Developing a Methodology for Identifying Significant Woodlands

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Abstract

The mandate for Halton Region to identify significant woodlands in their Official Plan came into effect in 1995 with reforms to The Planning Act under Bill 163. In 1996, The Planning Act was again amended altering the amount of protection required for significant woodlots, but stating that planning authorities must "have regard to" the impacts that proposed development could have upon the "form and function" of significant woodlands.

In 1995 a partnership was formed between the Ministry of Natural Resources and the Region of Halton to conduct a pilot study to identify significant woodlands in the Town of Oakville. Since completing the initial report new data sources have become available to aid in the selection of significant woodlands. The purpose of this study was to develop a method for identifying significant woodlands. This involved the research, formulation and testing of potential significant woodland criteria. In total nine criteria were selected: 1) Other Significant Natural Heritage Features; 2) Hydrological and Hydrogeological Sensitive Areas; 3) Community Diversity; 4) Forest Structure; 5) Linkages/Proximity; 6) Size; 7) Potential Interior Forest; 8) Shape; and 9) Age. It should be noted that, although the above criteria are presented individually, they are highly interdependent.

The results of this preliminary study are intended to be a basis for further discussion about identifying and designating significant woodlands in Halton. Currently, internal discussion amongst Halton Region Staff, and with external agencies, has helped to identify areas requiring more research. As well, investigation has started into planning policy implications for designating significant woodlands.

Introduction

A significant woodlands policy is intended to identify those areas where woodlands serve an important ecological function or have a significant form and prevent these features from any negative impacts caused by development. In 1995, under Bill 163, the Ontario Provincial Government amended *The Planning Act* and initiated legislation stating that planning authorities must include a significant woodlands designation in their Official Plan in order to make it consistent with the Province's *Comprehensive Set of Policy Statements*. In 1996, another amendment to *The Planning Act*, Bill 20, stated that the planning authorities should "have regard to" the *Provincial Policy Statement* and its stipulation that municipalities should designate significant woodlands. According to the *Provincial Policy Statement*, issued under Bill 20 "development and site alteration may be permitted...in significant woodlands...if it has been demonstrated that there will be no negative impacts on the natural features or ecological function for which the area is identified" (MNR, 1997).

In 1995, the Regional Municipality of Halton with the Ontario Ministry of Natural Resources (MNR) conducted a pilot project for identifying significant woodlands (Krahn et al., 1995). Despite this 1995 study, no significant woodlands policy was implemented into *The Regional Plan, Official Plan for the Halton Planning Area* (1995). As a result, in the Spring of 1998 Halton Region initiated a second woodlands study with the intention of implementing a significant woodlands policy in their Official Plan by the year 2000. A graduate student from the University of Waterloo worked with the Region of Halton in researching the processes involved in identifying significant woodlands (Riviere, 1999). This paper presents a portion of this research.

Research Objectives

The objectives of the research presented in this paper were to research, formulate and test potential criteria for identifying significant woodlands that are tailored specifically to Halton Region's natural environment. The results from this study are intended to provide a basis for further research and discussion regarding the formulation and implementation of a significant woodlands policy in Halton Region's Official Plan.

The Region of Halton

The Regional Municipality of Halton is located in southern Ontario, along the northern shores of Lake Ontario. It consists of four local municipalities: the City of Burlington and the Towns of Halton Hills, Milton and Oakville. Halton Region is one of the five Regional Municipalities in the Greater Toronto Area (GTA). This has many economic, social and environmental implications for the Region (Region of Halton, 1995).

The Regional Structure of Halton consists of three functional systems—Urban, Rural and Greenlands—that contain a number of mutually exclusive land use designations. Reference is made to woodlands in both Rural and Greenlands systems policies. For this reason, woodlands are applicable to both the Rural System and the Greenlands System.

Woodlands in Halton Region

Halton Region is fortunate to have a significant amount of natural area remaining. Approximately 12% of Halton's land area is designated as an Environmentally Sensitive Area. As well, roughly 15% of the urban area and 15% of the rural area are covered under a Greenlands System designation (Region of Halton, 1997). Calculations based upon the woodlands mapping data source used for this study (Figure 1) indicate that in 1995 the percentage of forest cover in Halton was 23.5%. The woodlands are not evenly dispersed across the Region. For instance, the percentage of forest cover in the urban areas is 9.7%, whereas it is 29.4% in the rural areas (defined as non-urban and non-Halton Urban Structure Plan area). As well, there is a great deal of difference between the amount of woodlands north and south of the Niagara Escarpment. Approximately 71% of the total woodland area occurs within, or north of the Niagara Escarpment Planning Area.

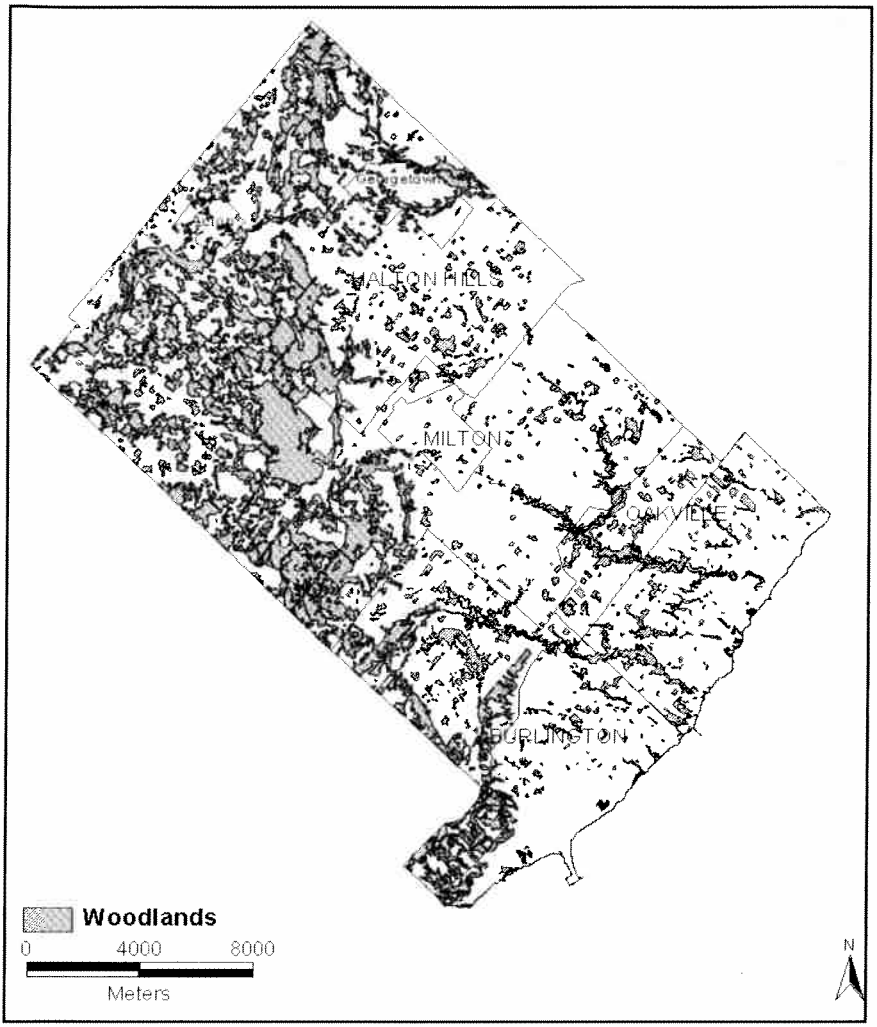

Figure 1: Woodlands in the Regional Municipality of Halton (Source: MNR 1996).

Potential Criteria for Identifying Significant Woodlands

This study proposes nine different criteria for identifying significant woodlands. These criteria were drafted by examining studies conducted by other municipal governments, as well as the *Implementation Guidelines for the Comprehensive Set of Policy Statements* (Province of Ontario, 1995) and the *Natural Heritage Training Manual for Policy 2.3 of the Provincial Policy Statement* (MNR, 1997). Although the nine criteria are listed individually they are highly interdependent. For example: the size and shape of a woodlot affects its potential to have an interior forest habitat; a forest's structure is influenced by its size; and, a forest's community diversity is influenced by the proximity of other woodlands and its structural characteristics (Pearlstine et al., 1997).

The nine criteria proposed for identifying significant woodlands are:

1) Presence of Other Significant Natural Heritage Features;
2) Hydrological and Hydrogeological Sensitive Areas;
3) Community Diversity;
4) Forest Structure;
5) Linkages/Proximity;
6) Size;
7) Potential Interior Forest Habitat;
8) Shape; and,
9) Age.

These criteria are discussed individually in the following sections.

1) Presence of Other Significant Natural Heritage Features

This criterion consists of seven further sub-components based on type of other significant natural features:

1) Environmentally Sensitive Areas (ESAs);
2) Areas of Natural and Scientific Interest (ANSIs);
3) Warm water fish habitat;
4) Cold water fish habitat;
5) Habitat for threatened and endangered species;
6) Niagara Escarpment Natural Area; and,
7) Lake Ontario and Burlington Beach Shorelines.

This criterion was selected because the presence of other significant natural heritage features confirms the important ecological functions and features of the area. Thus, the conservation of these woodlands is critical to the quality of Halton's natural environment.

Halton Region is fortunate to have digital map layers of the above listed features. By using Geographic Information Systems (GIS) map overlay technique it was possible to determine which woodlands were located in the designated areas. The map overlay function places a layer of information over another layer in order to produce a third layer with new information.

2) Hydrological and Hydrogeological Sensitive Areas

This criterion is based on six elements:

1) Hydrogeological Sensitive Areas;
2) Riparian Zones (defined as 15 meters from a watercourse);
3) Headwater areas;
4) Provincially significant wetlands (Class 1, 2, & 3);
5) Regionally significant wetlands (Class 4, 5, 6, & 7); and,
6) Floodplains.

A sensitive hydrogeological area is one where the ground water is susceptible to contamination because the water table is close to the surface. Land use planning must take these areas into account because land use decisions affecting these areas have the potential to impact ground water quality (Province of Ontario, 1995). This is important in Halton as approximately 25% of the total population relies upon ground water for their daily domestic water supply (Holysh, 1995). As well, cold water streams rely on groundwater discharge.

Moreover, trees and understorey vegetation can act as filters and prevent sediments and other pollutants from entering the water. The protection of headwater areas is important because they maintain stream flow and water quality (Brownell and Larson, 1995). As well, woodlands help recharge areas maintain their permeable qualities. Furthermore, the maintenance of vegetated river valleys in urban areas is important as it can impact the area's micro-climate. The "urban heat island" can be lessened by vegetation, which provides shade, wind protection and cooling through evaporation. This is important as the urban areas within Halton continue to expand.

Again, Halton Region is fortunate to have digital map layers of the sub-components used to measure this criterion. As a result, GIS overlay technique was used to determine the woodlands that are in the designated areas.

3) Community Diversity

The amount of data Halton Region had available for testing this criterion was somewhat limited. For this reason, testing this criterion was based on whether or not there are provincially, regionally or locally rare species located in the woodlands. Further research is required for testing this criterion.

This criterion is necessary for determining significant woodlands because it involves the ability of the wooded area to function as wildlife habitat. The internal function of the woodland is measured by examining the diversity of habitat types. This is important because different habitat types provide various elements required for species survival such as nesting, food and cover (Brownell and Larson, 1995). The presence of rare species is important because, as the name implies, they may only be found in select woodlands which have the necessary functions and features to support them.

The protection of these areas should be given high consideration during the planning process, as their loss would be detrimental to the ecological integrity of the area. Community diversity affects the functioning of an ecosystem by allowing species interactions and life cycle competition (Brownell and Larson, 1995).

4) Forest Structure

To test this criterion data was taken from Halton's *Environmentally Sensitive Area Study* (Geomatics International Ltd., 1993) and the Forest Resource Inventory (FRI) database (MNR, 1978) in order to determine which woodlands contain vegetation communities that are considered significant in Halton. As well, because upland woodlands are under pressure from development, this component was included as part of the forest structure criterion. Testing of this criterion is incomplete as more data is required.

Ideally, this criterion would reflect woodland structure by focussing on such features as tree height and diameter and its distribution pattern. Basal area, working group, cover type, stand distribution and maturity are also important factors which should be considered.

Examining woodland structure allows for an evaluation of its ability to self-perpetuate. Research has indicated that as a landscape becomes increasingly fragmented,

the diversity of native species will decrease and a patch's community structure will be increasingly influenced by its size and surrounding land use activities (Pearlstine et al., 1997). As a result determining forest patches in Halton that have a significant structure will help to indicate which woodlands are healthy and what stage of succession they have reached.

5) Linkages/Proximity

Using GIS buffering capabilities this criterion was tested by determining which woodlands are located 150 metres or less from another woodland. Although highly debated by ecologists, the 150 metre figure was selected based on a review of a variety of studies about forest species dispersal. For instance, studies have concluded that forest understorey species are generally bad dispersers, and the highest rate of colonization is 150 metres or less (Hough Stansbury Woodland Naylor Dance Ltd. and Gore and Storrie Ltd, 1994). This criterion is important in fragmented landscapes such as Halton because wildlife movement between different forest patches is important. As well, researchers have found that, even for large forest reserves, the number of individuals and species in a forest tract is directly related to the amount of forest in and near a tract.

6) Woodland Size

Due to the variation in forest cover in rural and urban areas this criterion is dependent on the percentage of forest cover in the two areas. In urban areas, where there is less than 15% forest cover, and the woodlands are generally small, the minimum size criterion is two hectares. In rural areas, where there is over 15% forest cover, and the woodlands are generally larger, the minimum size criterion is ten hectares.

This criterion is a good indicator of the wildlife habitat potential of the area, and its overall ecological integrity. Depending on its shape, the larger a woodlot the more likely it is to contain interior forest habitat. This is important as interior forest habitat—or core forest area—is generally unaffected by the environmental influences associated with the forest edge (Pearlstine et al., 1997). These environmental influences can affect species survival.

7) Potential Interior Forest Habitat

To test for potential interior forest, GIS analysis was used to determine those woodlands that had an internal polygon that was located 100 metres or more from the woodlot's edge. The 100 metre figure was determined from a review of various other woodland studies (Regional Municipality of Hamilton-Wentworth, 1997; Smith et al., 1996).

In fragmented landscapes such as Halton's, ecological imbalances are significant where a forested area meets other land uses (Riley and Mohr, 1994). Species that inhabit edge habitats are generally opportunistic and generalists, while species that require interior habitat are specialists. Researchers have found changes in light levels, air temperature, soil moisture, plant richness, tree basal area, canopy density and tree mortality from the forest edge to the interior (Burke and Nol, 1998). As well, there are generally higher rates of predation and brood parasitism in a forest edge.

8) Woodland Shape

This criterion assigns priority to woodlands with a more compact shape. To do this requires an examination of the woodlot's edge-to-area ratio. This ratio was calculated by dividing the woodland's perimeter by its area. The lower the ratio, the more compact the woodland's shape. Woodlands with an edge-to-area ratio equal to or less than the regional mean of 0.049 were considered to be fulfilling the criterion.

The potential impact of fragment shape has also been applied in landscape ecology studies where it is generally believed that the shape of a woodlot affects its potential to act as wildlife habitat. Forests that are circular or square in shape are considered compact and have a large interior because the edge-to-area ratio is lower. As well, irregularly shaped woodlands act as small units with a high edge-to-area ratio (Riley and Mohr, 1994). Woodlots with a smaller amount of edge have a lower likelihood of being disturbed by generalist species or having their internal resources affected by wind penetration.

9) Age

To fulfil this criterion a woodland has to consist of trees or communities of trees 100 years old or older. Woodlands over 100 years old are generally considered old growth in southern Ontario. They are considered significant in Halton as they are thought to be some of the remaining original forests or some of the initial forests that have regenerated after being disturbed by the original settlers. The 100 year time frame, used widely in forest studies in Ontario (Krahn et al., 1995; Brownell and Larson, 1995; Smith et al., 1996; Region of Hamilton-Wentworth, 1998), is related to settlement pattern. The initial settlers in Ontario viewed the trees as an impediment to agricultural development and massive deforestation was the norm in southern Ontario. Most of the forests that now exist are a result of the regeneration of abandoned farmland or because it was realized certain forested areas would not be viable for agricultural use (MNR, 1993).

Results

The results of testing each criterion are shown in the Table 1. This table indicates the number of forest polygons that satisfy each criterion, as well as the amount of woodland area (ha) that fulfil the criteria. Overall, the table shows that apart from a few of the criterion, there is not a great deal of variation in the percentage of wooded area fulfilled by each criterion. This is partially a function of how the criteria were structured and the data used to test them. As well, the majority of woodlands fulfilling the criteria are generally found in the Niagara Escarpment Area and along the major river valleys. Again, this is partially a function of the data available, as well as an assessment of woodland health.

Future Work

The Region intends to proceed with the process of identifying significant woodlands. Future work to be conducted by staff includes discussions with the four local municipalities, as well as Halton's Ecological and Environmental Advisory Committee (EEAC) and the Halton Agricultural Advisory Committee (HAAC). As

Criteria	Number of Polygons (2230)	Woodland Area (22854.2 ha)	Percentage of Total Woodland Area
Other Significant Natural Heritage Features	783	16139.3	70.6
Hydrological and Hydrogeological Sensitive Areas	1567	21503.3	94.1
Community Diversity	285	9630.2	42.1
Forest Structure	1654	21458.1	93.9
Linkages/Proximity	1964	21905.8	95.9
Woodland Size	591	1916.9	85.8
Potential Interior Forest	380	18192.3	79.6
Shape	1445	22365.6	97.8
Age	122	8435.1	36.9

Table 1: Number of woodlands satisfying proposed criteria.

well, Halton will continue to gather information about the woodlands in order to fill the data gaps. This information will be incorporated into an updated Natural Heritage System. Regional Staff intend to have a draft Regional Official Plan Amendment composed by the end of 1999 that will recognize this system.

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