III

FOREST RESTORATION

9.0 Restoration

Restoration to forest ecosystems will largely occur on private land. As such there is an equally important social and economic component to complement the technical approach. For this reason, the restoration approach in this report outlines technical steps and a decision making process to prioritize the targeting of restoration efforts.

The forest habitat type required the most in the watershed is interior habitat, the habitat that exists approximately 100 metres from the edge. Therefore, restoration that increases the size, and specifically the interior of existing forests, should occur first. Only 3.63% of the watershed can be classified as interior habitat. It ranges from 7.4% in the Nine Mile sub-basin to 1.0% in the South Maitland sub-basin. Analysis of the data demonstrates that a 10 metre and 50 metre buffer added to all woodlots gives the best ratio of increase of interior habitat to total forest cover. In other words a 10 metre buffer adds a little to the overall forest cover but results in a large increase of interior forest. The analysis consisted of calculating the total forest cover for 10 metre, 20 metre, 30 metre, 40 metre and 50 metre buffers. The interior forest was then calculated for these intervals. The difference between the intervals for interior forest was then divided by the difference between the intervals for total forest cover. The results are the ratio of increase in interior forest to the increase in total forest cover. Table 11 summarizes this process.

Table 11: Ratio of interior forest to total forest cover for buffers 10 metres through 50 metres.

Buffer Distance (m^2)	Total Forest Cover (km^2)	Difference in Total Forest Cover (km^2)	Total Interior Forest (km_2)	Difference in Interior Forest (km^2)	Percent Interior Forest of the Total Forest Cover Added(%)
0	543.6		104.9		
10	563.7	20.1	117.9	13.0	65
20	623.6	59.9	143.4	25.5	43
30	683.9	60.3	174.8	31.4	52
40	744.8	60.9	212.7	37.9	62
50	805.8	61.0	255.0	42.3	69

Although a 50 metre buffer around all woodlots produces the greatest ratio of increase of interior to total cover, it is not reasonable to assume the average landowner will reforest this amount of land. For the purposes of this restoration strategy, a 10 metre buffer will be used as the approach to increase interior forests within the watershed.

Another factor that was considered to increase forest interior was the isoperimetric quotient, or shape, of the woodlots. It was determined through analysis that this method was unsuitable as a strategy to increase forest interior. The shapes that most efficiently resulted in interior forest were small and the total amount of interior forest added to the watershed was negligible. Other shapes that resulted in a significant increase in interior forest across the watershed required large amounts of reforestation. Also, the equation used to calculate the isoperimetric quotient is more

complex and therefore not as readily understood. This could pose a barrier to on-site assessments and restoration efforts. In essence though, woodlots should be in-filled so that the perimeter is square. This may or may not increase the amount of interior forest but does reflect one of the best shapes to provide interior forest

The second restoration priority would be to enhance or restore wetland areas and riparian buffers. It has been well documented that restoring these areas improves water quality and baseflows by filtering out contaminants and encouraging infiltration. The buffers also provide a benefit to fish and wildlife. Soil type, slope, adjacent watershed size and cover type are all factors that need to be considered when calculating the width of the buffer needed. It is generally accepted, however, that a buffer with a minimum width of 30 metres is required to maximize the benefit (OMAFRA, 2008). Thirty metres was the value used in the development of map 8.

As a third priority fragile land would be retired and vegetated. Steep slopes and certain soils are prone to erosion. Restoring these areas will protect and stabilize the soil from weathering, and add structure in the form of organics. These lands were identified through the use of soil survey maps and soil capability classification for agriculture maps. The list below identifies the soil series that are prone to erosion.

- Bes - Berrien
- Bos - Bookton
- Brs - Brady
- Bs - Brookston
- Dos - Donnybrook
- Ds - Dumfries
- Fs - Fox
- Gs - Granby
- Hs - Harriston
- Hus - Huron
- Ls - Listowel
- M - Muck
- Pas - Parkhill
- Ps - Perth
- Tes - Teeswater
- Ts - Toledo
- Was – Wauseon

Soils with a soil capability sub-classification of “T” have been identified as having adverse topography. Soils with these characteristics were combined to represent fragile land.

The remaining land once the above are restored, would be isolated patches. It is therefore appropriate to connect these forest patches with corridors. Connections along watercourses should have first priority, followed by the criteria of the inter-patch distance. Large patches close together would be connected before those that are small and far apart.

Finally, isolated forest patches could be enhanced and created as opportunities arise.

The Maitland Valley Conservation Authority watershed is largely agriculture. It is not appropriate to focus restoration efforts on productive agricultural land from a social and

economical stand point. It is, however, reasonable to focus efforts on restoring old fields, marginal lands and corridors.

Old fields are those areas that do not appear to be in active agricultural production, and therefore the greatest step towards restoration has been completed. The property owner has made the decision to discontinue farming the land. Contacting the landowner to determine their attitude towards the area and informing them of the value of the area and its restoration potential could produce the greatest results with the least amount of effort.

The second restoration strategy would be marginal agricultural land. These are lands that have questionable profitability. Soils with a capability classification of 5, 6 or 7 are not suitable for annual cultivation (OMAF, 1985). The profitability of these lands is likely to vary as input costs and commodity prices fluctuate. Strategically these areas should be targeted when input costs are high and commodity prices are low.

The third focus for restoration efforts should be on corridors around watercourses and property boundaries. Benefits of afforestation in these areas include wind breaks, shelterbelts and living snow fences. These overall benefits are likely to outweigh the minimal workable land lost.

Map 8 highlights areas within the watershed that should be targeted for restoration. The mapped areas will add interior forests, buffer watercourses and wetlands and protect fragile soil on lands that are old fields and marginal for agriculture. Areas mapped as Priority 1 is where interior forests, riparian buffers and fragile soil overlap with old fields. Areas mapped as Priority 2 is where interior forests, riparian buffers and fragile soil overlap with marginal agricultural land. These strategies would respectively restore 36km^2 and 236km^2 of the watershed. Corridors were not considered as part of the mapping as their placement is complex and highly dependent upon the views, values and attitudes of the landowner.

The restoration strategy outlined above will help focus restoration initiatives and quantify efforts. It is recognized, however, that other strategies will be developed as science and social pressures change. It is anticipated that the strategy to restore forest cover to the watershed will endure and compliment other strategies.

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Glossary

Acres – A measurement of area. There are 43560 square feet in an acre. Acres = hectare x 2.47.
Climax Forest – The final stage of plant succession in which species composition remains relatively stable. This condition occurs in the absence of disturbance.
Cord – The amount of wood in a stack of 48-inch long logs that is 4 feet high and 8 feet wide.
Deciduous – Term applied to trees that lose the leaves and have a dormancy period at least once per year.
Dbh – Diameter at breast height; the average diameter (outside the bark) of a tree 4.5 feet above mean ground level.
Fbm – Foot board measure. A specialized unit of volume for measuring lumber. one square foot of lumber one inch thick is equal to a Fbm.
GIS – Geographical Information System. A system of capturing, checking, integrating, analyzing, and displaying data about the earth that is spatially referenced. Normally includes a spatially-referenced database and appropriate applications software.
Hectare – A measurement of area. There are 10000 square metres in a hectare. Hectare = acres x 0.405.
Log Rule Measurements – A method of estimating tree volume through a log rule that assumes taper. In Ontario, standing timber is estimated by consultants using the Ontario log rule. Timber and logs are bought and sold by contractors using the Doyle log rule. In the U.S. the Doyle, Scribner and International1/4" are used depending on location and intended purpose. Doyle rule underestimates standing timber by 15% for 20 inch (50 cm) diameter breast height (dbh) trees and up to 30% for 16 inch (40 cm) dbh trees. There is no industry standard for determining the volume or grade of sawlogs. The owner-contractor of each mill uses the method of their choice.
M3 – Cubed metres. A measure of volume. M3 = Mfbm x 4.4.
M3/ha – M3/ha = Mfbm/acre x 10.9.
Mfbm – A thousand board feet. See Fbm. A measure of volume. Mfbm = m3 x 0.227.
Mfbm/acre – Mfbm/acre = m3/ha x 0.92
Plantation – A planted and managed stand of trees.
Shelterwood – Removal of the mature timber in a series of cuttings that extend over a relatively short portion of the rotation in order to encourage the establishment of essentially even-aged reproduction under the partial shelter of seed trees.
Silvicultural system – A process, following accepted silvicultural principles, whereby the tree species constituting forests are tended, harvested, and replaced. Usually defined by, but not limited to, the method of regeneration.
Stocking – The number and density of trees in a forest stand. Stands are often classified as understocked, well-stocked or overstocked.
Succession – The natural process by which certain plant communities or vegetation stages replace each other in a particular order, within the same place unit.

Appendix I. Landowner Survey of Forest Harvesting Practices.

Interview Questions

Hi my name is ----------
I work for the Maitland Valley conservation Authority. We are collecting information about forest harvesting in the watershed and wondering if you have ten minutes to help us.
This is completely voluntary this conversation will remain confidential.

From the public record a notice of Intent was filed for your woodlot in *year*. It was filed by *Logger.*

Was your woodlot harvested?

What month did it occur?

Was the harvested portion in
upland forest
lowland forest
mixed woodlot 50 % conifer
conifer plantation
other Poplar

How many acres were harvested?

How was the sale set up;
- you contacted a logger
- you contacted a consultant
- a logger contacted you
- other *explain*

Was the woodlot marked ? Who?

How was the woodlot marked;
- Legal limit /diameter cut
- silviculture cut
- other

Do you know how much volume was removed? *board feet or cords*

Did you or anyone else harvest firewood? How many cords?

How was the sale completed?
- lump sum up front
- partial payment up front and the rest after the job
- percentage based on final harvest or scale
- other

How much money did you receive ?

Did you attach special conditions?

Were you happy with the results?

Can we visit your woodlot?

Appendix II. Forest Cover Data from Various Agencies.

Table 2a. Forest cover data in the Maitland watershed (excluding Bruce County)

	Acres	Hectares	
Total area	758,537	307,100	
Total forest area	129,626	52,480	
Percent of forest land			17.1%
Deciduous forest area	101,626	41,144	
Public deciduous forested area	1,976	800	
Privately-owned (p-o) deciduous forest area	99,650	40,344	
Deciduous forest harvest area (p-o) (1997-1999)	13,220	5,352	
Percent of deciduous forest harvested (p-o)			13.3%
Percent mean annual harvest			4.4%

Table 2b. Forest cover data in the ABCA watershed

Total area	322,335	130,500	
Total forest area	37,297	15,100	
Percent of forest land			11.6%
Public deciduous forested area	4,211	1,705	
Privately-owned forest area	33,086	13,395	
Deciduous forest harvest area (p-o) (1997-1999) *	3,263	1321	
Percent of forest harvested (p-o)			9.9%
Percent mean annual harvest			3.3%

* does not include harvest on ABCA land.

Table 2c. Forest cover data in the UTRCA watershed (1978 OBM)

Total area	298,870	121,000	
Total forest area	23,539	9,530	
Percent of forest land			7.9%
Public deciduous forested area	8,193	3,317	

Privately-owned deciduous forest area	15,346	6,213	
Deciduous forest harvest area (p-o) (1997-1999)	2,058	833	
Percent of forest harvested (p-o)			13.4%
Percent mean annual harvest			4.5%

Table 2d. Forest cover data in Huron County

Total area	844,345	341,840	
Total forest area	128,193	51,900	
Percent of forest land			15.2%
Deciduous forest area	97,071	39,300	
Public deciduous forested area	3,211	1,300	
Privately-owned (p-o) deciduous forest area	93,860	38,000	
Deciduous forest harvest area (p-o)(1997-1999)	14,776	5,982	
Percent of deciduous forest harvested (p-o)			15.7%
Percent mean annual harvest			5.2%

Table 2e. Forest cover data in Perth County.

Total area	550,733	222,969	
Total forest area	48,167	19,501	
Percent of forest land			8.7%
Deciduous forest area	38,285	15,500	
Public deciduous forested area	1,235	500	
Privately-owned (p-o) deciduous forest area	37,050	15,000	
Deciduous forest harvest area (p-o)(1997-1999)	4,271	1,729	
Percent of deciduous forest harvested (p-o)			11.5%
Percent mean annual harvest			3.8%

Calculating forest cover on private land is no easy task since there is no current forest inventory and there are a variety of area values determined through different means including satellite imagery and by different agencies. The Ontario Land Cover data that was derived from digital, multispectral LANDSAT Thematic Mapper provided a breakdown of forest types for this analysis (Spectranalysis Inc. 1999). Categories used to determine available forest area for harvest included 1) dense deciduous forest, 2) mixed forest mainly deciduous and 3) deciduous swamp. Categories not included were 4 and 5)sparse deciduous and coniferous forest, 6) mixed forest mainly coniferous, 7) dense coniferous forest, 8) coniferous swamp and 9) plantation.

For example, in Perth County the ‘total forest area’ of all nine forest categories was 48,167 acres. The area covered by the categories 1-3 was about 38,285 acres an 80% reduction. This lesser area was used as the ‘deciduous forest area’. The estimated ‘public deciduous forested land area’ (1,235 acres) was subtracted from this and the result was the ‘privately-owned (p-o) deciduous forest land area’ (37,050 acres). The ‘deciduous forest harvest area (p-o)’ (4,271 acres) was divided by 37,050 acres to obtain percent of deciduous forest harvested, in this case 11.5%. In calculating the deciduous forest area for the MVCA the weighted average of Huron and Perth Counties was used. The deciduous forest area was not determined for the ABCA and the UTRCA. Percent mean annual harvest is underestimated for these areas.