1, 2007

A. Garofalo, Jordana H.

November 6, 2007

A. Garofalo, K. Young-Chin

July 2, 2008

A. Garofalo, K. Young-Chin

August 27, 2008

A. Garofalo, K. Young-Chin

November 6, 2008

A. Garofalo, T. Staton, S. Mohamed

% of site visited

28.68 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

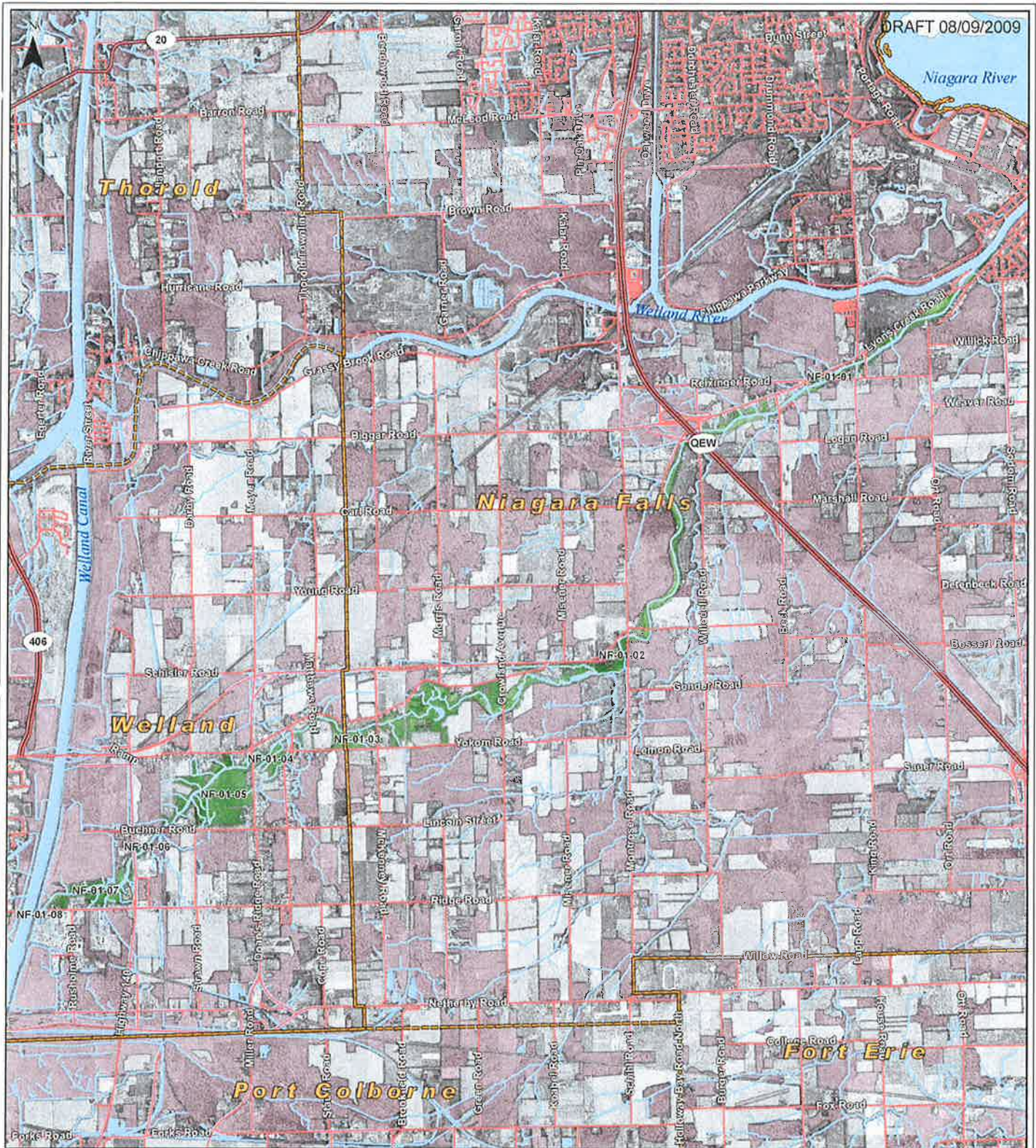
Gregory, D. 2003. *Sir Adam Beck Complex Natural Areas Survey*. Ontario Power

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-01



Natural Areas Inventory

Study Site NF-01

1:70,000

0 500 1,000 2,000 3,000 4,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 418 recorded taxa (unique plant records) for this study site

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)

Shallow Marsh (MAS)
Thicket Swamp (SWT)
Tree Cultivated (CUT)

Study Site NF-02

Heartland Forest

Municipality City of Niagara Falls

Formerly Cyanamid Corners (Brady, 1980)

Approximate Area 490 hectares

Watershed The north/west section of this study site drains to Thompson's Creek, the north/east section drains to the Chippawa Power Canal, and a small portion in the south drains directly to the Welland River East.

Ownership Mix of public and private.

General Summary

This study site is located between McLeod Road in the north and Chippawa Creek Road/ Welland River in the south. The western boundary is Thorold Townline Road and Montrose Road/ Queen Elizabeth Way make up the eastern boundary.

Physical Description

This natural area is situated just north of the Welland River corridor on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

A very small area in the north west is characterized by greater elevation and a better drained till moraine feature.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|--------------------------|
| ALLUVIUM | 6.17 |
| BEVERLY | 0.20 |
| BEVERLY - LOAMY PHASE | 2.10 |
| JEDDO - LOAMY RED PHASE | 0.07 |
| NIAGARA | 28.11 |
| NIAGARA - LOAMY PHASE | 1.59 |
| TOLEDO | 8.90 |
| WELLAND | 27.30 |
| WATER | 0.25 |
| NOT MAPPED | 25.30 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A diversity of Deciduous Forests were recorded for this study site. These were generally associated with upland, or ridge areas within the larger forest patches.

Drier sites include associations characterized by American Beech *Fagus grandifolia*),

Red Oak (*Quercus rubra*), Sugar Maple *Acer saccharum* ssp. *saccharum*), White Ash *Fraxinus americana*), Hop Hornbeam (*Ostrya virginiana*), and Black Cherry (*Prunus serotina*).

Fresh-moist sites include Basswood (*Tilia americana*), Red Maple (*Acer rubrum*), Sugar Maple, White Elm (*Ulmus americana*), and Bur Oak *Quercus macrocarpa*).

Groundcover in the upland forest communities was varied according to the microtopography. Common species observed included Spotted Crane's-bill (*geranium maculatum*), Wild Blue Phlox *Phlox divaricata*), Jack-in-the-pulpit (*Arisaema triphyllum* ssp. *triphyllum*), Western Poison Ivy (*Rhus radicans* ssp. *rydbergii*), Mayapple (*Podophyllum peltatum*), Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), and Virginia Creeper (*Parthenocissus quinquefolia*).

The Deciduous Thicket Communities were dominated by Gray Dogwood *Cornus foemina* ssp. *racemosa*) in association with various species of Hawthorn (*Craaigus* sp.).

The Deciduous Swamp communities were characterized by mature Red Maple and Silver Maple (*Acer saccharinum*) co-dominates, or Pin Oak (*Quercus palustris*). Other canopy species included White Elm and Swamp White Oak (*Quercus bicolor*).

Understory species included Spicebush (*Lindera benzoin*) with Sensitive Fern (*Onoclea sensibilis*), Skunk Cabbage (*Symplocarpus foetidus*), and Spotted Touch-me-not (*Impatiens capensis*).

Some sloughs supported Bur-reed (*Sparganium* sp.) Shallow Marsh communities while others favoured Duck-weed (*Lemna* sp.) Floating Aquatic communities. One particular slough pond supported an organic Buttonbush (*Cephalanthus occidentalis*) Thicket Swamp.

Vegetation Communities

There are a total of 406 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Bulrush Graminoid Mineral Meadow Marsh Type (MAMM1-15)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)

Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh Manitoba Maple Deciduous Forest Type (FODM4-5)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh White Ash-Hardwood Deciduous Forest Type (FODM4-2)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Hawthorn/ Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Hawthorn/Apple Deciduous Woodland Type (WODM4-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (Brady, 1980) – Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (ESG International, 1998) – S3

Nyssa sylvatica (Black Gum) (ESG International, 1998) – S3

Points of Interest

Faunal Records:

87 – Birds

15- Moths & Butterflies

13 – Reptiles & Amphibians

12 – Mammals

Site Visits

September 1, 1980

Brady, et al.

May 13, 1998

ESG International Inc.

May 22, 1998

ESG International Inc.

October 7, 1999

ESG International Inc.

May 24, 2007

A. Garofalo, M. Oldham, T. Staton, R. Kitchen

May 25, 2007

A. Garfalo, K. White, T. Staton, M. Oldham

May 25, 2007

B. Curry

June 25, 2007

B. Curry

July 31, 2008

R. Kitchen, B. Porter

August 25, 2008

R. Kitchen, B. Porter

September 5, 2008

R. Kitchen, B. Porter

% of site visited

36.84 % of the total study site was visited by NAI teams.

References Cited

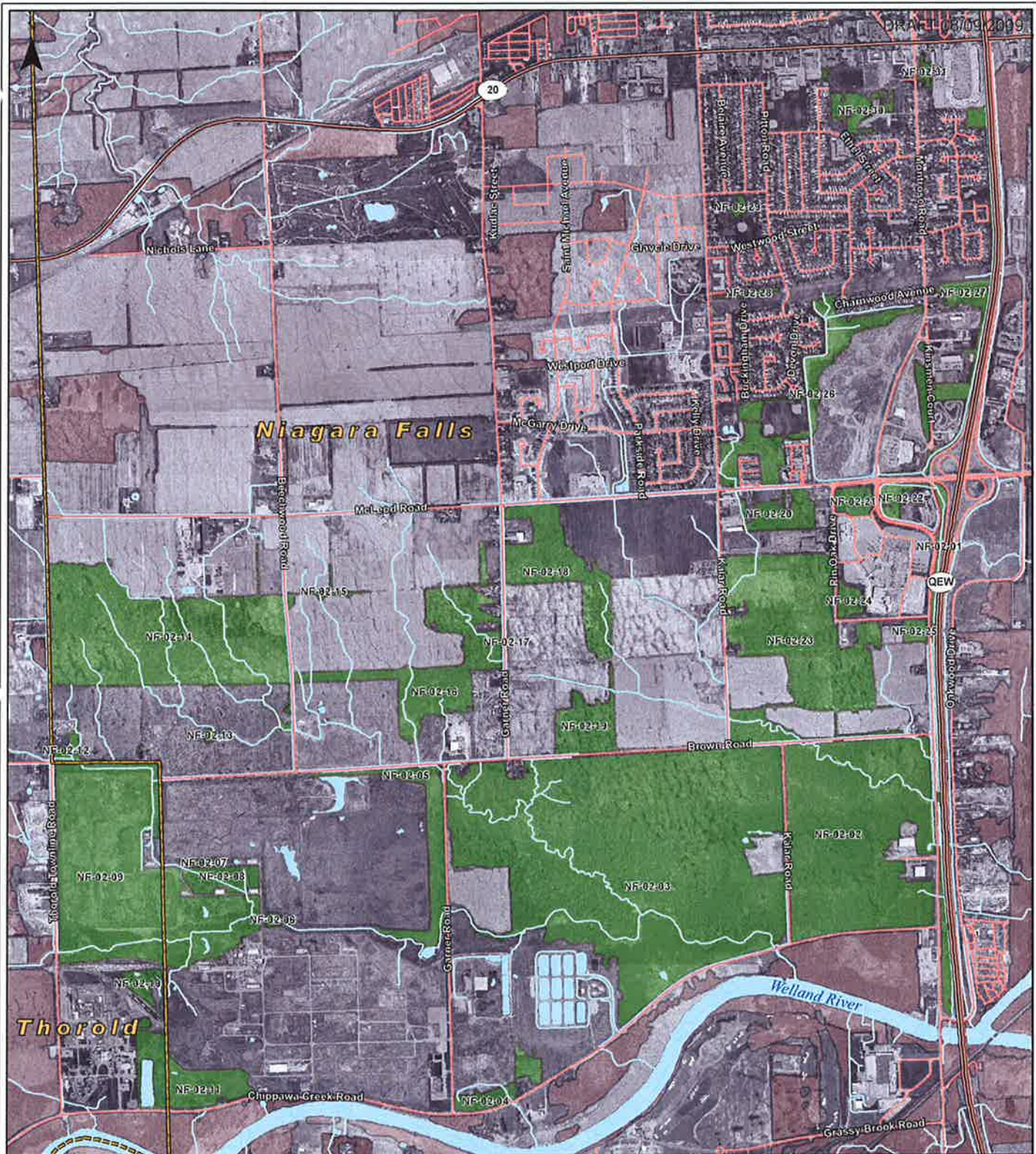
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

| | |
|-------------------|----------------------|
| Major Highways | Waterbodies |
| Regional Highways | Municipal Boundaries |
| Roads | Study Sites |
| Watercourses | Study Site NF-02 |



Natural Areas Inventory

Study Site NF-02

1:25,000

0 200 400 800 1,200 1,600 Meters

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There are a total of 405 recorded taxa (unique plant records) for this study site.

| | |
|--------------------------|--------------------------|
| Community Series: | Deciduous Woodland (WOD) |
| Deciduous Forest (FOD) | Shallow Marsh (MAS) |
| Deciduous Swamp (SWD) | Mixed Meadow (MEM) |
| Deciduous Thicket (THD) | |

Study Site NF-03

Dufferin Islands-Queen Victoria Park-Niagara Gorge

Municipality City of Niagara Falls

Formerly Dufferin Islands-Victoria Park-Niagara Gorge (Brady, et al., 1980)

Approximate Area 59 hectares

Watershed This study site drains directly to the Niagara River.

Ownership Public – Niagara Parks Commission

General Summary

This Study Site is within the municipality of Niagara Falls and follows the Niagara River on Niagara Parks Commission property from Upper Rapids Road in the south to the Whirlpool Bridge in the north. It is of course bound by the Niagara River to the east and the western boundary is the Portage Road/ Fallsview Boulevard/Victoria Avenue and Niagara River Parkway (south to north).

Physical Description

This study site is unique in that includes the Niagara River Gorge with all of its unique geology.

In a broader sense, this natural area is situated on the well drained sands and loamy sands of the Sand Plain. The north western portion is underlain by the shale, dolostone and limestone of the Lockport Formation. The south western portion is underlain by the dolostone of the Guelph Formation.

The rim of the gorge and the gorge itself has shallow soils underlain by the shale, sandstone, dolostone and limestone associated with the Clinton-Cataract Formation.

The gorge is famous for not only the cataract at the site of the world-renowned Niagara Falls but also for the many characteristic seeps of groundwater that flow from the gorge walls.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| NOT MAPPED | 100.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Natural Areas Inventory field crews only visited the forested areas of Dufferin Islands within this study site. The Niagara Parks Commission has undertaken their own inventory in recent years. That data is not included in this report. In addition, the Niagara Falls Nature Club has studied this area heavily over many years, their data is also not included in this report.

The Deciduous Forest communities of this study site are characterized by Sugar Maple (*Acer saccharum* ssp. *Saccharum*), and Red Oak (*Quercus rubra*).

Common understory associates are Eastern Hemlock (*Tsuga canadensis*), and Spicebush (*Lindera benzoin*).

Vegetation Communities

There are a total of 137 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Deciduous Swamp (SWD)

Thicket Swamp (SWT)

Vegetation Type

Black Ash Mineral Deciduous Swamp Type (SWDM2-1)

European Alder (SWTM1-2)

Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered

Gymnocladus dioica (Kentucky Coffee-tree) (Brady, et al., 1980) – Threatened

Juglans cinerea (Butternut) (Brady, et al., 1980) – Endangered

Provincially Rare Species

Saururus cernuus (Lizard's Tail) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

4 – Birds

1 – Reptiles & Amphibians

1 – Mammals

Recommendations

Development of further projects for restoration of natural areas on The Niagara Parks Commission owned properties in keeping with their newly minted Environmental Land Management Plan is recommended.

Site Visits

September 1, 1980

Brady, et al.

July 15, 2008

R. Kitchen, B. Porter

% of site visited

47.43 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Niagara Falls Nature Club. 2001-2009. [Flora and Fauna Inventories]. Unpublished raw data.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Oldham, M.J., 2007. *Vascular Plants of the Niagara River, Ontario* (Draft report). Peterborough, Ontario: Natural heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- International Boundary
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-03



Natural Areas Inventory

Study Site NF-03

1:24,000

0 150 300 600 900 1,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 137 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Forest (FOD)

Study Site NF-07

Horse Track Woods

Municipality City of Niagara Falls

Formerly Horse Track Woodlots (Brady et al, 1980)

Approximate Area 518 hectares

Watershed Lyons Creek to the Welland River

Ownership Mostly private

General Summary

This study site is located within the municipality of Niagara Falls. It is bound on the north by the east/west rail line and on the south by Lyon's Creek and Young Road. The western boundary is the north/south rail line and the eastern boundary is the Queen Elizabeth Way corridor.

Physical Description

This natural area is situated on the flat, poorly drained Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 1.91 |
| CASHEL - HEAVY RED PHASE | 2.13 |
| MALTON - HEAVY RED PHASE | 1.62 |
| NIAGARA | 18.75 |
| ONEIDA - RED PHASE | 0.18 |
| PEEL - HEAVY RED PHASE | 3.32 |
| WELLAND | 69.25 |
| WATER | 0.00 |
| NOT MAPPED | 2.84 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is very diverse with a number of communities that are listed as complexes or inclusions within the larger community patches.

The Swamp Forest communities noted were dominated by Swamp Maple (*Acer freemanii*) with Red Maple (*Acer rubrum*), Pin Oak (*Quercus palustris*), White Elm (*Ulmus americana*), Green Ash (*Fraxinus pennsylvanica*), and occasionally Black Gum (*Nyssa sylvatica*).

The understory was largely seedlings of the canopy species with Blue Beech (*Carpinus caroliniana*), Spotted Touch-me-not (*Impatiens capensis*), Goldenrod species (*Solidago*

sp.) and, Aster species (*Aster sp.*).

Numerous Buttonbush (*Cephalanthus occidentalis*) thickets and Sedge (*Carex sp.*) marshes were complexed throughout the study site in the slough ponds. These marshes were characterized by Fringed Sedge (*Carex crinita*), and Fowl Manna Grass (*Glyceria striata*).

The deeper pockets sustaining water for longer periods of time were characterized by Duckweed (*Lemna sp.*) floating-leaved communities. Many of the slough ponds were rimmed by Moss (*Moss sp.*), with Canada Mayflower (*Maianthemum canadense*), Swamp Dewberry (*Rubus hispidus*), and Starflower (*Trientalis borealis ssp. borealis*).

A unique community containing Cut-leaved Grape Fern (*Botrychium dissectum*), Clubmoss species (*Lycopodium sp.*), Squawroot (*Conopholis americana*), Indian-pipe (*Monotropa uniflora*), and Pinesap (*Monotropa hyposanthus*) was also noted within the larger Deciduous Swamp community.

The Deciduous Forests were made up of mostly Sugar Maple (*Acer saccharum ssp. saccharum*) in the drier upland areas, or on small moraine ridges between slough ponds.

Associated American Beech (*Fagus grandifolia*) and Maple-leaved Viburnum (*Viburnum acerifolium*), with False Solomon's Seal (*Maianthemum racemosum ssp. racemosum*), Canada Enchanter's Nightshade (*Circaea lutetiana ssp. canadensis*), and Large-leaved Aster (*Aster macrophyllus*) were also noted.

Successional Deciduous Thicket communities were dominated by Narrow-leaved Meadowsweet (*Spiraea alba*) or Grey Dogwood (*Cornus foemina ssp. racemosa*) with Black Raspberry (*Rubus occidentalis*), Avens species (*Geum sp.*), and Common Strawberry (*Fragaria virginiana ssp. virginiana*).

Rarely, patches of regenerating Hawthorn (*Crataegus sp.*) and Common Apple (*Malus pumila*) Woodland communities were recorded with very young Red Maple and White Elm trees.

The Meadow Marsh communities noted occurred in old field situations with numerous deeper sloughs, or Shallow Marshes throughout. These areas were dominated by Reed-canary Grass (*Phalaris arundinacea*) with Arrow-leaved Tearthumb (*Polygonum sagittatum*), and Smartweed (*Polygonum sp.*).

Vegetation Communities

There are a total of 347 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Graminoid Meadow (MEG)
Floating-leaved Shallow Aquatic (SAF)

Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Bulrush Graminoid Mineral Meadow Marsh Type (MAMM1-15)
Bulrush Mineral Shallow Marsh Type (MASM1-2)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Elm Deciduous Woodland Type (WODM5-2)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Mineral Shallow Marsh Type (MASM1-4)
Open Graminoid Meadow Type (MEGM4-1)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Water Milfoil Mixed Shallow Aquatic Type (OAO/SAM_1-7)
White Elm Mineral Deciduous Swamp Type (SWDM4-2)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

16 – Birds
7 – Reptiles & Amphibians
6 – Mammals
1 – Moths & Butterflies

Site Visits

September 1, 1980

Brady, et al.

May 17, 2007

A. Garofalo, K. Young-Chin

June 1, 2007

J. Sankey, J. Grassie, H. Teare, S. Istok, W. Laar

June 28, 2007

A. Garofalo, K. Young-Chin

June 29, 2007

A. Garofalo, K. Young-Chin

July 3, 2007

A. Garofalo, K. Young-Chin

September 14, 2007

J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

November 16, 2007

A. Garofalo, T. Staton, R. Kitchen, A. Yagi, R. Drabick

June 5, 2008

A. Garofalo, K. Young-Chin

June 9, 2008

A. Garofalo, K. Young-Chin

June 18, 2008

A. Garofalo, K. Young-Chin

% of site visited

15.54 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of
Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

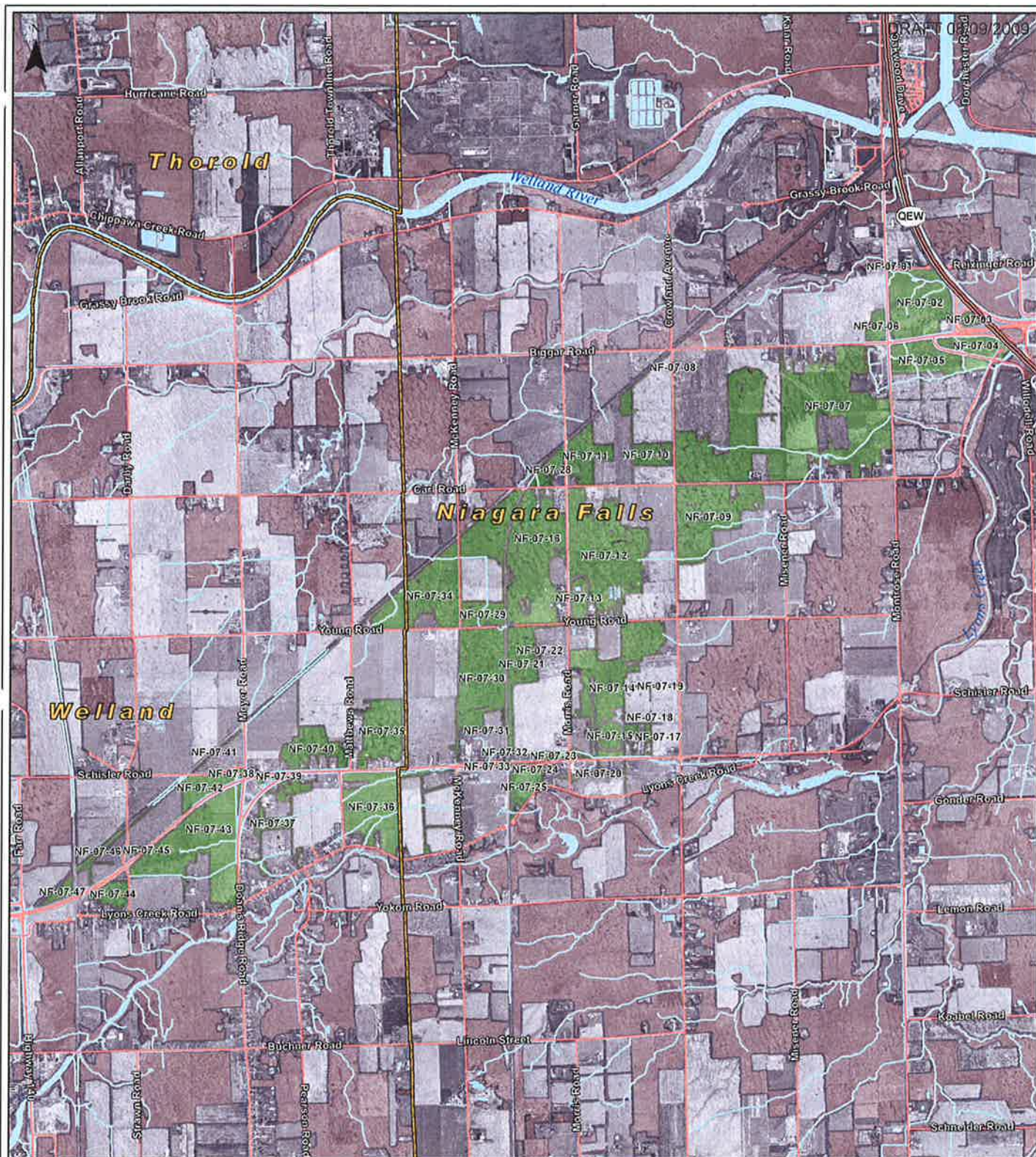
Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species

at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-07



Natural Areas Inventory

Study Site NF-07

1:40,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 347 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site NF-08

Young Woods

Municipality City of Niagara Falls

Formerly Young Woodlot (Brady et al., 1980)

Approximate Area 215 hectares

Watershed Lyons Creek to the Welland River

Ownership Mostly private

General Summary

This study site is located within the municipality of Niagara Falls. The northern boundary is just north of Carl Road in the east and Young Road in the west.. It is bound on the south by the Lyons Creek corridor. The western limit is Crowland Avenue and the eastern boundary is the Lyons Creek corridor.

Physical Description

This natural area is situated on the flat, poorly drained Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 1.60 |
| CASHEL - HEAVY RED PHASE | 7.06 |
| MALTON - HEAVY RED PHASE | 0.09 |
| NIAGARA | 17.07 |
| PEEL - HEAVY RED PHASE | 15.66 |
| WELLAND | 58.51 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is dominated by slough forests, Deciduous Swamp communities characterized by Red Maple (*Acer rubrum*) and Swamp Maple (*Acer fremanii*). Common associates recorded were White Elm (*Ulmus americana*), Green Ash (*Fraxinus pennsylvanica*), Blue Beech (*Carpinus caroliniana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*). The herbaceous layer was largely Spotted Crane's-bill (*Geranium maculatum*), Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), White Avens (*Geum canadense*), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

The deep pockets of open water in the sloughs supported Duckweed (*Lemna* sp.) or Sedge (*Carex* sp.) communities with patches of Iris (*iris* sp.), and occasionally Sensitive Fern (*Onoclea sensibilis*), or Common Water-plantain (*Alisma plantago-aquatica*). Large

patches of Sphagnum Moss (*Sphagnum sp.*) were noted on the rims of some slough ponds along with thickets of Buttonbush (*Cephalanthus occidentalis*).

A regenerating meadow community classified as a Deciduous Thicket was also noted for this study site. It was dominated by Gray Dogwood (*Cornus foemina ssp. racemosa*) and Hawthorn (*Crataegus sp.*), with Narrow-leaved Meadowsweet (*Spirea alba*) and occasionally White Elm.

Several inclusions were noted for this Thicket community including Broad-leaved Sedge and Cattail Mineral Shallow Marsh Communities adding to the overall diversity.

Vegetation Communities

There are a total of 265 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Kentucky Blue Grass Graminoid Meadow Type (MEGM3-4)
Manna Grass Mineral Shallow Marsh Type (MASM1-17)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rush Graminoid Mineral Meadow Marsh Type (MAMM1-13)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – S2

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Quercus shumardii (Shumard Oak) (NPCA, 2006-2009, volunteer crew) – S3

Points of Interest

Extensive defoliation by Gypsy Moth noted for this study site.

Faunal Records:

28 – Birds

5 – Moths & Butterflies

4 – Reptiles & Amphibians

2 – Mammals

Site Visits

September 1, 1980

Brady, et al.

May 18, 2007

J. Sankey, J. Grassie, F. Fohr, R. Armstrong, W. Laar

May 22, 2007

A. Garofalo, K. White

May 23, 2007

A. Garofalo, K. White

May 25, 2007

B. Curry

June 11, 2008

J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

June 17, 2008

A. Garofalo, K. Young-Chin, M. Oldham, S. Brinker

June 23, 2008

A. Garofalo, K. Young-Chin

% of site visited

13.26 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from

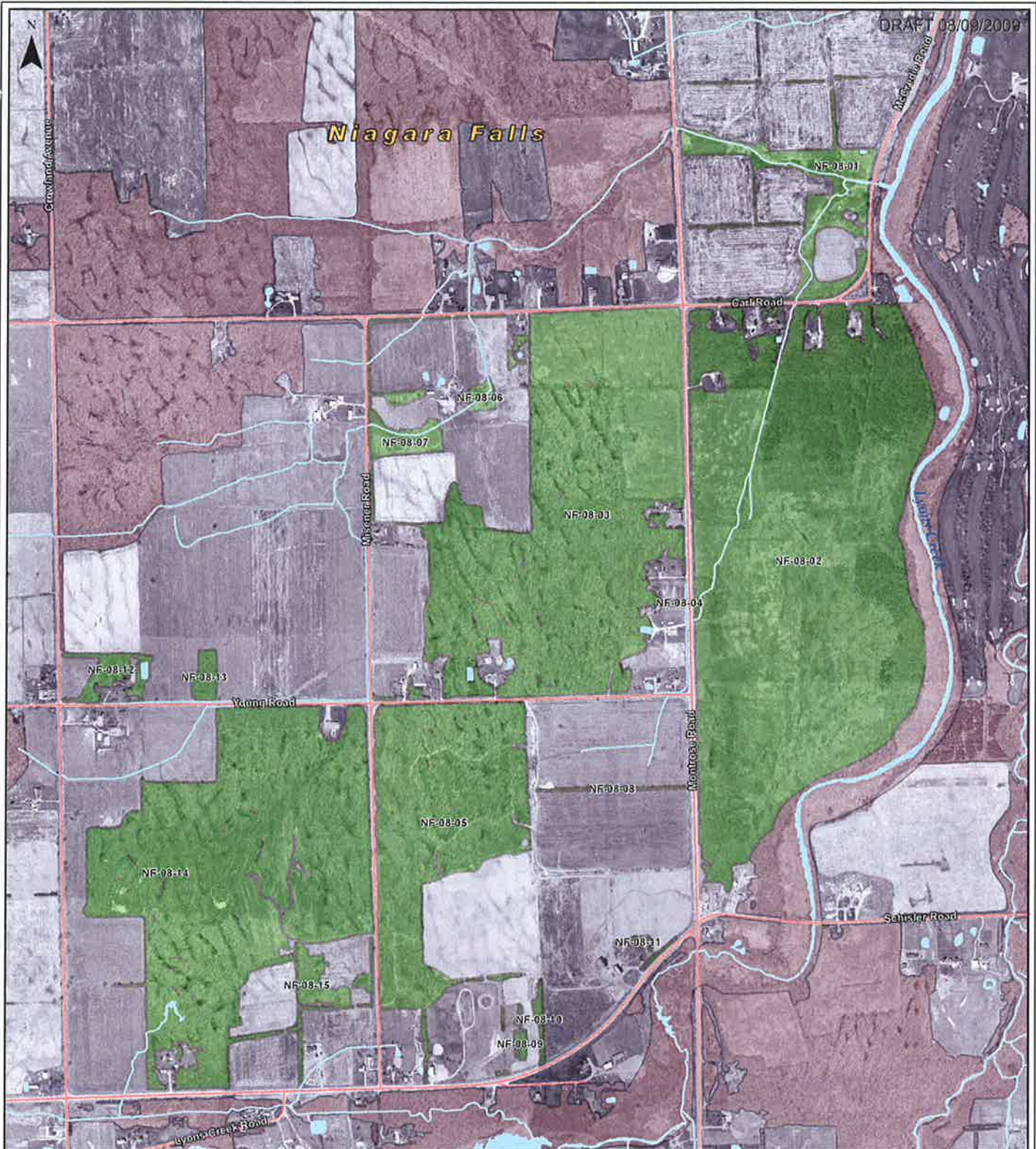
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 03/09/2009



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-08



Natural Areas Inventory

Study Site NF-08

1:14,000

0 100 200 400 600 800 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 265 recorded taxa (unique plant records) for this study site.

Community Series:

- Deciduous Forest (FOD)
- Deciduous Thicket (THD)
- Deciduous Swamp (SWD)

Study Site NF-10

Old Lincoln Street Slough Forest

Municipality City of Niagara Falls

Formerly Old Lincoln Street Woodlot (Brady et al., 1980)

Approximate Area 148 hectares

Watershed Most of this study site flows to Tee Creek with a very small portion in the north that flows to Lyons Creek.

Ownership Mostly private.

General Summary

This study site is a relatively small site located between Yokom Road to the north and Ridge Road to the south. It extends from Crowland Avenue in the west to Montrose Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| ALLUVIUM | 6.16 |
| CHINGUACOUSY - LOAMY RED PHASE | 3.27 |
| CHINGUACOUSY - RED WASHED PHASE | 0.16 |
| MALTON - HEAVY RED PHASE | 9.02 |
| NIAGARA | 22.42 |
| NIAGARA - LOAMY PHASE | 11.28 |
| PEEL - HEAVY RED PHASE | 1.25 |
| WELLAND | 46.41 |
| WATER | 0.00 |
| NOT MAPPED | 0.04 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area has a slough-ridge terrain and is generally drier than other study sites in the surrounding area. Several tributaries of Tee Creek flow through and around the site.

The most common community noted was Deciduous Swamp dominated by Red Maple (*Acer rubrum*), Pin Oak (*Quercus palustris*), Swamp Maple (*Acer fremanii*), and Green Ash (*Fraxinus pennsylvanica*).

The ground layer is a carpet of Moss (*Moss sp.*) with Canada Mayflower (*Maianthemum canadense*), and Swamp Dewberry (*Rubus hispidus*).

The majority of the slough ponds support Sedge (*Carex sp.*) marshes dominated by Bromelike Sedge (*Carex bromoides*), Fringed Sedge (*Carex crinita*), or Common Hop Sedge (*Carex lupulina*). Other slough ponds support Beggar-ticks (*Bidens sp.*) marshes, or Canada Blue-joint Grass (*Calamagrostis canadensis*).

The ridges within the slough forests are classified as Deciduous Forests dominated by Sugar Maple (*Acer sachharum ssp. saccharum*), with Hawthorn species (*Crategus sp.*), Gray Dogwood (*Cornus foemina ssp. racemosa*), and Common Buckthorn (*Rhamnus cathartica*).

The communities associated with the floodplain of the Tee Creek tributaries were largely Green Ash with Asters (*Aster sp.*) and Moneywort (*Lysimachia nummularia*). More open patches supported Reed-canary Grass (*Phalaris arundinacea*).

Vegetation Communities

There are a total of 284 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Canada Blue-joint Graminoid Mineral Shallow Marsh Type (MASM1-9)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Panicled Aster Mineral Meadow Marsh Type (MAMM2-2)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened

Provincially Rare Species

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – S2

Gleditsia triacanthos (Honey Locust) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009)- S3

Points of Interest

Faunal Records:

4 – Birds
2 – Reptiles & Amphibians
2 – Moths & Butterflies
2 – Mammals

Site Visits

September 1, 1980

Brady, et al.

August 27, 2007

A. Garofalo, K. Young-Chin

August 30, 2007

A. Garofalo, K. Young-Chin

June 1, 2007

J. Sankey, J. Grassie, S. Istok, W. Laar, F. Fohr, R. Armstrong

June 9, 2008

A. Garofalo, K. Young-Chin, I. Barrett

June 11, 2008

A. Garofalo, K. Young-Chin, I. Barrett, K. Frohlich

% of site visited

16.70 % of the total study site was visited by NAI teams.

References Cited

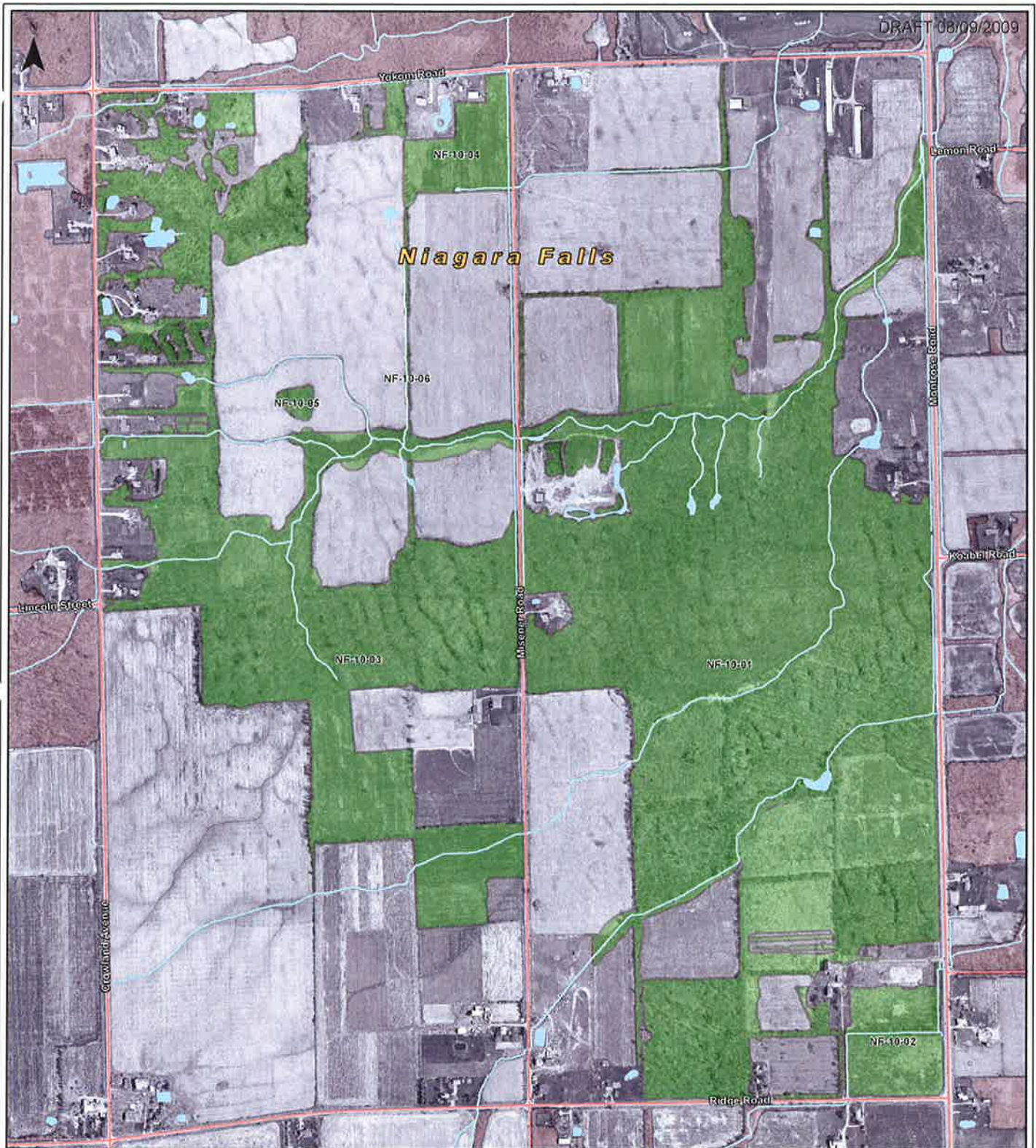
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-10



Natural Areas Inventory

Study Site NF-10

1:10,500

0 75 150 300 450 600 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 284 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)

Study Site NF-11

Willoughby Marsh

Municipality City of Niagara Falls

Formerly Willoughby Marsh (Brady, et al., 1980)

Approximate Area 1772 hectares

Watershed This large site has the majority of its drainage going to Tee Creek. There are two small areas in the south going to Bayers Creek and Black Creek, and an area in the north/east going to Usshers Creek.

Ownership Mix of public (Niagara Peninsula Conservation Authority) and private.

General Summary

This study site is very large. It is bound on the north by the Lyons Creek corridor and extends to just south of Netherby Road. It is bound on the west by Montrose Road and on the east by Sodom Road.

Physical Description

This natural area is situated on the flat, poorly drained Haldimand Clay Plain. The impoundments of water that give this area its name create deep organic deposits overlaying the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| ALLUVIUM | 3.16 |
| CHINGUACOUSY - LOAMY RED PHASE | 0.27 |
| CHINGUACOUSY - RED PHASE | 1.09 |
| CHINGUACOUSY - RED WASHED PHASE | 0.01 |
| JEDDO - RED PHASE | 0.01 |
| MALTON - HEAVY RED PHASE | 0.79 |
| NIAGARA | 14.12 |
| NIAGARA - LOAMY PHASE | 2.22 |
| ONEIDA - RED PHASE | 0.53 |
| PEEL - HEAVY RED PHASE | 1.97 |
| PEEL - RED PHASE | 0.63 |
| PORTSMOUTH | 1.18 |
| QUARRY | 3.29 |
| WELLAND | 68.02 |
| WELLAND - PEATY PHASE | 2.11 |
| WATER | 0.28 |
| NOT MAPPED | 0.34 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is known as Willoughby Marsh and it is a very large wetland complex in which the large pockets of marsh or swamp are connected by either man-made or natural waterways. There are very deep organic soils. In places, the organics are so fresh that twigs can still be identified to species when augured up. The topography is a complex of hummocks, sloughs and mounds.

The most common community noted for this study site was Deciduous Swamp. The swamps were mostly dominated Red Maple (*Acer rubrum*) while some were dominated by Yellow Birch (*Betula alleghaniensis*), Green Ash (*Fraxinus pennsylvanica*), Pin Oak (*Quercus palustris*), or Swamp Maple (*Acer fremanii*).

Associated understory species included White Swamp Oak (*Quercus bicolor*), White Elm (*Ulmus americana*), Blue Beech (*Carpinus caroliniana*), Spicebush (*Lindera benzoin*), and Narrow-leaved Meadowsweet (*Spiraea alba*).

The drier knolls between deep sloughs were mostly Red Oak (*Quercus rubra*), Black Cherry (*Prunus serotina*), and American Beech (*Fagus grandifolia*) with Winterberry (*Ilex verticillata*), Common Elderberry (*Sambucus canadensis*), and Highbush Blueberry (*Vaccinium corymbosum*).

The areas adjacent to the deep sloughs, or in shallow depressions were dominated by Reed Canary Grass (*Phalaris arundinacea*), Dotted Smartweed (*Polygonum punctatum*), and False Nettle (*Boehmeria cylindrica*).

In the floodplains of the various waterways, Reed Canary Grass was very common with associated Meadowsweet swamps, and small patches of Swamp Rose (*Rosa palustris*), Buttonbush (*Cephalanthus occidentalis*), or Hawthorn species (*Crateagus sp.*).

In the deeper sections of the creek channels, the community changes to Shallow Marsh dominated by Smartweed species (*Polygonum*), or Giant Bur-reed (*Sparganium eurycarpum*).

This floodplain represents an excellent example where one can observe the gentle grading of an open floodplain marsh into upland forest; and all the ecotones between from thicket swamp-forested swamp-lowland forest.

The Thicket Swamps were dominated by Narrow-leaved Meadowsweet, or Buttonbush with Silky Dogwood (*Cornus amomum ssp. obliqua*), Gray Dogwood (*Cornus foemina ssp. racemosa*), and Willow (*Salix sp.*).

The herbaceous layer was largely Wool Grass (*Scirpus cyperinus*), Giant Bur-reed, Cattails (*Typha sp.*), and Sedges (*Carex sp.*).

The upland Deciduous Forests were characterized by Red Oak and Sugar Maple (*Acer saccharum ssp. saccharum*) with Black Cherry, Hop Hornbeam (*Ostrya virginiana*), White Oak (*Quercus alba*), White Elm, and Shagbark Hickory (*Carya ovata*).

The understory was largely Maple-leaved Viburnum (*Viburnum acerifolium*), Witch-hazel

(*Hamamelis virginiana*), Downy Serviceberry (*Amelanchier arborea*), Gray Dogwood, and Hawthorn species.

The herbaceous layer was a mix of Spotted Crane's-bill (*Geranium maculatum*), with Large-leaved Aster (*Aster macrophyllus*), Common Cinquefoil (*Potentilla simplex*), Self-heal (*Prunella vulgaris* ssp. *vulgaris*), Common Strawberry (*Fragaria virginiana* ssp. *virginiana*), and Avens (*Geum* sp.).

Vegetation Communities

There are a total of 432 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Bulrush Mineral Shallow Marsh Type (MASM1-2)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Bur-reed Organic Shallow Marsh Type (MASO1-9)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Manna Grass Mineral Shallow Marsh Type (MASM1-17)

Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Poverty Oat Grass Graminoid Meadow Type (MEGM3-1)
Purple Loosestrife Mineral Shallow Marsh Type (MASM2-4)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Graminoid Organic Meadow Marsh Type (MAMO1-4)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Smartweed Organic Shallow Marsh Type (MASO2-6)
Spike Rush Organic Shallow Marsh Type (MASO1-8)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
Yellow Birch Organic Deciduous Swamp Type (SWDO3-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carya glabra (Pignut Hickory) (NPCA, 2006-2009) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009 – volunteer crew) – S3
Quercus shumardii (Shumard Oak) (NPCA, 2006-2009 – volunteer crew) – S3

Points of Interest

Faunal Records:

36 – Birds
9 – Moths & Butterflies
6 – Mammals
5 – Reptiles & Amphibians

Site Visits

September 1, 1980
Brady, et al.

October 18, 2006
A. Garofalo, K. McCauley

October 26, 2006
A. Garofalo, K. McCauley

May 18, 2007
J. Sankey, J. Grassie, F. Fohr, H. Teare, W. Laar

June 8, 2007
J. Sankey, J. Grassie, F. Fohr, H. Teare, R. Armstrong, S. Istok

June 25, 2007

B. Curry

July 5, 2007

A. Garofalo, K. Young-Chin, N. Iwanycki

July 24, 2007

B. Curry

August 14, 2007

A. Garofalo, K. Young-Chin

August 15, 2007

A. Garofalo, K. Young-Chin

August 15, 2007

A. Garofalo, K. Young-Chin, S. Veldman

August 20-22, 2007

A. Garofalo, K. Young-Chin

August 23, 24, 2007

A. Garofalo, K. Young-Chin, R. Ng

August 28, 2007

A. Garofalo, K. Young-Chin

September 17, 2007

A. Garofalo, K. Young-Chin

September 18, 2007

A. Garofalo, K. Young-Chin

September 19, 2007

A. Garofalo, B. Porter

September 19, 2007

A. Garofalo, K. Young-Chin

September 20, 2007

A. Garofalo, K. Young-Chin

September 24, 2007

A. Garofalo, K. Young-Chin

October 12, 2007

J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

October 18, 2007

A. Garofalo, K. Young-Chin

October 19, 2007

A. Garofalo, Jordana H.

October 22, 2007

A. Garofalo, K. Young-Chin

October 24, 2007

A. Garofalo, K. Young-Chin

October 30, 2007

A. Garofalo, K. Young-Chin

May 28, 2008

A. Garofalo, K. Young-Chin

October 1, 2008

J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

% of site visited

28.68 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

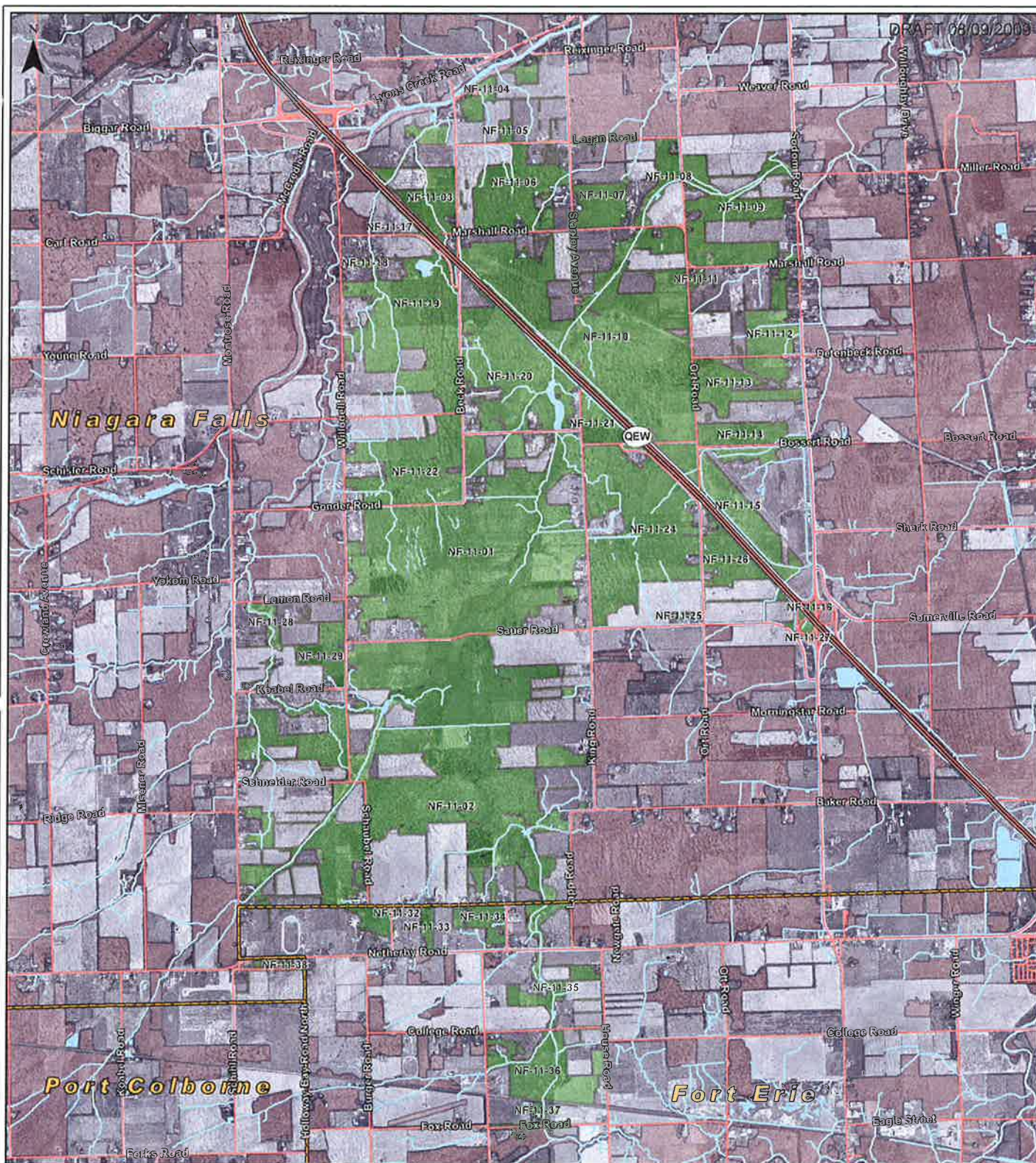
Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Niagara Peninsula Conservation Authority. 1982. *Humberstone Marsh and Willoughby Marsh Conservation Areas Master Plan*.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 08/09/2009



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-11



Natural Areas Inventory

Study Site NF-11

1:48,000

0 305 610 1,220 1,830 2,440 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 432 recorded taxa (unique plant records) for this study site
Community Series:
Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Grainoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site NF-12

Ussher's Creek

Municipality City of Niagara Falls

Formerly Willoughby Drive Woodlot (Brady et al., 1980)

Approximate Area 186 hectares

Watershed This study site drains to the Niagara River via Ussher's Creek.

Ownership Mix of private and public with some properties owned by The Niagara Parks Commission.

General Summary

This study site begins at the mouth of Ussher's Creek at Niagara River in the east and extends through the Legends on the Niagara Golf Course to Willoughby Drive in the west. It is bound on the north by Edgeworth Road and on the south by Weaver Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 12.56 |
| CASHEL - RED PHASE | 3.61 |
| COLWOOD | 0.82 |
| MALTON - HEAVY RED PHASE | 42.54 |
| NIAGARA | 3.00 |
| PEEL - HEAVY RED PHASE | 21.86 |
| PEEL - RED PHASE | 3.60 |
| WELLAND | 11.70 |
| WATER | 0.00 |
| NOT MAPPED | 0.30 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is one of the best locations for Lizard's Tail (*Saururus cernuus*) found during the NAI.

Beds of Tape Grass (*Vallisneria americana*) make up the submergent community in the Ussher's Creek channel. Occasionally, Water Milfoil (*Myriophyllum sp.*) species along with Canada Waterweed (*Elodea canadensis*), and some Pondweed species (*Potamogeton sp.*) were mixed with the Tape Grass.

The Wild Celery Submerged Shallow Aquatic Type community occurred from the mouth

of Ussher's Creek at the Niagara River upstream to at least the first golf cart bridge.

Along both shorelines, and creeping out into the open water is a Forb Mineral Shallow Marsh community dominated by Beggar-ticks (*Bidens sp.*).

In the more upland area is a narrow band of shrub swamp including Silky Dogwood (*Cornus amomum ssp. obliqua*), Buttonbush (*Cephalanthus occidentalis*), and scattered Green Ash (*Fraxinus pennsylvanica*).

A Red Oak (*Quercus rubra*) and Sugar Maple (*Acer saccharum ssp. saccharum*) dominated Deciduous Forest occupied the valley slopes with a Red Oak, Shagbark Hickory (*Carya ovata*), White Ash (*Fraxinus americana*) community on the dry rims.

The understory of these forests was largely regenerating canopy species with Hawthorn (*Crataegus sp.*), Honeysuckle (*Lonicera sp.*), Gray Dogwood (*Cornus foemina ssp. racemosa*), and Common Buckthorn (*Rhamnus cathartica*).

The ground layer was a mix of Garlic Mustard (*Alliaria petiolata*), Avens species (*Geum sp.*), Wild Coffee (*Triosteum aurantiacum*), and Tall Goldenrod (*Solidago altissima var. altissima*).

Vegetation Communities

There are a total of 71 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)

Vegetation Type

Dry - Fresh Oak - Hickory Deciduous Forest Type (FODM2-2)
Fresh - Moist Oak - Sugar Maple Deciduous Forest Type (FOD9-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Wild Celery Submerged Shallow Aquatic Type (SAS_1-5)

Significant Flora

Species at Risk – None noted

Provincially Rare

Peltandra virginica ssp. virginica (Green Arrow-arum) (NPCA, 2006-2009) – S2
Saururus cernuus (Lizard's Tail) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

2 - Birds
2 - Moths/Butterflies
1 - Mammal

Recommendations

The Forb Mineral Shallow Marsh should be called a "Lizard's Tail - Arrow Arum Mineral Shallow Marsh Type" due to the abundance of both plant species, however, that is not an option to choose from in the Ecological Land Classification Protocol. It is recommended that these anomalies be brought to the attention of the Ministry of Natural Resources for inclusion in future versions of the Ecological Land Classification protocol.

Site Visits

September 7, 2007

A. Garofalo

September 10, 2007

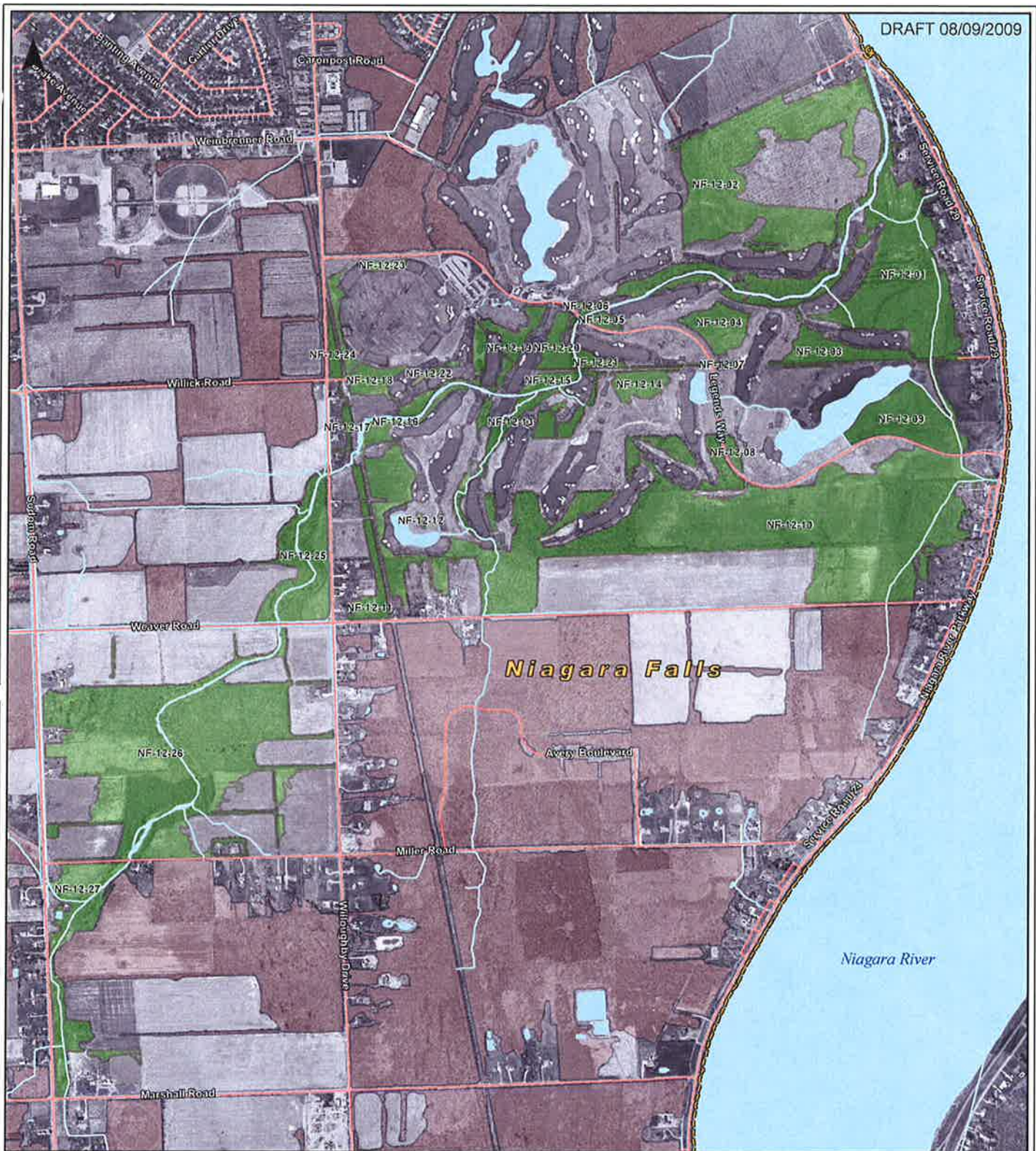
A. Garofalo, K. Young-Chin, A. Goodban

% of site visited

32.50 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-12



Natural Areas Inventory

Study Site NF-12

1:18,000

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 71 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Submerged Shallow Aquatic (SAS)

Study Site NF-13

Boyer's Creek-Willoughby Drive Wetlands

Municipality City of Niagara Falls

Formerly Boyer's Creek Bush (Brady, et al., 1980)

Approximate Area 1010 hectares

Watershed The drainage from this site is rather complex given its size and proximity to the Niagara River. Moving north to south, the following subwatersheds provide drainage for this study site: Ussher's Creek, Niagara River 11, Bayer's Creek, Niagara River 12, Niagara River 13, Black Creek.

Ownership Mix of private and public.

General Summary

This study site is located mostly within the municipality of Niagara Falls with a very small section in the south that is within Fort Erie. The study site is bound on the north by Weaver Road and extends south to Baker Road. The western limit is Sodom Road and it is bound on the east by the Niagara River.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 1.03 |
| MALTON - HEAVY RED PHASE | 27.88 |
| NIAGARA | 1.09 |
| ONEIDA - RED PHASE | 0.96 |
| PEEL - HEAVY RED PHASE | 17.12 |
| PEEL - RED PHASE | 0.12 |
| WELLAND | 50.04 |
| WATER | 0.05 |
| NOT MAPPED | 1.72 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area is a flat wetland with intermittent eutrophic ponds and streams. The area is bordered by successional meadows and agricultural fields.

The most common communities noted for this study site were Deciduous Swamp and Shallow Marsh.

The Deciduous Swamp communities were dominated by Red Maple (*Acer rubrum*), Pin

Oak (*Quercus palustris*), and Green Ash (*Fraxinus pennsylvanica*) with associated Swamp Maple (*Acer fremanii*) and Swamp White Oak (*Quercus bicolor*). The understory was characterized by the canopy species with some White Elm (*Ulmus americana*), Blue Beech (*Carpinus caroliniana*), Choke Cherry (*Prunus virginiana* ssp. *virginiana*), and Spicebush (*Lindera benzoin*).

The herbaceous layer was a mix of Aven species (*Geum* sp.), Fowl Manna Grass (*Glyceria striata*), Swamp Dewberry (*Rubus hispidus*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Jumpseed (*Polygonum virginianum*), Beggar-tick species (*Bidens* sp.), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

The Shallow Marshes were characteristic of the slough ponds and were largely dominated by Rice Cut Grass (*Leersia oryzoides*), with Common Reed (*Phragmites australis*), Reed Canary Grass (*Phalaris arundinacea*), or Broad-leaved Sedges (*Carex* sp.). Common associates included, Moneywort (*Lysimachia nummularia*), Marsh Purslane (*Ludwigia palustris*), Common Boneset (*Eupatorium perfoliatum*), and Spike-rush species (*Eleocharis* sp.).

The Thicket Swamp communities noted were mostly dominated by Narrow-leaved Meadowsweet (*Spirea alba*) or Buttonbush (*Cephalanthus occidentalis*). Other common species included Winterberry (*Ilex verticillata*), Narrow-leaved Cattails (*Typha angustifolia*), Silky Dogwood (*Cornus amomum* ssp. *obliqua*), and a variety of Willow species (*Salix* sp.). Associated with these Thicket Swamp communities were occasional sloughs of Rush (*Juncus* sp.) marsh and drier knolls of Gray Dogwood (*Cornus foemina* ssp. *racemosa*) thicket.

The successional areas were characterized by Gray Dogwood with Silky Dogwood, Narrow-leaved Meadowsweet and Common Blackberry (*Rubus allegheniensis*).

Common Cinquefoil (*Potentilla simplex*), Common Strawberry (*Fragaria virginiana* ssp. *virginiana*), and Grass-leaved Goldenrod (*Euthamia graminifolia*) were also common.

In very dry areas of the meadow knolls, Virginia Mountain Mint (*Pycnanthemum virginiana*), Common Strawberry, Hairy Aster (*Aster pilosis*), Poverty Oat Grass (*Danthonia spicata*), Early Goldenrod (*Solidago juncea*), and Small-flowered Agrimony (*Agrimonia parviflora*) were noted.

The floodplain areas of the various creeks were mostly, Green Ash with an understory of Moneywort and various Grasses.

The more uncommon Deciduous Forests noted supported a community of Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), and Shagbark Hickory (*Carya ovata*).

Vegetation Communities

There are a total of 332 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)

Deciduous Forest (FOD)

Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Common Reed Mineral Shallow Marsh Type (MASM1-12)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Exotic Lowland Deciduous Forest Type (FODM7-9)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Manna Grass Mineral Shallow Marsh Type (MASM1-17)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Narrow-leaved Sedge Mineral Shallow Marsh Type (MASM1-4)
Native Shrub Deciduous Hedgerow Thicket Type (THDM3-2)
Open Graminoid Meadow Type (MEGM4-1)
Panicked Aster Mineral Meadow Marsh Type (MAMM2-2)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Poverty Oat Grass Graminoid Meadow Type (MEGM3-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Rush Graminoid Mineral Meadow Marsh Type (MAMM1-13)
Water Milfoil Submerged Shallow Aquatic Type (SAS_1-4)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Carya laciniosa (Shellbark Hickory) (NPCA, 2006-2009) – S3
Gleditsia tricanthos (Honey Locust) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (Brady, et al., 1980) – S3
Quercus shumardii (Shumard Oak) (NPCA, 2006-2009) – S3

Points of Interest

The late Bruce Kershner, an expert on old growth trees of the northeast, studied this area and reported the ages of these ancient trees to be between 250 and 450 years old (Bert Miller Nature Club, 2003).

This would make this forested area home to the oldest population of broadleaf trees known in the Niagara Peninsula. He reported 48 trees 250-450 years old measuring from 18 - 24 inches in diameter. Growth rings were recorded to be 60 per inch

Faunal Records:

57 – Birds

15 – Moths & Butterflies

10 – Reptiles & Amphibians

7 – Mammals

Site Visits

September 1, 1980

Brady, et al.

June 7, 2007

B. Curry

June 15, 2007

J. Sankey, J. Grassie, H. Teare, W. Laar, R. Armstrong

July 5, 2007

A. Garofalo, K. Young-Chin, N. Iwanycki, L. Burtenshaw

August 2, 2007

A. Garofalo, K. Young-Chin

August 9, 2007

A. Garofalo, K. Young-Chin

October 1, 2007

A. Garofalo, R. Kitchen

October 2, 2007

A. Garofalo, R. Kitchen, J. Heyword, K. Young-Chin

October 3, 2007

A. Garofalo, J. Heyword

October 10, 2007

A. Garofalo, K. Young-Chin

October 11, 2007

A. Garofalo, K. Young-Chin

October 17, 2007

A. Garofalo, K. Young-Chin

October 31, 2007

A. Garofalo, K. Young-Chin

% of site visited

19.12 % of the total study site was visited by NAI teams.

References Cited

Bert Miller Nature Club. 2003. *Old Growth Forest Survey of Niagara Peninsula*, Report to Trillium Foundation by B. Kershner.

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- International Boundary
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-13



Natural Areas Inventory

Study Site NF-13

1:33,000

0 250 500 1,000 1,500 2,000 Meters

There are a total of 332 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)

Graminoid Meadow (MEG)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

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Study Site NF-16

Hunter's Creek Headwaters

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 234 hectares

Watershed This study site is part of the Hunter's Drain subwatershed with a very small portion in the north east that drains to the Niagara River 9 subwatershed.

Ownership Mostly private

General Summary

This study site is located in the municipality of Niagara Falls between Sodom Road in the east and Stanley Avenue in the west. It is bound on the north by Lyon's Creek and extends to Logan Road in the south.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM | 3.79 |
| NIAGARA | 17.50 |
| WELLAND | 78.40 |
| WATER | 0.22 |
| NOT MAPPED | 0.09 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was Deciduous Swamp dominated by either Red Maple (*Acer rubra*) or Pin Oak (*Quercus palustris*), with Swamp White Oak (*Quercus bicolor*) and White Elm (*Ulmus americana*). The understory was mostly Blue Beech (*Carpinus caroliniana*), Spicebush (*Lindera benzoin*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*), Avens (*Geum* sp.), Fowl Manna Grass (*Glyceria striata*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), and Stout Woodreed (*Cinna arundinacea*).

The Submerged Shallow Aquatic communities noted were characterized by several species of Pondweed including Curly Pondweed (*Potamogeton crispus*), Floating-leaf Pondweed (*Potamogeton natans*), and Flat-stem Pondweed (*Potamogeton zosteriformis*).

A Deciduous Woodland community dominated by several species of Hawthorn (*Crataegus sp.*) and Common Apple (*Malus pumila*) was also recorded for this study site.

Vegetation Communities

There are a total of 295 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Pondweed Submerged Shallow Aquatic Type (SAS_1-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Silky Dogwood Organic Deciduous Thicket Swamp Type (SWTO4-3)
Waterweed Submerged Shallow Aquatic Type (SAS_1-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carya laciniosa (Shellbark Hickory) (Gregory, 2005) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

17 – Birds
2 – Mammals
1 – Reptiles & Amphibians

Site Visits

October 29, 2000
Acres & Associates

May 4, 2005

D. Gregory

September 12, 2007

A. Garofalo, K. Young-Chin

September 13, 2007

A. Garofalo, K. Young-Chin

September 27, 2007

A. Garofalo, K. Young-Chin, R. Ng-Rozema

% of site visited

20.73 % of the total study site was visited by NAI teams.

References Cited

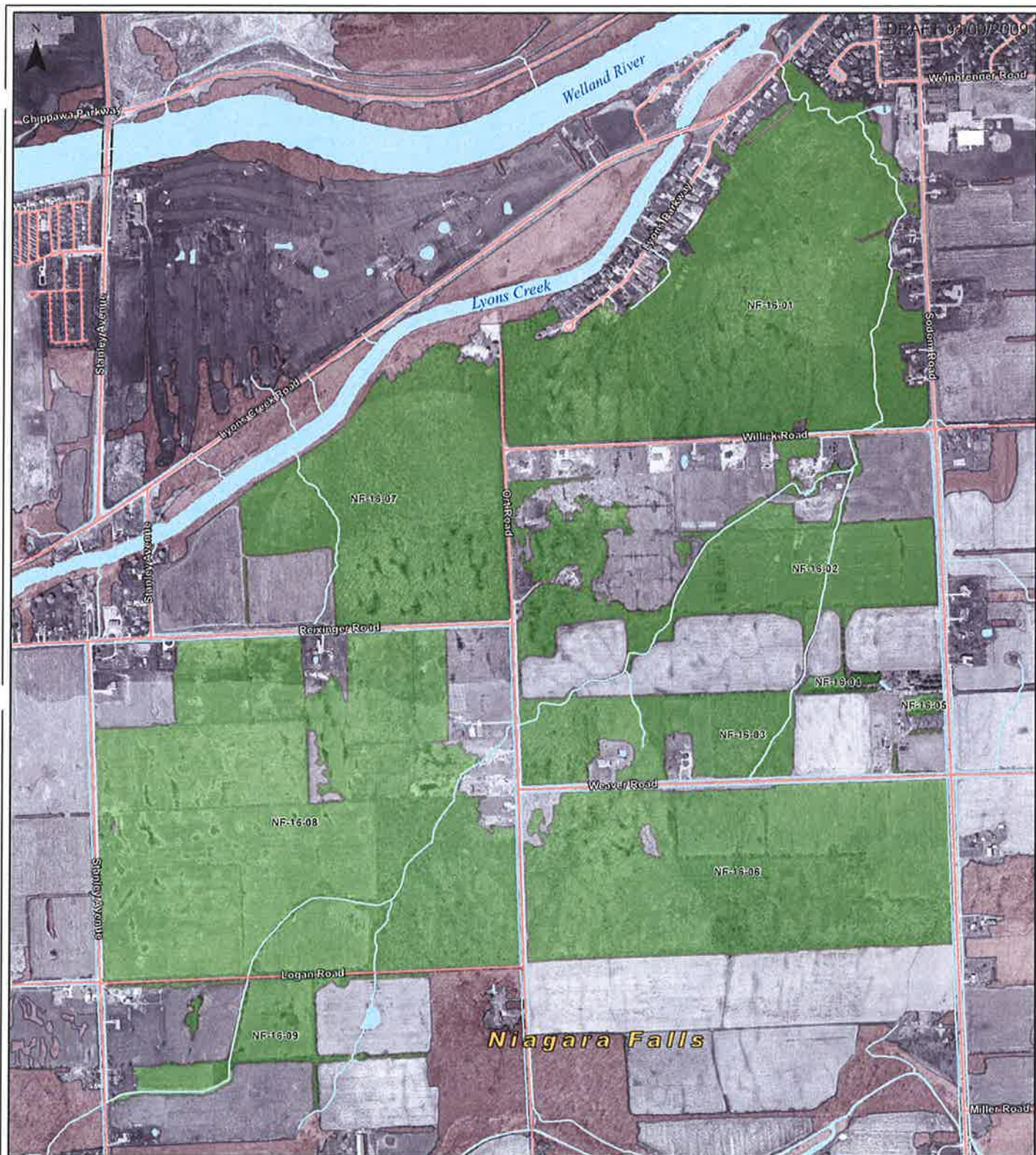
Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Gregory, D. 2005. *Natural areas survey. Welland River and Power Canal*. Oakville, Ontario: Ontario Power Generation Inc.

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-16



Natural Areas Inventory

Study Site NF-16

1:12,500



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There are a total of 295 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Swamp (SWD)
Deciduous Woodland (WOD)
Submerged Shallow Aquatic (SAS)

Study Site NF-17

Battlefield Woods

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 114 hectares

Watershed This study site drains directly to the Niagara River.

Ownership Public (Niagara Parks Commission)

General Summary

The natural area is located along the Niagara Parkway, bound to the north by the community of Chippawa, and to the east by the Niagara River. It is across the river from Navy Island and is situated between Legends Golf Course and the Chippawa Battlefield.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain in the northern half by the dolostone of the Guelph Formation, and in the southern half by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 0.15 |
| CASHEL - RED PHASE | 0.07 |
| MALTON - HEAVY RED PHASE | 82.98 |
| NIAGARA | 2.06 |
| PEEL - HEAVY RED PHASE | 0.16 |
| WELLAND | 12.95 |
| WATER | 0.00 |
| NOT MAPPED | 1.64 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was young to mid-aged Deciduous Swamps dominated by Green Ash (*Fraxinus pennsylvanica*), with White Elm (*Ulmus americana*), and Pin Oak (*Quercus palustris*) in the deeper sloughs.

The ground layer was largely patches of Moss (*Moss sp.*), Sedges (*Carex sp.*), Awns (*Geum sp.*), and Fowl Manna Grass (*Glyceria striata*) with scattered Gray Dogwood (*Cornus foemina ssp. racemosa*).

Complexed throughout the areas visited were stands of Hawthorn (*Crateagus sp.*) woodland with Common Apple (*Malus pumila*), and Thicket Creeper (*Parthenocissus inserta*).

Thicket Swamps noted were characterized by Narrow-leaved Meadowsweet (*Spirea alba*), Gray Dogwood, and Silky Dogwood (*Cornus amomum* ssp. *obliqua*), with Green Ash and White Elm.

The herbaceous layer was a mix of Mosses and Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*).

Vegetation Communities

There are a total of 93 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Vegetation Type

Fresh - Moist Green Ash - Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh - Moist Hawthorn / Apple Deciduous Woodland Type (WODM5-4)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Creeping Bent Grass Graminoid Mineral Meadow Marsh Type (MAMM1-8)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)

Significant Flora

Species at Risk –None noted

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

1 - Mammal

Site Visits

September 7, 2007

A. Garofalo, K. Young-Chin

October 29, 2007

A. Garofalo, K. Young-Chin

% of site visited

57.71% of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-17



Natural Areas Inventory

Study Site NF-17

1:15,000

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There are a total of 93 recorded taxa (unique plant records) for this study site.
Community Series:
 Deciduous Swamp (SWD)
 Deciduous Thicket (THD)
 Thicket Swamp (SWT)

Study Site NF-18

Bayer's Creek Headwaters

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 367 hectares

Watershed The majority of this study site drains to Bayer's Creek with a portion going to Tee Creek and a very small section in the north draining to Ussher's Creek.

Ownership Mostly private.

General Summary

This study site is located within the municipality of Niagara Falls between Lapp Road in the west and Sodom Road in the east. It extends from Sauer Road in the north to Netherby Road in the south.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| NIAGARA | 5.73 |
| WELLAND | 94.27 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community reported for this study site was Deciduous Swamp dominated by either Red Maple (*Acer rubrum*), Swamp Maple (*Acer fremanii*), or Green Ash (*Fraxinus pennsylvanica*), with Pin Oak (*Quercus palustris*) and White Swamp Oak (*Quercus bicolor*). In some areas it was difficult to tell which was more dominant Red Maple or Swamp Maple but the Swamp Maple was definitely more common on the slough pond edges, forming a ring.

The understory was largely Blue Beech (*Carpinus caroliniana*) and White Elm (*Ulmus americana*).

The herbaceous layer was a mix of Spotted Touch-me-nots (*Impatiens capensis*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Swamp Dewberry (*Rubus hispidus*), Jumpseed (*Polygonum virginianum*), White Avens (*Geum canadense*), Sedges (*Carex* sp.), and Canada Mayflower (*Maianthemum canadense*).

On the crest of the moraine ridges around the slough ponds, it was common to find drier species such as, American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*) and in some instances Shumard Oak (*Quercus shumardii*).

The Thicket Swamps noted were characterized by Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Silky Dogwood (*Cornus amomum* ssp. *obliqua*) and Narrow-leaved Meadowsweet (*Spiraea alba*).

A variety of Goldenrods were associated including, Canada Goldenrod (*Solidago canadensis* ssp. *canadensis*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Early Goldenrod (*Solidago juncea*), and Gray Goldenrod (*Solidago nemoralis* ssp. *nemoralis*), as well as, Common Strawberry (*Fragaria virginiana* ssp. *virginiana*), and Ox-eye Daisy (*Chrysanthemum leucanthemum*).

Vegetation Communities

There are a total of 405 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Open Graminoid Meadow Type (MEGM4-1)
Panicked Aster Mineral Meadow Marsh Type (MAMM2-2)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red-top Graminoid Mineral Meadow Marsh Type (MAMM1-4)
Reed Canary Grass Organic Shallow Marsh Type (MASO1-4)

Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Carex lupuliformis (Knobbed Hop Sedge) (NPCA, 2006-2009) – Endangered
Eurybia divaricata (White Wood Aster) (Gregory, 2004) – Threatened
Quercus shumardii (Shumard Oak) (NPCA, 2006-2009) – Special Concern

Provincially Rare Species

Carya laciniosa (Shellbark Hickory) (Gregory, 2004) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

40 – Birds
9 – Mammals
5 – Reptiles & Amphibians
2 – Moths & Butterflies

Site Visits

May 4, 2004
D. Gregory

July 6, 2007
J. Sankey, J. Grassie, R. Armstrong, S. Istok, B. Briant

August 10, 2007
J. Sankey, J. Grassie, F. Fohr, B. Briant

September 14, 2007
J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

October 12, 2007
J. Sankey, J. Grassie, R. Armstrong, F. Fohr, S. Istok

October 29, 2007
A. Garofalo, K. Young-Chin

November 2, 2007
A. Garofalo, R. Kitchen

June 4, 2008
A. Garofalo, K. Young-Chin

June 25, 2008
A. Garofalo, K. Young-Chin

July 4, 2008

J. Sankey, J. Grassie, R. Armstrong, H. Teare, B. Briant

% of site visited

13.31 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Gregory, D. 2004. *"Welland River and Power Canal."* Natural Areas Survey. Oakville, Ontario: Ontario Power Generation Inc.

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



DRAFT 08/09/2009

Legend

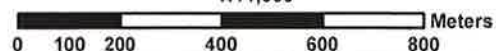
- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-18



Natural Areas Inventory

Study Site NF-18

1:14,000



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There are a total of 405 recorded taxa (unique plant records) for this study site
Community Series:
Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site NF-20

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 196 hectares

Watershed The majority of this study site drains to Lyons Creek but there is a portion of the site in the west that flows to Grassy Brook, and a small portion in the north that flows directly into the Welland River East.

Ownership Mostly private

General Summary

This study site is located in the municipality of Niagara Falls between Lyons Creek Road to the south and the Welland River to the north. It is bound on the west by the Queen Elizabeth Way and extends to just east of Stanley Avenue.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 5.81 |
| CASHEL - HEAVY RED PHASE | 1.06 |
| NIAGARA | 37.18 |
| NIAGARA - LOAMY PHASE | 19.35 |
| ONTARIO | 9.95 |
| WELLAND | 23.93 |
| WATER | 0.73 |
| NOT MAPPED | 2.01 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small portion of this study site was visited during the Natural Areas Inventory. The Deciduous Forest community noted was dominated by White Oak (*Quercus alba*) and Red Oak (*Quercus rubra*) with Red Maple (*Acer rubrum*), and Swamp White Oak (*Quercus bicolor*) as associates.

The understory was characterized by regenerating Red Maple, Hop Hornbeam (*Ostrya virginiana*), Black Cherry (*Prunus serotina*) and White Elm (*Ulmus americana*), with Downy Serviceberry (*Amelanchier arborea*), Green Ash (*Fraxinus pennsylvanica*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Avens (*Geum sp.*), Common Strawberry (*Fragaria virginiana ssp. virginiana*), Common Cinquefoil (*Potentilla simplex*), and Asters (*Aster sp.*).

A unique Deciduous Savanna community dominated by Hawthorn (*Crataegus sp.*) was also recorded for this study site. Associated species included Green Ash, White Elm, Gray Dogwood (*Cornus foemina ssp. racemosa*) and Common Buckthorn (*Rhamnus cathartica*). The understory was a mix of Grasses, and Goldenrods including, Rough Goldenrod (*Solidago rugosa ssp. rugosa*), Early Goldenrod (*Solidago juncea*), and Grass-leaved Goldenrod (*Euthamia graminifolia*).

Vegetation Communities

There are a total of 63 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Savanna (SVD)
Deciduous Swamp (SWD)

Vegetation Type

Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Hawthorn Deciduous Savanna Type (SVDM3-4)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

1 – Bird
1 – Mammal

Site Visits

October 25, 2007
A. Garofalo

% of site visited

3.69 % of the total study site was visited by NAI teams.

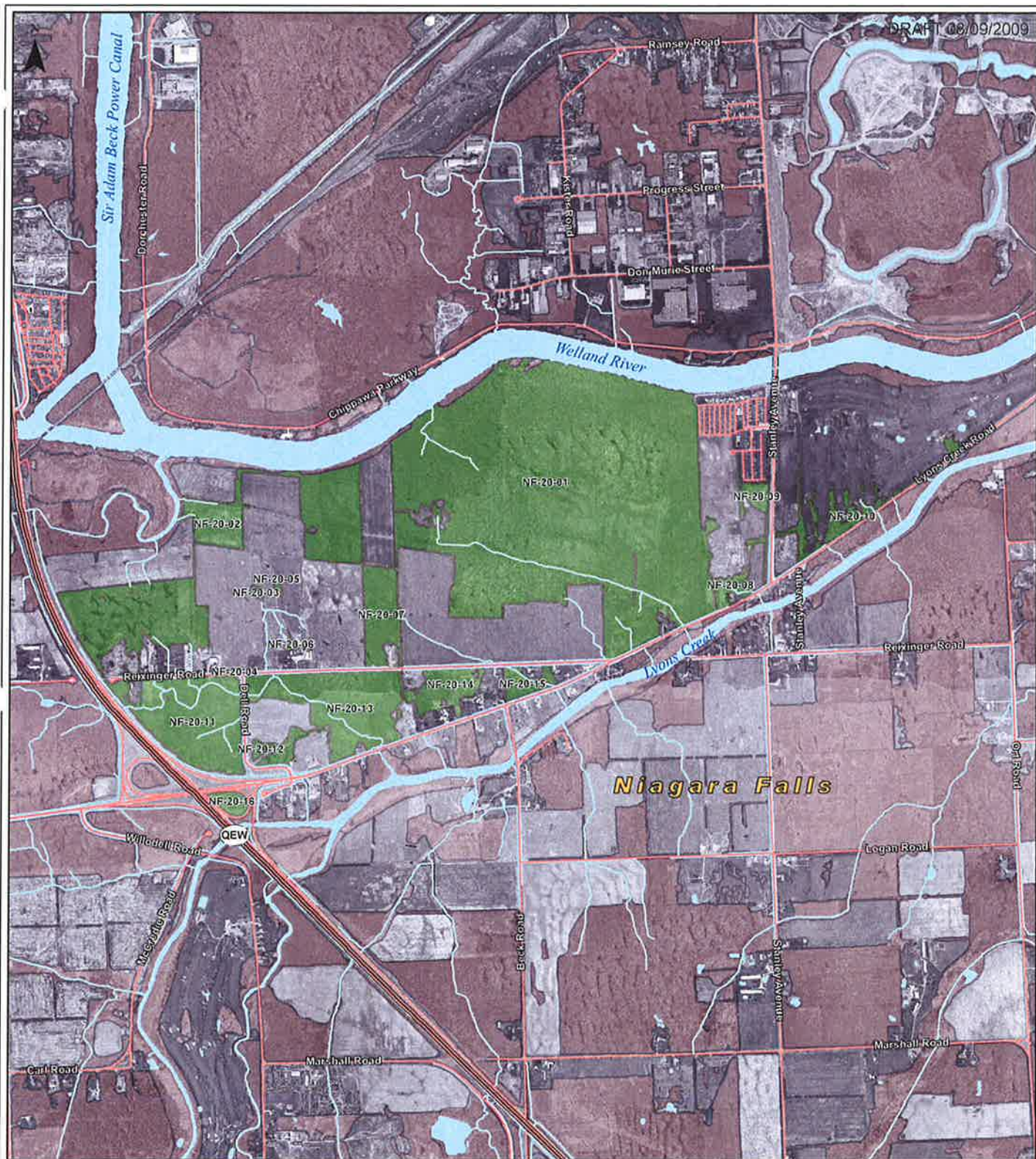
References Cited

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- == Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-20



Natural Areas Inventory

Study Site NF-20

1:21,500

0 150 300 600 900 1,200 Meters

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There are a total of 63 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Savanna (SVD)

Study Site NF-22

Garner Road Woods

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 454 hectares

Watershed The majority of this study site flows to Beaver Dams Creek, however there is a very small portion in the south west that drains to Thompson's Creek.

Ownership Mostly private.

General Summary

This study site includes a number of small urban forests fragmented throughout the area between Thorold Townline Road to the west and Dorchester Road, just east of the 420 interchange to the east. It extends from Beaverdams Road in the north to McLeod Road in the south.

Physical Description

This natural area is diverse in its physiography and soils as it is divided by flat, poorly drained clay and silty clay soils of the Clay Plain in the north west portion of the study site; well drained sandy and loamy sands of the Sand Plain in the north east portion; and mixed deposits of parent material in the till moraine area in the south.

The site is underlain by shale and dolostone of the Lockport Formation in the north and dolostone of the Guelph Formation in the south.

The height of land of the moraine dissects this natural area.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------------|---------------------------------|
| ALLUVIUM | 9.27 |
| BEVERLY | 9.00 |
| BEVERLY - LOAMY PHASE | 3.23 |
| CASHEL | 3.39 |
| CHINGUACOUSY - LOAMY RED PHASE | 6.67 |
| CHINGUACOUSY - RED PHASE | 2.76 |
| HALDIMAND | 3.17 |
| HALDIMAND - LOAMY PHASE | 6.01 |
| JEDDO - LOAMY RED PHASE | 0.68 |
| LINCOLN | 0.39 |
| LINCOLN - LOAMY PHASE | 9.72 |
| MALTON - LOAMY RED PHASE | 4.72 |
| MALTON - RED PHASE | 2.99 |
| NIAGARA | 5.08 |
| NIAGARA - LOAMY PHASE | 0.01 |

| | |
|--------------------------|--------|
| PEEL | 0.07 |
| PEEL - LOAMY RED PHASE | 3.42 |
| PEEL - RED PHASE | 0.28 |
| TOLEDO | 11.97 |
| TOLEDO - LOAMY RED PHASE | 1.68 |
| WELLAND | 3.34 |
| WATER | 0.25 |
| NOT MAPPED | 11.90 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small percentage of this study site was visited by the NAI teams during the course of this project.

The Deciduous Forests were mostly Red Oak (*Quercus rubra*) and Red Maple (*Acer rubrum*) with Green Ash (*Fraxinus pennsylvanica*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), and American Beech (*Fagus grandifolia*).

The understory was mostly regenerating canopy species with Spicebush (*Lindera benzoin*) and a ground cover of False Solomon's Seal (*Maianthemum racemosum* ssp. *racemosum*), Climbing Poison-ivy (*Rhus radicans* ssp. *negundo*), Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), and Garlic Mustard (*Allaria petiolata*).

The Deciduous Swamp communities were dominated by Red Maple and Swamp Maple (*Acer fremanii*), with associated Green Ash and White Elm (*Ulmus americana*).

The ground cover in these areas was mostly Sensitive Fern (*Onoclea sensibilis*) and Canada Enchanter's Nightshade.

A Meadow Marsh community was also noted for this site. It was characterized by Reed Canary Grass (*Phalaris arundinacea*), False Nettle (*Boehmeria cylindrica*), and Motherwort (*Leonurus cardiaca* ssp. *cardiaca*).

Vegetation Communities

There are a total of 167 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Vegetation Type

Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carex careyana (Carey's Wood Sedge) (NPCA, 2006-2009) – S2

Spiranthes magnicamporum (Great Plains Ladies' Tresses) (Gregory, 2004)

Points of Interest**Faunal Records:**

5 – Birds

3 – Mammals

1 – Reptile & Amphibian

Site Visits

May 4, 2004

D. Gregory

August 7, 2008

R. Kitchen, B. Porter

August 28, 2008

R. Kitchen, B. Porter, S. Mohamed

% of site visited

1.79 % of the total study site was visited by NAI teams.

References Cited

Gregory, D. 2004. "Welland River and Power Canal." *Natural Areas Survey*. Oakville, Ontario: Ontario Power Generation Inc.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from

<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 09/09/2009



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-22



Natural Areas Inventory

Study Site NF-22

1:33,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 167 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Study Site NF-23

Shriner's Creek

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 207 hectares

Watershed The majority of this study site drains to Shriner's Creek however there is a portion in the north that drains to the Ten Mile Creek subwatershed.

Ownership A mix of private and public with some property owned by the City of Niagara Falls and the Niagara Peninsula Conservation Authority.

General Summary

This study site extends from Mountain Road in the north to Beaverdams Road in the south. The western boundary is Taylor Road/ Thorold Townline Road and it is bound on the east by the Queen Elizabeth Way.

Physical Description

This natural area is situated just south of the Niagara Escarpment and thus, the northern portion of the study site is characterized by the mixed deposits of parent material associated with the till moraine feature. The southern portion is on the flat, poorly drained clay and silty clay soils of the Clay Plain.

The entire area is underlain by the shale, dolostone and limestone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|----------------------------|---------------------------------|
| ALLUVIUM | 22.03 |
| BEVERLY | 8.02 |
| BEVERLY - LOAMY PHASE | 15.76 |
| BEVERLY - LOAMY RED PHASE | 0.27 |
| BEVERLY - RED PHASE | 1.82 |
| BRANTFORD | 15.34 |
| BRANTFORD - RED PHASE | 3.99 |
| CHINGUACOUSY | 4.51 |
| CHINGUACOUSY - LOAMY PHASE | 1.09 |
| HALDIMAND | 0.42 |
| HALDIMAND - LOAMY PHASE | 0.54 |
| JEDDO - LOAMY PHASE | 1.52 |
| LINCOLN | 0.06 |
| MALTON - RED PHASE | 0.47 |
| MAPLEWOOD | 0.01 |
| PEEL - LOAMY RED PHASE | 0.23 |
| PEEL - RED PHASE | 2.73 |
| SMITHVILLE | 2.62 |
| TAVISTOCK | 0.01 |

| | |
|--------------------|--------|
| TOLEDO | 5.52 |
| TOLEDO - RED PHASE | 2.05 |
| WATER | 0.00 |
| NOT MAPPED | 10.99 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The drier Deciduous Forests noted were dominated by Red Oak (*Quercus rubra*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), Black Cherry (*Prunus serotina*), and Sugar Maple (*Acer saccharum* ssp. *saccharum*).

The understory was characterized by regenerating canopy species with, Hop Hornbeam (*Ostrya virginiana*) and Dogwood species (*Cornus* sp.).

The herbaceous layer was a mix of Common Strawberry (*Fragaria virginiana* ssp. *virginiana*), Asters (*Aster* sp.), and Goldenrods (*Solidago* sp.).

The wetter Deciduous Forests were dominated by Green Ash (*Fraxinus pennsylvanica*) or Black Walnut (*Juglans nigra*), with Pin Oak (*Quercus palustris*) and Willow Species (*Salix* sp.).

The understory of these forests was mostly Beggar-tick species (*Bidens* sp.), Spotted Touch-me-not (*Impatiens capensis*), and Avens (*Geum* sp.).

The Meadow Marshes within and between the larger forested patches were characterized by Reed Canary Grass (*Phalaris arundinacea*), with Sedges (*Carex* sp.) and Cow Vetch (*Vicia cracca*).

Large areas of early successional meadow were noted but were not classified since it is possible that they could return to agricultural uses at any time. They were characterized by fallow fields of Asters and Goldenrods with Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and Red-osier Dogwood (*Cornus stolonifera*).

Vegetation Communities

There are a total of 191 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
 Deciduous Forest (FOD)
 Deciduous Thicket (THD)
 Forb Meadow (MEF)
 Graminoid Meadow (MEG)
 Meadow Marsh (MAM)
 Mixed Meadow (MEM)
 Shallow Marsh (MAS)
 Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
Common Reed Mineral Shallow Marsh Type (MASM1-12)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FODM7-4)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist Willow Lowland Deciduous Forest Type (FODM7-3)
Goldenrod Forb Meadow Type (MEFM1-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Reed Canary Grass Graminoid Meadow Type (MEGM3-8)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora**Species at Risk**

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carex careyana (Carey's Wood Sedge) (NPCA, 2006-2009) – S2
Gleditsia triacanthos (Honey Locust) (NPCA, 2006-2009) – S2
Saururus cernuus (Lizard's Tail) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

4 – Birds
2 – Reptiles & Amphibians

Site Visits

July 8, 2008
R. Kitchen, B. Porter

July 14, 2008
R. Kitchen, B. Porter

August 5, 2008
R. Kitchen, B. Porter

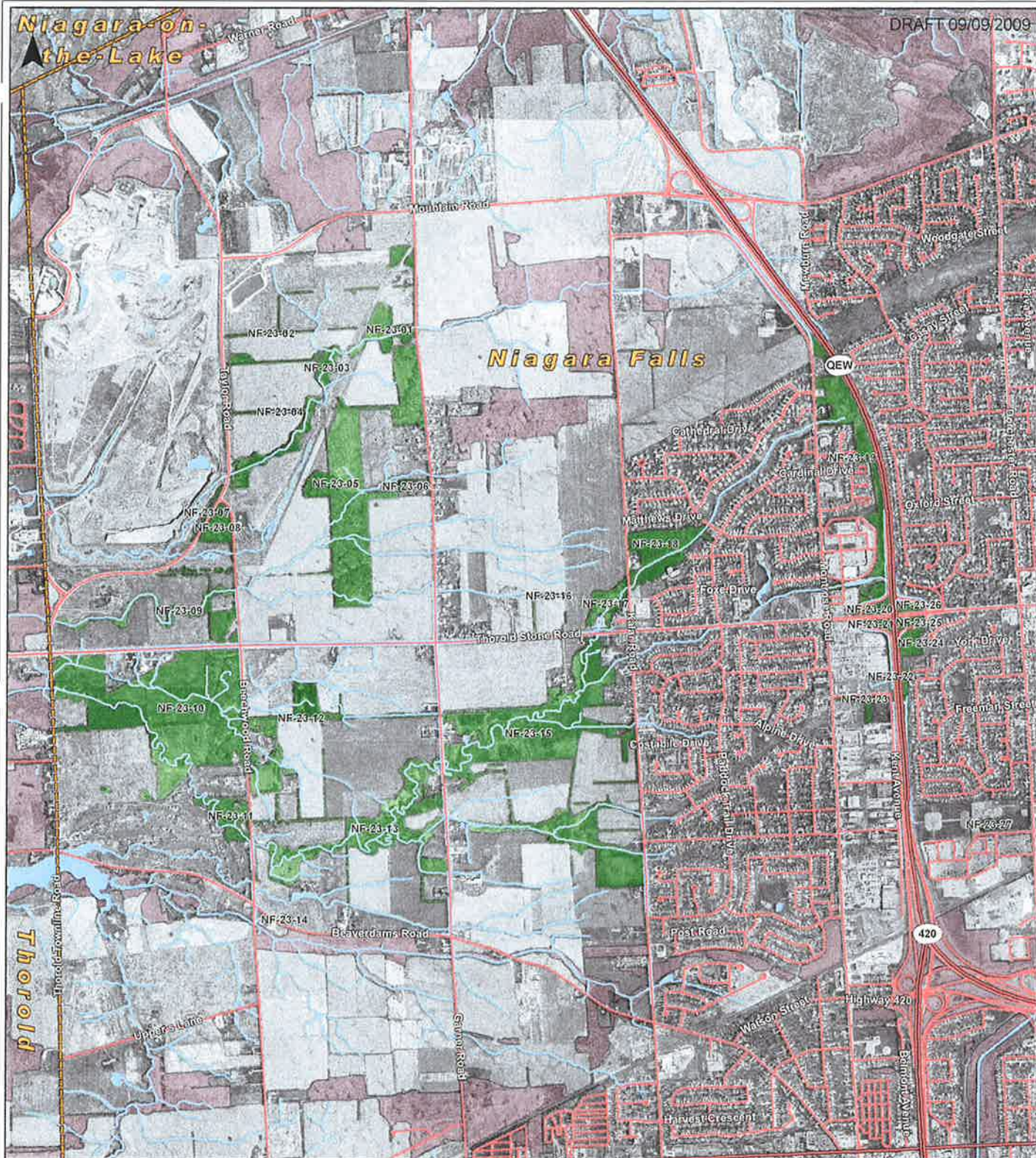
September 9, 2008
R. Kitchen, B. Porter

% of site visited

21.01 % of the total study site was visited by NAI teams.

References Cited

- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NF-23



Natural Areas Inventory

Study Site NF-23

1:28,000

0 200 400 800 1,200 1,600 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 191 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Thicket (THD)
Forb Meadow (MEF)

Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Shallow Marsh (MAS)

Study Site NF-26

Tee Creek Headwaters

Municipality City of Niagara Falls

Formerly N/A

Approximate Area 226 hectares

Watershed This study site drains to the Tee Creek subwatershed.

Ownership Mostly private with some publicly owned lands by the Niagara Peninsula Conservation Authority.

General Summary

This study site is located within the municipality of Niagara Falls in the south west near the border with Welland and Port Colborne. It is between Cope Road in the west and Montrose Road in the east. It is bound on the north by Buckner Road/ Lincoln Street and on the south by Netherby Road.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

One prominent feature of this area is the height of land associated with Doan's Ridge characterized by the outcropping of bedrock at the surface and shallow soils.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| CHINGUACOUSY - LOAMY RED PHASE | 6.71 |
| CHINGUACOUSY - RED PHASE | 10.75 |
| CHINGUACOUSY - RED WASHED PHASE | 4.80 |
| JEDDO - RED PHASE | 27.50 |
| MALTON - HEAVY RED PHASE | 31.28 |
| MALTON - RED PHASE | 3.34 |
| PEEL - HEAVY RED PHASE | 1.76 |
| PEEL - RED PHASE | 4.85 |
| WELLAND | 7.43 |
| WATER | 0.00 |
| NOT MAPPED | 1.57 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this site was the Narrow-leaved Meadowsweet (*Spirea alba*) dominated Thicket Swamps with associated Red Maple (*Acer rubrum*), Swamp Maple (*Acer fremanii*), and Green Ash (*Fraxinus pennsylvanica*) in the canopy.

In addition to the Meadowsweet, there was a mix of Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*) in the understory.

Wool Grass (*Scirpus cyperinus*), Reed Canary Grass (*Phalaris arundinacea*), Rough Avens (*Geum laciniatum*), Goldenrod species (*Solidago* sp.), and Sedges (*Carex* sp.) were all recorded in the herbaceous layer.

The Gray Dogwood Thicket Swamps were complexed throughout the Meadowsweet communities on the higher knolls.

Some inclusions of old field meadow occurred. These communities were largely a mix of Goldenrod and Aster with wetter inclusions of Wool Grass dominated Shallow Marshes.

Also, large Meadow Marsh communities characterized by Reed Canary Grass (*Phalaris arundinacea*) occurred throughout as inclusions.

Vegetation Communities

There are a total of 275 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bulrush Mineral Shallow Marsh Type (MASM1-2)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Canada Blue-joint Graminoid Organic Shallow Marsh Type (MASO1-3)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)

Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Open Graminoid Meadow Type (MEGM4-1)
Panicked Aster Mineral Meadow Marsh Type (MAMM2-2)
Pondweed Submerged Shallow Aquatic Type (SAS_1-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

11 – Birds
4 – Reptiles & Amphibians
2 – Mammals
1 – Moths & Butterflies

Site Visits

June 30, 2007

J. Sankey, J. Grassie, R. Armstrong, F. Fohr, B. Briant

July 30, 2007

A. Garofalo, K. Young-Chin

July 31, 2007

A. Garofalo, K. Young-Chin

August 2, 2007

A. Garofalo, K. Young-Chin

May 29, 2008

A. Garofalo, K. Young-Chin

June 2, 2008

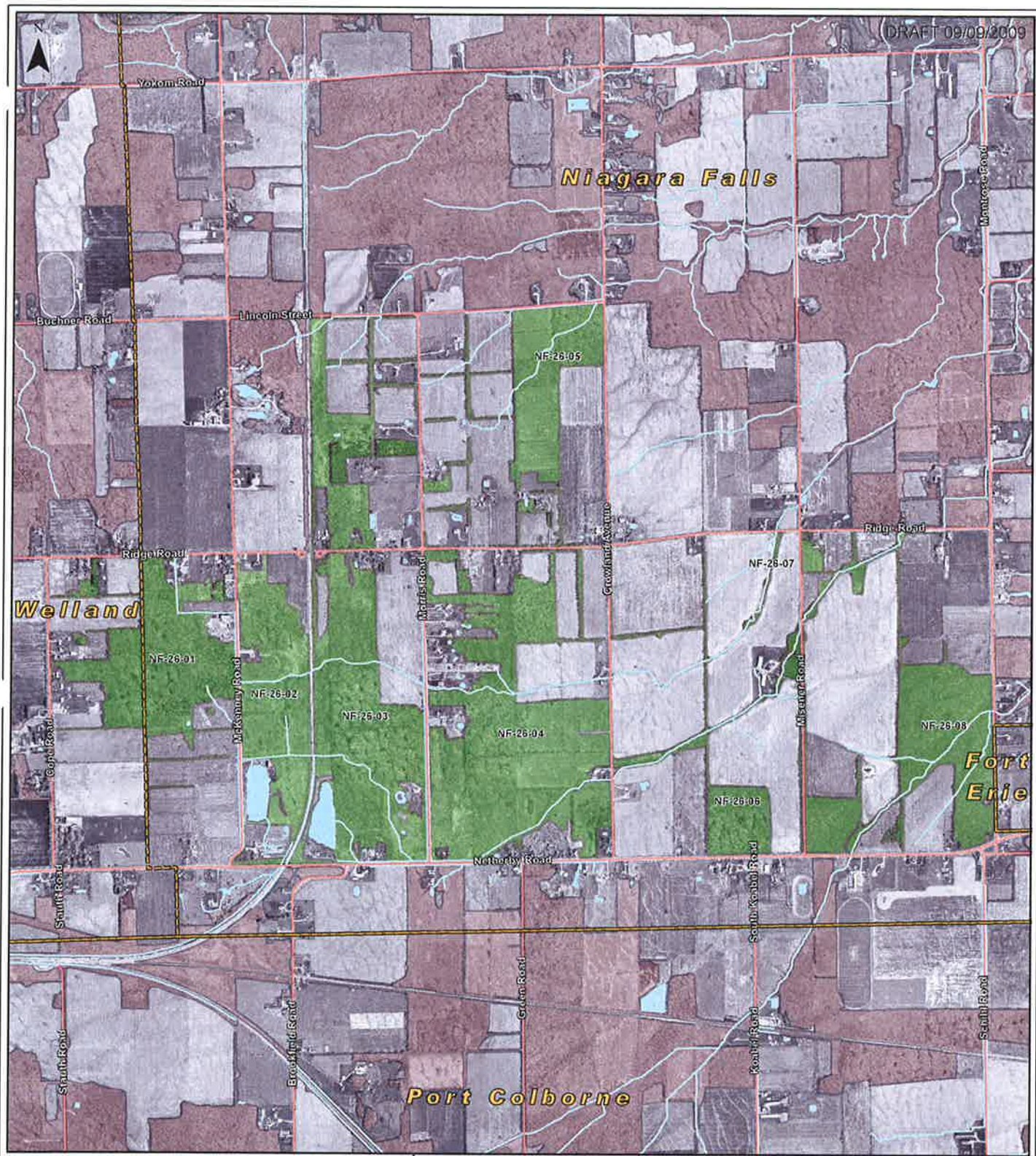
A. Garofalo, K. Young-Chin

% of site visited

25.38 % of the total study site was visited by NAI teams.

References Cited

- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

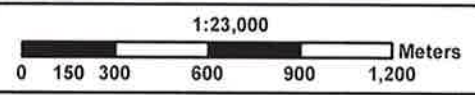


- Legend**
- Major Highways
 - Regional Highways
 - Roads
 - Watercourses
 - Waterbodies
 - Municipal Boundaries
 - Study Sites
 - Study Site NF-26



Natural Areas Inventory

Study Site NF-26



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 275 recorded taxa (unique plant records) for this study site.

Community Series:

- Coniferous Forest (FOC)
- Deciduous Forest (FOD)
- Deciduous Swamp (SWD)
- Thicket Swamp (SWT)

Study Site NL-01

Fireman's Park

Municipality Niagara-on-the-Lake

Formerly Fireman's Park/ St. David's Waterworks (Brady, et al., 1980)

Approximate Area 187 hectares

Watershed The drainage of this site is complex. It drains south to the Welland Canal subwatershed. It drains south and west to Six Mile Creek/ Airport Drain, and north and east to Four Mile Creek.

Ownership Private – Stamford Volunteer Firefighters and others

Public – City of Niagara Falls

General Summary

This study site is located in the municipality of Niagara-on-the-Lake near the border with Niagara Falls. It is bound on the north by General Brock Parkway also known as Highway 405, and on the south by Mountain Road. The eastern boundary is Stanley Avenue, and the Queen Elizabeth Way is the western boundary.

One of the largest properties visited is locally known as Fireman's Park since it is owned by the Stamford Volunteer Firefighters. This area and the area surrounding the park that is publically owned has also been studied in some detail by the local naturalist club.

Physical Description

This natural area is situated on a height of land of the Niagara Escarpment. The northern portion of the study site is characterized by shallow soils over the shale, sandstone, dolostone, and limestone of the Clinton-Cataract Formation.

The southern portion is characterized by the shale, dolostone, and limestone of the Lockport Formation. In areas associated with the slopes south of the escarpment, deeper till moraine soils are evident.

Soils

| Soil Type | Percentage of Study Site |
|----------------------------|---------------------------------|
| ALLUVIUM | 2.92 |
| BENNINGTON | 0.38 |
| BEVERLY | 0.26 |
| BRANT | 5.88 |
| BRANT - RED PHASE | 13.35 |
| CASHEL | 0.36 |
| CHINGUACOUSY | 0.36 |
| CHINGUACOUSY - LOAMY PHASE | 0.92 |
| ESCARPMENT | 4.36 |
| FLOODPLAIN | 1.18 |
| FONTHILL | 0.11 |
| GRIMSBY | 1.03 |
| MALTON - RED PHASE | 2.08 |

| | |
|------------------------|--------|
| ONEIDA | 0.39 |
| ONEIDA - RED PHASE | 10.70 |
| ONEIDA - WASHED PHASE | 2.16 |
| PEEL | 0.08 |
| PEEL - LOAMY RED PHASE | 0.90 |
| PEEL - RED PHASE | 2.70 |
| RIDGEVILLE | 0.11 |
| TAVISTOCK - RED PHASE | 1.06 |
| TUSCOLA - RED PHASE | 0.09 |
| WATER | 0.00 |
| NOT MAPPED | 48.59 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The dominant community in this study site was described as a Sassafras (*Sassafras albidum*) Deciduous Forest with fresh to moist characteristics in some areas and drier in others.

Other areas within the confines of Fireman's Park were very complex due to the diversity of topography found in the area making it very difficult to classify into communities. The site contained a complex of toe slope, mid slope, upper slope and crest communities which represent different moisture regimes depending on their position.

The driest communities found at the upper reaches were composed of Black Oak (*Quercus velutina*), or Bitternut Hickory (*Carya cordiformis*) dominated forests with a mix of other oak species, and Black Cherry (*Prunus serotina*).

The middle of the slopes were the areas of the dominant Sassafras community and the lower slopes were composed of largely Bitternut Hickory with associated Black Walnut (*Juglans nigra*), and Green Ash (*Fraxinus pennsylvanica*) with some mixing in the transition areas between communities.

The presence of prairie and savanna species such as Big Bluestem Grass (*Andropogon gerardii*), Hairy Bush clover (*Lespedeza hirta*), Butterfly Milkweed (*Asclepias tuberosa*), and Black Oak (one of the dominants in some areas) would indicate a historical presence of prairie and savanna communities. A look at 1934 air photos confirmed the absence of forest in this area.

In areas of the study site where the mowing along the creek has stopped, there were wet Meadow Marsh communities mixed with dry meadow communities. The Meadow Marshes were dominated by Spotted Touch-me-nots (*Impatiens capensis*) and Green Ash. There were also some pockets of Cattails (*Typha sp.*) throughout.

The drier Meadow communities noted were a mix of Raspberries (*Rubus sp.*), Pointed-leaved Tick-trefoil (*Desmodium glutinosum*), Hairy Bush-clover (*Lespedeza hirta*),

Goldenrods (*Solidago sp.*), and Asters (*Aster sp.*) with Black Walnut throughout.

Another interesting community noted for this study site was found on the talus slope of the Niagara Escarpment. The parent material was right at the surface making it impossible to determine the soil characteristics. The slopes were steep with many boulders of all shapes and sizes right at the surface. The NAI team did their best to classify this site although it did not meet the characteristic talus community as outlined in the ELC manual.

Vegetation Communities

There are a total of 320 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Buckthorn Deciduous Shrub Thicket Type (THDM2-6)
Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2)
Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-1)
Common Reed Mineral Shallow Marsh Type (MASM1-1)
Dry Big Bluestem Graminoid Tallgrass Prairie Type (MEGM1-2)
Dry-Fresh Black Oak Deciduous Forest Type (FODM1-3)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh Oak-Hickory Deciduous Forest Type (FODM2-2)
Dry-Fresh White Ash-Hardwood Deciduous Forest Type (FODM4-2)
Fresh-Moist Bitternut Hickory Deciduous Forest Type (FODM9-5)
Fresh-Moist Cottonwood Deciduous Forest Type (FODM8-3)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak Carolinian Deciduous Forest Type (FODM10-2)
Fresh-Moist Sassafras Deciduous Forest Type (FODM8-2)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Open Graminoid Meadow Type (MEGM4-1)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (NPCA, 2006-2009) – Endangered
Cornus florida (Eastern Flowering Dogwood) (Brady, 1980; Niagara Falls Nature Club 2004-2007; NPCA, 2006-2009; TERRA Geographical Studies Inc.) - Endangered
Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened
Gymnocladus dioicus (Kentucky Coffee-tree) (Niagara Falls Nature Club, 2004-2007) – Threatened
Juglans cinerea (Butternut) (Brady, 1980; Niagara Falls Nature Club, 2004-2007; NPCA, 2006-2009) – Endangered

Provincially Rare Species

Asimina triloba (Pawpaw) (Brady, 1990) – S3

Gleditsia triacanthos (Honey Locust) (Brady, 1980; Niagara Falls Nature Club, 2004-2007) – S2

Quercus ellipsoidalis – (Northern Pin Oak) (NPCA 2006-2009) – S3 not confirmed

Points of Interest

The areas with prairie indicator species might be good candidates for prairie restoration projects with the application of prescribed burn and invasive species removal (primarily Buckthorn (*Rhamnus sp.*)).

Faunal Records:

75 – Birds

24- Mammals

13- Reptiles & Amphibians

8 – Moths & Butterflies

Recommendations

Development of stronger partnership with the Stamford Volunteer Firefighters

Association is recommended to aid in the preservation of this uniquely diverse site.

Site Visits

September 1, 1980

Brady, et al

October 1, 1989

TERRA Geographical Studies Inc.

2004-2007 (several visits/ all seasons)

Niagara Falls Nature Club

September 8, 2006

Niagara Falls Nature Club

June 29, 2007

Niagara Falls Nature Club

July 21, 2008

R. Kitchen, B. Porter

August 7, 2008

R. Kitchen, B. Porter

August 8, 2008

R. Kitchen, B. Porter

August 11, 2008

R. Kitchen, B. Porter

August 13, 2008

R. Kitchen, B. Porter

2008

R. Kitchen, B. Porter, M. Nikitzuk

% of site visited

25.92 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

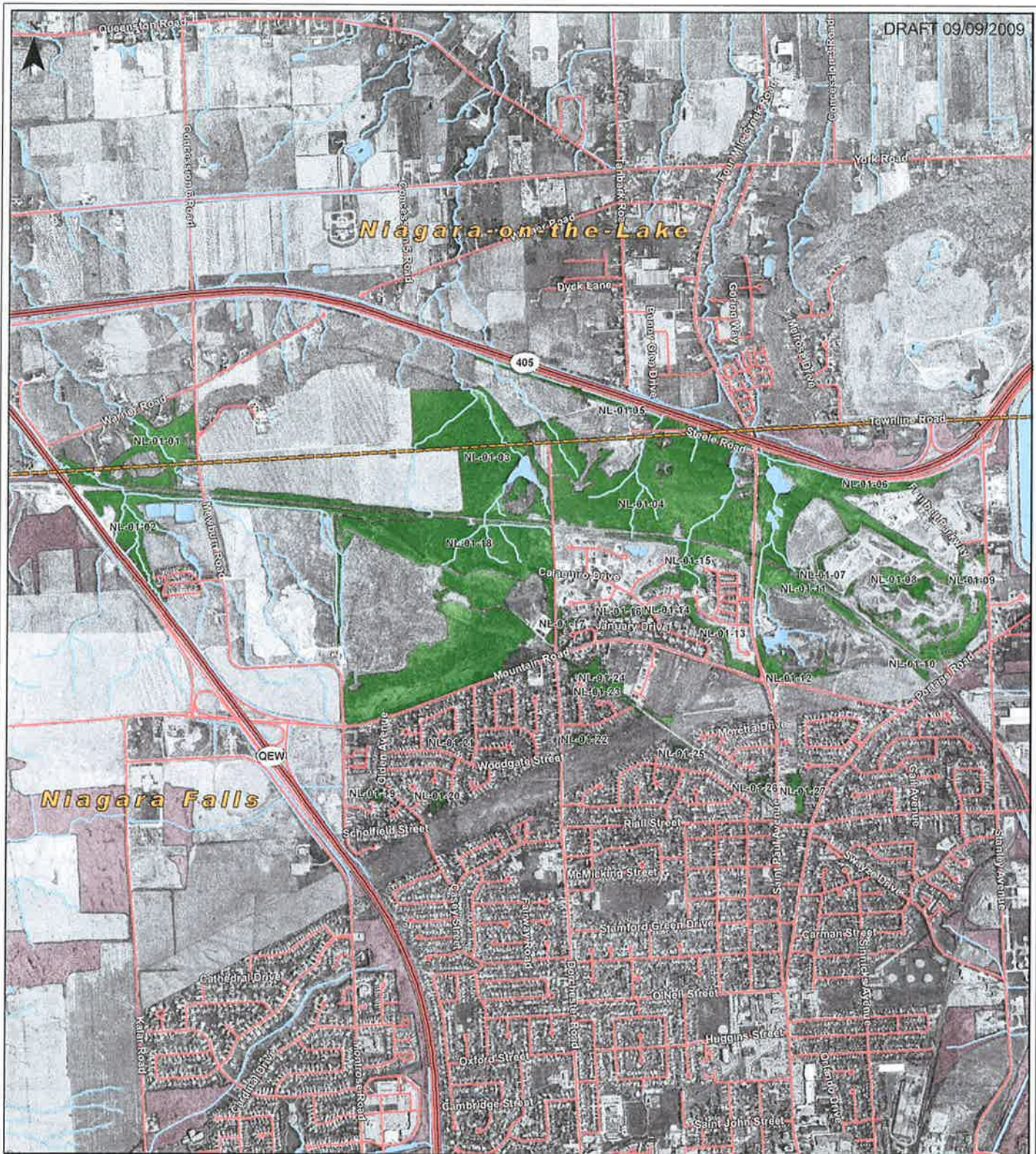
Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Niagara Falls Nature Club. 2001-2009. [Flora and Fauna Inventories]. Unpublished raw data.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

TERRA Geographical Studies Inc. 1989. "Mountain Road Landfill Site, Niagara Falls, Ontario." *Environmental Appraisal – Natural Environment*. Hamilton, Ontario. The Proctor & Redfern Group.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NL-01



Natural Areas Inventory

Study Site NL-01

1:25,000

0 150 300 600 900 1,200 Meters

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 All Frames: North American Datum 1983, Universal Transverse Mercator 6°
 Projection, Zone 17N, Central Meridian 81° West



There are a total of 320 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
 Deciduous Thicket (THD)
 Graminoid Meadow (MEG)

Meadow Marsh (MAM)
 Mixed Meadow (MEM)
 Thicket Swamp (SWT)

Study Site NL-04

Wood End

Municipality Niagara-on-the-Lake and Niagara Falls

Formerly Wood End (Brady, et al., 1980)

Approximate Area 95 hectares

Watershed The drainage of this study site mainly goes north east to Six Mile Creek/ Airport Drain. There is a small portion that drains north and west to Eight Mile Creek/ Airport Drain and a small portion that drains south to Ten Mile Creek.

Ownership Mainly private with a small portion in the north owned by the Niagara Peninsula Conservation Authority.

General Summary

This study site is located along the border between Niagara Falls and Niagara-on-the-Lake. It is bound on the west by Taylor Road and on the east by the Queen Elizabeth Way. The northern boundary is just north of Warner Road and the southern boundary is just south of Mountain Road.

Physical Description

This natural area is situated on a height of land of the Niagara Escarpment. The northern portion of the study site is characterized by the clay and silty clay soils of the Clay Plain over the shale, sandstone, dolostone, and limestone of the Clinton-Cataract Formation.

The southern portion is characterized by shallow soils over the shale, dolostone, and limestone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 3.10 |
| CASHEL - HEAVY RED PHASE | 2.72 |
| CHINGUACOUSY - RED PHASE | 5.32 |
| ESCARPMENT | 13.58 |
| MALTON - RED PHASE | 9.06 |
| ONEIDA - RED PHASE | 11.01 |
| PEEL | 3.12 |
| PEEL - RED PHASE | 52.10 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forest communities of this study site are dominated by Shagbark Hickory (*Carya ovata*), Red Oak (*Quercus rubra*), and Sugar Maple (*Acer saccharum* ssp. *saccharum*).

The understory is largely regenerating canopy species with Hop Hornbeam (*Ostrya virginiana*), Green Ash (*Fraxinus pennsylvanica*), and Poison Ivy (*Rhus sp.*).

The successional areas were classified as Meadow Marshes dominated by Reed-canary Grass (*Phalaris arundinacea*) and Beggar-ticks species (*Bidens sp.*). The wetter depressions in these successional fields support stands of Common Reed (*Phragmites australis*), or Cattails (*Typha sp.*).

Some areas of secondary growth were also classified as Deciduous Thickets characterized by Gray Dogwood (*Cornus foemina ssp. racemosa*) and Staghorn Sumac (*Rhus typhina*).

The understory of these areas is largely Grass-leaved Goldenrod (*Euthamia graminifolia*), Timothy (*Phleum pratense*), and Kentucky Blue Grass (*Poa pratensis ssp. pratensis*).

Vegetation Communities

There are a total of 105 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)

Vegetation Type

Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Fresh-Moist Sugar Maple- Beech Carolinian Deciduous Forest Type (FODM10-1)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Manna Grass Mineral Shallow Marsh Type (MASM1-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (Brady, 1980) - Endangered

Provincially Rare Species

Asimina triloba (Pawpaw) (Brady, 1980) – S3

Points of Interest

Faunal Records:

1- Reptiles & Amphibians
1- Mammals

Site Visits

September 1, 1980
Brady, et al.

July 10, 2008
R. Kitchen, B. Porter

July 28, 2008
R. Kitchen, B. Porter

July 29, 2008
R. Kitchen, B. Porter

% of site visited

10.03 % of the total study site was visited by NAI teams.

References Cited

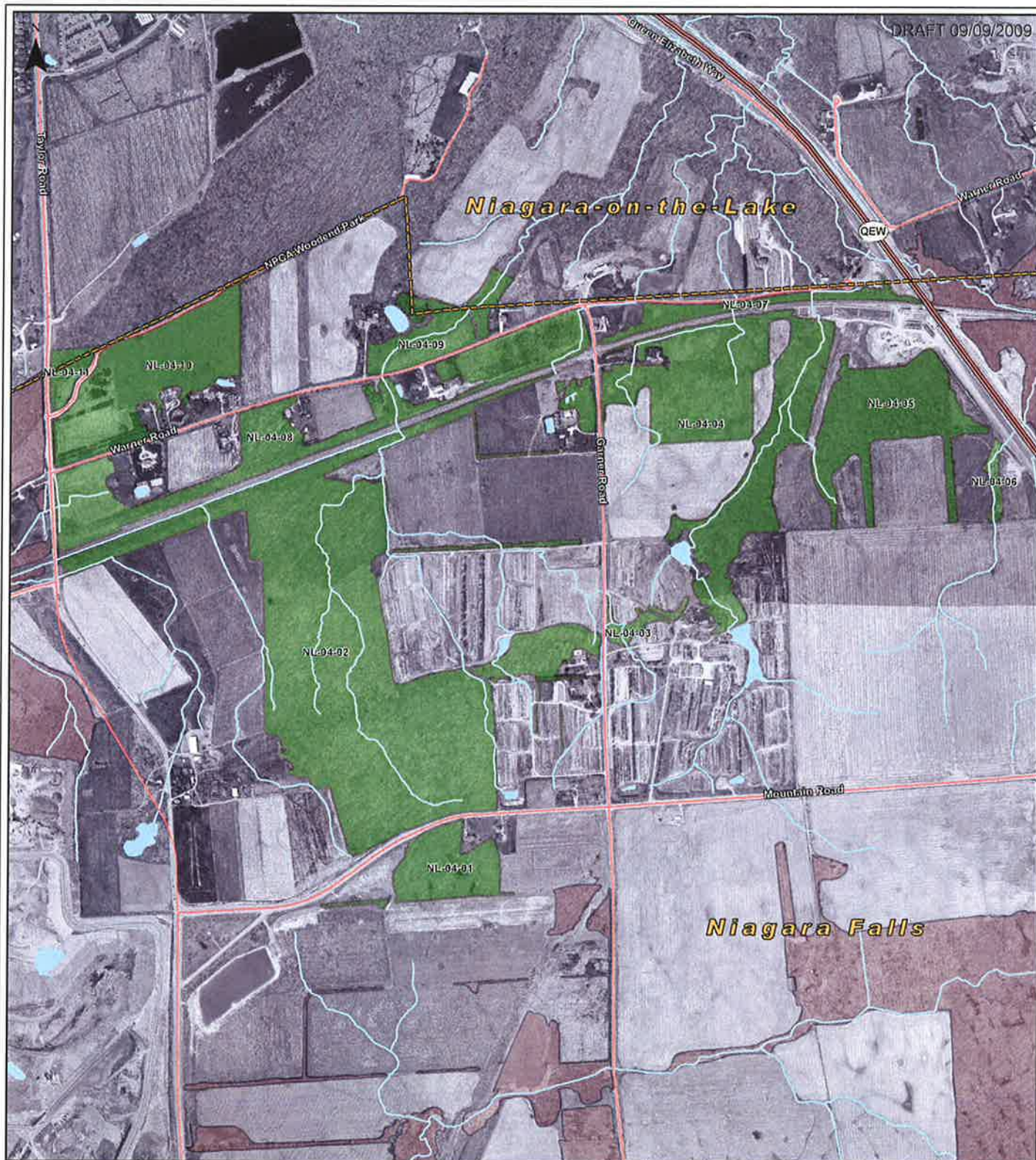
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site NL-04



Natural Areas Inventory

Study Site NL-04

1:12,500

0 100 200 400 600 800 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
Portions of this map produced under license with the Ontario Ministry of Natural Resources Queen's printer for Ontario, 2009. Reproduced with permission.
All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 105 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)

Deciduous Thicket (THD)
Meadow Marsh (MAM)

Study Site PC-01

Babion Woods

Municipality City of Port Colborne

Formerly Babion Woods (Brady, et al., 1980)

Approximate Area 751 hectares

Watershed The majority of this study site flows to the Indian Creek Drain with a small portion draining north/west to the Lyons Creek Drain.

Ownership Mostly private

General Summary

This study site is located in the municipality of Port Colborne just east of the Welland Canal. It is bound on the west by the Canal and extends to just east of White Road. The northern boundary is Forks Road and the southern boundary follows Third Concession Road and then, Chippawa Road.

Physical Description

This southern portion of this natural area is situated at the toe of the Onondaga Escarpment. The area is characterized by dolostone bedrock outcroppings of the Bertie Formation, and shallow soil deposits.

The northern section of PC-01 extends into the flat, poorly drained Haldimand Clay Plain underlain by the Salina Formation. The slough/ridge topography of this area is characteristic of much of the peninsula south of the Niagara Escarpment.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| CHINGUACOUSY - RED PHASE | 0.53 |
| FARMINGTON | 0.08 |
| FARMINGTON - VERY SHALLOW PHASE | 0.01 |
| FRANKTOWN - VERY SHALLOW PHASE | 0.01 |
| JEDDO - RED PHASE | 0.27 |
| LINCOLN | 49.07 |
| MALTON - HEAVY RED PHASE | 0.99 |
| NOT MAPPED | 46.20 |
| PEEL - HEAVY RED PHASE | 0.01 |
| WELLAND | 2.82 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The relatively flat terrain of this study site contains intermittent sloughs and numerous drainage ditches. The extensive network of drainage ditches and the construction of the highway have lead to a drier community than would have existed historically.

The most common community noted was the Deciduous Swamp dominated by Swamp Maple (*Acer fremanii*) and Green Ash (*Fraxinus pennsylvanica*). Associated species included, White Swamp Oak (*Quercus bicolor*), Red Maple (*Acer rubrum*), Silver Maple (*Acer saccharinum*), and White Elm (*Ulmus americana*).

The understory consisted of Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Blue Beech (*Carpinus caroliniana*), Spicebush (*Lindera benzoin*), Common Buckthorn (*Rhamnus cathartica*), and Prickly-Ash (*Zanthoxylum americanum*).

The herbaceous layer was a mix of Sedges (*Carex* sp.), Fowl Manna Grass (*Glyceria striata*), Jumpseed (*Polygonum virginianum*), Panicked Aster (*Aster lanceolatus* ssp. *lanceolatus*), Wood Nettle (*Laportea canadensis*), and Moneywort (*Lysimachia nummularia*).

Vegetation Communities

There are a total of 176 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Vegetation Type

Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Reed canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
White Elm Mineral Deciduous Swamp Type (SWDM4-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carya laciniosa (Shellbark Hickory) (Brady, et al., 1980) – S3

Points of Interest

Faunal Records:

None noted.

Site Visits

September 1, 1980
Brady, et al.

September 21, 2006
A. Garofalo, K. White

September 22, 2006
A. Garofalo, K. White

September 27, 2006
A. Garofalo, K. White

September 29, 2006
J. Kellam, J. Damude, D. Young, R. Young

% of site visited

5.80 % of the total study site was visited by NAI teams.

References Cited

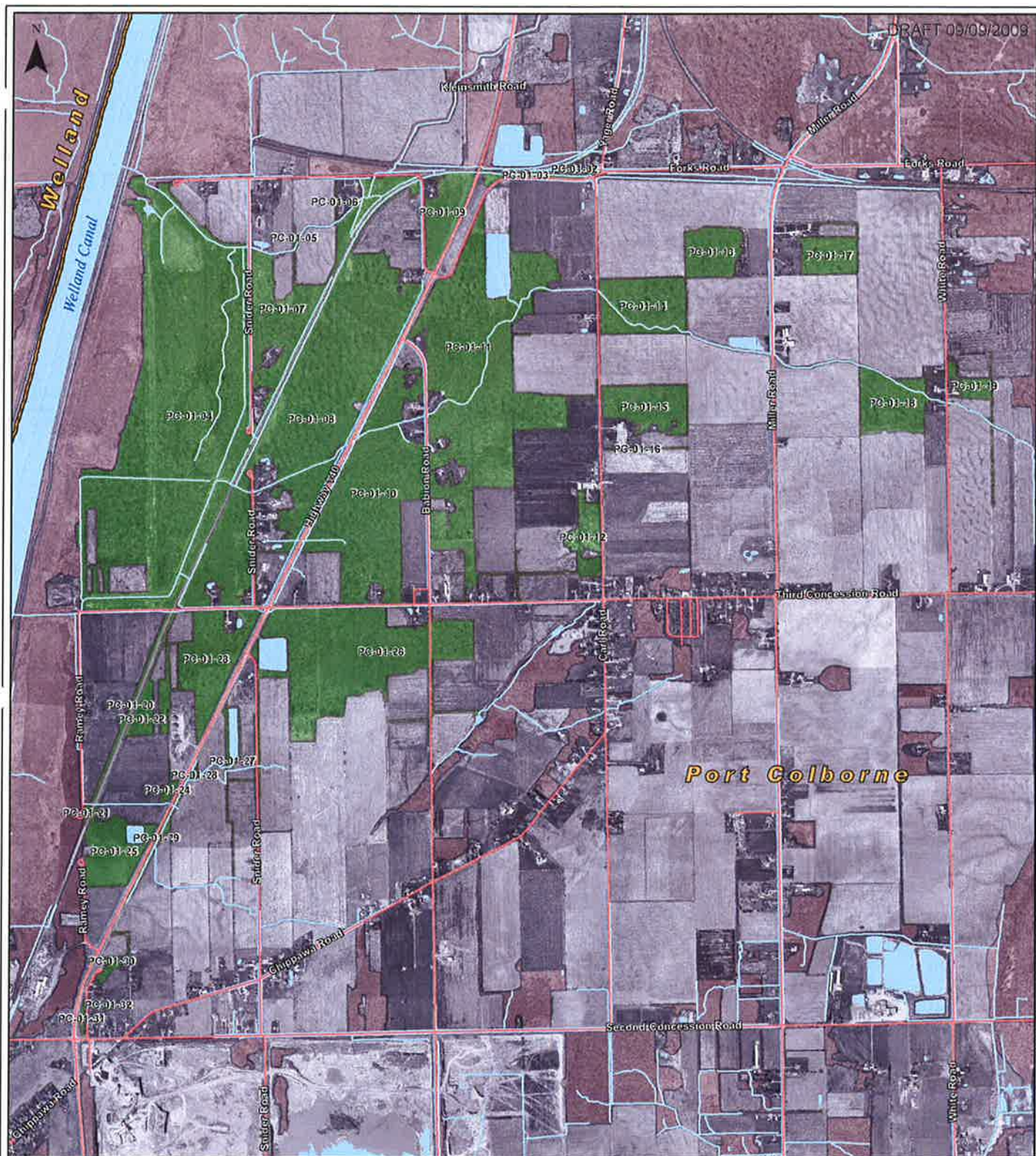
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-01



Natural Areas Inventory

Study Site PC-01

1:25,000

0 150 300 600 900 1,200 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 176 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Study Site PC-02

Upper's Woods

Municipality City of Port Colborne

Formerly Upper's Woods (Brady et al., 1980)

Approximate Area 190 ha

Watershed This study site drains to Black Creek with a small portion in the north draining to Tee Creek.

Ownership Mostly private

General Summary

This study site is between Fork's Road in the north and Third Concession Road in the south. It is bordered by South Brookfield Road to the west and Wilhelm Road to the east.

Physical Description

Study Site PC-02 is located on the flat, poorly drained Haldimand Clay Plain. The slough/ridge topography that is formed by the poor drainage and underlying dolostone and shale of the Salina Formation is characteristic of the majority of the peninsula south of the Niagara Escarpment.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| JEDDO - RED PHASE | 2.96 |
| MALTON - HEAVY RED PHASE | 41.74 |
| WELLAND | 55.30 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

There were several types of communities noted for this study site but some of the most common were Deciduous Swamps dominated by Red Maple (*Acer rubrum*), White Oak (*Quercus rubra*), Swamp Maple (*Acer freemanii*), and Pin Oak (*Quercus palustris*).

Understory associates included, Spicebush (*Lindera benzoin*), Blue Beech (*Carpinus caroliniana*), and Green Ash (*Fraxinus pennsylvanica*).

The herbaceous layer was largely Canada Mayflower (*Maianthemum canadense*), Sedges (*Carex sp.*), Fowl Manna Grass (*Glyceria striata*), and Swamp Dewberry (*Rubus hispida*).

The Thicket Swamps were characterized by Narrow-leaved Meadowsweet (*Spiraea alba*), with associated Sensitive Fern (*Onoclea sensibilis*), Spotted Touch-me-not (*Impatiens*

capensis), and Goldenrod (*Solidago sp.*).

Meadow Marshes recorded for this site were dominated by graminoid species such as Canada Blue-joint Grass (*Calamagrostis canadensis*), Sedges, and Rice Cut Grass (*Leersia oryzoides*).

The Shallow Marshes were mostly found within the deep slough ponds and were often dominated by Sedges, or Wool Grass (*Scirpus cyperinus*), and ringed with Spicebush and Highbush Blueberry (*Vaccinium corymbosum*).

Vegetation Communities

There are a total of 188 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bulrush Mineral Shallow Marsh Type (MASM1-2)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Canada Blue-joint Graminoid Mineral Meadow Marsh Type (MAMM1-1)
Dry - Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Rice Cut-grass Graminoid Mineral Meadow Marsh Type (MAMM1-14)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

2 – Reptiles & Amphibians
1 - Bird
1 – Moth & Butterfly

Site Visits

September 1, 1980
Brady et al.

August 24, 2006
A. Garofalo, K. White, T. Staton

August 28, 2006
A. Garofalo, K. White, T. Staton

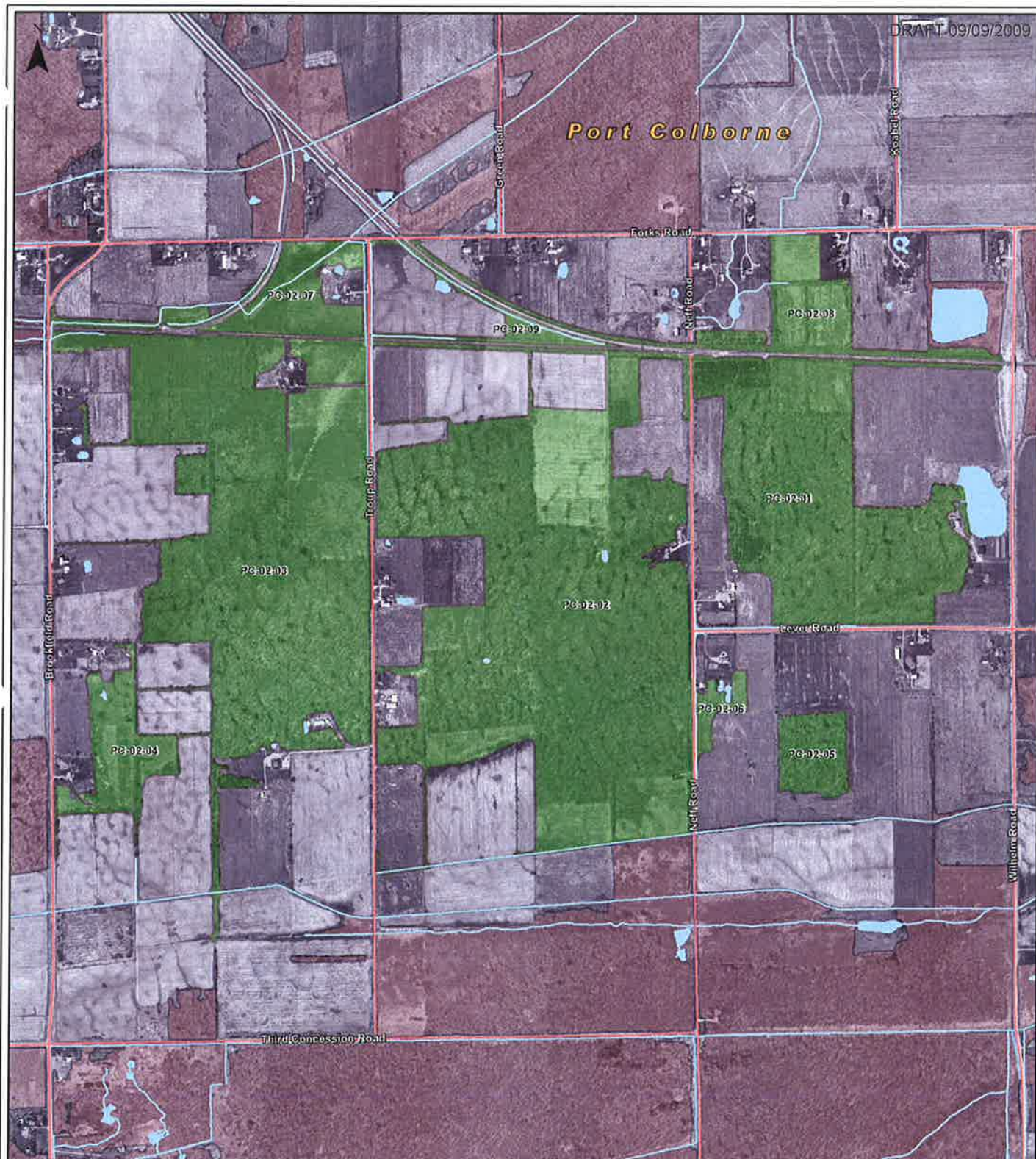
% of site visited

16.09% of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

Port Colborne



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-02



Natural Areas Inventory

Study Site PC-02

1:13,500

0 100 200 400 600 800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 188 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Study Site PC-03

Humberstone Marsh

Municipality City of Port Colborne

Formerly Humberstone Marsh (Brady, et al., 1980)

Approximate Area 895 hectares

Watershed The majority of this study site flows to Black Creek. There is a small portion in the west that drains to Indian Creek Drain, and a portion in the south west that drains to the Beaver Creek Drain.

Ownership Mix of Private and Public.

General Summary

This study site is located in the municipality of Port Colborne between White Road in the west and Point Abino Road North in the east. The northern boundary is the east-west rail line just south of Forks Road, and the southern limit is just south of Second Concession Road.

Physical Description

This natural area is unique in that it is characterized by the impoundment of water north of the Onondaga Escarpment resulting in deep, organic deposits of peat and muck overlaying dolostone of the Bertie Formation.

The northern section is more characteristic of the Haldimand Clay Plain with its shallow slough/ridge topography overlaying the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 0.34 |
| CHINGUACOUSY - RED PHASE | 1.94 |
| JEDDO - RED PHASE | 8.44 |
| LINCOLN | 0.14 |
| LORRAINE | 9.65 |
| MALTON - HEAVY RED PHASE | 1.99 |
| NIAGARA | 0.76 |
| ONEIDA - RED PHASE | 0.14 |
| PEEL - HEAVY RED PHASE | 0.03 |
| PORTSMOUTH | 3.17 |
| QUARRY | 1.29 |
| WELLAND | 55.95 |
| WELLAND - PEATY PHASE | 16.02 |
| WATER | 0.00 |
| NOT MAPPED | 0.15 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is known as the Humberstone Marsh. It is a very predominant feature in the Port Colborne area and serves as the source water for many tributaries that flow into Black Creek, and both the Welland Canal and Lake Erie.

A small area of this large site was visited by NAI Field Crews. The following is a summary of the notations taken in the field.

The dominant community noted was Deciduous Swamp with Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and Swamp Maple (*Acer fremanii*) as the dominant species.

The understory was characterized as Green Ash, White Elm (*Ulmus americana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Canada Mayflower (*Maianthemum canadense*), Spotted Touch-me-not (*Impatiens capensis*), Wild Sarsaparilla (*Aralia nudicaulis*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), False Nettle (*Boehmeria cylindrica*), and various Sedge species (*Carex* sp.).

The higher ground between wet depressions in the swamps was categorized as Deciduous Forest dominated by Red Oak, White Oak (*Quercus alba*), and Shagbark Hickory (*Carya ovata*).

The understory in these areas was largely Blue Beech (*Carpinus caroliniana*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and Spicebush (*Lindera benzoin*).

The Marshes for which this area is named were categorized as Sedge Marshes or Cattail Marshes. The Broad-leaved Sedge Marshes were dominated by a variety of sedges including Fox Sedge (*Carex vulpinoidea*), Porcupine Sedge (*Carex hystercina*), and Bladder Sedge (*Carex intumescens*) with Three-lobed Beggar-ticks (*Bidens tripartita*), Spotted Touch-me-not, and Sensitive Fern (*Onoclea sensibilis*).

The Shallow Marsh community dominated by Broad-leaved Cattails (*Typha latifolia*) and Rice Cut Grass (*Leersia oryzoides*) included Narrow-leaved Meadowsweet (*Spirea alba*), Three-lobed Beggar-ticks and Porcupine Sedge.

Vegetation Communities

There are a total of 286 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Shallow Marsh (MAS)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)

Cattail Mineral Shallow Marsh Type (MASM1-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Native Deciduous Regeneration Thicket Type (THDM4-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered
Quercus shumardii (Shumard Oak) (NPCA, 2006-2009) – Special Concern

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

9 – Birds
5 – Reptiles & Amphibians
2 – Mammals

Recommendations

Due to the large and diverse nature of this site, it is recommended that more field work be carried out in areas not covered by this project.

Site Visits

September 1, 1980
Brady, et al.

April 29, 2006
J. Sankey, F. Fohr, J. Grassie, H. Teare, R. Armstrong, J. Potter, D. Pierrynowski

July 26, 2006
A. Garofalo, K. White

September 6-8, 2006
A. Garofalo, K. White, T. Staton

September 15, 2006
A. Garofalo, K. White, T. Staton

September 29, 2006
J. Sankey, J. Grassie, F. Fohr, H. Teare, R. Armstrong, D. Pierrynowski, J. Potter

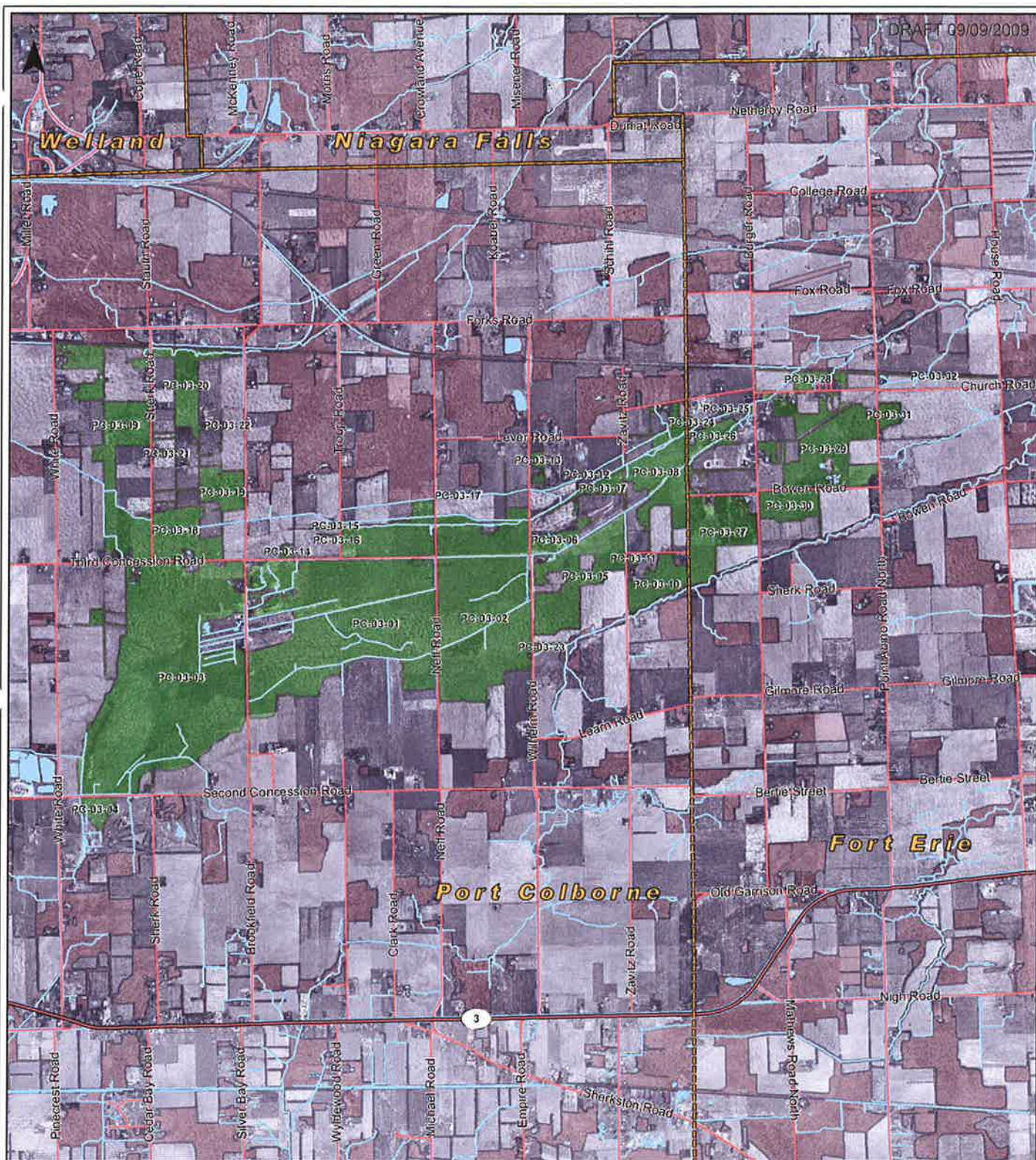
September 29, 2006
D. Young, J. Kellam, J. Damude, R. Young

% of site visited

25.41 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Niagara Peninsula Conservation Authority. 1982. *Humberstone Marsh and Willoughby Marsh Conservation Areas Master Plan*.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-03



Natural Areas Inventory

Study Site PC-03

1:46,000

0 300 600 1,200 1,800 2,400 Meters

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All Frames North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 286 recorded taxa (unique plant records) for this study site.

Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)

Study Site PC-04

Nickel Beach Woods

Municipality City of Port Colborne

Formerly Nickel Beach Woodlot (Brady et al, 1980)

Approximate Area 197 hectares

Watershed This study site drains via Wignell Drain to Lake Erie

Ownership Mostly private

General Summary

Study Site PC-04 is located east of the Welland Canal in the municipality of Port Colborne on the north shore of Lake Erie. The Nickel Beach Woods begins just west of Lake Road, and on the east is bordered by Weaver Road. It extends north to Killaly Street East and the southern boundary is Lake Erie.

Physical Description

This natural area is situated on the Onondaga Formation limestone plain characteristic of the Lake Erie shoreline. Silty, clay soils of the Haldimand Clay Plain are found in the northern section, with beach sand deposits associated with the Sand Plain found closer to the water's edge.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| ALLUVIUM | 0.55 |
| BROOKE - SHALLOW PHASE | 3.90 |
| CHINGUACOUSY - RED PHASE | 1.55 |
| FARMINGTON | 0.47 |
| FARMINGTON - SHALLOW PHASE | 1.68 |
| FARMINGTON - VERY SHALLOW PHASE | 0.20 |
| JEDDO - RED PHASE | 3.24 |
| NIAGARA | 0.64 |
| QUARRY | 56.87 |
| SMITHVILLE | 0.55 |
| WELLAND | 4.39 |
| WELLAND - PEATY PHASE | 3.09 |
| WATER | 5.95 |
| NOT MAPPED | 16.94 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site includes a very rich active dune community. It is the third largest extant of dune ecosystem in the entire NPCA watershed jurisdiction.

The active dunes were dominated by Beach Grass (*Ammophila breviligulata*), with Switch Grass (*Panicum virgatum*), Sagewort Wormwood (*Artemisia campestris* ssp. *caudata*), and a rare form of Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*) forming a thicket with stems up to 30-60cm tall.

The backdunes are a mix of Deciduous Forest characterized by Red Oak (*Quercus rubra*), and Hop Hornbeam (*Ostrya virginiana*) in the rich mature areas and naturalized Scots Pine (*Pinus sylvestris*) or Red Pine (*Pinus resinosa*) plantations.

A very rich Sugar Maple (*Acer saccharum* ssp. *saccharum*), Hemlock (*Tsuga canadensis*) forest covered cool, north facing slopes in parts of the study area. Also noted here were scattered old growth (balding bark) Bitternut Hickory (*Carya cordiformis*) trees with Bladdernut (*Staphylea trifolia*) in understory layer.

Occasional large diameter (in sheltered interdune valleys) or tortured, wind swept (on dune ridges) old growth individual trees were recorded. Several large diameter, but short, wind swept Red Oaks (1m+ dbh) in the mature, rich section were documented as well.

Vegetation Communities

A total of 154 recorded taxa (unique plant records) were collected for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Mixed Forest (FOM)
Open Sand Barren and Dune (SBO)

Vegetation Type

Dry-Fresh Red Oak Deciduous Forest Type (FODM1-1)
Dry-Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
Dry-Fresh Sugar Maple-Hemlock Mixed Forest Type (FOMM3-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Sugar Maple-Hemlock Mixed Forest Type (FOMM6-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Little Bluestem Switchgrass Beachgrass Open Graminoid Sand Dune Type (SBOD1-1)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered
Ptelea trifoliata (Common Hop tree) (NPCA, 2006-2009) - Threatened

Provincially Rare Species- None noted.

Points of Interest

Very old and stunted Hop Hornbeam (*Ostrya virginiana*) individuals were noted on dune ridges and throughout the understory layer.

The provincially threatened Fowler's Toad was also recorded for this study site.

Faunal Records:

8 - Moths & Butterflies

4 - Mammals

3 - Birds

1 - Reptile & Amphibian

The Volunteer Crew recorded the following fungi:

Turkeytail

Pear-shaped Puffball

Recommendations

Difficulty in classifying the unique plant communities found on the limestone outcroppings into Lake Erie suggest that more research is required in these areas.

Site Visits

September 1, 1980

Brady et al.

Oct. 6, 2006

J. Sankey, J. Kellam, D. Young, F. Fohr, J. Grassie, R. Young

June 5, 2007

A. Garofalo, K. White

July 20, 2007

Wildlife Survey: B. Curry

Nov. 5, 2007

A. Garofalo

% of site visited

1.77% of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

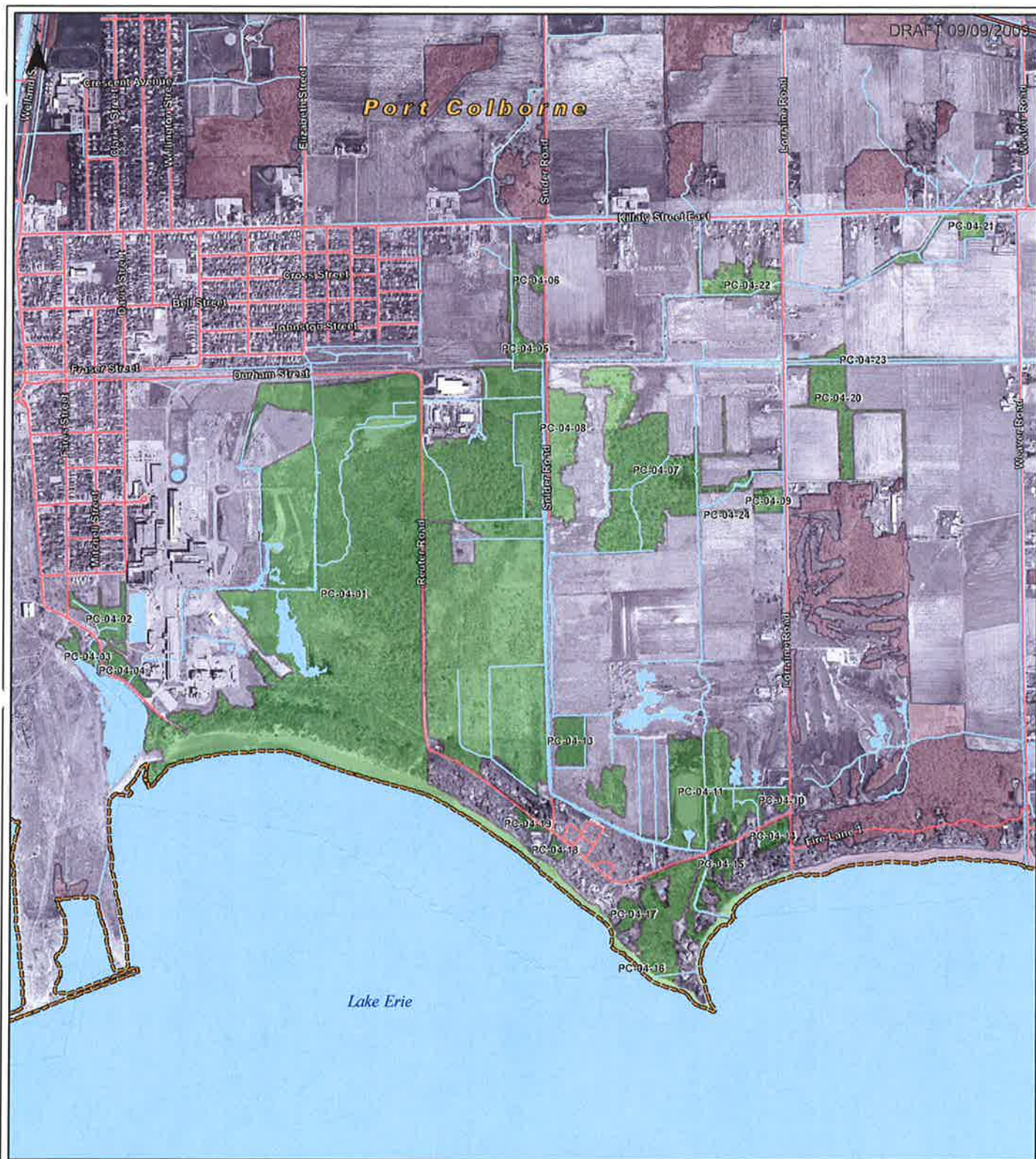
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-04



Natural Areas Inventory

Study Site PC-04

1:18,000

0 125 250 500 750 1,000 Meters

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There are a total 154 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Mixed Forest (FOM)
Open Sand Barren and Dune (SBO)

Study Site PC-05

Weaver Road Woods

Municipality City of Port Colborne

Formerly Weaver Road Woods (Brady, et al., 1980)

Approximate Area 190 hectares

Watershed The majority of this study site drains to Lake Erie via Beaver Dam Creek with a small portion in the east that drains via Oil Mill Creek.

Ownership Mostly private.

General Summary

This study site is bounded on the north by Main Street East/Highway 3 and extends south to Lake Erie. The western boundary is Weaver Road and the eastern boundary is Pinecrest Road.

Physical Description

This natural area is situated on the Onondaga Formation limestone plain characteristic of the Lake Erie shoreline. Silty, clay soils of the Haldimand Clay Plain are found in the northern section, with beach sand deposits associated with the Sand Plain found closer to the water's edge.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|--------------------------|
| CHINGUACOUSY - RED PHASE | 0.13 |
| FARMINGTON - VERY SHALLOW PHASE | 11.59 |
| FRANKTOWN - VERY SHALLOW PHASE | 6.14 |
| JEDDO - RED PHASE | 0.39 |
| WELLAND | 67.40 |
| WELLAND - PEATY PHASE | 4.77 |
| WATER | 0.00 |
| NOT MAPPED | 9.58 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was Deciduous Swamp dominated by Green Ash (*Fraxinus pennsylvanica*), Swamp Maple (*Acer freemanii*), and Red Maple (*Acer rubrum*) with White Elm (*Ulmus americana*).

The understory was largely Spicebush (*Lindera benzoin*), Climbing Poison-ivy (*Rhus radicans* ssp. *negundo*), Common Buckthorn (*Rhamnus cathartica*), and Gray Dogwood (*Cornus foemina* ssp. *racemosa*).

The herbaceous layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Fowl Manna Grass (*Glyceria striata*), Radiate Sedge (*Carex radiata*), Stout Woodreed (*Cinna arundinacea*), Awl-fruited Sedge (*Carex stipata*), Goldenrod species (*Solidago* sp.), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

One unique Deciduous Swamp noted was dominated by Bur Oak (*Quercus macrocarpa*) with Shagbark Hickory (*Carya ovata*), Green Ash and Swamp Maple.

The Thicket Swamps were characterized by Green Ash, Swamp Maple and White Elm.

The associated understory consisted of Silky Dogwood (*Cornus amomum* ssp. *obliqua*) and Common Buckthorn.

The herbaceous layer was Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Graceful Sedge (*Carex gracillima*), Tall Goldenrod (*Solidago altissima* ssp. *altissima*), and Kentucky Blue Grass (*Poa pratensis* ssp. *pratensis*).

Vegetation Communities

There are a total of 167 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Vegetation Type

Bur Oak Mineral Deciduous Swamp Type (SWDM1-2)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (Brady, et al., 1980) – Endangered

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

4 – Birds
2 – Mammals

Recommendations

Difficulty in classifying the unique plant communities found on the limestone outcroppings into Lake Erie suggest that more research is required in these areas.

Site Visits

September 1, 1980

Brady, et al.

June 5, 2007

A. Garofalo, K. White

June 11, 2007

A. Garofalo, K. White

% of site visited

12.66 % of the total study site was visited by NAI teams.

References Cited

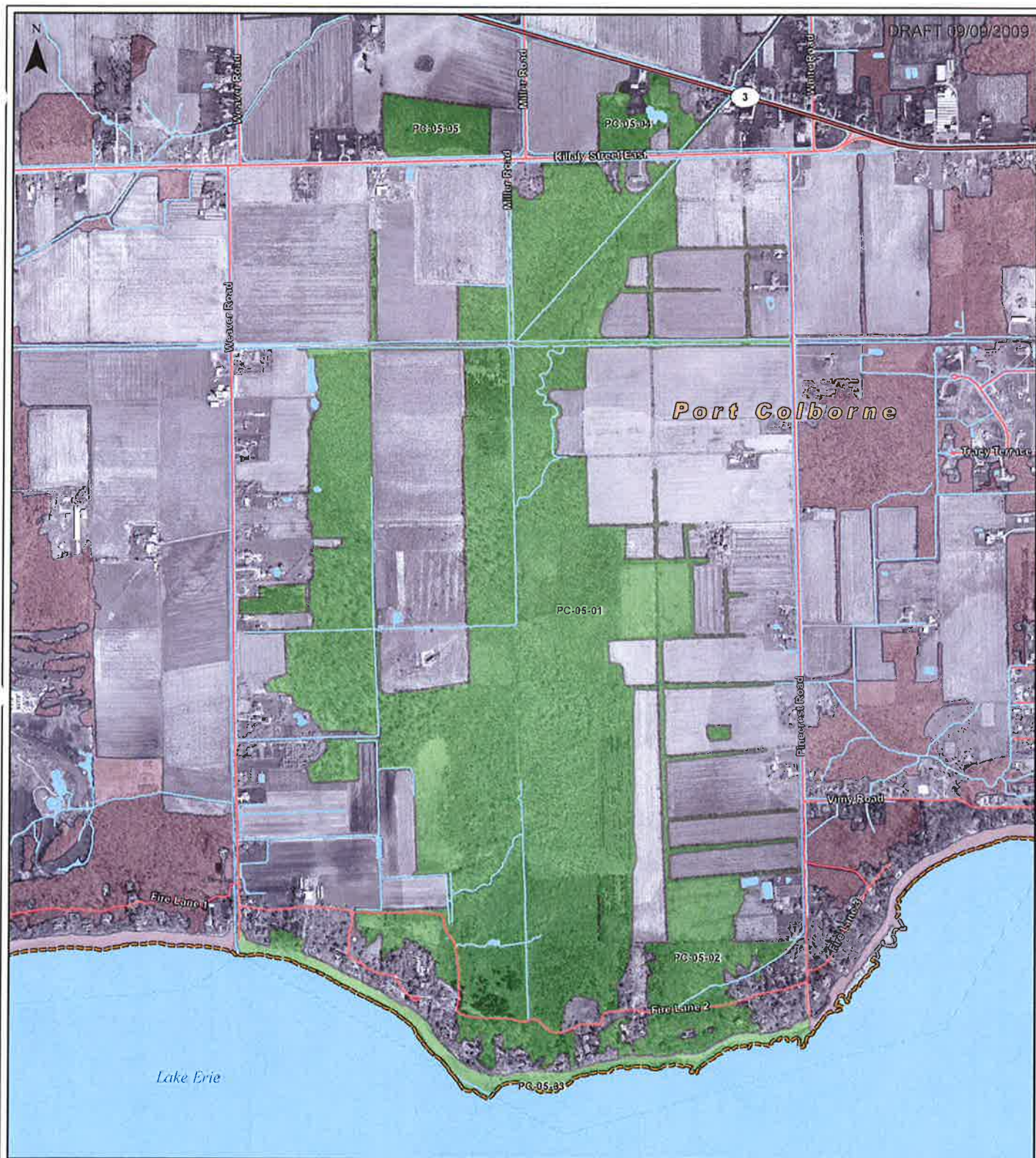
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- == Major Highways
- == Regional Highways
- Roads
- ~ Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-05



Natural Areas Inventory

Study Site PC-05

1:15,000

0 100 200 400 600 800 Meters

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There are a total of 167 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site PC-07

Bill's Bush

Municipality City of Port Colborne

Formerly Bill's Bush (Brady et al., 1980)

Approximate Area 316 hectares

Watershed The drainage for this study site is complex with portions flowing into Tee Creek (east), Lyon's Creek Drain (north and west) and Indian Creek Drain (south and west).

Ownership Mostly private

General Summary

This study site is bordered to the north by Townline Tunnel Road /Netherby Road and on the south by Forks Road. The eastern boundary is Brookfield Road and the rail line just east of Yagar Road is the western limit.

Physical Description

This natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| CHINGUACOUSY - RED PHASE | 0.36 |
| JEDDO - RED PHASE | 0.42 |
| LINCOLN | 61.02 |
| MALTON - HEAVY RED PHASE | 6.32 |
| PEEL - HEAVY RED PHASE | 3.97 |
| WELLAND | 22.85 |
| WATER | 0.05 |
| NOT MAPPED | 5.01 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Swamp communities recorded for this study site were found in a slough and ridge terrain with a number of open marsh areas. The swamp communities were dominated by Freeman's Maple (*Acer fremanii*) and Green Ash (*Fraxinus pennsylvanica*).

The understory was a mix of the Freeman's Maple and Green Ash, with White Elm (*Ulmus americana*), Silky Dogwood (*Cornus amomum* ssp. *obliqua*) and Spicebush (*Lindera benzoin*).

The groundcover is thick and includes Fern (*Osmunda* sp.) species, Northern Blue Flag

(*Iris versicolor*), Lily species (*Lilium sp.*), Raspberry species (*Rubus sp.*) and, Jack-in-the-pulpit *Arisaema triphyllum ssp. triphyllum*).

Vegetation Communities

There are a total of 211 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Common Reed Mineral Shallow Marsh Type (MASM1-12)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) – Endangered
Juglans cinerea (Butternut) (NPCA, 2006-2009) – Endangered

Provincially Rare Species

Quercus shumardii (Shumard Oak) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

10 – Birds
3- Reptiles & Amphibians
3- Mammals
1- Moth & Butterfly

Site Visits

September 1, 1980
Brady, et al.

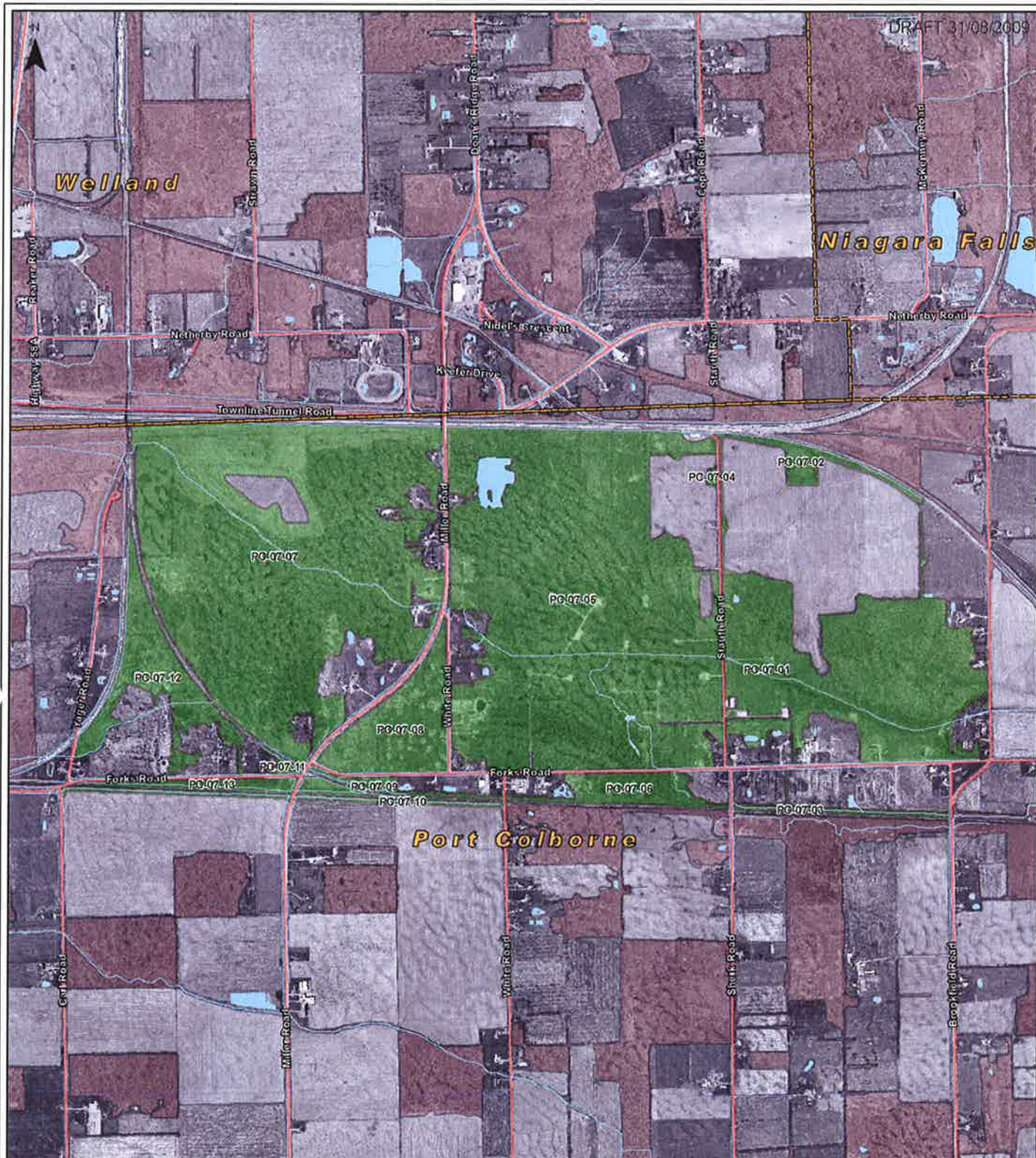
July 15, 2008
A. Garofalo, K. Young-Chin

% of site visited

29.74 % of the total study site was visited by NAI teams.

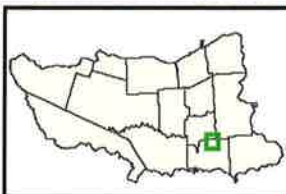
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- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



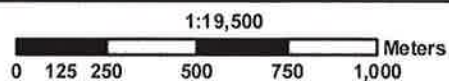
Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Natural Areas
- Study Site PC-07



Natural Areas Inventory

Study Site PC-07



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There are a total of 211 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Swamp (SWD), Deciduous Forest (FOD), Coniferous Forest (FOC), Hedgerow (HOC, HOD), Open Water (OAD), Marsh (MAX), Shallow Marsh (MAS), Meadow (MEM), Thicket Swamp (SWT), Deciduous Thicket (THD), Tree Agriculture (TAG), Coniferous Woodland (WOC), Deciduous Woodland (WOD)

Study Site PC-08

Municipality City of Port Colborne

Formerly N/A

Approximate Area 34 hectares

Watershed This study site drains to the Indian Creek Drain.

Ownership Mostly private

General Summary

This study site is located between Snider Road in the west and White Road in the east. The northern boundary is just north of Third Concession and the southern boundary is Chippawa Road.

Physical Description

This study site follows the ridge of the Onondaga Escarpment. It forms a narrow band that is characterized by the dolostone bedrock outcroppings from the Bertie Formation, and shallow soil deposits.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| CHINGUACOUSY - RED PHASE | 13.44 |
| FARMINGTON | 23.78 |
| FARMINGTON - SHALLOW PHASE | 1.98 |
| FARMINGTON - VERY SHALLOW PHASE | 18.17 |
| FRANKTOWN - SHALLOW PHASE | 13.99 |
| FRANKTOWN - VERY SHALLOW PHASE | 4.31 |
| JEDDO - RED PHASE | 5.71 |
| MALTON - HEAVY RED PHASE | 4.33 |
| ONEIDA - RED PHASE | 3.17 |
| PEEL - HEAVY RED PHASE | 3.87 |
| PEEL - RED PHASE | 6.15 |
| WATER | 0.00 |
| NOT MAPPED | 1.10 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study was characterized by Deciduous Forests dominated by Sugar Maple (*Acer saccharum* ssp. *saccharum*), White Ash (*Fraxinus americana*), Tulip Tree (*Liriodendron americana*), and some Black Maple (*Acer saccharum* ssp. *nigrum*).

The understory was a mix of the regenerating canopy species with some Hop Hornbeam (*Ostrya virginiana*).

The herbaceous layer was mostly Zig-zag Goldenrod (*Solidago flexicaulis*), Celandine (*Chelidonium majus*), and Common Strawberry (*Fragaria virginiana* ssp. *virginiana*).

The noted Deciduous Woodlands were dominated by Black Walnut (*Juglans nigra*), with White Ash.

The understory was mostly Black Raspberry (*Rubus occidentalis*), and Gray Dogwood (*Cornus foemina* ssp. *racemosa*).

The ground layer was a mix of Tall Goldenrod (*Solidago altissima* var. *altissima*), Avens species (*Geum* sp.), Garlic Mustard (*Alliaria petiolata*), and Jumpseed (*Polygonum virginianum*).

Vegetation Communities

There are a total of 125 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Deciduous Thicket (THD)

Deciduous Woodland (WOD)

Vegetation Type

Dry-Fresh Black Walnut Deciduous Woodland Type (WODM4-4)

Significant Species

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

None noted.

Site Visits

September 24, 2006

J. Grassie, J. Sankey, J. Potter, M. Potter, D Pierrynowski

September 25, 2006

A. Garofalo, K. White

% of site visited

13.75 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- == Major Highways
- == Regional Highways
- Roads
- ~ Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-08



Natural Areas Inventory

Study Site PC-08

1:15,000

0 100 200 400 600 800 Meters

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There are a total of 125 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
 Deciduous Thicket (THD)
 Deciduous Woodland (WOD)

Study Site PC-09

Upper Tee Creek Woods

Municipality City of Port Colborne

Formerly N/A

Approximate Area 212 ha

Watershed This study site drains to Tee Creek

Ownership Mostly private.

General Summary

This study site is located between Schiyl Road in the east and Brookfield Road in the west. It is bordered in the north by Netherby Road and Forks Road in the south.

Physical Description

This natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------------|--------------------------|
| CHINGUACOUSY - LOAMY RED PHASE | 1.22 |
| CHINGUACOUSY - RED PHASE | 4.31 |
| JEDDO - RED PHASE | 16.44 |
| MALTON - HEAVY RED PHASE | 42.58 |
| NIAGARA | 0.39 |
| PEEL - HEAVY RED PHASE | 4.54 |
| WELLAND | 30.50 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site has a diverse mix of communities the most common being Deciduous Swamp characterized by Green Ash (*Fraxinus pennsylvanica*), Red Maple (*Acer rubrum*), and Red Oak (*Quercus rubra*), with some White Elm (*Ulmus americana*), and Pin Oak (*Quercus palustris*) in the canopy.

The understory was largely Choke Cherry (*Prunus virginiana* ssp. *virginiana*), Narrow-leaved Meadowsweet (*Spiraea alba*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and Swamp Dewberry (*Rubus hispidus*).

The ground layer was a mix of Common Hop Sedge (*Carex lupulina*), Fowl Manna Grass (*Glyceria striata*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Jumpseed (*Polygonum virginianum*), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

The Deciduous Forest communities noted were dominated by Green Ash with White Elm, Red Maple, and Swamp Maple (*Acer fremanii*).

The understory was regenerating canopy species with Gray Dogwood, Choke Cherry, Narrow-leaved Meadowsweet, and Buckthorn (*Rhamnus* sp.).

The herbaceous layer was characterized by Tall Goldenrod (*Solidago altissima* var. *altissima*), Kentucky Blue Grass (*Poa pratensis* ssp. *pratensis*), New England Aster (*Aster novae-angliae*), White Avena (*Geum canadense*), and Common Strawberry (*Fragaria virginiana* ssp. *virginiana*).

The Meadow Marshes noted for this study site were dominated by either Narrow-leaved Meadowsweet or Reed-canary Grass (*Phalaris arundinacea*).

The lower layers were mostly Smartweed (*Polygonum* sp.) species, with Moneywort (*Lysimachia nummularia*), Rough Goldenrod, and Bur-reed (*Sparganium* sp.).

An inclusion of mixed naturalized plantation was also recorded included Red Pine (*Pinus resinosa*), Scots Pine (*Pinus sylvestris*), and Black Locust (*Robinia pseudo-acacia*).

Vegetation Communities

There are a total of 220 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Savanna (SVD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Forb Meadow (MEF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type & Complexes

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Common Reed Mineral Shallow Marsh Type (MASM1-12)
Dry - Fresh Deciduous Savanna Ecosite (SVD3)
Dry - Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
Duckweed Floating-leaved Shallow Aquatic Type (SAF 1-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh - Moist Green Ash - Hardwood Lowland Deciduous Forest Type (FODM7-2)

Fresh - Moist Oak - Maple Deciduous Forest Type (FODM9-2)
Fresh - Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Goldenrod Forb Meadow Type (MEFM1-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWDM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Naturalized Deciduous Plantation Ecosite (FODM12)
Open Graminoid Meadow Type (MEGM4-1)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MASM1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Smartweed Organic Shallow Marsh Type (MASO2-6)
White Elm Mineral Deciduous Swamp Type (SWDM4-2)

Significant Flora

Species at Risk

Quercus shumardii (Shumard Oak) (NPCA, 2006-2009) – Special Concern

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

4 - Birds

2 - Mammals

Site Visits

August 23, 2006

A. Garofalo, K. White, H. Najmudin

September 19, 2006

A. Garofalo, K. White

September 21, 2006

A. Garofalo, K. White

September 22, 2006

D. Young, J. Damude, J. Kellam, R. Young

September 29, 2006

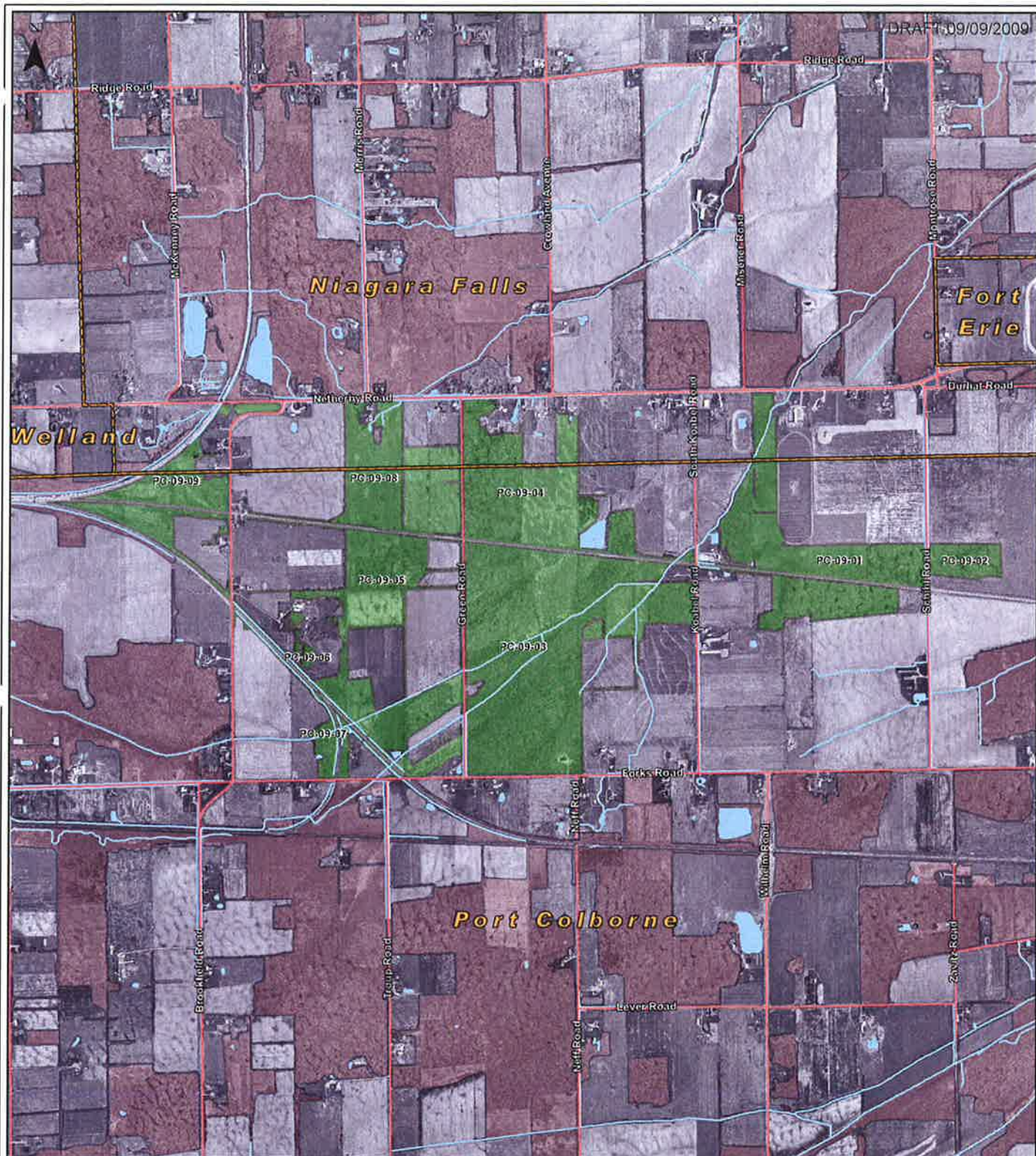
J. Sankey, F. Fohr, J. Grassie, H. Teare, R. Armstrong, J. Potter, D. Pierrynowski

% of site visited

40.09% of the total study site was visited by NAI teams.

References Cited

- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



DRAFT 09/09/2009

Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-09



Natural Areas Inventory

Study Site PC-09

1:23,000

0 150 300 600 900 1,200 Meters

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All Frames North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 220 recorded taxa (unique plant records) for this study site

Community Series:

| | |
|-------------------------|------------------------|
| Deciduous Forest (FOD) | Graminoid Meadow (MEG) |
| Deciduous Savanna (SVD) | Meadow Marsh (MAM) |
| Deciduous Swamp (SWD) | Thicket Swamp (SWT) |
| Deciduous Thicket (THD) | |

Study Site PC-10

Sugarloaf Hill (Sand Hills)

Municipality City of Port Colborne

Formerly N/A

Approximate Area 27 hectares

Watershed This study site drains to Eagle Marsh Drain

Ownership Mostly private with some public (City of Port Colborne and the Region of Niagara).

General Summary

This study site follows the Lake Erie shoreline from Elm Street in the east to Quarry Road in the west. The northern boundary is Lakeshore Road.

Physical Description

This natural area is situated on the Onondaga limestone plain characteristic of the Lake Erie shoreline. Shallow beach sand deposits associated with the Sand Plain are evident near the water's edge.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|---------------------------------|
| PLAINFIELD - DUNE PHASE | 6.51 |
| WALSINGHAM | 15.19 |
| WELLAND - LOAMY PHASE | 1.89 |
| WATER | 0.00 |
| NOT MAPPED | 76.41 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site includes very tall canopied mature forest with scattered old growth individuals. Many Red Oak (*Quercus rubra*) and Sugar Maple (*Acer saccharum* ssp. *saccharum*) trees were noted as being approximately 1m diameter at breast height (dbh).

The sand dunes seemed to be in the process of stabilizing. Red Oak and Sugar Maple dominated the Deciduous Forests with associated White Ash (*Fraxinus americana*).

The understory was mostly Choke Cherry (*Prunus virginiana* ssp. *virginiana*) and Bladdernut (*Staphylea trifolia*) along the dune ridges.

The ground layer was carpeted with Touch-me-not (*Impatiens* sp.) and Garlic Mustard (*Alliaria petiolata*). Some patches supported grassy areas of Nodding Fescue (*Festuca subverticillata*).

Unique communities of Great Lake Coastal Meadow Marsh followed the numerous bedrock fissures.

The majority of species recorded for this study site were observed on the Calcareous Rock/ Bedrock Open Shoreline Ecosite, the Willow Gravel Shrub Shoreline Type, and especially from the marshes which grow in the bedrock fissures closer to the waveline.

While the majority of the plants were recorded in the complexes, the open sandy beach covered a greater percentage of the area. In this Open Sandy Beach community, the plant cover is very patchy and barren. Sea Rocket (*Cakile edentula*), Clammy Weed (*Polanisia dodecandra*), Beach Pea (*Lathyrus japonicus*) and other upland species were found in this community.

The bedrock outcrop east of Sugarloaf Hill had nice Willow (*Salix sp.*) thickets with some shrubby Eastern Cottonwood (*Poplar deltoides*).

Closer to the wave line and interspersed throughout the Willow Thicket was a Graminoid Coastal Meadow Marsh Type community which is closely or almost exclusively associated with bedrock fissures where sand / soil can accumulate. A mix of Grasses, Rushes (*Juncus sp.*), and forbs dominated these linear patterned marshes.

Characteristic species in this community included Tufted Hairgrass (*Deschampsia cespitosa ssp. cespitosa*), Sneezeweed (*Helenium autumnale*), Greenish Sedge (*Carex viridula*), False Golden Sedge (*Carex garberii*), Rush species, Common Three-square (*Scirpus pungens*), Grass-leaved Goldenrod (*Euthamia graminifolia*), Reed Canary Grass (*Phalaris arundinacea*) and Purple Loosestrife (*Lythrum salicaria*).

Vegetation Communities

A total of 112 taxa (unique plant records) were collected for this study site.

Community Series

Deciduous Forest (FOD)
Meadow Marsh (MAM)
Open Shoreline (SHO)
Shrub Shoreline (SHS)

Vegetation Type

Calcareous Open Bedrock Shoreline Type (Ecosite) (SHOR1)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Graminoid Coastal Meadow Marsh Type (MAMM4-1)
Sea Rocket Sand Open Shoreline (SHOM1-2)
Willow Gravel Shrub Shoreline Type (SHSR1-2)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species- None noted.

Points of Interest

There appears to be a very old Hop Hornbeam (*Ostrya virginiana*) growing along the top ridge of Sugarloaf Hill.

Faunal Records:

1 - Bird

Site Visits

June 15, 2007

A. Garofalo, M. Oldham, K. White, T. Staton, R. Kitchen

June 15, 2007

A. Garofalo, M. Oldham

% of site visited

5.48 % of the total study site was visited by NAI teams.

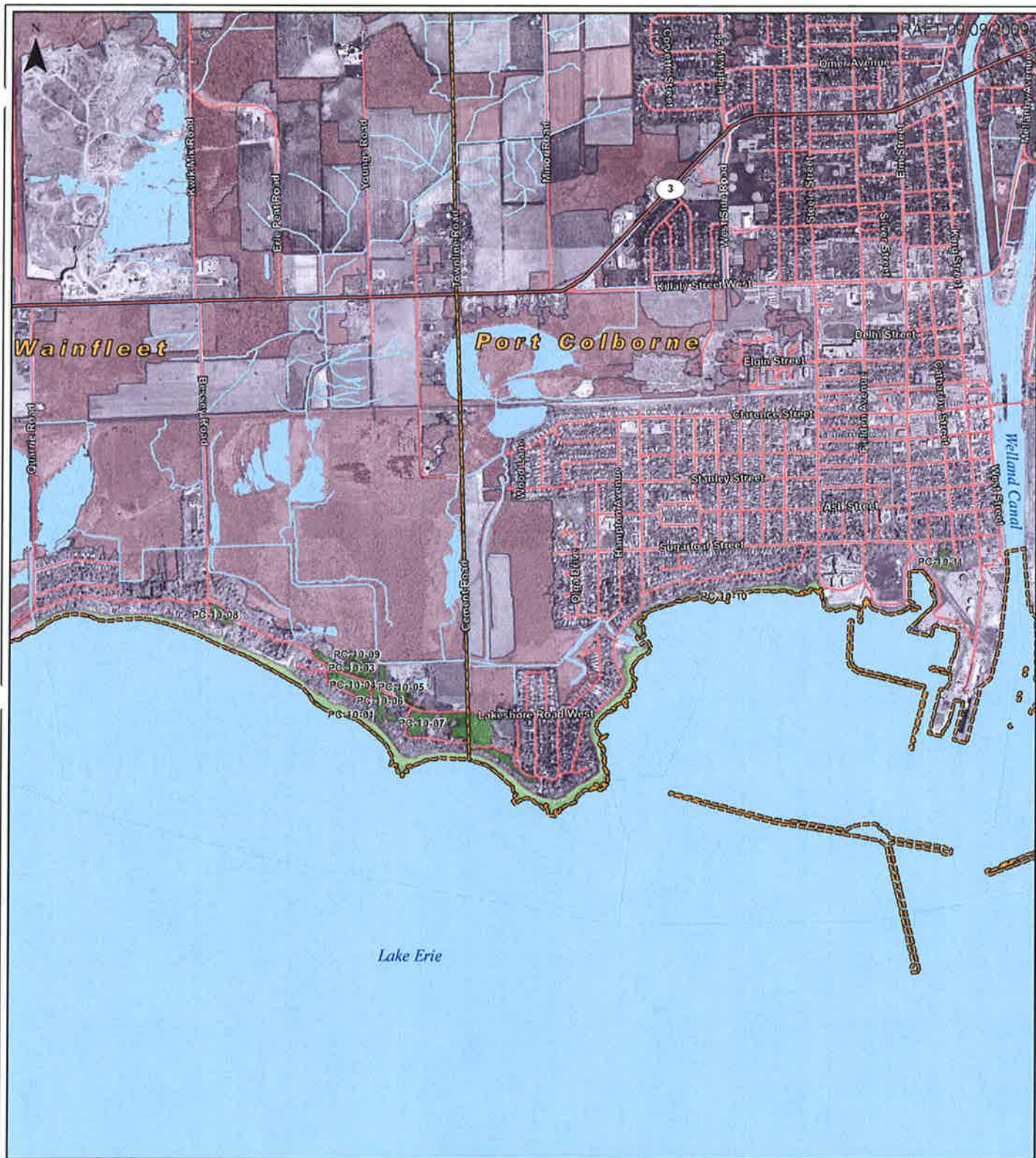
References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-10



Natural Areas Inventory

Study Site PC-10

1:24,500

0 150 300 600 900 1,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



A total of 112 taxa (unique plant records) were collected for this study site.
Community Series:
Deciduous Forest (FOD)
Open Shoreline (SHO)

Study Site PC-11

Black Creek Tableland

Municipality City of Port Colborne

Formerly N/A

Approximate Area 123 hectares

Watershed This study site drains to both Black Creek and Beaver Dam Creek.

Ownership Mostly private

General Summary

This study site is located between Sherk Road in the west and Point Abino Road in the east. It is bound on the north by Learn Road and on the south by Highway 3.

Physical Description

This natural area is located on the southern slope of the Onondaga Escarpment. The northern portion is underlain by the dolostone of the Bertie Formation with characteristic outcroppings of bedrock, and shallow soil deposits.

The central portion with its silty, clay soils is underlain by the Bois Blanc Formation of primarily limestone. The southern-most areas have similar soils over the Onandaga Formation of limestone.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------------|--------------------------|
| ALLUVIUM | 1.42 |
| CHINGUACOUSY - LOAMY RED PHASE | 2.20 |
| CHINGUACOUSY - RED PHASE | 24.05 |
| JEDDO - RED PHASE | 43.11 |
| MALTON - RED PHASE | 25.38 |
| ONEIDA - RED PHASE | 2.69 |
| PEEL - RED PHASE | 1.17 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is characterized by successional Deciduous Swamp forests regenerating around upland patches of Deciduous Forest.

The Deciduous Swamp was dominated by Pin Oak (*Quercus palustris*), Red Maple (*Acer rubrum*), Swamp White Oak (*Quercus bicolor*), Bur Oak (*Quercus macrocarpa*), and Green Ash (*Fraxinus pennsylvanica*), with White Elm (*Ulmus americana*).

The understory was a mix of Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Wild Red Raspberry (*Rubus idaeus* ssp. *melanolasius*).

The herbaceous layer was characterized by Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*), Fowl Manna Grass (*Glyceria striata*), Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Sedges (*Carex* sp.), and Stout Woodreed (*Cinna arundinacea*).

The Deciduous Forests were mostly Green Ash and White Elm with some Willow (*Salix* sp.), and Hawthorn (*Crataegus* sp.).

The lower layers were a mix of Gray Dogwood, Silky Dogwood (*Cornus amomum* ssp. *obliqua*), and Buckthorn (*Rhamnus* sp.) with Panicked Aster (*Aster lanceolatus* ssp. *lanceolatus*), Moneywort (*Lysimachia nummularia*), and Wild Rye (*Elymus* sp.).

Inclusions of Shallow Marsh dominated by Narrow-leaved Cattail (*Typha angustifolia*) and old field communities succeeding into Meadow Marshes of Reed Canary Grass were also recorded for this site.

Vegetation Communities

A total of 206 taxa (unique plant records) were collected for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Woodland (WOD)
Forb Meadow (MEF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)

Vegetation Type

Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry - Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh - Moist Green Ash - Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh - Moist Oak - Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Goldenrod Forb Meadow Type (MEFM1-1)
Graminoid Bedrock Shallow Marsh Type (MASR1-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Stonewort Submerged Shallow Aquatic Type (SAS_1-3)
White Ash Deciduous Woodland Type (WODM4-2)
White Elm Mineral Deciduous Swamp Type (SWDM4-2)

Significant Flora

Species at Risk – None noted

Provincially Rare Species – None noted

Points of Interest

The volunteer crew also noted the following fungi:

Amanita muscaria

Hericium americanum

Faunal Records:

1 – Reptiles & Amphibians

1 - Mammals

Site Visits

August 31, 2006

A. Garofalo, K. White, T. Staton

September 15, 2006

D. Young, R. Young

September 22, 2006

D. Young, J. Damude, J. Kellam, R. Young

% of site visited

38.33% of the total study site was visited by NAI teams.

References Cited

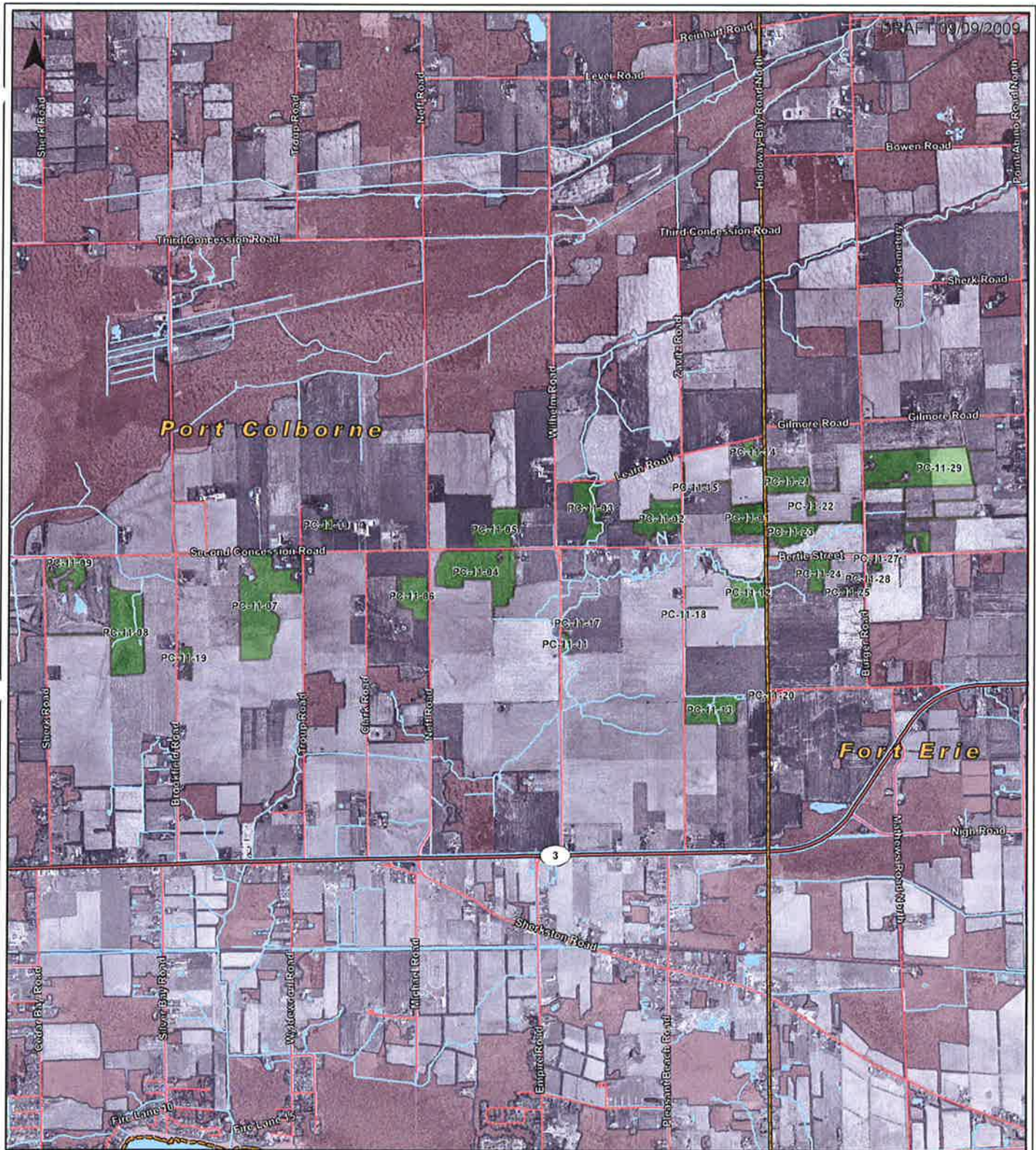
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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-11



Natural Areas Inventory

Study Site PC-11

1:34,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



A total of 206 taxa (unique plant records) were collected for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Forb Meadow (MEF)
Thicket Swamp (SWT)

Study Site PC-14

Old Mill Creek Wetlands and Dunes

Municipality City of Port Colborne

Formerly N/A

Approximate Area 129 hectares

Watershed This study site is split between Old Mill Creek and Bearss Drain sub watersheds.

Ownership Mostly private

General Summary

Study site PC-14 is located on the east side of the Welland Canal along the north shore of Lake Erie in the municipality of Port Colborne. It extends from Highway 3 in the north to Lake Erie in the south. Its western boundary is Pinecrest Road and the Bearss Drain is the boundary to the east.

Physical Description

This natural area is situated on the Onondaga Formation limestone plain characteristic of the Lake Erie shoreline. Silty, clay soils of the Haldimand Clay Plain are found in the northern section, with beach sand deposits associated with the Sand Plain found closer to the water's edge.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| BROOKE – SHALLOW PHASE | 31.59 |
| CHINGUACOUSY – LOAMY RED PHASE | 0.05 |
| CHINGUACOUSY – RED PHASE | 1.97 |
| FARMINGTON | 0.17 |
| FARMINGTON – VERY SHALLOW PHASE | 3.17 |
| FRANKTOWN – VERY SHALLOW PHASE | 17.89 |
| JEDDO – RED PHASE | 18.50 |
| PORTSMOUTH | 0.02 |
| WELLAND | 6.52 |
| WATER | 0.00 |
| NOT MAPPED | 20.11 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was Deciduous Swamp dominated by large Swamp Maple (*Acer freemanii*) or Red Maple (*Acer rubrum*) trees.

Green Ash (*Fraxinus pennsylvanica*) dominated some patches, with White Elm (*Ulmus americana*), Shagbark Hickory (*Carya ovata*), and occasionally Bitternut Hickory (*Carya cordiformis*), or Yellow Birch (*Betula alleghaniensis*) found as associates.

Large areas of standing water were found, over 30 centimetres deep in places. The ground layer in these areas was dominated by Sedges (*Carex* sp.), with patches of Sensitive Fern (*Onoclea sensibilis*), some mossy hummocks, and patches of Spotted Touch-me-not (*Impatiens capensis*).

On the drier knolls, the associates were Goldenrod species (*Solidago* sp.), Avens sp. (*Geum* sp), and Wild Strawberry (*Fragaria virginiana* ssp. *virginiana*). Patches of Wild Red Raspberry (*Rubus idaeus* ssp. *melanolasius*) also occurred occasionally.

A low, stabilized back-dune community of Deciduous Forest was dominated by very large diameter, mature Red Oak (*Quercus rubra*) with patches of American Beech (*Fagus grandifolia*).

The dune understory was sparsely vegetated with a deep leaf litter. Some areas nearer the developed sections had patches of Periwinkle (*Vinca minor*) with Herb Robert (*Geranium robertianum*).

A few Yellow Birch were recorded near the wetland edge, along with Black Cherry (*Prunus serotina*), and Tulip Tree (*Liriodendron tulipifera*).

Vegetation Communities

In this Study Site a total of 38 taxa (unique plant records) were documented.

Community Series

Deciduous Forest (FOD)

Deciduous Swamp (SWD)

Vegetation Type

Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)

Significant Flora

Species at Risk- None noted

Provincially Rare Species- None noted.

Points of Interest

There was a possible Pumpkin Ash tree. No fruit to confirm, but 45cm approx. or greater dia., tree in deepest section of vernal pool standing alone with a buttressed base.

There were pockets with deep organics measuring more than 30cm where the wetland and dune communities come together.

Faunal Record:

None noted.

Recommendations

Difficulty in classifying the unique plant communities found on the limestone outcroppings into Lake Erie suggest that more research is required in these areas.

Site Visits

April 4, 2007

A. Garofalo, T. Staton, I. Barrett, Purchaser\Realtor

% of site visited

0.89 % of the total study site was visited by NAI teams.

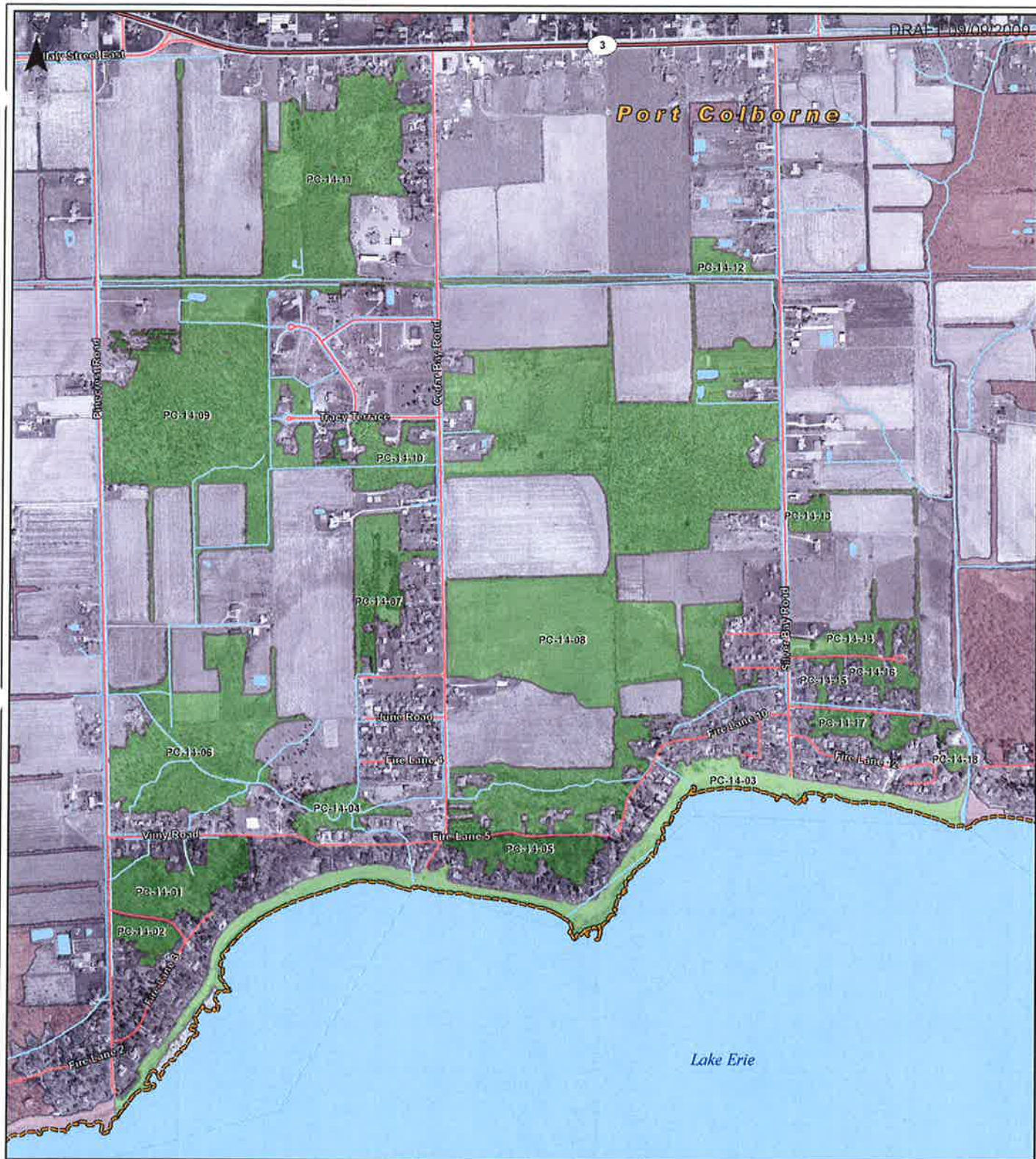
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-14



Natural Areas Inventory

Study Site PC-14

1:12,500

0 100 200 400 600 800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



In this Study Site a total of 38 taxa (unique plant records) were documented.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site PC-16

Dann Dunes

Municipality City of Port Colborne

Formerly N/A

Approximate Area 38 hectares

Watershed This study site drains via Wignell Drain to Lake Erie

Ownership Private

General Summary

Study Site PC-16 is located between Highway 3 and Lake Erie between Lorraine Road to the west and Weaver Road to the east.

Physical Description

This natural area is situated on the Onondaga Formation limestone plain characteristic of the Lake Erie shoreline. Silty, clay soils of the Haldimand Clay Plain are found in the northern section, with beach sand deposits associated with the Sand Plain found closer to the water's edge.

Soils

| Soils | Percentage of Study Site |
|---------------------------------|---------------------------------|
| BROOKE - SHALLOW PHASE | 0.19 |
| FARMINGTON | 27.53 |
| FARMINGTON - VERY SHALLOW PHASE | 11.80 |
| WELLAND | 1.50 |
| WELLAND - PEATY PHASE | 47.45 |
| WATER | 0.92 |
| NOT MAPPED | 10.62 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This natural area supports an excellent example of forested sand dunes with numerous old growth trees and old growth forest characteristics. The Deciduous Forests recorded were dominated by Sugar Maple (*Acer saccharum* ssp. *saccharum*), Red Oak (*Quercus rubra*), and some Eastern Hemlock (*Tsuga canadensis*).

A large Deciduous Swamp characterized by Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and Yellow Birch (*Betula alleghaniensis*) was also noted for this study site.

The herbaceous layer was a mix of Spinulose Wood Fern (*Dryopteris carthusiana*), Sensitive Fern (*Onoclea sensibilis*), and Cinnamon Fern (*Osmunda cinnamomea*).

The Thicket Swamp and Meadow Marsh communities were situated on mineral or deep organic soils in a backdune muck basin. The Thicket Swamp was dominated by Bebb's Willow (*Salix bebbiana*), with Silky Dogwood (*Cornus amomum ssp. obliqua*), and Narrow-leaved Meadowsweet (*Spirea alba*).

The Meadow Marsh was largely Reed Canary Grass (*Phalaris arundinacea*).

Along the Lake Erie shoreline, active dunes persist amongst a cottage community interspersed with manicured lawns and parkland. This natural area is noteworthy for its many old growth trees and for being one of the best examples of forested dune communities along the Lake Erie shoreline.

Vegetation Communities

There are a total of 160 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Open Sand Barren and Dune (SBO)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)
Treed Sand Barren and Dune (SBT)

Vegetation Type

Bebb's Willow Mineral Deciduous Thicket Swamp Type (SWTM3-2)
Cottonwood Treed Sand Dune Type (SBTD1-1)
Dry – Fresh Sugar Maple Deciduous Forest Type (FODM5-1)
Fresh-Moist Hemlock Coniferous Forest Type (FOCM3-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Pondweed Submerged Shallow Aquatic Type (SAS_1-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carex oligocarpa (Few-fruited Sedge) (NPCA, 2006-2009) – S3

Points of Interest

Old growth species include Sugar Maple, Red Oak, Eastern Hemlock, Yellow Birch and White Elm with diameters approaching one meter at breast height.

Eastern Milk Snake was also recorded for this site.

Faunal Records:

- 3- Reptiles & Amphibians
- 2- Mammals
- 1-Bird
- 1-Moth & Butterfly

Recommendations

Difficulty in classifying the unique plant communities found on the limestone outcroppings into Lake Erie suggest that more research is required in these areas. It is also suggested that where willing landowners exist, an effort should be made to preserve the unique shoreline and dune related communities.

Site Visits

May 30, 2007

A. Garofalo, K. White

June 1, 5, 2007

A. Garofalo, K. White

% of site visited

49.14% of this study site was visited by NAI teams.

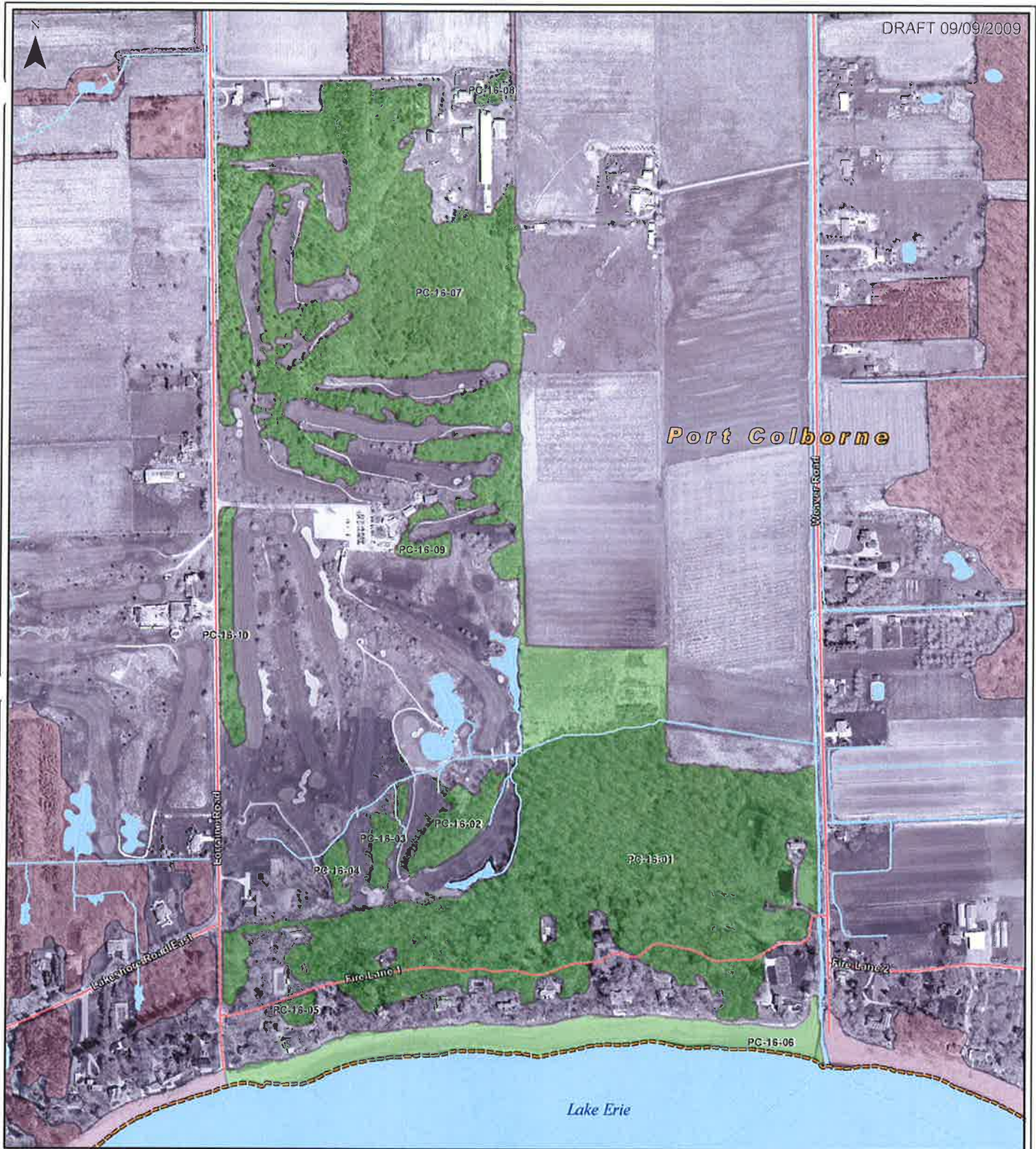
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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PC-16



Natural Areas Inventory

Study Site PC-16

1:7,000

0 50 100 200 300 400 Meters

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There are a total of 160 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Open Sand Barren and Dune (SBO)
Thicket Swamp (SWT)

Study Site PL-01

Short Hills

Municipality Town of Pelham, City of Thorold

Formerly Short Hills/ St. John's (Brady et al, 1980)

Approximate Area 1074 hectares

Watershed This study site drains to the Twelve Mile Creek subwatershed.

Ownership Mostly private

General Summary

Study Site PL-01 is known as the Short Hills area but it should be noted here that this study site does not include the Short Hills Provincial Park properties.

The boundaries of the study site are Roland/Holland Road to the north and Highway 20 to the south. It is bordered on the east by Cataract Road and extends to just west of Cream Street.

Physical Description

This natural area is situated on very complex physiographic and geologic features associated with the Fonthill Kame-Delta complex.

The height of land is a remnant of the Niagara Falls Moraine and is characterized by deep sand and gravel deposits. This Kame Moraine feature is underlain by the shale, dolostone and limestone of the Lockport Formation.

The northern portion of the study site is located on the shallow soils of the Escarpment, and the northern slopes are found on the poorly drained clay and silty clay soils of the Haldimand Clay Plain. Small areas in the north of the study site are underlain by the shale, dolostone and sandstone of the Clinton-Cataract Group.

Soils

| Soil Type | Percentage of Study Site |
|------------------------|---------------------------------|
| ALLUVIUM | 18.00 |
| BENNINGTON | 1.07 |
| BENNINGTON - RED PHASE | 0.47 |
| BEVERLY | 2.71 |
| BEVERLY - LOAMY PHASE | 0.98 |
| BOOKTON - RED PHASE | 0.56 |
| BRANT | 0.01 |
| BRANT - RED PHASE | 10.95 |
| BRANTFORD | 15.81 |
| BRANTFORD - RED PHASE | 5.98 |
| COLWOOD - RED PHASE | 1.46 |
| FLAMBOROUGH | 2.05 |
| FONTHILL | 6.70 |
| FOX | 0.39 |

| | |
|-------------------------|--------|
| FOX - RED PHASE | 0.03 |
| GRIMSBY | 18.96 |
| GRIMSBY - BROWN PHASE | 1.09 |
| HALDIMAND | 1.92 |
| HALDIMAND - LOAMY PHASE | 0.69 |
| LINCOLN | 3.33 |
| RIDGEVILLE | 0.07 |
| TAVISTOCK | 0.45 |
| TAVISTOCK - RED PHASE | 0.76 |
| TOLEDO | 0.35 |
| TOLEDO - LOAMY PHASE | 0.23 |
| TUSCOLA | 0.52 |
| TUSCOLA - RED PHASE | 0.04 |
| VINELAND | 2.09 |
| VINELAND - BROWN PHASE | 0.07 |
| VITTORIA | 0.29 |
| VITTORIA - RED PHASE | 0.18 |
| WATER | 0.04 |
| NOT MAPPED | 1.73 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The steep ravine slopes of this study site support a complex mix of repeating vegetation types. Therefore, complexes were used to describe these areas.

Generally, dry forested slopes and bottomlands supported Deciduous Forest communities with Red Maple (*Acer rubrum*) or American Beech (*Fagus grandifolia*) dominating the canopy. Oak (*Quercus* sp) or Sugar Maple (*Acer saccharum* ssp. *saccharum*) were usually noted as strong associates. Also common were Black Cherry (*Prunus serotina*), Tulip Tree (*Liriodendron tulipifera*), White Pine (*Pinus strobus*), Paper Birch (*Betula papyrifera*) or Eastern Hemlock (*Tsuga Canadensis*), occurring occasionally or in stands. In one area, Black Cherry and Sassafras (*Sassafras albidum*) dominated with Red Maple and a dense shrub layer of Spicebush (*Lindera benzoin*).

Very high quality Sugar Maple forest communities were dominate in many of the steep ravines and rolling uplands. In places along mid to lower slopes, the dense forest canopy, dominated by Sugar Maple, favours shade tolerant species such as Bitternut Hickory (*Carya cordiformis*) in the regeneration layer.

The dry ridges and rims of valley slopes along the edge of the tablelands supported dry oak forests dominated by Black Oak (*Quercus velutina*) with Red Maple or Sassafras as co-dominants. The driest areas support rarer species such as Pignut Hickory (*Carya glabra*), Eastern Flowering Dogwood (*Cornus florida*), or American Chestnut (*Castanea dentate*) in the subcanopy.

In some areas, the incised stream channels create very steeply perched tableland ridges. The forest communities found here are successional, but mature to intermediate

in age with an abundance of Red Maple and Paper Birch. Other associates such as Black Cherry, Black Oak, and the occasional White Pine also occur

Quite often, the north facing valley slopes were dominated by Paper Birch and Eastern Hemlock. Both the understory and herbaceous layer were sparse to bare in these communities.

Bottomlands / lowlands along stream floodplains and areas of organic seeps support a rich and dense ground layer of Spotted Touch-me-not (*Impatiens capensis*), Common Clearweed (*Pilea pumila*), and Wood Nettle (*Laportea Canadensis*) below a closed canopy of Sugar Maple.

Seepage marshes occur throughout this study site due to the significant groundwater inputs to the system. This area is characterized by the deep patches of organic soils 30-40+ cms in some areas with swamp fringes.

The seeps support Open Marshes of Spotted Touch-me-not, or Skunk Cabbage (*Symplocarpus foetidus*) with patches of Spicebush complexed throughout.

Golden Saxifrage (*Chrysosplenium Americana*) and Rough-leaved Goldenrod (*Solidago patula*) were also abundant in deeper organic seeps.

Due to the late timing of some surveys in this study site, the stand descriptions for the three unique fen communities were based on the "Ecological Survey of the Niagara Escarpment Biosphere Reserve. Volume I. Significant Natural Areas. Ontario Ministry of Natural Resources, South Central Region, Peterborough, Ontario. Riely, J.L., J.V. Jalava and S. Varga. 1996"

This report listed the dominant species in the vegetation community to be: Fen Star Sedge (*Carex sterilis*), Golden-fruited Sedge (*Carex aurea*), Bristle-stalked sedge (*Carex leptalea*), Inland Sedge (*Carex interior*), Tall Meadow-rue (*Thalictrum pubescens*), Thin-leaved Cottongrass (*Eriophorum viridi-carinatum*), Golden Ragwort (*Senecio aureus*), Field Horsetail (*Equisetum arvense*), Marsh Blue Violet (*Viola cucullata*), Rough-leaved Goldenrod (*Solidago patula*), Indian Paintbrush (*Castilleja coccinea*).

The cattail fen noted by the field crews had quaking mats of Sedges bordering open water sections. This fen occurred in an open gas pipeline corridor and was dominated by Narrow-leaved Cattail (*Typha angustifolia*). The open fen supported some stunted Tamarack (*Larix laricina*) trees with some more well developed specimens noted.

Other Deciduous Swamp communities were largely dominated by White Pine with a complex mix of Yellow Birch (*Betula alleghaniensis*), Red Maple, and Eastern Hemlock dominated communities.

The only Deciduous Thicket noted for this study site was dominated by stands of Sassafras on the ridge tops with thickets of draping Summer Grape (*Vitis aestivalis*). Occasionally, Staghorn Sumac (*Rhus typhina*) thickets were noted with a mix of dense tangles of Raspberry (*Rubus sp*) in the understory and ground layer along valley slopes and ravine bottomlands.

A large area of this study site is bisected by a hydro corridor. These areas are successional due to the maintenance of the corridor with large canopy gaps from dead snags or tip-ups. The communities found here were generally dense thickets of Summer Grape draped over successional stands of Sassafras.

The most common successional communities encountered were the old field/hayfield meadows between the rolling hollows and forested ravines. Blue Grass species (*Poa sp.*), Tomothy (*Phleum pratense*), Smooth Brome (*Bromus inermis ssp. intermis*), Orchard Grass (*Dactylis glomerata*), and Canada Goldenrod (*Solidago canadensis var. canadensis*), New-England Aster (*Aster novae-angliae*) and Wild Carrot (*Daucus carota*) are abundant.

Patches of regenerating meadow supported Gray Dogwood (*Cornus foemina ssp. racemosa*) thickets that encircle the open meadows.

Also found within this study site is a very nice example of an Alder Thicket Swamp. This rich wetland system has very deep organic accumulations greater than 110 cms. It was dominated by Speckled Alder (*Alnus incana ssp. rugosa*) with Dogwoods and an herbaceous layer of Spotted Touch-me-not, Skunk Cabbage and Spring Clearweed (*Pilea fontana*).

Finally, the Meadow Marsh communities of this study site were either dominated by Sedges or forbs such as Purple-stemmed Aster (*Aster puniceus*) or Spotted Joe Pye Weed (*Eupatorium maculatum*).

Vegetation Communities

There are a total of 618 recorded taxa (unique plant records) for this study site.

Community Series

- Coniferous Forest (FOC)
- Coniferous Swamp (SWC)
- Deciduous Forest (FOD)
- Deciduous Swamp (SWD)
- Deciduous Thicket (THD)
- Deciduous Woodland (WOD)
- Graminoid Meadow (MEG)
- Meadow Marsh (MAM)
- Mixed Forest (FOM)
- Open Fen (FEO)
- Shallow Marsh (MAS)
- Thicket Swamp (SWT)
- Treed Fen (FET)

Vegetation Type

- Cattail Mineral Shallow Marsh Type (MASM1-1)
- Cattail Organic Shallow Marsh Type (MASO1-1)
- Dry-Fresh Black Oak Deciduous Forest Type (FODM1-3)
- Dry-Fresh Black Walnut Deciduous Woodland Type (WODM4-4)
- Dry-Fresh Hemlock-White Pine Mixed Forest Type (FOMM3-3)

Dry-Fresh Norway Maple Deciduous Forest Type (FODM4-6)
 Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
 Dry-Fresh Oak-Red Maple Deciduous Forest Type (FODM2-1)
 Dry-Fresh Red Oak Deciduous Forest Type (FODM1-1)
 Dry-Fresh Red Pine Naturalized Coniferous Plantation Type (FOCM6-2)
 Dry-Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
 Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
 Dry-Fresh Sugar Maple Deciduous Forest Type (FODM5-1)
 Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Dry-Fresh Sugar Maple-Hickory Deciduous Forest Type (FODM5-5)
 Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)
 Dry-Fresh White Birch Deciduous Forest Type (FODM3-2)
 Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
 Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FODM7-4)
 Fresh-Moist Hemlock Coniferous Forest Type (FOCM3-1)
 Fresh-Moist Hemlock-White Pine Coniferous Forest Type (FOCM3-2)
 Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
 Fresh-Moist Sassafras Deciduous Forest Type (FODM8-2)
 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Fresh-Moist White Birch Mixed Forest Type (FODM8-2)
 Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
 Hemlock Mineral Coniferous Swamp Type (SWCM2-2)
 Inland Sedge Open Fen Type (FEOG1-9)
 Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
 Jewelweed Forb Organic Meadow Marsh Type (MAMO2-1)
 Joe Pye Weed Forb Mineral Meadow Marsh Type (MAMM2-6)
 Joe Pye Weed Forb Organic Meadow Marsh Type (MAMO2-2)
 Kentucky Blue Grass Graminoid Meadow Type (MEGM3-4)
 Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
 Mixed Forb Organic Meadow Marsh Type (MAMO2-3)
 Native Deciduous Regeneration Thicket Type (THDM4-1)
 Open Graminoid Meadow Type (MEGM4-1)
 Panicked Aster Mineral Meadow Marsh Type (MAMM2-2)
 Purple-stemmed Mineral Meadow Marsh Type (MAMM2-3)
 Raspberry Deciduous Shrub Thicket Type (THDM2-8)
 Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
 Sedge Graminoid Organic Meadow Marsh Type (MAMO1-6)
 Speckled Alder Mineral Deciduous Thicket Swamp Type (SWTM1-1)
 Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
 Spicebush Organic Deciduous Thicket Swamp Type (SWTO5-6)
 Tamarack Treed Fen Type (FETC1-1)
 Timothy Graminoid Meadow Type (MEGM3-7)
 White Pine Mineral Coniferous Swamp Type (SWCM2-1)
 Yellow Birch Mineral Deciduous Swamp Type (SWDM4-4)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (Varga, 1993, Natural Resource Solutions, 2001, NPCA, 2006-2009) - Endangered

Cornus florida (Eastern Flowering Dogwood) (Brady, 1980, Varga, 1993, NPCA, 2006-2009) – Endangered

Eurybia divaricata (White Wood Aster) (Varga, 1993, NPCA, 2006-2009) - Threatened

Juglans cinerea (Butternut) (Brady, 1980, Varga, 1993, Natural Resource Solutions, 2001, NPCA, 2006-2009)

Magnolia acuminata (Cucumber Magnolia) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carex virescens (Ribbed Sedge) (Varga, 1993) – S3

Carya glabra (Pignut Hickory) (Brady, 1980, Varga, 1993, NPCA, 2006-2009) – S3

Gleditsia triacanthos (Honey Locust) (Brady, 1980, NPCA, 2006-2009) – S2

Gymnocladus dioica (Kentucky Coffee-tree) (NPCA, 2006-2009) – S2

Lespedeza frutescens (Violet Bush-clover) (NPCA 2006-2009) – S1

Phegopteris hexagonoptera (Broad Beech Fern) (Varga, 1993, NPCA, 2006-2009) – S3

Uvularia perfoliata (Perfoliate Bellwort) (NPCA, 2006-2009) – S1

Vitis labrusca (Fox Grape) (NPCA, 2006-2009) – S1

Points of Interest

Many impressive trees were noted for this study site including a huge, old growth Eastern White Pine 75-100 ft tall or more with deeply furrowed bark deeper than two finger widths. A Tulip Tree 80cm + dbh was documented and it was noted that the first bow was up at least 80-90ft from the ground.

Also noted was the largest and only fruiting American Chestnut tree encountered during the NAI. It was a canopy tree, 40cm dbh with hundreds of fruit on the ground below.

It is also important to note that this site supported the highest density of Eastern Flowering Dogwood in the NAI study area.

In many places, large diameter Grape vines were found trailing from the old growth tree canopy.

In terms of unusual communities, this site contained quite possibly the only natural fen in Niagara, with stony, limey sands dominated by Sedges. In addition, a very rare Conifer Swamp type and the only White Pine Mineral Coniferous Swamp found during this NAI were both recorded for this site.

Interesting faunal notes include, some years ago, NPCA staff collected a rare mayfly species within the boundary of this study area, *Litobrantha recurvata*. At the time of that discovery, that species of Mayfly was found only here in all of Canada. It has since been noted in Nova Scotia.

Brook trout are also known from these tributaries of 12 Mile Creek proving that this is the only cold water stream in the NPCA's entire watershed jurisdiction.

Faunal Records:

180 - Birds

39 - Mammals

38 - Reptiles & Amphibians

10 – Moths & Butterflies

Recommendations

Due to the significance of the Kame-Delta Complex for groundwater recharge, further study of the natural areas in this area is recommended.

Site Visits

September 1, 1980

Brady et al.

March 6, 1993

S. Varga et al.

June 11, 1998

Natural Resource Solutions Inc.

April 1, 2001

Natural Resource Solutions Inc.

June 17, 2007

B. Curry

June 20, 2007

B. Curry

July 24, 2007

B. Curry

May 26, 2008

A. Garofalo, K. Young-Chin

September 9, 2008

A. Garofalo, K. Young-Chin, R. Houghton

September 10, 2008

A. Garofalo, K. Young-Chin

September 23, 2008

J. Sankey, R. Armstrong, H. Teare, W. Laar

October 1, 2008

A. Garofalo, K. Young-Chin

October 2, 2008

A. Garofalo, K. Young-Chin

October 3, 2008

A. Garofalo, K. Young-Chin, T. Staton, S. Mohamed

October 6, 2008

A. Garofalo, K. Young-Chin

October 7, 2008
A. Garofalo, K. Young-Chin

October 13, 2008
J. Sankey, J. Grassie, R. Armstrong, S. Istok, H. Teare

October 23, 2008
A. Garofalo, T. Staton

October 29, 2008
A. Garofalo

November 6, 2008
A. Garofalo, T. Staton, S. Mohamed

% of site visited

8.57 % of the total study site was visited by NAI teams.

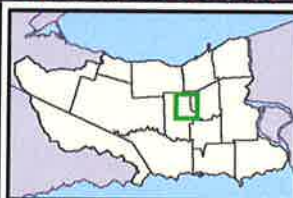
References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.
- Ontario Ministry of Natural Resources. 1996. *Ecological Survey of the Niagara Escarpment Biosphere Reserve. Volume I. Significant Natural Areas*. South Central Region, Peterborough, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-01



Natural Areas Inventory

Study Site PL-01

1:34,500

0 250 500 1,000 1,500 2,000 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009
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All Frames. North American Datum 1983, Universal Transverse Mercator 6°
Projection, Zone 17N, Central Meridian 81° West



There are a total of 618 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Coniferous Swamp (SWC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Mixed Forest (FOM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site PL-02

Boye's Explosive's-Fenwick Forests

Municipality Town of Pelham

Formerly Boye's Woodlot (Brady, et al., 1980)

Approximate Area 184 hectares

Watershed This study site drains to Fifteen Mile Creek.

Ownership Mostly private

General Summary

This Study Site is located within the Town of Pelham north of Canborough Road and South of Highway 20. The western boundary is Regional Road 24, and it is bound on the east by Balfour Road.

Physical Description

This natural area is situated on the western slope of the Fonthill Kame-Delta Complex.

The eastern portion in the higher elevations is characterized by the well drained, sand and gravel deposits of the Kame Moraine feature. The western portion is located on the poorly drained, clay and silty clay soils of the Haldimand Clay Plain.

The entire natural area is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|---------------------------------|
| ALLUVIUM | 0.44 |
| BEVERLY | 0.40 |
| BEVERLY - LOAMY PHASE | 10.62 |
| BRADY - RED PHASE | 0.77 |
| BRANTFORD | 0.44 |
| COLWOOD - RED PHASE | 0.90 |
| FOX - RED PHASE | 1.49 |
| GRANBY | 3.96 |
| GRIMSBY | 2.08 |
| MAPLEWOOD | 34.91 |
| MAPLEWOOD - RED PHASE | 0.01 |
| TAVISTOCK | 5.02 |
| TOLEDO | 3.59 |
| TOLEDO - LOAMY PHASE | 33.51 |
| VINELAND | 0.88 |
| WATER | 0.00 |
| NOT MAPPED | 1.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Mixed Swamp habitat in this study area is characterized by a species rich Hemlock (*Tsuga canadensis*) - Yellow Birch (*Betula alleghaniensis*) community which grades into Red Maple (*Acer rubrum*) swamp, on some upland edges. Small patches of Red Maple swamp also occurs in low spots or sloughs in the Deciduous Forest.

The driest knolls support Sugar Maple (*Acer saccharum* ssp. *saccharum*), or Sugar Maple - Beech (*Fagus grandifolia*) forest, while the majority of uplands gently grade from swamp to mixed communities.

Seepage areas with iron precipitates are present in areas. The water table is close to, or at the surface with occasional organic or open muck patches (up to 65cm of accumulation). These are generally dominated by Water Carpet (*Chrysosplenium*).

Some forested knolls support rare Cucumber Magnolia (*Magnolia acuminata*) habitat.

The ravine bottom is dominated by Thicket Creeper (*Parthenocissus inserta*), Canada Enchanter's Nightshade (*Circea luteana*), Jack-in-the-Pulpit (*Ariseama triphylum*), Spotted Touch-me-not (*Impatiens capensis*), Common Clearweed (*Pilea pumila*), and Garlic Mustard (*Allaria petiolata*).

Mixed Forest communities include rich upland \ wetland complexes with sandy knolls, or rolling uplands, dominated by a mixed Hemlock forest community. Surrounding the more upland habitat is deep, kettle-like, depressions. Occasionally, the kettles or slough ponds support floating mats of vegetation.

An excellent example of an uncommon Mixed Forest community type found within this study area is the Hemlock (*Tsuga canadensis*), White Oak (*Quercus alba*), Eastern White Pine (*Pinus strobus*), and Maple forest with an abundance of Paper Birch (*Betula papyrifera*) mixed in. It has a very "northern Ontario" feel.

Also found within this study site is a Deciduous Swamp community that is dominated by Green Ash (*Fraxinus pennsylvanica*), Trembling Aspen (*Populus tremuloides*), and Red Maple (*Acer rubrum*).

The understory layer is predominantly Spicebush (*Lindera benzoin*), Blue Beech (*Carpinus caroliniana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer is a mix of Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Panicked Aster (*Aster lanceolatus* ssp. *lanceolatus*), and White Avens (*Geum canadense*).

A Thicket Swamp Community is also found within this study site. It is largely an organic Red-osier Dogwood (*Cornus stolonifera*) thicket with a fringe of Trembling Aspen (*Populus tremuloides*).

A dense understory of Grey Dogwood (*Cornus foemina* ssp. *racemosa*) lines the dry banks of the floodplain and stream.

At either end of this thicket swamp, it opens into a Spotted Touch-me-not, Reed Canary Grass (*Phalaris arundinacea*) shallow marsh community with scattered pockets of Broad-leaved Cattail (*Typha latifolia*), and Common Boneset (*Eupatorium maculatum*).

Vegetation Communities

There are a total of 320 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Forest (FOM)
Mixed Swamp (SWM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Dry-Fresh Black Oak Deciduous Forest Type (FODM1-3)
Dry-Fresh Hardwood-Hemlock Mixed Forest Type (FOMM3-1)
Dry-Fresh Oak-Red Maple Deciduous Forest Type (FODM2-1)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
Dry-Fresh Sugar Maple Deciduous Forest Type (FODM5-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Hemlock-Hardwood Mixed Forest Type (FOMM6-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Forb Organic Shallow Marsh Type (MASO2-1)
Missouri Willow Mineral Deciduous Thicket Swamp Type (SWTM3-1)
Open Graminoid Meadow Type (MEGM4-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Red-osier Organic Deciduous Thicket Swamp Type (SWTO4-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Yellow Birch-Conifer Mineral Mixed Swamp Type (SWMM3-1)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (Brady et al., 1980, NPCA, 2006-2009) –
Endangered

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered
Juglans cinerea (Butternut) (NPCA, 2006-2009) – Endangered
Magnolia acuminata (Cucumber Magnolia) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (NPCA, 2006-2009) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Dead Chestnut stumps were observed occasionally throughout this study site.

One 19cm dbh Serviceberry was recorded. It was 50-60 ft tall, reaching the canopy.

Faunal Records:

15- Birds
9- Mammals
4- Reptiles & Amphibians
3- Moths & Butterflies

Site Visits

September 1, 1980
Brady, et al

August 15, 2008
J. Sankey, J. Grassie, R. Armstrong, H. Teare, B. Briant

September 17, 2008
A. Garofalo, K. Young-Chin

September 17, 2008
A. Garofalo, K. Young-Chin, Mr. Bowman

September 18, 2008
A. Garofalo, K. Young-Chin

September 22, 2008
A. Garofalo, K. Young-Chin

September 22, 2008
A. Garofalo, K. Young-Chin, R. Wright

September 24, 2008
A. Garofalo, K. Young-Chin, T. Staton

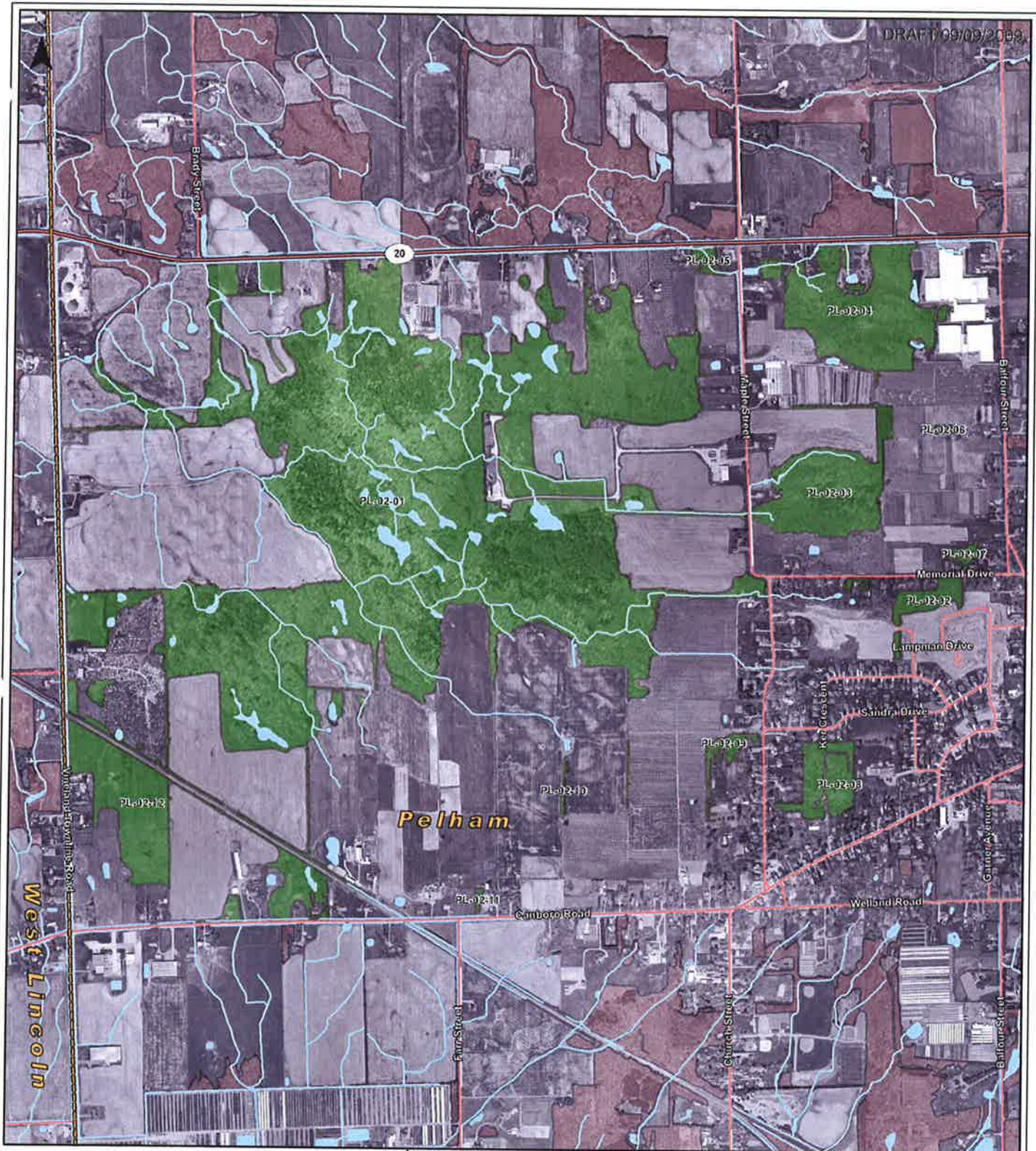
September 25, 2008
A. Garofalo, K. Young-Chin

% of site visited

17.58 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Macdonald, I., 1980. *Life Science Features of the Haldimand Clay Plain Physiographic Region*, Ministry of Natural Resources, Central Region, Richmond Hill.
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-02



Natural Areas Inventory

Study Site PL-02

1:16,000

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 320 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Graminoid Meadow (MEG)
Mixed Forest (FOM)
Mixed Swamp (SWM)
Thicket Swamp (SWT)

Study Site PL-03

Juard Woods – Ridgeville Swamp

Municipality Town of Pelham

Formerly Juard Woodlot (Brady, et al., 1980)

Approximate Area 333 hectares

Watershed This study site drains to the Coyle Creek subwatershed.

Ownership Mostly private

General Summary

Study site PL-03 is located in the municipality of Pelham along the Thorold and Welland border. Canborough Road borders to the north while Foss Road lies to the south. It extends from Cream Street in the west to Haist Street in the east.

Physical Description

This natural area is situated on the height of land of the south slope of the Fonthill Kame-Delta Complex.

The northern half of the study site is characterized by the well drained sand and gravel deposits of the Kame Moraine feature. The southern half is on the well drained sand and loamy sand soils of the Sand Plain.

The majority of this site is underlain by the dolostone of the Guelph Formation with a small area in the north east on the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------------|--------------------------|
| BEVERLY - LOAMY PHASE | 0.59 |
| BEVERLY - LOAMY RED PHASE | 0.33 |
| BRANT - RED PHASE | 9.77 |
| BRANTFORD - LOAMY RED PHASE | 0.25 |
| COLWOOD - RED PHASE | 23.71 |
| FONTHILL | 5.10 |
| FOX - RED PHASE | 0.59 |
| GRANBY | 0.18 |
| GRIMSBY | 29.02 |
| MAPLEWOOD | 15.04 |
| MAPLEWOOD - RED PHASE | 1.27 |
| TAVISTOCK | 0.77 |
| TAVISTOCK - RED PHASE | 4.69 |
| TOLEDO - LOAMY PHASE | 0.25 |
| TOLEDO - LOAMY RED PHASE | 1.93 |
| TUSCOLA | 0.00 |
| TUSCOLA - RED PHASE | 2.40 |
| VINELAND | 2.12 |
| VITTORIA | 0.01 |

| | |
|----------------|---------------|
| WALSHER | 0.01 |
| WATER | 0.00 |
| NOT MAPPED | 1.99 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was the Deciduous Forest dominated by mature Sugar Maple (*Acer saccharum ssp. saccharum*) growing over rolling hills of sand. Associated canopy species included American Beech (*Fagus grandifolia*), Tulip Tree (*Liriodendron tulipifera*), and Red Maple (*Acer rubrum*).

The understory supported regenerating canopy species and in some areas, there was an amazing abundance of White Wood Aster (*Eurybia divaricata*) throughout the ground layer.

There were also lowland areas with complex microtopography, or hummocks, which support similar Sugar Maple communities on the drier knolls. The lower lying areas were characterized as Deciduous Swamp dominated by Red Maple, Yellow Birch (*Betula alleghaniensis*), Trembling Aspen (*Populus tremuloides*), Black Cherry (*Prunus serotina*), and Green Ash (*Fraxinus pennsylvanica*).

The Marsh communities noted were rich with organics and were seepage-fed with a fast flowing stream meandering through it. There was a fringe of Black Walnut (*Juglans nigra*) Lowland on the upland \ lowland interface.

The Open Water area recorded supported floating mats of Rice Cut Grass (*Leersia oryzoides*) with the occasional Nodding Beggar-ticks (*Bidens cernua*). Also noted was a patch ringed by a fen-type sedge (*Carex sp.*) species (identification pending). Water flowed through this community, downstream, below the fen mat.

There was a unique fen-like community with a floating mat over 80cm of a sheet flow of water\organic muck. There was no defined stream channel through this section, although the stream channel is defined upstream from this Rice Cut Grass mat.

Vegetation Communities

There are a total of 270 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
 Deciduous Swamp (SWD)
 Deciduous Thicket (THD)
 Deciduous Woodland (WOD)
 Floating-leaved Shallow Aquatic (SAF)
 Forb Meadow (MEF)
 Meadow Marsh (MAM)
 Open Fen (FEO)

Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Bebb's Willow Organic Deciduous Thicket Swamp Type (SWTO2-2)
Dry - Fresh Black Locust Deciduous Forest Type (FODM4-11)
Dry - Fresh Black Oak Deciduous Forest Type (FODM1-3)
Dry - Fresh Black Walnut Deciduous Woodland Type (WODM4-4)
Dry - Fresh Oak - Red Maple Deciduous Forest Type (FODM2-1)
Dry - Fresh Red Maple Deciduous Forest Type (FODM4-7)
Dry - Fresh Sugar Maple Deciduous Forest Type (FODM5-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh - Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh - Moist Sassafras Deciduous Forest Type (FODM8-2)
Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Goldenrod Forb Meadow Type (MEFM1-1)
Inland Sedge Open Fen Type (FEOG1-9)
Joe Pye Weed Forb Organic Meadow Marsh Type (MAMO2-2)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Raspberry Deciduous Shrub Thicket Type (THDM2-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Trembling Aspen Organic Deciduous Swamp Type (SWDO3-3)
Yellow Birch Organic Deciduous Swamp Type (SWDO3-2)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened
Juglans cinerea (Butternut) (L. Campbell and Associates, 2006, NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (NPCA, 2006-2009) –S3
Gleditsia triacanthos (Honey Locust) (L. Campbell and Associates, 2006) – S2

Points of Interest

Chestnut stumps were observed for this site.

Faunal Records:

35-Birds
12-Mammals
9-Reptiles & Amphibians
1-Moths & Butterflies

Site Visits

March 10, 2000

Ontario Ministry of Natural Resources

June 11, 2006

L. Campbell & Associates

July 18, 2008

J. Sankey, J. Grassie, R. Armstrong, H. Teare, F. Fohr

October 16, 2008

A. Garofalo, K. Young-Chin

October 22, 2008

A. Garofalo

October 22, 2008

A. Garofalo, K. Young-Chin

October 30, 2008

A. Garofalo

% of site visited

9.72% of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

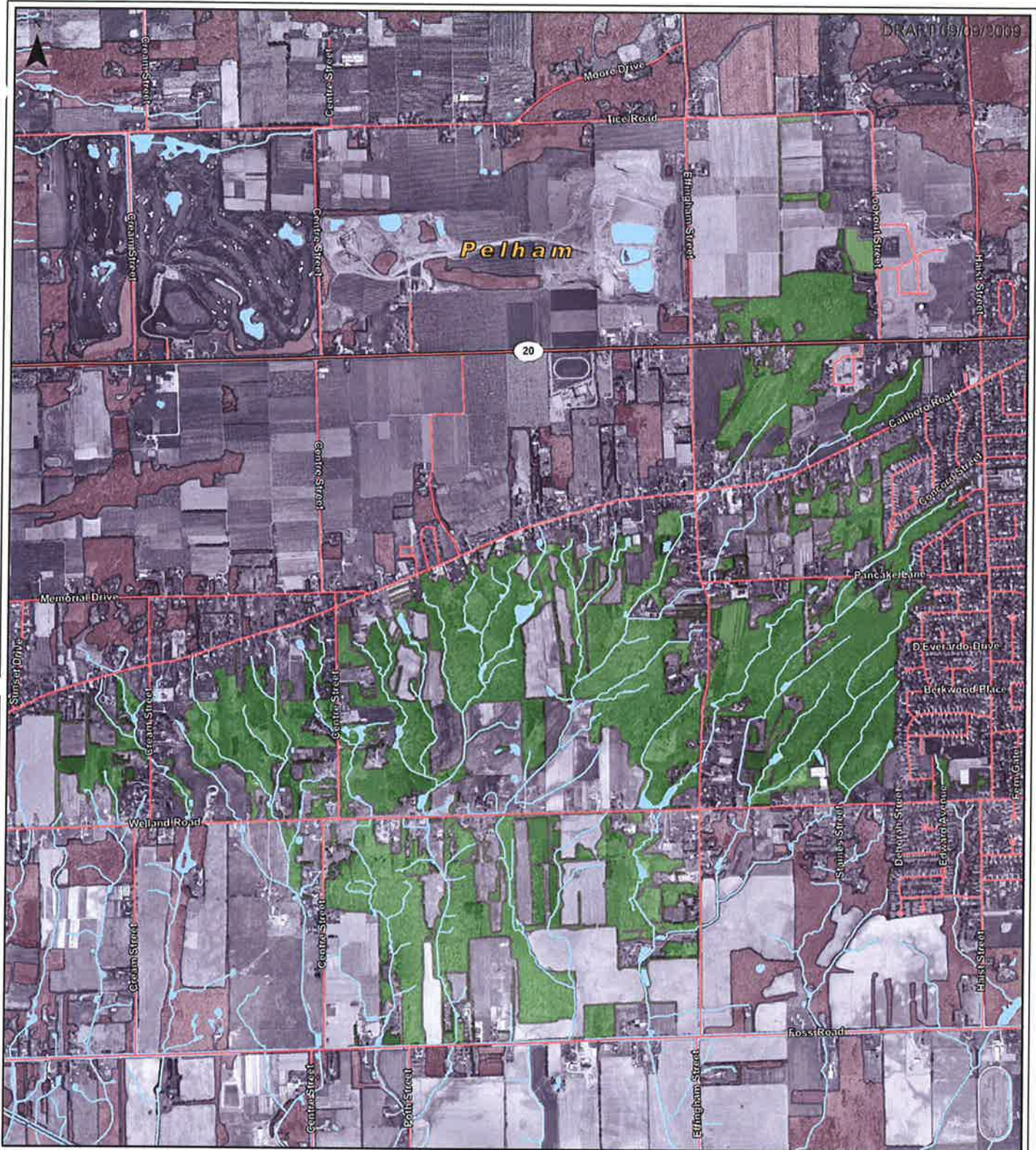
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-03



Natural Areas Inventory

Study Site PL-03

1:23,000

0 150 300 600 900 1,200 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 270 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Woodland (WOD)
Deciduous Swamp (SWD)

Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site PL-04

Coyle Creek Headwaters

Municipality Town of Pelham

Formerly Sumbler Road Woodlot, Riverview Woodlot, Welland Airport Woodlot (Brady et al., 1980)

Approximate Area 1038 hectares

Watershed A small portion of the southern part of this study site drains to the Welland River West subwatershed, but the majority drains to Coyle Creek subwatershed.

Ownership Mostly private

General Summary

Study Site PL-04 is a large site located within the Town of Pelham. It is bound on the north by Canborough Road and extends south to the Welland River. The eastern boundary is located just west of South Pelham Road and the Pelham/ Welland Townline at the divide between the Coyle Creek and Draper's Creek subwatersheds. The western boundary is Regional Road 24/Victoria Avenue.

Physical Description

This study site is located on the south western slope of the Fonthill Kame-Delta Complex.

The north east portion of this natural area is situated on the well drained sand and loamy sand soils of the Sand Plain. This area is largely underlain by the dolostone of the Guelph Formation.

The south west portion is characterized by the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

A small area in the far north of this study site is located on the height of land of the Kame Moraine feature, and is characterized by the well drained sand and gravel deposits. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------|---------------------------------|
| ALLUVIUM | 2.26 |
| BERRIEN | 3.40 |
| BEVERLY | 8.42 |
| BEVERLY - COARSE PHASE | 0.51 |
| BEVERLY - LOAMY PHASE | 9.31 |
| BEVERLY - LOAMY RED PHASE | 0.80 |
| BRANTFORD | 1.36 |
| COLWOOD - RED PHASE | 0.09 |
| GRIMSBY | 2.31 |
| MAPLEWOOD | 14.45 |

| | |
|--------------------------|--------|
| MAPLEWOOD - RED PHASE | 1.28 |
| TAVISTOCK | 7.48 |
| TAVISTOCK - RED PHASE | 1.19 |
| TOLEDO | 20.36 |
| TOLEDO - LOAMY PHASE | 19.52 |
| TOLEDO - LOAMY RED PHASE | 0.70 |
| TUSCOLA - RED PHASE | 0.54 |
| VINELAND | 0.71 |
| WAUSEON | 3.82 |
| WATER | 0.09 |
| NOT MAPPED | 1.40 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forests of this study site are very rich with a canopy of Red Maple (*Acer rubrum*), Black Cherry (*Prunus serotina*), American Beech (*Fagus grandifolia*) and Yellow Birch (*Betula alleghaniensis*).

The understory was a mix of regenerating canopy species with some Hop Hornbeam (*Ostrya virginiana*).

The herbaceous layer contained Beechdrops (*pifagus virginiana*), and in some areas, a carpet of New York Fern (*Thelypteris noveboracensis*) was noted. White Wood Aster (*Eurybia divaricata*) was found occasionally throughout the forest floor on dry upland knolls and especially around the raised bases of large trees with Canada Mayflower (*Maianthemum canadense*).

Deciduous Swamps are very common in this study site. The slough ponds in areas were noted as so diverse that they support deeper open water pockets of submerged aquatic and floating-leaved communities.

Complexed throughout the Deciduous Swamp communities of this large study site are sandy knolls (up to a meter in elevation above the wet pools and maple swamp communities). These areas support Deciduous Forest communities dominated by American Beech, or on the driest knolls.

Younger areas support Green Ash (*Fraxinus pennsylvanica*) dominated communities while the many rich sloughs are lined with Red Maple and occasionally Swamp Maple (*Acer fremanii*).

Most commonly Red Maple swamps have an abundance of Spicebush (*Lindera benzoin*) in the shrub layer.

Northern Lady Fern (*Athyrium filix-femina var. angustum*) is also abundant on the swamp / forest interface, or edge.

Eastern Hemlock (*Tsugacanadensis*) and occasionally Yellow Birch ring slough ponds and occur in the understory below the Red Maple swamp.

Rice Cut Grass (*Leersia oryzoides*) marshes, forming quaking mats, developed in some of the slough ponds. Beggars-ticks (*Bidens sp.*) were also common in areas surrounding deeper pockets of submerged aquatic vegetation such as, Common Bladderwort (*Utricularia vulgaris*), and Duckweed (*Lemna sp.*).

Surrounding the rich slough ponds are mossy rims, and mossy bolsters (dead mossy stumps) throughout the ponds support knurled Blueberry (*Vaccinium sp.*) shrubs. Species associated with these unique habitats include: Mosses (*Moss sp.*), Highbush Blueberry (*Vaccinium corymbosum*), Swamp Dewberry (*Rubus hispidus*), Starflower (*Trientalis borealis*), Sedges (*Carex sp.*), Royal Fern (*Osmunda regalis*), Cinnamon Fern (*Osmunda. cinnomomea*), Clubmoss (*Lycopodium sp.*) and, Partridge Berry (*Mitchella repens*).

Sections of this study site are a mid-aged to mature regenerating forests with remnant conifer plantation still hanging on. Some have large expanses of open Bent Grass (*Agrostis sp.*) Meadow Marsh complex throughout. Austrian Pine (*Pinus nigra*) with its wetland tolerance is surviving in these wet areas as the dominant tree species, but seems to be doing best on slighter higher and drier sandy knolls.

The area between the naturalized plantation and open Meadow Marsh supports patches of Narrow-leaved Meadowsweet (*Spirea alba*) and young stands of Poplar (*Populus sp.*) swamp.

In the more open areas, communities such as the Raspberry thicket are common. These open thickets support a few scattered, young Trembling Aspen (*Populus tremuloides*) and Birch (*Betula*) trees. Common Blackberry (*Rubus alleghanensis*) dominates in tangled patches surrounded by open meadows. An interesting thick carpet of mossy ground cover dominates with associated Common Cinquefoil (*Potentilla simplex*). Rough Goldenrod (*Solidago rugosa*), Gray Goldenrod (*Solidago nemoralis*), Grass-leaved Goldenrod (*Euthamia graminea*), Poverty Oat Grass (*Danthonia spicata*) and, Kentucky Blue Grass (*Poa pratensis*) are also abundant.

Bradshaw Park

Bradshaw Park is a property owned by the Town of Pelham within this study site. The majority of the property is a Red Maple-Black Cherry successional forest. Sloughs and drainage swales, supporting Meadowsweet thicket swamp communities are found throughout. Adjacent to these wet areas, the uplands abruptly dry out and support thickets of Gray Dogwood (*Cornus foemina ssp. racemosa*) and occasional patches of open meadow on the driest sandy knolls. Slough depressions with standing water, or vernal pools, support small stands of young Red Maple swamp

The wetland / upland edges in the open meadow or Gray dogwood thickets sustain a very interesting community with Foxglove Beard-tongue (*Penstemon digitalis*) and Little Bluestem Grass (*Schizachyrium scoparium*).

A dense Meadowsweet Thicket Swamp area of the property supports an inner pocket of

Bulrush (*Scirpus sp.*) Shallow Marsh.

In other areas along Coyle Creek, very open grass dominated swamps or floodplain forests support a dense cover of Asters, Snakeroot (*Sanicula*), Reed Canary Grass (*Phalaris arundinacea*) and, Sedges (*Carex sp.*) with an abundance of Wild Yamroot (*Dioscorea quaternata*) and Climbing Poison Ivy (*Rhus radicans ssp. negundo*) trailing over the dense shrub layer. An open canopy of Pin Oak (*Quercus palustris*), Red Maple or Green Ash partly shades a mix of Silky Dogwood (*Cornus amomum ssp. obliqua*) and Grey Dogwood, Meadowsweet, and Ash saplings.

Vegetation Communities

There are a total of 504 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Forb Meadow (MEF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Forest (FOM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Bladderwort Mixed Shallow Aquatic Type (SAM_1-6)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bulrush Mineral Shallow Marsh Type (MASM1-2)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh Hardwood-Hemlock Mixed Forest Type (FOMM3-1)
Dry-Fresh Hawthorn-Apple Deciduous Forest Type (FODM4-10)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh Oak-Red Maple Deciduous Forest Type (FODM2-1)
Dry-Fresh Poplar Deciduous Forest Type (FODM3-1)
Dry-Fresh Red Maple Deciduous Forest Type (FODM4-7)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
Dry-Fresh Sugar Maple-Red Maple Deciduous Forest Type (FODM5-9)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fowl Manna Grass Graminoid Mineral Meadow Marsh Type (MAMM1-5)

Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
 Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
 Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Fresh-Moist Sugar Maple-Yellow Birch Deciduous Forest Type (FODM6-3)
 Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
 Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
 Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
 Hawthorn/ Apple Deciduous Woodland Type (WODM4-1)
 Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
 Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
 Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
 Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
 Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
 Native Shrub Deciduous Hedgerow Thicket Type (THDM3-2)
 Open Graminoid Meadow Type (MEGM4-1)
 Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
 Poplar Mineral Deciduous Swamp Type (SWDM4-5)
 Poverty Oat Grass Graminoid Meadow Type (MEGM3-1)
 Raspberry Deciduous Shrub Thicket Type (THDM2-8)
 Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
 Red-top Graminoid Mineral Meadow Marsh Type (MAMM1-4)
 Reed Canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
 Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
 Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
 Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
 Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
 Spicebush Organic Deciduous Thicket Swamp Type (SWTO5-6)
 Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
 Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
 Water-parsnip Organic Shallow Marsh Type (MASO2-5)
 White Elm Mineral Deciduous Swamp Type (SWDM4-2)
 Willow Mineral Deciduous Swamp Type (SWDM4-1)
 Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (NPCA, 2006-2009) – Endangered
Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered
Juglans cinerea (Butternut) (Brady et al., 1980) – Endangered

Provincially Rare Species

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3
Polygala sanguinea (Field Milkwort) (NPCA 2006-2009) – S3
Smilax rotundifolia (Common Greenbrier) (NPCA 2006-2009) – S2

Points of Interest

Many large diameter dead American Beech snags.

Old growth individual trees can be found throughout the site. Old growth species include: Red Maple, White Oak, Eastern Hemlock

Great salamander habitat found in some areas

One location had thousands of stems of Common Greenbrier (*Smilax rotundifolia*).

Faunal Records:

39- Birds

21- Moths & Butterflies

16- Reptiles & Amphibians

13- Mammals

Recommendations

Further development of partnerships with the various partner groups, particularly the Bradshaw Park Committee and Town of Pelham is recommended. This will help to advance efforts to restore other areas of this diverse study site.

Site Visits

September 1, 1980

Brady et al.

July 6, 2007

B. Curry

May 27, 2008

A. Garofalo, K. Young-Chin

July 10, 2008

A. Garofalo, K. Young-Chin

July 14, 2008

A. Garofalo, K. Young-Chin, M. Nikitzuk

July 21, 2008

A. Garofalo, K. Young-Chin

July 22, 2008

A. Garofalo, K. Young-Chin

July 23, 2008

A. Garofalo, K. Young-Chin

July 25, 2008

A. Garofalo, K. Young-Chin

J. Sankey, J. Grassie, F. Fohr, A. Saxon, I. MacGregor

July 31, 2008

A. Garofalo, K. Young-Chin

August 6, 2008
A. Garofalo, K. Young-Chin

August 12, 2008
J. Sankey, J. Grassie, R. Armstrong, H. Teare, F. Fohr

August 13, 2008
A. Garofalo, K. Young-Chin

August 14, 2008
A. Garofalo, K. Young-Chin

August 19, 2008
A. Garofalo, K. Young-Chin

August 21, 2008
T. Staton, S. Mohamed, K. Young-Chin

September 2, 2008
A. Garofalo, K. Young-Chin

September 5, 2008
A. Garofalo, K. Young-Chin

September 4, 2008
A. Garofalo, K. Young-Chin

September 8, 2008
A. Garofalo, K. Young-Chin

September 15, 2008
J. Sankey, J. Grassie, R. Armstrong, S. Istok, H. Teare

September 16, 2008
A. Garofalo, K. Young-Chin

September 29, 2008
A. Garofalo, K. Young-Chin

% of site visited

10.33% of the total study site was visited by NAI teams.

References Cited

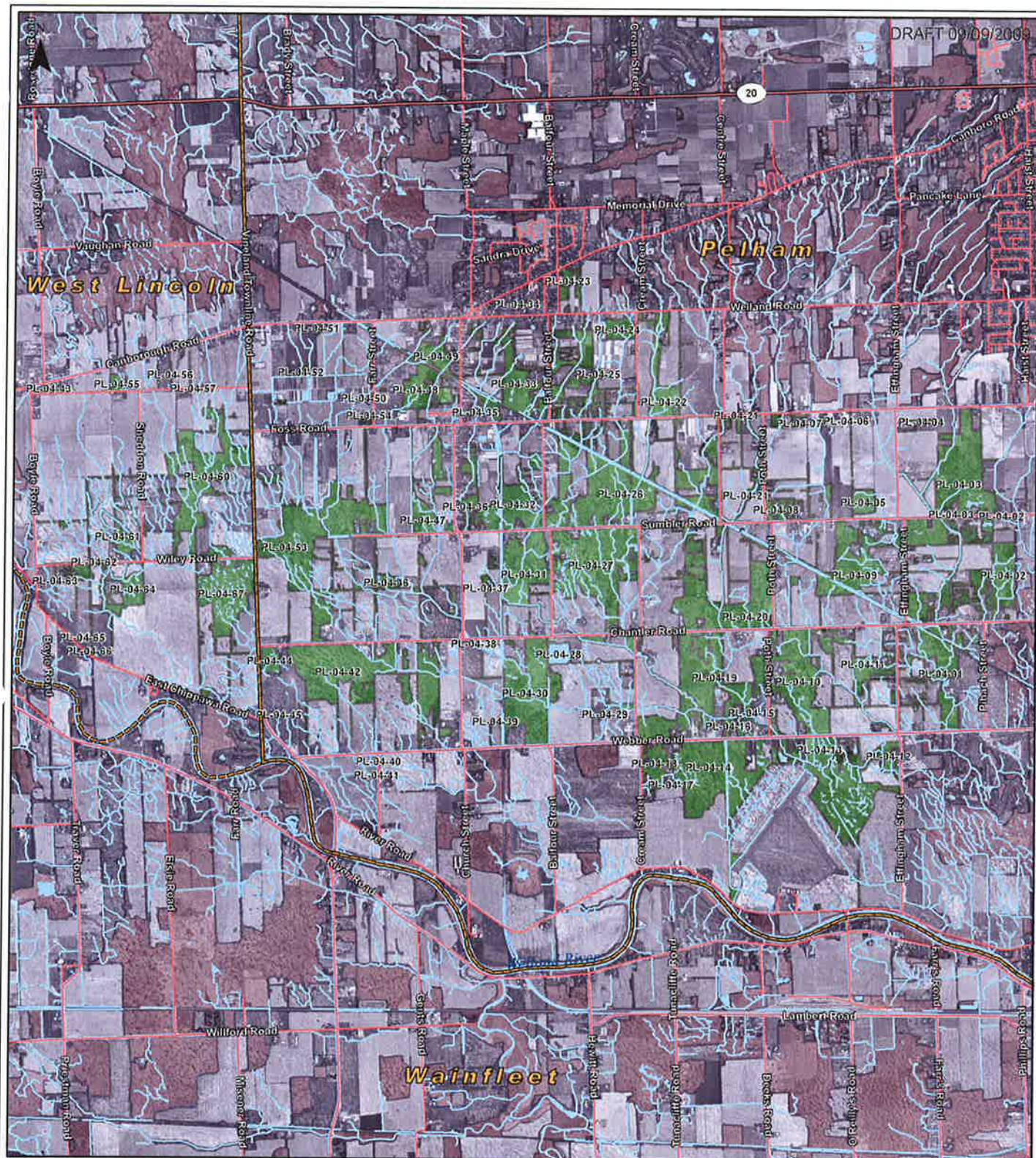
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Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-04



Natural Areas Inventory

Study Site PL-04

1:50,000

0 300 600 1,200 1,800 2,400 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 8° Projection, Zone 17N, Central Meridian 81° West



There are a total of 504 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Forb Meadow (MEF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)

Study Site PL-05

16 Mile Creek

Municipality Town of Pelham, Town of West Lincoln

Formerly Riverview Woodlot (Brady et al., 1980)

Approximate Area 188 hectares

Watershed The majority of this study site drains south and east to 16 Mile Creek but a portion does drain to the north/east to 18 Mile Creek.

Ownership Mostly private

General Summary

The 16 Mile Creek Study Site is bound on the west by Regional Road 24/ Victoria Avenue and extends to just east of Balfour Street. The northern boundary is Eighth Avenue at the Pelham/Lincoln Townline, and the 16 Mile Creek watershed line is the southern boundary.

Physical Description

This natural area follows the channel and closely associated floodplain areas of 16 Mile Creek.

It is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------------|--------------------------|
| ALLUVIUM | 28.55 |
| BEVERLY | 7.95 |
| BEVERLY - LOAMY PHASE | 2.84 |
| BRANTFORD | 24.33 |
| FRANKTOWN - VERY SHALLOW PHASE | 2.16 |
| HALDIMAND | 2.65 |
| HALDIMAND - LOAMY PHASE | 0.21 |
| LINCOLN | 14.71 |
| SMITHVILLE | 5.45 |
| SMITHVILLE - LOAMY PHASE | 0.09 |
| TAVISTOCK | 2.77 |
| TOLEDO | 3.34 |
| TOLEDO - LOAMY PHASE | 3.80 |
| WATER | 0.00 |
| NOT MAPPED | 1.15 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Forests of this study site are dominated by Black Walnut (*Juglans nigra*), White Ash (*Fraxinus americana*) and Shagbark Hickory (*Carya ovata*) or, Sugar Maple (*Acer saccharum* ssp. *saccharum*).

There are also Black Walnut Lowland communities noted that include Green Ash (*Fraxinus pennsylvanica*) as a dominant species. The understory is usually a mix of regenerating Black Walnut, White Ash and Shagbark Hickory with Hawthorn species (*Crataegus* sp.).

The herbaceous layer includes a mix of grasses with Black Raspberry (*Rubus occidentalis*), Goldenrods (*Solidago* sp.) and, Garlic Mustard (*Allaria petiolata*).

The Coniferous Forest communities noted were largely naturalizing Eastern White Pine (*Pinus strobus*) plantations.

Throughout the study site there are areas with a fair amount of pit and mound microtopography created by wind throw. The pits created sustain a Meadow Marsh or Graminoid Meadow community. The Meadow Marsh is characterized by a mix of Reed Canary Grass (*Phalaris arundinacea*), and European Stinging Nettle (*Urtica dioica* ssp. *dioica*) while the Graminoid Meadow contains some Grey Dogwood (*Cornus foemina* ssp. *racemosa*), and Staghorn Sumac (*Rhus typhina*).

The Mixed Meadows were found more in the mound areas dominated by Grass-leaved Goldenrod (*Euthamia graminifolia*), Common Teasel (*Dipsacus fullonum* ssp. *sylvestris*), Wild Carrot (*Daucus carota*), and some Bird's Foot Trefoil (*Lotus corniculatus*).

There is a very narrow forest band running along the valley slope of the stream. In the floodplain area, there is a Shallow Marsh community dominated by Smartweed (*Polygonum* sp.), Bur-reed (*Sparganium* sp.) and Bulrushes (*Scirpus* sp.).

Vegetation Communities

There are a total of 200 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)

Vegetation Type

Dry-Fresh Black Walnut Deciduous Woodland Type (WODM4-4)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FODM7-4)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Hawthorn Deciduous Shrub Thicket Type (THDM2-11)
Open Graminoid Meadow Type (MEGM4-1)
Pondweed Mixed Shallow Aquatic Type (SAM_1-4)
Reed Canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Aquatic Type (MASM1-14)

Significant Flora**Species at Risk**

Juglans cinerea (Butternut) (NPCA, 2006-2009) – Endangered

Provincially Rare Species – None noted

Points of Interest

One willow tree was observed in the flood plain very near the creek that was 161 cm dbh.

Good Monarch Butterfly habitat in flood plains and around the shallow marshes.

Faunal Records:

18- Birds
5- Reptiles & Amphibians
2 - Moths & Butterflies
2- Mammals

Site Visits

September 1, 1980
Brady, et al.

July 8, 2008
T. Staton, S. Mohamed

July 23, 2008
T. Staton, S. Mohamed

July 25, 2008
T. Staton, S. Mohamed

October 7, 2008
T. Staton, S. Mohamed

October 22, 2008
T. Staton, S. Mohamed

% of site visited

8.65 % of the total study site was visited by NAI teams.

References Cited

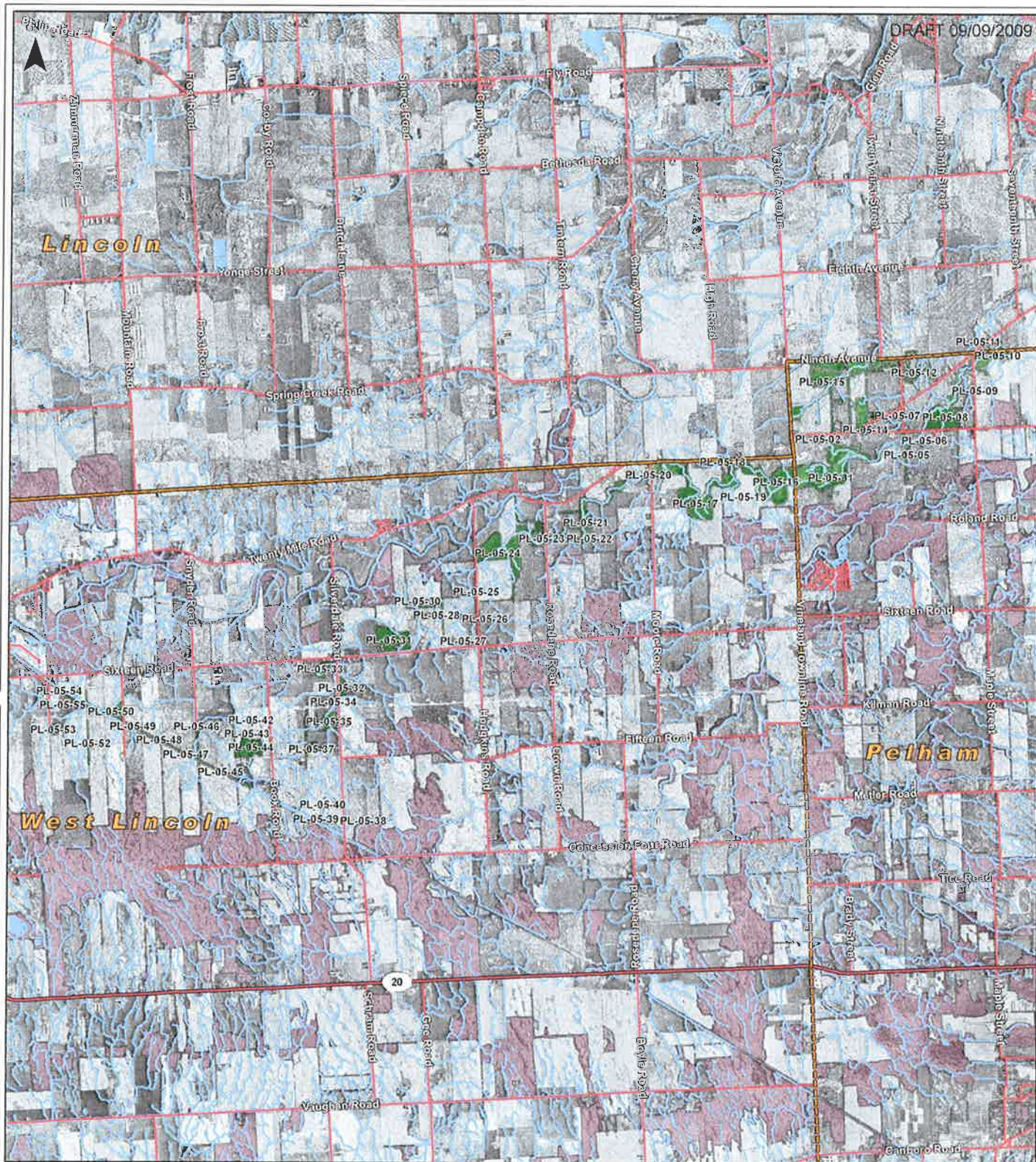
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Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-05



Natural Areas Inventory

Study Site PL-05

1:60,000

0 400 800 1,600 2,400 3,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 5° Projection, Zone 17N, Central Meridian 81° West



There are a total of 200 recorded taxa (unique plant records) for this study site

Community Series:

| | |
|--------------------------|---------------------|
| Coniferous Forest (FOC) | Meadow Marsh (MAM) |
| Deciduous Forest (FOD) | Mixed Meadow (MEM) |
| Deciduous Woodland (WOD) | Shallow Marsh (MAS) |
| Graminoid Meadow (MEG) | |

Study Site PL-07

Upper 15 Mile Creek

Municipality Town of Pelham

Formerly Welland Airport Woodlot (Brady et al., 1980)

Approximate Area 720 hectares

Watershed Fifteen Mile Creek to Lake Ontario

Ownership Mostly private

General Summary

This study site is bound to the north by the Lincoln/Pelham Townline and to the south by Highway 20. The western boundary is Regional Road 24/Victoria Avenue and the eastern boundary is the 12 Mile Creek watershed divide.

Physical Description

This natural area is located at the toe of the north west slope of the Fonthill Kame-Delta Complex.

It is largely situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain.

The northern portion is underlain by the shale, dolostone and limestone of the Lockport Formation, with the central portion being largely dolostone of the Lockport Formation.

The southern portion is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|---------------------------------|
| ALLUVIUM | 19.95 |
| BENNINGTON | 0.19 |
| BEVERLY | 7.36 |
| BEVERLY - LOAMY PHASE | 2.94 |
| BRANT - RED PHASE | 0.36 |
| BRANTFORD | 2.74 |
| COLWOOD - RED PHASE | 0.11 |
| FLAMBOROUGH | 0.01 |
| FOX - RED PHASE | 0.22 |
| GRANBY | 0.64 |
| GRIMSBY | 1.03 |
| HALDIMAND | 24.11 |
| HALDIMAND - LOAMY PHASE | 0.08 |
| LINCOLN | 21.43 |
| MAPLEWOOD | 1.37 |
| MAPLEWOOD - RED PHASE | 0.13 |
| SMITHVILLE | 7.70 |
| TAVISTOCK | 0.79 |

| | |
|--------------------------|--------|
| TAVISTOCK - RED PHASE | 0.38 |
| TOLEDO | 4.27 |
| TOLEDO - LOAMY PHASE | 1.26 |
| TOLEDO - LOAMY RED PHASE | 0.04 |
| TUSCOLA - RED PHASE | 0.81 |
| VINELAND | 1.83 |
| WATER | 0.05 |
| NOT MAPPED | 0.20 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The steep, dry valley slopes and tablelands of this study site are characterized by mature Deciduous Forest communities dominated by Red Oak (*Quercus rubra*) and Shagbark Hickory (*Carya ovata*).

The understory is largely Sugar Maple (*Acer saccharum ssp. saccharum*) with regenerating Red Oak, Shagbark Hickory and Choke Cherry (*Prunus virginiana ssp. virginiana*).

The herbaceous layer is generally a mix of Blue-stem Goldenrod (*Solidago caesia*), Herb Robert (*Geranium robertianum*) and, Canada Goldenrod (*Solidago canadensis var. canadensis*).

The 15 Mile Creek floodplain supports a Giant Burreed (*Sparganium eurycarpum*), Buttonbush (*Cephalanthus occidentalis*), and Lesser Duckweed (*Lemna minor*) wetland where the creek tends to slow down due to impediments.

In the old oxbows and abandoned channels of the creek, Thicket Swamps dominated by Buttonbush were recorded for the open water areas. Silky Dogwood (*Cornus amomum ssp. obliqua*) Thicket Swamp communities lined the lowlands and wet margins of the creek. Green Ash (*Fraxinus pennsylvanica*) was also very common in these low lying areas.

Higher elevations throughout the study sites were dominated by meadow areas containing a mix of Silky Dogwood and Grey Dogwood (*Cornus foemina ssp. racemosa*).

The herbaceous layer was commonly a mix of Reed Canary Grass (*Phalaris arundinacea*) and Asters (*Aster sp.*).

Vegetation Communities

There are a total of 141 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
 Deciduous Thicket (THD)
 Graminoid Meadow (MEG)
 Meadow Marsh (MAM)
 Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh Oak-Hickory Deciduous Forest Type (FODM2-2)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Open Graminoid Meadow Type (MEGM4-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Silky Dogwood Mineral Deciduous Thicket Swamp type (SWTM2-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nuphar advena (Large Yellow Pond Lily) (NPCA, 2006-2009) – S3
Nyssa sylvatica (Black Gum) (Brady et al., 1980) – S3

Points of Interest

It was noted in Brady et al. that this area was being drained into adjacent farmlands which it was believed could effect species composition in the future.

A heronry was mapped in this study site in the floodplain of the 15 Mile Creek.

Faunal Records:

99 – Birds
18 - Mammals
11- Reptiles & Amphibians

Site Visits

September 1, 1980
Brady et al.

October 29, 1999
Natural Resource Solutions Inc.

October 4, 2008
A. Garofalo, S. Mohamed, E. Feferman

November 3, 2008
A. Garofalo

% of site visited

1.46 % of the total study site was visited by NAI teams.

References Cited

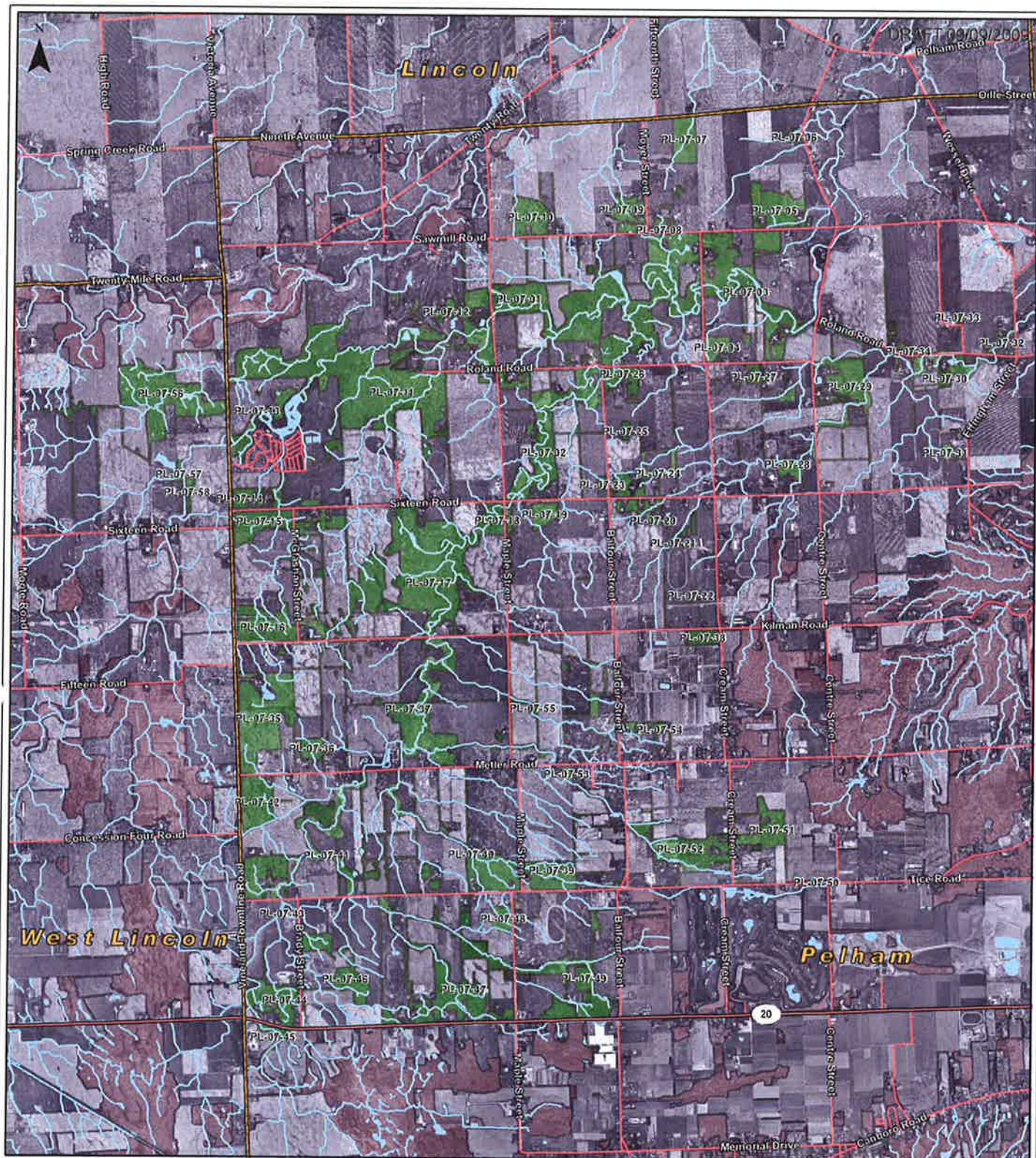
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-07



Natural Areas Inventory

Study Site PL-07

1:41,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 141 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Forest (FOD)
Deciduous Thicket (THD)
Thicket Swamp (SWT)

Study Site PL-10

Rose Little Woods – Merritt Road Swamp

Municipality Most of this study site is located in the City of Thorold however; it included an important area in the Town of Pelham.

Formerly Rose Little Woodlot (Brady et al., 1980)

Approximate Area 548 hectares

Watershed The majority of this study site drains to the north/ east to the Welland Canal North subwatershed. There is a small portion that drains to the south/ west to Draper's Creek.

Ownership Mostly private

General Summary

This Study Site is located mostly within the municipality of Thorold however there are some significant sites that are within Pelham that is connected to this study site.

This Study Site is located between the Welland Canal to the east, and Haist Street to the west. It extends from Highway 20 in the north to almost Woodlawn Road to the south.

Physical Description

This natural area is located on the eastern slope of the Fonthill Kame-Delta Complex on the well drained, sand and loamy sand soils of the Sand Plain. In the far eastern reaches of this study site, inverted soils are likely due to the construction of the Welland Canal.

It is underlain in the far northern portion by the shale, dolostone and limestone of the Lockport Formation, and in the central section by the dolostone of the Lockport Formation.

The southern portion is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------------|---------------------------------|
| ALLUVIUM | 2.54 |
| BERRIEN | 7.64 |
| BERRIEN - RED PHASE | 0.14 |
| BEVERLY | 2.90 |
| BEVERLY - COARSE PHASE | 2.86 |
| BEVERLY - LOAMY PHASE | 16.17 |
| BOOKTON | 2.57 |
| BRANT - RED PHASE | 0.15 |
| BRANTFORD | 0.11 |
| COLWOOD | 0.40 |
| GRIMSBY | 3.12 |
| MAPLEWOOD - RED PHASE | 3.03 |
| TAVISTOCK | 0.37 |

| | |
|-----------------------|--------|
| TAVISTOCK - RED PHASE | 3.41 |
| TOLEDO | 7.65 |
| TOLEDO - LOAMY PHASE | 31.26 |
| TUSCOLA | 1.52 |
| TUSCOLA - RED PHASE | 1.37 |
| VINELAND | 2.35 |
| VITTORIA | 0.03 |
| WALSHER | 0.01 |
| WAUSEON | 3.07 |
| WATER | 0.00 |
| NOT MAPPED | 7.34 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The majority of the areas visited within this study site were dominated by Deciduous Swamps. It was common throughout this site to have dry meadows occurring along the rims and crests of slight sandy ridges alternating with standing water pools, or slough ponds.

The Deciduous Swamps were characterized by Green Ash (*Fraxinus pennsylvanica*), Swamp Maple (*Acer fremanii*), and Red Maple (*Acer rubrum*) in the canopy.

The understory was largely Spicebush (*Lindera benzoin*) and Glossy Buckthorn (*Rhamnus frangula*).

The ground layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Fowl Manna Grass (*Glyceria striata*), Climbing Poison-ivy (*Rhus radicans* ssp. *negundo*), and Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*).

On the drier ridges, Mixed Meadow dominated by Little Bluestem (*Schizachyrium scoparium*) was present. Red Oak (*Quercus rubra*), White Elm (*Ulmus americana*) and, Green Ash were found on the slopes.

The wetland-terrestrial interface supported a mix of Foxglove Beard-tongue (*Penstemon digitalis*), Brown-eyed Susan (*Rudbeckia hirta*), and Early Goldenrod (*Solidago juncea*).

The interface of upland and lowland then graded into a typical Meadow Marsh community consisting of mainly Alpine Rush (*Juncus alpinoarticulatus*) with a mix of Sedges (*Carex* sp.).

The deeper open water slough ponds were dominated by Bebb's Willow (*Salix bebbiana*) and Narrow-leaved Cattail (*Typha angustifolia*) with Purple Loosestrife (*Lythrum salicaria*), Sensitive Fern (*Onoclea sensibilis*), Sedges and, Soft Rush (*Juncus effusus* ssp. *solutus*).

In disturbed areas it was noted that Glossy Buckthorn was the dominant species.

Vegetation Communities

There are a total of 211 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Bebb's Willow Mineral Deciduous Thicket Swamp Type (SWTM3-2)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Canada Blue-joint Graminoid Mineral Shallow Marsh Type (MASM1-9)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Non-native Mineral Deciduous Thicket Swamp Type (SWTM5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Rush Graminoid Mineral Meadow Marsh Type (MAMM1-13)
Spike-rush Mineral Shallow Marsh Type (MASM1-11)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (Brady et al., 1980) - Endangered
Cornus florida (Eastern Flowering Dogwood) (Brady et al., 1980) – Endangered
Juglans cinerea (Butternut) (Brady et al., 1980) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

5- Reptiles & Amphibians

4-Birds

1- Mammal

Site Visits

September 1, 1980

Brady et al.

July 20, 2006

A. Garofalo, K. White

July 24, 2006

A. Garofalo, K. White

November 4, 2008

A. Garofalo, S. Mohamed

November 5, 2008

A. Garofalo

% of site visited

0.84 % of the total study site was visited by NAI teams.

References Cited

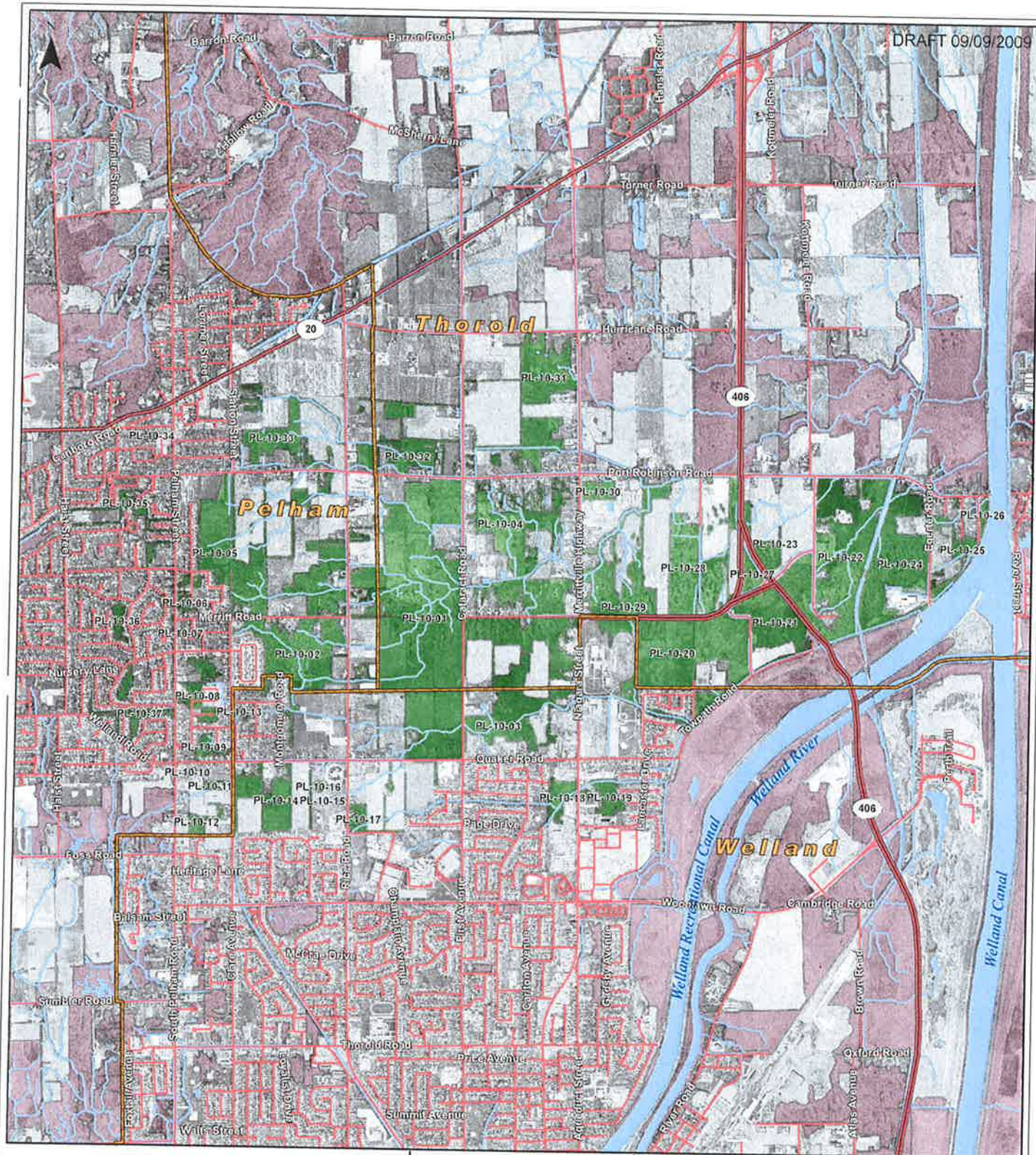
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site PL-10



Natural Areas Inventory

Study Site PL-10

1:37,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 5° Projection, Zone 17N, Central Meridian 81° West



There are a total of 211 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Swamp (SWD)

Deciduous Thicket (THD)

Meadow Marsh (MAM)

Mixed Meadow (MEM)

Shallow Marsh (MAS)

Study Site TH-02

Port Robinson Duck Ponds

Municipality City of Thorold

Formerly Port Robinson Duck Ponds (Brady et al., 1980)

Approximate Area 329 hectares

Watershed The majority of this study site drains south/ east to the Welland Canal North subwatershed. There is a small area to the north that drains to the Lake Gibson system.

Ownership Mostly private

General Summary

This Study site is located within the City of Thorold between Niagara St./Merrittville Highway to the west and the Welland Canal to the east. The northern boundary is Highway 20 and Port Robinson Road makes up the southern boundary.

Physical Description

The western portion of this natural area is characterized by the well drained sand and loamy sand of the Sand Plain. The eastern portion is characteristic of the flat, poorly drained, clay and silty clay soils of the Clay Plain.

The entire areas in underlain by the dolostone of the Guelph Formation.

The soils of the canal lands in the far east of this study site are inverted due to the digging operations during the canal construction.

Soils

| Soil Type | Percentage of the Study Site |
|-----------------------|-------------------------------------|
| ALLUVIUM | 7.08 |
| BERRIEN | 3.31 |
| BEVERLY | 8.92 |
| BEVERLY - LOAMY PHASE | 12.45 |
| BRANTFORD | 4.73 |
| TOLEDO | 38.06 |
| TOLEDO - LOAMY PHASE | 8.12 |
| TUSCOLA | 0.09 |
| TUSCOLA - RED PHASE | 0.22 |
| VINELAND | 0.22 |
| WAUSEON | 0.70 |
| WATER | 2.08 |
| NOT MAPPED | 14.03 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Deciduous Swamp communities in this study site were dominated by Red Oak (*Quercus rubra*), Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*) and, Pin Oak (*Quercus palustris*) with a few stands of Eastern White Pine (*Pinus strobus*) on the driest ridges.

The understory was largely Glossy Buckthorn (*Rhamnus frangula*), Grey Dogwood (*Cornus foemina* ssp. *racemosa*), Siky Dowood (*Cornus amomum* sp. *obliqua*) and, Common Buckthorn (*Rhamnus cathartica*).

The herbaceous layer was a mix of Sedges (*Carex* sp.), Avens (*Geum* sp.), Goldenrod (*Solidago* sp.) and, Asters (*Aster* sp.).

This bottomland and riparian areas supported a floodplain community with dense thickets of Glossy Buckthorn. An open canopied riparian Green Ash swamp with expansive marshes, along the creek channel and adjacent floodplain was noted. This community was dominated by Reed Canary Grass (*Phalaris arundinacea*), Panicked Aster (*Aster lanceolatus* ssp. *lanceolatus*) or One-sided Aster (*Aster lateriflorus* var. *lateriflorus*) and Moneywort (*Lysimachia nummularia*).

Also noted was the community for which this study site was originally named. Most of this study site is located on old canal excavation material. A railroad line prevents drainage creating large ponds. NAI teams did not visit the site however it was noted through air photo interpretation that the inundated valley wetlands were likely Duckweed (*Lemna* sp.) ponds, Buttonbush (*Cephalanthus occidentalis*) Thicket Swamps, and Bur-reed (*Sparganium* sp.) and Cattail (*Typha* sp.) Marshes in a reoccurring pattern.

Steep and well drained valley slopes supported the drier Deciduous Forest communities dominated by Red Oak, Shagbark Hickory (*Carya ovata*) and White Oak (*Quercus alba*). Occasionally, Sugar Maple (*Acer saccharum* ssp. *saccharum*) or American Beech (*Fagus grandifolia*) were also present.

The understory was largely Hop Hornbeam (*Ostrya virginiana*), Black Cherry (*Prunus serotina*), Blue Beech (*Carpinus caroliniana*) and Downy Serviceberry (*Amelanchier arborea*).

The herbaceous layer was a mix of Goldenrods and Asters with some Wild Leek (*Allium tricoccum*).

Vegetation Communities

There are a total of 83 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Vegetation Type

Dry-Fresh Oak-Hickory Deciduous Forest Type (FODM2-2)
Dry-Fresh Oak-Red Maple Deciduous Forest Type (FODM2-1)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Non-native Mineral Deciduous Thicket Swamp Type (SWTM5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora**Species at Risk**

Cornus florida (Eastern Flowering Dogwood) (Brady et al., 1980) - Endangered

Provincially Rare Species- None noted.

Points of Interest**Faunal Records:**

3- Reptiles & Amphibians
2- Birds
1- Mammal

Site Visits

September 1, 1980
Brady et al.

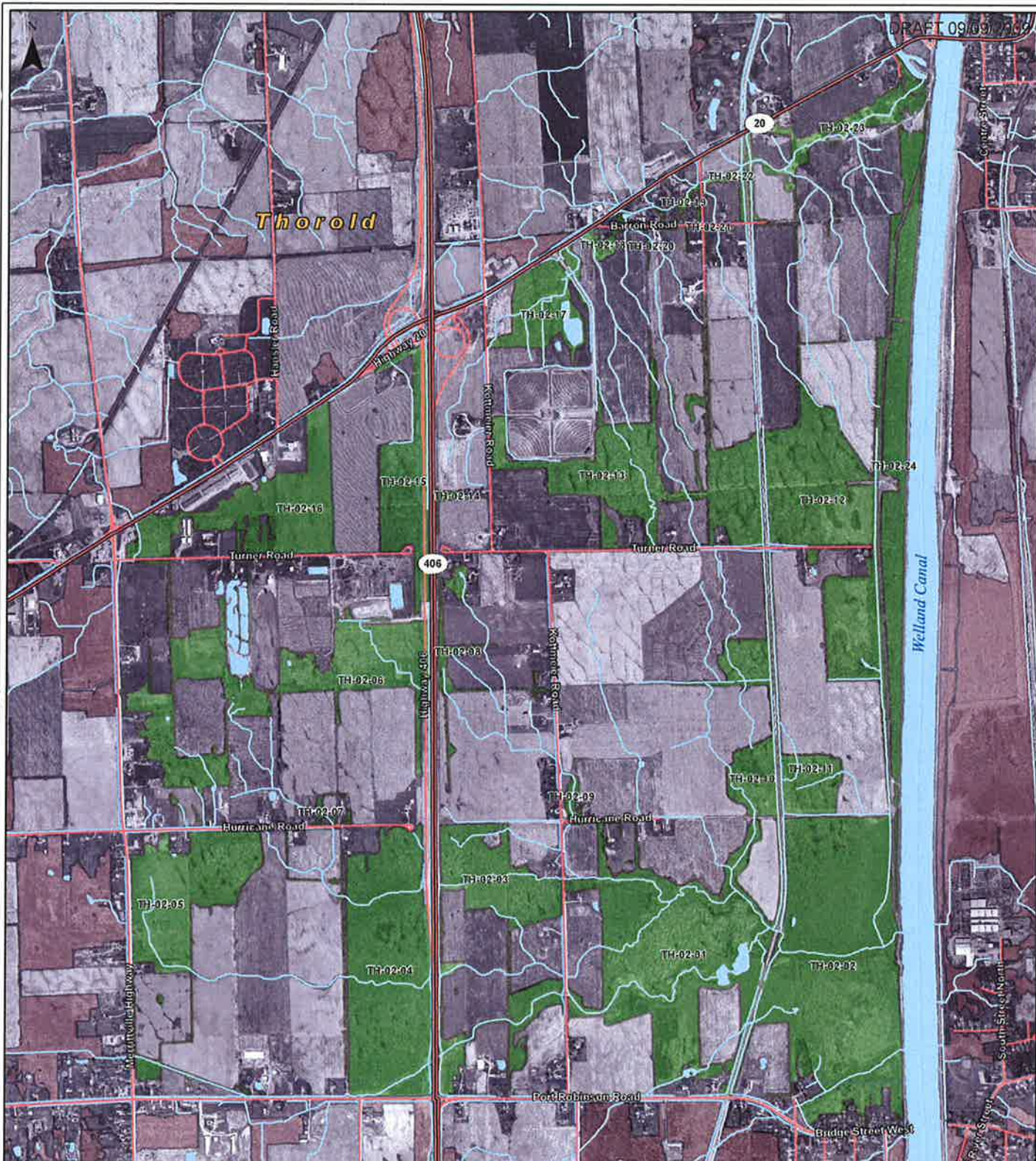
November 5, 2008
A. Garofalo

% of site visited

3.85 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site TH-02



Natural Areas Inventory

Study Site TH-02



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 All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 83 recorded taxa (unique plant records) for this study site.
Community Series:
 Deciduous Forest (FOD)
 Deciduous Swamp (SWD)

Study Site WF-01

Chippawa Creek Wetlands

Municipality Township of Wainfleet

Formerly Chippawa Creek Conservation and Wildlife Management Area (Brady, et al., 1980)

Approximate Area 500 hectares

Watershed The drainage for this study site is split between Wolf Creek Drain, Welland River West and an unnamed Creek.

Ownership Mostly private with some area owned by Niagara Peninsula Conservation Authority (Chippawa Creek Conservation Area).

General Summary

This study site is located within the Township of Wainfleet between Sideroad 42 in the east and Marshagan Rd/ Sideroad 50 in the west. It extends from the Welland River in the north to the Wainfleet/ Haldimand Townline in the south.

Physical Description

This northern portion of this natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

The southern reaches are situated on the better drained Sand Plain underlain with the same Salina Formation of dolostone and shale.

Soils

| Soil Type | Percentage of Study Site |
|------------------------|---------------------------------|
| ALLUVIUM | 1.01 |
| BERRIEN | 2.00 |
| BEVERLY | 7.98 |
| BEVERLY - COARSE PHASE | 2.04 |
| BEVERLY - LOAMY PHASE | 8.03 |
| BRANTFORD | 0.72 |
| LINCOLN | 0.47 |
| MAPLEWOOD | 0.01 |
| TAVISTOCK | 1.03 |
| TOLEDO | 30.23 |
| TOLEDO - COARSE PHASE | 1.96 |
| TOLEDO - LOAMY PHASE | 38.44 |
| WAUSEON | 3.99 |
| WATER | 0.66 |
| NOT MAPPED | 1.42 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This is a typical slough forest with the deepest areas of the swamp supporting Deciduous Swamps and Shallow Marshes and the driest knolls supporting a complex of terrestrial forest communities.

The Deciduous Swamps were dominated by Red Maple (*Acer rubrum*), Green Ash (*Fraxinus pennsylvanica*), and White Elm (*Ulmus americana*).

The drier knolls were slightly rolling with some microtopography. These were dominated by Sugar Maple (*Acer saccharum ssp. saccharum*), Red Oak (*Quercus rubra*) and, Blue Beech (*Carpinus caroliniana*). A few supported small stands of Largetooth Aspen (*Populus grandidentata*).

The understory was a mix of Asters (*Aster sp*) and Goldenrods (*Solidago sp*).

There were a few inclusions of Naturalized Conifer Plantations which were dominated by Norway Spruce (*Picea abies*).

The Shallow Marsh communities noted were largely dominated by Broad-leaved Sedges (*Carex sp*) and surrounded by Red Osier Dogwood (*Cornus stolonifera*), or Buttonbush (*Cephalanthus occidentalis*).

Vegetation Communities

There are a total of 531 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket Swamp (SWT)
Shallow Marsh (MAS)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Scotch Pine Naturalized Coniferous Plantation Type (FOCM6-3)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Forb Organic Shallow Marsh Type (MASO2-1)

Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (NPCA, 2006-2009) – Endangered
Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980; NPCA, 2006-2009; Putnam, 1975) - Endangered
Juglans cinerea (Butternut) (Putnam, 1975) – Endangered

Provincially Rare Species

Juncus acuminatus (Sharp-fruited Rush) (Putnam, 1975) – S3
Nuphar advena (Large Yellow Pond-lily) (Putnam, 1975) – S3
Nyssa sylvatica (Black Gum) (Brady, et al., 1980; NPCA, 2006-2009; Putnam, 1975)

Points of Interest

Faunal Records:

63 – Birds
11- Reptiles & Amphibians
11- Mammals
9 – Moths & Butterflies

Site Visits

July 1, 1975
Wm. Putman

September 1, 1980
Brady, et al.

June 2, 2007
B. Curry

July 20, 2007
B. Curry

September 21, 2007
T. Staton, R. Kitchen

September 25, 2007
T. Staton, R. Kitchen

October 15, 2008
T. Staton, R. Kitchen

% of site visited

10.47 % of the total study site was visited by NAI teams.

References Cited

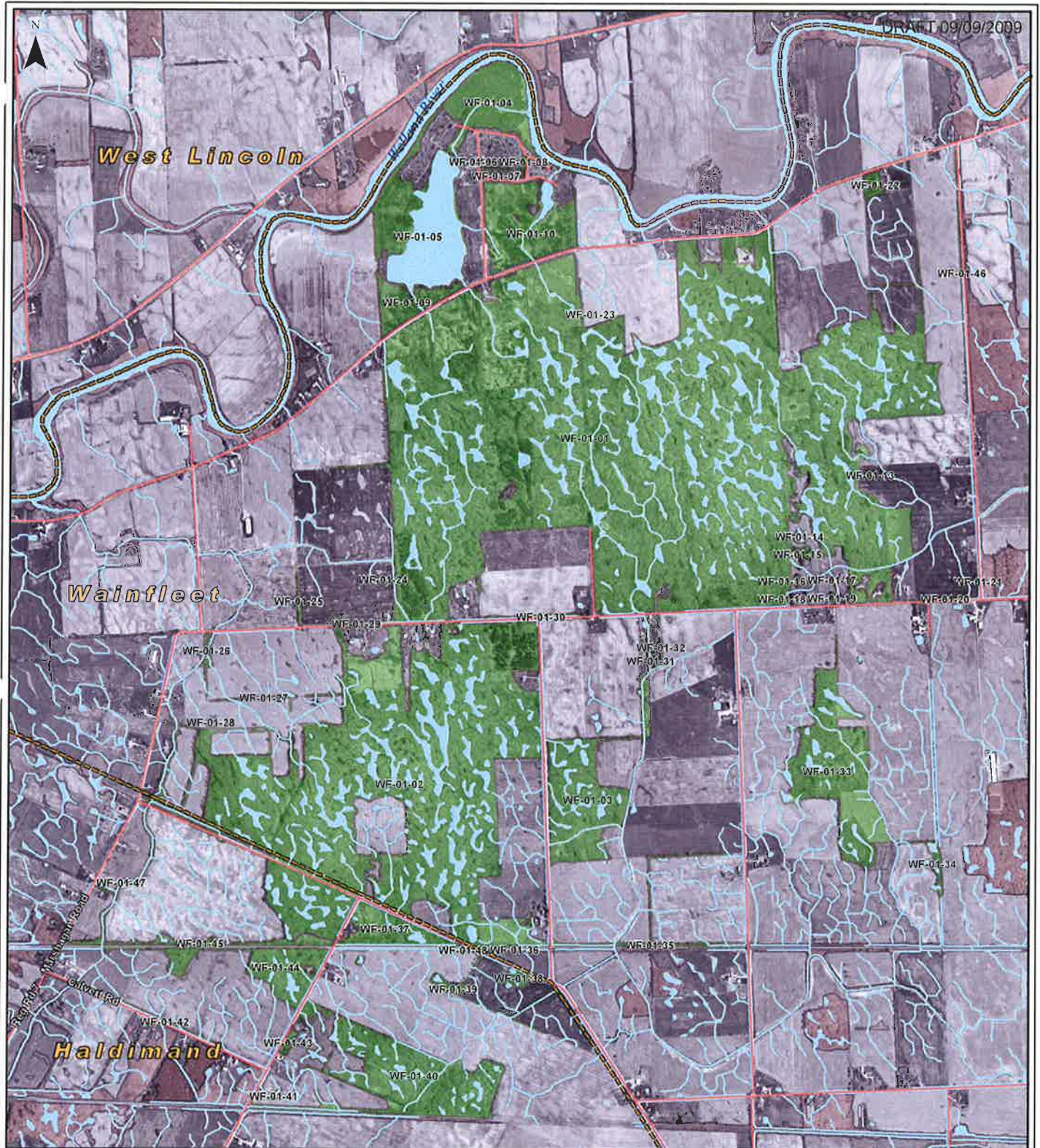
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-01



Natural Areas Inventory

Study Site WF-01

1:22,000

0 150 300 600 900 1,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 531 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WF-02

Myer's Woods

Municipality Wainfleet

Formerly Myer's Woodlot (Brady et al., 1980)

Approximate Area 255 hectares

Watershed This study site drains to the Little Forks Creek and Wolf Creek Drain East subwatersheds.

Ownership Mostly private

General Summary

Study site WF-02 is located in the Township of Wainfleet and is bound by Creek/River Road to the north, Gracey and Smith Roads to the east, Willford Road to the south, and Sideroad 42 to the west.

Physical Description

This northern portion of this natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

The southern reaches are situated on the better drained Sand Plain underlain with the same Salina Formation of dolostone and shale.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 0.10 |
| BEVERLY | 2.73 |
| BEVERLY - LOAMY PHASE | 13.31 |
| BRANTFORD | 0.08 |
| TOLEDO | 17.02 |
| TOLEDO - LOAMY PHASE | 66.77 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Study site WF-02 is highly variable with many complexes and inclusions noted.

The dominant community type was Deciduous Swamp characterized by Silver Maple (*Acer saccharinum*), with Red Maple (*Acer rubrum*) and Green Ash (*Fraxinus pennsylvanica*).

The understory was largely regenerating Silver Maple and Green Ash with Blue Beech (*Carpinus caroliniana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Goldenrod species (*Solidago* sp.) and Mosses (*Moss* sp.).

The areas of deep organic deposits were classified as either Winterberry (*Ilex verticillata*) Thicket Swamps, or Willow (*Salix* sp.) Thicket Swamps.

The areas with standing open water supported Cattail (*Typha* sp.) Shallow Marshes, or, Reed Canary Grass (*Phalaris arundinacea*) Shallow Marshes with Beggar-ticks (*Bidens* sp.) as an associate.

Vegetation Communities

There are a total of 138 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Deciduous Forest (FOD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Fresh - Moist Oak - Maple Deciduous Forest Type (FODM9-2)
Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type (FODM6-5)
Mixed Willow Organic Deciduous Thicket Swamp Type (SWTO2-6)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed Canary Grass Organic Shallow Marsh Type (MASO1-4)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk

Eastern Flowering Dogwood (*Cornus florida*) (Brady et al, 1980) – Endangered

Provincially Rare Species- None noted.

Regionally Rare Species

Points of Interest

Many of the trees over 40cm appear to be marked for logging.

Faunal Records:

10 - Birds
3 - Mammals

Site Visits

September 1, 1980
Brady et al.

October 24, 2007
T. Staton, R. Kitchen

% of site visited

11.19 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-02



Natural Areas Inventory

Study Site WF-02

1:19,500

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 138 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site WF-03

Little Forks Creek

Municipality Township of Wainfleet

Formerly Henderson Road Woodlots (Brady, et al., 1980)

Approximate Area 225 hectares

Watershed This study site drains north to the Welland River West subwatershed and also to the south and east by Little Forks Creek to the Welland River.

Ownership Mostly private

General Summary

This study site is located in the Township of Wainfleet between Gracey Road to the west and Vineland Townline Road in the east. The southern boundary is Concession 6 Road and Little Forks Creek while the Welland River is the northern boundary.

Physical Description

The majority of this natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

The far southern reaches are situated on the better drained Sand Plain underlain with the same Salina Formation of dolostone and shale.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 6.16 |
| BEVERLY | 15.75 |
| BEVERLY - LOAMY PHASE | 17.19 |
| BRANTFORD | 1.19 |
| TOLEDO | 11.89 |
| TOLEDO - COARSE PHASE | 0.00 |
| TOLEDO - LOAMY PHASE | 47.82 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site exhibits gently undulating slough and ridge topography.

The Deciduous Swamp communities were noted as being very wet. They were dominated by Freeman's Maple (*Acer fremanii*) and Green Ash (*Fraxinus pennsylvanica*) with some Sugar Maple (*Acer saccharum ssp. saccharum*) and Red Maple (*Acer rubrum*).

The understory was a mix of Common Clearweed (*Pilea pumila*), Thicket Creeper (*Parthenocissus inserta*), Cinnamon fern (*Osmunda cinnamomea*), and Royal fern (*Osmunda regalis* var. *spectabilis*).

The drier areas of this study site were noted as Deciduous Forest with a dominance of Sugar Maple, Black Walnut (*Juglans nigra*), and Red Oak (*Quercus rubra*).

The understory in these areas was characterized by Spicebush (*Lindera benzoin*), Maple-leaved Viburnum (*Viburnum acerifolium*), and Witch-hazel (*Hamamelis virginiana*) with Large-leaved Aster (*Aster macrophyllus*).

Also noted for this study site were several small swamps with sections of open marsh. These areas were largely dominated by Buttonbush (*Cephalanthus occidentalis*), Winterberry (*Ilex verticillata*) and Highbush Blueberry (*Vaccinium corymbosum*) and an herbaceous layer of Beggar-ticks (*Bidens* sp) and Spotted Touch-me-nots (*Impatiens capensis*).

The associated tree species where they existed were Freeman's Maple, Yellow Birch (*Betula alleghaniensis*), and some Black Gum (*Nyssa sylvatica*).

Vegetation Communities

There are a total of 266 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Oak-Sugar Maple Mineral Deciduous Swamp Type (SWDM9-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – S2
Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3
Solidago ulmifolia (Elm-leaved Goldenrod) (NPCA volunteers, 2006-2009) – S1 (unconfirmed)

Points of Interest**Faunal Records:**

- 7- Birds
- 5- Reptiles & Amphibians
- 5- Mammals
- 4- Moths & Butterflies

Site Visits

September 1, 1980

Brady, et al.

July 18, 2007

T. Staton, R. Kitchen

July 18, 2007

T. Staton, R. Kitchen

July 23-25, 2007

T. Staton, R. Kitchen

August 3, 2007

J. Kellam, M. Potter, J. Potter, R. Young

August 16, 2007

J. Damude, J. Kellam, M. Potter, J. Potter, R. Young

% of site visited

14.66 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-03



Natural Areas Inventory

Study Site WF-03

1:38,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 266 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Mixed Meadow (MEM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site WF-04

Perry Road Woods

Municipality Township of Wainfleet

Formerly Perry Road Woodlot (Brady, et al.)

Approximate Area 281 hectares

Watershed The majority of this study site drains to the Welland River via Beezor Drain. There are two small portions in the north that drain to Little Forks Creek and Big Forks Creek.

Ownership Mostly private

General Summary

This study site is located in the Township of Wainfleet between Putman Road in the east and Smith Road in the west. It is bound on the south by the rail line and in the north it extends to just north of Concession 6 Road.

Physical Description

Study site WF-04 is situated entirely within the Sand Plain characterized by well drained silty and loamy sands underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 0.01 |
| BERRIEN | 0.08 |
| BEVERLY | 0.02 |
| BEVERLY - LOAMY PHASE | 1.47 |
| MAPLEWOOD | 75.68 |
| TAVISTOCK | 11.51 |
| TOLEDO - LOAMY PHASE | 11.06 |
| WAUSEON | 0.18 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was Deciduous Swamp which was characterized by Freeman's Maple (*Acer fremanii*), Green Ash (*Fraxinus pennsylvanica*), with Bur Oak (*Quercus macrocarpa*), Red Oak (*Quercus rubra*), or Trembling Aspen (*Populus tremuloides*), White Elm (*Ulmus americana*) and Yellow Birch (*Betula alleghaniensis*).

The understory was mostly Spicebush (*Lindera benzoin*) and Dogwoods (*Cornus sp.*).

The herbaceous layer was generally dominated by Sedges (*Carex sp*) and Thicket Creeper (*parthenocissus inserta*).

The drier areas were classified as Deciduous Forest communities. The majority were dominated by Sugar Maple (*Acer saccharum ssp. saccharum*) and Red Oak with Basswood (*Tilia americana*), Black Cherry (*Prunus serotina*) and Bitternut Hickory (*Carya cordiformis*).

The understory was largely Spicebush, Witch-hazel (*Hamamelis virginiana*) and Gray Dogwood (*Cornus foemina ssp. racemosa*).

The herbaceous layer was a mix of Large-leaved Aster (*Aster macrophyllus*), Wild Sarsaparilla (*Aralia nudicaulis*) and Canada Mayflower (*Maianthemum canadense*).

Vegetation Communities

There are a total of 273 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh Black Cherry Deciduous Forest Type (FODM4-8)
Fresh-Moist Bitternut Hickory Deciduous Forest Type (FODM9-5)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Forb Organic Shallow Marsh Type (MASO2-1)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Rice Cut-grass Organic Shallow Marsh Type (MASO1-10)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
Silver Maple Organic Deciduous Swamp Type (SWDO2-2)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp Maple Organic Deciduous Swamp Type (SWDO2-3)
Willow Mineral Deciduous Swamp Type (SWDM4-1)

Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora

Species at Risk

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – Endangered

Castanea dentata (American Chestnut) (NPCA, 2006-2009) – Endangered

Chimaphila maculata var. *maculata* (Spotted Wintergreen) (NPCA, 2006-2009) – Endangered

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered

Juglans cinerea (Butternut) (Brad, et al., 1980) - Endangered

Provincially Rare Species

Gleditsia triacanthos (Honey Locust) (Brady, et al., 1980) – S2

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

19- Birds

9- Mammals

7 – Reptiles & Amphibians

2- Moths & Butterflies

Site Visits

September 1, 1980

Brady, et al.

July 23, 2007

T. Staton, R. Kitchen

July 31, 2007

T. Staton, R. Kitchen

August 1, 2007

T. Staton, R. Kitchen

August 7, 2007

T. Staton, R. Kitchen

August 15, 2007

T. Staton, R. Kitchen

August 20, 2007

T. Staton, R. Kitchen

September 7, 2007

T. Staton, R. Kitchen

October 18, 2007

T. Staton, R. Kitchen

% of site visited

25.76 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-04



Natural Areas Inventory

Study Site WF-04

1:23,000

0 150 300 600 900 1,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 273 recorded taxa (unique plant records) for this study site.

Community Series:

- Coniferous Forest (FOC)
- Deciduous Forest (FOD)
- Deciduous Swamp (SWD)

Study Site WF-05

Elsie Road Woods

Municipality Township of Wainfleet

Formerly Elsie Road Woodlot (Brady, et al., 1980)

Approximate Area 415 hectares

Watershed This study site drains north east to the Welland River via the Welland River west subwatershed and south east to the Welland River by the Big Forks Creek. There is a small portion in the north west that drains via the Beezor Drain to the Welland River.

Ownership Mostly private.

General Summary

This study site is located in the township of Wainfleet between Concession Road 6 in the north and the rail line in the south. It is bound on the west by Putman Road and extends to just east of Gents Road.

Physical Description

Study site WF-05 is situated entirely within the Sand Plain characterized by well drained silty and loamy sands underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 1.19 |
| BEVERLY | 6.94 |
| BEVERLY - LOAMY PHASE | 4.75 |
| BRANTFORD | 0.00 |
| MAPLEWOOD | 1.59 |
| TAVISTOCK | 1.25 |
| TOLEDO | 13.13 |
| TOLEDO - LOAMY PHASE | 71.15 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most dominant community noted for this study site was Deciduous Swamp. These areas were characterized by Freeman's Maple (*Acer fremanii*), Red Maple (*Acer rubrum*), and Green Ash (*Fraxinus pennsylvanica*) with some Basswood (*Tilia americana*), Red Oak (*Quercus rubra*), White Elm (*Ulmus americana*), Yellow Birch (*Betula alleghaniensis*), and Black Gum (*Nyssa sylvatica*).

The understory of these areas was a mix of Spicebush (*Lindera benzoin*), Narrow-leaved Meadowsweet (*Spiraea alba*) and Highbush Blueberry (*Vaccinium corymbosom*).

The herbaceous layer was largely Ferns (*Osmunda sp*, *Onoclea sp*), Sedges (*Carex sp*), Mosses (*Sphagnum sp*), and Thicket Creeper (*Parthenocissus inserta*). A second Deciduous Swamp community had Poplar species as a co-dominant.

The Thicket Swamps noted were mostly Yellow Birch and White Elm dominated with Winterberry (*Ilex verticillata*) and Highbush Blueberry, or Trembling Aspen (*Populus tremuloides*) and Willow (*Salix sp*).

The wetter depressions supported stands of Narrow-leaved Cattails (*Typha angustifolia*).

Vegetation Communities

There are a total of 215 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating - leaved Shallow Aquatic (SAF)
Forb Meadow (MEF)
Meadow Marsh (MAM)
Mixed Meadow (MEM)
Thicket Swamp (SWT)

Vegetation Type

Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fowl Manna Grass Graminoid Mineral Meadow Marsh Type (MAMM1-5)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Red Maple Organic Deciduous Swamp Type (SWDO2-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened

Provincially Rare Species

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – S2
Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

12- Birds
6 – Reptiles & Amphibians
4- Mammals
1 – Moths & Butterflies

Site Visits

September 1, 1980
Brady, et al.

May 15, 2007
T. Staton, R. Kitchen

June 19, 2007
T. Staton, R. Kitchen

July 3, 2007
T. Staton, R. Kitchen

July 5, 2007
T. Staton, R. Kitchen

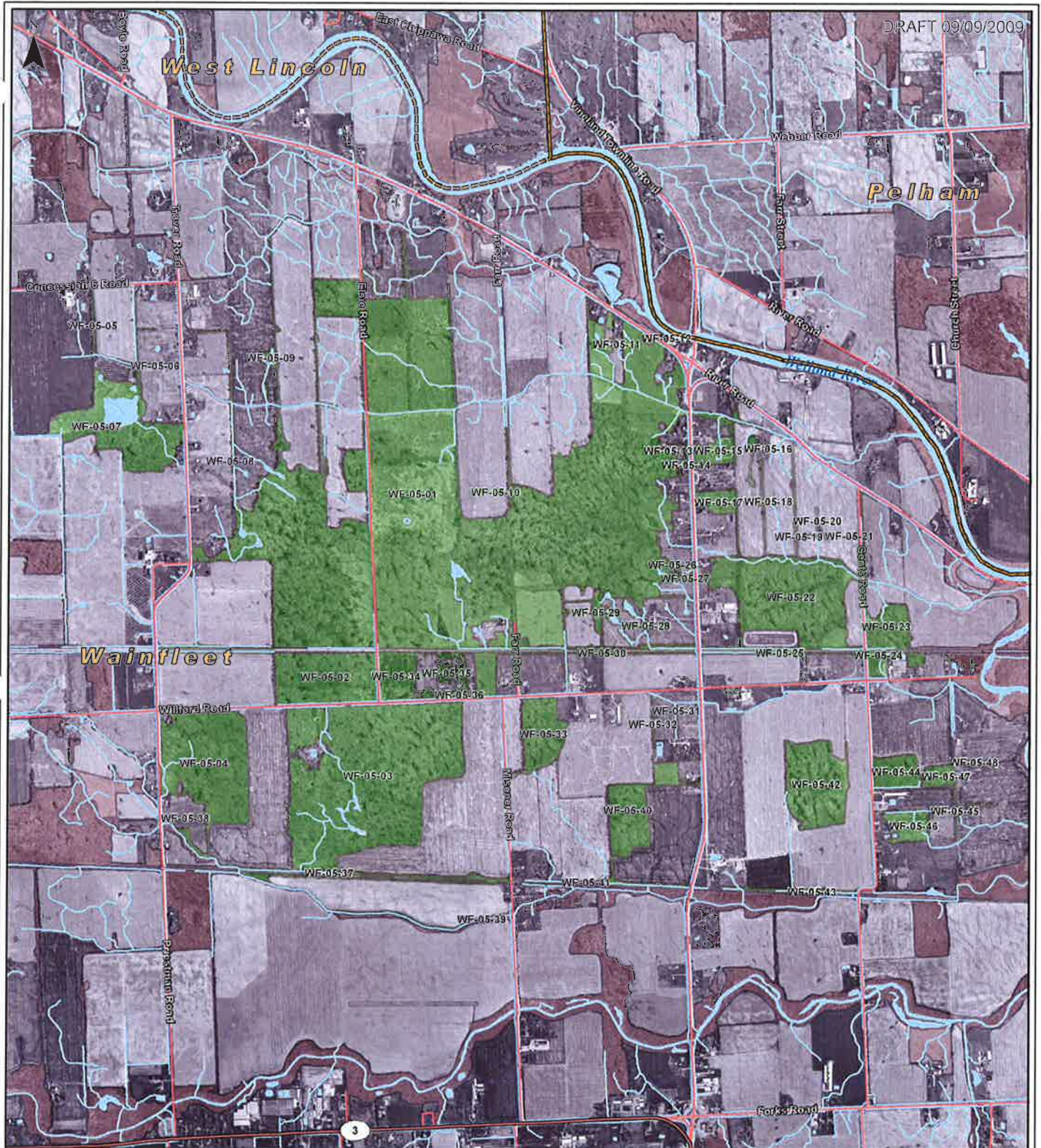
July 16, 2007
T. Staton, R. Kitchen

% of site visited

4.31 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-05



Natural Areas Inventory

Study Site WF-05

1:25,000

0 175 350 700 1,050 1,400 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 215 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Forb Meadow (MEF)

Meadow Marsh (MAM)
Mixed Meadow (MEM)
Thicket Swamp (SWT)

Study Site WF-06

Skrubbeltrang Woods

Municipality Township of Wainfleet

Formerly Skrubbeltrang Woods (Brady et al., 1980)

Approximate Area 102 hectares

Watershed The majority of this study site drains to Big Forks Creek and eventually the Welland River with a small portion in the north east draining to the Welland River via Beezor Drain.

Ownership Mostly private

General Summary

This study site is located in the Township of Wainfleet between Perry Road to the west and Pritestman Road in the east. It extends from Big Forks Creek in the south to the rail line in the north.

Physical Description

This natural area is situated entirely within the Sand Plain characterized by well drained silty and loamy sands underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 4.02 |
| BERRIEN | 0.28 |
| BEVERLY | 3.99 |
| BEVERLY - LOAMY PHASE | 17.63 |
| MAPLEWOOD | 64.08 |
| TAVISTOCK | 4.17 |
| TOLEDO | 0.19 |
| TOLEDO - LOAMY PHASE | 5.00 |
| WAUSEON | 0.65 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Swamp was dominated by Silver Maple (*Acer saccharinum*) and Green Ash (*Fraxinus pennsylvanica*) with Red Maple (*Acer rubrum*), and Basswood (*Tilia americana*).

The understory was largely Spicebush (*Lindera benzoin*), especially in areas disturbed by logging and fuel wood operations.

The herbaceous layer was Spicebush, Sensitive Fern (*Onoclea sensibilis*), and Fowl Manna Grass (*Glyceria striata*).

The drier forested areas were most often characterized by Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*) and Red Oak (*Quercus rubra*).

Spicebush, Witch-hazel (*Hamamelis virginiana*), Maple-leaved Viburnum (*Viburnum acerifolium*), and Christmas Fern (*Polystichum acrostichoides*) were common in the understory.

The Shallow Marsh communities noted were dominated by Silver Maple and Freeman's Maple (*Acer fremanii*) with White Elm (*Ulmus americana*), and Yellow Birch (*Betula alleghaniensis*).

The understory in these areas was once again characterized by Spicebush with Rice Cut Grass (*Leersia oryzoides*), Common Clearweed (*Pilea pumila*), Marsh Fern (*Thelypteris palustris* var. *pubescens*), and Beggar-ticks species (*Bidens* sp.).

Vegetation Communities

There are a total of 182 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Mixed Meadow (MEM)
Shallow Marsh (MAS)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Naturalized Deciduous Hedge-row Ecosite (FODM11)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3

Points of Interest

Faunal Records:

11 – Birds
5 – Reptiles & Amphibians
3 – Mammals
1 – Moth & Butterfly

Site Visits

September 1, 1980

Brady et al.

August 7, 24, 27, 2007

T. Staton, R. Kitchen

% of site visited

10.78 % of the total study site was visited by NAI teams.

References Cited

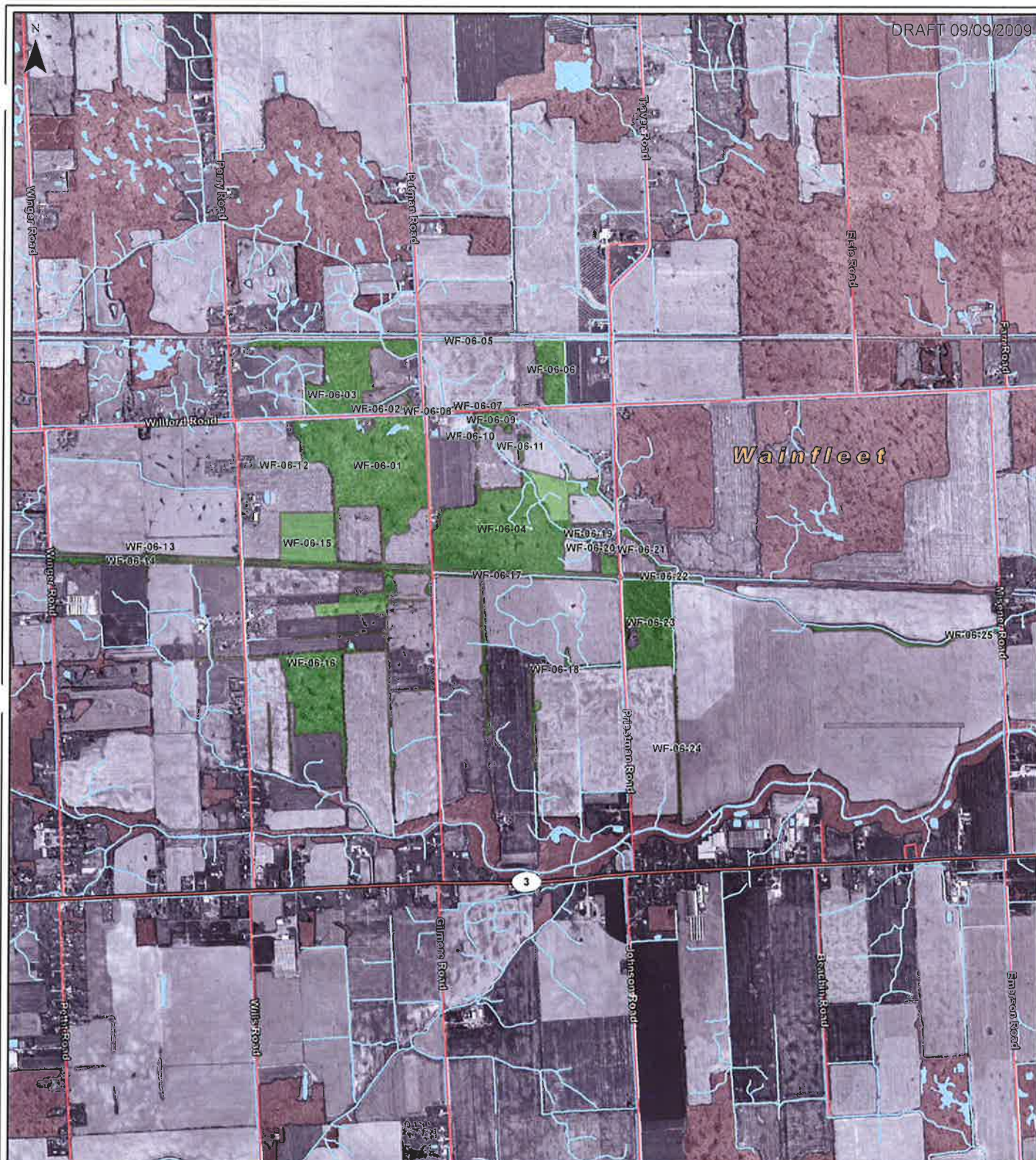
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- | | |
|-------------------|----------------------|
| Major Highways | Waterbodies |
| Regional Highways | Municipal Boundaries |
| Roads | Study Sites |
| Watercourses | Study Site WF-06 |



Natural Areas Inventory

Study Site WF-06

1:23,000

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 182 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD) Mixed Meadow (MEM)
Deciduous Swamp (SWD) Shallow Marsh (MAS)

Study Site WF-07

Forks Creek Meanders

Municipality Township of Wainfleet

Formerly Forks Creek Woods (Brady, 1980)

Approximate Area 203 hectares

Watershed This study site drains to Big Forks Creek.

Ownership Mostly private.

General Summary

This study site follows Big Forks Creek in the Township of Wainfleet from just west of Perry Road in the west to Hewitt Road in the east. It extends from Forks Road in the south to the rail line and River Road in the north.

Physical Description

This study site is characterized by the fact that it follows Big Forks Creek and includes the closely associated natural areas of the floodplain.

The headwaters of Big Forks Creek are in the silty and loamy sands of the Sand Plain, and outflow is in the clay and silty clay of the Welland River in the Haldimand Clay Plain. Both are underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 41.74 |
| BEVERLY | 34.33 |
| BEVERLY - LOAMY PHASE | 5.57 |
| BEVERLY - RED PHASE | 1.49 |
| BRANTFORD | 0.04 |
| COLWOOD | 0.19 |
| GRIMSBY - BROWN PHASE | 0.09 |
| MAPLEWOOD | 0.90 |
| TAVISTOCK | 1.57 |
| TOLEDO | 5.34 |
| TOLEDO - LOAMY PHASE | 7.75 |
| TOLEDO - RED PHASE | 0.96 |
| WATER | 0.03 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Much of this study site can be classified as a Deciduous Swamp complexed with drier knolls of Deciduous Forest. The swamp communities are characterized by Silver Maple (*Acer saccharum*), Red Maple (*Acer rubrum*), and Green Ash (*Fraxinus pennsylvanica*).

White Elm (*Ulmus americana*), Freeman's Maple (*Acer fremanii*), and Trembling Aspen (*Populus tremuloides*) were also noted.

The understory was largely Spicebush (*Lindera benzoin*), Spotted Touch-me-not (*Impatiens capensis*), and Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*) with Goldenrod species (*Solidago* sp.) and Spotted Crane's-bill (*Geranium maculatum*).

The slopes between these Deciduous Swamps and the drier Deciduous Forest communities were largely Shagbark Hickory (*Carya ovata*) and Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*) with Poison Ivy (*Rhus* sp.), Thicket Creeper (*Parthenocissus inserta*), and Common Clearweed (*Pilea pumila*).

Also noted were forests made up of Green Ash and Freeman's Maple with Black Walnut (*Juglans nigra*).

The driest forests were Red Oak (*Quercus rubra*) and Shagbark Hickory dominated with Basswood (*Tilia americana*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and Hawthorn species (*Crataegus* sp.).

The herbaceous layer was usually a mix of Goldenrods and Asters (*Aster* sp.), and Riverbank Grape (*Vitis riparia*).

The Mixed Shallow Aquatics were generally restricted to the edges of the stream and were dominated by Buttonbush (*Cephalanthus occidentalis*).

The majority of this community was complexed with open water where Pond-lilies (*Nuphar* sp.) dominated with Swamp Loosestrife (*Decodon verticillatus*), Duckweed (*Lemna minor*), Pickerel-weed (*Pontederia cordata*), and Common Arrowhead (*Sagittaria latifolia*). In places algae was abundant.

Vegetation Communities

There are a total of 260 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Arrow-head Mineral Shallow Marsh Type (MASM2-3)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)

Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Duckweed Mixed Shallow Aquatic Type (SAM_1-2)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FODM7-4)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Manna Grass Mineral Shallow Marsh type (MASM1-17)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Mineral Meadow Marsh Type (MAMM2-4)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Water Lily-Bullhead Lily Mixed Shallow Aquatic Type (SAM_1-8)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened
Juglans cinerea (Butternut) (Brady et al., 1980) – Endangered

Provincially Rare Species

Carex careyana (Carey's Wood Sedge) (NPCA, 2006-2009) – S2
Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3
Nuphar microphylla (Small Yellow Pond-lily) (NPCA, 2006-2009) – S3

Points of Interest

One marsh community supported a 20% cover of Crystalwort (*Riccia fluitans*).

Faunal Records:

15 – Birds
6 – Mammals
3 – Reptiles & Amphibians

Site Visits

September 1, 1980
Brady, et al.

May 25, 2007
J. Kellam, J. Damude, P. Foebel, J. Potter, R. Young, D. Young

June 19, 2007
T. Staton, R. Kitchen

June 20, 2007
T. Staton, R. Kitchen

July 10, 2007
T. Staton, R. Kitchen

July 12, 2007
T. Staton, R. Kitchen

July 13, 2007
T. Staton, R. Kitchen

% of site visited

16.73 % of the total study site was visited by NAI teams.

References Cited

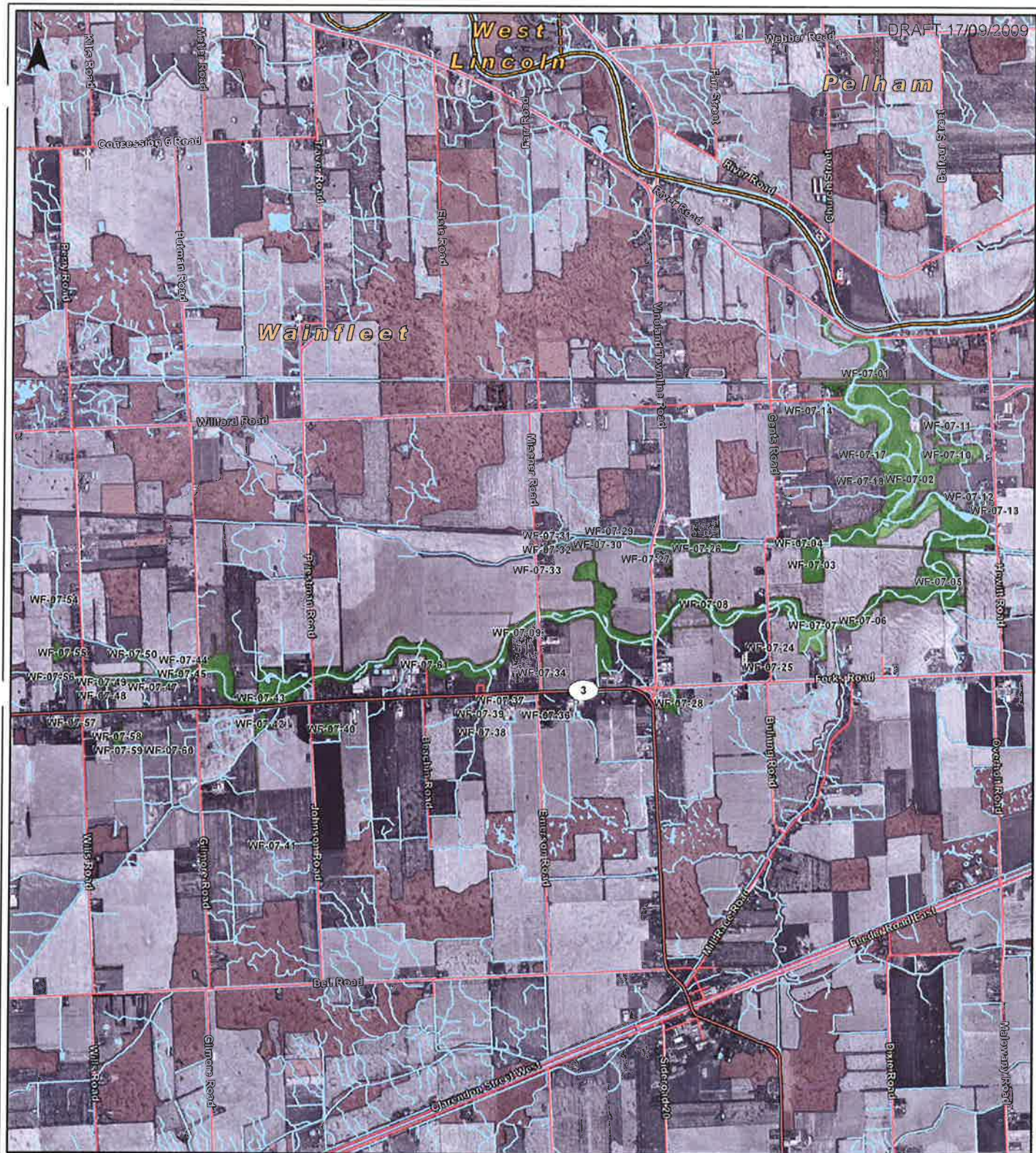
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Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- == Major Highways
- == Regional Highways
- Roads
- ~ Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-07



Natural Areas Inventory

Study Site WF-07

1:38,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 260 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)

Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site WF-08

Tunacliffe Road Woods

Municipality Township of Wainfleet

Formerly Tunacliffe Road Woods (Brady et al.)

Approximate Area 116 hectares

Watershed This study site drains to the Big Forks Creek subwatershed.

Ownership Mostly private

General Summary

This study site is located between Hewitt Road in the west and Deeks Road in the east. The northern boundary is River Road and the southern boundary is Forks Road.

Physical Description

The northern portion of this natural area is characterized by the distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

The southern reaches are situated on the better drained Sand Plain underlain with the same Salina Formation of dolostone and shale.

Soils

| Soil Type | Percentage of Study Site |
|----------------------|--------------------------|
| ALLUVIUM | 0.05 |
| BEVERLY | 5.04 |
| BEVERLY - RED PHASE | 4.87 |
| TOLEDO | 66.82 |
| TOLEDO - LOAMY PHASE | 3.37 |
| TOLEDO - RED PHASE | 9.32 |
| WATER | 0.00 |
| NOT MAPPED | 10.53 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Deciduous Swamp dominated by Pin Oak (*Quercus palustris*) with Swamp Maple (*Acer fremanii*), and Bur Oak (*Quercus macrocarpa*) was recorded for this site.

The understory was mostly regenerating canopy species with Green Ash (*Fraxinus pennsylvanica*), Blue Beech (*Carpinus caroliniana*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

Small dry knolls within the swamp supported Red Oak (*Quercus rubra*), Eastern Bracken Fern (*Pteridium aquilinum* var. *latiusculum*), and Large-leaved Aster (*Aster*

amcrophylloides).

Successional Thicket Swamp communities recorded had many smaller open Meadow Marsh areas. The Thicket Swamps were characterized by either Buttonbush (*Cephalanthus occidentalis*), or Gray Dogwood (*Cornus foemina* ssp. *racemosa*), with Soft Rush (*Juncus effusus* ssp. *solutus*), Goldenrod species (*Solidago* sp.) and Sedges (*Carex* sp.).

The open water communities were dominated by Greater Duckweed (*Spirodela polyhiza*).

Vegetation Communities

There are a total of 153 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)

Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)

Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

5 - Birds

4 - Moth/Butterflies

2 - Reptile/Amphibians

1 - Mammal

Site Visits

September 1, 1980

Brady, et al.

May 7, 2007

T. Staton, R. Kitchen

August 17, 2007

J. Kellam, M.Potter, D.Young, J.Potter, R.Young

% of site visited

6.11% of the total study site was visited by NAI teams.

References Cited

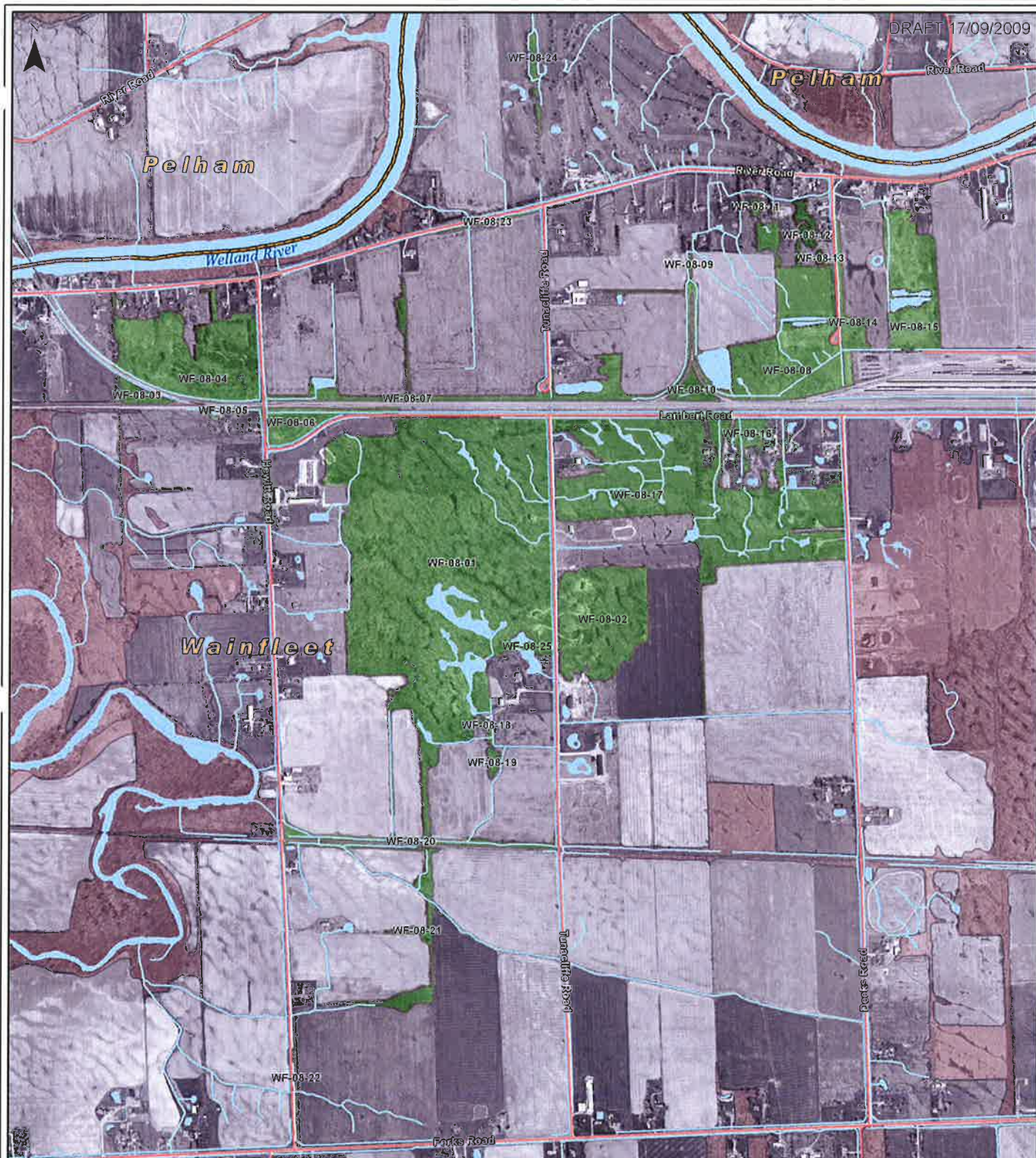
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Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-08



Natural Areas Inventory

Study Site WF-08

1:15,000

0 100 200 400 600 800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 153 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site WF-09

Farr's Road Woods

Municipality Wainfleet

Formerly Farr's Road Woods (Brady et al.)

Approximate Area 380 hectares

Watershed This study site drains to Big Forks Creek and the Welland River West subwatersheds.

Ownership Mostly private

General Summary

Study site WF-09 is located between the Welland River to the north and the abandoned Feeder Canal to the south. The western boundary is Tunacliffe Road and the eastern boundary is the intersection of the feeder Road East and Lambert Road.

Physical Description

This natural area is characterized by distinct slough/ridge topography associated with the flat, poorly drained Haldimand Clay Plain, and the underlying dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM | 0.16 |
| BEVERLY | 1.55 |
| BRANTFORD | 0.07 |
| TOLEDO | 93.55 |
| WATER | 0.00 |
| NOT MAPPED | 4.67 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most dominant community noted for this study site is Deciduous Swamp. There were two types delineated. The first was dominated by Red Maple (*Acer rubrum*), with Red Oak (*Quercus rubra*), Green Ash (*Fraxinus pennsylvanica*), and American Beech (*Fagus grandifolia*).

The second Deciduous Swamp noted was dominated by Pin Oak (*Quercus palustris*), with Red Maple, White Elm (*Ulmus americana*), and Trembling Aspen (*Populus tremuloides*).

The understory in both cases was mostly Narrow-leaved Meadowsweet (*Spirea alba*), Silky Dogwood (*Cornus amomum* ssp. *obliqua*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Lakebank Sedge (*Carex lacustris*), Spotted touch-me-not (*Impatiens capensis*), Hairy Solomon's Seal (*Polygonatum pubescens*), Sessile-leaved Bellwort (*Uvularia sessilifolia*), Canada Mayflower (*Maianthemum canadense*), and Virginia Spring Beauty (*Claytonia virginica*).

The Thicket Swamps recorded were largely Narrow-leaved Meadowsweet with Silky Dogwood and a scattering of Green Ash, Red Maple and Pin Oak.

The understory was a mix of Sedges, Asters (*Aster sp.*), and Sensitive Fern (*Onoclea sensibilis*).

The Shallow Aquatic community noted was characterized by Pondweed species (*Potamogeton sp.*) and Willow (*Salix sp.*).

Vegetation Communities

There are a total of 231 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Submerged Shallow Aquatic (SAS)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh - Moist Oak - Hardwood Deciduous Forest Type (FODM9-6)
Fresh - Moist Oak - Maple Deciduous Forest Type (FODM9-2)
Forb Mineral Shallow Marsh Type (MASM2-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Orchard Grass Graminoid Meadow Type (MEGM3-6)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Pondweed Submerged Shallow Aquatic Type (SAS_1-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady et al., 1980) – Endangered

Provincially Rare Species – None noted.

Points of Interest**Faunal Records:**

23 - Birds
5 – Reptiles & Amphibians
2 - Mammals
1 – Moth & Butterfly

Site Visits

September 1, 1980
Brady, et al.

May 16-18, 21, 28-29, 2007
T. Staton, R. Kitchen

June 1, 2007
J. Damude, J. Kellam, J. Potter, R. Young, D. Young

% of site visited

7.75% of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-09



Natural Areas Inventory

Study Site WF-09

1:27,000

0 200 400 800 1,200 1,600 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 231 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Graminoid Meadow (MEG)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)

Study Site WF-12

Jersey Woods (Mill Race Creek)

Municipality Township of Wainfleet

Formerly Jersey Woodlot (Brady et al., 1980)

Approximate Area 181 hectares

Watershed This study area drains west to East Kelly Drain and to Big Forks Creek to the east.

Ownership Mostly private

General Summary

This study site is located north of the feeder canal and south of Forks Road in the Township of Wainfleet. It stretches to just east of Overholt Road and is bound on the west by Johnson Road.

Physical Description

Study site WF-12 is situated entirely within the Sand Plain characterized by well drained silty and loamy sands underlain by the dolostone and shale of the Salina Formation.

Soils

| Soils | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 1.70 |
| BEVERLY | 1.10 |
| BEVERLY - LOAMY PHASE | 8.68 |
| COLWOOD | 1.21 |
| MAPLEWOOD | 1.21 |
| TOLEDO | 11.55 |
| TOLEDO - LOAMY PHASE | 74.55 |
| WATER | |
| NOT MAPPED | 0.01 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The dominant community throughout this study site is Deciduous Swamp dominated by Green Ash (*Fraxinus pennsylvanica*) with White Elm (*Ulmus americana*).

The understory was a mix of regenerating canopy species, Silky Dogwood (*Cornus amomum ssp. obliqua*), Western Poison-ivy (*Rhus radicans ssp. rydbergii*), and Spotted Touch-me-not (*Impatiens capensis*).

There are variations in canopy cover and soils due to the presence of deeper areas in the swamp where water is retained for longer periods of time. Some of these areas had standing water at the time of survey or bare soil which is generally an indicator of longer retention time for standing water.

The upland Deciduous Forests recorded were dominated by Red Oak (*Quercus rubra*) and Sugar Maple (*Acer saccharum* ssp. *saccharum*), with American Beech (*Fagus grandifolia*) and Shagbark Hickory (*Carya ovata*).

The understory was mostly regenerating canopy species with a herbaceous layer of Large-leaved Aster (*Aster macrophyllum*), Thicket Creeper (*Parthenocissus inserta*), and Canada Mayflower (*Maianthemum canadense*).

Vegetation Communities

A total of 193 taxa (unique plant records) were recorded for this study site.

Community Series

Deciduous Forest (FOD)

Deciduous Swamp (SWD)

Vegetation Type

Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)

Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)

Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady et al., 1980) –S3

Points of Interest

Two Butternuts approximately 50 centimetres in diameter were found within this study site.

Careful management of the property is reflected in the large number of species observed, along with extensive understory cover.

Faunal Records:

10 - Birds

3 - Mammals

1 - Reptiles & Amphibians

1 – Moth & Butterfly

Site Visits

September 1, 1980

Brady, et al.

June 18, 2007

T. Staton, R. Kitchen

September 21, 2007

R.Young , J. Potter, M. Potter, J. Kellam

September 28, 2007
R.Young , J. Potter, M. Potter, J. Kellam

% of site visited

4.14 % of this study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



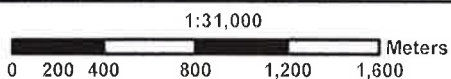
Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-12



Natural Areas Inventory

Study Site WF-12



Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames; North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



A total of 193 taxa (unique plant records) were recorded for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WF-13

Wainfleet Bog

Municipality Wainfleet

Formerly Wainfleet Bog (Brady et al.); ANSI

Approximate Area 2080 hectares

Watershed The majority of this study site is part of the Biederman Drain subwatershed with a portion in the west draining to the Mill Race Creek subwatershed.

Ownership Mostly private with some public ownership of the Wainfleet Bog Conservation Area

General Summary

This study site is located in both the City of Port Colborne and the Township of Wainfleet. It is bordered on the east by the Welland Canal and on the west by Dixie Road. It is located south of the feeder canal and stretches to just south of Highway 3

Physical Description

The Wainfleet Bog occurs as a broad, shallow depression of deep organic deposits of peat and muck at the interface between the silty and loamy sands of the Sand Plain, and the poorly-drained clay, and clay loam soils of the Haldimand Clay Plain. This area is underlain by the dolostone and shale of the Salina Formation.

Running along the south eastern portion of the bog is the Onondaga Escarpment characterized by the outcroppings of dolostone bedrock and shallow soil deposits of the Bertie Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| BROOKE - SHALLOW PHASE | 2.58 |
| BROOKE - VERY SHALLOW PHASE | 0.09 |
| CHINGUACOUSY - RED WASHED PHASE | 0.03 |
| FARMINGTON | 2.20 |
| FARMINGTON - VERY SHALLOW PHASE | 1.06 |
| FRANKTOWN - SHALLOW PHASE | 0.92 |
| FRANKTOWN - VERY SHALLOW PHASE | 3.11 |
| LORRAINE | 4.96 |
| MALTON - RED PHASE | 0.85 |
| MAPLEWOOD | 0.08 |
| NIAGARA | 0.03 |
| NIAGARA - LOAMY PHASE | 0.17 |
| PORT COLBORNE | 9.55 |
| QUARRY | 15.80 |

| | |
|-----------------------|--------|
| TAVISTOCK | 0.07 |
| TOLEDO | 6.80 |
| TOLEDO - LOAMY PHASE | 5.53 |
| TOLEDO - PEATY PHASE | 11.67 |
| WAINFLEET | 22.28 |
| WELLAND | 1.59 |
| WELLAND - LOAMY PHASE | 1.95 |
| WELLAND - PEATY PHASE | 1.29 |
| WATER | 0.00 |
| NOT MAPPED | 7.39 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This large study site can be subdivided into three areas; the Onondaga Escarpment, Mud Lake, and the remnant marsh locally known as the Wainfleet Bog. (Brady et al., 1980)

Onondaga Escarpment Sites

In places along the Onondaga Escarpment, vertical, open cliff face is periodically exposed. The most impressive spot to view the Onondaga Escarpment is along Ridge Road in the Township of Fort Erie as the elevation change including the talus slope is approximately 6-7 meters.

The Onondaga Escarpment contains the wooded scarp itself, which is surrounded by agriculture, and is the southern boundary of the Wainfleet Bog. The community occurring in large patches along the drier escarpment rim supports large, spreading Red Oaks (*Quercis rubra*) that dominate the canopy with Sugar Maple (*Acer saccharum*) as a close co-dominant. Associates include Bitternut Hickory (*Carya cordiformis*), American Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*) and occasionally, Red Elm (*Ulmus rubra*). The subcanopy is dominated by Sugar Maple with Hop Hornbeam (*Ostrya virginiana*), Black Maple (*Acer nigrum*) and American Elm (*Ulmus americana*) occasionally occurring. White Ash (*Fraxinus Americana*) and Choke Cherry (*Prunus virginiana*) form a very sparse shrub layer. On the ground layer, Blue Cohosh (*Caulophyllum thalictroides*) Wild Leeks (*Allium tricoccum*), Herb Robert (*Geranium robertianum*), Running Strawberry (*Euonymus obovata*) and False Solomon's Seal (*Maianthemum racemosum*) cover between 25-60% of the rocky\stony shallow soil. However, particularly in areas further back from the escarpment rim, Sugar Maple forms the canopy.

Red Maple swamp dominates the land at the base of the escarpment and out towards the Barrick Road area. This community does include many Red Oaks on the hummocks with Wild Leek, Choke Cherry and Red Elderberry as associates. The soils here are very rocky\stony with bedrock exposed in places.

As the Onondaga Escarpment makes its way westward, it forms the southern boundary of the Wainfleet Bog. In the area immediately outside of the Wainfleet Bog

Conservation Area, a very high quality forest grows along the rocky escarpment slope. There are numerous large, old Sugar Maple and Red Oak trees. It also supports a very rich ground layer with a beautiful display of spring ephemerals growing out of the rocky, bedrock exposed substrate.

Along an unopened road allowance that ends at the Wainfleet Bog Conservation Area, the escarpment gently rolls north from agricultural fields down to the wetland soils of the bog. In this area, Grey Dogwood (*Cornus foemina* ssp. *racemosa*) thicket is the dominate community. Also found here but far less abundant is the community consisting of Black Walnut (*Juglans nigra*) and Basswood (*Tilia americana*) with Choke Cherry (*Prunus virginiana*) in the shrub layer.

On the tableland of the escarpment, the successional woodland has an abundance of White Ash (*Fraxinus Americana*), Basswood and Bitternut Hickory (*Carya cordiformis*). This community grades into a linear band of Black Maple\Sugar Maple –Hop Hornbeam–Red Oak forest on the upper edge of woods before a grassy Black Walnut savannah\woodland.

Mud Lake Sites

The Mud Lake area is also part of this study site since the natural area is continuous. Mud Lake is a manmade reservoir owned by the Niagara Peninsula Conservation Authority. There is a band of wetland marsh defined by a berm of fill on the upland side and, the shallow water edge of the impounded reservoir that creates Mud Lake. The mineral sediment at the bottom of the Lake is very deep. Only patches of aquatic vegetation occur in the deeper water.

A band of shallow Mineral Meadow Marsh dominated by Spotted Touch-me-Not (*Impatiens capensis*) and Purple Loosestrife (*Lythrum Salicaria*) is found along the fringe of the upland boundary. The deeper water and seasonally exposed mud flats support a Forb Mineral Shallow Marsh community dominated by patches of Smartweed (*Polygonum* sp.), Purple Loosestrife and occasionally, Bittersweet Nightshade (*Solanum dulcamara*), Narrow-leaved Cattail (*Typha angustifolia*) or Flat Sedge sp. (*Cyperus*).

In places, Willow, Dogwood, Spirea or Buckthorn species dominate a narrow fringe along the interface between the weedy upland berm and wetland edge.

A second community ranges from dry, impoverished open meadow with only patches of shrubs to very shrubby, (45-80% shrub cover). The shrub cover is comprised of Grey Dogwood (*Cornus foemina* ssp. *racemosa*) and Buckthorn (*Rhamnus cathartica*) with scattered Red Cedars (*Juniperus virginiana*) and occasionally, Eastern Cottonwood (*Populus deltoids* ssp. *deltoids*), European Birch (*Betula pendula*) or, remnant cultivated White Cedar (*Thuja occidentalis*).

Ground cover is predominately Poverty Oat Grass (*Danthonia spicata*) with an abundance of Field Strawberry (*Fragaria virginiana* ssp. *virginiana*), Wild Carrot (*Daucus carota*) with Grey Goldenrod (*Solidago nemoralis*), sedges and, Hawkweed (*Hieracium* sp.) as associates. In some areas, crusty lime green patches of lichens also co-dominate the ground layer.

The topography of the Mud Lake Conservation Area (CA) is very complex with piles of fill forming raised berms (spoils from the digging of the Welland Canal), with tableland depressions and linear drainage channels below the berms that support forested swamp communities.

The community located on the fill berms is sparse in areas with impoverished sub soil. This soil condition greatly slows succession of woody species.

There is a small, more mature section of Maple Swamp in the southern portion of the property.

Green ash swamp dominates the lower areas around the spoil piles and the depressions on top of the fill berms. Additional swamp communities occur along the perimeter of the CA boundary in and around the drainage channels. Complexes of Green Ash Swamp are found as a mosaic throughout the eastern edge of the property.

More open successional areas support wet patches of Creeping Bent Grass (*Agrostis stolonifera*) or, grassy meadow patches of Grasses, Garlic Mustard (*Allaria petiolata*), Dame's Rocket (*Hesperous matronalis*) and Burdock (*Arctium minus*).

The community on the western-most edge of the property follows the raised berm. Buckthorn (*Rhamnus sp.*) dominates in two layers; the shrub layer and a taller sub canopy layer where it forms a canopy with Common Apple (*Malus pumila*). Scattered trees of Bird Cherry (*Prunus padus*), Green Ash, Black Cherry (*Prunus serotina*), Crack Willow (*Salix fragilis*) and White Elm (*Ulmus americana*) form a sparse canopy above. weedy species like Dame's Rocket, Garlic Mustard, Burdock and grasses occurring in the ground layer in patches as on other parts of the property.

In the center of the property is a large cattail marsh dominated by Narrow-leaved Cattail. Complexed within this marsh, sedges and Cyperus create distinct patches where they are the dominate cover. Below this layer, Smartweed and Beggarstick's (*Bidens frondosa*) occur.

Near the eastern boundary of the property is a pond dominated by Water Meal (*Wolffia columbiana*, *Wolffia borealis*) and Lesser Duckweed (*Lemna minor*). This pond is fringed with Burreed (*Sparganiaceae sp.*), Cattails, Jewelweed and Purple Loosestrife.

Between this pond and the Cattail Marsh is a patch of sedge dominated shallow marsh which supports living trees and dead snags of Green Ash and Willow (likely *Salix X rubens*).

Wainfleet Bog Sites

Much attention has been paid to the Wainfleet Bog over the years, our field crews did not collect data within the boundaries of the Conservation Area, however we visited several privately-owned properties in the area surrounding the publicly-owned properties.

The most common communities noted for this area were Deciduous Swamps dominated by Poplar species (*Populus sp.*). The mix of species was almost equal Eastern Cottonwood (*Populus deltoides ssp. deltoides*) and Trembling Aspen (*Populus tremuloides*) with occasional Pin Oak (*Quercus palustris*).

Of great concern in this area is the invasive European White Birch (*Betula pendula*) that has taken over many parts of the Bog to the detriment of the native swamp communities. The Niagara Peninsula Conservation Authority and its partners have been involved in pilot projects aimed at removal of the invasive Birch and restoring these areas.

The understory in these communities was a mix of Silky Dogwood (*Cornus amomum ssp. obliqua*), Gray Dogwood (*Cornus foemina ssp. racemosa*), Riverbank Grape (*Vitis riparia*), Common Buckthorn (*Rhamnus cathartica*), Willows (*Salix sp.*), Wild Red Raspberry (*Rubus idaeus ssp. melanolasius*), and, Narrow-leaved Meadowsweet (*Spiraea alba*).

The herbaceous layer was characterized by Mosses (*Moss sp.*), Spotted Touch-me-not (*Impatiens capensis*), Common Strawberry (*Fragaria virginiana ssp. virginiana*), Tall Buttercup (*Ranunculus acris*), Fowl Manna Grass (*Glyceria striata*) and Asters (*Aster sp.*).

In addition to the Deciduous Swamps, Thicket Swamps were common in this part of the study site. They were characterized by Narrow-leaved Meadowsweet, Gray Dogwood and Silky Dogwood, with Black Chokeberry (*Aronia melanocarpa*), and Common Elderberry (*Sambucus canadensis*). The ground layer was mostly Mosses (*Moss sp.*) with Slender Stinging Nettle (*Urtica dioica ssp. gracilis*), Common Blackberry (*Rubus allegheniensis*) and, Southern Arrow-wood (*Viburnum recognitum*).

Vegetation Communities

A total of 620 taxa (unique plant records) were recorded for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)
Treed Cliff and Talus (CTT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buckthorn Deciduous Shrub Thicket Type (THDM2-6)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)

Cattail Mineral Shallow Marsh Type (MASM1-1)
 Common Reed Graminoid Mineral Meadow Marsh Type (MAMM1-12)
 Dry-Fresh Black Walnut Deciduous Woodland Type (WODM4-4)
 Dry-Fresh Exotic Deciduous Forest Type (FODM4-12)
 Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
 Dry-Fresh Sugar Maple-Hardwood Calcareous Shallow Deciduous Forest Type (FODR1-1)
 Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)
 Dry-Fresh White Ash-Hardwood Deciduous Forest Type (FODM4-2)
 Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
 Fresh-Moist Basswood-White Ash Calcareous Treed Talus Type (CTTT1-5)
 Fresh Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
 Gray Dogwood Deciduous Shrub thicket Type (THDM2-4)
 Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
 Jewelweed Forb Mineral Meadow Marsh Type (MASM2-1)
 Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
 Meadowsweet Organic Deciduous Thicket Swamp Type (SWTO5-11)
 Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
 Pondweed Mixed Shallow Aquatic Type (SAM_1-4)
 Poplar Mineral Deciduous Swamp Type (SWDM4-5)
 Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
 Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
 Silky Dogwood Organic Deciduous Thicket Swamp Type (SWTO4-3)
 Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
 Trembling Aspen Organic Deciduous Swamp Type (SWDO3-3)
 Willow Mineral Deciduous Swamp Type (SWDM4-1)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (Brady et al., 1980) - Endangered

Provincially Rare Species

Carex albicans var. *emmonsii* (Blunt-scaled Oak Sedge / Emmon's Sedge) (NPCA, 2006-2009) – S1
Carex jamesii (James' Sedge/ Nebraska Sedge) (NPCA, 2006-2009)-S3
Carya glabra (Pignut Hickory) (Brady et al. 1980) -S3
Corydalis flavula (Yellow Corydalis) (NPCA, 2006-2009) –S2
Linum virginianum (Woodland Flax/ Slender Yellow Flax) (MacDonald, 1991) – S2
Ludwigia polycarpa (Many-fruited Ludwigia) (MacDonald, 1991) – S2,S3
Torreyochloa pallida (Pale False Manna Grass/Torrey's Manna Grass) (MacDonald, 1991) – S2

Points of Interest

This area is the largest block of organic swamp in the Niagara Region. Extensive drainage of the marsh area for peat extraction has significantly altered the habitat. The endangered and rare Massasauga Rattlesnake, Blanding's Turtle, Spotted Turtle and Short-eared Hawk are all known to inhabit this area. A large deer population is also present. These creatures are threatened by the changing ecosystems. Since the fire of 1971, the vegetation has been changed significantly; so much so, that Tamarack and Black Spruce are virtually extinct here. (Brady, 1980)

The life science ANSI encompasses the north eastern quarter of an extensive 1200 ha peatland, and supports the least disturbed natural peatland features of this otherwise moderately to severely disturbed area. (MacDonald, 1990)

Faunal Records:

112 - Birds
47 - Butterflies & Moths
30 - Reptiles & Amphibians
21 - Mammals

The following Lichens and Fungi were highlighted in the ANSI report (MacDonald, 1990).

Lichens: (7 records)

Cladonia cristatella (Tuck)
Cladonia chlorophaea (Flk. ex Somm.) Spreng
Cladonia cervicomis (Ach.) Flotow subsp. *verticillata* (Hoffm.) Ahti
Cladonia pyxidata (L.) Hoffm.
Cladonia gracilis (L.) Willd.
Cladonia coniocraea (auct.) (Flk.) Spreng.
Cladonia mitis (Sandst.) Hale & Culb.

Funghi: (18 records)

Amanita fulva (Schaeff.) Pers.
Boletus (edulis group)
Cantharellus betuletorum (?)
Entoloma sericeum (Bull. ex Fr.) Quel.
Entoloma serrulatum
Entoloma sphagnorum
Entoloma strictus
Entoloma species
Galerina paludosa
Hypholoma udum
Inocybe species
Laccaria proxima
Lactarius aquifolius
Leccinum species
Russula betulina
Russula fallax Cke.
Russula pectinatoides
Russula species

Recommendations

Given the size of this study site and its diversity it is suggested that further research be conducted with particular attention being paid to the significant species of flora and fauna.

Site Visits

September 1, 1980
Brady et al.

June 1, 1991
I. MacDonald.

August 3, 2006
A. Garofalo, K. White, R. Drabick, A. Yagi

September 27, 2006
A. Garofalo, K. White

May 7, 2007
A. Garofalo, T. Staton, R. Kitchen

May 9, 2007
A. Garofalo, T. Staton, R. Kitchen

May 10, 2007
A. Garofalo, T. Staton, R. Kitchen

May 9, 2007
A. Garofalo, K. White, T. Staton, R. Kitchen

May 9, 2007
A. Garofalo, K. White, T. Staton, R. Kitchen

May 11, 2007
M. Oldham, A. Garofalo, T. Staton

June 12, 2007
B. Curry

June 21, 2007
B. Curry

July 9, 2007
B. Curry

% of site visited

8.36 % of the total study site was visited by our field crews.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

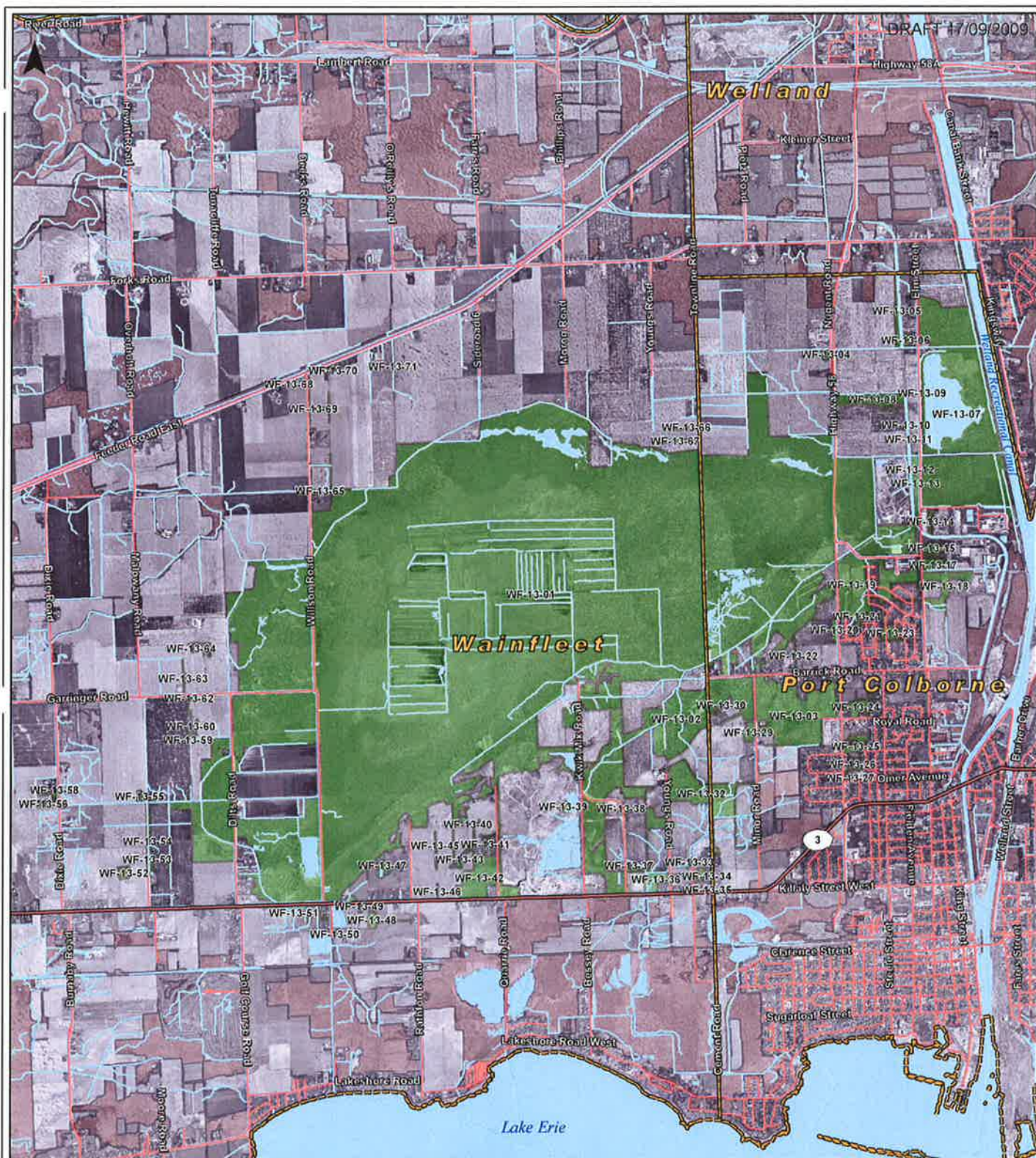
Macdonald, I.D. 1992. *A Biological Inventory and Evaluation of the Wainfleet Marsh Area of Natural and Scientific Interest*. Parks and Recreational Areas Section, Ontario

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Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of the Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-13



Natural Areas Inventory

Study Site WF-13

1:50,000

0 350 700 1,400 2,100 2,800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



In this Study Site a total of 620 taxa (unique plant records) were documented.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site WF-14

Wainfleet Bush

Municipality Township of Wainfleet

Formerly Wainfleet Bush (Brady et al., 1980)

Approximate Area 90 hectares

Watershed This study site drains to Mill Race Creek

Ownership Mostly private

General Summary

This study site is located within the Township of Wainfleet. It is south of the Feeder Canal and stretches to just south of Garringer Road/ Abbey Road. The eastern boundary is the unopened road allowance at Dilts Road, and the western boundary is Sideroad 20.

Physical Description

Study site WF-14 is situated entirely within the Sand Plain characterized by well drained silty and loamy sands underlain by the dolostone and shale of the Salina Formation.

Soils

| Soils | Percentage of Study Site |
|-----------------------|--------------------------|
| BEVERLY - LOAMY PHASE | 0.37 |
| COLWOOD | 0.03 |
| MAPLEWOOD | 5.90 |
| TAVISTOCK | 0.02 |
| TOLEDO | 28.97 |
| TOLEDO - LOAMY PHASE | 64.27 |
| WATER | 0.43 |
| NOT MAPPED | |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is dominated by Deciduous Swamps characterized by Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*), Swamp Maple (*Acer fremanii*), and Pin Oak (*Quercus palustris*).

The understory is a mix of Silky Dogwood (*Cornus amomum* ssp. *obliqua*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Spicebush (*Lindera benzoin*), and Red-osier Dogwood (*Cornus stolonifera*).

The herbaceous layer was largely Asters (*Aster* sp.) with Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*), Fowl Manna Grass (*Glyceria striata*), and Jumpseed (*Polygonum virginianum*).

The successional Forb Meadow community noted was dominated by Goldenrods and Asters.

Vegetation Communities

There are a total of 74 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Forb Meadow (MEF)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

At the time of the NAI field survey, there was standing water present and calling frogs were noted.

In another area of the study site, fill has caused a concentration of "pit and mound" topography that made for interesting, drier communities of meadow species on the higher mound areas.

Faunal Records:

2 - Birds

2 - Mammals

1 – Reptiles & Amphibians

Site Visits

September 1, 1980

Brady, et al.

October 28, 2008

T. Staton, S. Mohamed

% of site visited

8.06 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

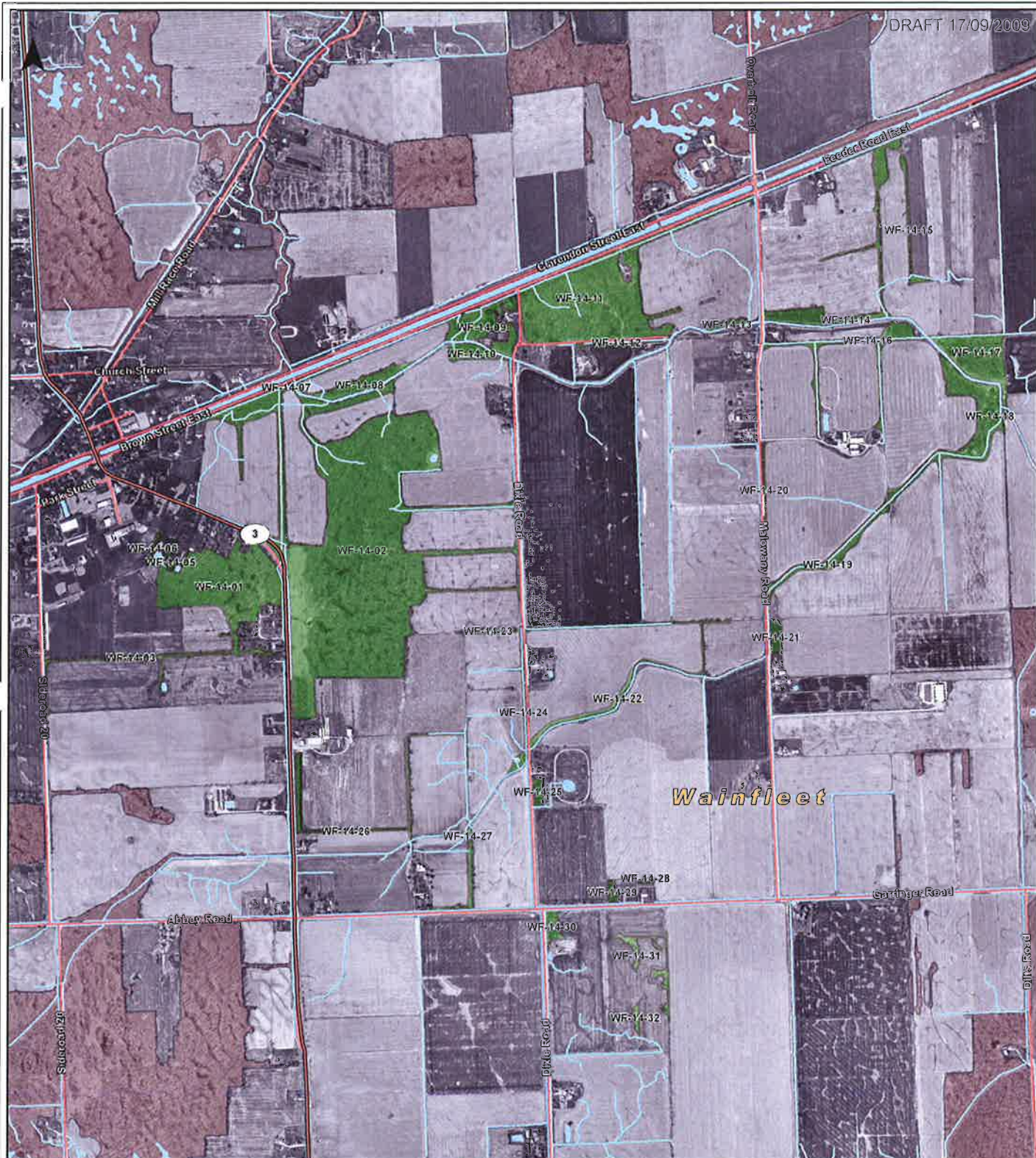
Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula

Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-14



Natural Areas Inventory

Study Site WF-14

1:18,000

0 125 250 500 750 1,000 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 74 recorded taxa (unique plant records) for this study site.
Community Series:
Decidious Swamp (SWD)
Forb Meadow (MEF)

Study Site WF-15

Fletcher Woods

Municipality Township of Wainfleet

Formerly Fletcher Woodlot (Brady, et al., 1980)

Approximate Area 167 hectares

Watershed This study site is located within the Mill Race Creek subwatershed.

Ownership Mostly private

General Summary

The Fletcher Woods study site is located in the Township of Wainfleet south of the Feeder Canal and the Village of Wainfleet, and stretches to just south of Concession 1 Road. It is between Sideroad 22 and Gilmore Road west of where Highway Number 3 turns north towards the Village of Wainfleet.

Physical Description

Study site WF-15 is situated within the Sand Plain characterized by well drained silty and loamy sands, underlain by the dolostone, and shale of the Salina Formation.

Soils

| Soils | Percentage of Study Site |
|-----------------------|---------------------------------|
| BEVERLY | 8.48 |
| BEVERLY - LOAMY PHASE | 2.13 |
| HALDIMAND | 4.27 |
| LINCOLN | 12.64 |
| LINCOLN - LOAMY PHASE | 2.55 |
| MAPLEWOOD | 10.05 |
| TOLEDO | 24.47 |
| TOLEDO - LOAMY PHASE | 35.42 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The dominant community in this study site was Deciduous Swamp. The canopy consisted of Green Ash (*Fraxinus pennsylvanica*) and Swamp Maple (*Acer freemanii*), with White Elm (*Ulmus americana*).

The understory was regenerating canopy species and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Spotted Touch-me-not (*Impatiens capensis*) and Goldenrod (*Solidago* sp.).

Within the Green Ash swamp were drier knolls that supported a community of Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum*), and White Ash (*Fraxinus americana*).

Some small depressions were found throughout this study site that held water for extended periods of time and thus, had no ground cover.

Vegetation Communities

A total of 29 taxa (unique plant records) were recorded for this study site.

Community Series

Deciduous Swamp (SWD)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Brady et al., 1980) - Endangered

Juglans cinerea (Butternut) (Brady et al., 1980) – Endangered

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

6 - Mammals

5 - Birds

Site Visits

September 1, 1980

Brady, et al.

June 4, 2008

T. Staton, S. Mohamed

% of site visited

0.52% of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-15



Natural Areas Inventory

Study Site WF-15

1:15,000

0 100 200 400 600 800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



A total of 29 taxa (unique plant records) were recorded for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site WF-17

Bunz Bush

Municipality This study site is located both in the Township of Wainfleet and the County of Haldimand.

Formerly Bunz Bush (Brady et al., 1980)

Approximate Area 727 hectares

Watershed This study site drains east to Mill Race Creek, south to Hoover Drain and west to Lowbanks Drain.

Ownership mostly private

General Summary

This is a very large study site spanning the border between The Region of Niagara and Haldimand County. It is located south of the Feeder Canal and is bound on the south by Lake Erie. The western limit is Townline Road in Lowbanks and Sideroad 30 in Wainfleet is the eastern boundary.

Physical Description

This natural area is situated within the Sand Plain characterized by well drained silty and loamy sands. The northern portion is underlain by the dolostone of the Bertie Formation.

As you move south through the study site, the bedrock material changes to the limestone characteristic of the Bois Blanc Formation.

Soils

| Soils | Percentage of Study Site |
|--------------------------|---------------------------------|
| BEACH | 0.23 |
| BEVERLY - COARSE PHASE | 0.75 |
| BRADY | 0.10 |
| HALDIMAND | 1.20 |
| HALDIMAND - COARSE PHASE | 0.63 |
| LINCOLN | 1.20 |
| LINCOLN - COARSE PHASE | 0.39 |
| LOWBANKS | 12.51 |
| MAPLEWOOD | 3.48 |
| NIAGARA | 1.70 |
| NIAGARA - COARSE PHASE | 0.06 |
| ONTARIO - COARSE PHASE | 0.01 |
| SCARP | 0.23 |
| TAVISTOCK | 0.02 |
| TOLEDO | 19.53 |
| TOLEDO - COARSE PHASE | 39.45 |
| TOLEDO - LOAMY PHASE | 7.75 |
| WAUSEON | 10.00 |
| WELLAND | 0.77 |
| WATER | 0.00 |

| | |
|------------|--------|
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community recorded for this study site was Deciduous Swamp dominated by either Green Ash (*Fraxinus pennsylvanica*), or Trembling Aspen (*Populus tremuloides*) with Swamp Maple (*Acer fremanii*), and White Elm (*Ulmus americana*).

The understory was largely Spicebush (*Lindera benzoin*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Choke Cherry (*Prunus virginiana* ssp. *virginiana*), Common Buckthorn (*Rhamnus cathartica*), and Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

The herbaceous layer was a mix of Raspberry (*Rubus* sp.), Goldenrod (*Solidago* sp.), Spotted Touch-me-not (*Impatiens capensis*), Sensitive Fern (*Onoclea sensibilis*), Fowl Manna Grass (*Glyceria striata*), and Virginia Creeper (*Parthenocissus quinquefolia*).

There are many large vernal pools.

Some of the wetter areas of the swamp contain organic accumulation up to 55cm deep.

The Thicket Swamp communities noted were dominated by Gray Dogwood, Green Ash, and Swamp Maple with Goldenrod, Narrow-leaved Meadowsweet (*Spiraea alba*), and Sedges (*Carex* sp.).

Vegetation Communities

There are a total of 130 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Forb Mineral Shallow Marsh Type (MASM2-1)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Organic Deciduous Swamp Type (SWDO1-2)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

- 14 - Birds
- 2 – Reptiles & Amphibians
- 2 - Mammals
- 1 – Moths & Butterflies

Site Visits

September 1, 1980
Brady et al.

June 23, 2008
T. Staton, S. Mohamed

June 24, 2008
T. Staton, S. Mohamed

June 25, 2008
R. Kitchen, B. Porter

% of site visited

3.0% of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-17



Natural Areas Inventory

Study Site WF-17

1:35,000

0 250 500 1,000 1,500 2,000 Meters

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There are a total of 130 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site WF-18

Harold Mitchell Nature Reserve

Municipality Township of Wainfleet

Formerly Harold Mitchell Nature Reserve (Brady, et al., 1980)

Approximate Area 66 hectares

Watershed this study site drains to Mill Race Creek and Hoover Drain subwatersheds.

Ownership Private

General Summary

Study site WF-18 is located in the Township of Wainfleet at Long Point. It is bound to the north by Concession 1 Road, to the east by Minor Road, to the west by Etling Road and to the south by Lakeshore Road. Lake Erie lies directly to the south of this study site.

Physical Description

This natural area is situated within the Sand Plain characterized by well drained silty and loamy sands. The northern portion is underlain by the dolostone of the Bertie Formation.

As you move south through the study site, the bedrock material changes to the limestone characteristic of the Bois Blanc Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| BRADY | 0.00 |
| HALDIMAND - COARSE PHASE | 0.12 |
| LINCOLN | 1.74 |
| LINCOLN - LOAMY PHASE | 1.74 |
| MAPLEWOOD | 8.91 |
| PLAINFIELD - DUNE PHASE | 0.10 |
| TAVISTOCK | 0.38 |
| TOLEDO - LOAMY PHASE | 18.32 |
| WELLAND - LOAMY PHASE | 56.56 |
| WATER | 0.00 |
| NOT MAPPED | 12.12 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area is a nature reserve owned by Ontario Nature and the Niagara Falls Nature Club members are the stewards of the land. It has slough-ridge terrain with many ponds and open marshes. This site contains the last remaining stand of Hemlock trees along Lake Erie in the Niagara Region.

The Shallow Marsh communities are characterized by Swamp Milkweed (*Asclepias*

incarnata ssp. *incarnata*) with Purple Loosestrife (*Lythrum salicaria*), Rice Cut Grass (*Leersia oryzoides*), Spike-rush species (*Eleocharis* sp.), and Lesser Duckweed (*Lemna minor*).

The Floating-leaved Aquatic areas were a mix of Giant Bur-reed (*Sparganium eurycarpum*), Bulrushes (*Scirpus* sp.), Water Meal (*Wolffia* sp.), and Lesser Duckweed.

The forested areas were classified as Deciduous Swamps dominated by Green Ash (*Fraxinus pennsylvanica*), or Red Maple (*Acer rubrum*) with Southern Arrow-wood (*Viburnum recognitum*), Narrow-leaved Meadowsweet (*Spirea alba*), Goldernod, Grasses and Wild Carrot (*Daucus carota*) in the ground layer.

Vegetation Communities

There are a total of 132 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Mixed Meadow (MEM)
Shallow Marsh (MAS)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Southern Arrow-wood Mineral Deciduous Swamp Type (SWT5-4)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted

Points of Interest

Faunal Records:

9 - Birds
4 – Reptiles & Amphibians
3 - Mammals
1 – Moths & Butterflies

Site Visits

September 1, 1980
Brady, et al.

July 31, 2008
T. Staton, S. Mohamed

% of site visited

0.91% of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



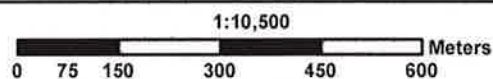
Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-18



Natural Areas Inventory

Study Site WF-18



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 132 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Mixed Meadow (MEM)
Shallow Marsh (MAS)

Study Site WF-19

Emerson Road Woods

Municipality Township of Wainfleet

Formerly Emerson Road Woodlot (Brady, 1980)

Approximate Area 331 hectares

Watershed This study site drains to Lake Erie via a number of drains. The eastern portion drains via Lake Erie 7, the central portion via Lake Erie, and the western portion via Lake Erie 9.

Ownership Mostly private.

General Summary

This study site is located within the Township of Wainfleet between Concession 1 Road to the north and Lake Erie/ Lakeshore Road to the south. It extends from Station Road in the east to Minor Road in the west.

Physical Description

This natural area is situated at the interface of where the poorly drained clay soils of the Haldimand Clay Plain meet the silty and loamy sands of the Sand Plain. The area is flat and shows some characteristic slough/ridge topography in the areas where clay is dominant.

The underlying material changes several times moving from north to south on this study site. The far northern reaches are underlain by the dolostone and shale of the Salina Formation. Moving south, the dolostone of the Bertie Formation changes to the limestones of the Bois Blanc and then the Onondaga as you get to the Lake Erie shore.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------|--------------------------|
| BERRIEN | 0.04 |
| FARMINGTON | 0.41 |
| FRANKTOWN - SHALLOW PHASE | 0.17 |
| HALDIMAND | 2.00 |
| HALDIMAND - LOAMY PHASE | 0.07 |
| LINCOLN | 40.10 |
| LINCOLN - LOAMY PHASE | 3.53 |
| MAPLEWOOD | 0.21 |
| NIAGARA | 0.06 |
| TOLEDO - LOAMY PHASE | 0.49 |
| WAUSEON | 0.04 |
| WELLAND | 41.04 |
| WELLAND - LOAMY PHASE | 9.65 |
| WATER | 0.00 |
| NOT MAPPED | 2.16 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The majority of this study site was Deciduous Swamp with typical slough forest communities and complex microtopography. It was noted that the canopy was highly variable and successional. There was some standing water present at the time of the survey.

The dominate species recorded included, Green Ash (*Fraxinus pennsylvanica*), Freeman's Maple (*Acer fremanii*), Red Maple (*Acer rubrum*), Red Oak (*Quercus rubra*), and White Elm (*Ulmus americana*). Other associates noted were Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*), Swamp White Oak (*Quercus bicolor*), and Willow (*Salix* sp.).

The understory was characterized by Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Nannyberry (*Viburnum lentago*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*) with some small Silver Maple (*Acer saccharinum*, or Shagbark Hickory (*Carya ovata*).

The herbaceous layer consisted of largely Spotted Tough-me-nots (*Impatiens capensis*), Sedges (*Carex* sp.), Thicket Creeper (*Parthenocissus inserta*), Avens (*Geum* sp.), and Goldenrods (*Solidago* sp.).

The Thicket Swamps were dominated by Narrow-leaved Meadowsweet (*Spirea alba*), Gray Dogwood, Southern Arrow-wood (*Viburnum recognitum*), Nannyberry, and Red-osier Dogwood (*Cornus stolonifera*).

The wet pockets categorized as Shallow Marshes contained Cattails (*Typha* sp.) and Willows (*Salix* sp.).

Vegetation Communities

There are a total of 206 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)

Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Open Graminoid Meadow Type (MEGM4-1)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (Brady , et al., 1980) – S3

Solidago ulmifolia var. *ulmifolia* (Elm-leaved Goldenrod) – unconfirmed (Vol. Crew NAI)
– S1

Points of Interest

There are possible old growth sections in this study site.

Faunal Records:

27 – Birds

4 – Mammals

3- Reptiles & Amphibians

1 – Moths & Butterflies

Site Visits

September 1, 1980

Brady, et al.

October 5, 2007

J. Kellam, M. Potter, J. Potter, R, Young

May 21, 2008

T. Staton, S. Mohamed

May 27, 2008

T. Staton, S. Mohamed

May 28, 2008

T. Staton, S. Mohamed

June 4, 2008

T. Staton, S. Mohamed

% of site visited

4.59 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of
Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species
at Risk in Ontario. Retrieved 11/05, 2009, from

<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- | | |
|-------------------|----------------------|
| Major Highways | Waterbodies |
| Regional Highways | Municipal Boundaries |
| Roads | Study Sites |
| Watercourses | Study Site WF-19 |



Natural Areas Inventory

Study Site WF-19

1:18,000

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 206 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site WF-21

Morgan's Point

Municipality Township of Wainfleet

Formerly Morgan's Point (Brady et al.)

Approximate Area 194 hectares

Watershed This study site drains to Casey Drain and Mill Race Creek subwatersheds

Ownership Mostly private with some public (Niagara Peninsula Conservation Authority)

General Summary

Study site WF-21 is bordered by Lake Erie to the south and Highway 3 to the north. The eastern boundary is just east of Golf Course Road and the western boundary is Sideroad 18.

Physical Description

This natural area is characterized by the change in elevation from the flat, poorly drained clay soils of the Haldimand Clay Plain to the well drained silty and loamy sands of the active dune community along the Lake Erie shore.

The underlying material is mostly limestone from the Onondaga Formation with a small section in the far north of this study site falling within the Bois Blanc Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|--------------------------|
| BEVERLY - LOAMY RED PHASE | 1.14 |
| BROOKE - SHALLOW PHASE | 11.41 |
| BROOKE - VERY SHALLOW PHASE | 1.86 |
| CHINGUACOUSY - LOAMY RED PHASE | 8.51 |
| CHINGUACOUSY - RED PHASE | 0.34 |
| FARMINGTON - VERY SHALLOW PHASE | 31.81 |
| FRANKTOWN - SHALLOW PHASE | 0.51 |
| FRANKTOWN - VERY SHALLOW PHASE | 10.91 |
| MALTON - RED PHASE | 0.87 |
| NIAGARA - LOAMY PHASE | 1.42 |
| ONEIDA - RED PHASE | 2.97 |
| ONEIDA - RED WASHED PHASE | 1.88 |
| PEEL - RED PHASE | 0.87 |
| TAVISTOCK - TILL RED PHASE | 0.77 |
| TOLEDO | 0.10 |
| TOLEDO - LOAMY PHASE | 0.24 |
| TOLEDO - LOAMY RED PHASE | 1.14 |
| TUSCOLA - RED PHASE | 0.37 |
| WELLAND | 4.22 |
| WELLAND - LOAMY PHASE | 7.60 |

| | |
|------------|--------|
| WATER | 0.00 |
| NOT MAPPED | 11.07 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is characterized by very rich upland Deciduous Forest communities. The most common was a Sugar Maple (*Acer saccharum* ssp. *saccharum*), White Ash (*Fraxinus americana*) community with Staghorn Sumac (*Rhus typhina*), and Black Raspberry (*Rbus occidentalis*).

Shagbark Hickory (*Carya ovata*) was the dominate canopy species in some areas with an herbaceous layer of White Trillium (*Trillium grandiflorum*), Herb Robert (*Geranium robertianum*), and some Garlic Mustard (*Allaria petiolata*).

A very rocky area of the Onondaga Escarpment with vernal pools associated with changes in microtopography was recorded for this site. In this area, the canopy was more fragmented with many dying White Ash. Some regeneration was noted along with a thicker shrub layer.

A Deciduous Thicket community was also noted consisting of Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Silky Dogwood (*Cornus amomum* ssp. *obliqua*), and a ground layer of Kentucky Blue Grass (*Poa pratensis* ssp. *pratensis*), and Goldenrod (*Solidago* sp.).

Vegetation Communities

There are a total of 209 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Mixed Forest (FOM)
Open Shoreline (SHO)

Vegetation Type

Dry - Fresh Ironwood Deciduous Forest Type (FODM4-4)
Dry - Fresh Oak - Hardwood Deciduous Forest Type (FODM2-4)
Dry - Fresh Sugar Maple - Hickory Deciduous Forest Type (FODM5-5)
Dry - Fresh Sugar Maple - White Ash Deciduous Forest Type (FODM5-8)
Dry - Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Kentucky Blue Grass Graminoid Meadow Type (MEGM3-4)

Significant Flora

Species at Risk

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – Threatened
Juglans cinerea (Butternut) (Brady, et al., 1980) - Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3

Points of Interest

There were a few large diameter trees exhibiting old-growth characteristics. Two Bitternut Hickory (*Carya cordiformis*) at 50cm dbh and 60cm dbh, and Hop Hornbeam (*Ostrya virginiana*) at 25cm dbh.

On the Lake Erie front was a Red Oak (*Quercus rubra*) that was likely 300 to 400 years old and larger than 120cm dbh. The top had fallen off some years ago but the tree still had some live branches.

Faunal Records:

23 - Birds

10 – Moths & Butterflies

4 – Reptiles & Amphibians

Site Visits

September 1, 1980

Brady, et al.

May 3, 2007

T. Staton, R. Kitchen

May 29, 2007

T. Staton, R. Kitchen

May 30, 2007

T. Staton, R. Kitchen

June 4, 2007

T. Staton, R. Kitchen

June 9 & 17, 2008

T. Staton, S. Mohamed

July 21, 2007

Wildlife Survey: B. Curry

August 24, 2007

T. Staton, R. Kitchen

% of site visited

5.64% of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

Study Site WF-22

Wainfleet Wetlands – Eagle Marsh Drain

Municipality Township of Wainfleet

Formerly Wainfleet Wetlands – Eagle Marsh Drain (Brady, et al.)

Approximate Area 454 hectares

Watershed This study site drains to the Wainfleet Marsh and Eagle Marsh Drain

Ownership Mostly private, some public (Niagara Peninsula Conservation Authority)

General Summary

Study site WF-22 is located south of the Wainfleet Bog/ Highway 3 between Golf Course Road to the west and Steele Street to the east. The southern boundary is Lake Erie.

Physical Description

This natural area is characterized by alternating areas of higher elevation with notably shallower soil and exposed bedrock from the Limestone Plain, and lower lying areas of clay and silty clay from the Haldimand Clay Plain.

The majority of the study site overlies the Onondaga Formation of limestone with a small portion in the north/west in the Bois Blanc Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|--------------------------|
| BEVERLY - LOAMY RED PHASE | 0.04 |
| BROOKE - SHALLOW PHASE | 18.66 |
| BROOKE - VERY SHALLOW PHASE | 4.02 |
| CHINGUACOUSY - LOAMY RED PHASE | 0.90 |
| FARMINGTON | 2.36 |
| FARMINGTON - VERY SHALLOW PHASE | 3.65 |
| FRANKTOWN - SHALLOW PHASE | 10.68 |
| FRANKTOWN - VERY SHALLOW PHASE | 1.50 |
| LINCOLN - PEATY PHASE | 1.99 |
| MALTON - RED PHASE | 4.16 |
| ONEIDA - RED PHASE | 0.06 |
| PEEL - RED PHASE | 4.16 |
| PLAINFIELD - DUNE PHASE | 0.09 |
| TOLEDO - LOAMY RED PHASE | 0.04 |
| WALSINGHAM | 0.21 |
| WELLAND | 4.76 |
| WELLAND - LOAMY PHASE | 9.94 |
| WATER | 2.34 |
| NOT MAPPED | 30.42 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Many visits were made to this site over the course of the NAI project. This study site is unique in that it contains all of the expected wetland communities but also has interesting communities associated with exposed rock including alvar and rock barren.

The most common community recorded for this study site was the Shallow Marsh community characterized by Common Reed (*Phragmites australis*), Rushes (*Juncus sp.*), Sedges (*Carex sp.*), Cattails (*Typha latifolia*), (*Typha angustifolia*), and Canada Blue-joint (*Calamagrostis canadensis*).

The study site also has a very rich coastal marsh, which is most likely the largest coastal shallow marsh along the Lake Erie Shoreline from Fort Erie to Wainfleet. A dam immediately north of Lakeshore Road disconnects this marsh from fluctuating lake levels.

The second most common community denoted was Thicket Swamp. This community was dominated by Silky Dogwood (*Cornus amomum ssp. obliqua*) with Gray Dogwood (*Cornus foemina ssp. racemosa*), Southern Arrow-wood (*Viburnum recognitum*), Narrow-leaved Meadowsweet (*Spiraea alba*), Nannyberry (*Viburnum lentago*), Willows (*Salix sp.*), and Manitoba Maple (*Acer negundo*).

The Niagara Peninsula Conservation Authority land, known as Wainfleet Wetlands, has many landforms which make this area significant are a result of man's activities (e.g. the large stone quarry, the clay pits that are now filled with water, the agricultural fields that have developed into successional meadows and Eagle Marsh Drain that drains the area). Also of importance to the area is the presence of deer and migrating ducks that are attracted by the suitable habitat.

The large quarry pond is approximately 2.8 hectares in size and supports a recreational fishery. Watermilfoil (*Myriophyllum sp.*) dominates the submergent vegetation. Muskrat was also a noted species for this site.

In one area, the shallow soils over bedrock sustained pools of water and supported Green Ash (*Fraxinus pennsylvanica*) Swamp. The upland knolls or slightly drier areas were characterized as Deciduous Forests. They were scattered throughout the study site and dominated by Shagbark Hickory (*Carya ovata*). The shallow soils and presence of Shagbark Hickory and Prickly Ash (*Zanthoxylum americanum*) lead this community to be recorded as Shagbark Hickory - Prickly Ash Treed Alvar Type, a very interesting community.

In places where the bedrock was at the surface, the trees such as Eastern Red Cedar (*Juniperus virginiana*), Basswood (*Tilia americana*), Buckthorn (*Rhamnus sp.*) and Hop Hornbeam (*Ostrya virginiana*) appeared stunted.

The Deciduous Forests recorded for this site were dominated by Shagbark Hickory, Red Oak (*Quercus rubra*), White Ash (*Fraxinus americana*), and Basswood (*Tilia americana*). The understory was dominated by regenerating canopy species with American Beech

(*Fagus grandifolia*), Blue Beech (*Carpinus caroliniana*), and Spicebush (*Lindera benzoin*). The herbaceous layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Spotted carne's-bill (*Geranium maculatum*), and Sedges (*Carex* sp.).

The Deciduous Swamp forests were largely Green Ash, Bur Oak (*Quercus macrocarpa*), and White Elm (*Ulmus americana*), with Spicebush and Tartarian Honeysuckle (*Lonicera tatarica*) and a ground layer of Spotted Touch-me-not and Sedges.

Other unique communities for this site include the Hawthorn (*Crataegus* sp) Alvar Woodland and Deciduous Savanna.

Vegetation Communities

There are a total of 564 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Savanna (SVD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Shallow Marsh (MAS)
Submerged Shallow Aquatic (SAS)
Thicket Swamp (SWT)
Transportation (COT) / Railway
Treed Rock Barren (RBT)

Vegetation Type

Bebb's Willow Mineral Deciduous Thicket Swamp type (SWTM3-2)
Bladderwort Mixed Shallow Aquatic Type (SAM_1-6)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Bur Oak Mineral Deciduous Swamp Type (SWDM1-2)
Canada Blue-joint Graminoid Mineral Shallow Marsh Type (MASM1-9)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Cattail Organic Shallow Marsh Type (MASO1-1)
Common Reed Mineral Shallow Marsh Type (MASM1-12)
Dry - Fresh Beech Deciduous Forest Type (FODM4-1)
Dry - Fresh Black Walnut Deciduous Woodland Type (WODM4-4)
Dry-Fresh Sugar Maple-Beech Deciduous Forest Type (FODM5-2)
Dry - Fresh Sugar Maple - Oak Deciduous Forest Type (FODM5-3)
Dry - Fresh Sugar Maple - White Ash Deciduous Forest Type (FODM5-8)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Bur Oak Deciduous Forest Type (FODM9-3)
Fresh-Moist Elm Deciduous Woodland Type (WODM5-2)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)

Gray Dogwood Deciduous Thicket Type (THDM5-1)
 Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
 Hawthorn Alvar Woodland Type (RBTA1-8)
 Hawthorn Deciduous Savanna Type (SVDM3-4)
 Hawthorn Deciduous Shrub Thicket Type (THDM2-11)
 Kentucky Blue Grass Graminoid Meadow Type (MEGM3-4)
 Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
 Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
 Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
 Narrow-Leaved Sedge Mineral Shallow Marsh Type (MASM1-4)
 Open Graminoid Meadow Type (MEGM4-1)
 Shagbark Hickory-Prickly Ash Treed Alvar Type (RBTA1-2)
 Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
 Spike-rush Mineral Shallow Marsh Type (MASM1-11)
 Sumac Deciduous Shrub Thicket Type (THDM2-1)
 Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
 Water Milfoil Submerged Shallow Aquatic Type (SAS_1-4)
 White Elm Mineral Deciduous Swamp type (SWDM4-2)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (Experience 76 Biology Crew, Brock University, 1976) – Endangered
Juglans nigra (Butternut) (Experience 76 Biology Crew, Brock University, 1976) – Endangered
Morus rubra (Red Mulberry) (Experience 76 Biology Crew, Brock University, 1976) – Endangered
Panax quinquefolius (Ginseng) (Experience 76 Biology Crew, Brock University, 1976) – Endangered

Provincially Rare Species

Blephilia ciliata (Downy Wood Mint) (Experience 76 Biology Crew, Brock University, 1976) – S1
Carex albicans var. *albicans* (Sharp-scaled Oak Sedge) (NPCA, 2006-2009) – S3
Carex oligocarpa (Few-fruited Sedge) (NPCA, 2006-2009) – S3
Carya glabra (Pignut Hickory) (Experience 76 Biology Crew, Brock University, 1976) – S3
Lithospermum canescens (Hoary Puccoon) (Experience 76 Biology Crew, Brock University, 1976) – S3
Lycopus virginicus (Virginia Water-horehound) (Experience 76 Biology Crew, Brock university, 1976) – S3
Potentilla canadensis (Dwarf Cinquefoil) (Experience 76 Biology Crew, Brock University, 1976) – S2
Ranunculus hispidus var. *hispidus* (Hairy Buttercup) (Wren and Associates, 2005) – S3

Points of Interest

The highly invasive (for wheat growers) Jointed Goose Grass (*Aegilops cylindrical*) was noted along this railroad and on the southwest edge of the quarry north of the railroad. It was originally noted a few years ago by M. J. Oldham and we revisited the site during

this field visit to check if it had been eliminated by the federal government. It was still growing between the tracks and on the quarry edge north of the railroad. This is the only known location in Ontario for this aggressive alien from the western prairies and originally Europe.

Beaver dam was found 100m upstream from the northwest corner of the site. The dam was active with wet mud applied to the leading edge of the dam and water flowed west up-stream.

Faunal Records:

89 - Birds

15 – Moths & Butterflies

12 – Mammals

10 – Reptiles & Amphibians

Site Visits

June 24, 1976

M. Box, R. Demers, A. Melaragni, V. Soyka (Brock university, Experience 76 Biology Crew)

September 1, 1980

Brady et al.

May 25, 2001

L. Campbell & Associates

July 30, 2004

C. Wren & Associates

June 5, 2007

T. Staton, R. Kitchen

June 7, 2007

T. Staton, R. Kitchen

June 11, 2007

T. Staton, R. Kitchen

June 12-14, 2007

A. Garofalo, K. White

June 14, 2007

T. Staton, R. Kitchen

June 15, 2007

A. Garofalo, K. White, M. Oldham, T. Staton, R. Kitchen

June 20-21, 25, 2007

A. Garofalo, K. White

June 21, 2007

A. Garofalo

July 25, 2007

B. Curry

August 1, 2007

T. Staton, R. Kitchen

August 8, 2007

A. Goodban, A. Garofalo, K. Young-Chin, T. Staton, R. Kitchen, K. White, R. Ng

August 22, 2007

B. Curry

November 1, 2007

T. Staton, R. Kitchen

June 4, 2008

T. Staton, R. Kitchen

June 13, 2008

A. Garofalo, K. White

% of Site Visited

43.67% of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

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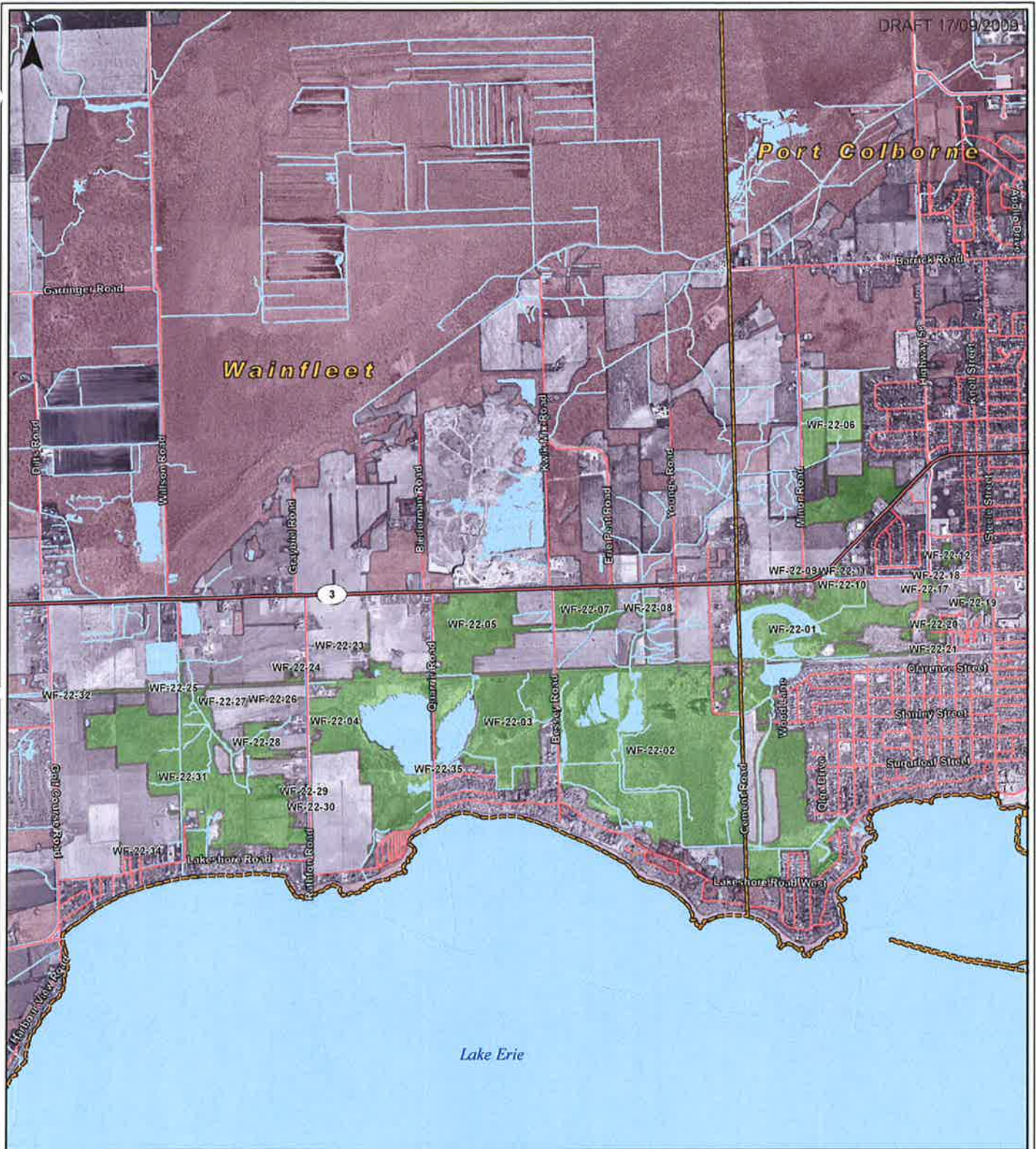
C. Wren and Associates, & M.A.Q. Aggregates Inc. (2005). *Level 2 natural environment report. In support of an application under the Aggregate Resources Act for the proposed Reeb Quarry*. Campbellville, Ontario: M A Q Aggregates Inc.

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-22



Natural Areas Inventory

Study Site WF-22

1:34,000



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All Frames. North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 564 recorded taxa (unique plant records) for this study site.

| | | |
|--------------------------|--------------------------|---------------------------------|
| Community Series: | | |
| Deciduous Forest (FOD) | Deciduous Woodland (WOD) | Submerged Shallow Aquatic (SAS) |
| Deciduous Savanna (SVD) | Graminoid Meadow (MEG) | Thicket Swamp (SWT) |
| Deciduous Swamp (SWD) | Meadow Marsh (MAM) | Transportation (COT) / Railway |
| Deciduous Thicket (THD) | Shallow Marsh (MAS) | Treed Rock Barren (RBT) |

Study Site WF-24

Municipality Township of Wainfleet

Formerly N/A

Approximate Area 246 hectares

Watershed The drainage for this study site is complex with the eastern portion draining via Big Forks Creek, the central section flows to Ellsworth Drain, the south/west goes to South Forks Drain and the north/west flows to North Forks Drain. All drainage eventually leads to the Welland River.

Ownership Mostly private.

General Summary

This study site straddles the Halimand County - Niagara Region border with the majority of the site in the Township of Wainfleet. The northern boundary is Wilford Road and the southern boundary is Highway 3. The western boundary is just west of the Townline Road/ border and the eastern boundary is just east of Petit Road.

Physical Description

Study site WF-24 is situated entirely within the Sand Plain characterized by well drained silty and loamy sands, underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------|---------------------------------|
| ALLUVIUM | 3.50 |
| BERRIEN | 16.69 |
| BEVERLY - COARSE PHASE | 0.54 |
| BEVERLY - LOAMY PHASE | 7.05 |
| FLAMBOROUGH - BROWN PHASE | 5.47 |
| MAPLEWOOD | 17.55 |
| PLAINFIELD | 0.92 |
| PLAINFIELD - DUNE PHASE | 4.65 |
| SILVER | 0.60 |
| TAVISTOCK | 12.56 |
| TOLEDO - COARSE PHASE | 2.56 |
| TOLEDO - LOAMY PHASE | 6.39 |
| TUSCOLA | 0.10 |
| VINELAND - BROWN PHASE | 1.80 |
| WALSINGHAM | 7.98 |
| WAUSEON | 11.29 |
| WATER | 0.00 |
| NOT MAPPED | 0.35 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area is slightly rolling with some vernal pools noted. The most commonly recorded community for this study site is the Deciduous Forest. These communities were dominated by Red Oak (*Quercus rubra*), Black Cherry (*Prunus serotina*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Beech (*Fagus grandifolia*), and Bitternut Hickory (*Carya cordiformis*).

The understory of these communities was largely recorded as smaller trees of the dominant species with Hop Hornbeam (*Ostrya virginiana*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), Silky Dogwood (*Cornus amomum* ssp. *obliqua*), White Elm (*Ulmus americana*), Choke Cherry (*Prunus virginiana* ssp. *virginiana*), and White Ash (*Fraxinus americana*).

The herbaceous layer was dominated by Running Strawberry-bush (*Euonymus obovata*), Mayapple (*Podophyllum peltatum*), Western Poison-ivy (*Rhus radicans* ssp. *rydbergii*), Blue Cohosh (*Caulophyllum thalictroides*), Asters (*Aster* sp.), and Goldenrods (*Solidago* sp.).

The wet depressions found throughout the forest communities were mostly recorded as Deciduous Swamps dominated by Silver Maple (*Acer saccharinum*) and Green Ash (*Fraxinus pennsylvanica*) with Silky Dogwood and Buttonbush (*Cephalanthus occidentalis*) as associates.

Vegetation Communities

There are a total of 224 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Savanna (SVD)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Shallow Marsh (MAS)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh White Cedar Coniferous Savanna Type (SVD4-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Green Ash Organic Deciduous Swamp Type (SWDO1-2)

Mixed Forb Organic Shallow Marsh Type (MASO2-1)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Open Graminoid Meadow Type (MEGM4-1)
Silver Maple Mineral Deciduous Swamp Type (SWDM3-2)
Silver Maple Organic Deciduous Swamp Type (SWDO2-2)
Waterweed Submerged Shallow Aquatic Type (SAS_1-2)
Willow Mineral Deciduous Swamp Type (SWDM4-1)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

Mouse captured and pictures taken. Likely a Woodland Jumping Mouse (*Napaeozapus insignis*) or Meadow Jumping Mouse.

10 – Birds
4 – Mammals
3 – Reptiles & Amphibians
1 – Moths & Butterflies

Site Visits

August 21, 2007
T. Staton, R. Kitchen

September 5, 2007
T. Staton, R. Kitchen

September 7, 2007
T. Staton, R. Kitchen

September 12, 2007
T. Staton, R. Kitchen

September 15, 2007
T. Staton, R. Kitchen

September 24, 2007
T. Staton, R. Kitchen

% of site visited

6.25 % of the total study site was visited by NAI teams.

References Cited

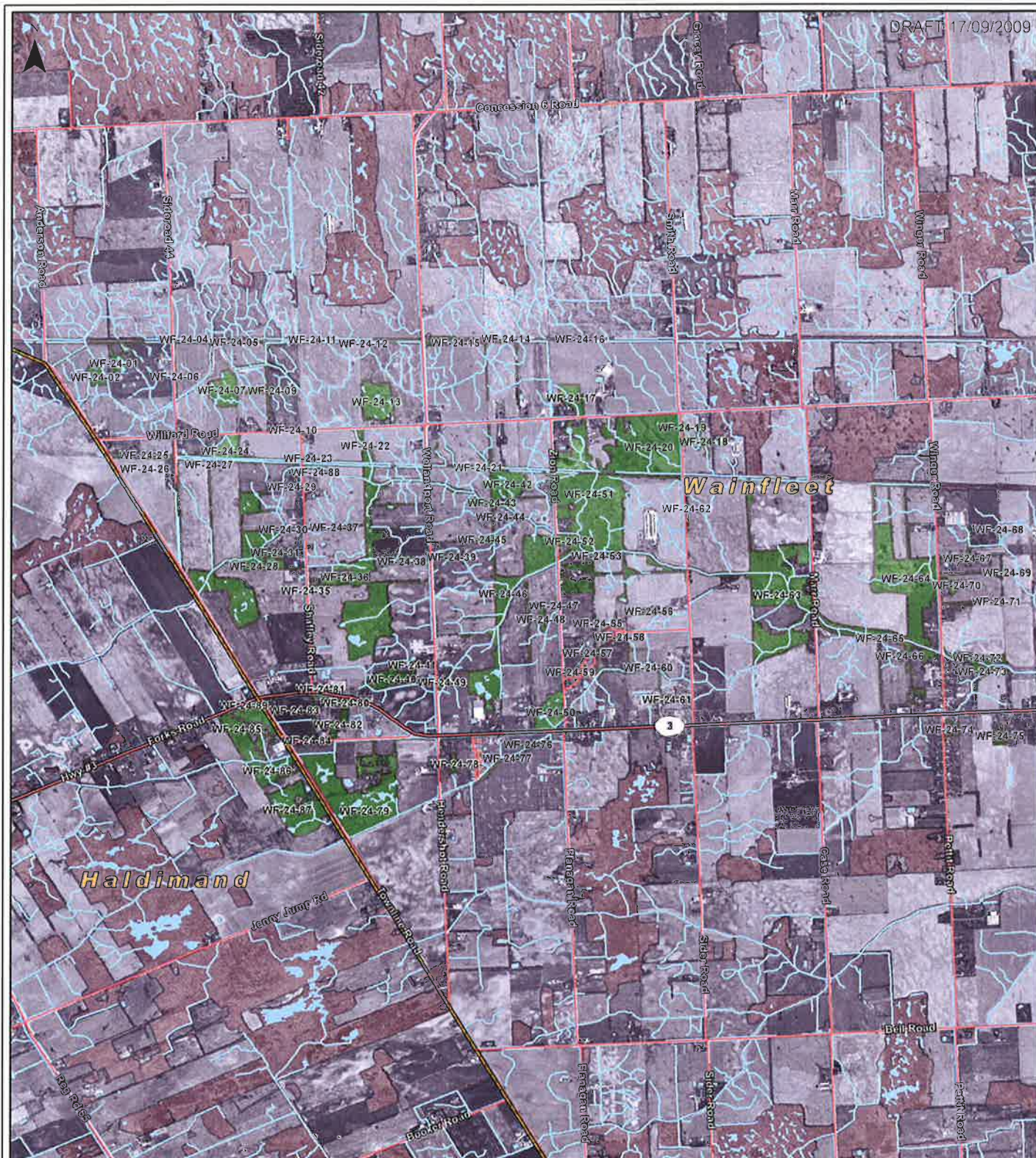
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-24



Natural Areas Inventory

Study Site WF-24

1:34,500

0 250 500 1,000 1,500 2,000 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 224 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Shallow Marsh (MAS)

Study Site WF-25

Municipality Township of Wainfleet

Formerly N/A

Approximate Area 93 hectares

Watershed This study site drains to Mill Race Creek subwatershed.

Ownership Mostly private

General Summary

Study site WF-25 is located within the Township of Wainfleet. The northern boundary is the Feeder Canal and Concession 1 Road is the boundary to the south. It runs from Highway 3 to the east, and Sideroad 22 to the west.

Physical Description

This study site is characterized by the flat, poorly drained clay soils of the Haldimand Clay Plain. The majority of the site is underlain by the dolostone and shale of the Salina Formation, with a section in the east underlain by the dolostone of the Bertie Formation.

Soils

| Soils | Percent of Study Site |
|----------------------------|------------------------------|
| BEVERLY | 0.34 |
| BEVERLY - LOAMY PHASE | 0.24 |
| HALDIMAND | 9.60 |
| HALDIMAND - LOAMY PHASE | 0.65 |
| LINCOLN | 60.86 |
| TAVISTOCK - TILL RED PHASE | 0.01 |
| TOLEDO | 26.14 |
| TOLEDO - LOAMY PHASE | 2.16 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site was characterized by a very typical Deciduous Swamp community dominated by Red Maple (*Acer rubrum*) or Freeman's Maple (*Acer X freemanii*), with Green Ash (*Fraxinus pennsylvanica*), Red Oak (*Quercus rubra*), White Elm (*Ulmus americana*), and Basswood (*Tilia americana*).

The understory was a mix of canopy species with Spicebush (*Lindera benzoin*).

The herbaceous layer was largely Spotted Touch-me-not (*Impatiens capensis*), Virginia Creeper (*Parthenocissus quinquefolia*), Spotted Crane's-bill (*Geranium maculatum*), and Climbing Poison-ivy (*Rhus radicans* ssp. *rydbergii*).

Some of the wetter areas support Buttonbush (*Cephalanthus occidentalis*), or Speckled Alder (*Alnus incana* ssp. *rugosa*) Thicket Swamp communities.

There is evidence of historic logging.

Vegetation Communities

A total of 131 taxa (unique plant records) were recorded for this site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Speckled Alder Organic Deciduous Thicket Swamp Type (SWTO1-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted

Provincially Rare Species- None noted

Points of Interest

A large Red Oak (*Quercus rubra*) was measured @ 107.75 cm dbh. Also a Silver Maple (*Acer saccharinum*) of 104cm dbh was observed.

Several Turkey Vultures were observed along with an active nesting site in a hollow tree. The nest tree contained two Turkey Vulture chicks in good health.

Faunal Records:

11 - Birds
2 - Reptiles & Amphibians
1 - Moths & Butterflies
1 - Mammals

Site Visits

June 11, 2008
S.Mohamed, T. Staton

June 16, 2008
S. Mohamed, T. Staton

% of site visited

16.31% of the total study site was visited by NAI teams.

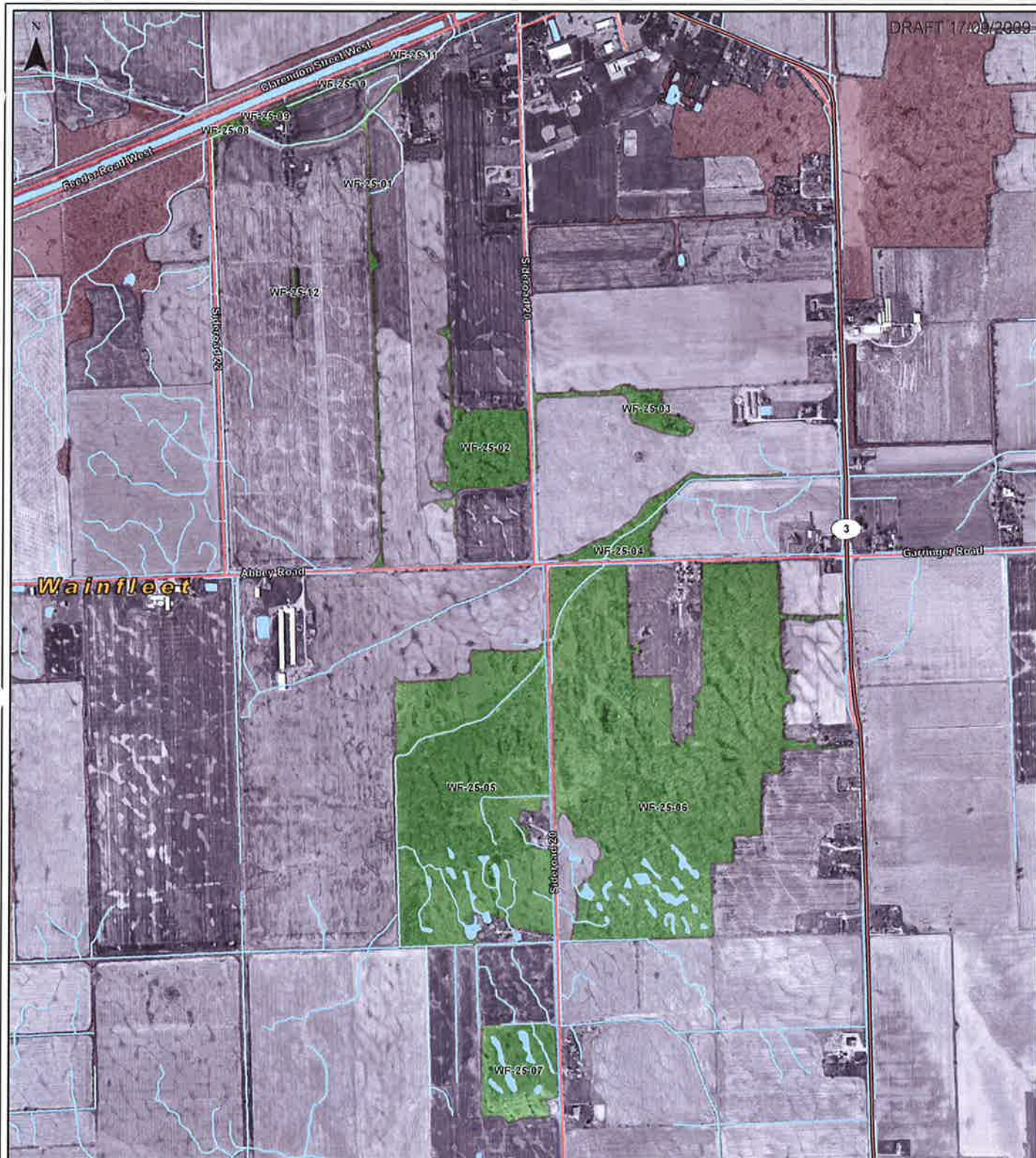
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-25



Natural Areas Inventory

Study Site WF-25

1:14,000

0 100 200 400 600 800 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 8° Projection, Zone 17N, Central Meridian 81° West



A total of 131 taxa (unique plant records) were recorded for this site.

Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WF-29

Welland River

Municipality City of Hamilton, Township of West Lincoln, Township of Wainfleet, City of Welland

Formerly N/A

Approximate Area 357 hectares

Watershed This study site drains to the Welland River West subwatershed.

Ownership Mixture of private and public

General Summary

This study site includes the main channel of the Welland River, and its closely associated woodlands from the headwaters near Sinclairville Road in the City of Hamilton, to the Welland Canal in the City of Welland.

Physical Description

This study site is characterized by the fact that it follows the Welland River and includes its closely associated floodplain communities. It falls entirely within the area of flat, poorly drained clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|---------------------------------|
| ALLUVIUM | 30.70 |
| BEVERLY | 18.92 |
| BEVERLY - LOAMY PHASE | 0.77 |
| BEVERLY - RED PHASE | 0.35 |
| BRANTFORD | 16.76 |
| BRANTFORD - RED PHASE | 0.06 |
| HALDIMAND | 1.23 |
| HALDIMAND - LOAMY PHASE | 0.01 |
| LINCOLN | 0.83 |
| SMITHVILLE | 0.05 |
| TOLEDO | 4.92 |
| TOLEDO - LOAMY PHASE | 0.10 |
| WATER | 18.95 |
| NOT MAPPED | 6.34 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is unique in that its boundaries are based on the floodplain of the Welland River and the closely associated woodlands. Most of the communities recorded were fresh-moist Deciduous Forests with some Thicket Swamps and Shallow or Meadow

Marsh communities.

The Deciduous Forests were dominated by Black Walnut (*Juglans nigra*), Red Oak (*Quercus rubra*), Silver Maple (*Acer saccharinum*), and Green Ash (*Fraxinus pennsylvanica*). The associated understory contained Choke Cherry (*Prunus virginiana* ssp. *virginiana*), Hawthorns (*Crataegus* sp.), Basswood (*Tilia americana*), and Gray Dogwood (*Cornus foemina* ssp. *racemosa*). The herbaceous layer was characterized by a mix of Grasses, Sedges (*Carex* sp.), Asters (*Aster* sp.), and in some cases, Garlic Mustard (*Alliaria petiolata*).

The Thicket Swamp communities were dominated by Red Maple (*Acer rubrum*), Poison Sumac (*Rhus vernix*), and Yellow Birch (*Betula alleghaniensis*) with Hawthorn (*Crataegus* sp.), Winterberry (*Ilex verticillata*), Highbush Cranberry (*Vaccinium corymbosum*), and Buttonbush (*Cephalanthus occidentalis*). The herbaceous layer was commonly a mix of Ferns (*Osmunda* sp.), Mosses and Sedges (*Carex* sp.).

The Shallow Marsh communities were characterized by Reed Canary Grass (*Phalaris arundinacea*) and Broad-leaved Cattails (*Typha latifolia*) with associated Rice Cut Grass (*Leersia oryzoides*), Devil's Beggar-ticks (*Bidens frondosa*), and Sedges.

The Meadow Marshes were largely Common Elderberry (*Sambucus canadensis*), Gray Dogwood, and Reed Canary Grass with scattered Green Ash and White Elm (*Ulmus americana*).

The successional meadow areas were dominated by Kentucky Blue Grass (*Poa* sp.), New England Aster (*Aster novae-angliae*), Tall Goldenrod (*Solidago altissima* var. *altissima*), and Grass-leaved Goldenrod (*Euthamia graminifolia*).

Vegetation Communities

There are a total of 373 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Forb Meadow (MEF)
Floating-leaved Shallow Aquatic (SAF)
Graminoid Meadow (MEG)
Mixed Swamp (SWM)
Meadow Marsh (MAM)
Mixed Forest (FOM)
Mixed Meadow (MEM)
Mixed Shallow Aquatic (SAM)
Open Water (OAW)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Canada Blue-joint Graminoid Mineral Meadow Marsh Type (MAMM1-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh Black Locust Deciduous Forest Type (FODM4-11)
Dry-Fresh Hawthorn – Apple Deciduous Forest Type (FODM4-10)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Mixed Shallow Aquatic Type (SAM_1-2)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Black Walnut Lowland Deciduous Forest Type (FODM7-4)
Fresh-Moist Exotic Lowland Deciduous Forest Type (FODM7-9)
Fresh-Moist Green Ash- Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Fresh-Moist Sugar Maple-Hemlock Mixed Forest Type (FODM6-1)
Fresh-Moist Sugar Maple-Lowland Ash Deciduous Forest Type (FODM6-1)
Fresh-Moist White Cedar Coniferous Forest Type (FOCM4-1)
Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Fresh-Moist Willow Lowland Deciduous Forest Type (FODM7-3)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Goldenrod Forb Meadow Type (MEFM1-1)
Gray Dogwood Deciduous Thicket Type (THDM5-1)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Hawthorn Deciduous Shrub Thicket Type (THDM2-11)
Hemlock-Hardwood Organic Mixed Swamp Type (SWMO4-2)
Kentucky Blue Grass Graminoid Meadow Type (MEGM3-4)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Native Shrub Deciduous Hedgerow Thicket Type (THDM3-2)
Open Graminoid Meadow Type (MEGM4-1)
Orchard Grass Graminoid Meadow Type (MEGM3-6)
Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed Canary Grass Graminoid Meadow Type (MEGM3-8)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-1)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Water Lily-Bullhead Lily Floating-leaved Shallow Aquatic Type (SAF_1-1)
Water Milfoil Mixed Shallow Aquatic Type (SAM_1-7)
Water-parsnip Organic Shallow Marsh Type (MASO2-5)
Willow Mineral Deciduous Swamp Type (SWDM4-1)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora**Species at Risk**

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) – Endangered

Juglans cinerea (Butternut) (NPCA, 2006-2009) – Endangered

Provincially Rare Species

Gleditsia triacanthos (Honey Locust) (NPCA, 2006-2009) – S2

Nuphar microphylla (Small Yellow Pond-lily) (NPCA, 2006-2009) – S3

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

32 – Birds

10 – Mammals

7 – Reptiles & Amphibians

4 – Moths & Butterflies

Site Visits

June 1, 2007

J. Kellam, J. Damude, J. Potter, R. Young

June 8, 2007

J. Kellam, J. Potter, D. Young, R. Young

July 6, 2007

R. Young, D. Young

July 17, 2007

T. Staton, R. Kitchen

September 13, 2007

T. Staton, R. Kitchen

September 17, 2007

T. Staton, R. Kitchen

September 18, 2007

T. Staton, R. Kitchen

September 19, 2007

T. Staton, R. Kitchen

September 20, 2007

T. Staton, R. Kitchen

October 16, 2007

T. Staton, R. Kitchen

October 30, 2007
T. Staton, R. Kitchen

November 6, 2007
T. Staton, R. Kitchen

August 6, 2008
T. Staton, S. Mohamed

August 13, 2008
T. Staton, S. Mohamed

August 18, 2008
T. Staton, S. Mohamed

August 22, 2008
T. Staton, S. Mohamed

September 2, 2008
T. Staton, S. Mohamed

September 27, 2008
R. Kitchen, B. Porter

September 29, 2008
R. Kitchen, B. Porter

October 1, 2008
R. Kitchen, B. Porter

October 14, 2008
T. Staton, S. Mohamed

% of site visited

8.50 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

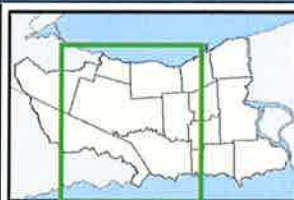
Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WF-29



Natural Areas Inventory

Study Site WF-29

1:226,000

0 3,000 6,000 9,000 12,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 373 recorded taxa (unique plant records) for this study site.

Community Series:

- | | | |
|-------------------------|------------------------|-----------------------------|
| Coniferous Forest (FOC) | Forb Meadow (MEF) | Mixed Shallow Aquatic (SAM) |
| Deciduous Forest (FOD) | Graminoid Meadow (MEG) | Open Water (OAW) |
| Deciduous Swamp (SWD) | Meadow Marsh (MAM) | Shallow Marsh (MAS) |
| Deciduous Thicket (THD) | Mixed Forest (FOM) | Thicket Swamp (SWT) |

Study Site WE-01

McKenny Road Woods

Municipality City of Welland

Formerly McKenny Road Woods (Brady et al., 1980)

Approximate Area 171 hectares

Watershed This study site drains to Grassy Brook.

Ownership Mostly private

General Summary

The boundaries are Grassy Brook Road to the north, the rail line to the south, Darby Road to the west and Morris Road to the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 6.12 |
| BEVERLY - RED PHASE | 4.06 |
| MALTON - HEAVY RED PHASE | 0.08 |
| NIAGARA | 16.46 |
| TOLEDO - RED PHASE | 1.83 |
| WELLAND | 71.44 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The areas of this study site that were visited by the NAI teams were dominated by regenerating Thicket or Thicket Swamp communities.

Grey Dogwood (*Cornus foemina* ssp. *racemosa*) thickets were common on the dry knolls surrounded by Thicket Swamps of mostly Narrow-leaved Meadowsweet (*Spirea alba*), and Grey Dogwood.

A large Narrow-leaved Sedge Marsh was noted along a swale. The associated seasonally dry mud flats supported assemblages of Spike-rushes (*Eleocharis* sp.), Clammy Hedge-hyssop (*Gratiola neglecta*), and Marsh Speedwell (*Veronica scutellata*).

In the areas associated with the watercourse, Deciduous Swamp communities were dominated by Green Ash (*Fraxinus pennsylvanica*). Red Maple (*Acer rubrum*), Pin Oak

(*Quercus palustris*) and, White Swamp Oak (*Quercus bicolor*) were also noted.

The understory was commonly White Elm (*Ulmus americana*) and Freeman's Maple (*Acer fremanii*).

The herbaceous layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), White Avena (*Geum canadense*), and Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*).

The raised floodplains supported a more lowland community with a mix of Hawthorn (*Crataegus* sp.) and Willow (*Salix* sp.) above the characteristic mix of Bent Grass (*Agrostis* sp.), Garlic Mustard (*Alliaria petiolata*), Moneywort (*Lysimachia nummularia*) and Spotted Touch-me-not.

The open water creek channel contained patches of Eastern Manna Grass (*Glyceria septentrionalis*) and in areas with drawn down water levels, carpets of Marsh Purslane (*Ludwegia palustris*) were noted.

Vegetation Communities

There are a total of 196 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Meadow Marsh (MAM)
Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

12 – Birds
3- Mammals

Site Visits

September 1, 1980

Brady et al.

June 8, 2007

J. Sankey, J. Grassie, F. Fohr, H. Teare, R. Armstrong

June 22, 2007

J. Sankey, J. Grassie, H. Teare, W. Laar, S. Istok

June 24, 2008

A. Garofalo, K. Young-Chin

% of site visited

6.8 % of the total study site was visited by NAI teams.

References Cited

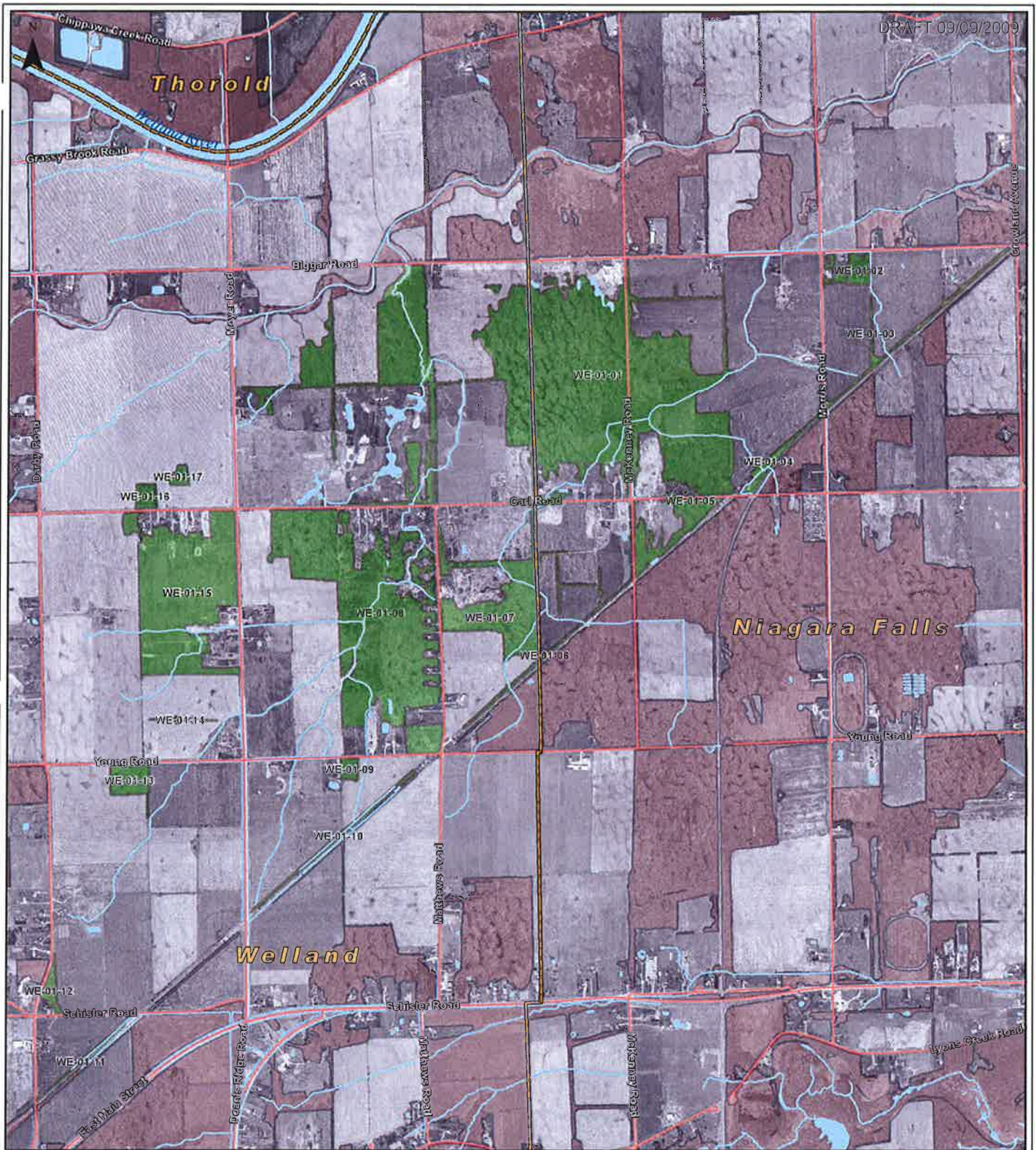
Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-01



Natural Areas Inventory

Study Site WE-01

1:22,000

0 150 300 600 900 1,200 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 196 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Thicket Swamp (SWT)

Study Site WE-02

Woodlawn Park

Municipality City of Welland

Formerly N/A

Approximate Area 12 hectares

Watershed This study site drains to the Draper's Creek subwatershed.

Ownership Publicly owned by the City of Welland.

General Summary

This city owned park is located south of Woodlawn Road between Rice Road to the east and Silvan Drive to the west.

Physical Description

This natural area is situated just south of the Fonthill Kame Moraine complex on the well drained sand and silty sand soils of the Sand Plain. It is underlain by the dolostone of the Guleph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------------|--------------------------|
| BEVERLY - COARSE PHASE | 2.49 |
| TOLEDO | 2.49 |
| WATER | 0.00 |
| NOT MAPPED | 95.02 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This area is known for its rich slough forests. The edges of the slough ponds are lined with Green Ash (*Fraxinus pennsylvanica*) dominated Deciduous Swamp communities. The provincially rare Black Gum (*Nyssa sylvatica*) grows on the margins of the Green Ash swamps. Patches of similar habitat also occurs throughout this study site in other low lying areas.

The higher knolls adjacent to the sloughs support Deciduous Forest communities characterized by Red Oak (*Quercus rubra*) and Sugar Maple (*Acer saccharum* ssp. *saccharum*). The canopy is generally very high.

More open areas with deeper standing water supported Rice Cut-grass (*Leersia oryzoides*) Meadow Marshes and the deepest pockets, or middle of some slough ponds supported Duckweed (*Lemna* sp.) Shallow Aquatic pools with deep organic accumulations.

Moist sections in the shade of the forest canopy without much standing water were

commonly Spotted Touch-me-not (*Impatiens capensis*) dominated communities.

Disturbed areas are being overtaken with Purple Loosestrife (*Lythrum salicaria*) and Moneywort (*Lysimachia nummularia*).

Vegetation Communities

There are a total of 128 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)

Vegetation Type

Dry-Fresh Beech Deciduous Forest Type (FODM4-1)
Dry-Fresh Oak-Hardwood Deciduous Forest Type (FODM2-4)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)

Significant Flora

Species at Risk

Smilax rotundifolia (Common Greenbrier) (NPCA, 2006-2009) – Threatened

Provincially Rare Species

Eurybia divaricata (White Wood Aster) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Based on 1955 air photos, a high quality slough forest, slightly larger than present day Woodlawn Park continued south of the Woodlawn Road allowance. It was also present in the 1978 air photos.

Faunal Records:

4- Birds

Site Visits

July 19, 2006
A. Garofalo, K. White

July 20, 2006
A. Garofalo, K. White

% of site visited

46.52 % of the total study site was visited by NAI teams.

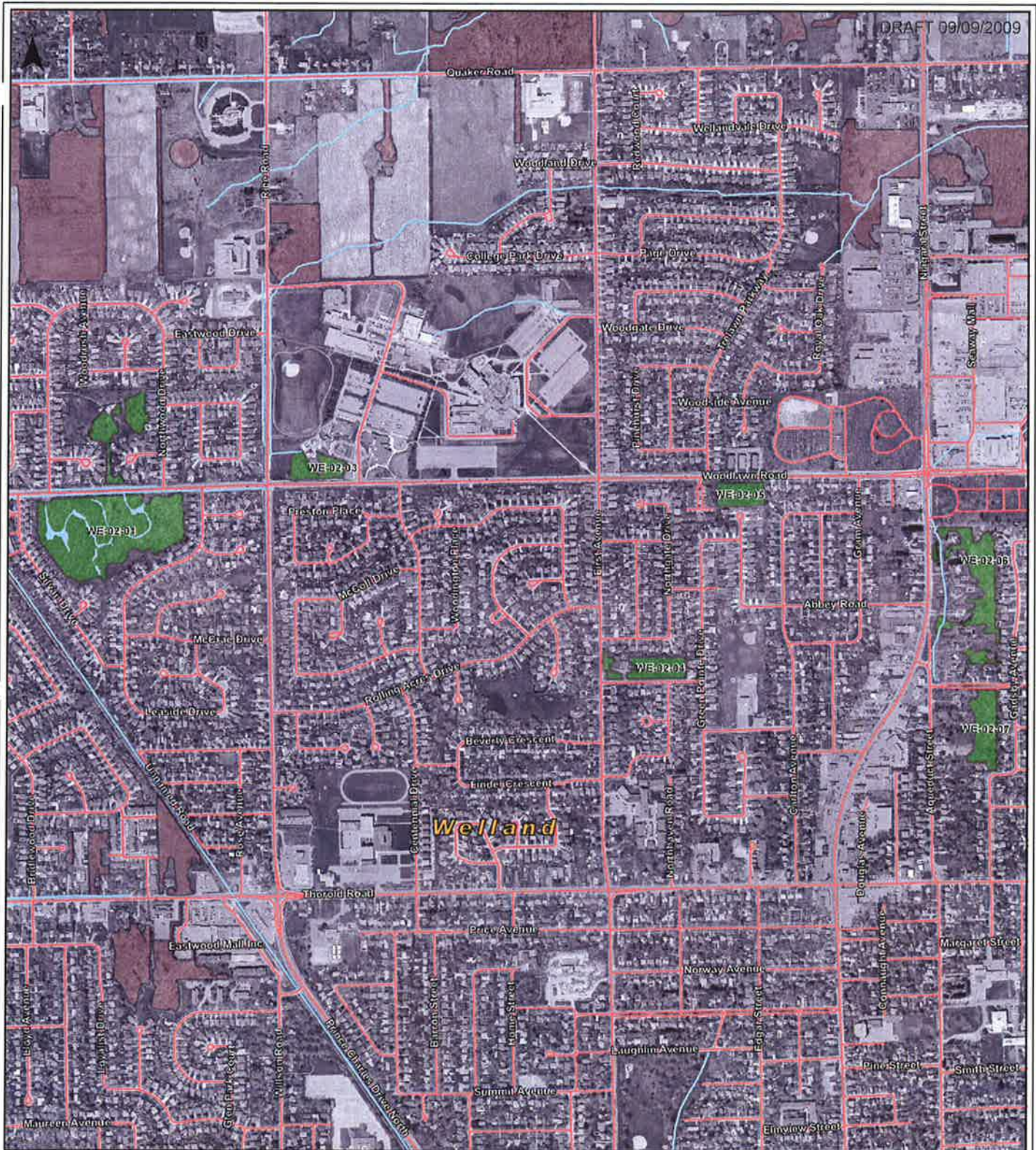
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-02



Natural Areas Inventory

Study Site WE-02

1:13,000

0 100 200 400 600 800 Meters

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There are a total of 128 recorded taxa (unique plant records) for this study site.
Community Series:
 Deciduous Forest (FOD)
 Meadow Marsh (MAM)
 Shallow Marsh (MAS)

Study Site WE-03

Atlas Swamp/Wetlands

Municipality City of Welland

Formerly N/A

Approximate Area 42 hectares

Watershed This study site drains to the Welland River between Canals subwatershed.

Ownership Mostly private

General Summary

This Study Site is located within the municipality of Welland in a highly industrialized portion of the City. The study site is bound on the north and west by a rail line that runs north east to south west. The southern boundary is East Main Street and the eastern boundary is the Welland Canal.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Inverted soils associated with fill from the construction of the Welland Canal are possible in the far eastern portion of this study site.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| WELLAND | 78.52 |
| WATER | 0.00 |
| NOT MAPPED | 21.48 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The Deciduous Swamp communities noted for this study site were dominated by Red Maple (*Acer rubrum*), Pin Oak (*Quercus palustris*) or Green Ash (*Fraxinus pennsylvanica*), with White Elm (*Ulmus americana*) and/or Swamp White Oak (*Quercus bicolor*).

The understory was generally a mix of the above plus Blue Beech (*Carpinus caroliniana*) with Spotted Touch-me-nots (*Impatiens capensis*), Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), White Avens (*Geum canadense*), Rough Avens (*Geum laciniatum*), Asters (*Aster* sp.) and Goldenrods (*Solidago* sp.).

The drier knolls or suite of small moraine ridges (Menzies J., 2001) separated by slough ponds or wet depressions, supported high quality Oak-Maple forests.

Between the small moraine ridges, slight slough depressions supported wet areas of Red Maple Swamp co-dominated by Pin Oak, and occasionally Red Oak (*Quercus rubra*), rooted on areas with slightly raised microtopography.

Other deeper sloughs and younger regenerating forested swamp/successional areas supported swamps of Pin Oak.

The deepest slough ponds, too wet to sustain tree species, most commonly supported Thicket Swamps dominated by Buttonbush (*Cephalanthus occidentalis*) with open water pockets ringed with Buttonbush, Rice Cut Grass (*Leersia oryzoides*), Star Duckweed (*Lemna trisulca*) and Bladderwort sp. (*Utricularia sp.*) or Pondweed (*Potamogeton sp.*). Buttonbush in some areas reached heights of 3-5m and looked almost tree-like. Black Gum (*Nyssa sylvatica*) was present in places around the rich and diverse Buttonbush thicket swamps.

Vegetation Communities

There are a total of 236 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Coral mushrooms also observed (pale crème color).
Also observed Red-faced Meadow Hawk.

Faunal Records:

8- Birds
3- Reptiles & Amphibians
2- Mammals

Site Visits

October 29, 2000
Acres and Associates

August 8, 2008
A. Garofalo, K. Young-Chin

August 11, 2008
A. Garofalo, K. Young-Chin

August 12, 2008
A. Garofalo, K. Young-Chin, S. Mohamed

August 25, 2008
A. Garofalo, K. Young-Chin, S. Mohamed

% of site visited

25.72 % of the total study site was visited by NAI teams.

References Cited

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Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

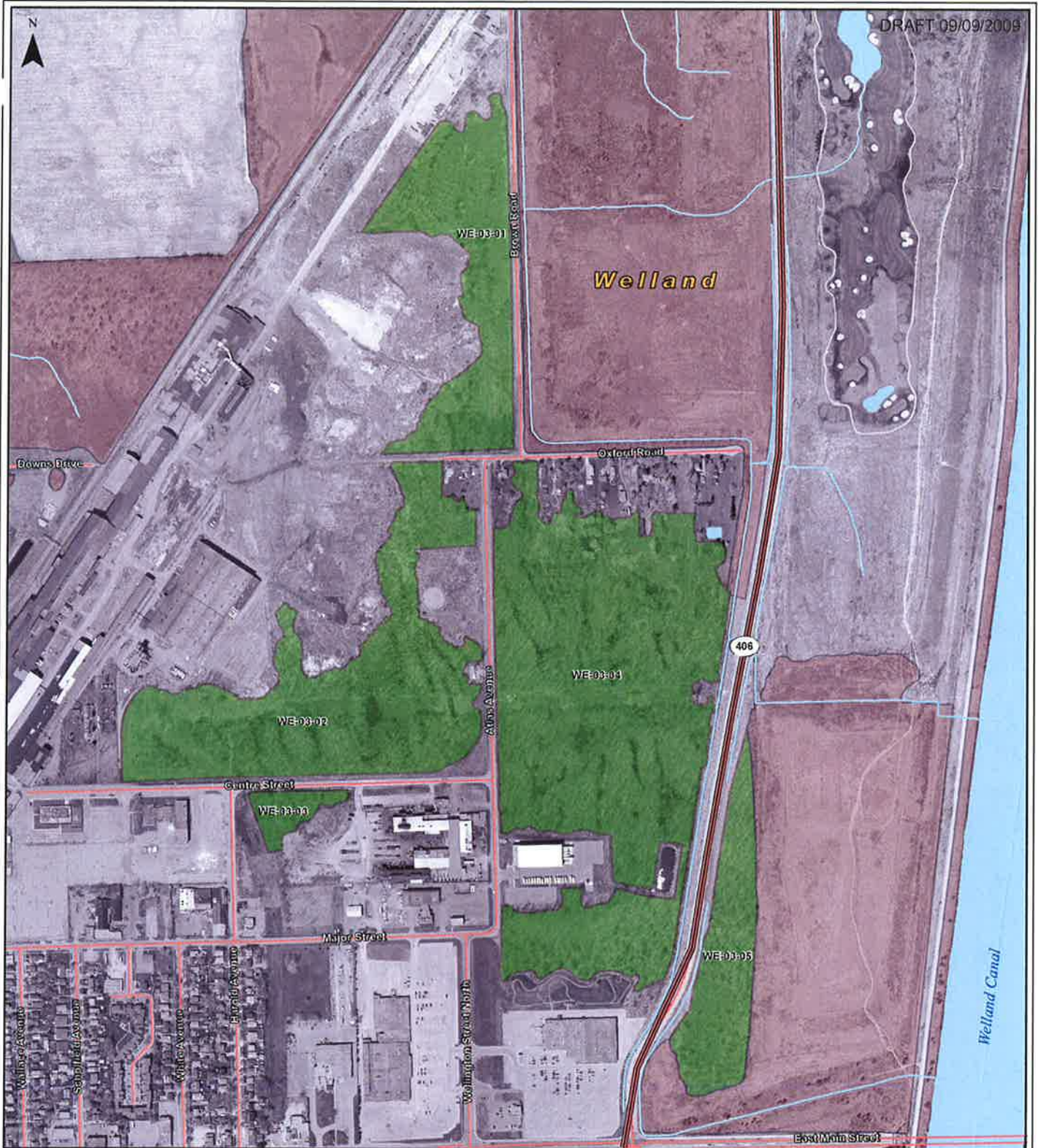
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

DRAFT 09/09/2009



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-03



Natural Areas Inventory

Study Site WE-03



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 236 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site WE-04

Welland River/ Merrit Island

Municipality City of Welland

Formerly N/A

Approximate Area 73 hectares

Watershed This study site drains to the Welland River between Canals subwatershed.

Ownership A mix of public and private.

General Summary

This study site is located within the municipality of Welland between the old and the new Welland Canal just south of where the two merge. It is dissected by the Welland River. It includes a property owned by the City of Welland known locally as Merrit Island.

It is bound on the west by the Old Welland Canal and on the east by the active Welland Canal. It extends in a narrow band to the Welland River syphons in the south and to the merge point of the two canals in the north.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain.

The majority of this study site is underlain by the dolostone and shale of the Salina Formation, with a small area in the north underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------------|--------------------------|
| ALLUVIUM | 0.70 |
| NIAGARA | 14.75 |
| ONTARIO | 8.93 |
| TAVISTOCK - HEAVY RED PHASE | 0.57 |
| WELLAND | 24.98 |
| WATER | 7.50 |
| NOT MAPPED | 42.57 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Silky Dogwood (*Cornus amomum ssp. obliqua*) was the dominant species in the Thicket Swamp communities of the floodplain. Grey Dogwood (*Cornus foemina ssp. racemosa*) was the dominant species on the drier areas or fill berms. The steep valleys and floodplain slopes were mostly Grey Dogwood thickets and a few areas along the slope support stands of White Elm (*Ulmus americana*).

Within the floodplain, especially along the top of bank on the Welland River, were regenerating stands of Green Ash (*Fraxinus pennsylvanica*) with Poverty Oat Grass (*Danthonia spicata*), Sedges (*Carex sp.*) and, Rushes (*Juncus sp.*).

One area supported a submerged aquatic community along the shoreline of the Welland River. This was dominated by Horned Pondweed (*Zannichellia palustris*) with Curly Pondweed (*Potamogeton crispus*), Small White Water-lily (*Nymphaea odorata* ssp. *odorata*) and, Water-milfoil species (*Myriophyllum sp.*).

Vegetation Communities

There are a total of 159 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Mixed Shallow Aquatic (SAM)
Thicket Swamp (SWT)

Vegetation Type

Fresh-Moist White Elm Lowland Deciduous Forest Type (FODM7-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Poverty Oat Grass Graminoid Meadow Type (MEGM3-1)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

Faunal Records:

17 – Birds
5- Mammals
2- Butterflies & Moths
2- Reptiles & Amphibians

Site Visits

July 4, 2008

A. Garofalo, K. Young-Chin, T. Staton, S. Mohamed

% of site visited

7.51 % of the total study site was visited by NAI teams.

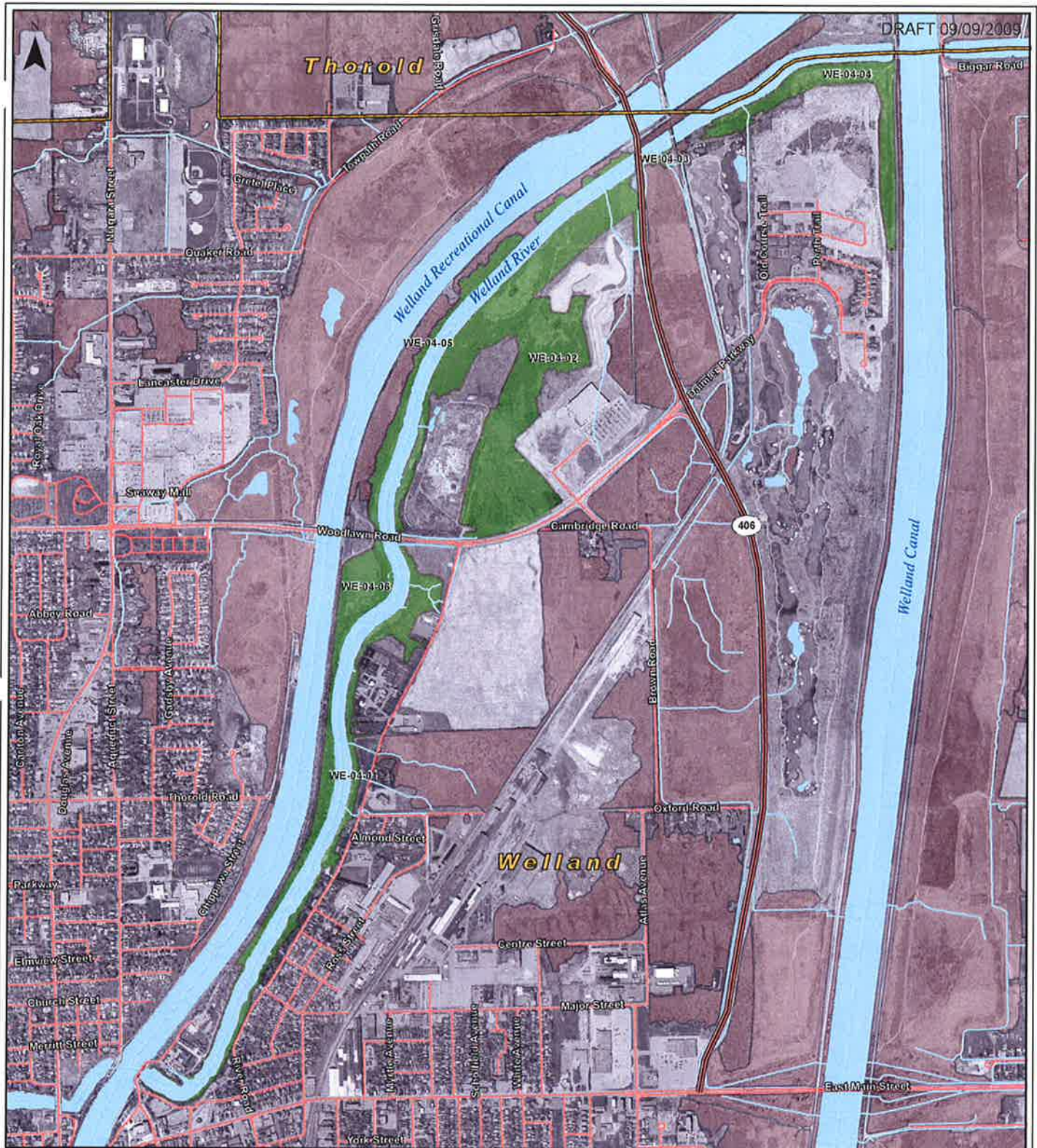
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There are a total of 159 recorded taxa (unique plant records) for this study site.

Study Site WE-06

Highway 140/ Netherby Slough Forest

Municipality City of Welland

Formerly N/A

Approximate Area 163 hectares

Watershed Half of this Study Site drains to the Welland Canal subwatershed and half to Lyon's Creek.

Ownership Mostly private

General Summary

This study site is located just east of the Welland Canal between Ridge Road in the north and Townline Tunnel Road in the south. It is bound on the east by Doan's Ridge Road.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|-----------------------|--------------------------|
| ALLUVIUM | 0.99 |
| LINCOLN | 5.57 |
| NIAGARA | 2.43 |
| NIAGARA - LOAMY PHASE | 1.20 |
| WELLAND | 83.75 |
| WATER | 0.00 |
| NOT MAPPED | 6.06 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Species rich Deciduous Swamp and Thicket Swamp complexes were common in more mature areas of this study site. Black Gum (*Nyssa sylvatica*), Cut-leaved Grape Fern (*Botrychium dissectum*), and Flat-topped White Aster (*Aster umbellatus* var. *umbellatus*) were commonly found with a canopy of Red Maple (*Acer rubrum*), and Green Ash (*Fraxinus pennsylvanica*).

Early Goldenrod (*Solidago juncea*), Moss species (*Moss sp.*), Lichens (*Lichen sp.*), Common Cinquefoil (*Potentilla simplex*), and Common Speedwell (*Veronica officinalis*) were found on drier knolls in the successional swamp communities.

Vegetation Communities

There are a total of 122 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Thicket Swamp (SWT)

Vegetation Type

Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

17 – Birds
8- Butterflies & Moths
1- Reptile & Amphibian

Site Visits

July 9, 2007
B. Curry

August 26, 2008
A. Garofalo, K. Young-Chin

% of site visited

2.05 % of the total study site was visited by NAI teams.

References Cited

- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-06



Natural Areas Inventory

Study Site WE-06

1:15,000

0 100 200 400 600 800 Meters

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There are a total of 122 recorded taxa (unique plant records) for this study site
Community Series:
Deciduous Swamp (SWD)

Study Site WE-07

Canal Lands

Municipality Portions of this study site are found in the municipalities of Niagara Falls, Welland and Port Colborne.

Formerly N/A

Approximate Area 1081 hectares

Watershed This study site spans many subwatersheds due to the very nature of the way in which it follows the canals. It spans the Welland Canal North, Welland Canal, Welland Canal South and Welland River Between Canals watersheds.

Ownership Mostly public.

General Summary

This study site follows the Welland Canal on both sides from the Welland River to Lake Erie.

Physical Description

The majority of this natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

In the southern portion there is an area that is underlain by the dolostone of the Bertie Formation.

The far southern tip of this study site is very near the Lake Erie shore. It is situated on the Limestone Plain characterized by very shallow soils and bedrock outcropping at the surface. This portion is underlain by the limestone of the Bois Blanc Formation.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| ALLUVIUM | 0.34 |
| BERRIEN | 0.02 |
| BEVERLY | 0.04 |
| BEVERLY - RED PHASE | 0.02 |
| BOOKTON | 0.02 |
| FARMINGTON - VERY SHALLOW PHASE | 0.00 |
| FRANKTOWN - VERY SHALLOW PHASE | 0.01 |
| LINCOLN | 0.01 |
| MALTON - HEAVY RED PHASE | 0.06 |
| NIAGARA | 3.06 |
| ONEIDA - RED PHASE | 0.28 |
| ONEIDA - RED WASHED PHASE | 0.04 |
| ONTARIO | 0.12 |
| PEEL - HEAVY RED PHASE | 0.04 |

| | |
|-----------------------------|--------|
| TAVISTOCK - HEAVY RED PHASE | 0.03 |
| TOLEDO | 0.27 |
| WELLAND | 10.33 |
| WATER | 1.02 |
| NOT MAPPED | 84.29 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site was characterized by poor soils due to the construction of the canals. The soil horizon in many areas is inverted and thus there are vast areas where no vegetation is present.

Much of this study site is fenced off so access was an issue. Field crews did visit some vegetated areas of Deciduous Swamp communities with dominant Green Ash (*Fraxinus pennsylvanica*) and Swamp Maple (*Acer fremanii*).

The understory was largely regenerating Green Ash and Swamp Maple with a ground cover of Fowl Manna Grass (*Glyceria striata*), Crested Sedge (*Carex cristatella*), Spotted Touch-me-not (*Impatiens capensis*), and False Nettle (*Boehmeria cylindrica*).

Vegetation Communities

There are a total of 92 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

None noted.

Site Visits

June 10, 2007

A. Garofalo, K. Young-Chin

% of site visited

This study site was not visited by the NAI teams however given its historical importance, a technical summary has been written.

References Cited

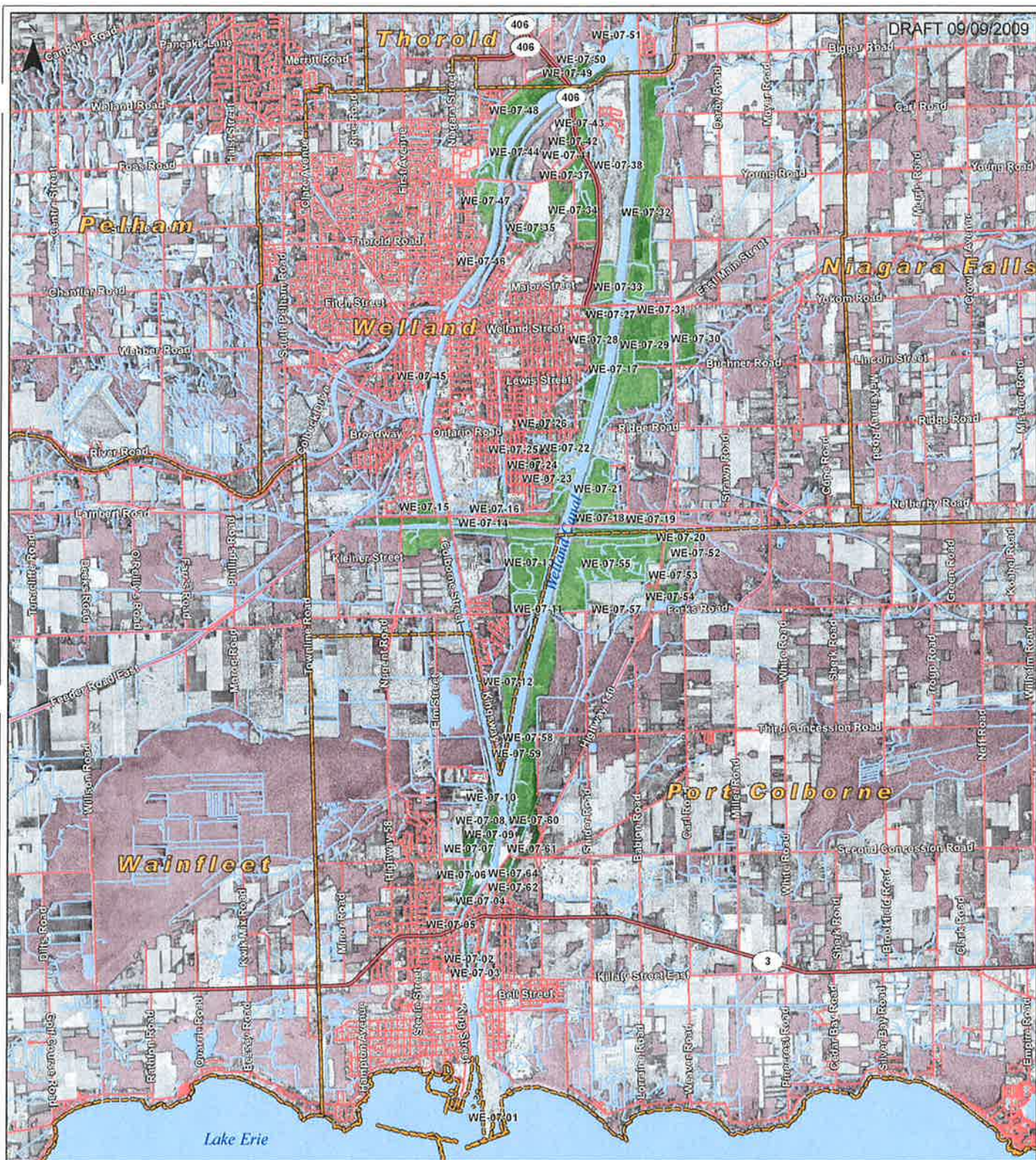
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-07



Natural Areas Inventory

Study Site WE-07

1:88,000

0 625 1,250 2,500 3,750 5,000 Meters

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There are a total of 92 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site WE-08

Railway Fen

Municipality City of Welland

Formerly N/A

Approximate Area 44 hectares

Watershed This study site drains to the Welland River West subwatershed.

Ownership It is a mix of private and public.

General Summary

This study site is relatively small in an urban area extending between the rail line and Riverside Dr. The southern boundary is Broadway St., and it extends to a corridor owned by Transport Canada in the north.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

This area is unique in that a very low-lying depression was created during the construction of the railway. The impounded water has created deep organic soils, and in turn unique communities for which this study site is named.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 10.25 |
| TOLEDO | 60.79 |
| WATER | 0.00 |
| NOT MAPPED | 28.95 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The dominant wetland of this study site seems to have been formed by impounded water held back by the calcareous gravels of the railway bed. It was classified as a Shallow Marsh community characterized by a dense mat of Cattails (*Typha sp.*) in floating mats that quake over deep water (knee to waist deep). Sedges (*Carex sp.*), Star Duckweed (*Lemna trisulca*), Lesser Duckweed (*Lemna minor*) and, Liverwort (*Riccia fluitans*) were also found.

Also noted in this study site is a very nice Deciduous Swamp community with numerous; species rich slough ponds / vernal pools complexed throughout. It is dominated by Swamp White Oak (*Quercus bicolor*) with Pin Oak (*Quercus palustris*), and Green Ash (*Fraxinus pennsylvanica*).

The sloughs support a diverse Buttonbush (*Cephalanthus occidentalis*) Thicket Swamp community with some open water pockets dominated by species of Duckweed.

A few knolls, or ridges, favour stands of White Oak (*Quercus alba*) or Red Oak (*Quercus rubra*), with carpets of Large-leaved Aster (*Aster macrophyllus*).

The community recorded for the open Transportation Canada corridor follows an abandoned railway line and rail yard. The regenerating vegetation is dominated by a mixture of open meadows and thickets of Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and occasional patches of Staghorn Sumac (*Rhus typhina*), or areas that have succeeded to open stands of Poplar (*Populus* sp.) species.

Vegetation Communities

There are a total of 150 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Deciduous Woodland (WOD)
Deciduous Forest (FOD)
Floating-leaved Shallow Aquatic (SAF)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Hawthorn/Apple Deciduous Woodland Type (WODM5-4)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Poplar Deciduous Forest Type (FODM8-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Mixed Willow Mineral Deciduous Thicket Swamp type (SWTM3-6)
Sumac Deciduous Shrub Thicket Type (THDM2-1)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk- None noted.

Provincially Rare Species- None noted.

Points of Interest

Spring Peepers calling in October!

Seems like a very rich odonate (Dragonfly and Damselfly) spot!

Faunal Records:

- 3- Birds
- 3- Reptiles & Amphibians
- 2- Mammals

Site Visits

October 9, 2008

A. Garofalo, K. Young-Chin

% of site visited

55.93 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-08



Natural Areas Inventory

Study Site WE-08

1:6,500

0 50 100 200 300 400 Meters

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There are a total of 150 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD) Shallow Marsh (MAS)
Deciduous Thicket (THD) Thicket Swamp (SWT)

Study Site WE-11

Doan's Ridge

Municipality City of Welland

Formerly N/A

Approximate Area 290 hectares

Watershed The majority of this study site drains north and east to Lyon's Creek with a small portion to the south draining to the Lyon's Creek Drain.

Ownership Mostly private

General Summary

This study site is located on the border between the City of Welland and the City of Niagara Falls. It is bordered on the north by Lyon's Creek Road and on the south by Towline Tunnel Road/ Netherby Road. It extends from Highway 140 on the west to the north/south rail line on the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

The prominent ridge is a former beach, or shoreline likely associated with glacial lake Warren, and the Fort Erie Moraine. The height of land is characterized by sand and gravel deposits.

Soils

| Soil Type | Percentage of Study Site |
|---------------------------------|---------------------------------|
| ALLUVIUM | 1.11 |
| BERRIEN - TILL PHASE | 0.97 |
| CHINGUACOUSY - LOAMY RED PHASE | 3.41 |
| CHINGUACOUSY - RED PHASE | 2.41 |
| CHINGUACOUSY - RED WASHED PHASE | 0.58 |
| JEDDO - LOAMY RED PHASE | 2.05 |
| JEDDO - RED PHASE | 2.42 |
| LINCOLN | 2.31 |
| MALTON - HEAVY RED PHASE | 7.63 |
| MALTON - RED PHASE | 1.81 |
| NIAGARA | 3.16 |
| NIAGARA - LOAMY PHASE | 0.54 |
| ONEIDA - RED PHASE | 2.39 |
| ONTARIO | 0.01 |
| PEEL - HEAVY RED PHASE | 9.10 |
| PEEL - RED PHASE | 4.03 |
| TAVISTOCK - TILL RED PHASE | 3.86 |

| | |
|------------|--------|
| VINELAND | 1.05 |
| WELLAND | 50.03 |
| WATER | 0.04 |
| NOT MAPPED | 1.11 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is characterized by a Deciduous Swamp community with well defined layers and lots of tip-ups, hummocks and hollows. The microtopography results in a varied forest composition including Red Maple (*Acer rubrum*) and Red Oak (*Quercus rubra*) with stands of American Beech (*Fagus grandifolia*), or mixes of Sugar Maple (*Acer saccharum* ssp. *saccharum*) with Yellow Birch (*Betula alleghaniensis*) or, Basswood (*Tilia americana*).

The ground cover was also varied making a determination under ELC difficult at times.

Wet sloughs surrounded by islands of raised knolls dominated by Sugar Maple and White Wood Aster (*Eurybia divaricata*) occur throughout the swamp areas.

A very small patch of Green Ash (*Fraxinus pennsylvanica*) swamp occurred within a more dominant Red Maple, Freeman's Maple (*Acer freemanii*) community.

The understory was largely Canada Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*), Sedges (*Carex* sp.), and White Avens (*Geum canadense*).

Vegetation Communities

There are a total of 205 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
 Deciduous Swamp (SWD)
 Floating-leaved Shallow Aquatic (SAF)
 Graminoid Meadow (MEG)
 Shallow Marsh (MAS)

Vegetation Type

Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
 Forb Mineral Shallow Marsh Type (MASM2-1)
 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
 Fresh-Moist Sugar Maple –Yellow Birch Deciduous Forest Type (FODM6-3)
 Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
 Open Graminoid Meadow Type (MEGM4-1)
 Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
 Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Eurybia divaricata (White Wood Aster) (MPCA, 2006-2009) – S2

Points of Interest

Areas of this study site are very rich in fungi, due to the rich microtopography developed from natural forest processes and intact mycorrhizal connections. Some logging was evident.

Sandhill Cranes have been seen feeding in the same open field for the past 9 years.

Faunal Records:

8- Birds

2- Mammals

1-Reptiles & Amphibians

Site Visits

July 7, 2008

A. Garofalo, K. Young-Chin

July 8, 2008

A. Garofalo, K. Young-Chin

% of site visited

4.81 % of the total study site was visited by NAI teams.

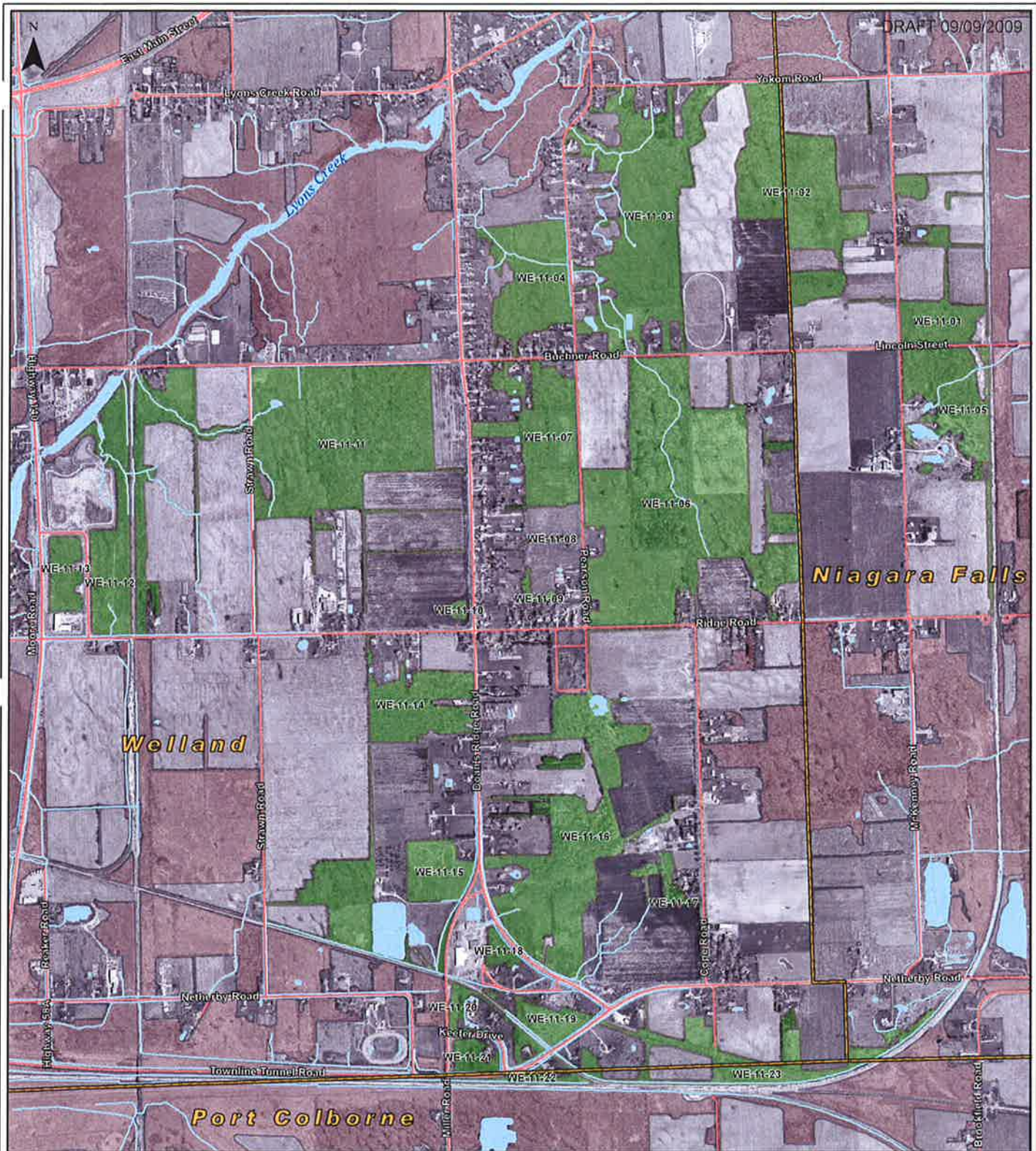
References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-11



Natural Areas Inventory

Study Site WE-11

1:20,000

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 205 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WE-12

Old Growth Pin Oak Sloughs

Municipality City of Welland

Formerly N/A

Approximate Area 194 hectares

Watershed This study site is divided almost in thirds. The western portion drains to the Welland River West subwatershed. The central third drains to Beiderman Drain #2, and the eastern portion drains to the Welland Canal directly.

Ownership Mostly private.

General Summary

This study site is located between the east-west rail line in the north to south of Concession 4 Road. The western boundary is the Feeder Canal/ Morog Road and the eastern limit is the Welland Canal.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| TOLEDO | 90.63 |
| WATER | 0.00 |
| NOT MAPPED | 9.37 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small percentage of this study site was visited by NAI teams.

Of the area covered, Deciduous Swamp communities were the most common. The first was a Green Ash (*Fraxinus pennsylvanica*) dominated community with Red Maple (*Acer rubrum*) and Bur Oak (*Quercus macrocarpa*).

The understory was largely Gray Dogwood (*Cornus foemina* ssp. *racemosa*) and Raspberry species (*Rubus* sp.). The ground layer was a mix of Sedges (*Carex* sp.), Asters (*Aster* sp.), and Thicket Creeper (*Parthenocissus inserta*).

The second swamp community noted was dominated by old growth Pin Oak (*Quercus palustris*) with Red Maple, White Elm (*Ulmus americana*), and Green Ash.

The understory was largely Gray Dogwood with some Narrow-leaved Meadowsweet (*Spiraea alba*) and Choke Cherry (*Prunus virginiana* ssp. *virginiana*). The ground layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Asters and Sedges.

Vegetation Communities

There are a total of 65 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Thicket Swamp (SWT)

Vegetation Type

Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)

Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)

White Birch-Cottonwood Deciduous Swamp Type (SWDM4-6)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

11 – Birds

1 – Reptiles & Amphibians

1 – Moths & Butterflies

1 – Mammals

Site Visits

May 14, 2007

T. Staton, R. Kitchen

May 16, 2007

T. Staton, R. Kitchen

July 9, 2007

B. Curry

% of site visited

5.60 % of the total study site was visited by NAI teams.

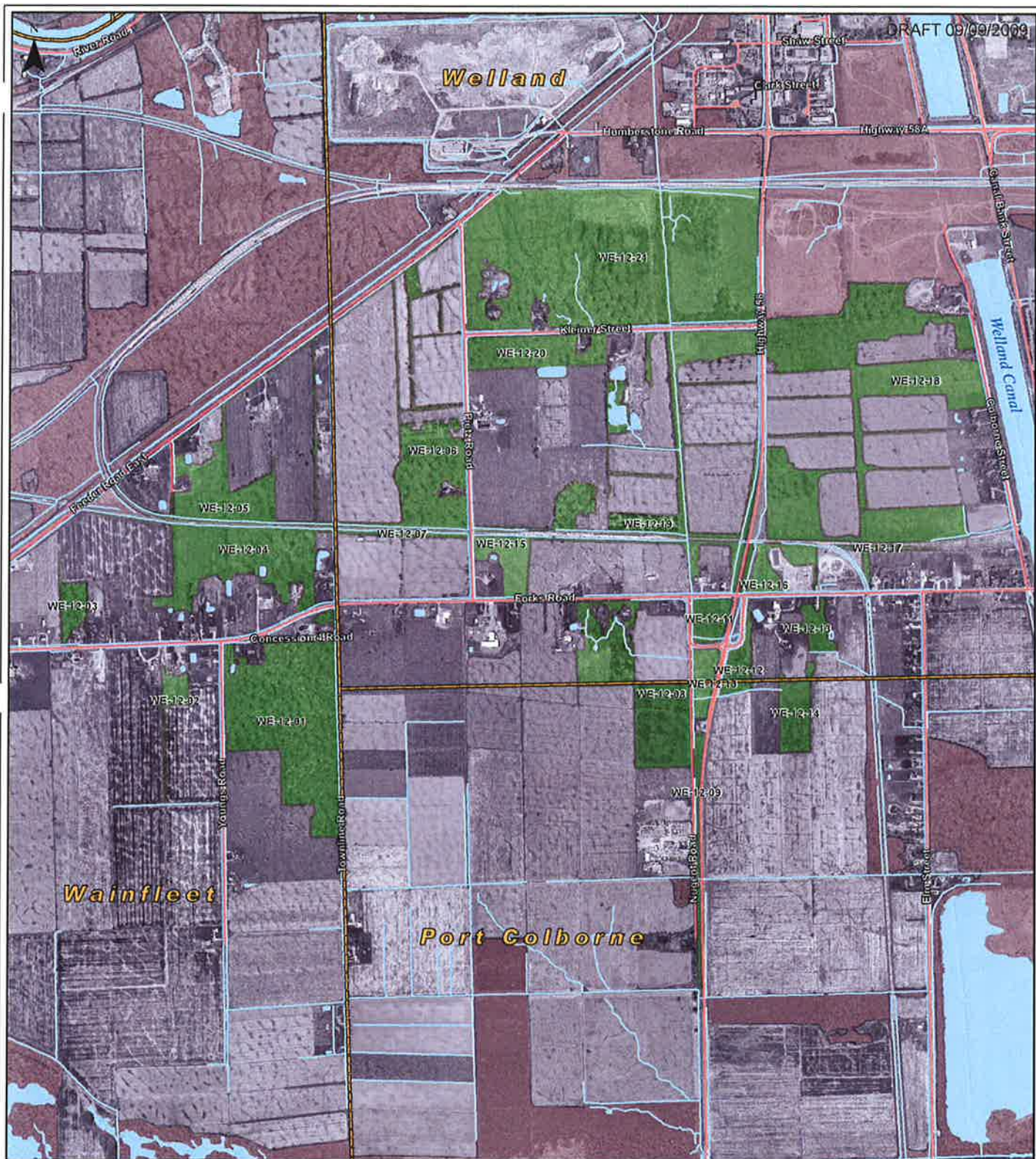
References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WE-12



Natural Areas Inventory

Study Site WE-12

1:19,000

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 65 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site WL-02

Mill Creek – Inverary Woods

Municipality Township of West Lincoln

Formerly Inverary Woods (Brady, et al. 1980)

Approximate Area 363 hectares

Watershed The majority of this study site drains to the Mill Creek subwatershed with a small portion in the south/east draining to Moores Creek.

Ownership Mostly private

General Summary This study site is located near the boundary of the Niagara Region and the City of Hamilton within the Township of West Lincoln. It is between Sixteen Road in the north and Bismark Road in the south. It extends from Westborok Road in the west to Caistor Centre Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

A small finger of well drained, sand and gravel of a till moraine feature associated with a Fort Erie Moraine is found in the far north west of this study site.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 4.82 |
| HALDIMAND | 8.13 |
| LINCOLN | 55.17 |
| TOLEDO | 30.54 |
| WATER | 0.00 |
| NOT MAPPED | 1.34 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A small portion of this study site was visited. The dominate community noted was Deciduous Swamp consisting of Red Maple (*Acer rubrum*), Bur Oak (*Quercus macrocarpa*), White Swamp Oak (*Quercus bicolor*), and Shagbark Hickory (*Carya ovata*) in the canopy.

The understory was largely regenerating canopy species with Blue Beech (*Carpinus caroliniana*), Highbush Blueberry (*Vaccinium corybosum*), Selfheal (*Prunella vulgaris* ssp. *vulgaris*), and Winterberry (*Ilex verticillata*).

The ground layer was a mix of Spotted Touch-me-nots (*Impatiens capensis*), Aster species (*Aster sp.*), Fowl Manna Grass (*Glyceria striata*), and Rough Goldenrod (*Solidago rugosa ssp. rugosa*).

A slightly drier community noted was dominated by Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum ssp. saccharum*) and White Ash (*Fraxinus americana*).

The understory was characterized by Hop Hornbeam (*Ostrya virginiana*), Black Cherry (*Prunus serotina*), and Serviceberry (*Amelanchier sp.*).

The herbaceous layer was a mix of Large-leaved Aster (*Aster macrophyllus*), Canada Blue Grass (*Poa compressa*), and Sedges (*Carex sp.*).

Vegetation Communities

There are a total of 84 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Deciduous Forest (FOD)

Shallow Marsh (MAS)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)

Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)

Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) – Endangered

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

2 – Mammals

1 – Reptiles & Amphibians

Site Visits

September 1, 1980

Brady, et al.

October 31, 2008

T. Staton, S. Mohamed

% of site visited

6.73 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
- Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.
- Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

Study Site WL-05

McCready's Bush

Municipality Township of West Lincoln

Formerly McCready's Bush (Brady, et al., 1980)

Approximate Area 358 hectares

Watershed This study site is basically split in half with the western portion flowing into Moores creek and the eastern portion flowing into Welland River West.

Ownership Mostly private

General Summary

This study site is located between Caistor Centre Road to the west and Smithville Road to the east. It extends from Bismark Road to the north and Concession Two Road to the south.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM | 0.15 |
| HALDIMAND | 13.57 |
| LINCOLN | 85.34 |
| SMITHVILLE | 0.15 |
| WATER | 0.00 |
| NOT MAPPED | 0.79 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was the Deciduous Swamp dominated by Red Maple (*Acer rubrum*) with Swamp White Oak (*Quercus bicolor*), Green Ash (*Fraxinus pennsylvanica*), and the occasional White Elm (*Ulmus americana*).

The understory was a mix of Green Ash, Blue Beech (*Carpinus caroliniana*), and Winterberry (*Ilex verticillata*).

The herbaceous layer was characterized by Common Cinquefoil (*Potentilla simplex*), Spotted Touch-me-not (*Impatiens capensis*), and Sedges (*Carex* sp.).

The drier areas within the Deciduous Swamps and upland areas of the study site were classified as Deciduous Forests. These forests were dominated by Red Oak (*Quercus rubra*) and White Oak (*Quercus alba*) with Sugar Maple (*Acer saccharum* ssp.).

saccharum), Serviceberry (*Amelanchier* sp.), Black Cherry (*Prunus serotina*), Witch-hazel (*Hamamelis virginiana*), and Hop Hornbeam (*Ostrya virginiana*) as understory associates.

The herbaceous layer was a mix of Pennsylvania Sedge (*Carex pennsylvanica*), Black Raspberry (*Rubus allegheniensis*), and Hawkweed (*Hieracium* sp.).

The Thicket Swamp community noted was dominated by Narrow-leaved Meadowsweet (*Spirea alba*) and Three-lobed Beggar-ticks (*Bidens tripartita*).

Vegetation Communities

There are a total of 190 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Mixed Meadow (MEM)
Thicket Swamp (SWT)
Coniferous Forest (FOC)
Floating-leaved Shallow Aquatic (SAF)
Meadow Marsh (MAM)
Thicket Swamp (SWT)
Shallow Marsh (MAS)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Jewelweed Forb Mineral Meadow Marsh Type (MAMM2-1)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Mineral Meadow Marsh Type (MAMM3-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carya glabra (Pignut Hickory) (NPCA, 2006-2009) – S3
Silphium perfoliatum (Cup-plant) (NPCA, 2006-2009) – S2

Points of Interest

Faunal Records:

11 – Birds
6 – Reptiles & Amphibians

5 – Mammals

Site Visits

September 1, 1980

Brady, et al.

September 18, 2008

T. Staton, S. Mohamed

September 25, 2008

T. Staton, S. Mohamed

October 2, 2008

T. Staton, S. Mohamed

October 15, 2008

T. Staton, S. Mohamed

% of site visited

4.71 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

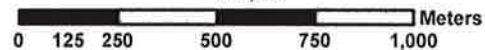
- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-05



Natural Areas Inventory

Study Site WL-05

1:18,000



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 190 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD) Mixed Meadow (MEM)
Deciduous Swamp (SWD) Thicket Swamp (SWT)

Study Site WL-06

Ruigrok Tract – Caistor Canborough Slough Forest

Municipality Township of West Lincoln

Formerly Ruigrok Tract (Brady, et al., 1980)

Approximate Area 1605 hectares

Watershed The drainage for this study site is split almost in half with the northern drainage going to the Welland River West subwatershed and the south draining to Oswego creek.

Ownership Mostly private with some area owned publicly by the Niagara Peninsula Conservation Authority.

General Summary The study site is located along the boundary between the Region of Niagara and the County of Haldimand so that about two thirds falls within Niagara and about one third in Haldimand. The northern boundary is York Road/ South Chippawa Road and the southern boundary is Regional Road 2/ Regional Road 63. It extends from just east of Turnbull Road in the west to, Caistor-Gainsborough Townline Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|---------------------------------|
| ALLUVIUM | 0.61 |
| ALLUVIUM 1 | 0.04 |
| BEVERLY | 3.64 |
| BRANTFORD | 0.24 |
| HALDIMAND | 39.06 |
| HALDIMAND - COARSE PHASE | 0.33 |
| LINCOLN | 52.04 |
| NOT MAPPED | 0.09 |
| SENECA | 0.18 |
| SMITHVILLE | 3.65 |
| TOLEDO | 0.12 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is part of what could potentially be a globally rare community of slough forest. These Deciduous Swamps were dominated by Red Maple (*Acer rubrum*),

Swamp Maple (*Acer freemanii*), and Swamp White Oak (*Quercus bicolor*). Associates included White Elm (*Ulmus americana*), White Ash (*Fraxinus americana*), Basswood (*Tilia americana*), and Shagbark Hickory (*Carya ovata*).

The understory was regenerating canopy species with Blue Beech (*Carpinus caroliniana*), Black Raspberry (*Rubus occidentalis*), Highbush Blueberry (*Vaccinium corymbosum*), Royal Fern (*Osmunda regalis* var. *spectabilis*), Gray Dogwood (*Cornus foemina* ssp. *racemosa*), and Silky Dogwood (*Cornus amomum* ssp. *obliqua*).

The ground layer was a mix of Asters (*Aster* sp.), Sedges (*Carex* sp.), Arrow-leaved tearthumb (*Polygonum sagittatum*), Common Boneset (*Eupatorium perfoliatum*), False Nettle (*Boehmeria cylindrica*), and Rice Cut Grass (*Leersia oryzoides*).

The most common community documented by field teams was the Thicket Swamp. These communities were dominated by Swamp Maple, Swamp White Oak, Red Maple, with Winterberry (*Ilex verticillata*), Buttonbush (*Cephalanthus occidentalis*), Narrow-leaved Meadowsweet (*Spiraea alba*), or Poison Sumac (*Rhus vernix*).

The understory was largely Black Chokeberry (*Aronia melanocarpa*), Highbush Blueberry, Speckled Alder (*Alnus incana* ssp. *rugosa*), and Gray Dogwood.

The ground cover was a mix of Eastern Manna Grass (*Glyceria septentrionalis*), Canada Blue-joint (*Calamagrostis canadensis*), Cinnamon Fern (*Osmunda cinnamomea*), Swamp Rose (*Rosa palustris*), Arrow-leaved Tearthumb (*Polygonum sagittatum*), Devil's Beggar-ticks (*Bidens frondosa*), Spotted Touch-me-nots (*Impatiens capensis*), and Sedges such as, Lakebank Sedge (*Carex lacustris*).

The Deciduous Forests were dominated by White Oak, Red Oak (*Quercus rubra*), Shagbark Hickory, White Ash, and Sugar Maple (*Acer saccharum* ssp. *saccharum*).

Maple-leaved Viburnum (*Viburnum acerifolium*), Choke Cherry (*Prunus virginiana* ssp. *virginiana*), Gray Dogwood, Common Blackberry (*Rubus allegheniensis*), and Narrow-leaved Meadowsweet were common in the understory.

The herbaceous layer was characterized by Large-leaved Aster (*Aster macrophyllus*), Pennsylvania Sedge (*Carex pennsylvanica*), Grass-leaved Goldenrod (*Euthamia graminifolia*), New England Aster (*Aster novae-angliae*), and Eastern Bracken Fern (*Pteridium aquilinum* var. *latiusculum*).

Successional communities of Meadow Marshes and Forb Meadows were also documented for this site. The Meadow Marshes were largely Winterberry and Highbush Cranberry with the occasional White Swamp Oak or Swamp Maple. Very wet depressions supported small inclusions of Narrow-leaved Cattails (*Typha angustifolia*).

The Forb Meadows were mostly Asters and Goldenrods with a ground layer of Mosses (*Moss* sp.) and Common Strawberry (*Fragaria virginiana* ssp. *virginiana*).

The Shallow Marsh communities noted were dominated by Lakebank Sedge and Common Hop Sedge (*Carex lupulina*) with Three-lobed Beggar-ticks (*Bidens tripartita*),

Northern Water-horehound (*Lycopus uniflorus*), Lady's Thumb (*Polygonum persicaria*), Rice Cut Grass, and Fowl Manna Grass (*Glyceria striata*).

Vegetation Communities

There are a total of 313 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)
Forb Meadow (MEF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Shrub Bluff (BLS)
Thicket Swamp (SWT)

Vegetation Type

Aster Forb Meadow Type (MEFM1-2)
Beggar-ticks Organic Shallow Marsh Type (MASO2-4)
Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2)
Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FODM5-3)
Dry-Fresh White Oak Deciduous Forest Type (FODM1-2)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Shagbark Hickory Deciduous Forest Type (FODM9-4)
Goldenrod Forb Meadow Type (MEFM1-1)
Gray Dogwood Deciduous Shrub Thicket Type (THDM2-4)
Gray Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-3)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Forb Organic Meadow Marsh Type (MAMO2-3)
Mixed Graminoid Graminoid Mineral Meadow Marsh Type (MAMM1-16)
Narrow-leaved Sedge Graminoid Mineral Meadow Marsh Type (MAMM1-9)
Poison Sumac Organic Deciduous Thicket Swamp Type (SWTO5-8)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Raspberry Low Shrub Bluff Type (BLSM1-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Rice Cut-grass Graminoid Mineral Meadow Marsh Type (MAMM1-14)
Sedge Graminoid Organic Meadow Marsh Type (MAMO1-6)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)
Winterberry Organic Deciduous Thicket Swamp Type (SWTO5-3)

Significant Flora**Species at Risk**

Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered

Juglans cinerea (Butternut) (NPCA, 2006-2009) - Endangered

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest**Faunal Records:**

17 – Birds

6 – Mammals

5 – Reptiles & Amphibians

Site Visits

September 1, 1980

Brady, et al.

August 9, 2007

K. White, R. Ng-Rozema

August 30, 2007

K. White, R. Ng-Rozema

September 15, 2007

B. Wilson, R. Ng-Rozema

October 3, 2008

R. Kitchen, B. Porter

October 15, 2008

R. Kitchen, B. Porter

November 3, 2008

R. Kitchen, B. Porter

% of site visited

8.74 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from

<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Macdonald, Ian D. 1980. *Life Science Features of the Haldimand Clay Plain Physiographic Region*. Richmond Hill, Ontario,

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-06



Natural Areas Inventory

Study Site WL-06

1:78,000

0 500 1,000 2,000 3,000 4,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 313 recorded taxa (unique plant records) for this study site.

Community Series:

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Deciduous Thicket (THD)

Forb Meadow (MEF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site WL-08

Silverdale Woods – South St. Anne's Slough Forest

Municipality Township of West Lincoln

Formerly Silverdale Woodlot (Brady et al., 1980)

Approximate Area 440 hectares

Watershed This study site is split into three parts. The south/west drains to an unnamed creek while the south/east drains to Sucker Creek. The northern section drains to Sixteen Mile Creek and eventually they all flow to the Welland River.

Ownership Mostly private

General Summary

This study site is located between the east-west rail line to the north and Highway 20 to the south. It extends from Wellandport Road in the west to Silverdale Road/ Schram Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|--------------------------|
| HALDIMAND | 27.52 |
| HALDIMAND - LOAMY PHASE | 12.94 |
| LINCOLN | 55.94 |
| SMITHVILLE | 1.68 |
| WATER | 0.00 |
| NOT MAPPED | 1.93 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A small portion of this study site was visited by field crews. The most common community noted was Deciduous Swamp dominated by Red Maple (*Acer rubrum*) with White Elm (*Ulmus americana*), Swamp White Oak (*Quercus bicolor*), Green Ash (*Fraxinus pennsylvanica*), and Black Gum (*Nyssa sylvatica*).

The understory was characterized by Winterberry (*Ilex verticillata*), Swamp Dewberry (*Rubus hispidus*), and Blue Beech (*Carpinus caroliniana*) with a ground layer of Spotted Touch-me-not (*Impatiens capensis*), Asters (*Aster sp.*), Canada Mayflower (*Maianthemum canadense*), and Sessile-leaved Bellwort (*Uvularia sessilifolia*).

The higher ground between the sloughs was a drier community of American Beech (*Fagus grandifolia*), Birch (*Betula sp.*), Black Cherry (*Prunus serotina*), and Trembling Aspen (*Populus tremuloides*).

The understory was largely regenerating canopy species with Witch-hazel (*Hamamelis virginiana*), and a ground layer of Canada Mayflower and Wintergreen (*Galtheria procumbens*).

Vegetation Communities

There are a total of 133 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Bur Oak Mineral Deciduous Swamp Type (SWDM1-2)
Bur-reed Mineral Shallow Marsh Type (MASM1-8)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) – Endangered
Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – Endangered

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

10 – Birds
5 – Reptiles & Amphibians
2 – Mammals
1 – Moths & Butterflies

Site Visits

September 1, 1980
Brady, et al.

July 15, 2008
T. Staton, S. Mohamed

August 20, 2008
T. Staton, S. Mohamed

% of site visited

2.82 % of the total study site was visited by NAI teams.

References Cited

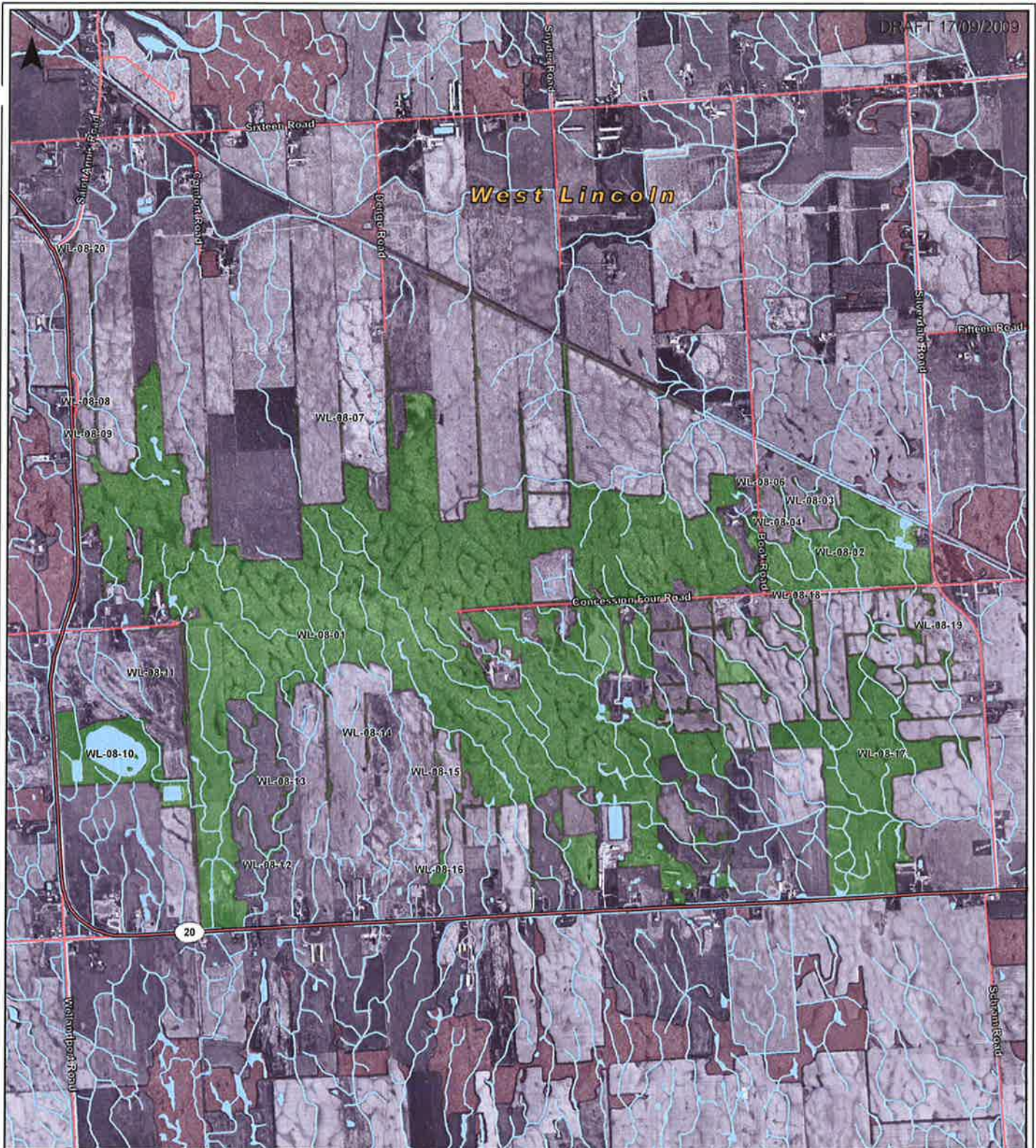
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Sites WL-08



Natural Areas Inventory

Study Site WL-08

1:24,000

0 175 350 700 1,050 1,400 Meters

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All Frames, North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 133 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)

Study Site WL-09

Sucker Creek

Municipality Township of West Lincoln

Formerly Sucker Creek (Brady, et al., 1980)

Approximate Area 79 hectares

Watershed The drainage for this study site is split into three parts. The entire eastern portion drains via Fifteen Mile Creek while the western portion is split between Sixteen Mile creek in the north and Sucker creek in the south.

Ownership Mostly private

General Summary

This study site is located near the West Lincoln and Pelham border between Silverdale Road in the west and Rosedene Road in the east. The northern boundary is Fifteen Road while Highway 20 makes up the southern boundary.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 0.03 |
| BEVERLY | 0.05 |
| BRANTFORD | 0.07 |
| HALDIMAND | 11.70 |
| HALDIMAND - LOAMY PHASE | 14.93 |
| LINCOLN | 71.82 |
| SMITHVILLE | 1.17 |
| SMITHVILLE - LOAMY PHASE | 0.11 |
| TOLEDO | 0.02 |
| WATER | 0.00 |
| NOT MAPPED | 0.10 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A small percentage of this study site was visited by project field crews. The sites visited were characterized by complex microtopography where the drier knolls supported Deciduous Forests while the lower lying areas were classic Deciduous Swamps.

The Deciduous Forests were dominated by Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), Eastern White Pine (*Pinus strobus*), and Basswood (*Tilia americana*). Occasionally, Hop Hornbeam (*Ostrya virginiana*), Green Ash

(*Fraxinus pennsylvanica*), and Choke Cherry (*Prunus virginiana* ssp. *virginiana*) were noted for the understory.

The herbaceous layer was a mix of Large-leaved Aster (*Aster macrophyllus*), Mayapple (*Podophyllum peltatum*), and Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*).

The Deciduous Swamps were largely Red Maple (*Acer rubrum*) and White Swamp Oak (*Quercus bicolor*), with Green Ash and White Elm (*Ulmus americana*).

The understory was Blue Beech (*Carpinus caroliniana*) and Highbush Blueberry (*Vaccinium corymbosum*), with Canada Mayflower (*Maianthemum canadense*), Swamp Dewberry (*Rubus hispidus*), and Rough Goldenrod.

A naturalized Eastern White Pine plantation was also noted for this site.

Vegetation Communities

There are a total of 120 recorded taxa (unique plant records) for this study site.

Community Series

Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Organic Shallow Marsh Type (MASO1-6)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Cattail Mineral Shallow Marsh Type (MASM1-1)
Dry-Fresh White Pine Naturalized Coniferous Plantation Type (FOCM6-1)
Fresh-Moist Exotic Lowland Deciduous Forest Type (FODM7-9)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Silky Dogwood Mineral Deciduous Thicket Swamp Type (SWTM2-2)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

13 – Birds
7 – Reptiles & Amphibians
3 – Mammals
1 – Moths & Butterflies

Site Visits

September 1, 1980

Brady, et al.

July 22, 2008

T. Staton, S. Mohamed

August 5, 2008

T. Staton, S. Mohamed

% of site visited

3.78 % of the total study site was visited by NAI teams.

References Cited

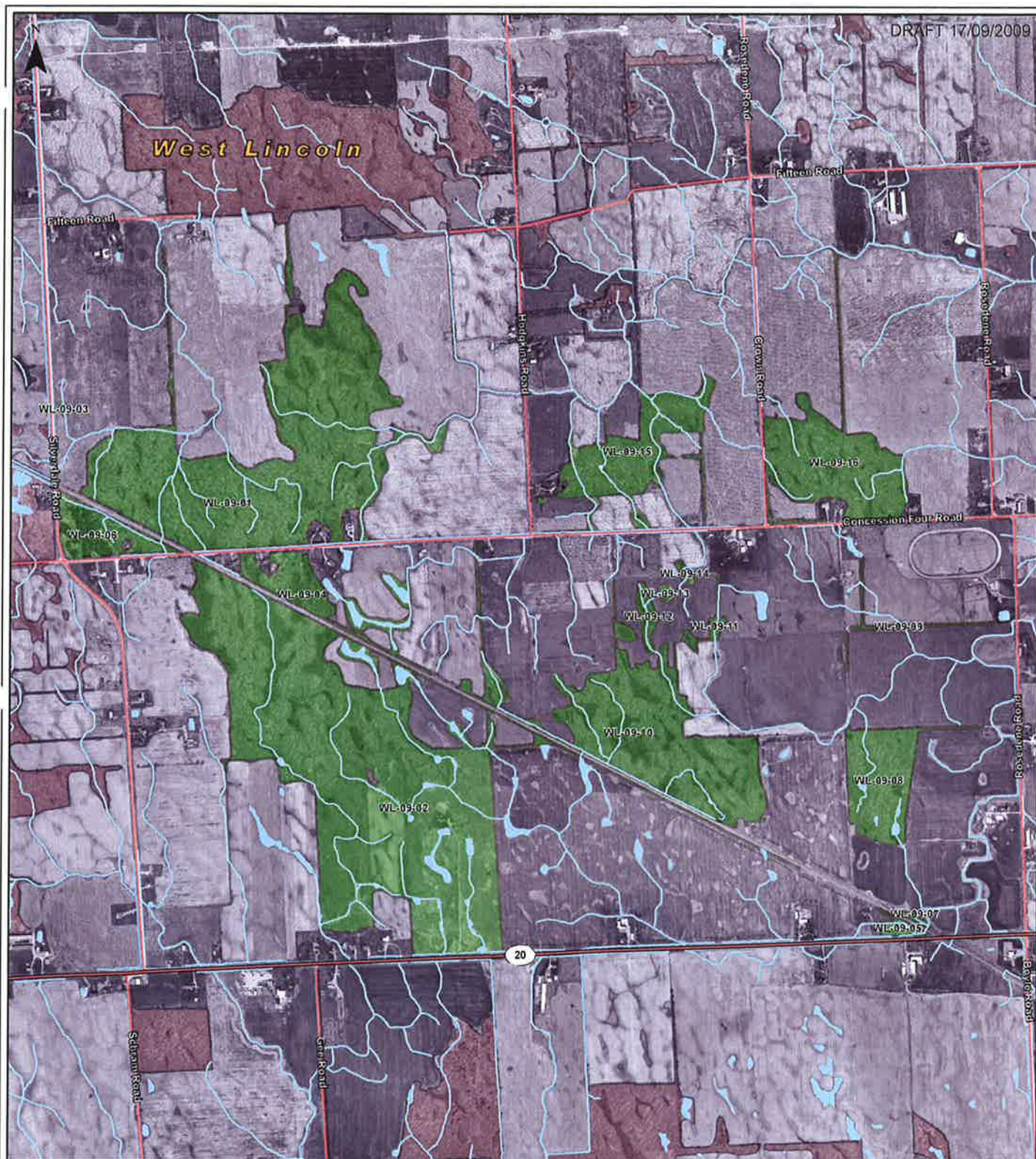
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-09



Natural Areas Inventory

Study Site WL-09

1:18,000

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 120 recorded taxa (unique plant records) for this study site.
Community Series:
Coniferous Forest (FOC)
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WL-10

Hafeman's Bush

Municipality Township of West Lincoln

Formerly Hafeman's Bush (Brady, et al., 1980)

Approximate Area 169 hectares

Watershed This study site is divided almost in half between the Sixteen Mile Creek subwatershed that drains the north/west portion, and the Fifteen Mile Creek that drains the south/east portion.

Ownership Mostly private

General Summary

This study site is located between the Twenty Mile Creek corridor to the north and Fifteen Road to the south. The western boundary is Silverdale Road and the eastern boundary is just west of Vineland Townline Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. The northern half is underlain by the dolostone of the Lockport Formation, and the southern half is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|--------------------------|
| ALLUVIUM | 0.08 |
| BEVERLY | 0.16 |
| BRANTFORD | 4.65 |
| HALDIMAND | 18.01 |
| HALDIMAND - LOAMY PHASE | 3.76 |
| LINCOLN | 72.50 |
| SMITHVILLE | 0.37 |
| WATER | 0.00 |
| NOT MAPPED | 0.48 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site was a mix of Deciduous Swamps with Deciduous Forests on the drier knolls.

The Deciduous Swamp communities noted were dominated by Red Maple (*Acer rubrum*) with White Swamp Oak (*Quercus bicolor*), Shagbark Hickory (*Carya ovata*), and Green Ash (*Fraxinus pennsylvanica*).

The ground cover was a mix of Spotted Touch-me-not (*Impatiens capensis*), Spotted Crane's-bill (*Geranium maculatum*), and Canada Mayflower (*Maianthemum canadense*).

The Deciduous Forests were characterized by Red Oak (*Quercus rubra*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), White Oak (*Quercus alba*), and Red Maple.

The understory included Black Cherry (*Prunus serotina*), American Beech (*Fagus grandifolia*), Serviceberry (*Amelanchier* sp.), and Hop Hornbeam (*Ostrya virginiana*).

The herbaceous layer was a mix of Large-leaved Aster (*Aster macrophyllus*), Avens (*Geum* sp.), and Common Strawberry (*Fragaria virginiana* ssp. *virginiana*).

One area of successional Graminoid Meadow was also recorded for this study site. It was dominated by Blue Grass species (*Poa* sp.), Timothy (*Phleum pratense*) and Asters (*Aster* sp.), with Cow Vetch (*Vicia cracca*), Bird's-foot Trefoil (*Lotus corniculatus*), and Rough-fruited Cinquefoil (*Potentilla recta*).

Vegetation Communities

There are a total of 183 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Graminoid Meadow (MEG)
Thicket Swamp (SWT)
Floating-leaved Shallow Aquatic (SAF)
Deciduous Thicket (THD)
Shallow Marsh (MAS)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Gray Dogwood Deciduous Thicket Swamp Type (THDM2-4)
Manna Grass Mineral Shallow Marsh Type (MASM1-17)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Mixed Willow Mineral Deciduous Thicket Swamp Type (SWTM3-6)
Open Graminoid Meadow Type (MEGM4-1)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Timothy Graminoid Meadow Type (MEGM3-7)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk

Cornus florida (Eastern Flowering Dogwood) (NPCA, 2006-2009) – Endangered

Provincially Rare Species

Carya glabra (Pignut Hickory) (Brady, et al., 1980) – S3

Points of Interest

Faunal Records:

20 – Birds

2 – Reptiles & Amphibians

2 – Moths & Butterflies

1 – Mammal

Site Visits

September 1, 1980

Brady, et al.

July 1, 2008

R. Young, J. Damude, P. Foebel, J. Potter, M. Potter

July 2, 2008

T. Staton, S. Mohamed

July 18, 2008

R. Young, J. Damude, J. Kellam, J. Potter, M. Potter

% of site visited

10.31 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

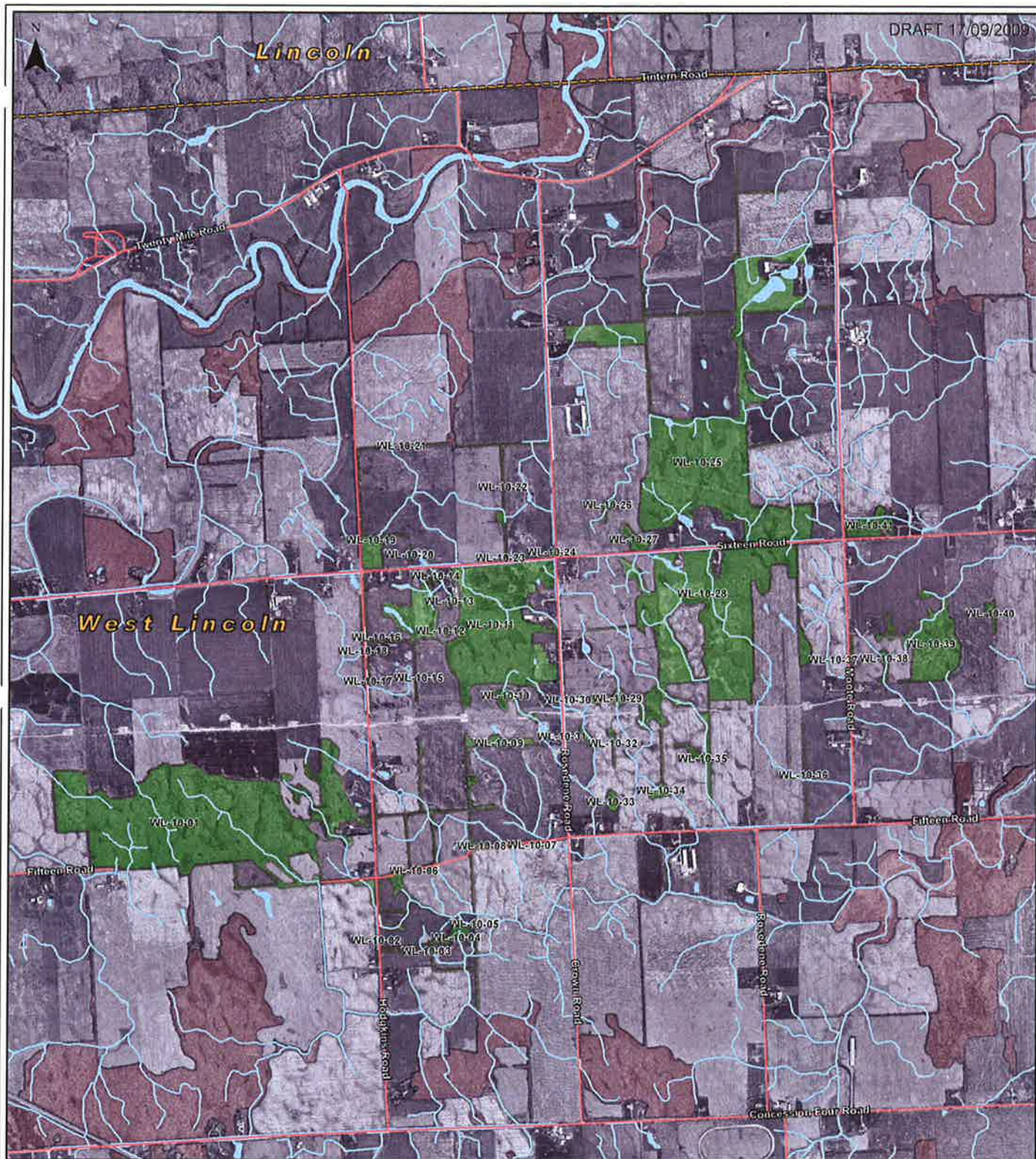
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-10



Natural Areas Inventory

Study Site WL-10

1:22,000

0 150 300 600 900 1,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 183 recorded taxa (unique plant records) for this study site.

Community Series:

Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Graminoid Meadow (MEG)
Thicket Swamp (SWT)

Study Site WL-12

Vaughan Forest

Municipality Township of West Lincoln

Formerly Vaughan Forest (Brady, et al., 1980)

Approximate Area 117 hectares

Watershed The majority of this study site drains to the Beaver Creek subwatershed with a portion in the east that drains to Black Ash Creek.

Ownership Mostly private

General Summary

This study site extends from Bismark Road in the north to just south of Vaughan Road in the south. Its western boundary is Caistor/ Gainsborough Townline Road and the eastern boundary is Port Davidson Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM | 0.02 |
| HALDIMAND | 11.08 |
| LINCOLN | 88.74 |
| WATER | 0.00 |
| NOT MAPPED | 0.39 |
| Total % | 100.00 |

Ecological Land Classification

Summary

Field crews visited a small portion of this study site.

Drier areas were noted as Deciduous Forests dominated by White Oak (*Quercus alba*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), Red Oak (*Quercus rubra*), and White Ash (*Fraxinus americana*).

The understory was largely regenerating canopy species with Hop Hornbeam (*Ostrya virginiana*), and Maple-leaved Viburnum (*Viburnum acerifolium*).

The herbaceous layer was characterized by Large-leaved Aster (*Aster macrophyllus*), Grasses (*Poa* sp.), and Goldenrod (*Solidago* sp.).

The wetter communities noted were classified as Deciduous Swamps and Thicket Swamps. The Deciduous Swamps were largely Green Ash (*Fraxinus pennsylvanica*)

and Red Maple (*Acer rubrum*), with Shagbark Hickory (*Carya ovata*) and White Elm (*Ulmus americana*).

The understory was mostly regenerating Green Ash with some Blue Beech (*Carpinus caroliniana*). The ground layer was a mix of Spotted Touch-me-nots (*Impatiens capensis*), Asters (*Aster sp.*), and Goldenrod (*Solidago sp.*).

The Thicket Swamp communities were dominated by Buttonbush (*Cephalanthus occidentalis*) and Winterberry (*Ilex verticillata*) with occasional White Elm, Green Ash and Swamp White Oak (*Quercus bicolor*).

The understory was Devil's Beggar-ticks (*Bidens frondosa*) and Narrow-leaved Meadowsweet (*Spirea alba*) with a ground layer of Liverwort (*Riccia fluitans*), and Mosses (*Moss sp.*).

Vegetation Communities

There are a total of 126 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

3 – Birds
2 – Reptiles & Amphibians
2 – Mammals

Site Visits

September 1, 1980
Brady, et al.

September 5, 2008
T. Staton, S. Mohamed

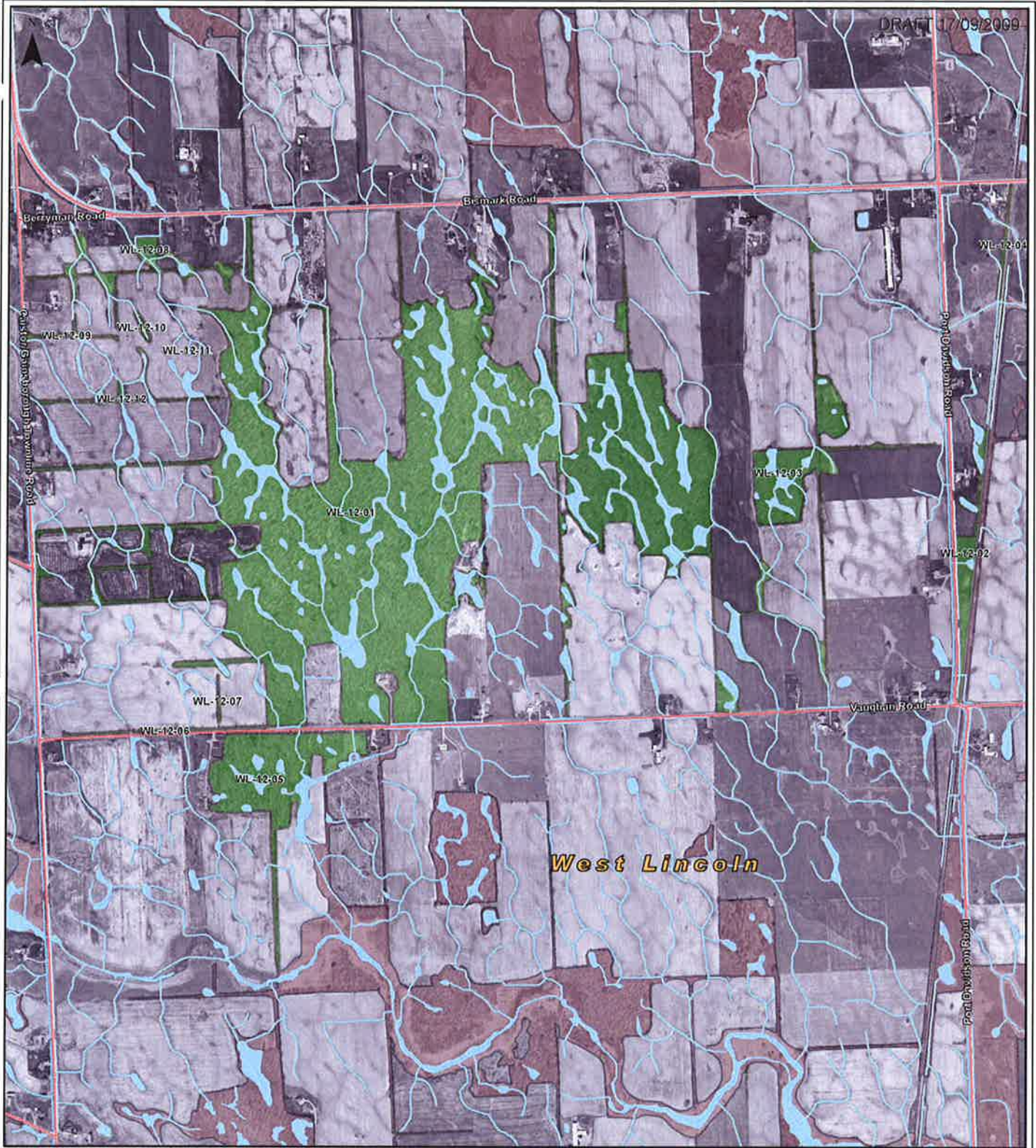
% of site visited

3.30 % of the total study site was visited by NAI teams.

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DRAFT 17/09/2009



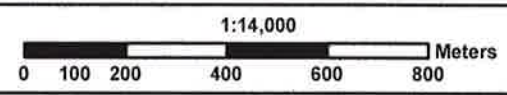
Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-12



Natural Areas Inventory

Study Site WL-12



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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 126 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)

Study Site WL-15

Garber's Grove

Municipality Township of West Lincoln

Formerly Garber's Grove (Brady, et al., 1980)

Approximate Area 291 hectares

Watershed The northern portion of this study site drains to North Creek and the southern portion flows to Black Ash Creek. There are small slivers of this site that flow east to Parkers Creek and west to Beaver Creek.

Ownership Mostly private

General Summary

This study site is located between Townline Road to the north and Concession Four Road to the south. It extends from Caistor/ Gainsborough Townline Road in the west to Port Davidson Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| BEVERLY | 0.07 |
| HALDIMAND | 7.94 |
| LINCOLN | 91.60 |
| SMITHVILLE | 0.01 |
| TOLEDO | 0.07 |
| WATER | 0.00 |
| NOT MAPPED | 0.31 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was Deciduous Swamp dominated by Red Maple (*Acer rubrum*) or Swamp White Oak (*Quercus bicolor*). Associated species included Green Ash (*Fraxinus pennsylvanica*), White Elm (*Ulmus americana*), and Shagbark Hickory (*Carya ovata*).

The understory was a mix of regenerating canopy species with Blue Beech (*Carpinus caroliniana*), Highbush Blueberry (*Vaccinium corymbosum*), Winterberry (*Ilex verticillata*), and Serviceberry (*Amelanchier* sp.).

The herbaceous layer consisted of Spotted Touch-me-not (*Impatiens capensis*), Sedges (*Carex* sp.), Asters (*Aster* sp.), Swamp Dewberry (*Rubus hispidus*), and Woodrush species (*Cinna* sp.).

The drier knolls and the upland communities within this study site were classified as Deciduous Forests dominated by Red Oak (*Quercus rubra*) and White Oak (*Quercus alba*), with American Beech (*Fagus grandifolia*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), and the occasional Hop Hornbeam (*Ostrya virginiana*).

The understory was largely regenerating canopy species with Grey Dogwood (*Cornus foemina* ssp. *racemosa*).

The ground layer was dominated by Large-leaved Aster (*Aster marcophyllus*), Pennsylvania Sedge (*Carex pennsylvanica*), and Goldenrod species (*Solidago* sp.).

Vegetation Communities

There are a total of 221 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Rice Cut-grass Mineral Shallow Marsh Type (MASM1-10)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA 2006-2009, volunteer crew) – S3

Regionally Rare Species

Points of Interest

Faunal Records:

9 – Birds
7 – Reptiles & Amphibians
4 – Mammals

Site Visits

September 1, 1980
Brady, et al.

June 12, 2008
D. Young, R. Young, J. Kellam, J. Potter, M. Potter

October 1, 2008
T. Staton, S. Mohamed

October 2, 2008
T. Staton, S. Mohamed

October 16, 2008
T. Staton, S. Mohamed

October 20, 2008
T. Staton, S. Mohamed

% of site visited

14.86 % of the total study site was visited by NAI teams.

References Cited

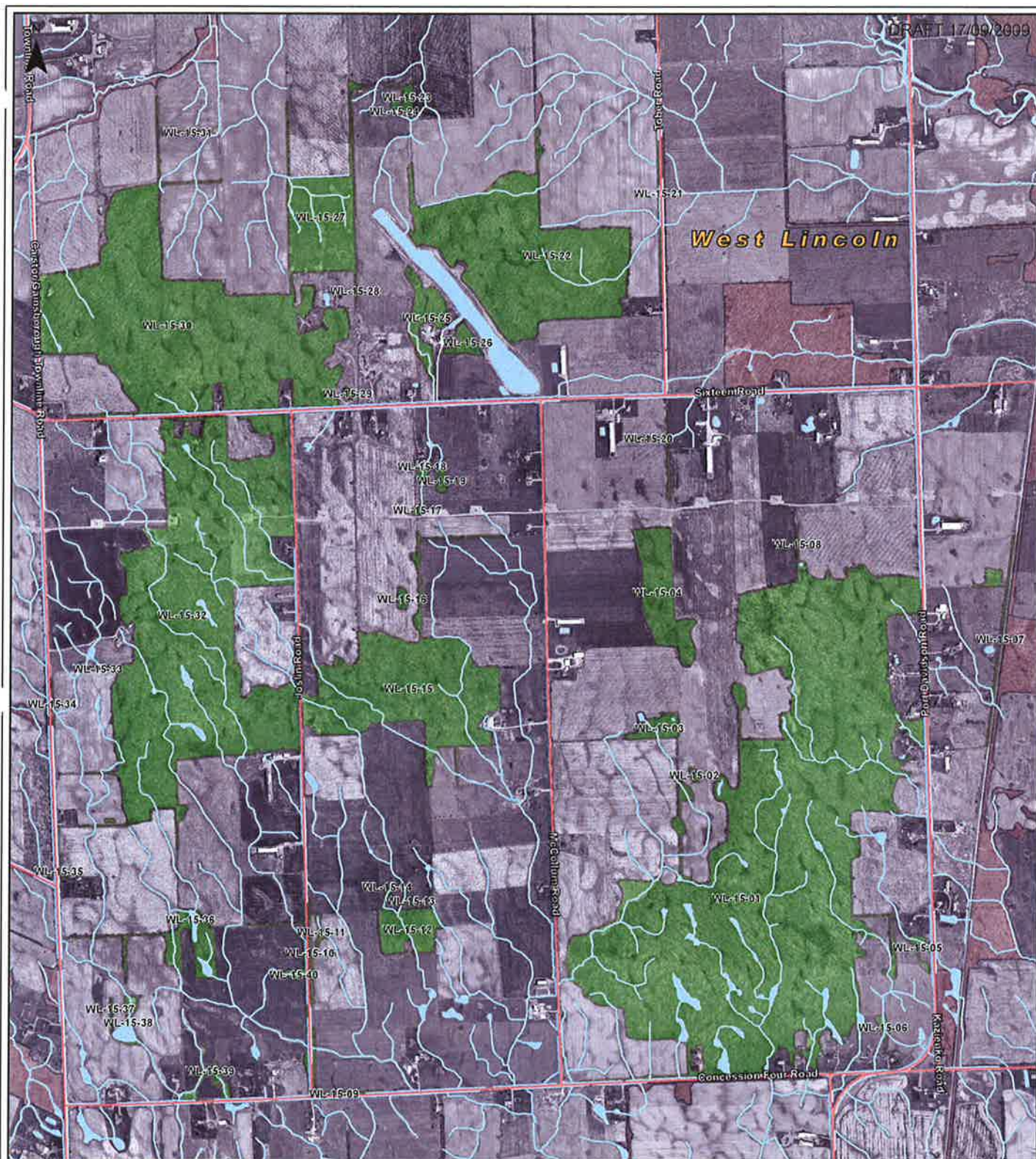
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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-15



Natural Areas Inventory

Study Site WL-15

1:17,000

0 125 250 500 750 1,000 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 221 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WL-16

East Smithville Slough Forest

Municipality Township of West Lincoln

Formerly Spring Creek Bush (Brady, et al., 1980)

Approximate Area 450 hectares

Watershed Drainage of this study site is split nearly in half between Spring Creek in the north and Twenty Mile Creek to the south.

Ownership Mostly private

General Summary

This study site is located between Young Street in the north and Highway 20/Twenty Mile Road in the south. It extends from South Grimsby Road Six in the west to Mountain Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------|--------------------------|
| ALLUVIUM | 1.17 |
| BEVERLY | 19.08 |
| BRANTFORD | 1.46 |
| CHINGUACOUSY | 0.50 |
| HALDIMAND | 0.09 |
| JEDDO | 0.50 |
| LINCOLN | 2.71 |
| SMITHVILLE | 0.76 |
| TOLEDO | 71.75 |
| WATER | 0.00 |
| NOT MAPPED | 1.98 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community recorded for this study site was Shallow Marsh dominated by Reed Canary Grass (*Phalaris arundinacea*) with Asters (*Aster sp.*), Goldenrod (*Solidago sp.*), and the occasional Swamp Maple (*Acer fremanii*).

The Deciduous Swamp communities recorded for this study site were largely Swamp Maple, Swamp White Oak (*Quercus bicolor*), and Red Maple (*Acer rubrum*).

The understory was a mix of regenerating canopy species with Blue Beech (*Carpinus caroliniana*), Serviceberry (*Amelanchier sp.*) and Green Ash (*Fraxinus pennsylvanica*).

The ground layer was Sedges (*Carex sp.*), Spotted Touch-me-not (*Impatiens capensis*), and Mosses (*Moss sp.*).

The Thicket Swamp recorded was dominated by Narrow-leaved Meadowsweet (*Spirea alba*) with Grey Dogwood (*Cornus foemina ssp. racemosa*) and Southern Arrow-wood (*Viburnum recognitum*). Scattered throughout the Thicket Swamp were Green Ash and Sugar Maple (*Acer saccharum ssp. saccharum*) trees.

The ground layer was a mix of Goldenrods, Asters, Reed Canary Grass, and Mosses.

Vegetation Communities

There are a total of 192 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Deciduous Forest (FOD)
Forb Meadow (MEF)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Aster Forb Meadow Type (MEFM1-2)
Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Type (FODM6-5)
Meadowsweet Mineral Deciduous Thicket Swamp Type (SWTM5-7)
Poplar Mineral Deciduous Swamp Type (SWDM4-5)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Reed Canary Grass Mineral Shallow Marsh Type (MASM1-14)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species

Carex careyana (Carey's Wood Sedge) (Trow Consulting Engineers Ltd., 2000) – S2

Points of Interest

Faunal Records:

57 – Birds
9 – Mammals
8 – Reptiles & Amphibians
2 – Moths & Butterflies

Site Visits

September 1, 1980
Brady, et al.

May 31, 2000
Trow Consulting Engineers Ltd.

July 1, 2008
R. Kitchen, B. Porter

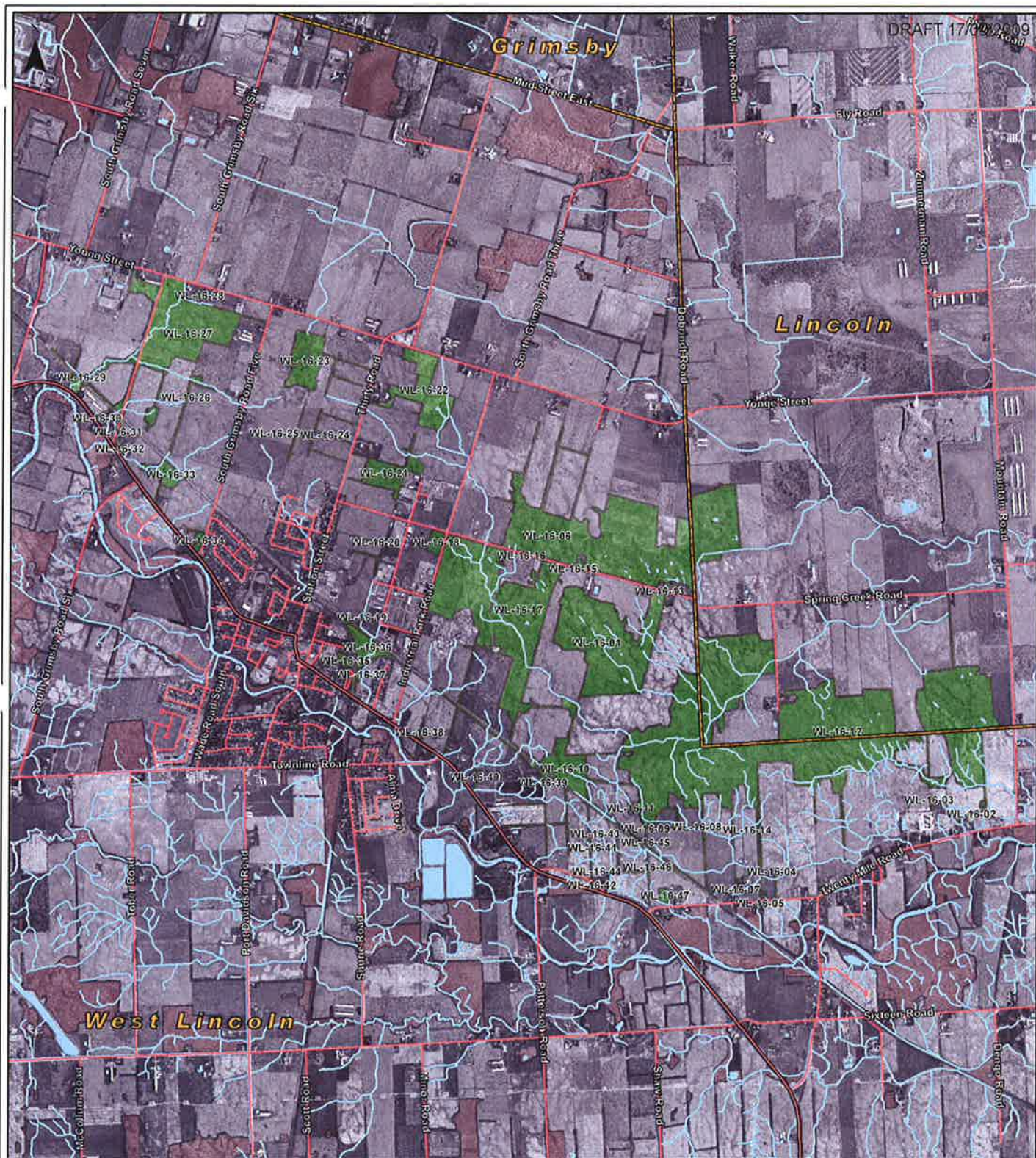
September 19, 2008
T. Staton, S. Mohamed

% of site visited

2.07 % of the total study site was visited by NAI teams.

References Cited

- Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.
- Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>
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- Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.
- Trow Consulting Engineers Ltd. 2000. "St. Ann's North Slough Woodlot, DynaStart Facility – Industrial Park Drive, West Lincoln, Ontario." *Draft Environmental Impact Statement*. Stoney Creek, Ontario: Mr. D. Kirkwood, DynaStart Inc.



DRAFT 17/09/2009

Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-16



Natural Areas Inventory

Study Site WL-16

1:38,000

0 250 500 1,000 1,500 2,000 Meters

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All Frames North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 192 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Study Site WL-20

Comfort's Bush

Municipality Township of West Lincoln

Formerly Comfort's Bush (Brady, et al., 1980)

Approximate Area 447 hectares

Watershed The majority of this study site flows to the Fifteen Mile Creek subwatershed with a very small portion draining south to Welland River West.

Ownership Mostly private with a portion in public ownership (Gainsborough Conservation Area, Niagara Peninsula Conservation Authority).

General Summary

This study site is located between Sixteen Road to the north and Canborough Road to the south. It extends from Boyle Road/ Rosedene Road/ Moote Road in the west to Vineland Townline Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|--------------------------|--------------------------|
| ALLUVIUM | 5.12 |
| BEVERLY | 0.25 |
| BEVERLY - LOAMY PHASE | 0.43 |
| BRANTFORD | 0.01 |
| HALDIMAND | 10.86 |
| HALDIMAND - LOAMY PHASE | 0.52 |
| LINCOLN | 22.25 |
| SMITHVILLE | 13.00 |
| SMITHVILLE - LOAMY PHASE | 0.02 |
| TOLEDO | 46.35 |
| TOLEDO - LOAMY PHASE | 0.26 |
| WATER | 0.00 |
| NOT MAPPED | 0.93 |
| Total % | 100.00 |

Ecological Land Classification

Summary

The most common community noted for this study site was the Deciduous Swamp dominated by Red Maple (*Acer rubrum*), Swamp White Oak (*Quercus bicolor*), Green Ash (*Fraxinus pennsylvanica*), and Pin Oak (*Quercus palustris*).

The understory was characterized by Blue Beech (*Carpinus caroliniana*), Serviceberry (*Amelanchier* sp.), Winterberry (*Ilex verticillata*), and Highbush Blueberry (*Vaccinium corymbosum*).

The herbaceous layer was a mix of Spotted Touch-me-not (*Impatiens capensis*), Reed Canary Grass (*Phalaris arundinacea*), Canada Mayflower (*Maianthemum canadense*), Swamp Dewberry (*Rubus hispidus*), Sessile-leaved Bellwort (*Uvularia sessilifolia*), Eastern Bracken Fern (*Pteridium aquilinum* var. *latiusculum*), and Large-leaved Aster (*Aster macrophyllus*).

The upland communities were Deciduous Forests dominated by White Oak (*Quercus alba*), Red Oak (*Quercus rubra*), Red Maple, and Shagbark Hickory (*Carya ovata*).

The understory was characterized by Highbush Blueberry (*Carpinus caroliniana*), Hawthorn (*Crataegus* sp.), and Witch-hazel (*Hamamelis virginiana*).

The ground layer was a mix of Large-leaved Aster and Rough Goldenrod (*Solidago rugosa* ssp. *rugosa*).

Vegetation Communities

There are a total of 156 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Thicket Swamp (SWT)
Shallow Marsh (MAS)

Vegetation Type

Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Oak-Maple Deciduous Forest Type (FODM9-2)
Green Ash mineral Deciduous Swamp Type (SWDM2-2)
Pin Oak Mineral Deciduous Swamp Type (SWDM1-3)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk

Castanea dentata (American Chestnut) (NPCA, 2006-2009) – Endangered
Cornus florida (Eastern Flowering Dogwood) (Brady, et al., 1980) – Endangered

Provincially Rare Species

Carex seorsa (Swamp Star Sedge) (NPCA, 2006-2009) – S2
Nyssa sylvatica (Black Gum) (Brady, et al., 1980) – S3

Points of Interest**Faunal Records:**

30 – Birds

18 – Moths & Butterflies

7 – Reptiles & Amphibians

4 – Mammals

Site Visits

September 1, 1980

Brady, et al.

July 6, 2007

B. Curry

July 10, 2008

T. Staton, S. Mohamed

July 21, 2008

T. Staton, S. Mohamed, M. Nikitzuk

% of site visited

5.48 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

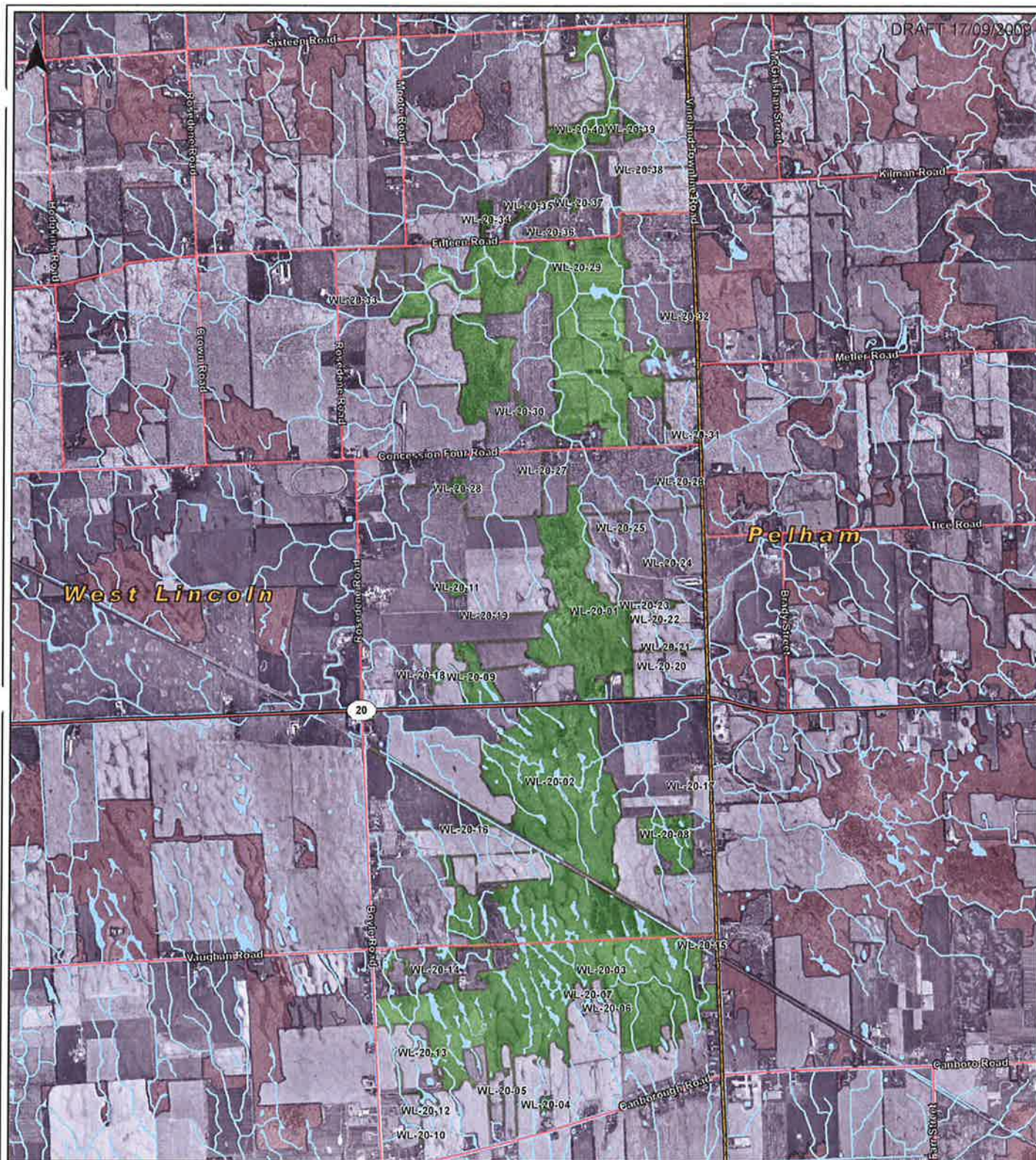
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-20



Natural Areas Inventory

Study Site WL-20

1:30,000

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There are a total of 156 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)

Study Site WL-22

Twenty Mile Creek

Municipality Township of West Lincoln

Formerly Twenty Mile Creek (Brady, et al., 1980)

Approximate Area 584 hectares

Watershed Twenty Mile Creek

Ownership Mix of private and public

General Summary

This study site follows the Twenty Mile Creek from the watershed boundary at Westbrook Road to Tintern Road near the Pelham border. The northern boundary is Highway 20/ Range Road 1/ Twenty Mile Road. The southern boundary is Twenty Road/ Sixteen Road.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------------|---------------------------------|
| ALLUVIUM | 34.21 |
| ALLUVIUM - VERY SHALLOW PHASE | 0.26 |
| BEVERLY | 9.33 |
| BEVERLY - LOAMY PHASE | 1.50 |
| BRANTFORD | 16.12 |
| HALDIMAND | 7.54 |
| LINCOLN | 7.13 |
| SMITHVILLE | 7.91 |
| SMITHVILLE - LOAMY PHASE | 0.56 |
| TOLEDO | 4.32 |
| WATER | 8.34 |
| NOT MAPPED | 2.78 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small portion of this study site was visited by NAI teams. This study site includes the floodplain and associated upland communities of the Twenty Mile Creek corridor.

The communities noted were what would be expected for a floodplain situation. Meadow Marshes dominated by Reed-canary Grass (*Phalaris arundinacea*) were commonly noted along with Graminoid Meadows of Fescue Grass (*Festuca sp.*), Common Teasel (*Dipsacus fullonum ssp. sylvestris*), Reed-canary Grass, and Gray

Dogwood (*Cornus foemina* ssp. *racemosa*) with occasional Green Ash (*Fraxinus pennsylvanica*) trees.

The Deciduous Forests progressed up the floodplain slope from Green Ash sominated to more upland stands dominated by Shagbark Hickory (*Carya ovata*), Sugar Maple (*Acer saccharum* ssp. *saccharum*), Red Oak (*Quercus rubra*), and White Ash (*Fraxinus americana*).

The understory for these communities was mostly Hop Hornbeam (*Ostrya virginiana*) along with Gray Dogwood, and Choke Cherry (*Prunus virginiana* ssp. *virginiana*).

The herbaceous layer was a mix of Grasses (*Grass* sp.), Asters (*Aster* sp.), and Moneywort (*Lysimachia nummularia*).

The Open Water communities recorded were dominated by Water-lily species (*Nymphaea* sp.) and Bullhead Lilies (*Nuphar* sp.).

Vegetation Communities

There are a total of 93 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)
Meadow Marsh (MAM)
Mixed Shallow Aquatic (SAM)
Open Water (OAW)
Shallow Marsh (MAS)

Vegetation Type

Dry-Fresh Sugar Maple-Red Maple Deciduous Forest Type (FODM5-9)
Forb Mineral Shallow Marsh Type (MASM2-1)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Native Shrub Deciduous Hedgerow Thicket Type (THDM3-2)
Open Graminoid Meadow Type (MEGM4-1)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Water-lily-Bullhead Lily Mixed Shallow Aquatic Type (SAM_1-8)

Significant Flora

Species at Risk

Juglans cinerea (Butternut) (Brady, et al., 1980) – Endangered

Provincially Rare Species

Gleditsia triacanthos (Honey Locust) (Brady, et al., 1980) – S2

Points of Interest

Faunal Records:

10 – Birds
3 – Moths & Butterflies
1 – Reptiles & Amphibians

1 – Mammals

Site Visits

September 1, 1980

Brady, et al.

June 13, 2007

B. Curry

July 24, 2008

T. Staton, S. Mohamed

July 25, 2008

T. Staton, S. Mohamed

July 29, 2008

T. Staton, S. Mohamed

% of site visited

0.45 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-22



Natural Areas Inventory

Study Site WL-22

1:130,000

0 1,000 2,000 4,000 6,000 8,000 Meters

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There are a total of 93 recorded taxa (unique plant records) for this study site

Community Series:

Deciduous Forest (FOD)
Deciduous Thicket (THD)
Graminoid Meadow (MEG)

Meadow Marsh (MAM)
Open Water (OAW)

Study Site WL-23

Stewart's Woods

Municipality Township of West Lincoln

Formerly Stewart's Wood (Brady, et al., 1980)

Approximate Area 298 hectares

Watershed The drainage for this study site is split nearly in half between Twenty Mile Creek to the south and Forty Mile Creek to the north.

Ownership Mostly private

General Summary

This study site is located between Mud Street East to the north and Highway 20 to the south. It extends from Grassie Road in the west to South Grimsby Road Six in the east.

Physical Description

The northern portion of this natural area is situated on the well drained, sand and gravel deposits of the till, moraine feature associated with the remnant Niagara Falls Moraine. The southern portion of this area is characterized by the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain.

The entire study site is underlain by the dolostone of the Lockport Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------|--------------------------|
| ALLUVIUM | 1.99 |
| BEVERLY | 8.53 |
| BRANTFORD | 1.71 |
| HALDIMAND | 11.37 |
| LINCOLN | 44.86 |
| MALTON | 0.11 |
| PEEL | 0.25 |
| SMITHVILLE | 0.06 |
| TOLEDO | 30.31 |
| WATER | 0.00 |
| NOT MAPPED | 0.81 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small portion of this study site was visited by NAI teams.

The most common community recorded was a dry Deciduous Forest dominated by White Oak (*Quercus alba*) and Red Oak (*Quercus rubra*), with Shagbark Hickory (*Carya ovata*), and Sugar Maple (*Acer saccharum* ssp. *saccharum*).

The understory was characterized by Hop Hornbeam (*Ostrya virginiana*), Sugar Maple, Serviceberry (*Amelanchier* sp.), and Black Cherry (*Prunus serotina*).

The ground cover was mostly regenerating canopy trees with Maple-leaved Viburnum (*Viburnum acerifolium*), Large-leaved Aster (*Aster macrophyllus*), and Goldenrod (*Solidago* sp.).

Vegetation Communities

There are a total of 50 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)

Deciduous Swamp (SWD)

Vegetation Type

Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)

Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)

Significant Flora

Species at Risk - None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

3 – Reptiles & Amphibians

2 – Birds

1 – Mammal

Site Visits

September 1, 1980

Brady, et al.

October 31, 2008

T. Staton, S. Mohamed

% of site visited

1.50 % of the total study site was visited by NAI teams.

References Cited

Brady, R., et al. 1980. *Environmentally Sensitive Areas*. Regional Municipality of Niagara, Brock University, Department of Geography, St. Catharines, Ontario.

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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ed.). Peterborough, Ontario: Natural Heritage Information Centre, Ontario
Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of
Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- + Study Sites
- Study Site WL-23



Natural Areas Inventory

Study Site WL-23

1:33,000

0 250 500 1,000 1,500 2,000 Meters

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There are a total of 50 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)

Study Site WL-26

Beaver Creek

Municipality Township of West Lincoln

Formerly N/A

Approximate Area 387 hectares

Watershed The majority of this study site drains to the Beaver Creek subwatershed. There is a very small portion that drains north to an unnamed creek, and south to Welland River West.

Ownership Mostly private.

General Summary

This study site closely follows Beaver Creek between Vaughn Road in the north and Canborough Road in the south. It extends from Caistor/Canborough Townline Road in the west to Wellandport Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone and shale of the Salina Formation.

In the far north west of this study site there is a small area that is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|-------------------------|--------------------------|
| ALLUVIUM | 23.28 |
| BEVERLY | 0.02 |
| BRANTFORD | 0.33 |
| HALDIMAND | 27.98 |
| HALDIMAND - LOAMY PHASE | 0.87 |
| LINCOLN | 38.66 |
| SMITHVILLE | 6.49 |
| TOLEDO | 0.03 |
| WATER | 1.44 |
| NOT MAPPED | 0.90 |
| Total % | 100.00 |

Ecological Land Classification

Summary

This study site is characterized by Deciduous Swamps that are associated with the floodplain of Beaver Creek. These swamp communities were dominated by Swamp White Oak (*Quercus bicolor*), Swamp Maple (*Acer fremanii*), and Green Ash (*Fraxinus pennsylvanica*) with some White Elm (*Ulmus americana*).

The understory was a mix of Hawthorn (*Crataegus sp.*), Gray Dogwood (*Cornus foemina ssp. racemosa*), Buttonbush (*Cephalanthus occidentalis*), Winterberry (*Ilex verticillata*), Narrow-leaved Meadowsweet (*Spirea alba*), Blue Beech (*Carpinus caroliniana*), and Willow (*Salix sp.*).

The herbaceous layer was mostly Spotted Touch-me-not (*Impatiens capensis*), Asters (*Aster sp.*), Avens (*Geum sp.*), and Reed-canary Grass (*Phalaris arundinacea*).

The transition zones between the swamp communities and the drier Deciduous Forests were classified as Meadow Marshes dominated by Reed-canary Grass.

The Deciduous Forests were largely dominated by Green Ash and White Elm with the same basic understory of Gray Dogwood, Hawthorn and Tartarian Honeysuckle (*Lonicera tatarica*).

The ground cover was a mix of Avens and Goldenrod, with Garlic Mustard (*Allaria petiolata*).

Vegetation Communities

There are a total of 74 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)
Shallow Marsh (MAS)
Thicket Swamp (SWT)
Floating-leaved Shallow Aquatic (SAF)

Vegetation Type

Broad-leaved Sedge Mineral Shallow Marsh Type (MASM1-5)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Buttonbush Organic Deciduous Thicket Swamp Type (SWTO5-1)
Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)
Fresh-Moist Green Ash-Hardwood Lowland Deciduous Forest Type (FODM7-2)
Fresh-Moist Oak-Sugar Maple Deciduous Forest Type (FODM9-1)
Green Ash Mineral Deciduous Swamp Type (SWDM2-2)
Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)
Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
Swamp White Oak Mineral Deciduous Swamp Type (SWDM1-1)
Winterberry Mineral Deciduous Thicket Swamp Type (SWTM5-6)

Significant Flora

Species at Risk – None noted.

Provincially Rare Species – None noted.

Points of Interest

Faunal Records:

8 – Birds
4 – Reptiles & Amphibians

- 1 – Moths & Butterflies
- 1 – Mammals

Site Visits

September 4, 2008

T. Staton, S. Mohamed

September 8, 2008

T. Staton, S. Mohamed

% of site visited

3.21 % of the total study site was visited by NAI teams.

References Cited

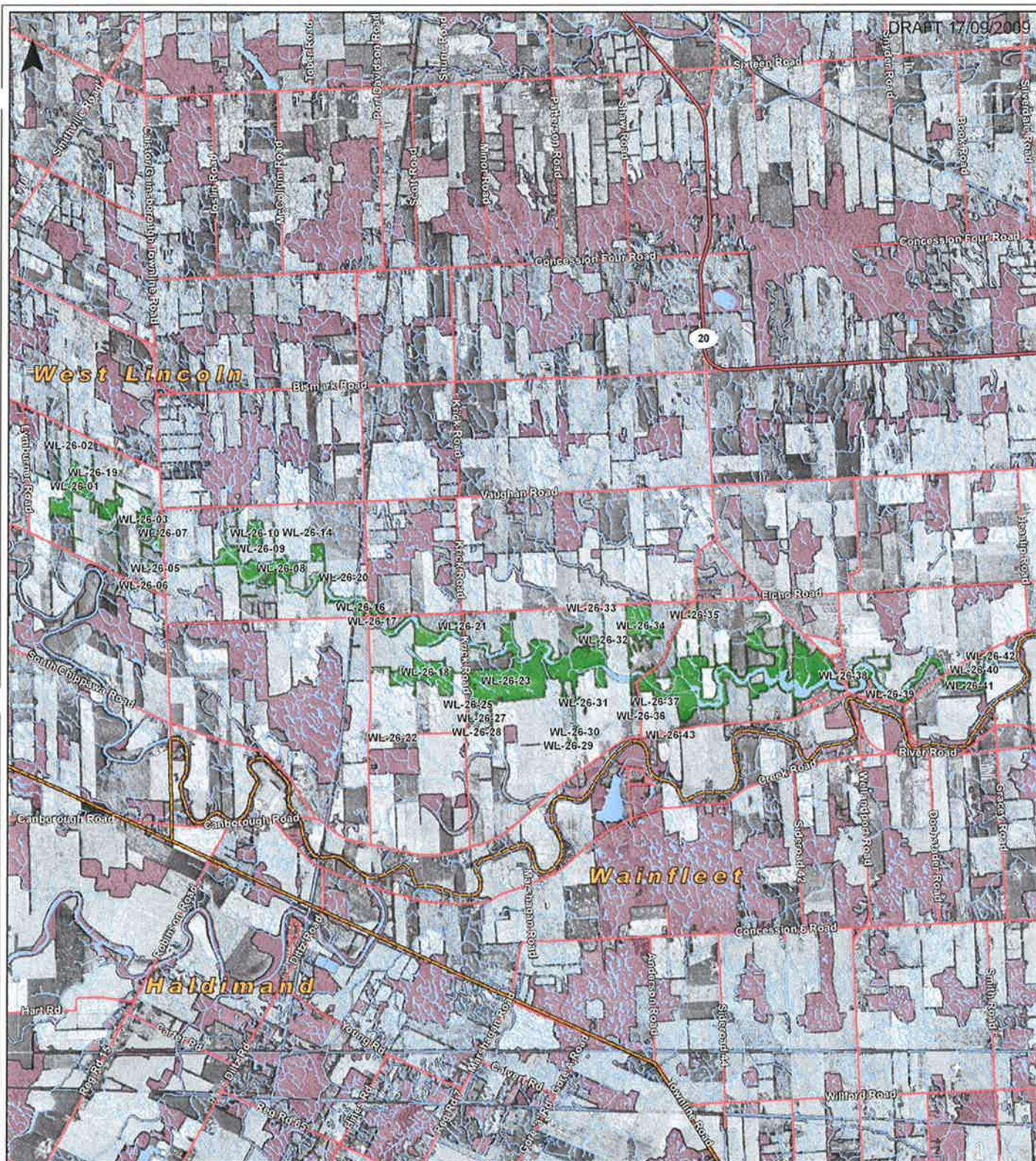
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<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.



Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-26



Natural Areas Inventory

Study Site WL-26

1:64,000

0 400 800 1,600 2,400 3,200 Meters

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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 74 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Forest (FOD)
Deciduous Swamp (SWD)
Meadow Marsh (MAM)

Study Site WL-27

Beaver Creek Headwaters

Municipality Township of West Lincoln

Formerly N/A

Approximate Area 153 hectares

Watershed This study site drains to an unnamed creek.

Ownership Mostly private

General Summary

The northern boundary of this study site is Vaughan Road and the southern boundary is Canborough Road. It extends from just west of Wellandport Road in the west to Heaslip Road in the east.

Physical Description

This natural area is situated on the flat, poorly drained, clay and silty clay soils of the Haldimand Clay Plain.

The northern portion is underlain by the dolostone of the Guelph Formation. The southern portion is underlain by the dolostone and shale of the Salina Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| ALLUVIUM | 7.24 |
| HALDIMAND | 30.29 |
| LINCOLN | 46.99 |
| NIAGARA | 0.54 |
| SMITHVILLE | 14.94 |
| WATER | 0.00 |
| NOT MAPPED | 0.00 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small portion of this study site was visited by NAI teams.

The most common community noted was Deciduous Swamp dominated by Red Maple (*Acer rubrum*), Basswood (*Tilia americana*), Shagbark Hickory (*Carya ovata*), and Green Ash (*Fraxinus pennsylvanica*).

The understory was characterized by regenerating canopy species with Blue Beech (*Carpinus caroliniana*).

The herbaceous layer was a mix of Fowl Manna Grass (*Glyceria striata*), Asters (*Aster* sp.), Spotted Touch-me-not (*Impatiens capensis*), and Spotted Crane's-bill (*Geranium maculatum*).

Other communities of note were Thicket Swamps dominated by Buttonbush (*Cephalanthus occidentalis*), and Shallow Marsh communities dominated by Beggar-ticks (*Bidens* sp.).

Vegetation Communities

There are a total of 151 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)
Deciduous Forest (FOD)
Shallow Marsh (MAS)
Thicket Swamp (SWT)

Vegetation Type

Beggar-ticks Mineral Shallow Marsh Type (MASM2-2)
Buttonbush Mineral Deciduous Thicket Swamp Type (SWTM5-1)
Fresh-Moist Sugar maple-Hardwood Deciduous Forest Type (FODM6-5)
Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk –None noted.

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009) – S3

Points of Interest

Faunal Records:

14- Birds
5 – Moths & Butterflies
4 – Reptiles & Amphibians
2 – Mammals

Site Visits

August 1, 2008

R. Young, J. Damude, J. Kellam, J. Potter, M. Potter

August 14, 2008

T. Staton, S. Mohamed

% of site visited

2.16 % of the total study site was visited by NAI teams.

References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

Natural Heritage Areas Inventory 2006-2009. Unpublished database, Niagara Peninsula Conservation Authority, Welland, Ontario.

Oldham, M. J., & Brinker, S. R. 2009. *Rare Vascular Plants of Ontario (Fourth Edition ed.)*. Peterborough, Ontario: Natural Heritage Information Centre, Ontario Ministry of Natural Resources.

Ontario Ministry of Agriculture and Food. 1989. *The Soils of The Regional Municipality of Niagara*, Report No. 60 of the Ontario Institute of Pedology, Guelph, Ontario.

Study Site WL-32

Little Wolf Creek

Municipality Township of West Lincoln

Formerly N/A

Approximate Area 197 hectares

Watershed The drainage for this study site is divided nearly in half with the western portion draining to Little Wolf Creek and the eastern portion draining to Wolf Creek.

Ownership Mostly private.

General Summary

This study site is located along the Hamilton border between Westbrook Road to the west and Caistorville Road in the east. The northern boundary is Concession Three Road and the southern boundary is Concession one Road.

Physical Description

This natural area is situated on the flat, poorly drained clay and silty clay soils of the Haldimand Clay Plain. It is underlain by the dolostone of the Guelph Formation.

Soils

| Soil Type | Percentage of Study Site |
|------------------|---------------------------------|
| ALLUVIUM | 21.99 |
| HALDIMAND | 16.66 |
| LINCOLN | 41.04 |
| SMITHVILLE | 19.96 |
| WATER | 0.00 |
| NOT MAPPED | 0.35 |
| Total % | 100.00 |

Ecological Land Classification

Summary

A very small portion of this study site was visited by NAI teams.

The dominant community noted was a Deciduous Swamp characterized by Red Maple (*Acer rubrum*), Red Oak (*Quercus rubra*), Green Ash (*Fraxinus pennsylvanica*), with the occasional White Oak (*Quercus alba*).

The understory was a mix of Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Beech (*Fagus grandifolia*), Blue Beech (*Carpinus caroliniana*), and Smooth Serviceberry (*Amelanchier laevis*).

The herbaceous layer was mostly Sedges (*Carex* sp.), Asters (*Aster* sp.), Beggar-ticks (*Bidens* sp.), and Spotted Touch-me-nots (*Impatiens capensis*).

The Shallow Aquatic community noted was dominated by Lesser Duckweed (*Lemna minor*).

Vegetation Communities

There are a total of 82 recorded taxa (unique plant records) for this study site.

Community Series

Deciduous Swamp (SWD)

Deciduous Forest (FOD)

Floating-leaved Shallow Aquatic (SAF)

Vegetation Type

Duckweed Floating-leaved Shallow Aquatic Type (SAF_1-3)

Fresh-Moist Oak-Hardwood Deciduous Forest Type (FODM9-6)

Red Maple Mineral Deciduous Swamp Type (SWDM3-1)

Significant Flora

Species at Risk

Carex lupuliformis (Knobbed Hop Sedge) (NPCA, 2006-2009) – Endangered

Provincially Rare Species

Nyssa sylvatica (Black Gum) (NPCA, 2006-2009)-S3

Points of Interest

Faunal Records:

2 – Birds

2 – Reptiles & Amphibians

Site Visits

August 1, 2008

R. Kitchen, B. Porter

% of site visited

2.09 % of the total study site was visited by NAI teams.

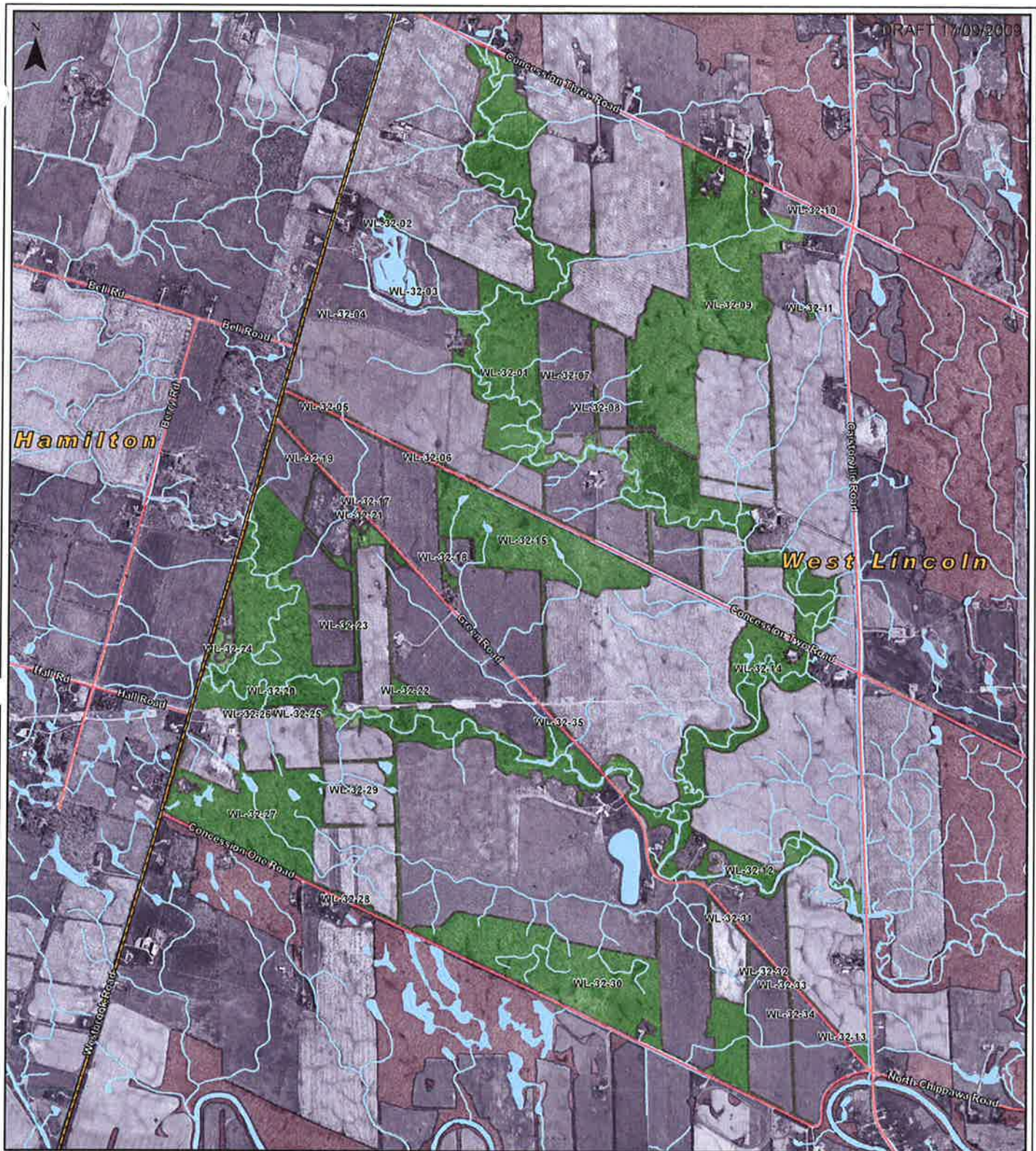
References Cited

Government of Ontario, Ministry of Natural Resources. 2009. Deciduous Forest. Species at Risk in Ontario. Retrieved 11/05, 2009, from <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276504.html>

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Legend

- Major Highways
- Regional Highways
- Roads
- Watercourses
- Waterbodies
- Municipal Boundaries
- Study Sites
- Study Site WL-32



Natural Areas Inventory

Study Site WL-32

1:18,000

0 125 250 500 750 1,000 Meters

Produced by the Niagara Peninsula Conservation Authority, 2009.
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All Frames: North American Datum 1983, Universal Transverse Mercator 6° Projection, Zone 17N, Central Meridian 81° West



There are a total of 82 recorded taxa (unique plant records) for this study site.
Community Series:
Deciduous Swamp (SWD)