SO, YOU OWN A WOODLOT

NOW WHAT?

BY

J. R. IRWIN

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Congratulations, you are one of the select few in Ontario that can lay claim to his own piece of forested real estate. But wait, ownership of anything implies some responsibilities. As ownership of a car or a house or livestock, even pets, brings with it ceratin obligations, so does owning a piece of forested land.

Most people who buy forested land, or even those who acquire it in conjunction with other land, have some expectations of it. These expectations can take the form of recreational use, aesthetics, wildlife appreciation, maple syrup, fuelwood or sawlog material and can include the generation of periodic or annual revenues.

FOREST MANAGEMENT

If even enough revenues are to be generated to pay the taxes, or even if firewood is to be utilized to reduce heating costs, then whether you realize it or not, you are practising forest management. "Forest Management" is "The application of business methods and technical forestry principles to the operation of a forest property". Surely a farmer in the business of farming, or a maple syrup producer in the business of producing maple products cannot ignore the fact that the woodlot is part of his business. In some cases, the woodlot can even be a financial drain on other aspects of the business. If one's expectation of forest land is simply to watch it grow, then forest management is being practised, and forest processes are at work, although the business may be in the red. Some owners are willing to accept this loss, and to accept whatever the resultant forest becomes, to accomplish their particular objectives.

SILVICS

Assuming that one decides not to disturb a forest property except perhaps to harvest a few dead trees, the owner can enjoy the forest in perpetuity. But can he? Forests are never static. A forest is a biological community on which natural forces are constantly acting. Trees are constantly being stressed by insects, diseases, drought, excesses of water, competition for;

moisure, nutrients, rooting space, and sunlight. When trees are young and on good sites, they are better able to withstand these stresses. As they age or, on poor sites, they are not.

Such subtle pressures also result in succession. Forests almost always tend to evolve from communities of light demanding species such as oak and ash to those more tolerant of shade such as maple and beech. The need or relative need for sunlight is part of the "silvics" of a species. "Silvics" is "the life history and general characteristics of forest trees and stands, with particular reference to environmentatl factors". Thus, a tree's shade tolerance, its seed frequency and germinative ability, its site requirements, its rooting characteristics, its growth rate and its geographic range are its silvics.

SILVICULTURE

In 1898 a French forester, de-Liocourt, discovered that if forests were left to their own devices, so-called "virgin" forests would eventually acheive a stable stand structure. This can be defined by a mathematical equation and can be graphed to illustate the stand structure. The most important factor of this mathematical wizardry is the "q" value which defines the mathematical curve which matches the stand structure. Thus, even those forest owners who do not do anything to their forests are allowing silvicultural principles to occur. "Silviculture" is "the art of producing and tending a forest; the application of the knowledge of silvics in the treatment of a forest; the theory and practice of controlling forest establishment, composition, and growth". In short, any of the natural forces acting on a forest change the characteristics of the forest even if man does nothing.

There exists a common misconception, that when the white man came to this province, there existed an unbroken forest canopy from Ottawa to Windsor. Nothing could be further from the truth. In fact, native populations commonly practised a form of silviculture by their clearing of land for agricultural purposes, game management, and villages, and by moving on to new areas and letting old clearings revert to forest. This partially explains the occurence of light demanding species such as oak and pine in today's woodlots.

It should also be realized by those who allow their woodlots to proceed to a mature, and essentially static state, that volume or "biomass" accumulation may be totally balanced by death and decay of both older trees, and those trees which are being crowded out by faster growing trees. These forests are poor accumulators of additional wood fibre; composed primarily of carbon dioxide and water, and therefore they contribute next to nothing in removing carbon dioxide from the air. In fact, where rot and decay, which are processes that remove oxygen from the air and release carbon dioxide, are excessive, the forest may be a drain on atmospheric oxygen supplies. Since forest ecosystems represent a balance of recycling natural elements, the only way to interrupt the balance is to remove one element. For example, to remove carbon dioxide from the ecosystem, one removes the component of the ecosystem which is largely made up of that element; wood fibre, and uses that component in a product that has a much longer life span than the tree from which it came. Such a use might be furniture or building components, but certainly not firewood.

For those forest owners who are willing to do nothing and accept the results, you have probably read as far as you want to. For those others, read on.

THE TREE

Now that you have trudged this far through the murk of theory and definition, let's take a good look at the woodlot. Aside from the obvious need to assess the species in the woodlot, one has to look at the needs of the individual trees. How does one tell the condition of a tree? Obviously, if one can see holes, defects, cankers, fungus or dead wood, one knows a tree is suffering. On the other hand, how does one recognize the most vigorous trees?

Work in Algonquin Park has determined that to be thrifty and vigorous a tree should have forty percent of its total height in live branches or "crown". Thus, a one hundred foot tall tree would have a sixty foot clear stem and forty feet of crown. Of course, for syrup production, a much deeper crown is acceptable, however, one must realize that much of the tree's production of wood will go into the branches and not on the stem. In addition, the tree should have a ratio of twenty to one in terms of the width of the crown to the width of the stem. A twenty foot wide crown is suited to a one foot diameter tree. Crown width has been found to be the factor most affecting sap and sugar production of maple trees. The crown shape should be egg-shaped, as a rounded or flat-topped crown indicates a tree that is aging or is in decline and crown position above, in, or below the general crown level of the stand is also important. An easy way to allow a tree sufficient space to develop this crown is to express its diameter in inches and multiply by two. Thus, a twelve inch tree, to maintain a twenty foot wide crown and to allow it some room to grow and expand, would require twenty-four feet of space.

And what about the stem? It must be realized that as a tree produces wood on the stem, it also produces bark. As the interior grows in size, the bark gets thicker and as it cannot stretch, it often splits into furrows or plates. If one has two sugar maple trees in a woodlot, both the same diameter, and one has very smooth bark and the other thick and platy with folded edges, chances are that the one with the rough bark can be twice as old as the other. This gives an indication of the relative growth rates and therefore their growth vigour and their potential to survive mechanical damage or other stresses.

Does the woodlot have any young trees in it? Many woodlots have a carpet of young seedlings. What many people do not realize is that these are constantly dying and being replaced by new ones. Unless given sunlight, they will stay static. Some young trees may begin to grow into an opening in the stand and if the opening closes again, their growth becomes negligible. Look at the terminal shoot, or the most recent year's growth. If is is less than a foot, or if the trees do not have a definite vertical shoot, or if the trees are beginning to grow out laterally rather than upward, your saplings are in trouble. They may be in a state known as "suppression" and if left long enough in this condition, they may be worthless even if they do grow into the stand. They are poor trees on which to invest your future capital.

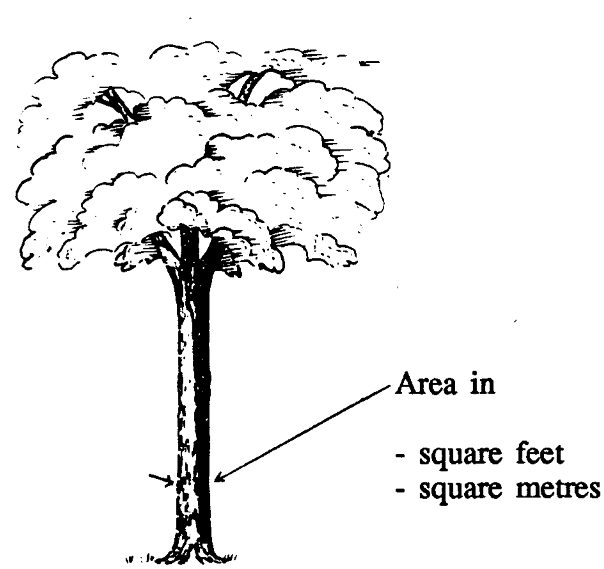
THE STAND

Once you have looked at the trees that make up the woodlot or the stand, with an idea for species, health, vigour and perhaps their numbers, look at the soil. The measure of a tree's suitability to a soil type is expressed as its "site index". This measures a tree's ability to grow to a specified height in a standard length of time, usually fifty years. Information is now available whereby using the soil characteristics such as texture; gravel, sand, loam, silt, clay and moisture regime; very dry, dry, fresh, moist, wet, the compatibility of a soil type and a tree species can be determined.

Assuming the right species are growing in the woodlot, the next factor that merits consideration is "basal area". "Basal Area" is "the area, usually expressed in square feet or square metres of the cross section at "breast height", 4.5 feet above the ground, of a single tree or of all the trees in a stand". See Figure #1. This factor is a measure of stocking, or the amount of the ground actually occupied by tree stems. For instance, a woodlot could have 100 trees per acre of 13.5 inches diameter for a basal area of 100 square feet per acre. Alternately, the same basal area could be made up of 50 trees of 19 inches in diameter.

FIGURE #1

BASAL AREA



Normally, basal area in a woodlot, depending on its history, could range from 50 to as high as 150 square feet. How does one know which is the optimum level, and of what sized trees?

Remember de-Liocourt? He is the forester that studied stand structure and the "q" value. Since 1898, many scientists have refined his stand structure concepts until now we know, among other things, that in a tolerant hardwood (sugar maple, beech, ash, basswood, cherry, hemlock) stand:

- a "q" value of 1.3 produces maximum production of sawlog growth, if a minimum of 70 square feet of basal area of sawlogs (9.6 inches dbh (diameter at breast height) and greater) is retained in the stand.

- If the sawlog component of the stand exceeds 90 square feet, "over-stocking" may result in tree death through crowding.

- If sawlog stocking falls to as low as 50 square feet, total stand growth will not be reduced, but sawlog production will be sacrificed to fuelwood or other fibre production.

- Total stand growth at 30, 50, and 70 square feet is almost identical, and when stocking exceeds 90 square feet, total growth is only slightly less.

From the above, we can see that total stand growth varies little over a wide range of stocking levels. Assuming that we choose to concentrate on sawlog growth, we know that the stand should be composed of those trees listed in Figure 2. A glance at the table will show that there is close to 70 square feet in trees 9.6 inches diameter and greater, which we know is what is required to obtain the most sawlog growth. This table is comparable to a "q" of 1.3, which we also know is what we want. When put on a graph, the stand appears as in Figure 3.

Gobledegook you say? True. However, if one looks at the trees per acre and from the previous discussion of multiplying the diameter in inches by a factor of two and adding up the areas required for each tree, one finds that this stand structure comes within 20 % of providing each tree with the space it requires, not allowing for overtopping of some of the smaller trees by some of the larger ones. If one accepts this 20 % overlap, then the requirements of the individual tree and of the stand seem to mesh pretty closely. Also, if one wishes to produce maple syrup from such a stand, assuming all the trees are maple, such a structure provides, at recommended tapping guidelines, 87 taps per acre. This is well within the recommendations for efficient sap production. The overall stocking level is also consistent with, or only slightly higher than the recommended stocking guides for a sugar bush.

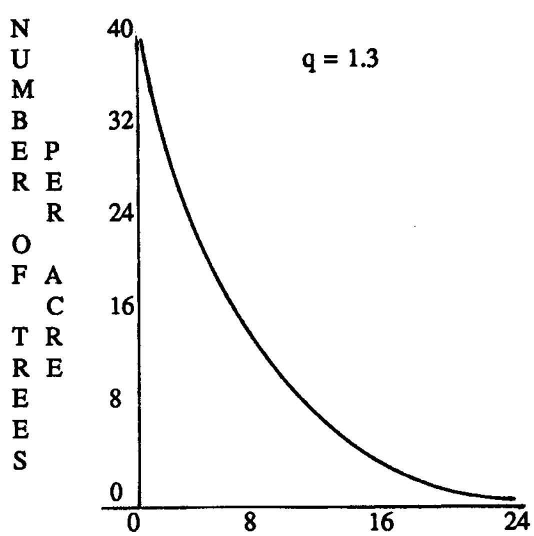
FIGURE #2

DESIRABLE STOCKING PER ACRE FOR GOOD CONTINUOUS GROWTH

Diameter at breast height (inches)	Desirable stand after cutting: Trees		Basal Area		Diameter at breast height (inches)	Desirable stand after cutting: Trees		Basal Area	
	Number		Square feet			Number		Square feet	
2	118)		2.6)		15	4)		4.9)	
3	53)	202	2.6)	8	16	4)		5.6)	
4	31)		2.7)		17	3)	17	4.7)	26*
					18	3)		5.3)	
5	21)		2.9)		19	3)		5.9)	
6	15)		2.9)						
7	12)	65	3.2)	16	20	2)		4.4)	
8	9)		3.1)		21	2)		4.8)	
9	8)		3.5)		22	2)	8	5.3)	20*
					23	1)		2.9)	
10	7)		3.8)		24	1)		3.1)	
11	6)		4.0)						
12	5)	28	3.9)	22*					
13	5)		4.6)		Total	320		92.0	68*
14	5)		5.3)						

FIGURE #3

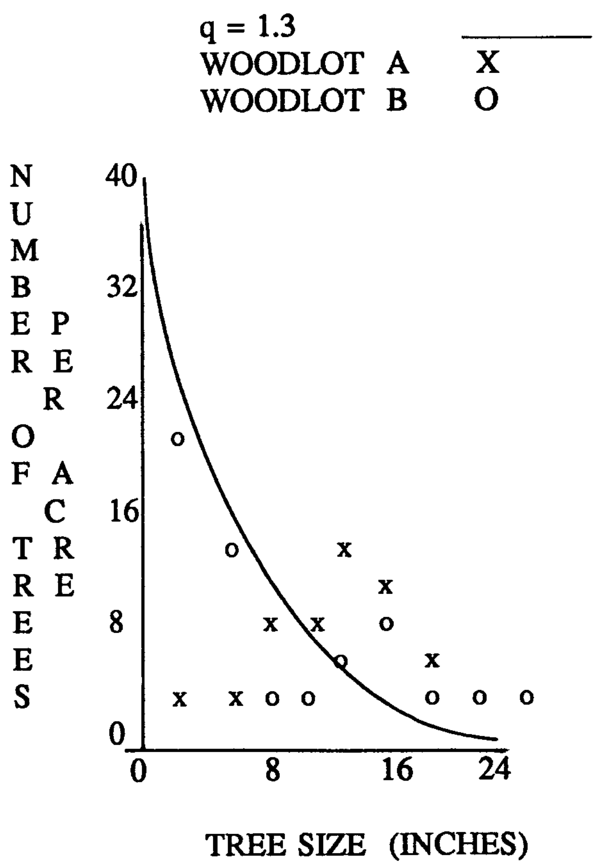
DESIRABLE STAND STRUCTURE



But how does a landowner know, in this detailed a form, what condition his woodlot is in? Actually, a landowner can very easily establish several sample plots, tenth acre plots are very handy, measure and tally the trees in those plots, calculate the basal areas of the trees and graph them over a standard such as the "q"=1.3 curve. See Figure #4. This will very quickly give him an indication of which sizes of trees are too numerous, too few, or if his woodlot is over or understocked. Re-measurement over a period of years can also show him the changes in the stand.

FIGURE #4

WOODLOT COMPARISON



Now we are ready to devise a "silvicultural system". A "Silvicultural system" is "the series of silvicultural operations whereby the woodlot owner intends to meet the silvicultural objectives for the stand; such as stand structure, in order to meet his management objectives; such as sawlog or sap production". If the current stand basal area is 130 square feet and most of the trees are greater than 18 inches in diameter, then in order to produce a stand with a certain desired structure, one has to carry out some silvicultural operation, likely involving some form of harvest cutting. This will reduce the stocking level, remove unhealthy or overmature trees, concentrate volume growth on the better stems, and allow for growth of younger trees. It also should be mentioned here that harvest cutting is not an end in itself. Removal of the most valuable trees for the top dollar is not necessarily good forest management. Harvest cutting as a silvicultural tool or as a management tool should only be used to accomplish a silvicultural objective for the stand itself. In other words, there should be some benefit to the stand as a result of the harvest cut and it should be carried out as part of the silvicultural system which is in use.

In actual practice, to bring a non-regulated stand into the desired structure may require several harvest cuts over a period of years. Once the desired structure is reached, periodic cutting will also be necessary to maintain the desired structure and to hold the stand within the desired stocking level, as the stand grows. Experience has shown that such a stand can produce in the range of 200 to 300 board feet per acre per year plus annually, about half a cord (128 cubic foot cord) of firewood. Landownders using this system have shown dollar returns, in a 1989 case, of about $80.00 per acre for sawlogs and additionally, $30.00 per acre of firewood on an annual basis. This compares favourably with other agricultural crops. Maple syrup can net an additional $5.00 per tap hole.

OPTIONS

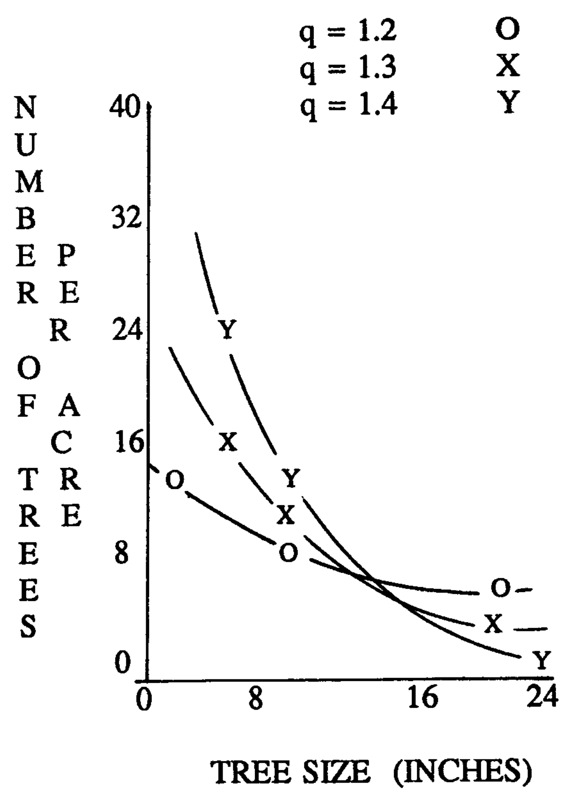
As with cars or houses, silvicultural systems have options. The "all - aged selection" silvicultural system which has been described here has many variations. On some sites, or for some management purposes, different "q" values can be chosen, different residual stocking levels can be used, or one may wish to choose a larger or smaller maximum tree size because of a different site index, or in order to take advantage of a different rate of return. Many of these variables have not been explored, particularly with regard to producing maple sap. For instance a "q" of 1.2 produces 95 taps per acre on 55 trees; a "q" of 1.3 produces 88 taps per acre on 56 trees; and a "q" of 1.4 produces 85 taps per acre on 58 trees. All of these variations take place at the same stocking level or basal area; however, looking at trees which are tapping size, the "q" of 1.2 produces the least crowded stand, the "q" of 1.4 the most crowded. This results because of differences in tree sizes and numbers. See Figure #5.

One must look at the investment in equipment per tap, the numbers of trees per acre one wants to invest in, the sap production per tap and the chracteristics of the trees grown in the stand to decide on the best option. From growth studies the lower "q" values, 1.3, produce optimum sawtimber growth. Higher "q" values, 1.4, produce a slightly reduced volume production and because of overcrowding, growth is offset by mortality of intermediate sized and smaller trees. Therefore if periodic revenues from wood sales, or wood production for fuel are a consideration for the woodlot business, stand growth must be considered a factor in selecting options.

Another consideration in choosing options is the presence of shade intolerant species such as oak, soft maple, or cherry. Maintaining these species may require more drastic stand disturbance such as choosing an even - aged silvicultural system. Under this option, the entire stand or parts of the stand may be cut and replaced with young trees or groups of trees of essentially the same age. These trees are then allowed to grow with full sunlight and no overtopping stand. In order to help species such as oak compete with other hardwood trees and shrubs, herbicides or prescribed fire, and planting of oak seedlings may be required.

FIGURE #5

STAND STRUCTURE COMPARISON



Whatever your expectations, your decisions should be the right ones for the woodlot and for the tree species. Acheive your management goals bearing in mind the silvics of the trees you have to deal with and try to devise a silvicultural system that will benefit yourself and the woodlot. After all, with ownership, comes responsibility.