

SELLING YOUR TIMBER

J.R. IRWIN

**The "Coveralls" Series:
Real Answers to Real Questions**

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SELLING YOUR TIMBER

Removing timber from your forest can be an end in itself, or it can be the means to an end. Forests provide multiple benefits, regardless of what the owner's management objectives are. The important thing is that the forest be managed sustainably so that it can continue to provide all those benefits for the foreseeable future.

The focus of this workbook is the harvest of timber. This focus has allowed for only minimal consideration of management issues related to recreation, aesthetics, and ecology. This should not be interpreted to mean that these issues are less important, nor should it be assumed that the connections are weak. It means only that this booklet is meant to help people who have already set objectives and taken inventory, and created a plan for achieving their forest management objectives.

It is suggested that before you decide whether or not to harvest timber, you consider carefully what your priorities and long-term objectives are, and research, or have a consultant plan out, the best methods to achieve your goals. Keep in mind that the primary purpose of a timber thinning or harvest is to improve conditions in the remaining forest. You may find that you wish to modify a planned timber harvest to preserve a treasured area for recreation, or you may find that a timber harvest is the most effective way to move toward a desired ecological state in the forest where a harvest had not previously been considered.

This booklet can help you get the most out of your timber harvest: financially, ecologically, or for any objective. Other information sources should be consulted for the inventory and planning process.

HIRING A CONSULTANT _____

If contemplating the hiring of a consultant, consider:

 **Qualifications.** Forestry people are either foresters, who have a bachelors or masters degree in forestry from a university, or a forest technician who has a diploma from a community college. Foresters may further be associated with the Ontario Professional Foresters Association and use the initials R.P.F., or Registered Professional Forester. Often people label themselves as foresters when they work in forestry related jobs. Be comfortable asking for a Resume or Curriculum Vitae which lists the person's qualifications and experience. Ask if the staff who work for him or her are also qualified foresters or technicians.

 **Method of Payment.** Some consultants work on an hourly rate. Others work for a percentage of the sale price. It will sometimes be said that a consultant might be receiving a percentage from the timber buyer or mill who purchases the wood. Ask enough questions of a prospective consultant to reassure yourself that he represents your interests.

 **References.** Ask for references or a list of previous clients.

PREPARING A MANAGEMENT PLAN _____

The objective of having a management plan for a forest is to set out long term objectives for the forest, and to set out how these will be achieved.



An important part of this planning process is to identify objectives for various forest values or uses such as:

- timber production and income generation;
- wildlife habitat;
- recreation;
- aesthetics;
- sanctuary;
- water quality;
- protection of soils from erosion and compaction.

An essential part of the planning process is to integrate these objectives so that they complement each other rather than conflict or preclude one another.

SILVICULTURAL SYSTEMS

Based on the objectives and features of the forest, a silvicultural system is chosen. A silvicultural system must be tailored to the species present in the forest, and adapted to the particular forest site. While a silvicultural system is a method of controlling forest regeneration, growth, and composition, it must be tailored to accomplish the particular landowner's objectives. Some examples of silvicultural systems are:

A. All-aged management systems:

The most common all-aged system is the selection system. This system removes individual trees or groups of trees at regular intervals of 10 to 20 years, to create a stand structure with many ages or sizes of trees present at the same time. An idealized stand structure model guides the management of the forest by suggesting ideal numbers of trees in each size category.

It is important with this system to:



Control residual stocking or stand density.

- to control the quality and type of regeneration (seedlings are preferred over sprouts)
- to maintain optimum rate of growth
- to maximize dollar return
- to maintain the harvest schedule.



Maintain or improve tree quality through successive harvests.



Maintain species composition

This system is best suited to trees that will grow in partially shaded conditions, such as sugar maple or beech.

B. Even-aged management systems

- uniform shelterwood;
- group shelterwood;
- clear-cutting with standards;
- clear-cutting.

A shelterwood means that a new stand is established under the shelter of the old one. Clear-cutting involves removal of the mature stand in one harvest. In even-aged management, the stand is grown to maturity and replaced in one or a series of harvests within a specific time period. Even-aged management is suited for species that require full sunlight to regenerate. Establishing a new stand may be done by natural seeding or planting, often before the mature stand is removed. Shelterwood cutting is most often used for such species as oak, soft maple and white pine. Clear-cutting is used in northern Ontario for jack pine, black spruce and poplar.



Before selecting even-aged management to maintain such species as oak, an evaluation of the site should be carried out to determine if maintaining this species is feasible, and what difficulties may be encountered. Regeneration success with oak and other trees intolerant, or only moderately tolerant of shade, varies considerably from one site to another.

NOTE: CONIFER PLANTATIONS. When harvesting pine plantations, the stump must be treated with a fungicide such as borax within 15 minutes of cutting down the tree. This prevents the infection of the stump with *Fomes annosus* root rot which would grow through the cut stump and infect healthy trees via intertwined roots.

FOREST PROTECTION

The following are important to forest and ecosystem health:

- den trees and snags (standing dead trees) for wildlife (pg. 24);
- mast trees (providing wildlife food) such as oak and beech;
- protecting nests of hawks and owls (pg. 25);
- protecting streams and stream banks.

TIMING OF OPERATIONS

The best time to log is in late summer, fall, or winter.

- **Spring break-up:** In March and early April, soils are soft and easily damaged, causing erosion and compaction.
- **Spring and early summer:** Trees are adding diameter growth and bark is easily sloughed off by equipment, permanently damaging the value of the tree and allowing entry of disease. Birds are nesting and should be allowed to raise their young without disruption.

CONDUCT OF LOGGING OPERATIONS

Planning of forestry operations should involve the buyer and the landowner or his agent discussing:

- access to the woodlot and agricultural crop damage;
- location of skidways (log piles) and truck access;
- location of property lines;
- damage to fences;
- protection of roads, culverts;
- damage to sensitive areas such as steep slopes, floodplains and streams;
- municipal tree cutting by-law.

EQUIPMENT AND DAMAGE TO TREES AND SOILS

Many people have reservations about the use of wheeled skidders. Skidders are like hammers, they can be a tool or a weapon.

Logging damage can be reduced by:

- directional felling - felling trees so the butt end is pointed at the skid trail and the log does not have to swing around to be removed;
- felling trees so as to avoid trees which are to be left uncut;
- winching logs to the skid trail instead of backing the skidder to each log;

NOTE: Grapple skidders, those with a mechanical grasping tool rather than cables, should not be used in selection harvests as they require the machine to back up to each log. These machines were designed for use in northern Ontario in conjunction with mechanical harvesters.

- skid trails laid out to reduce damage to hills and to avoid areas of young trees and areas not to be cut;
- swing or bumper trees left on skid trails - trees left on trail corners to absorb skidding damage and protect other trees. These bumper trees are removed last;



- NOT skidding trees with tops attached;
- NOT removing firewood by skidding full tops;
- NOT skidding the full tree length. Tree stems should be cut into lengths not exceeding 25 feet or 8 metres. Skidding longer lengths will increase skidding damage. Skidding short lengths will sometimes result in the log wedging sideways behind the skidder and damaging residual trees;
- using floatation tires. NOTE that this can also be a disadvantage if these tires make the skidder exceptionally wide. Similarly, chains can cause damage to trees along skid trails.

NOTE: In order to not introduce exotic weed species (such as garlic mustard or buckthorn) into your woodlot, it is imperative that the equipment be washed down before it leaves the woodlot previous to yours, and washed down before it leaves your woodlot.

It has been suggested that lopping of slash; cutting up tops so that they are not more than 3 ft. high above the ground, is desirable. This operation, while perhaps improving aesthetics, is generally not reasonable economically. There are benefits to leaving tops on site, whether whole or lopped, i.e. for nutrient cycling. Considerably more nutrients are retained in the leaves and twigs of trees than in the main stem.

TREE CUTTING BYLAWS

There may be a tree cutting bylaw within your municipality which:

- sets out the size of trees which can be legally harvested;
- sets out which species can be legally harvested;
- requires you to notify the county or region when you intend to harvest;
- requires information on trees to be removed and left, and some stocking or density measurements.

Contact your local municipal clerk's office.

TREE MARKING

It is wise to have the trees marked prior to cutting, if for no other reason than to make sure the companies interested in the wood are bidding on the same volume of wood. Trees should be marked at eye level and at the base to ensure only marked trees are harvested. Some paint, on the base of the tree, should be evident on each stump after harvest.

Marking is a crucial step as it is the way that your silvicultural system is implemented, and the way to ensure your objectives are achieved.

NOTE: Make sure during a harvest that additional trees are not marked by unscrupulous loggers. Know how many trees have been marked for sale.

VOLUME ESTIMATION

It is desirable, though not necessary, to know what volume you are selling. Providing the trees are marked, and all buyers are bidding on the same trees, each buyer will be calculating the volume he/she will get out of the trees. Each mill also has different wood quality requirements and therefore each company will be evaluating the trees with different end uses and markets in mind. However, there are several volume estimation methods that are normally used in the field. These are attached as an appendix on pages 35-39.

The Ontario Rule is used by the Ontario government and is based on tree volumes typical for Ontario. This rule is based on a form class 79, which means that the diameter inside the bark, at the small end of the first 16 foot log, is 79% of the diameter outside the bark at chest height. The Doyle rule is generally used by the logging industry and this rule attributes lower volumes to small logs, and higher volumes to larger logs.



METHOD OF PAYMENT

When dealing with volume estimation, also consider method of payment.

A "***lump sum***" sale happens when the buyer names one price for the trees marked, whether logs, firewood, or both. In this sale method, the buyer assumes the risk that the volume will be there when the tree is cut. It is also to his advantage to use as much of the stem as possible to create a "volume over-run". A deposit, for instance, 25% can be paid when the contract is signed, but payment should be made in full before logging commences.

A "***scaled volume***" sale sets the price according to the volume and grade of the logs on the landing or at the mill. In this arrangement, the landowner assumes or hopes that the trees will produce high grade logs which will fetch the high price. He also must trust the logger or the mill that he will get a fair measurement or "scale". A scaled volume sale normally requires a deposit, and final payment after cutting.

INCOME REPORTING

Revenue Canada has determined that:

Where a farm includes a woodlot from which the income usually is minor in relation to the income from other farming operations:

- (a) proceeds from the sale of logs, lumber, poles, firewood or Christmas trees are income from farming.
- (b) amounts received (whether in lump sum or on a stumpage basis) for permitting other persons to remove standing trees from the woodlot are considered to be on account of capital.

- (c) an allowance for depletion of the woodlot may be claimed with the rules in Schedule VI of the Income Tax Act.

Check Interpretation Bulletin IT-373R from Revenue Canada.

CHOOSING A LOGGER

Wood can be advertised in a local newspaper or in a provincial newsletter, the Forest Marketing Bulletin published by the Ontario Forestry Association. Often loggers advertise their services, or will knock on doors. Local mills can be contacted, who will send out a buyer to inspect the woodlot. Contact local forestry consultants or contact municipal tree inspectors through the municipal clerk's office.



ALWAYS GET MORE THAN ONE BID!! Two as a minimum. Three bids are better.



Talk to your local Ministry of Natural Resources, and your neighbours.



Ask for names of landowners where the logger has worked before.

THE TIMBER SALE AGREEMENT

Consideration should be given to preparing a contract, with the aid of a lawyer, which sets out the terms and conditions of the sale. The following are some of the aspects of the sale that should be addressed in the agreement.



REALIZE THAT A CONTRACT PREPARED BY A TIMBER BUYER MAY BE PRIMARILY TO PROTECT THE LOGGER, NOT THE LANDOWNER.

Have a written contract which includes the following:

1. Payment

- Sale by lump-sum for all marked material (preferred method as opposed to a scaled volume).
- Payments in full at the time the contract is signed or before cutting begins.

2. Specify What Trees and Products are Being Sold

- Trees marked by private consultant?
- Know your local tree cutting by-laws: An operator may try to convince you that additional trees should be cut to the by-law. The municipal by-laws are only a means of retaining minimum growing stock and are not a management or silvicultural system.
- Are you selling the tops and standing firewood with the logs?

3. Damage to Remaining Trees

- A substantial liquidated damage clause should be included for cutting or damage to unmarked trees.

Logging "skid" trails can be used in such a way that marked trees are left along the trail to prevent damage to remaining trees. These trees may be scarred or damaged, and are removed last, leaving the remaining trees undamaged. In hardwood woodlots, the logger should not be allowed to skid full tree material; the tops at least should be lopped off. More logging damage is caused by skidding tops than skidding logs.

4. Precaution Against Fire

5. Damage to Fences, Roads, Culverts, Ditches, Drains

- You may want to request a certified cheque as a damage deposit which can be returned after the harvest.

6. Assignment of Contract

- Who is going to do the actual cutting and skidding?

7. Expiry Date

- Under No Circumstances, should you enter into an open-ended contract with no termination date.

8. Inspection of Logging Operations

- If possible, plan to be on the property during the harvest period to protect your interests.

9. Access to Woodlot and Location of Log Piles for Truck Access

- Maps and written instructions.

10. Arbitrator Clause

- Should there be a disagreement arising out of the contract or the logging operation.

In Addition:

- Establish and mark clearly your property boundaries before considering a harvest;
- Have trees felled and all operations conducted within your property boundaries, ie. don't trespass;
- Notify your neighbouring property owners of your intentions to harvest your woodlot;
- Have an agreement or understanding with your neighbours before cutting begins.



TAKE THIS SAMPLE SALE AGREEMENT AND DISCUSS IT WITH YOUR LAWYER BEFORE SIGNING ANY CONTRACT WITH A WOOD BUYER.

SAMPLE TIMBER SALE AGREEMENT

This contract entered into this ____ day of ____, 19__ between:

(seller) _____ of (address) _____

_____ hereinafter called the Seller,

and (purchaser) _____ of (address) _____

_____ hereinafter called the Purchaser.

Whereas the Seller desires to sell certain designated trees standing and lying on a tract of land owned by him or her located:

Lot(s) _____ Concession(s) _____

Township _____ Area in Acres _____ Hectares _____

County or Regional Municipality _____

Now, therefore, this contract witnesseth:

I. The Seller agrees to sell and the Purchaser agrees to buy:

1. all sawlog trees marked prior to sale, with a yellow dot at eye level and at the ground:

Species: _____ Number of trees: _____

Species: _____ Number of trees: _____

etc.

2. all fuelwood trees marked prior to sale, with a yellow slash at eye level and at the ground,

3. all tops of sawlog trees,

on the above tract of land for a total sum of \$ ____: \$ ____ payable by cash or certified cheque at the time of signing of this contract, \$ ____ payable by cash or certified cheque within ____ calendar days of the signing of this contract or prior to the commencement of logging operations whichever comes first.

Selling Your Timber

Title to the felled trees shall pass to the Purchaser upon removal of the felled trees within the time provided for in subparagraph III (b). Notwithstanding the ownership of the felled trees, the Purchaser shall assume the risk of theft or destruction of the felled logs immediately upon the felling and cutting or bucking of the trees.

II. The Seller further agrees:

- a. To guarantee title to the forest products covered by this contract and to defend it against all claims at his/her expense.
- b. To ensure property or woodlot boundaries are clearly defined or marked prior to the commencement of cutting.
- c. The spouse of the Seller releases his/her interest in the timber to the Purchaser.
- d. The mortgagee of the lands consents to the sale and removal of the timber.
- e. That the Purchaser and his employees are hereby granted a licence to enter onto the property of the Seller with necessary vehicles and equipment for the purpose of exercising the rights and carrying out the obligations of the Purchaser under this agreement (until date set out in Section III b).
- f. The Purchaser shall have access to the trees by the following route, and the Purchaser shall be responsible for any costs associated with making the route accessible for the required machinery and equipment:

- g. The Purchaser will be allowed space for the purpose of bucking logs and loading trucks at the following location(s):



III. The Purchaser further agrees:

- a. To notify the Seller by telephone, or in writing, 72 hours before the commencement of logging operations.
- b. The trees and forest products sold herein shall be felled and removed from the property on or before the _____ day of _____ 19__, and that after this date all rights conferred upon the Purchaser to remove trees, cut or standing, from the lands, terminate and thereafter the Seller may dispose of any trees, cut or standing, remaining on the lands, as the seller sees fit.
- c. To cut trees in such a manner as to leave evidence of butt marking.
- d. To fell and remove the marked trees in such a manner as will minimize damage to the unmarked trees and young growth and other trees not designated for cutting. All trees and logs will be skidded in lengths not exceeding 25 feet (8 metres) and whole tops will not be skidded. Any severed or partially severed trees, or trees hung up in standing trees, will be pulled to the ground daily.
- e. To pay to the Seller as liquidation of damages and not as penalty the following amounts for each tree felled or unnecessarily damaged that is not marked for sale: \$ _____, for trees with stump diameters less than 12 inches (30 cm.), \$ _____, for trees with stump diameters 12 inches (30 cm.) or greater, such trees to remain the property of the Seller.
- f. In plantations, to treat all exposed wood on conifer stumps as directed, within 15 minutes of felling the tree, with a fungicide appropriate to controlling root infection.

- g. To restore to their condition prior to the commencement of this agreement, all roads, trails, fences, culverts, bridges, drains, utilities or other structures or improvements damaged during logging operations carried out by the Purchaser on the Seller's property.
- h. That if any of the timber is lost through theft, or destroyed or devalued in any way, however caused, such losses shall be borne entirely by the Purchaser.
- i. Not to assign this contract to a third party, in whole or in part, or employee subcontractors, without the written consent of the Seller. Subcontractors are to be governed by a subsequent sale agreement.
- j. To take all necessary steps to prevent and to suppress any forest fire on the sale area.
- k. That no garbage or litter will be left on the property during or after the operation.
- l. To wash logging equipment prior to entry onto the land of the Seller, so as to remove seeds and parts of plants that may be foreign to the woodland of the Seller, and to wash equipment again before removing it from the lands of the Seller.
- m. To indemnify and save harmless the Seller from and against all claims, demands, loss, costs, damages, actions, suits or other proceedings by whomsoever made, brought or prosecuted for any damage or injury to persons or property occasioned in the carrying on of the operations of the Purchaser under this agreement or by any neglect, misfeasance, or nonfeasance on the Purchaser's part or on the part of persons employed by him/her or under his/her control.



- n. That the Seller is released from any and all claims for injury or damage to property, however caused, which may be sustained by the Purchaser or his employees while carrying out operations under this agreement.
- o. To comply with any applicable municipal, provincial or federal statutes or regulations, and at his own expense to obtain all permits from public authorities, relating to the carrying out of the obligations of the Purchaser under this agreement.
- p. To comply with all the requirements of the *Worker's Compensation Act*, the *Occupational Health and Safety Act*, and all other applicable acts.
- q. To carry adequate personal liability (\$1,000,000 minimum) and property damage insurance that protects the Seller, the Purchaser, the Purchaser's employees and the Purchaser's equipment against any claim arising out of any act or omission of the Purchaser, any employee of the Purchaser, or any of them, in performance or intended performance of this contract. On the request of the Seller, the Purchaser shall provide written proof of such insurance prior to the commencement of work on the Seller's lands.

The Seller and Purchaser further agree:

- a. If trees or logs are taken to a neighbouring property that the terms of this agreement still apply.
- b. The Seller or his agent may make periodic inspections of the cutting operations and order the immediate cessation of all work if any of the conditions of this agreement are being breached.
- c. That upon the request of the Seller, or of the Purchaser, logging operations may be ceased during prolonged wet periods, in order to lessen damage to the site. In the event of such a cessation, the expiry date of this agreement, with

mutual agreement, shall be extended for a period of time equal to the time lost due to such delay.

- d. All modifications of this contract will be in writing, dated, signed and witnessed and will be attached to this contract.
- e. In case of dispute as to the meaning of any of the provisions of this agreement, the Seller and the Purchaser agree to submit such dispute to arbitration in accordance with the *Arbitration Act*. Each contracting party will select one arbitrator and two arbitrators selected shall select a third arbitrator, and the decision of the arbitrators shall be final.

In witness whereof the parties hereto have executed this agreement. Signed in duplicate this ___ day of ____, 19 ____.

Witnesses:

_____ (Purchaser) _____
 (Address) _____ (Address) _____
 Phone, Fax. _____

_____ (Seller) _____
 (Address) _____ (Address) _____
 Phone, Fax _____



APPENDICES

BOARD FOOT VOLUME TABLE

A quick method of estimating approximate volume of standing timber based on the Ontario Log Rule form class #79*

Merchantable Lengths in Feet

| DBH 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| 10 | 16 | 20 | 24 | 28 | 32 | 35 | 37 | 40 | 44 | 46 | 48 | 50 | 53 | 55 | 58 | 60 | 61 |
| 11 | 20 | 26 | 31 | 36 | 41 | 44 | 47 | 51 | 55 | 58 | 60 | 64 | 67 | 70 | 73 | 75 | 77 |
| 12 | 25 | 31 | 37 | 43 | 50 | 54 | 58 | 62 | 67 | 71 | 74 | 78 | 82 | 86 | 91 | 94 | 97 |
| 13 | 30 | 37 | 45 | 53 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 114 | 117 |
| 14 | 36 | 46 | 54 | 63 | 73 | 79 | 85 | 92 | 99 | 105 | 110 | 116 | 122 | 128 | 134 | 138 | 142 |
| 15 | 42 | 53 | 64 | 75 | 85 | 92 | 99 | 108 | 116 | 122 | 129 | 136 | 143 | 150 | 157 | 162 | 168 |
| 16 | 49 | 61 | 74 | 86 | 98 | 107 | 115 | 125 | 135 | 142 | 149 | 157 | 166 | 175 | 184 | 190 | 197 |
| 17 | 56 | 70 | 91 | 101 | 112 | 122 | 131 | 143 | 154 | 162 | 170 | 180 | 190 | 200 | 211 | 219 | 226 |
| 18 | 62 | 78 | 94 | 110 | 125 | 136 | 147 | 160 | 173 | 183 | 193 | 204 | 215 | 227 | 239 | 248 | 256 |
| 19 | 70 | 88 | 106 | 123 | 141 | 153 | 166 | 180 | 195 | 206 | 218 | 230 | 243 | 256 | 270 | 279 | 289 |
| 20 | 78 | 98 | 118 | 138 | 157 | 172 | 186 | 202 | 218 | 230 | 243 | 257 | 272 | 287 | 302 | 314 | 325 |
| 21 | 87 | 109 | 131 | 153 | 175 | 191 | 207 | 225 | 243 | 257 | 271 | 287 | 304 | 320 | 337 | 352 | 362 |
| 22 | 96 | 121 | 145 | 169 | 193 | 208 | 224 | 246 | 269 | 290 | 311 | 325 | 338 | 356 | 374 | 389 | 403 |
| 23 | 106 | 133 | 160 | 186 | 212 | 232 | 252 | 275 | 297 | 315 | 332 | 351 | 371 | 392 | 413 | 429 | 445 |
| 24 | 117 | 146 | 176 | 205 | 234 | 256 | 278 | 303 | 328 | 348 | 367 | 384 | 401 | 429 | 457 | 475 | 492 |
| 25 | 127 | 159 | 191 | 223 | 255 | 279 | 303 | 330 | 357 | 378 | 399 | 423 | 447 | 472 | 498 | 517 | 536 |
| 26 | 137 | 172 | 207 | 241 | 275 | 301 | 327 | 357 | 387 | 410 | 432 | 458 | 485 | 513 | 541 | 562 | 583 |
| 27 | 149 | 186 | 222 | 260 | 298 | 326 | 355 | 398 | 420 | 444 | 468 | 497 | 526 | 558 | 589 | 612 | 635 |
| 28 | 161 | 203 | 242 | 282 | 323 | 354 | 385 | 420 | 456 | 482 | 509 | 541 | 573 | 606 | 640 | 665 | 689 |
| 29 | 173 | 217 | 260 | 304 | 347 | 380 | 414 | 452 | 490 | 520 | 549 | 583 | 617 | 652 | 688 | 725 | 743 |
| 30 | 187 | 233 | 280 | 327 | 374 | 410 | 447 | 488 | 529 | 561 | 594 | 631 | 667 | 705 | 743 | 773 | 802 |
| 31 | 200 | 250 | 300 | 350 | 400 | 439 | 478 | 523 | 567 | 601 | 635 | 674 | 714 | 756 | 799 | 830 | 862 |
| 32 | 214 | 267 | 320 | 374 | 428 | 470 | 513 | 560 | 608 | 645 | 683 | 720 | 768 | 813 | 858 | 893 | 928 |
| 33 | 228 | 284 | 341 | 399 | 457 | 502 | 547 | 598 | 649 | 688 | 727 | 773 | 818 | 869 | 919 | 955 | 991 |
| 34 | 243 | 302 | 365 | 424 | 487 | 535 | 584 | 638 | 692 | 735 | 777 | 826 | 875 | 927 | 978 | 1018 | 1058 |
| 35 | 257 | 320 | 385 | 450 | 515 | 566 | 617 | 674 | 732 | 777 | 822 | 874 | 925 | 1030 | 1036 | 1079 | 1122 |
| 36 | 273 | 341 | 411 | 478 | 546 | 601 | 656 | 717 | 778 | 827 | 876 | 931 | 986 | 1045 | 1103 | 1149 | 1195 |
| 37 | 290 | 362 | 435 | 508 | 580 | 638 | 696 | 762 | 828 | 878 | 929 | 987 | 1045 | 1110 | 1174 | 1223 | 1272 |
| 38 | 306 | 381 | 454 | 533 | 612 | 674 | 736 | 806 | 875 | 929 | 983 | 1045 | 1108 | 1176 | 1244 | 1297 | 1350 |
| 39 | 323 | 402 | 485 | 565 | 646 | 708 | 771 | 847 | 923 | 982 | 1040 | 1106 | 1172 | 1241 | 1311 | 1367 | 1422 |
| 40 | 340 | 425 | 511 | 596 | 681 | 751 | 821 | 898 | 975 | 1038 | 1101 | 1170 | 1240 | 1313 | 1386 | 1444 | 1508 |



* Diam. at 16.5' inside bark, is 79% of DBH outside bark.

Merchantable Lengths in Feet

| DBH | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 10 | 62 | 64 | 66 | 67 | 68 | 69 | 71 | 72 | 74 | 75 | | | | | | |
| 11 | 79 | 82 | 84 | 86 | 88 | 90 | 93 | 95 | 97 | 99 | 102 | | | | | |
| 12 | 100 | 104 | 108 | 111 | 114 | 116 | 119 | 122 | 124 | 127 | 130 | | | | | |
| 13 | 120 | 124 | 128 | 131 | 134 | 138 | 142 | 145 | 148 | 152 | 156 | 159 | 162 | | | |
| 14 | 146 | 151 | 155 | 160 | 164 | 169 | 174 | 178 | 182 | 187 | 192 | 196 | 200 | 205 | | |
| 15 | 173 | 178 | 184 | 189 | 194 | 200 | 205 | 210 | 215 | 220 | 226 | 231 | 236 | 242 | 247 | |
| 16 | 204 | 210 | 216 | 222 | 228 | 234 | 241 | 247 | 253 | 260 | 266 | 272 | 278 | 284 | 291 | 297 |
| 17 | 233 | 241 | 248 | 255 | 262 | 270 | 277 | 284 | 291 | 298 | 305 | 313 | 320 | 328 | 335 | 342 |
| 18 | 246 | 273 | 282 | 290 | 298 | 307 | 316 | 324 | 332 | 341 | 350 | 358 | 366 | 375 | 384 | 392 |
| 19 | 299 | 309 | 319 | 329 | 339 | 349 | 359 | 369 | 379 | 389 | 399 | 409 | 419 | 429 | 439 | 449 |
| 20 | 337 | 348 | 359 | 370 | 381 | 392 | 404 | 415 | 426 | 438 | 449 | 460 | 471 | 482 | 494 | 505 |
| 21 | 375 | 388 | 400 | 413 | 426 | 438 | 451 | 464 | 477 | 490 | 502 | 515 | 528 | 540 | 553 | 566 |
| 22 | 417 | 432 | 446 | 460 | 474 | 488 | 503 | 517 | 531 | 546 | 560 | 574 | 588 | 602 | 617 | 631 |
| 23 | 460 | 476 | 492 | 508 | 524 | 540 | 555 | 571 | 587 | 602 | 618 | 634 | 650 | 666 | 681 | 697 |
| 24 | 510 | 528 | 546 | 563 | 581 | 598 | 616 | 634 | 652 | 670 | 687 | 705 | 723 | 740 | 758 | 776 |
| 25 | 555 | 574 | 593 | 612 | 631 | 650 | 669 | 688 | 707 | 726 | 745 | 764 | 783 | 802 | 821 | 840 |
| 26 | 604 | 625 | 646 | 667 | 688 | 708 | 728 | 748 | 768 | 788 | 810 | 831 | 851 | 872 | 892 | 913 |
| 27 | 658 | 681 | 704 | 727 | 748 | 770 | 792 | 813 | 834 | 856 | 878 | 899 | 920 | 942 | 964 | 985 |
| 28 | 714 | 739 | 764 | 789 | 812 | 834 | 856 | 879 | 902 | 924 | 946 | 969 | 992 | 1014 | 1036 | 1059 |
| 29 | 767 | 792 | 822 | 852 | 874 | 896 | 919 | 941 | 963 | 986 | 1008 | 1030 | 1052 | 1074 | 1097 | |
| 30 | 831 | 861 | 891 | 921 | 946 | 971 | 996 | 1020 | 1045 | 1070 | 1095 | 1120 | 1145 | 1170 | | |
| 31 | 894 | 926 | 958 | 990 | 1016 | 1042 | 1068 | 1094 | 1120 | 1146 | 1172 | 1198 | 1224 | | | |
| 32 | 963 | 998 | 1032 | 1067 | 1094 | 1122 | 1149 | 1176 | 1204 | 1231 | 1259 | 1286 | | | | |
| 33 | 1027 | 1064 | 1102 | 1140 | 1169 | 1197 | 1226 | 1254 | 1283 | 1312 | 1340 | | | | | |
| 34 | 1098 | 1139 | 1179 | 1220 | 1250 | 1280 | 1311 | 1341 | 1371 | 1402 | | | | | | |
| 35 | 1166 | 1210 | 1252 | 1295 | 1327 | 1358 | 1390 | 1422 | 1453 | | | | | | | |
| 36 | 1240 | 1286 | 1332 | 1379 | 1412 | 1445 | 1478 | 1511 | | | | | | | | |
| 37 | 1325 | 1372 | 1420 | 1469 | 1504 | 1538 | 1573 | | | | | | | | | |
| 38 | 1403 | 1457 | 1509 | 1561 | 1597 | 1668 | | | | | | | | | | |
| 39 | 1477 | 1533 | 1588 | 1643 | 1681 | | | | | | | | | | | |
| 40 | 1568 | 1628 | 1687 | 1746 | | | | | | | | | | | | |

Selling Your Timber

**TREE CLASSIFICATION FOR HARDWOOD SPECIES
LOCATION AND EXTENT OF DEFECTS**

| * DEFECTS | A: UP TO 10% VOLUME LOSS ALLOWED | B: 10 - 33% VOLUME LOSS ALLOWED |
|-----------------------------|---|--|
| DEAD LIMB | small- no swelling at base - less than 6" diam. * if clustered, count as 1 | large-no swelling at base- from 6-8" |
| CONKS (fungus spore bodies) | dry - less than 4" | open-active, less than 6" |
| CAT FACES | small-less than 4" diam., dry | 4-6", little evidence of decay |
| TOPS | some portion (large limbs) recently broken | dry-broken or dead |
| CRACK & SEAM | small-less 1/2" wide -no sign of rot- not over 1/3 of butt log | over 1/2" wide-not over 1/3 merchantable length little sign of rot |
| HOLE OR CAVITY | not allowed | up to 6" diam. above butt log |
| ROTTEN BURL | small-less 4" diam. no fruiting bodies | 4-6" diam. |
| SCAR OR FLAT SPOT | dry-above butt log, not to exceed 12" in length | above butt log, not to exceed 2' in length |
| CROOK OR SWEEP | not allowed | excessive above butt log |
| FIRE SCAR | not to exceed 12" from ground-dry-no rot | over 12" from ground, evidence of decay |
| SPIRAL SEAM | not allowed | above butt log |

* A: Only 1 OF THE ABOVE ALLOWED

* B: 2 OF THE ABOVE ALLOWED

- If more defects than allowed, drop the tree one quality class.

A: Able to yield at least 1 16' grade 1 log, B: Can yield one or more grade 2 logs



| | |
|--|--|
| C: 33 - 66% VOLUME LOSS ALLOWED | D |
| large-with swelling over 8" | |
| open-active, over 6" | |
| over 6"-blackish colour, folded edges-some decay | |
| broken & rotten | |
| open-folded edges ½ of merchantable length | HIGHLY DEFECTIVE UNMERCHANTABLE TREES - CULLS |
| over 6" diam. above butt log | (MAY HAVE USE FOR DEN TREES) |
| Over 6" diam. within merchantable length | |
| over 2' in length | |
| excessive | |
| large-rotten | |
| affects all logs in total merchantable length | |

C: 2 OR MORE IF TREE NOT A CULL

D: NO USABLE LOG VOLUME

- If defects are confined to one particular log section, **other than the butt log**, within the merchantable length, the tree should be raised one class.

C: Grade 3 logs, D: Cull trees with no usable log volume

Selling Your Timber

Identification of tree snag types

Snags are standing dead trees. Following death, snags decay in a predictable fashion and provide habitat for different kinds of wildlife at each stage of deterioration.

DECAY CLASS 1 : - tree recently dead



- top is intact
- fine branching present
- used by raptors, flycatchers for perching

DECAY CLASS 2 : - top is intact



- most fine branches fallen
- > 50% coarse branches remain
- bark begins to loosen
- used as in Decay Class 1
- bats may nest under loose bark

DECAY CLASS 3 : - top is intact



- < 50% coarse branches remain
- bark may begin to slough off
- used as in Decay Class 2
- nesting substrate for powerful excavators like pileated woodpecker

DECAY CLASS 4 : - top is broken (Fig.D45)



- no coarse branches remain
- bark sloughing off
- provides perch sites
- good nesting habitat for weaker excavators like downy woodpecker

DECAY CLASS 5 : - stub only



- top repeatedly broken
- height < 6 m
- bark sloughed off
- nesting habitat for chickadees

Recommended number of snags (Guidelines for Cavity Nesters, Wildlife Branch)

Riparian areas

- 9 large snags/ha (3/acre)
- 18 small snags/ha (6/acre)
- 27 snags/ha (9/acre)

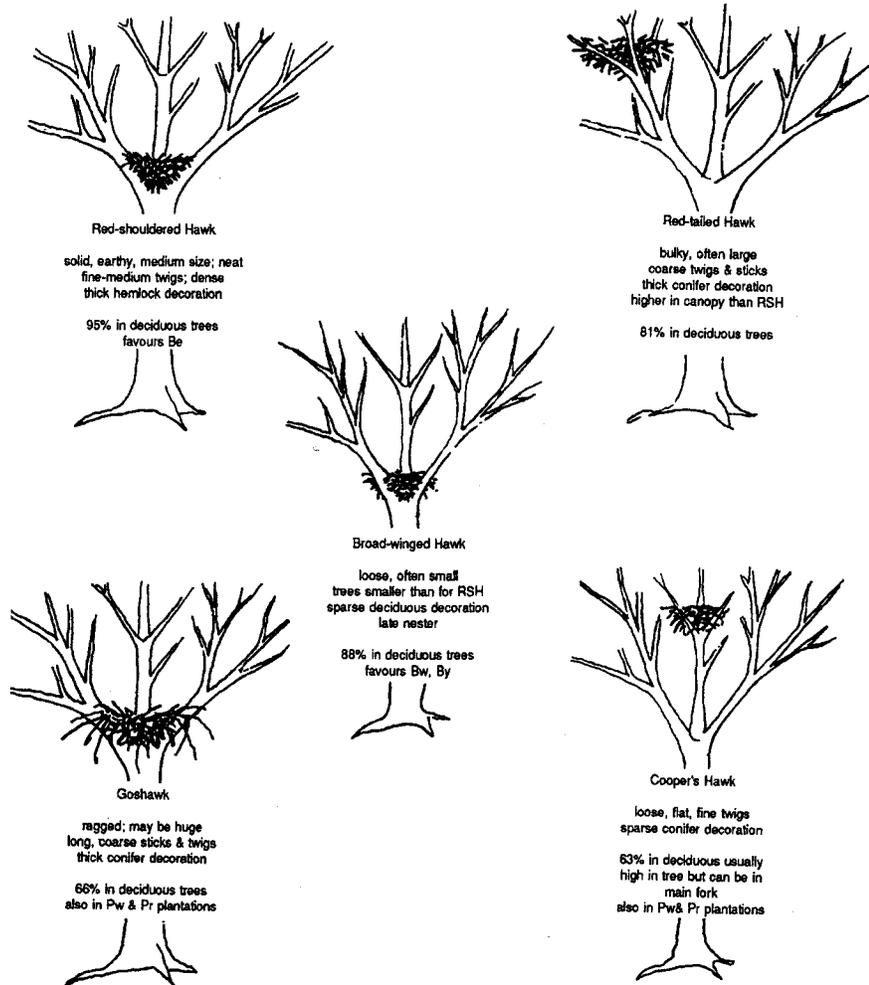
Upland areas

- 6 large snags/ha (2/acre)
- 12 small snags/ha (4/acre)
- 18 snags/ha (6/acre)



Real Answers
to
Real Questions

Typical appearance of hawk stick nests in hardwoods (from Szuba and Bell 1991)



Retention of at least one forked tree per 10 hectares will ensure adequate potential nest sites for stick nest-building birds. Some guidelines recommend that a tree-length reserve of unharvested forest be maintained around all stick nests.

Two species of forest-nesting hawks, the red-shouldered hawk and the Cooper's hawk, are considered to be rare provincially. Special habitat guidelines are recommended around these nests. Nest features characteristic of these hawk species are outlined above.

Make Your Own "Diameter Tape"

| Diameter Class | Circumference (in eighths: .1+1.25 eighths) | |
|------------------------|--|-----------------|
| 2 inch (1.0 - 2.99) | 3.1 - 9.4 | or 3-1/8 - 9/38 |
| 4 inch (3.0 - 4.99) | 9.5 - 15.7 | 9-1/2 - 15-3/4 |
| 6 inch (5.0 - 6.99) | 15.8 - 21.9 | 15-3/4 - 21-7/8 |
| 8 inch (7.0 - 8.99) | 22.0 - 28.2 | 22 - 28-1/4 |
| 10 inch (9.0 - 10.99) | 28.3 - 34.5 | 28-1/4 - 34-1/2 |
| 12 inch (11.0 - 12.99) | 34.6 - 40.8 | 34-1/2 - 40-3/4 |
| 14 inch (13.0 - 14.99) | 40.9 - 47.1 | 40-7/8 - 47-1/8 |
| 16 inch (15.0 - 16.99) | 47.2 - 53.4 | 47-1/4 - 53-3/8 |
| 18 inch (17.0 - 18.99) | 53.5 - 59.7 | 53-1/2 - 59-7/8 |
| 20 inch (19.0 - 20.99) | 59.8 - 65.9 | 59-3/4 - 65-7/8 |
| 22 inch (21.0 - 22.9) | 66.0 - 72.2 | 66 - 72-1/4 |
| 24 inch (23.0 - 24.99) | 72.3 - 78.5 | 72-1/4 - 78-1/2 |

To make things simple in the field, make up a chart like this and tape it to your clipboard. An alternative would be to take an old tape measure and place markings on the tape at the appropriate place, to make a "diameter tape" which reads directly in diameter rather than circumference.



CONVERSION FACTORS

Terms in *italics* are defined elsewhere in the conversion factors.

Acre

- 0.4047 *hectares*,
- 2.471 acres equal 1 hectare.

Basal Area

- Basal Area is the cross-sectional surface area of the stem of the tree measured at 4.5 feet above the ground at the base of the tree. (Area = (diameter/2)squared X pi - 3.14)
- One square foot of basal area usually represents between 100 and 125 board feet. For conifers, if the basal area per acre is divided by a factor of 4, (See table below) this gives a reasonable estimate of cords per acre (*net merchantable volume*: see below). This works for trees 50 feet tall. Of course for taller trees, a smaller factor is appropriate, and for shorter trees, a larger factor.

VOLUME FACTORS FOR PLANTATION VOLUMES: **

| Stand Height | Gross Merchantable Volume | Net Merchantable Volume |
|---------------------|----------------------------------|--------------------------------|
| 25 | 7.0 | 7.3 |
| 30 | 6.0 | 6.3 |
| 35 | 5.2 | 5.4 |
| 40 | 4.6 | 4.8 |
| 45 | 4.1 | 4.3 |
| 50 | 3.7 | 3.9 |
| 55 | 3.4 | 3.6 |
| 60 | 3.2 | 3.4 |
| 65 | 2.9 | 3.0 |
| 70 | 2.7 | 2.8 |
| 75 | 2.6 | 2.7 |
| 80 | 2.4 | 2.5 |
| 85 | 2.3 | 2.4 |
| 90 | 2.2 | 2.3 |

** This works for white pine, red pine and spruce. For Scots pine and jack pine, multiply the resultant cords X 0.6 to allow a volume deduction for poor form.

- 1 square foot of basal area per acre equals .2296 square metres per hectare.
- 1 square metre per hectare equals 4.356 square feet per acre.

Cord

- 4 ft. X 4 ft. X 8 ft or 128 cubic feet.
- Contains only 85 cubic feet of solid wood when bark and air are taken into consideration.
- 1 cord stacked therefore is equal to 3.64 cubic metres, but 1 cord, considering the 85 cubic feet of solid wood contains only 2.4069 cubic metres of solid wood.



- One 21 inch diameter hardwood tree or one 24 inch conifer tree will yield one cord (See table below).
- 1000 fbm of hardwood sawlogs will generally yield 1.5 cords of fuelwood from the tops of the trees.

TREES REQUIRED TO EQUAL ONE CORD

| Tree DBH | Hardwood | Softwood |
|-----------------|-----------------|-----------------|
| 7 | 15 | 20 |
| 8 | 11 | 13 |
| 9 | 8 | 10 |
| 10 | 6 | 8 |
| 11 | 5 | 7 |
| 12 | 4 | 6 |
| 13 | 3.5 | 4.5 |
| 14 | 3 | 3.7 |
| 15 | 2.5 | 3 |
| 16 | 2 | 2.5 |
| 17 | 1.7 | 2.1 |
| 18 | 1.5 | 1.9 |
| 19 | 1.3 | 1.6 |
| 20 | 1.2 | 1.5 |
| 21 | 1.0 | 1.4 |
| 22 | .9 | 1.2 |
| 23 | .8 | 1.1 |
| 24 | .7 | 1.0 |
| 25 | .6 | .9 |
| 26 | .58 | .8 |
| 27 | .5 | .77 |
| 28 | .44 | .7 |
| 29 | .43 | - |

Fbm (Feet Board Measure) NO METRIC EQUIVALENT!

- Also commonly referred to as board feet, this is a measure of lumber 1 foot square and 1 inch thick.
- One cubic foot of tree volume produces, when sawn, 5.35 board feet, Ontario Rule.
- 1,000 fbm is roughly equivalent to 2 cords. In 1,000 fbm of logs, one can also usually produce 1.5 cords of firewood from the tops. Therefore, 1,000 fbm of standing trees represents a total of 3.5 cords of wood.
- One cubic metre equals 227 fbm, Ontario Rule.
- As a rough calculation then, a tree that was 24 inches in diameter at the stump and 12 inches in diameter at the point where it divided into heavy limbs at a height of 50 feet would have 3, 16 foot logs in it and would have roughly:
 - $2 \text{ feet} + 1 \text{ foot} / 2 = 1.5 \text{ feet}$ average diameter for the tree X 48 feet of length [50 feet less trim for the boards, called "broomage"] = 72 cubic feet of volume in the tree.
 - then: 72 cubic feet X 5.35 board feet per cubic foot = 385 board feet.
- Since trees have parabolic (rounded) surfaces instead of straight sides, the true figure is actually higher than 385, (460 fbm). The same calculations can be done for logs. Remember that defects such as rot or crooked stems must be deducted from this calculation of *gross merchantable volume*.



Gross Merchantable Volume

- The total volume of a tree(s) (*gross total volume*) less the top and stump. For tree harvesting, stump height should be a maximum of 12 inches or the diameter of the stump to a maximum of 24 inches. Top diameter for hardwoods is normally 10 inches and for conifers, 4 inches.

Gross Total Volume

- Total volume of the tree.

Hectare

- 2.47105 acres.

Net Merchantable Volume

- The total volume of the tree(s) (*gross total volume*) less the top and stump, (*gross merchantable volume*) and less cull (rot) = net merchantable volume.

Heating Value of Native Species of Wood *

| Species | Gross Heating Value for Air Dry Cord (BTU) * |
|-------------------|---|
| Rock Elm | 32,000,000 |
| Shagbark Hickory | 30,600,000 |
| White Oak | 30,600,000 |
| Bitternut Hickory | 29,200,000 |
| Sugar Maple | 29,000,000 |
| Beech | 27,800,000 |
| Red Oak | 27,300,000 |
| Yellow Birch | 26,200,000 |
| Red Elm | 25,400,000 |
| White Ash | 25,000,000 |
| White Elm | 24,500,000 |
| Red Maple | 24,000,000 |
| Tamarack | 24,000,000 |
| Black Cherry | 23,500,000 |
| White Birch | 23,400,000 |
| Black Ash | 22,600,000 |
| Green Ash | 22,100,000 |
| Silver Maple | 21,700,000 |
| Manitoba Maple | 19,300,000 |
| Large Tooth Aspen | 18,200,000 |
| Hemlock | 17,900,000 |
| Trembling Aspen | 17,700,000 |
| Butternut | 17,400,000 |
| Balsam Poplar | 17,260,000 |
| White Pine | 17,100,000 |
| Basswood | 17,000,000 |
| White Cedar | 16,300,000 |
| White Spruce | 16,200,000 |
| Balsam Fir | 15,500,000 |



When to Harvest

As soon as a tree has enough wood fiber to meet the overhead costs of felling, limbing, bucking, skidding, loading, transporting, and processing, it has a positive dollar value to the forest owner. It is usually financially unwise to harvest trees as soon as they reach merchantable size, however, because they are not yet at their peak value. The following are a number of important timber management considerations:

- At 10 to 14 inches DBH, hardwoods have a low value, but the rate at which they are increasing in value is high, especially for fast-growing trees with proper growing space.
- As a hardwood tree increases in diameter from 14 to 24 inches, it may nearly double in height, increase 4-1/2 times in volume (135 to 630 board feet), and increase tenfold in dollar value. If a market is available for veneer, its value may increase substantially more.
- At 14 to 20 inches DBH, hardwoods may double in value for each 2 inches of growth in diameter as log grade improves with size and as growth in height continues. At a rate of 2 inches growth in diameter every 10 years, a tree will also double in value in 10 years (a compound growth rate of 7 percent, not including inflation).
- At 20 to 24 inches DBH, hardwoods increase substantially on a dollar basis, but because the grade has peaked, the rate at which their value is increasing may slow to a compound growth rate of 3.5 percent or less. The increase in dollar value is mostly the result of the increase in volume.
- At 24 to 28 inches DBH, the dollar value continues to increase, but change in grade and height are unlikely. Also, growth in diameter is typically slow as the tree reaches biological maturity.

**Value of Sugar Maple Trees
Based on Size and Grade**

| DBH ^a (inches) | No. of 16 foot logs | Volume (board ft.) ^b | Grade ^c | Dollar Value per 1,000 board ft ^d | Dollar Value per tree |
|------------------------------|------------------------|------------------------------------|--------------------|---|--------------------------------|
| 12 | 1.7 | 80 | 3 | 55 | 4 |
| 14 | 2.0 | 135 | 2-3 | 60 | 8 |
| 16 | 2.3 | 200 | 2 | 70 | 14 |
| 18 | 2.6 | 290 | 1-2 | 90 | 26 |
| 20 | 2.8 | 390 | 1 | 100 | 39 |
| 24 | 3.0 | 630 | 1 | 125 | 79 |
| 28 | 3.0 | 880 | 1 | 150 | 132 |

- a Diameter at breast height or 4-1/2 feet above ground
- b International 1/4 inch Rule
- c Grade classification of butt log: 1=highest value. These are typical grade changes with size.
- d Based on the quantity and quality of expected yield of one-inch lumber: 1983 stumpage value

Note: Reprinted with permission from *Timber Management for Small Woodlands* by Gary R. Goff, James P. Lassoie, and Katherine M. Layer.



DOYLE LOG RULE

| Diameter of Log, Small End, Inside Bark (inches) | Length of Log in Feet | | | | | |
|--|-------------------------------|-----|-----|------|------|------|
| | 8 | 10 | 12 | 14 | 16 | 18 |
| | Contents of Log in Board Feet | | | | | |
| 6 | 2 | 3 | 3 | 4 | 4 | |
| 7 | 4 | 5 | 7 | 8 | 9 | 10 |
| 8 | 8 | 10 | 12 | 14 | 16 | 18 |
| 9 | 12 | 16 | 19 | 22 | 25 | 28 |
| 10 | 18 | 22 | 27 | 31 | 36 | 40 |
| 11 | 24 | 31 | 37 | 43 | 49 | 55 |
| 12 | 32 | 40 | 48 | 56 | 64 | 72 |
| 13 | 40 | 51 | 61 | 71 | 81 | 91 |
| 14 | 50 | 62 | 75 | 87 | 100 | 112 |
| 15 | 60 | 76 | 91 | 106 | 121 | 136 |
| 16 | 72 | 90 | 108 | 126 | 144 | 162 |
| 17 | 84 | 106 | 127 | 148 | 169 | 190 |
| 18 | 98 | 122 | 147 | 171 | 196 | 220 |
| 19 | 112 | 141 | 169 | 197 | 225 | 253 |
| 20 | 128 | 160 | 192 | 224 | 256 | 288 |
| 21 | 144 | 181 | 217 | 253 | 289 | 325 |
| 22 | 162 | 202 | 243 | 283 | 324 | 364 |
| 23 | 180 | 226 | 271 | 316 | 361 | 406 |
| 24 | 200 | 250 | 300 | 350 | 400 | 450 |
| 25 | 220 | 276 | 331 | 386 | 441 | 496 |
| 26 | 242 | 302 | 363 | 423 | 484 | 544 |
| 27 | 264 | 331 | 397 | 463 | 529 | 595 |
| 28 | 288 | 360 | 432 | 504 | 576 | 648 |
| 29 | 312 | 391 | 469 | 547 | 625 | 702 |
| 30 | 338 | 422 | 507 | 591 | 676 | 760 |
| 31 | 364 | 456 | 547 | 638 | 729 | 820 |
| 32 | 392 | 490 | 588 | 686 | 784 | 882 |
| 33 | 420 | 526 | 631 | 736 | 841 | 946 |
| 34 | 450 | 562 | 675 | 787 | 900 | 1012 |
| 35 | 480 | 601 | 721 | 841 | 961 | 1081 |
| 36 | 512 | 640 | 768 | 896 | 1024 | 1152 |
| 37 | 544 | 681 | 817 | 953 | 1089 | 1225 |
| 38 | 578 | 722 | 867 | 1011 | 1156 | 1300 |
| 39 | 612 | 766 | 919 | 1072 | 1225 | 1378 |
| 40 | 648 | 810 | 972 | 1134 | 1296 | 1458 |

To find the number of board feet in a log according to the Doyle rule: Deduct 4 from the diameter (in inches) of the small end and square the remainder. This gives the contents of a 16 foot log in board feet. The number of board feet in logs of other lengths is in proportion to their lengths; for example, an 8 foot log contains half as many board feet as a 16 foot log and so on.

ONTARIO LOG RULE

Length of Log in Feet

| | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|--|----------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Diameter in Inches Inside Bark at Small End of Log | Volume in Board Feet | | | | | | | | | | |
| 4 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 |
| 5 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 |
| 6 | 8 | 9 | 10 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 7 | 12 | 14 | 15 | 17 | 19 | 20 | 22 | 23 | 25 | 26 | 28 |
| 8 | 17 | 19 | 21 | 23 | 26 | 28 | 30 | 32 | 34 | 36 | 38 |
| 9 | 22 | 25 | 28 | 31 | 34 | 37 | 39 | 42 | 45 | 48 | 51 |
| 10 | 29 | 32 | 36 | 39 | 43 | 47 | 50 | 54 | 57 | 61 | 64 |
| 11 | 36 | 40 | 44 | 49 | 53 | 58 | 62 | 67 | 71 | 76 | 80 |
| 12 | 43 | 49 | 54 | 59 | 65 | 70 | 76 | 81 | 86 | 92 | 97 |
| 13 | 52 | 58 | 64 | 71 | 77 | 84 | 90 | 97 | 103 | 110 | 116 |
| 14 | 61 | 68 | 76 | 83 | 91 | 99 | 106 | 114 | 121 | 129 | 136 |
| 15 | 70 | 79 | 88 | 97 | 106 | 115 | 123 | 132 | 141 | 150 | 159 |
| 16 | 81 | 91 | 101 | 111 | 122 | 132 | 142 | 152 | 162 | 172 | 182 |
| 17 | 92 | 104 | 115 | 127 | 139 | 150 | 162 | 173 | 185 | 196 | 208 |
| 18 | 104 | 117 | 130 | 144 | 157 | 170 | 183 | 196 | 209 | 222 | 235 |
| 19 | 117 | 132 | 146 | 161 | 176 | 190 | 205 | 220 | 234 | 249 | 264 |
| 20 | 131 | 147 | 163 | 180 | 196 | 212 | 229 | 245 | 261 | 278 | 294 |
| 21 | 145 | 163 | 181 | 199 | 217 | 235 | 254 | 272 | 290 | 308 | 326 |
| 22 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 |
| 23 | 176 | 198 | 219 | 241 | 263 | 285 | 307 | 329 | 351 | 373 | 395 |
| 24 | 192 | 216 | 240 | 264 | 288 | 312 | 336 | 360 | 384 | 408 | 432 |
| 25 | 209 | 235 | 261 | 288 | 314 | 340 | 366 | 392 | 418 | 444 | 471 |
| 26 | 227 | 255 | 284 | 312 | 341 | 369 | 397 | 426 | 454 | 483 | 511 |
| 27 | 246 | 276 | 307 | 338 | 369 | 399 | 430 | 461 | 491 | 522 | 553 |
| 28 | 265 | 298 | 331 | 364 | 398 | 431 | 464 | 497 | 530 | 563 | 596 |
| 29 | 285 | 321 | 356 | 392 | 428 | 463 | 499 | 535 | 570 | 606 | 642 |
| 30 | 306 | 344 | 382 | 421 | 459 | 497 | 536 | 574 | 612 | 650 | 688 |
| 31 | 328 | 369 | 409 | 450 | 491 | 532 | 573 | 614 | 655 | 696 | 737 |
| 32 | 350 | 394 | 437 | 481 | 525 | 569 | 612 | 656 | 700 | 743 | 787 |
| 33 | 373 | 420 | 466 | 513 | 559 | 606 | 653 | 699 | 746 | 792 | 839 |
| 34 | 397 | 446 | 496 | 545 | 595 | 645 | 694 | 744 | 793 | 843 | 892 |
| 35 | 421 | 474 | 526 | 579 | 632 | 684 | 737 | 790 | 842 | 895 | 948 |
| 36 | 446 | 502 | 558 | 614 | 670 | 725 | 781 | 837 | 893 | 949 | 1004 |
| 37 | 472 | 531 | 590 | 650 | 709 | 768 | 827 | 886 | 945 | 1004 | 1063 |
| 38 | 499 | 561 | 624 | 686 | 749 | 811 | 873 | 936 | 998 | 1061 | 1123 |
| 39 | 526 | 592 | 658 | 724 | 790 | 856 | 921 | 987 | 1053 | 1119 | 1185 |
| 40 | 555 | 624 | 693 | 763 | 832 | 901 | 971 | 1040 | 1109 | 1179 | 1248 |



USEFUL MEASURES THAT YOU WON'T FIND ANYWHERE ELSE

Length

| | | |
|----------------------|---|---|
| 1 surveyor's link | = | .66 feet - 7.92 inches |
| 1 foot | = | 12 inches |
| 1 yard | = | 3 feet |
| 1 fathom | = | 6 feet |
| 1 rod, pole or perch | = | 5.5 yards |
| 1 chain | = | 4 rods = 22 yards = 100 links = 66 feet |
| 1 furlong | = | 10 chains = 220 yards = 40 rods |
| 1 mile | = | 8 furlongs = 80 chains = 1,760 yards = 5,280 feet = 320 rods |

Area

| | | |
|----------------|---|---|
| 1 square link | = | .44 square feet = 62.73 square inches |
| 1 square foot | = | 144 square inches |
| 1 square yard | = | 9 square feet = 1,296 square inches |
| 1 square chain | = | 16 square rods = 484 square yards = 10,000 square links |
| 1 rood | = | 40 square rods |
| 1 acre | = | 4 roods = 10 square chains = 160 square rods |
| 1 acre | = | 4,840 square yards = 43,560 square feet = 100,000 square links |
| 1 square mile | = | 640 acres = 3,097,600 square yards = 27,878,400 square feet |
| 1 acre | = | .405 hectares |
| 1 hectare | = | 2.47 acres |
| 1 arpent | = | .845 acres = .342 hectares |

Solid Cubic Measure

| | | |
|--------------|---|--|
| 1 cubic foot | = | 1,728 cubic inches |
| 1 cubic yard | = | 27 cubic feet |
| 1 cunit | = | 100 cubic feet of solid timber |
| 1 cord | = | 128 cubic feet |
| 1 m.b.f. | = | 200 cubic feet = 2.25 cords (rough) 1.99 cords (peeled) |

CUBIC FOOT RULE

| Diameter Inside Bark in Inches | Length of Log in Feet | | | | | |
|-----------------------------------|-----------------------------|--------------|--------------|--------------|--------------|--------------|
| | 4 | 5 | 6 | 7 | 8 | 9 |
| | <u>Volume in Cubic Feet</u> | | | | | |
| 4 | .35 | .44 | .52 | .61 | .70 | .79 |
| 5 | .55 | .68 | .62 | .95 | 1.09 | 1.23 |
| 6 | .79 | .98 | 1.18 | 1.37 | 1.57 | 1.77 |
| 7 | 1.07 | 1.34 | 1.60 | 1.87 | 2.14 | 2.41 |
| 8 | 1.40 | 1.75 | 2.09 | 2.44 | 2.79 | 3.14 |
| 9 | 1.77 | 2.21 | 2.65 | 3.09 | 3.53 | 3.98 |
| 10 | 2.18 | 2.73 | 3.27 | 3.82 | 4.36 | 4.91 |
| 11 | 2.64 | 3.30 | 3.96 | 4.62 | 5.28 | 5.94 |
| 12 | 3.14 | 3.93 | 4.71 | 5.50 | 6.28 | 7.07 |
| 13 | 3.69 | 4.61 | 5.53 | 6.45 | 7.37 | 8.30 |
| 14 | 4.28 | 5.34 | 6.41 | 7.48 | 8.55 | 9.62 |
| 15 | 4.91 | 6.14 | 7.36 | 8.59 | 9.82 | 11.04 |
| 16 | 5.58 | 6.98 | 8.38 | 9.77 | 11.17 | 12.57 |
| 17 | 6.30 | 7.88 | 9.46 | 11.03 | 12.61 | 14.19 |
| 18 | 7.07 | 8.84 | 10.60 | 12.37 | 14.14 | 15.90 |
| 19 | 7.88 | 9.84 | 11.81 | 13.78 | 15.75 | 17.72 |
| 20 | 8.73 | 10.91 | 13.09 | 15.27 | 17.45 | 19.63 |
| 21 | 9.62 | 12.03 | 14.43 | 16.84 | 19.24 | 21.65 |
| 22 | 10.56 | 13.20 | 15.84 | 18.48 | 21.12 | 23.76 |
| 23 | 11.54 | 14.43 | 17.31 | 20.20 | 23.08 | 25.97 |
| 24 | 12.57 | 15.71 | 18.85 | 21.99 | 25.13 | 28.27 |
| 25 | 13.64 | 17.04 | 20.45 | 23.86 | 27.27 | 30.68 |
| 26 | 14.75 | 18.43 | 22.12 | 25.81 | 29.50 | 33.18 |
| 27 | 15.90 | 19.88 | 23.86 | 27.83 | 31.81 | 35.78 |
| 28 | 17.10 | 21.38 | 25.66 | 29.93 | 34.21 | 38.48 |
| 29 | 18.35 | 22.93 | 27.52 | 31.11 | 36.69 | 41.28 |
| 30 | <u>19.63</u> | <u>24.54</u> | <u>29.45</u> | <u>34.36</u> | <u>39.27</u> | <u>44.18</u> |

Formula of cylinder: $D^2 \times .005454 \times L = \text{Cubic feet}$
 D = diameter in inches
 L = length in feet



Length of Log in Feet

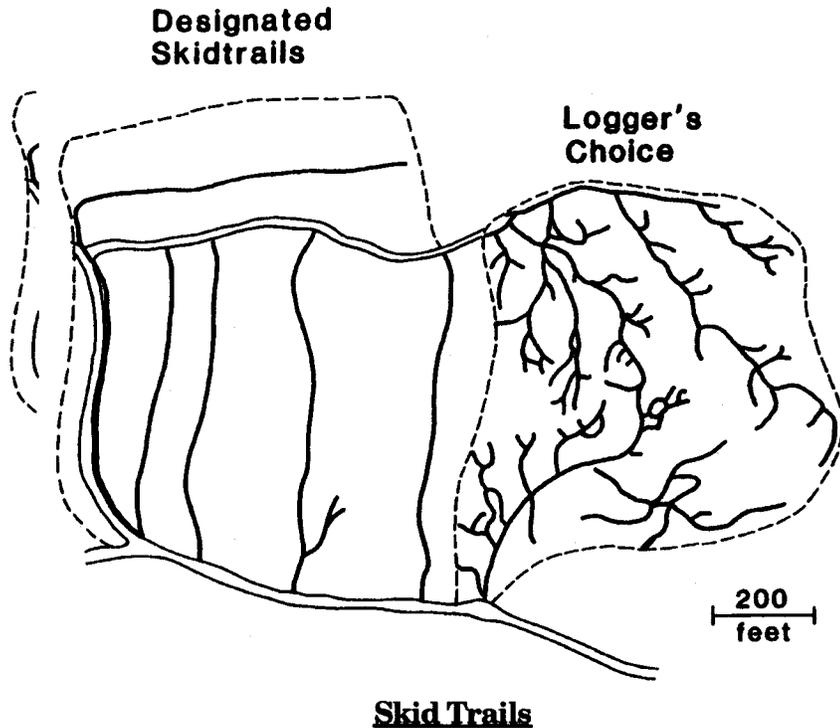
| <u>10</u> | <u>12</u> | <u>14</u> | <u>16</u> | <u>18</u> | <u>20</u> | |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|-----------|
| <u>Volume in Cubic Feet</u> | | | | | | |
| .87 | 1.05 | 1.22 | 1.40 | 1.57 | 1.75 | 4 |
| 1.36 | 1.64 | 1.91 | 2.18 | 2.45 | 2.75 | 5 |
| 1.96 | 2.36 | 2.75 | 3.14 | 3.53 | 3.93 | 6 |
| 2.67 | 3.21 | 3.74 | 4.28 | 4.81 | 5.34 | 7 |
| 3.49 | 4.19 | 4.89 | 5.58 | 6.28 | 6.98 | 8 |
| 4.42 | 5.30 | 6.18 | 7.07 | 7.95 | 8.84 | 9 |
| 5.45 | 6.54 | 7.64 | 8.73 | 9.82 | 10.91 | 10 |
| 6.60 | 7.92 | 9.24 | 10.56 | 11.88 | 13.2 | 11 |
| 7.85 | 9.42 | 11.00 | 12.57 | 14.14 | 15.71 | 12 |
| 9.22 | 11.06 | 12.90 | 14.75 | 16.59 | 18.43 | 13 |
| 10.69 | 12.83 | 14.97 | 17.10 | 19.24 | 21.38 | 14 |
| 12.27 | 14.73 | 17.18 | 19.63 | 22.09 | 24.54 | 15 |
| 13.96 | 16.75 | 19.55 | 22.34 | 25.13 | 27.92 | 16 |
| 15.76 | 18.91 | 22.07 | 25.22 | 28.37 | 31.52 | 17 |
| 17.67 | 21.21 | 24.74 | 28.27 | 31.81 | 35.34 | 18 |
| 19.69 | 23.63 | 27.56 | 31.50 | 35.33 | 39.38 | 19 |
| 21.82 | 26.18 | 30.54 | 34.91 | 39.27 | 43.63 | 20 |
| 24.05 | 28.86 | 33.67 | 38.48 | 43.29 | 48.10 | 21 |
| 26.40 | 31.68 | 36.96 | 42.24 | 47.52 | 52.79 | 22 |
| 28.85 | 34.62 | 40.39 | 46.16 | 51.93 | 57.70 | 23 |
| 31.42 | 37.70 | 43.98 | 50.26 | 56.55 | 62.83 | 24 |
| 34.09 | 40.91 | 47.72 | 54.54 | 61.36 | 68.18 | 25 |
| 36.87 | 44.24 | 51.62 | 58.99 | 66.36 | 73.74 | 26 |
| 39.76 | 47.71 | 55.66 | 63.62 | 71.57 | 79.52 | 27 |
| 42.76 | 51.31 | 59.86 | 68.41 | 76.97 | 85.52 | 28 |
| 45.87 | 55.04 | 64.22 | 73.39 | 82.56 | 91.74 | 29 |
| <u>49.09</u> | <u>58.90</u> | <u>68.72</u> | <u>78.54</u> | <u>88.35</u> | <u>98.17</u> | <u>30</u> |

To obtain volume of a log, multiply the square of the diameter in inches by the length in feet by the factor .005454.



Articulated Skidder equipped with a cable arch.





Skid Trails

Designating where skid trails will be, as illustrated below, can help minimize damage to soil and the remaining trees. Planned skid trails, plus maximum use of the winch will allow much of the forest to remain untouched by the equipment.

In contrast, the "Logger's Choice" method involves unplanned skid trails and backing up to logs instead of winching them to the skidder. **This method is not recommended.**