Chapter 2

Forest Conditions

2.1 Introduction

Hardwood forests covered the majority of the Upper Thames watershed prior to European settlement. Today, the forest cover is highly fragmented, existing as small woodlots separated by agricultural fields, urban development and other land uses.

There is much debate about the long term viability of these remaining woodlots. Of concern is the dwindling amount of forest cover on the landscape and the ability of the individual woodlots to support a healthy diversity of native plants and animals.

The loss of forest cover also means a loss of benefits to the human community. Forests fulfill many functions, including:

- protecting and building the soil (humus layer);
- producing oxygen and taking up pollutants;
- moderating the climate;
- protecting groundwater;
- providing fuel, timber, seeds and berries;
- providing areas for recreation and education;
- providing habitat for game and other wildlife; and
- contributing to our heritage.

Small and medium sized woodlots in an agricultural landscape.

Many organizations have expressed the need for region-wide planning and evaluation of southern Ontario's woodland resources. This report card project does this by measuring and comparing forest conditions across the Upper Thames watershed on a subwatershed scale.

"Deforestation is often seen as just a net loss of forest cover. But deforestation can also refer to the loss of quality of the remaining forests. The size and shape of a woodlot affect its quality, as do its proximity and linkage to other landscape features." *Source: Federation of Ontario Naturalist's Woodlands Facts*

2.2 Indicators and Grades

Forest health is generally measured directly using field survey information such as species diversity, forest age, disturbance, and so on. However, this information is not available on a watershed scale; therefore, landscape-level indicators were sought that could be calculated relatively quickly and uniformly across the subwatersheds. As well, it was important to choose indicators that measure unique aspects of forest integrity as opposed to measuring the same thing in a different way.

After a review of the pertinent literature on forest health and fragmentation, the following three indicators were selected to give a measure of forest conditions:

- percent forest cover,
- percent forest density, and
- percent forest interior.

A description and definition of each indicator is given in Table 1 and in each Report Card (see Appendix B).

Table 2 shows the actual percentage values that were obtained for each watershed and indicator. For each indicator, the percentage values were separated into six more-or-less equal increments with corresponding grades.

The decision about where to separate the As from the Bs and the Bs from Cs was somewhat discretionary, but it did take into account provincial and local conditions and objectives. For example, 25-30% forest cover is considered the ideal for southern Ontario and so anything over 25% was graded an A. On the other hand, there is no provincial standard for forest interior. In this case, the values were separated into equal increments based primarily on the spread of numbers whereby the highest was given an A, the lowest an F.

Table 1. Description of Indicators of Forest Conditions

Indicator	% Forest Cover	% Forest Density	% Forest Interior
What it measures	• the percentage of the watershed that is forested	• the percentage of the watershed that has woodlots clustered together (within 2 km of each other)	• the percentage of the watershed that is "interior forest" • interior is that portion of a woodlot left when a 100 metre strip is removed from the perimeter
How it is calculated	• divide the area of forested land by the area of the watershed	• draw a 2 km radius circle around the centre of each woodlot • circles that overlap with 7 or more other circles indicate high density • divide the area of high density by the area of the watershed	• divide the area of forest interior by the area of the watershed
Why it is important	It is believed that there should be 25-30% natural cover in southern Ontario's landscape to sustain our native plants and animals (Carolinian Canada, 2000). This is a long term goal taking several generations.	Woodlots that are close to each other tend to have greater species diversity than those that are isolated. Seeds can be transported and animals move more easily between nearby woodlots to increase the gene pool or to re-populate an area where a species has been wiped out.	The outer 100 metres is considered 'edge' habitat and prone to high predation, alien species, damage from sun and wind, etc. Many bird species whose populations are declining require large forests so they can live within the sheltered interior.

The final grades were achieved by adding together the point scores of the three indicators. In exercises like this, one parameter is often weighted more heavily than another due to its relative importance. After several trials using different weights, it was decided to weight each indicator the same. All three indicators measure something unique and each is equally important in determining forest conditions. Thus, the point scores for each indicator were multiplied by 33% and then added together.

2.3 Data Source

Forest cover information was taken from 1994 National Topographic Series (NTS) maps. These maps are produced at a scale of 1:50,000 and are available digitally, so that GIS technology can be used to calculate various sizes and percentages.

Wooded areas are shaded green, but this includes all types of forest such as upland deciduous and coniferous woods, treed swamps, plantations and mature shrub thickets. Other non-woody habitats such as meadows, old fields, cattail marshes, and tallgrass prairies are present in the watershed but are less common. These latter habitats are not distinguished on NTS maps and thus are not included in this study.

2.4 Results

Table 2 lists the data and final grades and point scores for each of the 28 subwatersheds. Figure 3 maps the distribution of the subwatershed grades within the Upper Thames basin. The watershed report cards are provided in Appendix B. Table 3 summarizes the information in table form.

Table 2. Forest Conditions: Indicator Data, Points and Grades

	Area	Forest Cover			Forest Density			Forest Interior			Final	
Subwatershed	sq. km	sq. km	%	Points	sq. km	%	Points	sq. km	%	Points	Points	Grade
Avon	168.92	18.50	10.9	2	69.92	41.4	1	4.12	2.4	4	2.3	D
Black	143.90	22.35	15.5	3	41.40	28.8	0	10.11	7.0	5	2.6	C
Cedar	97.59	11.82	12.1	2	29.31	30.0	0	3.20	3.3	5	2.3	D
Dingman	175.86	25.17	14.3	2	123.94	70.5	3	2.04	1.2	1	2.0	D
Dorchester	126.89	26.78	21.1	4	103.97	81.9	4	5.72	4.5	5	4.3	B
Fish	156.69	12.93	8.3	1	47.81	30.5	0	1.28	0.8	1	0.7	D-
Flat	91.29	8.92	9.8	1	42.25	46.3	1	0.73	0.8	1	1.0	D-
Forks	87.40	11.30	12.9	2	53.66	61.4	2	0.49	0.6	0	1.3	D-
Glengowan	119.69	11.59	9.7	1	53.51	44.7	1	1.04	0.9	1	1.0	D-
Gregory	64.36	5.35	8.3	1	18.80	29.2	0	0.34	0.5	0	0.3	F
Komoka	23.72	4.87	20.5	4	21.89	92.3	4	0.61	2.6	4	4.0	B
Medway	206.24	22.19	10.8	2	115.63	56.1	2	2.01	1.0	1	1.7	D
Middle Thames	172.10	22.45	13.0	2	138.69	80.6	4	2.82	1.6	2	2.6	C
Mud	152.01	18.79	12.4	2	116.50	76.6	3	2.52	1.7	2	2.3	D
North Mitchell	175.64	8.55	4.9	0	12.86	7.3	0	0.56	0.3	0	0.0	F
North Woodstock	249.89	32.38	13.0	2	158.99	63.6	2	4.97	2.0	3	2.3	D
Otter	61.33	6.15	10.0	2	39.26	64.0	2	0.65	1.1	1	1.7	D
Oxbow	88.82	13.59	15.3	3	71.83	80.9	4	1.41	1.6	2	3.0	C
Plover Mills	111.65	13.54	12.1	2	53.87	48.2	1	0.80	0.7	0	1.0	D-
Pottersburg	50.44	3.47	6.9	1	29.55	58.6	2	0.22	0.4	0	1.0	D-
Reynolds	160.61	18.92	11.8	2	93.49	58.2	2	2.57	1.6	1	1.7	D
River Bend	55.76	13.36	24.0	4	53.62	96.2	5	1.05	1.9	3	4.0	B
South Thames	220.05	23.76	10.8	2	115.15	52.3	2	3.59	1.6	2	2.0	D
Stoney	37.59	4.68	12.4	2	36.49	97.1	5	0.39	1.0	1	2.6	C
Trout	161.06	26.18	16.3	3	124.77	77.5	4	4.82	3.0	5	4.0	B
Waubuno	106.25	12.32	11.6	2	84.90	80.1	4	1.47	1.4	2	2.6	C
Whirl	129.98	8.88	6.8	1	23.12	17.8	0	0.86	0.7	0	0.3	F
Wye	51.71	4.44	8.6	1	20.66	40.0	1	0.42	0.8	1	1.0	D-
Total	**3447.44**	**413.21**			**1895.84**			**60.81**			**55.4**	
Average	**123.12**		**12.0**	**D**		**55.0**	**D**		**1.8**	**D**	**2.0**	**D**

Range of Percentage Values separated into Points and Grades

Forest cover			Forest Density			Forest Interior			Final	
%	Points	Grades	%	Points	Grades	%	Points	Grades	Points	Grades
>25%	5	A	>95%	5	A	>2.8%	5	A	4.6-5.0	A
20-25%	4	B	80-95%	4	B	2.4-2.8%	4	B	3.6-4.5	B
15-20%	3	C	65-80%	3	C	19.-2.3%	3	C	2.6-3.5	C
10-15%	2	D	50-65%	2	D	1.4-1.8%	2	D	1.6-2.5	D
5-10%	1	D-	35-50%	1	D-	0.8-1.3%	1	D-	0.6-1.5	E
<5%	0	F	<35%	0	F	0.3-0.7%	0	F	0-0.5	F

The data was extracted from digitized National Topographic Series maps (Energy, Mines and Resources Canada, 1994).

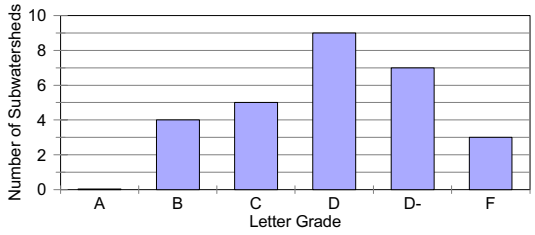
The area of forest cover, density and interior is divided by the area of the subwatershed to achieve the % (percentage) values.

Table 3. Final Forest Condition Grades

A (4.6 - 5.0 points)	B (3.6 - 4.5 points)	C (2.6 - 3.5 points)	D (1.6 - 2.5 points)	D- (0.6 - 1.5 points)	F (0.0 - 0.5 points)
-------	Komoka Cr. (4.0) River Bend (4.0) Trout Cr. (4.0) Dorchester (4.3)	Black Cr. (2.6) Middle Thames (2.6) Stoney Cr. (2.6) Waubuno Cr. (2.6) Oxbow (3.0)	Medway Cr. (1.7) Otter Cr. (1.7) Reynolds Cr. (1.7) Dingman Cr. (2.0) South Thames (2.0) Avon R. (2.3) Cedar Cr. (2.3) Mud Cr. (2.3) N Woodstock (2.3)	Fish Cr. (0.7) Glengowan (0.7) Flat Cr. (1.0) Plover Mills (1.0) Wye Cr. (1.0) Pottersburg Cr. (1.0) Forks (1.3)	North Mitchell (0.3) Whirl Cr. (0.3) Gregrory Cr. (0.3)

As Figure 4 illustrates, the distribution of grades falls into a classic bell-shaped curve. Most of the watersheds fall into the average grades (C and D) and fewer in the excellent and very poor grades (A, B and F).

Figure 4. Distribution of Grades
Forest Conditions



As a whole, the Upper Thames River watershed scores a D grade. This low grade is not surprising considering the Upper Thames watershed is located in a highly developed part of southern Ontario where over 80% of the forest cover has been lost to agricultural and urban development.

The wide range of grades (B to F) illustrates the variability of the landscape, even within a relatively small area such as the Upper Thames basin. For example, forest conditions are poor (F grade) in the upper part of the watershed within Perth County, but good (B grade) in the Dorchester area. In the Mitchell area, agriculture is very prosperous, resulting in small woodlots that are confined to narrow strips at the back of farms. Alternatively, in the Dorchester subwatershed there are several large forested swamps (e.g. Dorchester Swamp) that lie in close proximity to each other and provide good habitat for plants and animals.

Urban development has also occurred at the expense of the local forests. For example, forest cover around London is low and dwindling; the woodlots are isolated from each other by commercial, residential and industrial land uses.

In some parts of the Upper Thames basin, the amount of forest cover has actually increased since 1900. For example, some landowners with marginal farmland have reforested these lands. In addition, a great deal of tree planting and naturalization has occurred within the three large conservation areas (i.e. Fanshawe, Wildwood and Pittock) since the 1950s.

The percent forest cover ranges from a low of 5% in the North Mitchell watershed to a high of 24% in the River Bend watershed. The overall average for the Upper Thames is 12% forest cover (D grade). This is in the mid- to low range for southern Ontario.

Forest density is generally poor throughout the watershed (D grade overall). Woodlots in the North Mitchell watershed are the most isolated, while they are least isolated in the Stoney Creek and Komoka watersheds

The percent forest interior is generally low throughout the Thames due to the fact that most woodlots are small and narrow. Woodlots must be over 200 metres wide or 4 ha in area (assuming a square shape) to possess forest interior. Again, the overall grade for the Upper Thames basin is a D (1.8% forest interior) but this ranges from a low of 0.3% in North Mitchell to a high of 7% in the Black Creek watershed. Ellice Swamp is the largest wooded area in the Upper Thames (1015 ha) but about half of all woodlots are under 4 ha and only 9% are over 40 ha.

2.5 Additional Information

In addition to the data used to calculate the grades, a great deal of additional information was compiled for each subwatershed including:

- land use,
- woodlot size,
- riparian forests,
- rare species, and
- significant natural sites.

This information is outlined in each report card and is presented in more detail in Appendix A. These parameters help describe why the forests are in good or poor condition (e.g. due to woodlot size) and identifies resources in need of protection (e.g. significant natural sites) or improvement (e.g. riparian forests).

2.6 Actions for Improvement

Using the information presented above, a list of actions needed for improvement was developed and is presented in each watershed report card. The list is not definitive, but outlines many tried and true practices that have been used to improve forest health.

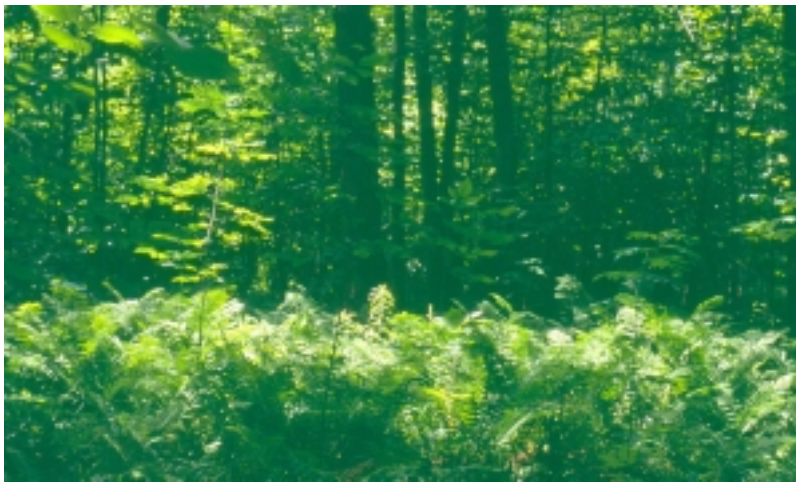
Some actions are specific to a particular watershed. However, there are several actions that are common to most watersheds, such as the need to protect woodlands at the municipal planning level. Other actions include encouraging landowners to widen their woodlots and prepare Woodlot Management Plans. The need to expand forest cover along the downstream end of rivers and creeks is also common to many watersheds.

Tree planting project by the Upper Avon Conservation Club

This list of actions can also be viewed as a starting point for landowners, groups and agencies who want to make a difference in a watershed. No actions are mandatory as it is recognized that there are many other issues (e.g. economics) that determine the ability or willingness of individuals or groups to undertake the actions. The actions simply present options.

2.7 Information Gaps

One limitation of the data used in this study is that woodland types are not distinguished. For example, a 10 ha conifer plantation is species-poor compared to a 10 ha deciduous forest, but both are shown as forest cover on the NTS maps. Also, windbreaks, hedgerows, and river buffers are not illustrated on these maps (primarily due to scale) and this limits our ability to measure the connections between wooded areas.



Ostrich ferns growing in a healthy deciduous forest.

New satellite imagery and interpretation techniques will soon make it possible to distinguish between deciduous woods, coniferous woods, plantation, thicket, swamp, tallgrass prairie, and pasture (Graham, pers. comm.). This imagery will also make it possible to undertake more frequent analysis of natural vegetation cover.

Another limitation is our ability to calculate forest density or how close woodlots are to each other. As the Upper Thames contains thousands of woodlots, rigorous calculations on each woodlot were not practical. Instead, an indirect method was used (see Table 1). Experimentation with GIS capabilities and dialogue with others in the field will likely enable more accurate measurements in the future.