Forests of Pickering: Significant Woodlands in the Town of Pickering

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FORESTS OF PICKERING:

Significant Woodlands in the Town of Pickering

Draft Report
May 1996

Ministry of Natural Resources

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SUMMARY

This draft report identifies the most significant woodlands in the Town of Pickering. The proposed method of evaluating woodlands is presented. An analysis of the general characteristics of the forests of Pickering is also presented to aid in the evaluation of significant woodlands. Information from this study can be used for a variety of purposes including the conservation of woodlands through municipal planning and the Managed Forest Tax Rebate.

Comment on this draft report is invited from the public, interested individuals and groups, and from government agencies. We invite comment on the proposed approach to assessing woodland significance and request additional woodland information from knowledgeable people.

The report is the first phase of a larger project to evaluate woodlands in Durham Region. The Durham Area Team plans to continue work on evaluation of the woodlands of other municipalities in Durham.

Information used for this report was collected from a wide variety of sources. The information includes MNR mapping and inventory, as well as information from other agencies including the Town of Pickering and conservation authorities.

17.6 percent of the Town is forested. Forest cover decreased from 19% in 1978 to 17.6% in 1993. About 500 hectares of forest has been lost, while another 200 hectares of young forests have grown since 1978. In addition, an area of 1422 hectares of old field indicates much more forest may regenerate if land uses do not change.

Four criteria are used to evaluate Pickering's woodlands: woodland size; other natural heritage features; uncommon forest features; and ecological functions. Several components are defined within each of these criteria. If a woodland meets the standards for any one component within one criterion, it is considered to meet that criterion.

Forest cover varies across Pickering with forest cover varying from six percent in the urbanized south to 30 percent in the rural ninth concession. This report proposes that south of Finch Avenue a woodland more than four hectares in size be considered important, while north of Finch Avenue woodlands more than 40 hectares in size be considered important. Forty-seven woodlands totalling 2332 hectares are considered significant for size. This represents 58.1% of the area of forest.

Other natural heritage features include: areas of natural and scientific interest (ANSIs); classified wetlands; environmentally significant areas (ESAs); habitat for of vulnerable, threatened, or endangered species; Oak Ridges Moraine natural heritage core and corridor areas; and woodlands ranking highly in studies of Seaton and Airport Lands. Ninety-seven woodlands totalling 2575 hectares are identified as other natural heritage features. This represents 64.2percent of the woodland area in Pickering.

The method used to assess uncommon woodland features addresses five components: uncommon tree species; uncommon forest communities; old growth forest stands; forest interior habitat; and tree species diversity. A specific method for each component is outlined. Two options are presented for both uncommon tree species and uncommon forest composition. Using the preferred options, one hundred and seventy woodlands covering 2422 hectares or 60 percent of Pickering's forests met the uncommon forest feature criterion.

The method used to assess ecological functions addresses three components: watercourses and wetlands; headwater and groundwater areas; and linkages. A specific method for the watercourses and wetlands component is outlined. The headwater and groundwater areas and linkage components are not fully developed and will be completed in the final report. Two hundred and one woodlands covering 3499 hectares or 87 percent of Pickering's forests met the ecological function criterion.

Two options are presented here for overall woodland significance. Under the Option 1, if a woodland meets at least one of the criteria it is considered significant. Under this option 290 woodlands totalling 3826 hectares or 95% of Pickering's forest area would be considered significant. Option 2 would assess a woodland significant if it met two or more criteria or it met either the size or other natural heritage feature criteria. Under that option 157 woodlands totalling 3273.5 hectares or 82% of Pickering's forest would be considered significant.

It is important to note that under either option, almost two thirds of the woodland area in Pickering is considered significant already. Most woodland areas identified under either option are also identified as natural area in the draft official plan for the Town of Pickering. Furthermore, most of the woodlands offer major development constraints due to their association with valleylands.

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INTRODUCTION

Two centuries ago forests blanketed southern Ontario's landscapes. Forests of maple, oak, pine and cedar covered what is now the Town of Pickering. With the disappearance of these forests and their ecological diversity and functions, we lost an important part of our heritage. But our forests are recovering from these losses. Due to an increased environmental awareness, Ontario's citizens now value forests as an important part of every community's future.

Ontario accepted that sustainable forest ecosystems are one key part of sustaining the communities of Ontario, with the recent adoption of the "Policy Framework on Sustainable Forests" (OMNR 1994). The goal of that policy framework is "to ensure the long-term health of our forest ecosystems for the benefit of the local and global environments, while enabling present and future generations to meet their material and social needs". Ontario's Ministry of Natural Resources bases the approach to forest conservation and management on the principle of ecological sustainability.

A consensus has also emerged among those involved in land use planning that woodlands require more effective protection and consideration in municipal planning. Consequently, sustaining southern Ontario's woodlands is also a goal of the Natural Heritage policies that are part of the new Provincial Policy Statement (and previous Comprehensive Set of Policy Statements). The intent of these policies is to ensure the long-term health of Ontario's natural ecosystems and requires sound woodland inventory and evaluation.

The Durham Area Team of the Ministry of Natural Resources, initiated a Natural Heritage mapping project in the summer of 1995 to identify and map significant woodlands in the Town of Pickering.

PURPOSE

This draft report identifies the most significant woodlands in the Town of Pickering. An analysis of the general characteristics of the forests of Pickering is also presented to aid in the evaluation of significant woodlands. The proposed method of evaluating woodlands is presented. This draft report is the first part of an effort to evaluate woodlands in Durham Region. In cooperation with municipal governments, the Durham Area Team hopes to continue work on the woodlands in Durham Region.

The products of the project include maps the woodland information on 1:10,000 maps and a data base of the resulting information on each

woodland. In the longer term this data base will provide input for a Geographic Information System (GIS). The data base is GIS compatible and each woodland is georeferenced.

The study reflects the need to better understand Pickering's forests and to better plan for the conservation of these forests for the future. Clearing for farming, urban development and poor forestry practices all threaten the health of southern Ontario's forests. Information from this study can be used for a variety of purposes including the conservation of forest through municipal planning. In addition, the recently announced Managed Forest Tax Rebate Program offers a rebate on municipal taxes for certain woodlands, up to 75% of the total taxes. Most woodlands more than ten hectares in size and significant woodlands between four and ten hectares may be eligible for the tax rebate (OMNR 1996).

Within a municipality like Pickering, the protection of natural features is best done through identifying a system of natural areas with corridors and linkages that connect the system together (OMNR 1991a, Riley and Mohr 1993). Large core areas help protect ecosystem integrity and the connections provide for dispersal of plants and animals among the different natural areas. The system of natural heritage areas and features includes wetlands, woodlands, valleylands, environmentally significant areas, and areas of natural and scientific interest (ANSI).

This report on woodlands expands upon studies already done to identify significant natural features including wetlands, environmentally sensitive areas, and areas of natural and scientific interest (ANSIs). The Town of Pickering has produced a "Natural Systems Plan" as background to their Official Plan review. This current study complements and expands upon work of the Town of Pickering in identifying existing forests, old fields and hedgerows (Town of Pickering 1994a).

COMMENT INVITED ON DRAFT REPORT

Comment on this draft report is invited from the public, interested individuals and groups, and from government agencies. We invite comment on the proposed approach to assessing woodland significance. Information is also being sought from those who may have detailed information on these woodlands. In particular, we are interested in the tree species composition of forest stands not recorded in the 1978 Forest Resource Inventory (FRI) and the occurrence of plant and animal species considered rare in Ontario and Durham Region (Austen et al. 1994, Kamstra 1992, 1993, Nisbet 1994, Riley et al. 1993).

Comments on this report should be sent to the Ministry of Natural Resources, Durham Area Team, 10401 Dufferin Street, Maple, Ontario, L6A 1S9 by **September 15, 1996**.

STUDY LIMITATIONS

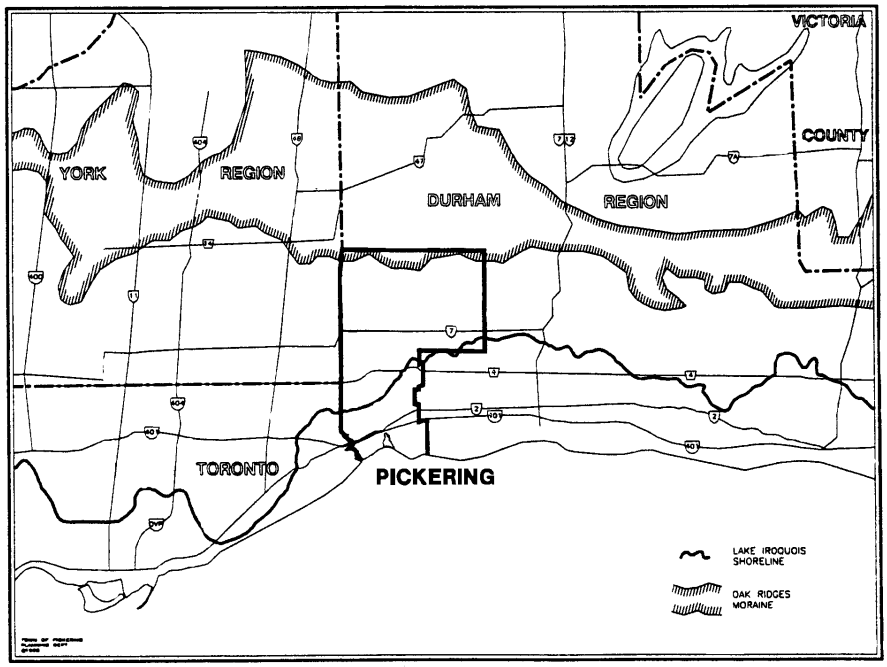
A limitation of this study is the lack of field work to update information on forest composition, and to check information from air photos and maps. The Forest Resource Inventory (FRI) was last updated in 1978. Therefore, 1993 air photos were used to confirm the existence and sizes of woodlands still present and ones now disappeared. No forest composition data exist for woodlands that originated after 1978 or not recorded as woodlands in 1978 due to young age. Nevertheless, the FRI data do provide a reasonable information source particularly for the mid to late successional forests. Most of the forests developed since 1978 will be early successional in nature. Studies for the Seaton Community compared forest composition data collected in 1974 with information collected in 1990 and found no major changes in general composition (Geomatics et al. 1991). That study also noted losses of woodlands since 1974.

BACKGROUND

A thorough woodland evaluation and inventory is needed for the Regional Municipality of Durham. The 1978 Forest Resource Inventory and 1992 Greater Toronto forest mapping provide only basic descriptions and mapping of each forest stand. The Durham Team hopes to continue woodland evaluation for other parts of Durham over time. We seek the cooperation of the Regional Municipality of Durham, conservation authorities and the local municipalities, Ajax, Brock, Clarington, Pickering, Oshawa, Scugog, Uxbridge and Whitby.

The Town of Pickering was selected to begin an evaluation of significant woodlands because the Town's official plan is under review and due to the general development pressure in the Town. Pickering, along with the other southern urbanized portions of Durham, continues to experience urban growth, and this growth puts pressure on existing woodlands and other natural heritage features. The Town's new plan has an increased focus on environmental conservation (Town of Pickering 1995). This new information on significant woodlands should be useful in finalizing the new Official Plan for Pickering. Preliminary information from this report was used in preparing MNR comments on the draft official plan.

Figure 1



PLANNING & POLICY CONTEXT

The Town of Pickering is located within the Durham Regional Municipality, just east of Metropolitan Toronto (Figure 1). Located on the north shore of Lake Ontario, it lies between the City of Scarborough and Town of Markham on the west, the Towns of Ajax and Whitby on the east, and the Township of Uxbridge to the north.

Pickering has a population of approximately 73,000 which has been increasing at an average rate of 3,000 people a year. Of the current 73,000 people about 68,000 live in an urban setting compared to 5,000 that are located in rural areas. The rural land area of Pickering is five times the size of its urban area (Town of Pickering 1994a).

Pickering Official Plan

A review of the Town's official plan has been underway for a number of years (Town of Pickering 1995). A number of background studies have been produced including a natural systems plan (Town of Pickering 1994). That study analyzes a variety of natural features including woodlands. The Town generously supplied additional maps and information used in this study. The present report builds on the work by the Town.

Durham Regional Official Plan

The Durham Regional Plan contains a variety of policies on forests, environmentally sensitive areas and other natural areas (Regional Municipality of Durham 1991). These policies include commitments to conducting forest inventories, expanding forest cover in the Region, requiring assessment of the impact of development on significant woodlands, and monitoring implementation of the Regional tree-cutting by-law.

Provincial Lands & Planning Initiatives

Large holdings of provincial lands are present in Pickering, acquired in anticipation of the development of a large urban community in this area. The proposed community of Seaton remains a proposal for a portion of these lands. Studies for the Seaton project have also identified significant natural areas (Walden and Griffiths 1974, Geomatics et al. 1991, HGT AGRA Ltd. 1994).

In the western portion of the provincial lands, Ontario has designated a portion of land as part of the Rouge Valley Park. In addition, the Rouge-Duffin Wildlife Corridor was established to link the Rouge Park with the highly significant Duffin Creek Valley to the east (recognized in the Durham Official Plan). Existing vegetation on public land within the Rouge-Duffin Wildlife Corridor will be enhanced through natural succession and active vegetation restoration. Other provincial lands in the area are to be sold.

The other significant provincial initiative relevant to this study is the planning study for the Oak Ridges Moraine. June 1991 saw the issuing of the Implementation Guidelines for the provincial interest in the Oak Ridges Moraine and the beginning of a two-year planning study which is now complete. That study commissioned studies that examined a wide variety of issues and natural features on the moraine. Of particular interest is a report by Geomatics International Inc. (1993) defining a Natural Heritage System for the moraine that includes the identification of significant woodlands.

Large federal land holdings also exist in the northern portion of Pickering resulting from land acquisitions for a proposed airport in the 1970s. Many significant natural areas exist on these federal lands (Walden and Griffiths 1974).

PICKERING'S NATURAL REGIONS

The Town of Pickering can be divided into a series of ecological regions or natural regions. There are a variety of ways of making these divisions: forest regions, physical geography or physiography, watersheds, or composite "ecoregions". The Natural Systems Plan prepared by the Town (1994) provides greater detail on many aspects of the Town's natural history. All these types of classifications are important and help us understand the natural variety of forests in Pickering.

Ecological Regions (Site Districts)

The Ministry of Natural Resources identifies natural heritage features including Areas of Natural and Scientific Interest within ecological regions called site districts. Site districts combine divisions based on physical geography, soils, climate and vegetation. Pickering straddles three Site Districts: 6-7, 6-13, and 7-4.

The northern portion of Pickering falls within Site District 6-7, which encompasses the Oak Ridges Moraine and adjacent lands. The site district is "composed of sand and gravel, underlain by silt and clay intermixed with coarse materials" (Lindsay 1984: vii). Typical vegetation includes upland forests, kettle wetlands and river valleys on the moraine, and river valleys cut into the till plains sloping south from the moraine (Lindsay 1984: vii).

Site district, 6-13, is "typified by the cliffs, terraces, and ancient shore-lines of the old Lake Iroquois lakebed..." and extends from Whitby in the east to Brougham (Hanna 1984 (a), vii). Lakefront marshes, swamps, river valley systems, and shoreline cliffs are the only vegetation-landform features which have remained relatively undisturbed from urbanization (Hanna 1984a: vii).

Site District 7-4 covers the southern portion of Pickering and incorporates the Carolinian Forest portion of the Town. This area is similar to 6-13 in that it is characterized by the cliffs, terraces, and ancient shorelines of the old Lake Iroquois lakebed (Hanna 1984 (b), vii). The main vegetation-landforms that exist in this district include river and lakefront marshes, shoreline cliffs, river valley systems, and upland woodlots (Hanna 1984b: vii).

Forest Regions

Pickering lies on the boundary between the Deciduous or Carolinian Forest Region of Ontario and the Great Lakes-St. Lawrence Forest Region. As with most natural vegetation transition zones, no specific line or feature can identify a hard and fast boundary of the Carolinian Region. Some regard the Lake Iroquois Shoreline as the northern limit of the Carolinian Forest while others suggest a temperature based definition. In fact information collected in this study can be used to better define where a boundary might be logically placed.

The Carolinian Forest region is generally characterized as having a diverse flora and fauna and dominated by hardwood tree species including some more southerly species such as red mulberry, black walnut, shagbark hickory and bitternut hickory.

The Great Lakes-St. Lawrence Forest represents a transitional region between the southern forests and the northern boreal forests stretching across northern North America. Species such as Sugar Maple, Beech, Hemlock and Yellow Birch are characteristic of the region's mature forests. More northern species such as White Spruce and Black Spruce can also be found.

Physiographic Regions

The Town of Pickering is traversed by five major physiographic regions which include the Ajax-Whitby Clay Plain, Lake Iroquois Sand Plain, Moraine South Slope Till Plain, Peel Clay Plain, and the Oak Ridges Moraine. This physiography and the associated soils have a large effect on forest composition (also see Town of Pickering 1994).

All of the lands north of Lake Ontario to Kingston Road (Kings Highway 2) are located on the Ajax-Whitby Clay Plain. The Plain is characterized by alternating layers of clay and silt which represent the former Lake Iroquois bottom.

North of the Ajax-Whitby Clay Plain lies the Lake Iroquois Sand Plan. The northern boundary of the Plain follows the former shoreline of Lake Iroquois. Due to the high quality sand and gravel deposits of the ancient

shoreline many resources have been and continue to be extracted from this area. Because the Plain consist primarily of sandy soils, and is surrounded by dense soils, this area provides key ecological functions such as groundwater discharge and recharge.

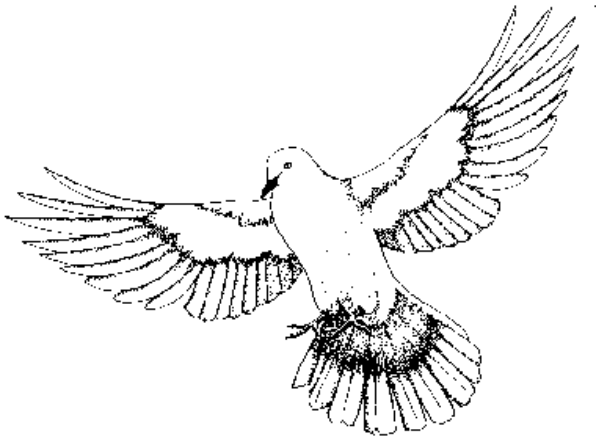
The Lake Iroquois Shoreline is also highly important because the large percentage of remaining forest and successional vegetation cover make it an excellent habitat linkage across Pickering and indeed, across much of Durham. The Rouge-Duffin Wildlife Corridor lies on a portion of the Lake Iroquois Shoreline. The importance of the Lake Iroquois Shoreline is recognized in the Whitby and Clarington Official Plans as well as in the Lake Ontario Greenway Strategy.

The moraine south slope till plain encompasses the land south of Oak Ridges Moraine to the north of the Lake Iroquois Shoreline. This region is comprised of till, which consists mainly of silty sand and gravel with some clay. River valleys contain the majority of woodlands in this area and therefore provide excellent linkages.

The Peel Clay Plain extends roughly from Green River in the south to the West Duffins Creek valley in the north and east. Since this area of silty clay soils is wet with a neutral pH level, the dominant vegetation species include, cedar, eastern hemlock, white pine, willow, dogwood and birch.

The Oak Ridges Moraine runs east-west through Pickering and is located primarily in the ninth concession and a portion of the eighth concession. Little urbanization has occurred in this part of Pickering resulting in the moraine remaining heavily wooded and containing the oldest forests in the Town.

The Oak Ridges Moraine consists mainly of irregularly stratified sand and gravel deposits mixed with some clay and minimal organic material. These materials are porous and permeable, providing important hydrological functions for the surrounding areas. For example, the moraine provides an area for groundwater recharge and discharge, and acts as the headwater region for many rivers in Pickering.



INFORMATION & DATABASES

The information used for this report was collected from a wide variety of sources. The information includes MNR mapping and inventory, as well as information from other agencies including the Town of Pickering and conservation authorities. The following list outlines the types of information used in this report.

•Town of Pickering forest, old field and hedgerow maps - scale of 1:10,000; identified the existing mature forests, hedgerows, and old fields (data from 1993 air photos; Town of Pickering 1994).

• Forest Resource Inventory maps (FRI) - scale of 1:10,000; identified *Productive Forests* (data current as of 1978).

•Forest Resource Inventory (FRI) data files. These computer files of species composition and forest stand information for 705 forest stands in Pickering were loaded into Lotus 123 spreadsheets for analysis.

• OMNR Wetland Evaluations and Maps - scale 1:10,000 identified all evaluated wetlands (data current as of 1995).

• Environment Canada Wetland Mapping, Third Approximation. scale 1:50,000; identified all wetlands deemed to be present, these include some wetlands now lost and wetlands not yet evaluated (data current as of 1985).

• Areas of Natural and Scientific Interest (ANSI) mapping: scale 1:50,000 and 1:10,000 identified Life and Earth Science ANSIs of Provincial, Regional, and Local significance.

• Area of Natural and Scientific Interest, Site District Reports - numbers 6-7, 6-13, and 7-4 (Hanna 1984a, b, Lindsay 1984). These identify ANSIs for each natural region or site district in Pickering.

• OMNR Rare Species mapping - at a scale of 1:50,000 identified locations of Vulnerable, Threatened, and Endangered (VTE) species (Riley et al. 1992)

•Natural Heritage Information Centre data on rare species and habitats.

• Oak Ridges Moraine Natural Heritage System report and maps - identified a system of natural heritage areas and features for the moraine (Geomatics International Inc. 1993)

• Environmentally Significant Area (ESA) reports - conducted by Metro Toronto Region and Central Lake Ontario Conservation Authorities (MTRCA 1982, CLOCA 1978)and more recent updates

• Natural area and habitat inventories conducted for the Pickering Airport and Seaton Community studies (Walden and Griffiths 1974, Geomatics et al. 1991, HBT AGRA Ltd. 1994).

The information sources identified above were used to assemble a data base on 342 woodlands in Pickering. This data base includes mapped information on each woodland (see Map 1 in the back of this report) and electronic data in a Lotus 123 spreadsheet. The types of information included in the woodland database is outlined in the following sections and in Appendix A. Specific information on each woodland is found in Appendix B.

Pickering's woodlands consist of 342 contiguous woodlands. The 1978 FRI recorded information on 705 forest stands which composed the woodlands of Pickering in 1978. FRI forest stands were identified as separate vegetation communities that may be part of a larger contiguous woodland area. Some 596 of the 1978 FRI forest stands survive today and make up 233 of the 342 woodlands. 109 FRI forest stands present in 1978 have been lost to development and clearing for other purposes. No information on forest composition exists for the 102 remaining woodlands originated since 1978 (Figure 2).

Woodland maps were obtained from the Town of Pickering Planning Department (1: 10,000 and 1: 50,000 scales). Map 1 was provided by the Town and modified for our work. These maps were important baseline information, since they illustrated all the mature forests, hedgerows, and old fields. These maps were checked with 1993 air photos to ensure existence of the woodlands and general accuracy. All the woodlands south of Taunton Road were checked while a sample of the woodlands north of Taunton Road were checked. Some woodlands were added to the maps and some boundaries adjusted.

GENERAL INFORMATION ON EACH WOODLAND

The geographic location of each woodland was recorded as UTM Coordinates (Universal Transverse Mercator). Northing and easting co-ordinates for each woodland were determined and recorded in the spreadsheet. The lot and concession of each woodland were also recorded allowing linkage with specific development applications.

The size of all woodlands was measured with a planimeter. A unique identifying number (e.g., 1,2,3,4, etc.) was associated with each wood-

land and the respective size entered into the Lotus 123 spreadsheet (also see Appendix B).

AREAS OF NATURAL AND SCIENTIFIC INTEREST

Mapping and reports on Areas of Natural and Scientific Interest (ANSI) were consulted to identify whether woodlands were within areas already identified as ANSIs, both life and earth science areas at provincial, regional, and local significance levels.

VULNERABLE, THREATENED & ENDANGERED SPECIES

The location of vulnerable, threatened and endangered species with respect to woodlands was identified through the use of rare species mapping (Riley et al. 1992). If a rare species was located in woodlands this was noted. The classification of species as vulnerable, threatened or endangered was also noted.

WETLANDS

Woodland locations were cross referenced with MNR wetland evaluations and mapping to determine whether the woodland falls within an evaluated wetland. This data was also entered into the spreadsheet for future reference.

Most of Durham's wetlands have been evaluated by the MNR. However, some wetlands remain unevaluated, particularly smaller wetlands. These areas were noted using Environment Canada's Wetland Mapping, Third Approximation.

ENVIRONMENTALLY SIGNIFICANT AREAS

Environmentally significant area (ESA) Studies conducted by Conservation Authorities (i.e. MTRCA and CLOCA) were used to identify which woodlands fall within identified ESAs (also recognized in the Durham Official Plan). If a woodland was located within an ESA, the name and number of the ESA were entered into the Lotus 123 spreadsheet.

FOREST INTERIOR

The importance of protecting areas of large forest interior has been recognized across the world. Woodlands with significant forest interior were identified from the Ontario Hydro LandSat Forest Cover Maps. Forest interiors of 100-200m, 200-300m, and 300m were recorded in the data file.

WATERCOURSES

The presence of rivers, streams and seasonal watercourses was determined from Ontario Base Maps (OBMs). If a woodland included the shoreline of a river or stream it was considered *to include the water-*

course. If a woodland was within 30m of a watercourse it was deemed on *adjacent land*.

INFORMATION FROM OTHER WOODLAND EVALUATIONS

Several studies of woodlands and other habitats on the federal and provincial lands have been carried out over the last twenty years related to proposals for an airport, the Seaton community and land disposition (Walden and Griffiths 1974, Geomatics et al. 1991, HBT AGRA Ltd. 1994). The two studies which examined woodlands assigned specific identifiers to each woodland and ranks each woodland with respect to a series of criteria. The Lotus 123 spreadsheet on Pickering woodlands includes a field listing the identifiers used by those previous studies (Walden and Griffiths 1974, Geomatics et al. 1991, HBT AGRA Ltd. 1994) to cross reference those with identifiers assigned in this study.

FOREST RESOURCE INVENTORY DATA

Data on the structure and composition of each forest stand was obtained from the provincial database in Sault Ste. Marie. The type of information in this data base are illustrated in Appendix A. The percentage composition of each tree species, estimated age, height, stocking and other characteristics are included. These data were converted into another Lotus 123 spreadsheet and cross-referenced with each woodland identifier. These two spreadsheets, one with FRI data and the other with composite woodland data, were merged into one dataset for some analyses.

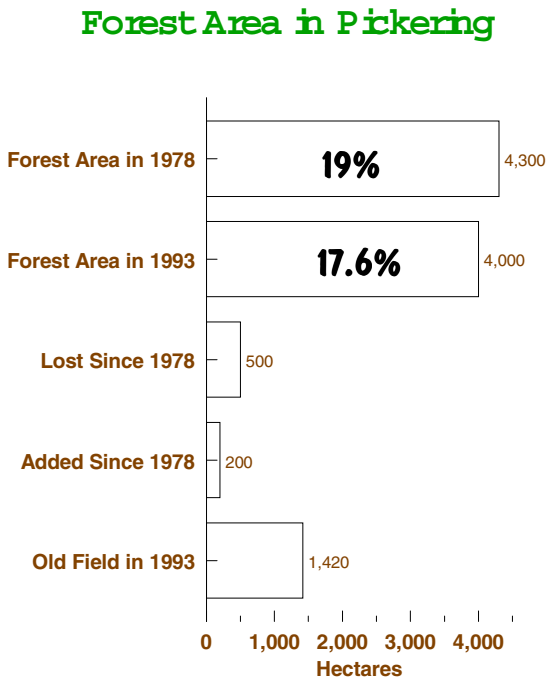
Of the 342 woodlands identified in Pickering, FRI data exists for 233, while none exists for 109 woodlands. The 1992 GTA forest mapping can provide basic composition information such as plantation, mature woodland or early successional forest.

GENERAL CHARACTERISTICS OF THE FORESTS OF PICKERING

A general ecological overview of the state of forests in Pickering provides an appropriate context for assessing the significance of woodlands in Pickering . The information presented here provides an overview of the ecology of tree species and forest communities in Pickering. (Additional analyses not presented here are available from the Ministry).

The analysis presented here is based on information from the Forest Resource Inventory (FRI) and analysis of the Town of Pickering's 1993 air photos. The FRI is still the most complete comparative information on Pickering's forests. The status of each forest stand was checked against 1993 air photos. A 1991 study (Geomatics et al. 1991) checked forest composition in 1990 against 1970s data (Walden and Griffiths 1974) and found good correlation between the two, particularly for mid to late successional forests.

Figure 2



Of course the limitation of the information is that it is based on air photo interpretation with limited ground truthing. The FRI also only records the dominant tree species in each forest stand. So it cannot be used to assess a complete distribution of each species, but can give a sense of the distribution of the species as a dominant species in the forests of Pickering. The FRI also undersamples trees that are normally understory trees, such as Ironwood and Blue Beech.

FOREST COVER

One of the most significant statistics about any landscape is the amount of forest cover. As the Town of Pickering (1994) showed, 17.6 percent of the Town is forested (Figure 2). Using the FRI as the baseline for 1978, forest cover decreased from 19% in 1978 to 17.6% in 1993. About 500 hectares of forest has been lost, while another 200 hectares of young forests have grown since 1978. In addition, an area of 1422 hectares of old field indicates much more forest may regenerate if land uses do not change.

Forest cover varies considerably across Pickering. Figure 3 shows percent forest cover by concession. Forest cover is limited in the urbanized southern portion of the Town (Concessions R2, R3 and 1) and more extensive in rural areas. Concessions six and seven have lower forest cover than other rural areas, although extensive old field areas are found there. The greater forest cover in concessions two, three, four and five corresponds to the location of the Lake Iroquois Shoreline. The presence of the Oak Ridges Moraine accounts for the high forest cover in concessions eight and nine.

A very large proportion of the forest cover lies in valleys and ravines. Tableland forests are exceedingly uncommon. The pattern of forest cover snakes up river and stream valleys. Map 1 shows in detail all recorded forest cover in Pickering from the work of the Town of Pickering (1994), supplemented by our own work. Hedgerows and regenerating old fields offer many opportunities to reconnect now isolated woodlands to a larger system of natural areas.

The draft Pickering official plan sets a goal of increasing forest cover in Pickering from 17% to 25%. Based on the presence of young forests and old field habitats this goal can easily be achieved if nature is left to take its course. However, if provincial lands are sold to private owners, some of the old field and forest areas could be lost.

TREE SPECIES

As noted earlier, Pickering lies on the boundary between the southern, Carolinian forest region and the Great Lakes-St. Lawrence forest region. The distributions of each tree species reflects this climatic and forest region transition. Some tree spe-

Figure 4

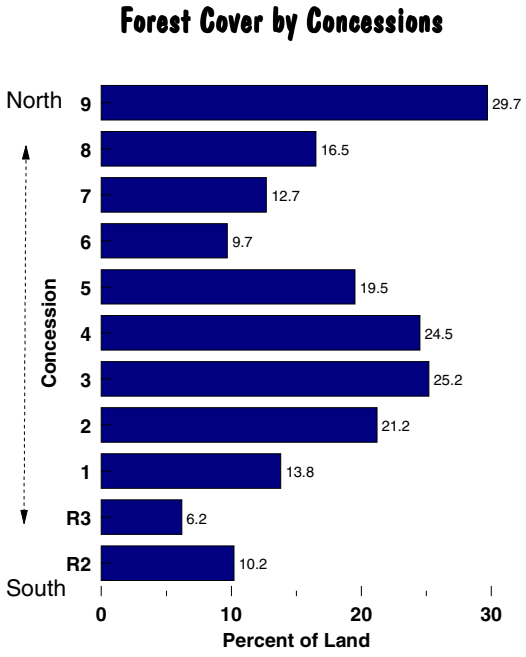


Figure 3

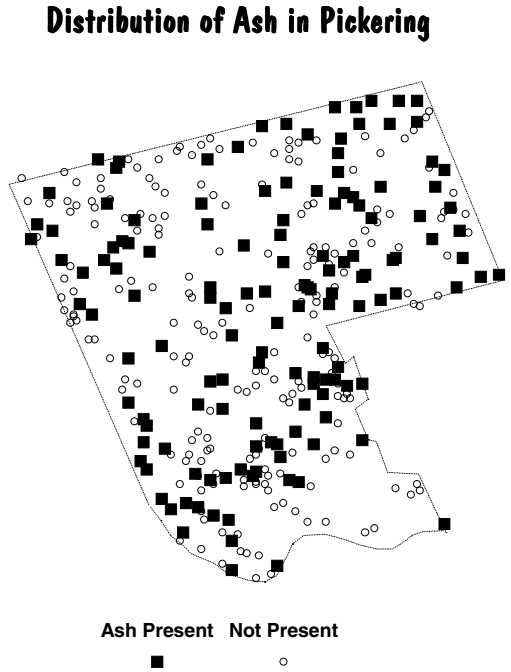


Figure 5

White Oak Distribution in Pickering

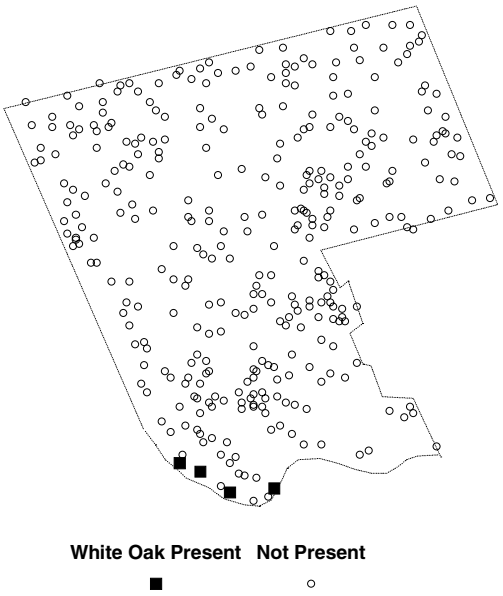


Figure 6

Yellow Birch Distribution in Pickering

cies are ubiquitous in distribution reflecting their wide ecological tolerances and occurrence in both forest regions. These include ash species and white cedar. Figure 4 shows the distribution of ash within Pickering with occurrences in the south, across the Lake Iroquois shoreline and up to the Oak Ridges Moraine. (Ash in Pickering may be suffering from the viral "Ash Yellows" disease.)

Other tree species are associated with the Carolinian forests of extreme southern Ontario. Figure 5 shows the distribution of White Oak restricted to the extreme southwestern corner of Pickering.

A number of tree species tend to be associated with cooler microclimates and conditions that are found on the Oak Ridges Moraine, in wetlands and in groundwater recharge and discharge areas such as the Lake Iroquois shoreline. Figure 6 shows the distribution of one such species, Yellow Birch, a more northern species generally associated with the Great Lakes-St. Lawrence forest region.

Tree species vary in their abundance and breadth of distribution. Within Pickering some tree species are more common that others. Figure 7 shows the relative uncommonness of all tree species recorded in the FRI. It is a frequency distribution of the number of forest stands in which each species occurs. Only naturally occurring forest stands are included (i.e. no plantations). Also shown is the change in commonness of each species with the loss of 500 hectares of forest from 1978 to 1993.

White Cedar, Ash and Hard Maple are the most common and widespread species in Pickering (Figure 7). Another group of species are quite common but not as dominant: Hemlock, Poplar, White Birch, Yellow Birch, Beech and Soft Maple. Basswood, Black Cherry, naturally occurring White Pine and Red Oak form a third, even less common group of species (Ironwood, an understory tree, is undersampled by the FRI).

White Oak, Hickory, Balsam Fir and Tamarack are the most uncommon tree species.

FOREST COMMUNITIES

Classifying Ontario's forest types has been a task foresters and ecologists have long grappled with. Many different classifications have been developed. The plant ecologist Paul Maycock developed a detailed classification for Ontario. A vegetation classification for the Carolinian forest region was also developed (Kavanaugh 1990). Forest Ecosystem Classifications have been developed for many parts of northern Ontario based on multivariate analysis of environmental and vegetation characteristics. Forest Working Groups have been developed by foresters.

Classifications can take many forms and each form offers some advantages over others. In this study we have selected two different ways of classifying forests, working groups and statistically based cluster analyses. Neither type of classification is perfect but taken together these two methods should provide a reasonable snapshot of the diversity of forest communities in Pickering.

Figure 8 illustrates the forest community types derived from one cluster analysis. The Figure also shows the relative commonness of these forest community types.

Figure 7

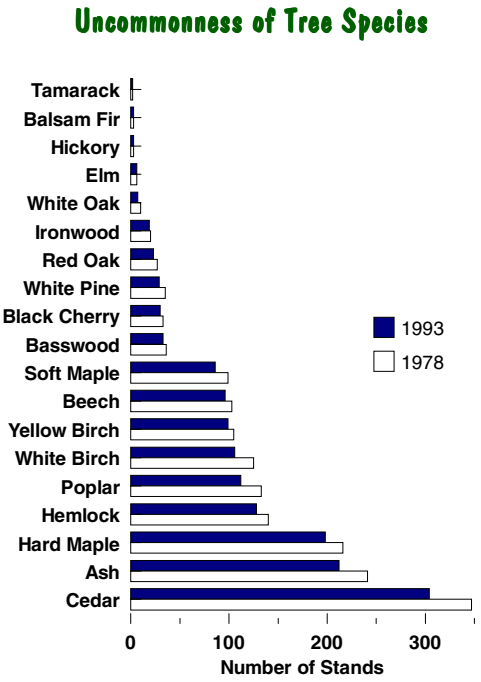
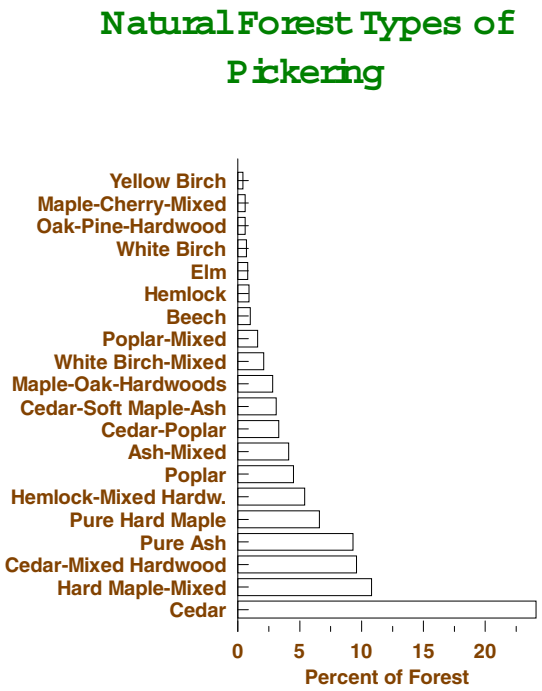


Figure 8

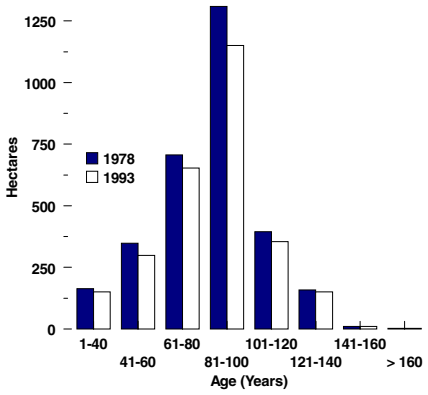


White Cedar forests are most prevalent in Pickering (also see Geomatics et al. 1991). These include wetland forests and secondary successional forests. Cedar and poplar are both important pioneer tree species in the region. A number of other early to mid successional community types are present such as White Birch dominated communities and pure ash stands (Figure 8).

Hard maple-dominated forest communities are also ubiquitous. Many variants of mesic upland mixed forest are found that include various mixes of hardwood species and sometimes hemlock. Smaller amounts of purer species-specific stands can be found, such as beech and hemlock (Figure 8).

Figure 9

Ages of Pickering Forests



Soil and site type affect the species composition. For example, dry or xeric conditions favour oaks and pines. Moisture and drainage gradients are extremely important factor in variation in forest composition.

AGE & SIZE OF FORESTS

The landscape of Pickering is changing through time. Over the last two centuries Pickering has loss much of its forest. In the last 20 or 30 years some forests have begun to recover, as they have across much of eastern North America. The presence of a large amount of old field successional habitat indicates a great opportunity to increase forest cover in the future.

Figure 10 shows the ages of Pickering's forests. Many forests are in excess of 100 years old. The distribution suggests that the forests more than 100 years old are forests remaining from original forests, although likely cut over a number of times. The large amount of forests in the 81-100 year-old range suggests these represent a first wave of second growth forests recovering from nineteenth century clearing. Conversion from wood to coal fuel also occurred in the mid to late 1800s. Many young forests are now present, an additional 200 hectares since 1978 as well as another 1422 hectares of old field successional habitat (Figure 2).

The size of each woodland affects its ecological function and value. Figure 11 shows the frequency distribution of the size of woodlands in Pickering. The vast majority of woodlands are extremely small com-

pared with the original, presettlement forests of Ontario. This has tremendous effects on the many species that depend on large tracts of forest as habitat. Great concern has developed in recent years for the conservation and restoration of large tracts of forest. Research shows that a woodland must be at least four hectares to have any "forest interior" habitat and must be several hundred hectares in size to support some nesting woodland bird species.

Forest interior habitat includes conditions such as greater shade, more moisture, less wind and fewer edge species characteristic of open habitat. These species often prey on or compete with forest interior species.

This analysis suggests that efforts should be made to link existing woodlands together to form larger forested tracts and to recreate habitat corridors between currently isolated woodlands. This approach is consistent with the comprehensive natural heritage system MNR advocates for natural area identification and evaluation (OMNR 1991). This approach has also been advocated by studies of the woodlands of Seaton (Geomatics et al. 1991, HGT AGRA Ltd. 1994) and the Natural Systems Plan of the Town of Pickering (1994).

A truism in ecology is that the number of species found in woodlands generally increases with size. This is true for Pickering's woodlands (Figure 11). What is interesting is that the number of dominant tree species present appears to level off at around 75 hectares. (Dominant tree species recorded in the FRI.)

Figure 10

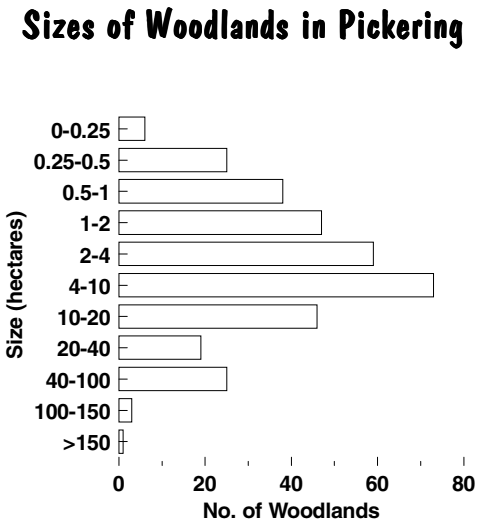
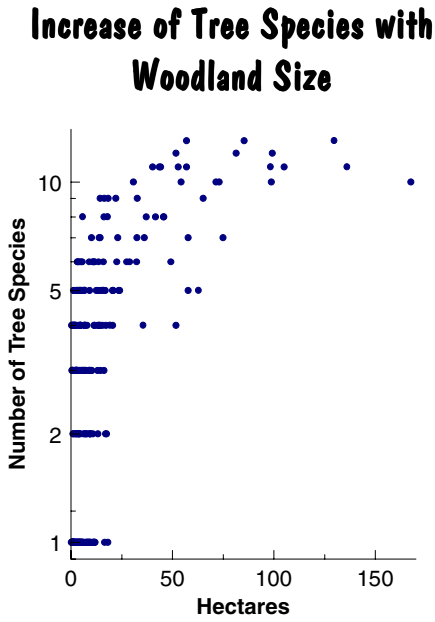


Figure 11



IDENTIFYING SIGNIFICANT WOODLANDS

Evaluation of natural areas, including woodlands, for land use planning is carried out around the world using many different techniques (Usher 1986, Smith and Theberge 1986, 1987, Spellerberg 1992). Woodland evaluation methods vary but those used here parallel techniques used elsewhere (Kirby 1986, Domon and Bergeron 1987, Strobl 1994).

The Technical Training Manual for Evaluating Woodlands was released by the Ministry of Natural Resources in 1994 (OMNR 1994c). That document, coupled with the method outlined by the MNR Halton-Peel Team for Mississauga and Brampton (OMNR 1994) and the Oak Ridges Moraine Natural Heritage mapping project (Geomatics 1991), have informed the Durham Area Team's approach. Some innovations are proposed in this report which will contribute to the development of practical and ecologically sound methods.

WOODLAND SIZE

Size is an important consideration in woodland evaluations because it is highly correlated with many other ecological criteria (OMNR 1994c: 6). For example, larger woodlands are likely to support internal ecosystem functions such as nutrient cycles and food webs as well as allowing different successional stages to co-exist on the site (OMNR 1995: 6). Large woodlands provide habitat for forest interior species which are those most under pressure in an urbanizing landscape.

Small woodlands are still important especially in planning areas where there is limited forest cover. Small woodlands still provide necessary ecological functions. For example, small woodlots can provide a temporary *resting place* for migrating birds, remove nutrients and sediments from watercourses, and provide a future link to larger woodlands.

The Technical Training Manual suggests that woodland size criteria be based on percent of forest cover in the planning area (OMNR 1994c). The Manual suggests that if 5 - 15% of the land base is forested, then woodlands four hectares in size or larger should be considered significant. If forest cover is between 15 and 30 percent, woodlands of 40 hectares or more should be considered significant. The study for the Oak Ridges Moraine considered woodlands greater than 30 hectares as significant (Geomatics International 1993). Twenty hectares is used for Seaton woodland studies (HGT AGRA Ltd. 1994).

In Pickering, overall forest cover is 17.6 percent (Figure 2). This varies across Pickering with forest cover varying from 6.2 percent in the

urbanized south (Range 3) to 29.7 percent in the rural ninth concession (Figure 3). The relative rarity of forest cover in the southern urbanized part of Pickering suggests the 40 hectare threshold size criterion is not appropriate for that area. The Durham Area Team proposes that south of Finch Avenue a four hectare size criterion be used, while north of Finch Avenue the 40 hectare criterion be adopted (Table 1). This is based on the fact that the area south of Finch has lost most woodlands. In two other concessions forest cover is less than 15 percent. However, the extent of old field in those concessions is extensive (Map 1).

Thirty-nine woodlands in the Town of Pickering are considered significant due to their size, 4 hectares south of Finch Avenue or 40 hectares north of Finch (Table 2). This represents 55.4% of the area of forest in Pickering .

OTHER NATURAL HERITAGE FEATURES

Natural Heritage Systems incorporate a variety of natural features, areas, and functions including woodlands (OMNR 1992a, Riley and Mohr 1993). This systems approach is meant to better incorporate all the needed ecological features in a system to conserve a region's ecological diversity.

For Pickering's woodlands, the presence of any of the following list of features were considered to qualify a woodland as having additional natural heritage features.

- areas of natural and scientific interests (ANSIs),
  (all provincially significant ANSIs and regional significant life science ANSIs)
- classified wetlands
- environmentally significant areas (ESAs)
- presence of vulnerable, threatened, or endangered species,
- Oak Ridges Moraine natural heritage core and corridor areas
- Woodlands highly ranking in studies of Seaton and Airport Lands
- significant valleylands,
- significant fish and wildlife habitat

Within the limitations of this draft report, noting the presence of significant valleylands was not possible due to the lack of criteria and information on which valleylands should be considered significant. This information may be added later. Significant wildlife habitat is covered to some extent by other criteria but this information may be added to later as well.

In addition, this report seeks information from local naturalists on the presence of significant species that may occur in Pickering woodlands. Information currently available to MNR is included in this draft report.

Ninety-seven woodlands totaling 2575 hectares are also identified as other natural heritage features (Table 2). This represents 64.2 percent of the woodland area in Pickering. Ten woodlands fall within five Areas of Natural and Scientific Interest (ANSIs) in Pickering:

• Rouge River Central Woodland Complex	Provincial Life Science
• Lower Rouge Marshes	Provincial Life Science
• Duffin Creek Marshes	Provincial Life Science
• Little Rouge Creek Section	Provincial Life Science
• Uxbridge Forest Kames	Provincial Earth Science
• Clarke's Hollow (Proposed)	Provincial Life Science (Proposed)

The Clarke's Hollow proposed ANSI has not been formally identified as an ANSI but was proposed in the natural heritage studies for the Seaton Community (Geomatics et al 1991). The regionally significant earth science ANSI, Kinsale Raised Shoreline, was also present but not included in this analysis, consistent with the Maple District treatment of regionally significant earth science ANSIs.

Nineteen woodlands totaling 410 hectares include portions of 11 evaluated wetlands in Pickering (Table 2):

• Rouge River Marshes	Class 2
• Frenchman's Bay Marshes	Class 2
• Town Swamp Complex	Class 3
• Whitevale Corridor Wetland	Class 4
• Claremont Wetland Complex	Class 6
• Brock Road Wetland	Class 7
• South of Claremont Wetland	Class 7
• Brock Road Wetland	Class 7
• Cherrywood Swamps	Class 7
• Urfe Creek Wetland	Class 7
• Salem Road Wetland	Class 7

A further three woodlands (35.1 hectares) include unevaluated wetlands according to Environment Canada wetland mapping (Third approximation). These wetlands are not included as other natural heritage features but are dealt with under ecological functions (see below).

Twenty woodlands totaling 725.7 hectares include all or portions of environmentally significant areas:

Table 1. Proposed Criteria for Significant Woodlands

CRITERION	APPLICATION
Size of Woodland	*South of Finch Avenue*: • Forest cover less than 15% of the land base, Woodlands 4 hectares or larger in size are significant. *North of Finch Avenue:* • Forest cover greater than 15% of the land base, Woodlands 40 hectares or larger in size are significant.
Other Natural Heritage Features	Woodlands that have one or more significant natural heritage features or areas within their boundary are significant (Classified wetland, ANSI, ESA, rare species, Oak Ridges Moraine core and corridor areas, high ranked woodlands on Airport & Seaton lands)
Uncommon Forest Features	The occurrence of woodlands of a composition, age, size, or site quality that is uncommon for the study area are significant. • uncommon tree species • uncommon forest type • forest 100 years of age or more • high mid to late successional tree species diversity (>6 late successional tree species)
Ecological Functions	<u>Watercourses & wetlands</u> • Presence of a watercourse or wetland <u>Forest Interior</u> • Woodlands with forest interior habitat (>100 metres to edge) <u>Headwaters & Groundwater Areas</u> • Location in headwaters of river system or groundwater recharge or discharge area <u>Linkages</u> • Woodlands within the Rouge-Duffin Wildlife Corridor • Woodlands near other Natural Heritage features with an opportunity to restore adjacent areas

- Little Rouge Forest #81
- Rouge Marsh Area #79
- Petticoat Creek Forest #94
- Frenchman's Bay #126
- Duffin's Marsh #96
- Altona Forest #95
- Major Spink #97
- Whitevale Corridor #98
- Byer-Saddler Area #103
- Birrell-Boyer Area #104
- Pugh Forest #106
- Skunk Cabbage Bog (Proposed)

These ESAs are all within the watersheds of the Metro Toronto and Region Conservation Authority. The Skunk Cabbage Bog has not been formally identified as an ESA but was proposed in the natural heritage studies for the Seaton Community (Geomatics et al 1991).

Thirteen woodlands totalling 536.5 hectares include vulnerable or threatened species. The woodlands and the species are not identified here in order to protect the species from harm.

The proposed ANSI and ESA encompass three woodlands and 283 hectares.

As part of the Oak Ridges Moraine planning study, a natural heritage system of core, corridor and linkage areas was identified (Geomatics 1993). Twenty-six woodlands with an area of 625 hectares include portions of core and corridor areas.

Natural area and habitat inventories of the federal and provincial lands associated with the former proposed Pickering Airport and the Seaton Community ranked woodlands (Walden and Griffiths 1974, Geomatics et al. 1991, HBT AGRA Ltd. 1994). Various criteria were used especially diversity and wildlife value. Woodlands receiving an A+ or A ranking for either diversity or wildlife value, a high function or special features were assessed as meeting the other natural heritage feature criterion (Walden and Griffiths 1974, Geomatics et al. 1991, HBT AGRA Ltd. 1994). Ranks that were identified as not valid given impacts on woodlands since 1974 were not used (Geomatics et al. 1991). Only woodlands on the Seaton lands were checked by Geomatics et al. (1991), so ranks for woodlands on the federal airport lands may be subject to change.

Table 2. Significance of Woodlands for Each Criterion

Criterion	Number of Woodlands	Area (hectares)	Percent of Forests
Size	39	2223.6	55.4
Other Natural Heritage Features	95	2575.2	64.2
ANSIsProvincial Life Science	6	147.9	3.7
Provincial Earth Science	2	75	1.9
Regional Life Science	2	99.7	2.5
Wetlands Class 2	7	88.4	2.2
Class 4-7	12	321.9	8.0
Environmentally Significant Areas	20	725.7	18.1
Vulnerable & Threatened Species	13	536.5	13.4
Oak Ridges Moraine Core & Corridor	26	625.2	15.6
Proposed ANSI & ESA	3	283	7.1
High Ranked Woodlands on Airport & Seaton Lands	37	1177.7	27.4
Uncommon Forest Features	170	2422.2	60.4
Uncommon Tree Species	12	461.4	11.5
Forest Type	41	1250.9	31.2
Old Growth Forests	65	1892	47.2
Tree Species Diversity	14	950.7	23.7
Ecological Functions	201	3499.2	87.2
Watercourses	182	3355.3	83.7
Wetlands	22	423.9	10.6
Headwaters & Groundwater Areas	N/A	N/A	N/A
Forest Interior	12	862.2	21.5
Linkages	12	109.9	2.7

Thirty-seven woodlands totalling 1178 hectares were ranked as A+ or A, high function or special features in previous studies (Table 2).

UNCOMMON FOREST FEATURES

The Technical Training Manual (OMNR 1994c: 10) suggests that woodlands with an unusual composition, cover type, age, size or site quality be considered significant. The manual suggested that if a woodland feature occurs in less than 5% of the woodlands in the municipality then the feature should be considered significant (OMNR 1994c: 7).

Table 3. Evaluation for Uncommon Tree Species

	Most Uncommon Species	Uncommon Species
Total Area (Hectares)	461.4	2042.7
% of Forest	11.5	50.9
Number of Woodlands	12	65

The method used for Pickering's woodlands addresses four aspects of uncommon woodland features: uncommon tree species; uncommon forest communities; old growth forest stands; and tree species diversity. Each of these aspects is examined in detail below.

To determine the effect of the criteria on the evaluation of woodlands this study examined the use of features that occur in 5% and 2.5% of woodlands in Pickering.

Uncommon Tree Species

The presence of tree species uncommon in Pickering is based on the Forest Resource Inventory data. Figure 7 shows the number of forest stands in which the various tree species are found. This is a measure of the relative uncommonness of tree species. Conifer tree species planted in plantations are excluded from these species. Based on the empirical frequency distribution in Figure 7, two groups of uncommon tree species were selected.

Most Uncommon Tree Species
Balsam Fir (naturally occurring)
Hickory
Tamarack (naturally occurring)
White Oak

Uncommon Tree Species
Basswood
Black Cherry
Red Oak
White Pine (naturally occurring)

Twelve woodlands covering 461 hectares harbour the most uncommon tree species (Table 3). A total of 65 woodlands composing 2043 hectares include either the most uncommon or the uncommon tree species. It is proposed that the criterion of uncommon tree species be based on the four most uncommon species noted above. It is important to remember that the FRI only notes the occurrence of species as a dominant and so does not fully represent rarer species.

Uncommon Forest Composition

Uncommon forest composition is determined by developing classifications for the types of forest present in Pickering and identifying which types cover less than a certain percentage of the forest area. No forest classification is perfect so three different classifications were used. Two statistical classifications were derived from cluster analysis of the Forest Resource Inventory data using the Statistical Analysis System (SAS). As well, the standard classification of forest working groups of the Forest Resource Inventory was also used.

The working groups tend to lump many hardwood forests together as tolerant hardwoods. As a result we chose to supplement this information with the cluster analyses. These analyses better account for the range of forest types in hardwood forests and mixed forests.

Collectively, the three classifications likely identify most unusual types of forest composition. Figure 8 illustrates one of the forest classifications derived from cluster analysis and the uncommon forest types. A forest type that represented less than a certain percentage of all forest in either of the three classifications was considered uncommon.

Two options were examined to assessing unusual forest composition using these three classifications (Table 4). The presence of any forest types composing less than five percent of Pickering's forests was used as one option for uncommon forest composition. Another option examined was all forest types composing less than 2.5 percent of Pickering forests.

Table 4. Woodlands with Uncommon Forest Communities

	Option A: 5% Forest Types Composing Less than 5%of Forest Stands	**Option B: 2.5%** Forest Types Composing Less than 2.5%of Forest Stands
Classification 1	1673.7	600.6
Classification 2	1928.6	395.7
Working Groups	1321	495.8
Total Area (hectares)	2472.1	1250.9
% of Forest	61.6	31.2
Number of Woodlands	90	41

A number of the "uncommon" forest communities were early successional forest communities. These young vegetation communities are generally of less conservation concern and are also likely much more common in the newer, undocumented forests. Consequently, early successional forest communities were excluded from the analysis.

Table 4 shows the comparative results of the two options. The use of three different classifications for this analysis tends to identify more uncommon forest types than would be noted using only working groups. For reasons stated, the method proposed for use here is Option B using mid to late successional forest communities that compose 2.5 percent or less of all Pickering forests (Table 4).

Old Growth Forests

Old Growth forests are generally recognized as significant. The Ministry recently adopted an Old Growth Forest Policy for Red and White Pine and intends to develop policies for other old growth forests (OMNR 1994a). For this study, woodlands including stands 100 years or older are considered Old Growth Forests. Figure 9 shows the age distribution of forests in Pickering, for stands where age has been estimated.

Sixty-five woodlands covering 1892 hectares or 47 percent of Pickering's woodlands contained forest stands 100 years of older.

Tree Species Diversity

Ecological diversity is often used to evaluate natural areas. Traditionally ecological diversity meant edge habitats. However, it is important not to emphasize edge habitat as conservation biology has identified that large blocks of forests with less edge habitat are needed to conserve many species.

To assess ecological diversity we used the number of mid to late successional tree species present in each woodland. This measure avoids weighting the assessment toward edge habitat by focusing on mid to late successional species. Woodlands with the highest levels of tree species diversity (> 6 Species) were considered significant. (Tree Species included: ash, basswood, black cherry, beech, hemlock, hickory, hard maple, ironwood, red oak, soft maple, white elm, white oak and yellow birch).

Fourteen woodlands covering 950.7 hectares or 23.7 percent of Pickering's forests had more than six species of mid to late successional tree species (Table 2).

ECOLOGICAL FUNCTIONS

Woodlands provide many ecological functions important to maintaining ecosystems (OMNR 1993b). Functions such as storm or flood water conveyance, buffering of soil erosion and nutrient flow, and linkage to other natural areas, water, or other woodlands, could be considered significant (OMNR 1994c: 10). Other significant functions include, woodlands located in a headwater region (e.g., woodlands on the Oak Ridges Moraine), or areas of groundwater recharge and discharge (e.g., woodlands on the Lake Iroquois Shoreline), because they affect the quality and quantity of water downstream.

Watercourses and Wetlands

For Pickering, if a woodland included a watercourse or wetland it was considered to have a significant water-related ecological function. The many benefits of protecting vegetated stream corridors are summarized in the report *Streams and Stream Corridors: their Characteristics, Functions and Proper Management in an Urban Environment* (Ontario Ministry of Natural Resources. 1991a).

One hundred and eighty-two woodlands covering 3355 hectares or 84% of Pickering woodlands included a watercourse (Table 2). These watercourses include permanent and seasonal watercourses that were mapped on Ontario Base Maps (OBM 1 :10,000).

Clearing for farming and urbanization has destroyed most tableland forests in Pickering and Greater Toronto. The fact that 84% of woodlands include a watercourse emphasizes this fact. A method to identify tableland forests should be developed.

Forest Interior

World-wide recognition exists for the particular importance and scarcity of forest interior habitat. Consequently, any woodland with forest interior greater than 100 metres from an edge was considered to have an important ecological function. This assessment was based on Ontario Hydro mapping of forest interior.

The Ontario Hydro maps used to delineate forest interior had two limitations. First, the interior forest areas were derived from analysis of satellite imagery. This process complexes woodlands together, regardless of area or type, and only identifies vegetation over four metres in height. Thus some existing linkages may be missed because of vegetative height. The scale (1:100,000) of the map does not allow mapping of all roads (e.g., only regional roads were shown). Thus some larger forest tracts are bisected by roads not shown on the Hydro maps.

Based on the analysis of the Ontario Hydro maps, 12 woodlands have a forest interior more than 100 metres from an edge. These 12 woodlands have a combined area of 862.2 hectares which represents 21.5% of the woodland area in Pickering (Table 2).

Finally, it is important to note three factors: (i) no FRI data exist for two of the woodlands, (ii) two woodlands have an interior of 200-300 metres, and (iii) 10 woodlands have a forest interior of 100-200 metres.

Linkages

No fully developed approach to assessing the linkage criterion is presented here. A project to define a natural heritage system including corridors and linkages is underway and will be used in the final version of this report to assess the linkage criterion.
However, the Rouge-Duffin Wildlife Corridor has been identified as important. Thus woodlots falling within the corridor--north of the Hydro corridor and south of the CPR railway--are assessed as meeting the linkage criterion. These 12 woodlots total 109.9 hectares.

Another wildlife corridor was proposed by Geomatics et al. (1991) in their studies of habitat on the Seaton Community lands. While this proposal has merit, it will be evaluated in the context of the larger project to define a natural heritage system for the area.

Guidelines suggest that for a linkage to be feasible a woodland must be located within 250 meters of another natural heritage feature, water, or woodland larger than the minimum size and a realistic potential exists to restore the adjacent area (OMNR 1994c: 7). The northern part of Pickering has many areas with extensive old field that is now regenerated and forms excellent opportunities to connect isolated forest tracts together into larger blocks.

Application of this criterion was not completed and will be included in the final version of this report. It can be expected that a small number of additional woodlands may gain significance through full application of this criterion.

Headwaters and Groundwater Areas

A woodland located within the headwater region of a particular stream or river is considered significant because of its hydrological function (OMNR 1994c: 7). Similarly woodlands in other areas of groundwater recharge or discharge also perform important ecological functions. Woodlands on the Oak Ridges Moraine, the Lake Iroquois shoreline and in the headwaters of each creek system would all qualify under this criterion. Studies for the Seaton community also developed hydrologic function assessment for habitat evaluation (HBT AGRA Ltd. 1994).

Application of this criterion was not completed and will be included in the final version of this report. It can be expected that a small number of additional woodlands may gain significance by applying this criterion.

COMPLEXING WOODLANDS

Woodlands may consist of one contiguous forested area or they may consist of one or more fragments of forest that are in close proximity. To guide when closely linked woodlands should be considered as one woodland complex, as series of guidelines were formulated. These guidelines were not applied due to time constraints. Application of these guidelines will be undertaken before the final version of this report is issued. Any comments on the following complexing guidelines are welcomed.

Woodlands should be considered contiguous when intersected by ownership boundaries and standard local roads (i.e., 66' or 21m). Woodlands should not considered a woodland complex when divided by regional roads or provincial highways (e.g., Highway 7 and Altona Road). This approach was developed in part from technical manual (OMNR 1994c) and the work done by the MNR for Halton and Peel.

Table 5. Overall Significance of Woodlands

	Number of Woodlands	Area (hectares)	Percent of Forests
Number of Criteria			
4	18	1430.1	35.7
3	32	834.7	20.8
2	96	925.0	23.1
1	147	636.6	15.9
0	49	175.8	4.4
Specific Criteria			
Size	39	2223.6	55.4
Other Natural Heritage Features	97	2575.2	64.2
Uncommon Forest Features	170	2422.2	60.4
Ecological Functions	201	3499.2	87.2
Options for Overall Woodland Significance			
Option 1: One Criterion or more *(Proposed Method)*	293	3792.5	95.4
Option 2: Two Criteria or Size criterion or Natural Heritage criterion	156	3266.5	81.4

In the data base, information on all woodlands remains separate in order to avoid mixing site specific data. There is a data field suggesting woodlands that could be complexed.

OVERALL SIGNIFICANCE OF WOODLANDS

A variety of methods are used to determine overall significance of natural areas based on a series of criteria (Smith and Theberge 1987; OMNR 1994c). The method recommended is the disjunctive method in which sites which meet certain minimum standards for a defined number of criteria are considered significant. Using this method, no adding or weighting of criteria is done.

Four criteria are used to evaluate Pickering's woodlands: woodland size; other natural heritage features; uncommon forest features; and ecological functions (Tables 1 and 2). Several components are defined within each of these criteria. If a woodland meets the standards for any one component within one criterion, it is considered to meet that criterion.

Two options are presented here for overall woodland significance. Under Option 1, if a woodland meets at least one of the criteria, it is considered significant. For Option 2, a woodland would be considered significant if it met two or more criteria or it met either the size or other natural heritage feature criteria.

Table 5 presents the results of woodland evaluation for all four criteria and for the two options for overall woodland significance. The Durham Area Team proposes that any woodland meeting one criterion be considered significant (Option 1). This is consistent with approaches taken by the Halton-Peel Team for Mississauga and Brampton. The total percentage of woodlands considered significant is similar to the Halton-Peel studies.

It is important to note that under either option, almost two thirds of the woodland area in Pickering is considered significant already. Most woodland areas identified under either option are also identified as natural area in the draft official plan for the Town of Pickering. Furthermore, most of the woodlands offer major development constraints due to their association with valleylands.

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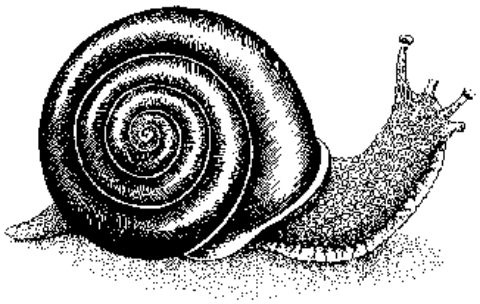


Appendix A INFORMATION IN DATA BASES ON PICKERING'S WOODLANDS

Two Lotus 123 spreadsheets were created to house information on Pickering's woodlands. One contains basic information on each of 342 woodlands. The second contains all Forest Resource Inventory information on 705 forest stands taken from a provincial database in Sault Sainte Marie. Each woodland may have one or more forest stands within it.

Woodland Data Base
Ontario Base Map Sheet
Woodland Identification Code
Concession, Lot
Easting, Northing
Nearby Woodlots for Potential Complexing
FRI Stand Number
Airport/Seaton Lands Identifier
Forest Interior: recorded as 100m, 200m or 300m
Size (ha)
ANSI Name
ANSI Type: recorded as: PE, PL, RL or LL
Site District
Wetland Name
Wetland Class: recorded as Class 1-7
ESA Name
Vulnerable, Threatened or Endangered Species
Shoreline Type
Stream/River Name

Forest Resource Inventory Data Base
Forest Stand Number
Woodland Identification Code
Working Group
Stocking
Age
Height
Area
A field is included for each species recorded: Ash, Basswood, Beech, Balsam Fir,White Birch, Yellow Birch, Black Cherry, White Cedar, Elm, Hemlock, Larch, Hard Maple, Soft Maple, Red Oak, White Oak, Poplar, Red Pine, Scot's Pine, White Pine, Black Spruce, White Spruce, Ironwood, Hickory, Other hardwoods

Appendix B INFORMATION ON EACH WOODLAND

Information on each woodland is presented below. The woodland numbers correspond to those on Map 1 at the back of the report. Significance under Options 1 and 2 refers to options in Table 5. The four criteria are those referred to in Table 1. More detailed information on each woodland is available.

Woodland #	Con.	Lot	Size (ha)	Significant Option 1	Significant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
001	R3	34	32.8	x	x	x	x	x	
002	R3	33	2.7	x	x			x	x
003	R2/3	32/33	22.2	x	x	x	x	x	x
004	R2	31	6.4	x	x	x	x	x	
005	R3	31/32	22.6	x	x		x		x
006	R3	31	2.9	x				x	
007	R3	31	0.8	x	x		x	x	x
008	R3	31	3.8	x	x	x	x	x	x
009	R3	30	12.0	x	x	x	x		x
010	R2	28/29	18.4	x	x	x	x	x	x
011	R2	31	1.3	x				x	
012	R3	25/26	5.1	x	x	x	x	x	x
013	R3	24	0.9	x	x		x	x	x
014	R3	21	2.0	x	x		x	x	x
015	R3	20	0.8	x				x	
016	R3	16	1.2						
017	R3	15/16	7.0	x	x	x			x
018	R2	15	0.8	x	x		x		x
019	1	16/15	13.2	x	x	x			x
020	1	17	7.7	x	x	x			
021	1	24	21.3	x	x	x		x	
022	1	24	2.0						
023	1	25	6.9	x	x	x		x	x
024	1	25/26	2.7	x	x			x	x
025	1	26	4.3	x	x	x		x	x
026	1	27	0.4	x				x	
027	1	27	7.5	x	x	x		x	x
028	1	27	0.3	x				x	
029	1	28	0.8	x				x	
030	1	30	1.5	x				x	
031	1	32	66.0	x	x	x	x	x	x
032	1	31	4.3	x	x	x			
033	1	32	0.7	x	x			x	x
034	1	33	2.4	x					x
035	1	33	0.2	x	x		x	x	x
036	1	33	3.3	x					x
037	1	33/34	13.7	x	x	x	x		x
038	1	35	2.6	x	x		x	x	
039	1	53	10.8	x	x	x	x	x	x
040	1	34/35	32.6	x	x	x	x		x

Woodland #	Con.	Lot	Size (ha)	Signifi-cant Option 1	Signifi-cant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
041	2	33/34/35	13.7	x	x		x		x
042	2	35	14.6	x					x
043	2	33	4.7	x	x			x	x
044	2	32	1.3	x	x			x	x
045	2	31	0.9	x				x	
046	2	32	4.8						
047	2	32	5.3	x	x			x	x
048	2	32	0.5	x	x			x	x
049	2	31	0.6	x	x			x	x
050	2	31	0.5						
051	2	31	0.9	x					x
052	2	29/30	16.3	x	x		x	x	x
053	2	30	4.1						
054	2	30	1.3	x				x	
055	2	30	0.2	x	x			x	x
056	2	27/28	10.8	x					x
057	2	28	6.7	x					x
058	2	28	8.0						
059	2	27	0.3	x				x	
060	2	27	4.5	x					x
061	2	27	1.6	x					x
062	2	26	3.3	x					x
063	2	26	5.6	x					x
064	2	25	3.8						
065	2	26	1.2	x	x			x	x
066	2	26	0.7	x	x			x	x
067	2	26	3.2						
068	2	25	7.1						
069	2	25	11.5	x					x
070	2	22-24	54.4	x	x	x	x	x	x
071	2	24	0.5	x					x
072	2	23/24	10.9	x				x	
073	2	21/22	51.9	x	x	x		x	x
074	2	21	2.9	x				x	
075	2	20	2.0	x					x
076	2	19	1.6						
077	2	19	10.2	x					x
078	2	17/18	43.7	x	x	x	x	x	x
079	3	16	27.5	x	x		x	x	x
080	3	17	15.6	x	x		x		x
081	3	17	0.8	x				x	
082	3	17	1.0	x				x	
083	3	18	0.8	x				x	
084	3	18	0.9	x	x			x	x
085	3	17/18	7.4	x	x		x		x
086	3	18	1.9	x	x		x		x
087	3	18	0.6						
088	3	19	3.9	x	x		x		
089	3	19	20.6	x	x		x		
090	3	20	16.5	x	x		x	x	x
091	3	20/21	57.0	x	x	x	x	x	x
092	3	20	7.3	x	x		x		x
093	3	21/22	9.4	x	x		x		

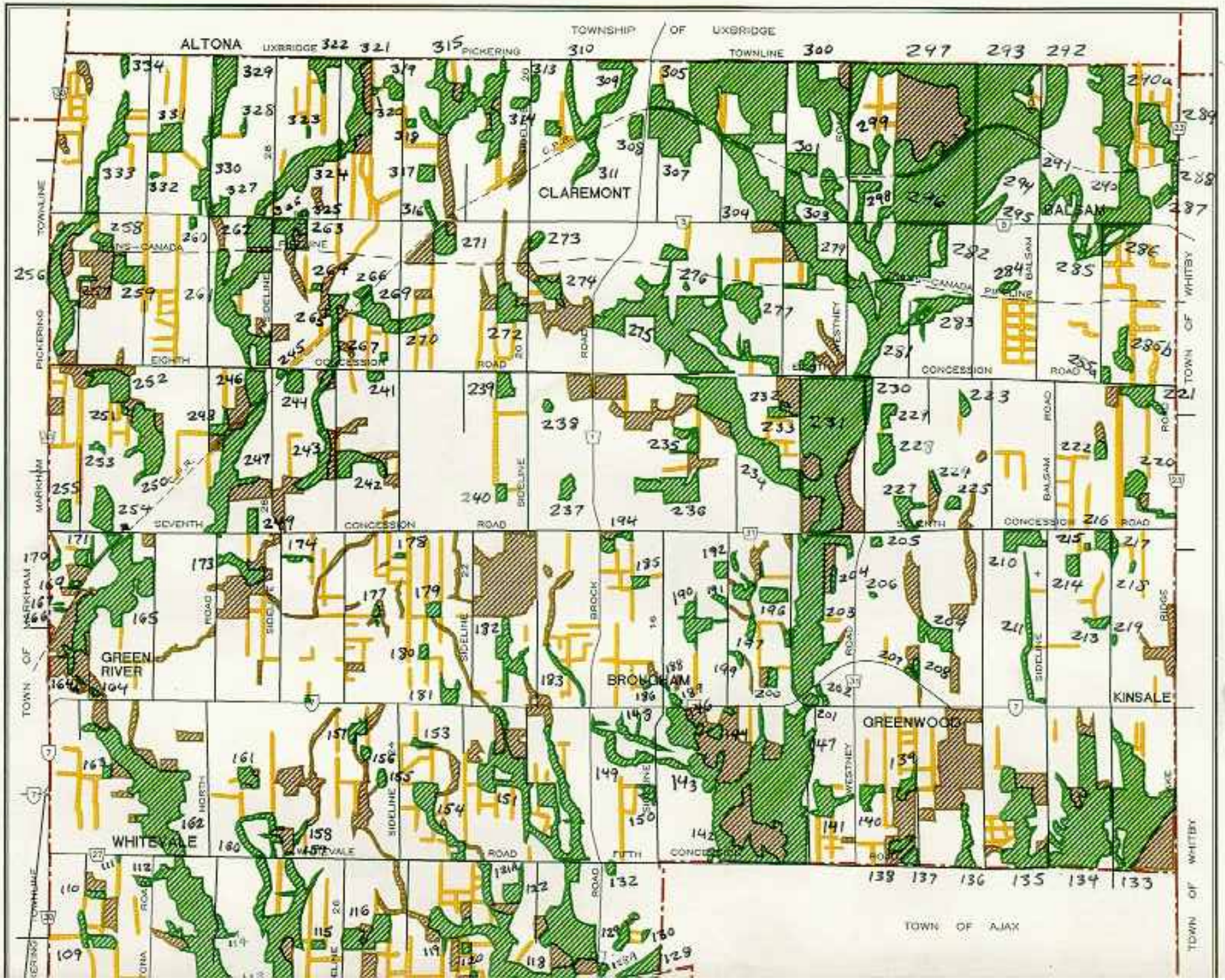
Woodland #	Con.	Lot	Size (ha)	Signifi-cant Option 1	Signifi-cant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
094	3	22	1.2	x				x	
095	3	22	1.0	x				x	
096	3	22	0.4	x				x	
097	3	22-28	136.0	x	x	x	x	x	x
098	3	25-28	41.8	x	x	x	x	x	x
098a	3	28	15.3	x	x			x	x
099	3	29/30	0.2	x				x	
100	3	30	1.2	x				x	
101	3	31	1.2	x				x	
102	3	33	4.1						
103	3	33	1.1						
104	3	35	4.0						
105	3	34/35	6.2	x	x		x		x
106	3	33/34	17.0	x	x		x		x
107	3	35	3.4	x	x			x	x
108	4	33/34	3.9						
109	4	34	8.0						
110	4	34	2.2	x				x	
111	4	34	0.2	x				x	
112	4	33	2.1	x	x			x	x
113	4	27-31	167.6	x	x	x	x	x	x
114	4	30	2.8	x	x		x		
115	4	27	1.3						
116	4	25/26	16.4	x	x		x	x	
117	4	25	1.4						
117a	4	25	4.4						
117b	4	24	4.2	x	x			x	x
118	4	19-23	105.2	x	x	x	x	x	x
119	4	23	0.4	x				x	
120	4	23	1.1						
121a	4	22	5.0	x					x
121	4	22	2.9	x					x
122	4	21	6.3	x	x			x	x
123	4	20	2.5	x	x		x		x
124&125	4	19/20	9.1	x	x			x	x
126	4	18	4.0	x				x	
127	4	17/18	20.8						
128	4	17	8.5	x				x	
128a	4	18	1.5						
129	4	18	3.9	x				x	
130	4	17	0.9	x				x	
131	4	17	0.7						
132	4	18	1.6						
133	5	1/2	45.7	x	x	x		x	x
134	5	3/4	75.0	x	x	x		x	x
135	5	5/6	36.2	x	x			x	x
136	5	7	8.7	x	x		x		x
137	5	9	2.8	x					x
138	5	9	3.8						
139	5	9	4.8						
140	5	10	4.8	x					x
141	5	11	9.6	x					x
142	5	12-15	129.7	x	x	x	x	x	x
143	5	14-16	14.4	x					x

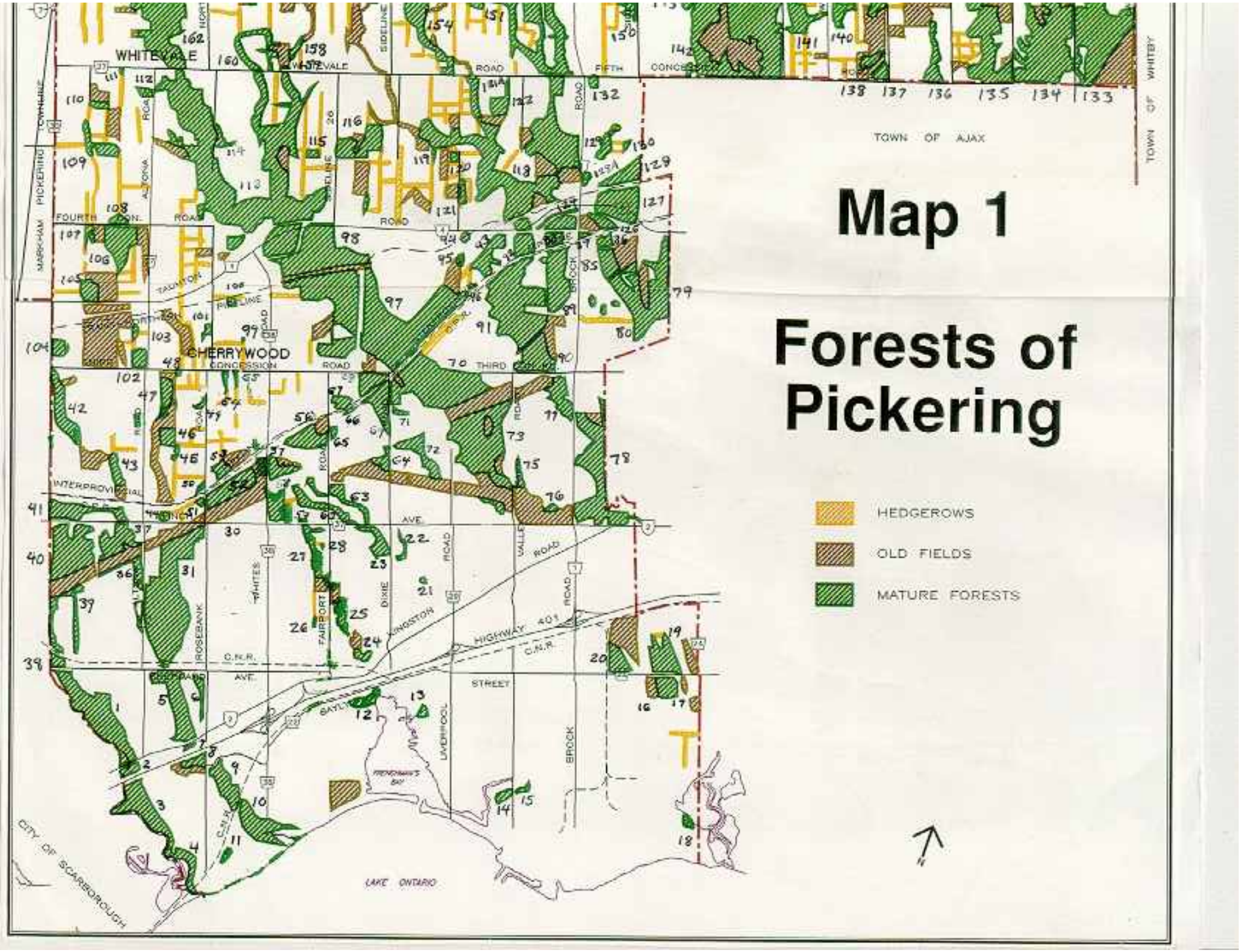
Woodland #	Con.	Lot	Size (ha)	Significant Option 1	Significant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
144	5	14/15	2.4						
145	5	14	0.7						
146	5	15/16	16.7	x					x
147	5	16	0.4	x	x			x	x
148	5	17/18	5.0	x	x			x	x
149	5	17/18	11.3	x					x
150	5	17	3.2	x				x	
151	5	19-22	62.8	x	x	x	x		x
152	5	21/22	3.0	x	x			x	x
153	5	23/24	1.5	x				x	
154	5	23/24	17.1	x	x		x		x
155	5	25	2.4	x				x	
156	5	25/26	1.8	x				x	
157	5	26	4.3	x	x			x	x
158	5	27/28	2.0	x	x			x	x
159	5	28	0.5	x	x			x	x
160	5	28-30	10.3	x	x			x	x
161	5	29/30	5.1	x					x
162	5	31-34	71.6	x	x	x	x	x	x
163	5	34	1.4	x	x		x		
164	6	34	0.7	x				x	
164a	6	35	0.5	x				x	
165	6	33-35	57.9	x	x	x	x		x
166	6	35	0.7	x				x	
167	6	35	0.3	x				x	
168	6	35	0.1	x				x	
169	6	35	0.6	x	x			x	x
170	6	35	1.9	x				x	
171	6	34/35	6.7	x	x			x	x
172	6	30	0.2	x				x	
173	6	29/30	9.6	x	x		x		x
174	6	28	1.7	x				x	
175	6	28	0.5	x				x	
176	6	25	0.3	x				x	
177	6	25/26	1.1	x				x	
178	6	25	0.6	x				x	
179	6	24	3.0	x					x
180	6	24	1.9						
181	6	23/24	3.1						
182	6	21/22	14.0	x	x		x		x
183	6	19/20	3.3	x					x
184	6	18	4.4	x	x		x		x
185	6	17	2.7						
186	6	17	1.0	x				x	
187	6	17	0.4	x					x
188	6	16	0.5	x					x
189	6	16	1.3	x	x		x		x
190	6	15/16	10.8						
191	6	15	1.4	x	x			x	x
192	6	15	3.2	x					x
193	6	14	1.3	x	x			x	x
194	6	13	0.5						
195	6	14	4.7	x					x
196	6	13	6.0						

Woodland #	Con.	Lot	Size (ha)	Signifi-cant Option 1	Signifi-cant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
197	6	14	2.1	x	x			x	x
198	6	13	1.4						
199	6	14	1.6	x					x
200	6	13	2.5	x				x	
201	6	12	2.3	x					x
202	6	11/12	1.5						
203	6	11/12	73.1	x	x	x	x	x	x
204	6	11	1.7	x				x	
205	6	10	1.4	x				x	
206	6	10	0.3	x				x	
207	6	9	0.7						
208	6	7	1.5	x					x
209	6	8	9.2	x	x			x	x
210	6	5/6	10.1	x	x			x	x
211	6	5	8.2	x					x
212	6	5	0.6	x				x	
213	6	3	2.8	x					x
214	6	4	4.1						
215	6	3	0.5	x				x	
216	6	3	4.6	x					x
217	6	2	1.6	x				x	
218	6	2	0.7	x				x	
219	6	2	0.6	x				x	
220	7	1/2	9.9	x					x
221	7	1/2	9.7	x					x
222	7	3	3.1						
223	7	7	2.8	x				x	
224	7	8	1.4	x	x			x	x
225	7	8	2.5	x				x	
226	7	9	0.4	x	x			x	x
227	7	9/10	6.5	x					x
228	7	10	9.0	x					x
229	7	10	4.1						
230	7	10	3.3	x					x
231	7	11/12	98.9	x	x	x	x	x	xR
232	7	13	0.7						
233	7	13	2.4	x				x	
234	7	13-16	57.8	x	x	x			x
235	7	16	5.4	x	x		x		x
236	7	16/17	19.1	x	x		x		x
237	7	19	4.6	x	x		x		x
238	7	20	1.4	x				x	
239	7	21	5.6	x	x			x	x
240	7	21/22	2.4						
241	7	25	2.1	x				x	
242	7	25/26	11.3	x					x
243	7	27/28	17.6	x					x
244	7	28	5.6						
245	7	28	0.9						
246	7	29	9.1	x	x		x		x
247	7	29/30	5.1	x					x
248	7	30	3.7	x	x		x		x
249	7	29	4.0	x				x	
250	7	32/33	24.1	x					x

Woodland #	Con.	Lot	Size (ha)	Significant Option 1	Significant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
251	7	33	0.6	x				x	
252	7	33/34	13.9	x	x		x		x
253	7	34	1.4	x				x	
254	7	33/34	11.7	x					x
255	7	35	4.0						
256	8	34/35	35.5	x	x		x		x
257	8	34	1.1	x				x	
258	8	34	4.8	x	x		x		
259	8	33	10.4	x					x
260	8	31	0.9	x				x	
261	8	29/30	51.8	x	x	x	x		x
262	8	29	11.8	x	x		x		x
263	8	28	9.3	x	x		x		
264	8	27	1.2	x	x		x	x	
265	8	26/27	5.7	x	x			x	x
266	8	25/26	1.8	x	x		x	x	
267	8	26/27	4.2	x	x			x	x
268	8	25	0.8	x				x	
269	8	25/26	13.3	x					x
270	8	24	6.1	x					x
271	8	23	8.0	x	x		x		x
272	8	21	13.2	x					x
273	8	20	2.8	x	x		x		x
274	8	19/20	7.4	x					x
275	8	13-18	98.3	x	x	x	x	x	x
276	8	15/16	0.5	x				x	
277	8	13/14	14.5	x	x		x	x	x
278	8	13	0.4	x	x			x	x
279	8	11/12	28.9	x	x		x	x	x
280	8	12	3.5	x				x	
281	8	9/10	45.8	x	x	x			x
282	8	8-10	52.9	x	x	x	x	x	x
283	8	7/8	14.9	x					x
284	8	5	2.5	x					x
285	8	3	6.9	x					x
285a	8	2	2.1	x	x			x	x
285b	8	2	7.0	x					x
286	8	2	5.7	x					x
287	9	1	4.0	x	x			x	x
288	9	1	2.5	x	x		x	x	x
289	9	1	16.1	x	x		x	x	
290	9	2	23.6	x	x		x		x
290a	9	2	40.3	x	x	x	x	x	
291	9	4	15.8	x	x		x		x
292	9	4	18.0	x	x		x	x	x
293	9	5/6	57.0	x	x	x	x	x	x
294	9	5/6	44.3	x	x	x		x	x
295	9	6	4.9	x					x
296	9	7-9	81.5	x	x	x	x	x	x
297	9	7-10	65.2	x	x	x	x	x	x
298	9	10	5.6	x					x
299	9	10	14.5	x	x		x		x
300	9	11/12	37.2	x	x		x		x
301	9	12	9.1						

Woodland #	Con.	Lot	Size (ha)	Significant Option 1	Significant Option 2	Size Criterion	Natural Heritage Criterion	Uncom. Feature Criterion	Ecol. Function Criterion
302	9	11	0.8	x	x			x	x
303	9	11/12	20.8	x	x		x		x
304	9	13/14	32.5	x	x		x		x
305	9	13-15	99.3	x	x	x		x	x
306	9	15	0.3	x					x
307	9	15-17	30.8	x	x			x	x
308	9	17	4.4	x					x
309	9	17/18	14.0	x	x		x		x
310	9	18/19	11.7	x	x		x	x	x
311	9	18/19	6.8	x	x		x		x
312	9	20	2.9						
313	9	20	2.7						
314	9	21	2.6	x				x	
315	9	21-24	49.4	x	x	x	x		x
316	9	23/24	2.0	x	x		x	x	
317	9	24	4.0	x	x			x	x
318	9	24	0.9	x				x	
319	9	25	5.1						
320	9	25	0.6	x					x
321	9	26	20.6	x	x		x		x
322	9	27	6.8	x					x
323	9	27	0.4	x				x	
324	9	27/28	23.2	x					x
325	9	28	0.6	x				x	
326	9	29	3.8	x					x
327	9	30	4.0	x	x		x		x
328	9	29/30	1.0	x	x			x	x
329	9	30	17.3	x	x		x		x
330	9	31	11.5	x					x
331	9	31	12.5	x	x		x		
332	9	31	0.5	x				x	
333	9	33/34	18.2	x	x		x		x
334	9	34	2.0	x	x		x	x	x


ALTONA
UXBRIDGE
PICKERING
TOWNSHIP OF UXBRIDGE
TOWNLINE
CLAREMONT
BALSAM
GREEN RIVER
BROUGHAM
KINSALE
GREENWOOD
WHITEVALE
TOWN OF AJAX
TOWN OF WHITBY
TOWN OF MARKHAM
EIGHTH CONCESSION ROAD
SEVENTH CONCESSION ROAD
SIDELINE
BROCK ROAD
WESTNEY ROAD
RIDGE ROAD
BALSAM ROAD
PIPELINE


Map 1
Forests of Pickering
HEDGEROWS
OLD FIELDS
MATURE FORESTS
WHITEVALE
CHERRYWOOD
CONCESSION
ROAD
FOURTH CON.
FIFTH CONCESSION
THIRD CONCESSION
TOWN OF AJAX
TOWN OF WHITBY
CITY OF SCARBOROUGH
LAKE ONTARIO
HIGHWAY 401
C.N.R.
INTERPROVINCIAL
KINGSTON
LIVERPOOL
BROCK
DIXIE
FAIRPORT
ROSEBANK
TAUNTON
SIDELINE
MARKHAM
PICKERING
TOWNLINE
ALTONA
PIPELINE
VALLEY
STREET
AVE.