BUILDING A CASE FOR SUSTAINABLE MANAGEMENT OF PRIVATE WOODLANDS

CASE STUDY: RUSS HORNING WOODLOT

What factors motivate private woodland owners to manage their woodlots sustainably? For some it is personal interest or stewardship ethic, while others may be more influenced by potential for economic returns.

This is one of several case studies profiling woodland owners who have not only demonstrated long-term stewardship of their forests, but have also documented financial returns over the years. The case studies have been undertaken, in part, to investigate if economic returns from woodlots can compare favourably with those from agriculture. Returns from these managed forests (mostly from timber sales but possibly including other activities such as production of maple syrup) have been compared to the income from agricultural crops on comparable land over the same period.

It is hoped these case studies will provide incentive for woodlot owners to manage their woodlots responsibly, either by demonstrating the potential for enhanced long-term financial returns or through the example of responsible stewardship provided by the woodland owners profiled in the case studies.

We appreciate the assistance of the woodland owners who have so generously shared their stories with us.

Part One: The Horning Woodlot Story

Russ Horning started learning about woodlot management pulling one end of a cross-cut saw when he was 12. He was big for his age and his father thought he could do a man's job on the other end of the saw.

His father used the bush as many other farmers did back then. A few trees would be selectively harvested to earn cash to pay taxes and other cash needs with the tops cut up to heat the house on the family farm near Arkwright in Bruce County.

"My father only cut trees if there was something wrong with them," he recalls, and he learned the lesson. The bush has never been cut to the diameter limit allowed by the county tree bylaw.

Because trees have only been cut selectively, there's a good undergrowth in the bush and the trees stretch up to the light, providing long, straight, branchless trunks that will make high-value timber.

Besides tree tops, his father would select ironwood trees or cull trees for use as firewood. He estimates 15-20 face cords a year were used for firewood in those days. Until 1955 they also made maple syrup using their own firewood to boil the sap.

Back in the early days it was the responsibility of the farmer to get the logs to the sawmill before he'd be paid. It meant only a few logs would be taken out in any one year. It also meant there was a steady supply of logs going to market, not the modern situation where there's a

major harvest one year, then nothing for another 10-15 years.

One year Horning remembers six loads of logs going to market. Back then stake trucks were used for hauling cattle in summer and logs in the winter and could only hold about 1,000 board feet worth of logs at a time. Another year he recalls 60-70 logs going to the mill. He thinks he's being conservative in saying 3,000 board feet per year went to market, a total of 60,000 board feet over the years.

The first major harvest of the Horning woodlot came in 1975 when 28,989 board feet of maple and 21,267 board feet of beech were taken out. Five years later a windstorm did some damage and another 1,400 board feet were salvaged from affected trees.

In 1990 he took advantage of the marking and marketing service offered by the Ministry of Natural Resources. The cut sent 48,900 board feet to market. When Horning looked at the bush after the cut, it struck him that too many of the larger trees had been removed. He feels it probably hurt the next cut in 2002 when 13,143 board feet were removed in a clean-up cut, estimating there could have been 25,000 board feet if more larger trees had been left 12 years earlier. With only 13,000 board feet, there wasn't as much competition from buyers as if there had been a larger cut, Horning says. In retrospect, he feels he trusted the expertise of the markers too much. He asked them to mark for the good of the bush and auction off the timber for him and didn't pay much attention until the cut was finished.

"I learned by the experience that when you're marking for the current cut, you're also marking for the cut you're going to make 10 or 15 years down the road," he says. "Don't thin your bush too much and you'll get better bids (from timber buyers). If you have a minimum 1,000 board feet per acre you'll get more competitive bids."

That 2002 cut was marked by a consultant and he and his son Jeff were along, asking questions about why each tree was chosen to be
marked. "We only looked for trees with defects," Horning says.
"We looked for damaged tops or trees that were past their best. We still have our good quality trees left."

"If you keep taking out the poorer trees you're improving your growing stock and over time will generate better trees," he says, comparing tree selection to breed improvement in livestock.

Adding it all up, the harvests over the years come to a total of 173,697 board feet of lumber, which averages 3047 board feet of lumber per year from the 16 acres of bush or 190 board feet per acre, per year. At $900 per thousand board feet, it means an average return of $171 per acre per year at today's values.

And that doesn't include income from firewood. Sale of firewood added $400 in 1975, $35 in 1980, $200 in 1981, $2,800 from tops in 1991 and $1,400 from tops in 1992 for a total of $4835. He also expected more income from the sale of firewood from the tops of trees harvested in 2002-2003 but the buyer hadn't finished the cut yet. With his average per acre return of $171, Horning argues that the woodlot gives a better return than most projects on the farm.

Horning's woodlot has a high percentage of hard maple while some woodlots have only soft maple, but even there, at $250 per thousand board feet you'd still get $47.50 per acre per year. "It will make you a good dollar for a minimum of input," he says.

Unlike the rest of the farm there are no expensive tools and machinery to buy, he says. "The biggest thing you need is knowledge. You have to know what you're looking at (when you look at your trees)."

The best way to gain that knowledge is to join your local woodlot association, Horning says. At association meetings you get to meet other woodlot owners and compare notes and you hear speakers who can bring you up to date on the latest information.

"To me that's the only way to go," he says of his decision to join the Grey-Bruce Woodlot Association. "It's been a real good thing for me. I've learned a lot. I wish they'd had it going 20 years ago."

Everybody who owns a woodlot should have a plan for it, he urges, even if it's only a one-line plan. Take a day and walk through your woodlot and see what you have there, he says. "You want to look 40-50 years ahead," he says in setting the goal you will manage toward. If you don't have any idea about how to manage your woodlot, join a good organization.

"Our bush is geared to produce top quality hardwood timber," he says of his own plan. The average woodlot, he says, has about five per cent of its logs that can be sold for veneer production. Veneer logs can bring a woodlot owner about three times as much as a log sold for lumber. It's quite possible through good management to increase the number of logs that qualify for veneer prices, he says. He expects his woodlot will have 15 or even 20 per cent of its logs in future going at veneer prices. "There a huge difference in dollar return because veneer is where the big dollars are."

Another simple thing woodlot owners can do to increase

their return is to get competitive bids. “It certainly pays to get bids in timber,” he says, pointing out there was $6,000 difference between the high and low bids on his recent sale. “The more bids you have the better. If you manage your woodlot well you’ll have higher quality and bigger volume making it more attractive to get bids.”

He also warns farmers against allowing companies to come in and take all trees above the minimum diameter specified in their county’s tree bylaw. “In my opinion, anyone who would cut healthy trees at minimum diameter is wasting money and wasting trees,” he says. “To cut a 19-inch tree is foolish. It’s putting on dollars in growth (every year), especially from 19-24 inches (in diameter). It’s going to make you seven to 10 per cent per year standing there and all you have to do is watch.”

He also advises woodlot owners not to let anyone harvest their bush in the spring until at least the end of June or the damage may be devastating to the bush. There’s a lot of damage to the floor of the bush when the ground is soft leaving deep ruts that will damage tree roots, he says. “I won’t let anyone in my bush after March,” he says. “I guess I’m fussy but that’s the way it is.” The winter is the best time to harvest, especially if there are a couple of feet of snow on the ground. The snow cushions the logging activities in the bush and the bark is tight on the trees during the winter, preventing excessive injuries to neighbouring trees from felling and skidding activities.

“I would encourage anybody, no matter how long they stay on the farm, to record anything you take out of your woodlot so it can be passed on, even if you only take out 50 cords of wood,” he says. “Over time a long-term record can be gained as to what is happening. Even if it’s a lump-sum sale of $20,000, write it down so somebody has some idea of what woodlots are worth.” After all, he reasons, people record bushels of corn from acres but wood has a greater value and a value that continues to increase.

The woodlot has been in the Horning family since 1885 and with Jeff living on Russ’s old farm nearby and taking an interest in the bush, Russ is hopeful the family tradition will be continued. Jeff has been attending woodlot association meetings and learning more about managing trees.

“He’s taking an interest in it which I’m really pleased to see,” Russ says. “He’s realizing the value of this stuff.” Russ wants to know that the bush will be productive for Jeff and possibly for his grandchildren to come. “I don’t know if I’ll be around to see another cut,” he says of his bush, “but if I’m not, I’m leaving a good stand of trees for the next generation.”

Russ Horning in his farm woodlot

Is This Forest Being Managed in a Sustainable Way?

It is reasonable to ask if the forests profiled in these case studies are being managed sustainably, or if the growing stock may have been sacrificed in the interest of short term economic gain. In an effort to answer this question an inventory was carried out in several of the case study sites and the data compared to the recommended stand structure diagram for tolerant hardwoods in Site region 6E (which includes much of the area where these case studies are located). The stand structure diagram (see "Recommended" curve in Figure 1) represents the ideal size class distribution in an all age forest being managed under a single tree selection system, as is recommended for upland tolerant hardwood forests such as the one represented in this case study. The "y" axis represents the number of trees per unit of area, while the "x" axis represents the diameter at breast height (dbh) of the trees. The resulting curve, often referred to as a "Reverse J" curve, is representative of trees found in a well managed stand, i.e. many trees in the smaller size classes and progressively fewer as size increases. When the stand structure of the Horning woodlot is compared to the recommended distribution there are some minor differences (i.e. a deficit of trees from 10 to 25cm and a surplus from 30 to 50 cm), but on the whole the Horning structure compares quite favourably with that recommended, allowing us to conclude that the forest is in a reasonably good state of management.

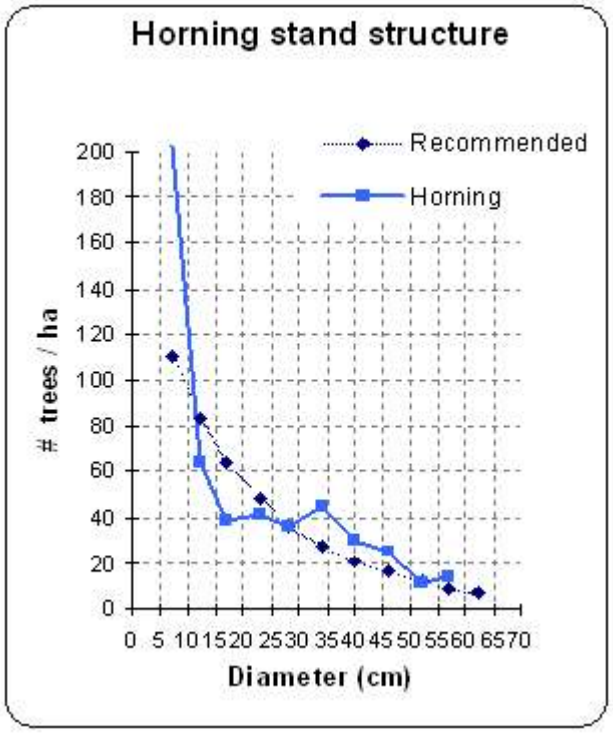

Figure 1

Part Two:
Economic Comparison of Woodlot and Crop Production for the Horning Case Study

The objective of this economic analysis was to compare historical returns from the Horning woodlot to that from agricultural crops on comparable land over the same period. In order to make the comparison, a crop rotation was selected that would have likely been used in this area (see Crop Production Model description). Using historical returns for these crops a Net Present Value (NPV) calculation was used to estimate the returns in 2003 dollars (see Net Present Value description). The NPV of returns from woodlots and the crop production model are listed in Table 1.

Economic information for the woodlot was obtained through a personal interview with the landowner. Actual revenue and costs were collected for each forest operation for which data was available (In the Horning case this stretched back to 1975). Profits (or margin) were determined (revenue minus costs), then a Net Present Value calculation was used to estimate a 2004 value for returns from the woodlots.

The NPV of returns were then calculated on a per acre basis and summed over the time period since 1975 in order to compare returns from the woodlots to that from agricultural land.

Net Present Value
Typically sales from agricultural crops are made on an annual basis, while sales from woodlots are made only periodically. In order to compare them in a way that is economically valid, a Net Present Value (NPV) calculation is done to estimate the value sales would have at a future date (for this case study 2004 was used). The NPV calculation assumes that the profit (or margin) from sales is invested and compounded (i.e. the interest is added to the total investment annually) until the date that is to be used for the comparison. A 5% return was felt to be most realistic and is reflected in most of the tables, however calculations for 7.5% and 10% were also used and are mentioned periodically as well.

The Horning Farm
Background information on the farm and forest is found in Table 2. There are 16 acres of upland hardwood woodlot on a 100 acre farm in Bruce County. The balance of the farm was previously farmed by Mr. Horning, and is currently rented for grain and hay production (less areas ocuppied by the farm buildings and a small forested wetland. There have been three harvests in the 16 acre woodlot between 1975 and 2004.

Crop Production Model
Representative crop models were developed by region for typical crop rotations in Ontario using corn, soybeans & wheat. The representative farm model was based on crop enterprise budgets developed by the Ontario government, which reflect industry average costs and returns. Both variable and fixed costs were used in the calculations. Although fixed costs do not change with changes in acreage, overall fixed costs, including depreciation, must be covered to maintain long-term profitability. (Fixed costs do not include land rent or interest on land.)

Historic crop enterprise budgets were not readily available for all the required years. For the years that data was not available, values were estimated by averaging the total costs. To accommodate changes in reporting of crop enterprise budgets over the years, estimates using linear trends and averages based on the available historic numbers were determined.

Crop yields and prices are cyclical in nature, so the order of the crop rotation would have an impact on the end results The crop model was evaluated assuming the rotation planted 1/3 to corn, 1/3 to soybean and 1/3 to wheat annually. The present value of the rotation was used for the purpose of comparison with the woodlot per acre revenue.

Comparison of Returns

The economic analysis indicates the Horning woodlot has generated a total (in present value terms) of $60,701 in revenue from timber sales, while costs were $675, resulting in a margin of $60,026. The Horning woodlot is 16 acres in size, so the total earnings were $3,752/acre. The woodlot also generated $686/acre in fuel wood sales since 1975 (values in 2004 dollars calculated at a 5% compound rate).

Following analysis of all sources of income from the Horning woodlot, the total earnings were determined on a per acre basis over the last 30 years (1975-2004). Table 1 illustrates that the Horning woodlot has generated between $4,437 and $9,409 revenue per acre from combined fuelwood and timber sales, depending on the compound rate applied. The agriculture rotation generated between $3,177 and $7,156 per acre.

Summary

The results of this analysis indicate that the Horning woodlot was able to generate substantially more revenue per acre from 1975-2004 than a typical crop rotation of corn, soybeans and wheat in western Ontario. At the various compound rates
the difference between woodlot management timber sales (including fuelwood sales) and crop rotation ranged from $1,260 (40% higher for woodlot) to $3,664 (51% higher for woodlot) more in profit per acre. See the tables below for a summary of the data.

This analysis does not attempt to place a monetary value on the many other woodlot benefits such as site protection, contributions to water quality or groundwater recharge, opportunities for recreational use, etc. It is typically more difficult to place a dollar value on these benefits, although in some locations landowners are charging for access or leasing hunting and fishing rights.

Table 1: Summary All Sources of Income (1975 - 2004) From the Horning Woodlot (Present Value, $/acre)

Source of Income	5%	7.5%	10%
Timber Sales	$ 3,752	$ 5,799	$ 9,409
Fuelwood Sales	$ 686	$ 972	$ 1,412
Woodlot Total	**$ 4,437**	**$ 6,771**	**$ 10,820**
Average Crop Rotation	$ 3,177	$ 4,712	$ 7,156
Difference	**$ 1,260**	**$ 2,059**	**$ 3,664**

Note: columns may not sum correctly due to rounding

Table 2: The Horning Farm Land Use and Forest Description

Land use	Description	Hectares (acres)
Forest	Sugar maple 90%, Black cherry 5%, minor components of white ash, red oak, beech and white pine; rolling terrain with large central drumlin – sandy loam to loam soils	6.5 (16)
Agriculture	Including farmstead, and small wetland	34.5 (84)

Table 3: Present Value of Corn, Soybeans and Wheat Rotation (at 5% rate) *(i)*

Year of Harvest	Actual Revenue/Acre	Actual Cost/Acre	Present Value Revenue/Acre	Present Value Costs/Acre	Margin/Acre
1975	169.58	150.84	698.03	620.86	77.16
1976	147.91	150.84	579.84	591.30	-11.46
1977	175.18	153.86	654.04	574.44	79.60
1978	187.82	156.95	667.82	558.05	109.77
1979	228.78	162.85	774.74	551.46	223.28
1980	281.23	169.27	907.00	545.92	361.08
1981	243.06	183.77	746.57	564.46	182.11
1982	218.76	202.77	639.93	593.16	46.77
1983	292.75	201.11	815.59	560.27	255.32
1984	269.18	211.98	714.22	562.45	151.77
1985	249.87	220.01	631.41	555.97	75.44
1986	200.38	213.42	482.24	513.62	-31.39
1987	284.95	208.84	653.12	478.66	174.46
1988	258.38	203.48	564.00	444.17	119.83
1989	232.78	229.67	483.94	477.46	6.48
1990	240.71	209.62	476.58	415.04	61.54
1991	253.37	204.77	477.76	386.13	91.64
1992	209.88	214.90	376.91	385.93	-9.02
1993	279.24	225.03	477.59	384.87	92.72
1994	298.29	228.72	485.88	372.55	113.33
1995	441.91	232.41	685.54	360.54	325.00
1996	336.96	239.27	497.84	353.51	144.33
1997	335.07	246.14	471.47	346.34	125.13
1998	281.81	253.17	377.66	339.27	38.39
1999	310.32	243.24	396.06	310.44	85.62
2000	267.51	254.03	325.16	308.77	16.39
2001	266.82	256.12	308.88	296.49	12.39
2002	373.50	251.46	411.78	277.23	134.55
2003	367.24	270.33	385.60	283.85	101.75
2004	313.86	291.00	313.86	291.00	22.86
Total					**$ 3,176.86**

Note: columns may not sum correctly due to rounding

(i) Using data from the historical crop enterprise budgets it was possible to calculate the total revenue and costs per acre for each of the harvest years of the crop rotation. The crop rotation assumes that the corn, soybean and wheat rotation is based in western Ontario and uses values from that area. Using the 5%, 7.5% and 10% compound rate, the NPV revenue and costs per acre were determined for each crop rotation. The present value costs were subtracted from revenue to determine the NPV margin per acre. As identified in the table above, the total margin for the crop rotation over the 30 year time period from 1975 to 2004 (expressed in 2004 dollars, using a compound interest rate of 5%) was $3,177 per acre. For 7.5% and 10% compound rates, net present values were $4,712 and $7,156 per acre respectively.

Table 4: Present Value of Timber Sales (at 5% rate) (16 acre - woodlot)

Year of Harvest	Volume Harvested (fbm) *(ii)*	Actual Revenue	Actual Costs *(iii)*	Present Value of Revenue	Present Value of Costs	Present Value of Margin	Present Value Margin/Acre
1975	50,254	5,837	0	24,026	0	24,026	1,502
1980	1,400	310	70	1,000	226	774	48
1990	48,900	11,200	0	22,175	0	22,175	1,386
2004	13,143	13,500	449	13,500	449	13,051	816
Total (1975 -2004)	113,697			**$ 60,701**	**$ 675**	**$ 60,026**	**$ 3,752**

Note: columns may not sum correctly due to rounding

(ii) (fbm) foot board measure (board feet)

(iii) All harvests were completed by a logger, therefore Mr. Horning did not incur harvesting costs. In addition, no costs were incurred for marking and planning the 1990 harvest, as it was done at no cost through Ministry of Natural Resources programs.

Table 5: Present Value of Fuel Wood Sales (at 5% rate) (16 acre - woodlot)

Year of Harvest	Volume Harvested (face cords)	Actual Revenue	Actual Costs	Present Value of Revenue	Present Value of Costs	Present Value of Margin	Present Value Margin/Acre
1975	?	400	0	1,646	0	1,646	103
1980	?	35	0	113	0	112	7
1989	?	200	0	416	0	416	26
1991	70	2,800	0	5,280	0	5,280	330
1992	36	1,400	0	2,514	0	2,514	157
2004	?	1,000	0	1,000	0	1,000	63
Total				**$ 10,969**	**$ 0**	**$ 10,969**	**$ 686**

Note: columns may not sum correctly due to rounding

Acknowledgments:
Part One written by Keith Roulston. Economic analysis carried out by Cher Brethour of the George Morris Centre. Financial and /or in-kind support provided by Huron Stewardship Council, George Morris Centre, Huron Perth Chapter of the Ontario Woodlot Association, Maitland Watershed Partnership Initiative, Ontario Ministry of Natural Resources and Ontario Stewardship Opportunity Fund.

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