A GUIDE TO CHRISTMAS TREE GROWING IN ONTARIO

By

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The Christmas Tree Growers' Association

The Christmas Tree Growers' Association of Ontario was formed in 1955. A small group of growers banded together to promote goodwill between responsible growers and their customers. Then, as now, the association's objective was to co-operate and share experience to solve production and marketing problems.

By 1982, membership was more than 100, and growing.

Membership has many benefits to the grower. It brings producers together to discuss their problems and exchange information. Association workshops and field days provide practical demonstrations of management techniques. The association can put members in touch with market outlets and with provincial, federal and municipal government agencies. Newsletters keep members informed of developments in the industry. The association promotes and advertises Ontario-grown Christmas trees and speaks for the industry to the news media on subjects affecting growers and buyers of Christmas trees.

It is Ontario's only province-wide organization of Christmas tree growers.

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A grower who contemplates the development of a "choose and cut" sales system should first visit established operations as an observer and discuss management with the owner before making a firm decision to proceed with the venture.

The operator of a "choose and cut" business can expect that a very high percentage of the sales will occur on the weekends just before Christmas, when parents are off work and children are out of school. While the weekends will be peak sales periods, the lot should be open for business daily to accommodate customers who may be free at mid-week. Prevailing weather conditions during the sales period will have a profound effect on the volume of sales. Pleasant weather with good driving conditions will encourage people to travel and enjoy the outdoor experience of cutting their own tree. Inclement weather will have the opposite effect and the buyer will tend to buy a tree at the most convenient sales lot.

Weather will influence the length of time a buyer spends in selecting and cutting a tree. On a fine day people will take their time and enjoy the outdoors. In unfavourable weather they will tend to pick a tree quickly and get on the road. The trees in a plantation may all be of excellent quality, but if they are burdened with a load of snow the buyer may have difficulty in making a selection. The owner can prepare for this and perhaps hasten sales by tagging at least seventy five per cent of the trees in advance and suggesting to the buyer that tagged trees are the best quality.

The operation of a "choose and cut" sale can range from elaborate to simple. Some owners believe that by offering added attractions such as sleigh rides, bonfires and food and drink concessions, they provide a memorable experience for buyers that will bring repeat business. At the other end of the scale, the operator may feel that the buyer is not there to be entertained and amused, but simply to acquire a Christmas tree. The individual operator must plan a style of operation best suited to the situation.

There are certain features in planning for a "choose and cut" sale that are common to all operations. Adequate parking is of top priority. The parking lot should be planned to provide easy access and exit for customers' vehicles at all times. Permitting travel through the plantations by vehicles is not recommended as it can result in frustrating traffic tie-ups and stuck vehicles in bad weather.

Advertising the "choose and cut" farm is absolutely essential for a successful sale. The advertisement should give the exact location of the farm and provide instructions on the best route to follow. The inclusion of a map or sketch may be helpful information for the buyer. Dates and hours that the lot will be open for business, species and sizes of trees available, price

range and the telephone number of the farm should be included in the advertisement.

An efficient method of expediting "choose and cut" sales is providing a shuttle service with a tractor and wagon between the parking lot and cutting area. The buyers are transported to the plantations as they arrive, and are picked up with their trees on return trips. If saws are provided by the owner, the tractor driver can issue them to buyers and retrieve them when trees and customers are picked up.

When the customer returns to the sales area with a chosen tree, a salesman prices the tree and collects payment before the buyer proceeds to the parking area with the purchase. An operator should be prepared to wrap or package the tree if the customer requests the service. A supply of twine or cord should be available at all times for tying the trees on cars, as many customers will be totally unprepared and overlook the need to bring it with them.

A small number of top-quality cut trees should be stocked at the sales area for those customers who simply are unable to find a tree that suits them in the entire cutting area. Sales of cut trees at a "choose and cut" operation will be minimal, but if having them available results in a satisfied customer, the effort is justified.

The well organized "choose and cut" sales operation, large or small, should aim at providing a unique and memorable experience for the buyer, a quality product, and service which will encourage return business.

RETAIL SALES

The owner or manager of a Christmas tree farm might sell some of the trees on retail sales lots. Plazas, malls and large service station lots are suitable locations for retail sales. A good retail lot should offer easy access from main traffic arteries, ample parking for customers, and good lighting. Sufficient space to display the trees is important. The sales lot should be set up and open for business no later than December 10, and the operation should clean up and remove any unsold trees by December 24. Unsold trees left on lots after the Christmas season present a very poor image of the industry.

The staff of a retail sales lot should offer service to customers by giving information on the species offered for sale, assisting buyers in making their choices and either helping load the tree on the customer's vehicle or offering delivery service.

Retail sales of Christmas trees can be increased substantially by advertising through the news media. Advertisements should include information on the location of the sales lot, hours of operation, species available and the price range of trees.

Christmas trees should be displayed in a standing position for inspection by buyers, and may be marked with individual price tags or grouped by species, size and grade at one price. Some retailers prefer to sell the trees at a specified price per foot, and the salesman prices the tree after the customer has made a selection. This sales method required additional staff during peak sales periods and often results in haggling or bargaining with the buyer. A small percentage of the trees on any retail sales lot will become shopworn or damaged through handling by salesmen and buyers. These trees should be removed from the lot or offered for sale at reduced prices.

A retail sales lot operator who develops a reputation for good customer service and top-quality trees at currently acceptable prices can expect an annual increase in the volume of sales.

SAFETY IN THE TREE FARM OPERATION

The machines and tools used in the operation of a Christmas tree farm are all dangerous if operated or handled carelessly. The owner or manager should demonstrate the safe operation of mechanized equipment to workers, and provide any safety clothing required.

Chemicals such as insecticides and herbicides should be handled only by experienced personnel. Workers using chain saws should always wear safety pants and mitts or gloves.

Mechanized equipment such as tree planters, mowers, sprayers and tree balers should always be shut down before any adjustments are made. Shearing knives can be especially dangerous and safety precautions must be strictly enforced among workers using them. Leg guards should be worn at all times when knife shearing and employees should never work close to each other. Knives should not be carried to a rest area, because many needless accidents occur from whittling or chopping with the knives during a break.

The Christmas tree industry in Ontario has a commendable safety record compared to farming operations in general. With due concern for safety the owners and managers can maintain this record.

BUSINESS OF CHRISTMAS TREE FARMING

Christmas tree farming in Ontario can be a profitable enterprise. As with any business, efficient management is the key to a successful operation.

The return on investment from the production of Christmas trees will compare favourably with other field crops grown in the province. Regional differences in land costs and labour rates make it impractical to attempt a cost-benefit analysis for Christmas tree growing in Ontario. The rate of inflation and interest is unpredictable, and current statements might be outdated by the time of publication.

CHRISTMAS TREE GRADES

A regulation for Christmas tree grades was enacted in 1965 by the Province of Ontario under the Farm Products Grades and Sales Act. (Appendix I). This regulation remains in place, and knowledge of Ontario grade standards will be useful to the tree grower in culturing the crop.

A survey of Ontario growers in 1981 showed that much of the crop sold to wholesale orders was graded by the producer to the equivalent of Ontario grade standards. The industry is currently in a seller's market situation, but this may change as the supply of trees for market becomes greater through probable increased production. If marketing becomes more competitive it will be beneficial to the grower to have grading certified by inspectors from the Ontario Ministry of Agriculture and Food.

THE FUTURE OF THE INDUSTRY

To maintain a healthy and viable industry, Ontario Christmas tree growers must be aware of future supply and demand for trees and plan production accordingly. The current shortfall of quality trees to meet market demands has encouraged increased planting which could result in oversupply within the next decade.

Surveys by the Christmas Tree Growers Association of Ontario, show that planting in the past three years in Ontario, Quebec and the United States is approximately three times the annual harvest. Should this trend continue it can only result in a glut of trees on the market within eight to ten years.

At the same time there is no evidence of a corresponding increase in demand for the natural tree on the Ontario domestic market. With increased production in the United States, the export market for Ontario trees to that country is declining (Coons 1981).

Competition from the artificial tree continues to pose a threat to growers of natural trees. The Ontario Ministry of Natural Resources has provided a very useful service to the industry by conducting surveys in Metropolitan Toronto which keeps growers informed on the position of the natural tree in relation to the artificial tree in the marketplace. (O.M.N.R. 1980)

In future Ontario growers must strive to efficiently produce quality trees, promote the natural Christmas tree at every opportunity, and develop export markets. The best way to contribute to all of these is through active membership in the Christmas Tree Grower's Association of Ontario.

O. Reg. 201/65.
Christmas Trees — Grades.
Made — August 12th, 1965.
Filed — August 13th, 1965.

REGULATION MADE UNDER
THE FARM PRODUCTS GRADES AND SALES ACT

CHRISTMAS TREES — GRADES

Interpretation

1. In this Regulation,

   (a) "candlestick taper" means that a Christmas tree forms a cone the base of which is less than 40 per cent of its height as viewed from the best face of the tree;

   (b) "Christmas tree" means a tree, whether sheared or unsheared, that is,

      (i) sold, offered for sale or intended to be sold severed from its root system and with its bark, branches and foliage mainly intact, and

      (ii) of the coniferous species, including but not limited to,

         A. Douglas fir (Pseudotsuga Menziesii),

         B. Balsam fir (Abies balsomea),

         C. Black spruce (Picea mariana),

         D. White spruce (Picea glauca),

         E. Scotch pine (Pinus sylvestis),

         F. Norway spruce (Picea excelsa),

         G. Red pine (Pinus resinosa), and

         H. Red spruce (Picea rubens);

(c) "clean" means almost entirely free from moss, lichen growth, vines or other foreign material which detracts from the appearance of the Christmas tree;

(d) "crow's nest" means a cluster of short branches forming a compact nest type of whorl arrangement;

(e) "curved stem" means a bend in the stem of a Christmas tree that affects the appearance and balance of the tree;

(f) "defects" includes one or more of the following conditions or any variation thereof,

1. A decided gap or abnormal space between whorls of branches.
2. Unduly long branches.
3. Excessively uneven density in any face.
4. Weak branches.
5. Broken branches.
6. A lower whorl which is barren of needles or branches.
7. An opening in the foliage of considerable size caused by a lack of branches or foliage.
8. A stem whose length above the top whorl of branches is excessively long in relation to the overall height of the Christmas tree.
9. An incomplete whorl of branches.
10. A handle which is not proportionate to the height of the Christmas tree.
11. A curved stem.
12. Multiple stems, either above or below the top whorl of branches.
13. A crow's nest.
14. A goose neck.
15. Galls on the branches in noticeable quantity.

16. An abnormal loss of needles.

17. An abnormal curling of needles.

18. A noticeable presence of dead twigs.

(g) "density" means density of foliage;

(h) "Director" means the Director of The Farm Products Inspection Service;

(i) "face" means the surface area of a Christmas tree lying within 45 degrees, measured radially from and perpendicular to the stem, on either side of a straight centre line connecting the vertex of the cone formed by the tree and the circumference of the base of the cone;

(j) "fairly clean" means moderately free from moss, lichen growth, vines or other foreign material which detracts from the appearance of the Christmas tree;

(k) "flaring taper" means that a Christmas tree, other than of the genus pinus, forms a cone the base of which is more than 70 per cent of its height or, in the case of a Christmas tree of the genus pinus, forms a cone the base of which is more than 80 per cent of its height as viewed from the best face of the tree;

(l) "fresh" means that the needles are pliable and generally firmly attached with not more than slight shattering at room temperature;

(m) "goose neck" means a stem that has a greater distance than usual between two whorls of branches;

(n) "handle" means that portion of the stem between the butt or base of a Christmas tree and the lowest complete whorl of foliated branches;

(o) "healthy" means fresh, and natural in appearance;

(p) "height" means the distance from the butt or base of a Christmas tree to the top of the tree;

(q) "inspection" means inspection by an inspector appointed under the Act and "inspected" has a corresponding meaning;

(r) "normal taper" means that a Christmas tree other than of the genus pinus, forms a cone, the base of which is more than 40 per cent and

less than 70 per cent of its height or, in the case of a Christmas tree of the genus pinus, forms a cone the base of which is more than 40 per cent and less than 80 per cent of its height as viewed from the best face of the tree;

(s) "stem" means the trunk of a Christmas tree from the base or butt of the tree to the top of the tree;

(t) "well trimmed" means that all barren branches below the first whorl of branches have been removed and the butt of the stem has been smoothly cut at approximately right angles to the stem.

2. Christmas trees are designated farm products.

3. This Regulation applies to the grading and sale of Christmas trees in Ontario.

GENERAL

4. (1) No person shall,

(a) sell, offer for sale, advertise or represent any Christmas tree as having been graded unless such tree has been graded in accordance with this Regulation;

(b) misrepresent the grade of any Christmas tree; or

(c) attach any tag to a Christmas tree describing or relating to the grade of such Christmas tree unless the markings on such tag comply with this Regulation.

(2) No person shall sell or offer for sale any Christmas tree the handle of which measures less than one inch in length for every foot of the tree's height.

GRADING

5. (1) Any person who is a grower of Christmas trees or who is in possession of Christmas trees may apply in Form 1 to the Director to have such trees inspected.

(2) Any person making application under subsection 1 shall submit such application to the Director prior to the 1st day of June in the year in which such person proposes to sell the Christmas trees.

(3) Any person making application under subsection 1 shall grade the Christmas trees prior to inspection and shall attach to each tree a grade tag in accordance with section 6 indicating the grade to which the tree conforms under section 13.

(4) For the purposes of grading Christmas trees, each Christmas tree shall be deemed to have four faces, the centre lines of which are at ninety degree intervals around the tree measured radially from and perpendicularly to the stem.

6. (1) Every grade tag attached to a Christmas tree under subsection 3 of section 5 shall include,

(a) the name and address of the person who applied for the inspection;

(b) the grade of the tree; and

(c) in the case of a tree imported from outside Canada, the country of origin.

(2) All letters and figures marked on a grade tag in accordance with subsection 1 shall be at least one-quarter of an inch in height.

INSPECTION

7. Upon receipt of an application in Form 1, the Director may cause the Christmas trees referred to in the application to be inspected.

8. (1) For variations incidental to proper grading and handling, the tolerance set out in subsection 2 is permitted in any lot of Christmas trees at the time the trees are inspected.

(2) Ten per cent of the Christmas trees in a lot may be below the requirements for the grade marked on grade tags attached thereto, but not more than 5 per cent shall be below the requirements for the grade next lower than that marked on the grade tags.

(3) In calculating the tolerance referred to in subsection 2, percentages shall be calculated on the basis of actual count using individual trees as the units.

(4) The tolerance referred to in subsection 2 does not apply to Christmas trees sold, offered for sale or advertised for sale at retail.

9. (1) After every inspection the inspector shall complete an inspection certificate in Form 2.

(2) The inspector shall serve a copy of the inspection certificate upon the person who applied for the inspection by delivering it to him or by mailing it to him at the address shown on the application.

DETENTION

10. (1) Where an inspector detains any Christmas tree or lot of trees he may attach thereto a numbered detention tag.

(2) No person shall, without the written authority of an inspector, sell, offer for sale, transport or cause to be transported any Christmas tree or lot of trees that have been detained or remove any detention tag.

FEES

11. Where the services of an inspector are required for inspecting Christmas trees, the fees payable shall be at the cost of the services and the method of payment shall be determined by negotiation between the Director and the person who applied for the services.

GRADES FOR CHRISTMAS TREES

12. (1) The grades for Christmas trees are as follows:

1. Ontario Premium, consisting of Christmas trees of any height that posses the characteristics typical of the species and that are fresh, clean, healthy, well trimmed, of not less than medium density, with normal taper and with each of the four faces free from defects.

2. Ontario No. 1 or Ontario Choice, consisting of Christmas trees of any height that possess the characteristics typical of the species and that are fresh, clean, healthy, well trimmed, of not less than medium density, with normal taper and with three faces free from defects.

3. Ontario Standard, consisting of Christmas trees of any height that posses the characteristics typical of the species and that are fresh, fairly clean, healthy, well trimmed, of not less than light density, with candlestick taper, normal taper or flaring taper and with two adjacent faces free from defects.

(2) Christmas trees that fail to meet the requirements of Ontario Premium, Ontario No. 1, Ontario Choice or Ontario Standard shall have affixed thereto grade tags bearing the words "below Grading Standards".

Form 1

The Farm Products Grades and Sales Act

APPLICATION FOR INSPECTION OF CHRISTMAS TREES

To The Director,
Farm Products Inspection Service,
Ontario Department of Agriculture,
Parliament Buildings,
TORONTO.

Name of Applicant .....

Address .....

makes application for inspection of .....
(approximate number of trees)

Christmas trees composed of ..... located at
(species)

.....
(location)

Dated at ....., this ..... day of ....., 19 .....

.....
(signature of applicant)

Form 2

The Farm Products Grades and Sales Act
CHRISTMAS TREE INSPECTION CERTIFICATE

I, ...
(name of inspector)

have inspected the Christmas trees referred to below, in accordance with the regulations respecting grades for Christmas trees made under *The Farm Products Grades and Sales Act*, and certify that such trees have been graded in accordance with the said Regulations to the tolerances set forth therein.

Name of grower or person in possession .....

.....

Address .....

Location of Christmas Trees .....

.....

Species and approximate number of Christmas Trees:

.....

Dated at ....., this ..... day of ....., 19.....

.....
(signature of inspector)

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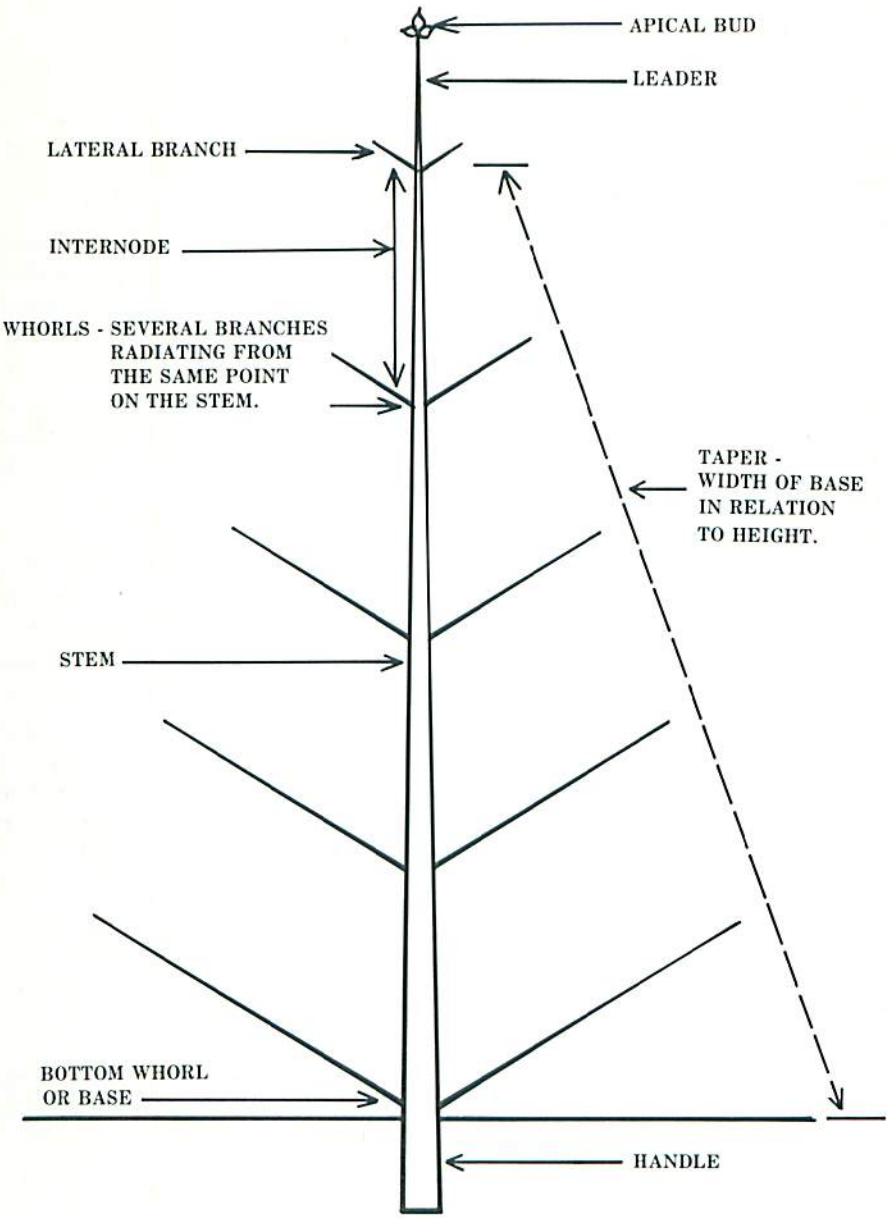

CHRISTMAS TREE TERMINOLOGY

INTRODUCTION

Decorating a tree at Christmas has long been part of our tradition. The use of Christmas trees has been well documented in articles and stories. In 1981 the Government of Canada recognized the Christmas tree by depicting decorated trees on an issue of postage stamps.

The Christmas tree growing industry in Ontario is a relatively recent development compared with other farm crops. For many years, enough spruce and fir trees were available from the natural forests to supply the trees required at Christmas.

About 1940, due to increasing population and prosperity in Canada and the United States, the number of trees required rose dramatically. Improved transportation facilities made it possible and profitable to move trees to regions on the continent and abroad where evergreens had not been available. It became evident that the supply from natural forests could not continue to provide enough trees. At the same time, foresters expressed concern about the depletion of forest resources by the annual cutting of young trees. Thus, the combination of growing demand and a lack of future supply were the main factors behind the development of Christmas tree farms in Ontario.

Christmas tree farming on marginal land, usually unsuitable for the production of other agricultural crops, is a profitable and sensible land use. Christmas trees are a labour-intensive crop, and production provides much seasonal employment.

Many ecological benefits are evident. Tree crops beautify otherwise barren land, help to control erosion, contribute to clean air and water, and provide suitable cover for wildlife and birds.

The challenge to Ontario Christmas tree growers now and in the future is to supply market requirements at home and abroad with a high-quality product.

STARTING CHRISTMAS TREE FARMING

Are you thinking of starting a Christmas tree farm? If so, you should first consider this: The people you wish to join have been variously described as "that fellow who wears the yellow rain suit and doesn't know enough to come in out of the rain", "that guy stuck in the snow on the 6th concession hill with a truckload of trees", or "that couple who flail away at trees with long knives on a hot July weekend when they could be at the beach". If you're still interested, you have cleared the first hurdle.

The production of a top-quality Christmas tree demands a commitment from the grower to carry out work within a specific time frame from planting to final delivery at the sales lot. Meeting these goals often involves working long hours outdoors in foul weather.

Planting must be done at the optimum time for seedling survival. Shearing and pruning must be completed at the proper time to ensure maximum bud production. Insects or disease should be controlled before damage to the trees occurs. Control of competing grass and weeds is necessary. Finally, the trees must be harvested and delivered to the sales lots. The potential sales period for Christmas trees is short, and each day lost through late delivery reduces the potential sales period. Trees delivered to a sales lot on December 26, because the truck was stuck or inoperative on December 20, are indeed of questionable value.

Christmas tree farming can be a full-time business enterprise or, on a smaller scale, a part-time outdoor interest or hobby. In either case, success demands a high degree of dedication, motivation, and commitment from the owner.

Many Christmas tree farming operations have failed simply from lack of prior knowledge of the time and effort required to produce good quality trees. Prospective growers should familiarize themselves with every aspect of management before deciding to proceed with the venture. This can be best achieved through visits to operating tree farms and actually participating in all phases of the work involved. Discussions with established growers, perusal of relevent literature and attendance at tree farmers' workshops or field days are invaluable sources of information for the prospective grower.

The prime consideration is, of course, the financial or business aspect. Christmas trees are a long-term crop and it must be recognized at the outset that at least seven years will elapse before any return on the investment is realized from a first crop. During this time annual expenses are incurred through establishment and management of the plantations.

If the property obtained for Christmas tree production includes a woodlot or natural forest area, immediate annual revenue could be realized from the sale of timber or firewood. Wild white spruce or balsam fir trees can be cultured and managed to produce an earlier crop of Christmas trees. Fields designated for future plantations might be rented to farmers for pasture or crops. The opportunity for some immediate return will naturally vary widely depending on the circumstances and nature of the property owned.

Once the decision to establish a Christmas tree farm is made, the first step is acquiring land. Production objectives should be considered carefully. Does additional available land present an opportunity for future expansion? Are trucks, tractors and machines available on reasonable notice for rental or custom work? Is seasonal casual labour readily available? Where is the potential market in relation to the property's location? If a "choose and cut" operation is considered, the location must be reasonably close to a large population. Commuting distance to a farm is a very important factor for a part-time operation. There are many other conditions which will influence the purchase of a particular property. The foregoing are simply points that apply in general.

The farm should be accessible by an all-weather road, suitable for large trucks or transports. Well drained, gently sloping or level fields are ideal. Land with very steep slopes should not necessarily be rejected for tree farming, but management will be more difficult on this type of site. Land with an excessive cover of brush or herbaceous growth, particularly bracken fern, should be avoided unless the owner is prepared to accept the expense and work of clearing the acreage. A heavy cover of bracken fern creates an exceedingly difficult situation for the tree farmer. The plant must be eradicated by cultivation and use of herbicides before Christmas trees can be grown successfully.

Stony, rough land with boulders and rock outcrops is generally unsatisfactory and should be avoided. Operation of machines is extremely difficult on such terrain, and expensive breakdowns will occur frequently. Soils are usually shallow on this class of land, and in general are unsuitable for production of quality Christmas trees.

Rough land may be unsuitable for Christmas tree production, but should be planted. The owner might consider having these areas planted and managed by the Ontario Ministry of Natural Resources under the Woodlands Improvement Act (Department of Lands and Forests, 1970).

The class of soils on the property will influence the choice of species to be planted. Sandy, well drained soils are ideal for pines, while spruces

and firs prefer fine-textured, moist soils. The inexperienced tree farmer is advised to seek the advice of a forester or established grower on suitable species for the site.

A variety of species should be considered if the soils and topography are suitable. It is distinctly advantageous at the market stage to have a variety available. Moreover, producing more than one species tends to distribute the workload throughout the year. The pines must be sheared and pruned within a specific period at midsummer whereas the spruces and firs can be done during the dormant season.

An ample source of water on a property should not be the major factor in land selection, but it is a most desirable feature.

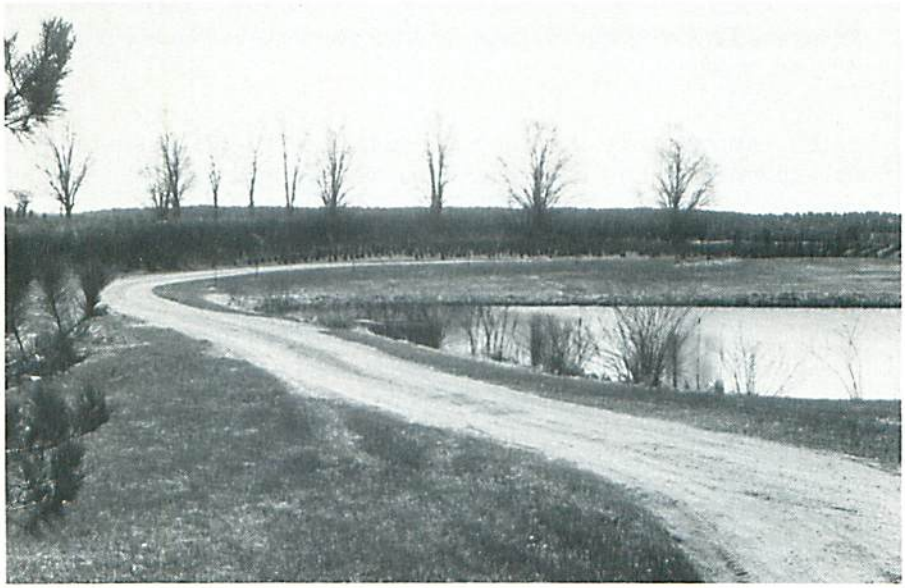

Figure 1 — Pond on tree farm supplies water for fire protection and irrigation.

Water is necessary for fire protection, to irrigate nursery beds in dry weather, and to keep nursery stock moist at planting time. The spray application of insecticides and herbicides will require large volumes of water on occasion.

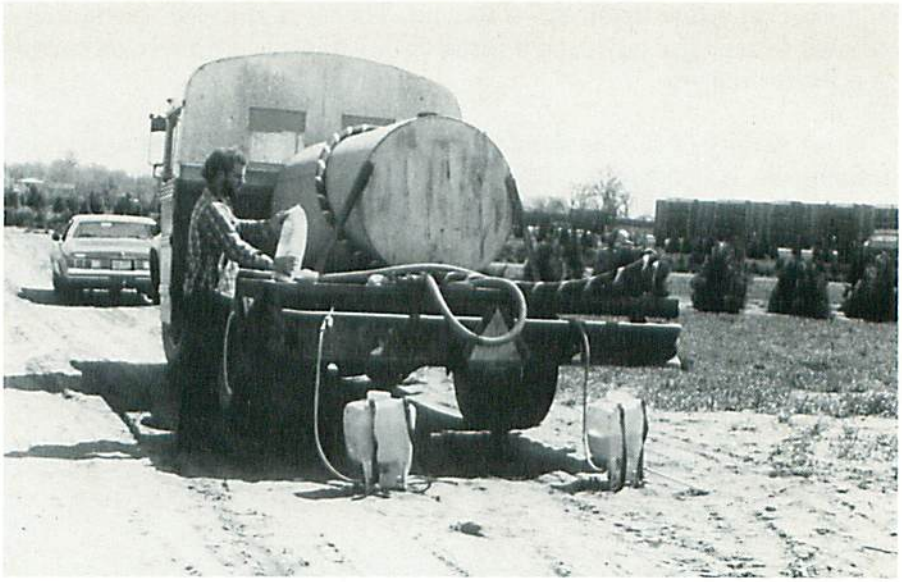

Figure 2 — Tank truck supplies water for mixing herbicide and insecticide when spraying in plantations.

If a natural source of water is available, the owner is spared the additional expense of drilling or digging wells, which can be costly and does not always produce satisfactory results.

The initial investment in machines, tools and equipment to start tree farming need not be great. The projected plan for the operation will dictate requirements. If a large operation with a high production volume is planned, the investment in expensive items such as tractors, power sprayers, tree balers and trucks can be justified. The small operator might find that renting such equipment as needed is more economical. In either case, the time between initial plantation establishment and first harvest will allow the owner some latitude in acquisition of equipment.

Recommendations for basic tools and equipment are based on the premise that the operator should begin with the modest initial planting. Whatever volume of production is ultimately planned, it is sensible to start in a small way, allowing time to learn management techniques and procedures through experience.

The first-priority list of equipment should include suitable clothing for outdoor work in all weather. A good rain suit is essential. Safety boots and gloves are necessary.

A reliable lightweight chain saw is a justifiable initial expense. This

versatile tool may be used for brush removal during site preparation, for fence and building repairs, and will ultimately serve in harvesting the first crop.

A back-pack hydraulic sprayer should be among the first equipment obtained.

Figure 3 — Application of herbicide for grass and weed control with a back-pack sprayer.

The sprayer will be needed to apply herbicides during the preparation of planting sites, and must be available for immediate use to control insect infestation or disease.

Planting tools such as spades or shovels will be required at planting time, along with pails or suitable containers to carry planting stock. Proper management of the young trees will require hand pruners or secateurs and shears in the first year after planting. Small hand tools such as axes, brush hooks, machetes and bow saws are relatively inexpensive and will prove useful. Shearing trees with knives is not usually done until the fourth growing year, so the acquisition of shearing knives and the related safety equipment be deferred to a later time.

The foregoing is intended as a general guideline for the beginning tree farmer with limitations on initial capital outlay. Through experience as the enterprise develops, the owners will recognize the machines and equipment best suited to their operation. Following the tradition of farmers in general, the Christmas tree grower will innovate and devise various items of equipment and tools as necessary.

PLANNING THE TREE FARM LAYOUT

The value of good planning in farm layout cannot be overemphasized. A well organized plan will facilitate all phases of management and ultimately result in reduced labour costs. A map of the property should be prepared when the plan is completed. The map or sketch should show topographic features, the road system, and the size and location of plantation compartments. Numbers or names may be assigned to roads and compartments to provide a reference when instructing planting, shearing or harvesting crews. A master plan will help the manager keep records of the species and age of plantations, of treatments and procedures, and finally of the inventory of merchantable trees by size and grade.

Major factors to be considered when planning the layout include road systems, size of plantation compartments and provision for a convenient yarding and storage area for the harvested trees. If "choose and cut" sales form part of the management plan, special consideration must be given to road systems suited to this type of operation. Reference will be made to road requirements in a later discussion of "choose and cut" sales.

The general topography of the property should be studied carefully when the major road systems are planned. Steep hills and abrupt slopes must be avoided if possible. A slope which presents no problem on a dry July day is quite a different story under several inches of wet snow in October or November.

Low, continually wet areas where wheeled vehicles may bog down should be bypassed if possible. If there is no suitable alternate route, the owner must assume the expense of adding granular fill or gravel to these areas.

Main roads should be wide enough to allow for piling trees along the sides, yet permit clear passage for trucks and tractors. Secondary roads will be required in plantation compartments for access, and for gathering the cut trees at harvest time. The interval between access roads will vary widely according to topography and the choice of the manager. Where the trees are planted at six-foot spacing between rows, provision for a roadway at 20-row intervals is a reasonable plan. This short distance between roads facilitates the work of dragging the cut trees out for pickup during the harvest operations.

On large, highly mechanized operations, some managers favour a spacing of seven or eight feet between rows. This permits easy access for mechanized equipment through the entire plantation block, eliminating the need for access roads at regular intervals.

The small operator who plans maximum utilization of the land may consider planting the entire area without access road reserve. If this method is adopted, all management procedures will have to be done on foot, using back-pack, hand-operated equipment. At harvest time, full rows of trees are removed to provide access roads as required.

The long-term production objectives of the enterprise should be understood before plantation compartments are planned. If the aim of the owner is a continuous annual crop of Christmas trees, the land area must be organized to meet this objective. If the available land area and topography permit, an ideal arrangement would provide at least ten compartments of comparable size. A planting would be established on one of the compartments each year. At the end of the eight to ten years required from planting to first harvest, all compartments would be in production. The arrangement also provides time for site preparation before planting the second crop in the rotation.

The ultimate advantage of this type of management plan is the continuity of supply to established market outlets. Last, but certainly not least, it provides for an annual return on investment.

It is recognized that such an arrangement would not be suitable for the owner of a small tract who plans to grow a single crop of Christmas trees. In this case some variation of the plan might be used.

The selection and plan of an area for yarding, storage and shipment of the trees is important. Ideally, the location should be sheltered from prevailing winds. It should be on level ground with a dry, firm and clean base which will support continual movement of many heavy vehicles without breaking up under wet conditions. The owner may have to apply gravel or granular base at least on the roadways to maintain acceptable conditions.

Ample space to permit the free movement of trucks and transports will avoid tie-ups during the shipping season. Obviously the location must be easily identified and readily accessible to major roads and highways.

Since seasonal workers will be employed at this location during grading, sorting, baling and shipment, it will be necessary to provide comfort stations. And out-of-the-way parking to keep employee-owned vehicles from impeding work-related traffic should be considered.

If operation is large enough to warrant the initial cost, a building at the yard will offer many advantages. During the harvest season, it can serve as a temporary office where telephone service can be available and clerical work and record-keeping performed indoors. A first-aid station can be maintained in the building for the treatment of minor injuries to employees.

THE ESTABLISHMENT OF PLANTATIONS

Before proceeding with any discussions of plantation establishment, it is appropriate to offer a word of caution to aspiring growers about the number of trees initially planted. Whatever your future production objectives, start with modest numbers. All too frequently, enthusiastic beginners talk of planting 20,000, 50,000, or 100,000 trees. Frustrating failures, usually resulting from lack of experience, are not uncommon to any new venture. These temporary setbacks can be accepted and overcome more readily if they involve hundreds, rather than thousands of trees. The experience of managing a modest number of trees from planting through the harvest and sales will prove invaluable, and indeed may ensure the future success of the enterprise.

When planning initial plantings, the manager should have a good knowledge of the site's suitability for producing a particular species. It would be impractical to offer more than broad general guidelines in this manual. As previously indicated, the owner should seek the advice of a forester or experienced tree farmer in evaluating the specific location.

The market potential for a species of Christmas tree is an important consideration. In Ontario, Scots pine continue to maintain a strong position in domestic and export markets. White spruce is second in popularity. There is a narrow, regional demand for red, Austrian and white pine. Experimental work with the culture of jack pine as a Christmas tree is encouraging, but the market acceptance of this species is not yet well enough known to warrant large plantings. Balsam fir, long a traditional favourite in Eastern Canada, has a definite but limited demand in Ontario. The cultural management of natural balsam fir wildlings could produce enough trees to supply the demand for this species in the immediate future. Assuming that the site is suited to Scots pine, white spruce or both, the aspiring tree farmer might consider production of these two varieties when planning initial plantings.

In Ontario, seedling planting stock may be obtained from Ministry of Natural Resources tree nurseries. The cost of stock from this source is nominal, and is adjusted to reflect production costs. Prospective growers should contact the local district office of the Ontario Ministry of Natural Resources for information on ordering seedlings.

The following table may be used as a guide when ordering seedlings to plant a specific area.

Spacing Between and Within Rows	Number of Trees Per Acre
4 x 4 feet	2722 plants
5 x 5 feet	1472 plants
6 x 6 feet	1210 plants
6 x 8 feet	907 plants

Privately owned tree nurseries in Canada and the United States offer seedling nursery stock for sale. The cost of stock from these commercial nurseries is usually considerably higher than for stock obtained from the Ontario provincial nurseries. The operators of a large tree farm with a high production objective might plan to develop a tree nursery to generate their own supply of seedling stock. Successful operation of a tree nursery requires special expertise and cannot be covered adequately in this manual.

The care of seedling planting stock, from the time it is received from the nursery until the trees are planted, is of vital importance. Poor survival of newly planted seedlings often stems from lack of attention to this important detail.

Figure 4 — A nursery bed of seedlings which will be lifted for planting in the field.

The farm manager should strive to have the seedlings planted with the least possible delay after the stock is received from the nursery. Inclement weather, machine breakdown, planting site preparation, and shortage of seasonal labour all can delay the planting operation. With proper care, seedling stock may be safely held for a maximum of three weeks.

The safest method of maintaining seedlings in a viable condition is "heeling in", and this technique is recommended if stock must be held for an extended period. A totally shaded, moist location is most suitable for the "heeling in" bed. A trench is dug in the moist soil, root systems of the bundles of seedlings are placed in the trench, and the soil firmly pressed around the

roots to exclude air. Should unusually dry weather occur during the "heeled in" period, the beds should be watered daily to maintain high soil moisture.

Figure 5 — Seedling planting stock "heeled in" before planting in the field.

Seedlings may be safely stored in cool storage such as a root cellar for short periods. Root systems must be kept moist at all times.

Bales or bundles of seedlings should never be piled except briefly during transportation. Piling bales or bundles may cause heating which will seriously damage root systems. Stock should never be stored in direct sunlight under tarps or plastic sheets either during transport or at the planting site.

Careful care of planting stock will be rewarded with a high survival rate of planted seedlings. Quality trees begin with good planting. Poor planting is reflected by an unacceptably low survival of planted seedlings, reduced vigour of trees, and - - in the case of Scots pine in particular - - crooked handles or stems. Whatever planting method is employed, it is imperative that the seedling be set in a perpendicular position to promote straight stem growth. Root systems should be spread to avoid "bunching", and soil well packed around the roots to exclude air. The farm manager should keep these factors in mind when selecting a planting method and supervising the planting operation.

Plantations may be established by mechanical planting or by hand planting. The decision to employ either method or combination of the two will be governed by the topography of the planting site and the availability of casual labour. In the final analysis, if either option is open, cost will be a deciding factor. Good planting can be achieved with either method.

Before further discussing planting methods and procedures, we must recognize the probable need for treatment of a site before planting. In the urgency to get trees planted, the new grower may be tempted to overlook this important requirement.

Conditions will vary widely and each planting area must be assessed before deciding on the need for pre-planting treatment. This is an area where the new grower can benefit immensely from the advice of a forester or experienced tree farmer. Proper preparation of a field before planting will pay continuing dividends through the entire crop rotation. Ease of planting, a higher rate of seedling survival, improved tree growth and quality, and reduced management costs are all benefits of well planned planting site preparation.

The problems and possibilities of a planting site will be specific to the particular area. Therefore, only guidelines will be given in this manual.

Fields with a light sod cover and sparse herbaceous growth do not usually require preparatory treatment for planting. Competing vegetation which may develop later can be controlled through the crop rotation by mowing, herbicide treatment or a combination of both.

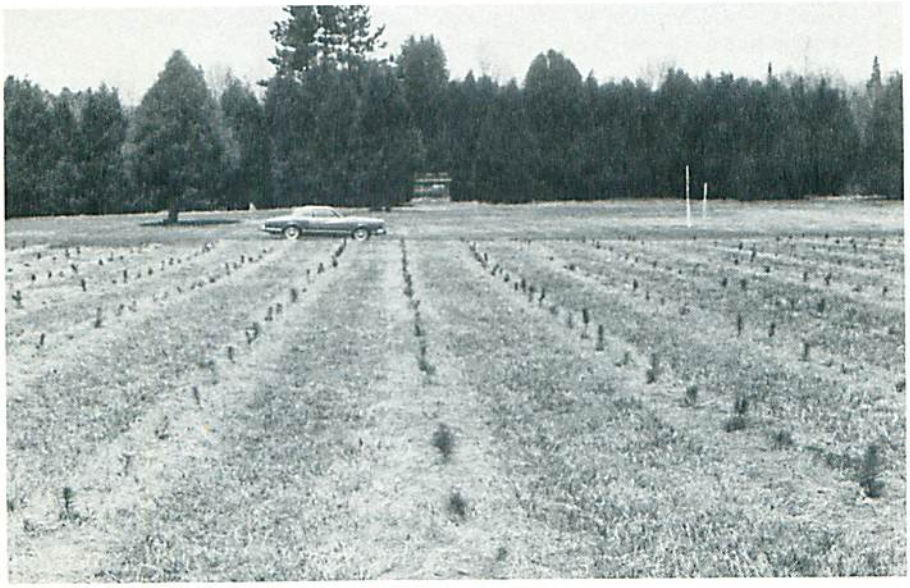

Figure 6 — Grass and weeds are controlled around the young trees by herbicide application. Weeds are mowed between the treated strips.

Planting sites with a heavy sod and dense growth of herbaceous plants, grasses and woody shrubs present an immediate problem, and must be treated before planting. If the topography permits the operation of machinery, cultivation is the most effective and economical method. Cultivation will control the competing vegetation until the young trees are well established.

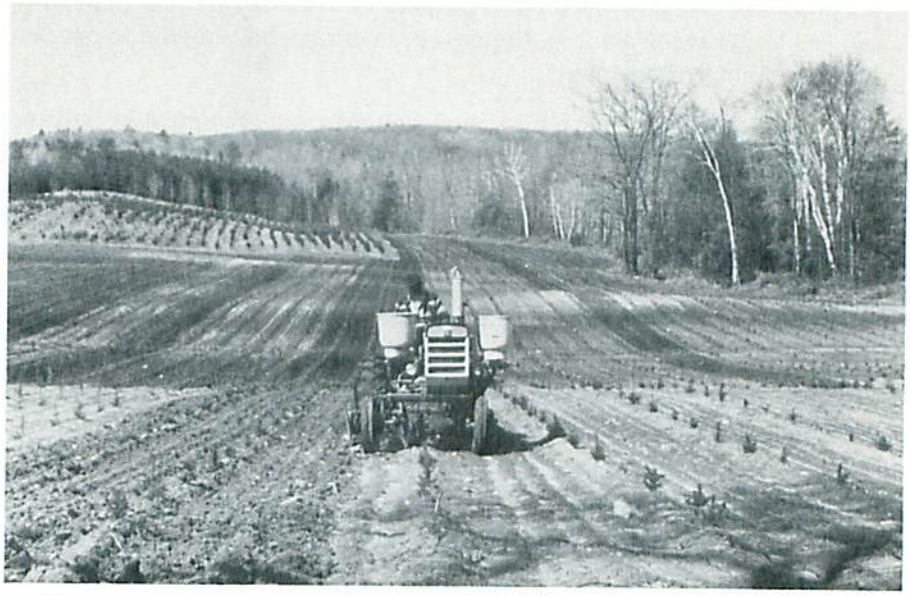

Figure 7 — Cultivation of young plantation for grass and weed control. Note hoppers on tractor for fertilizer application.

The manager may then evaluate the situation and formulate a plan for weed control throughout the crop rotation. Cultivation is not a suitable pre-planting preparation for very rolling land, as it predisposes the site to washing and erosion. Control of vegetation is better accomplished on this type of site by pre-planting herbicidal treatment.

The relative merits of machine or hand planting must be considered by the farmer when planning plantation establishment. It is impractical to suggest that either method of planting trees is "best". Both have advantages and disadvantages. In the final analysis, the method which achieves good planting at the lowest cost will be favoured. Managers of established Christmas tree farms usually employ both methods to some extent.

In a large operation, machine planting is almost a necessity, unless large numbers of seasonal workers are readily available in the area. Even if workers are available, maintenance of good planting quality requires considerable supervision by the managers.

Under good operating conditions, two men with a farm tractor and planting machine can plant up to 1,000 seedlings per hour, a production rate that compares favourably with the achievement of eight to ten hand planters.

Figure 8 — A tree planting machine in operation.

On first view it would appear that machine planting is the more economical method. However, the capital cost of the tractor and planter must be considered when comparing planting costs. In the initial stages of development of the Christmas tree farm, the owner might investigate rental of a mechanized planting equipment, or contract the tree planting to a custom operator.

Mechanized planting is best suited to large fields, where long rows are possible. In small areas, as much time is consumed in turning at the end of rows as in the actual planting. Level or gently rolling land is ideal for the operation of machines. Abrupt slopes are difficult to plant mechanically, and low or wet areas where the tractor and planter might bog down should be avoided.

Where site conditions allow mechanized planting, there are many advantages in the use of machines for plantation establishment. The most apparent is the planting rate which can be achieved with a small number of workers. The seedlings can be planted with a minimum of delay after they are lifted from the nursery beds, an important factor in good survival of the newly planted trees. Control of planting quality is more easily maintained and straight rows more readily achieved with machine planting. Establish-

ed growers attribute a higher seedling survival rate to machine planting. This may be true in some cases. However, planting quality, whatever the method, usually determines seedling survival.

There are many makes and models of tree planting machines on the market. A tree farmer contemplating the purchase of a planting machine should consult with the manager of an established tree farm who uses machines for advice on a suitable model.

Basically all planting machines employ similar principles. A rolling coulter splits the earth ahead of a trencher which opens the soil to receive the seedlings as the operator places them. A pair of packing wheels follows, firming the soil around the tree roots as the trench closes. The planter operator is usually seated directly over the packing wheels, providing additional weight to help pack the soil firmly.

Figure 9 — A tree planting machine mounted on farm tractor in raised position. Note rolling coulter, trencher and packing wheels.

In general there are two types of planters. One opens the ground to receive the tree and is commonly called a slit planter. The other is equipped with mouldboards and throws a scalp or furrow ahead of the trencher, on either side of the row of trees. The latter is usually called a "scalping" or "furrow" planter.

Cultivated fields, areas with a light sod cover, or sites where vegetation is controlled by pre-planting herbicidal treatment are well suited to the

use of the "slit" planter. Sites with heavy sod cover where no pre-planting treatment is done must be planted with the type of machine which scalps or furrows.

Furrowing has long been an accepted method of site preparation for tree planting.

Figure 10 — A field prepared for hand planting by furrowing.

Unquestionably, furrows provide some early benefits in the establishment of the plantation. The method provides temporary control of competing vegetation, and on a heavy sod site permits better packing of the soil around the roots. Furrowing or scalping has initial benefits on some sites, but furrows are a nuisance to all other aspects of management through a crop rotation. Furrows will impede wheeled vehicles which are required to provide power for mowing and spraying operations. The rough ground makes foot travel difficult during pruning, shearing and harvesting.

Mechanical planters of either type are very difficult to operate on stony, coarse gravel sites. Maintaining proper trencher depth is difficult, and soil packing is poor. Time-consuming and costly breakdowns will occur more frequently. In general, hand planting of this class of site is recommended.

The success of mechanized planting operation will depend on the skill of the tractor driver and planter operator, whatever type of equipment is used. Each has a specific role and they must work as a well co-ordinated team. The tractor driver is responsible for straight rows and proper spac-

ing. A constant forward speed must be maintained, because changes upset the rhythm of the tree planter, causing irregular spacing of the trees within the row. Since the planter operator must concentrate on setting the seedlings, the tractor operator should be alert to any hazards to the safety of the planter operator. An effective communication system between the driver and planter, such as a horn or bell, is necessary to stop the machine immediately in the event of planter malfunction, breakdown or clogging.

Planting quality should be supervised at all times during a machine planting operation. An experienced person, travelling on foot behind the planting unit, can quickly detect planting faults which are not readily apparent to the operator of the planter. Early detection and immediate correction of planting faults will avoid repeated and costly mistakes over the entire field. Assuming that the planting job is proceeding satisfactorily, the supervisor can expedite the operation by supplying planting stock, fuel and refreshment to the planting crew. With experienced operation, mechanized planting usually achieves a more uniform planting job than hand planting, and requires a minimum of supervision.

Christmas tree farms, both large and small, will use hand planting to some extent in the management plan. Small operators who start with limited capital and plan to do much of the work themselves will find hand planting to be less complicated. And if it is done carefully, it will produce satisfactory results.

Figure 11 — A seedling which has been hand planted in a furrow. Tree should be planted to the same depth as it grew in the nursery.

The manager of the larger business may use hand planting on areas unsuited to mechanized treatment, and to fill misses or failures in machine-planted fields.

Supervision of a hand planting operation should include a preliminary training program for workers. The time spent instructing workers and demonstrating proper planting methods is well justified and will result in improved planting quality. The work of the planting foreman or supervisor is simplified if workers fully understand the standards expected before the work begins. While planting costs are important, the rate of production should not be the prime consideration when evaluating the abilities of planters. Not all employees can work at the same speed while maintaining good planting quality. A high rate of seedling survival attained through careful planting is more important in the long run than the number of seedlings planted in a day. Depending on the physical capability of the worker and the type of planting site, careful planting of 100 trees per hour is a reasonable rate of production to expect from a hand planter. This figure is given as a general guideline, as circumstances will influence performance.

Hand tools which may be used for planting trees are readily available. The most commonly used planting tools are round-mouthed shovels and square spades, with either short or long handles; planting bars or dibbles; and the mattock or grub hoe. The choice will depend largely on the soil conditions of the planting site. Personal preference by the manager or workers will also influence the selection.

Light, dry sandy soils with a thin sod cover are well suited to the "wedge" method of planting with a spade or shovel. A wedge of soil is removed from the planting hole, the seedling placed against the vertical side of the hole, and the wedge returned and firmed around the roots with the planter's feet.

Care in handling stock during hand planting is most important in seedling survival. The plants may be carried in a pail or bucket containing water to keep the root systems moist. Some workers prefer canvas planting bags attached to a belt around the waist. Such bags allow free use of both hands to handle the planting tool. Stock carried in planting bags is kept moist by packing wet moss around the root systems. Supervisors should discourage the habit of carrying a number of seedlings in the free hand, as it exposes the bare roots to the drying effect of sun and wind, which can be very damaging to the seedlings.

Whatever type of tool is used in hand planting, there are certain basic standards that must be observed to obtain good survival of the planted seedlings. The tree should be set perfectly straight in the planting hole. Root

systems should be well spread and covered. Packing the soil around the roots to keep air out is very important.

Whether planters work singly or in pairs is largely a matter of choice for the manager and planting crew. Either arrangement can produce good planting at a satisfactory rate.

Whether plantations are established by machine or hand planting, the spacing of trees must be considered when formulating a management plan. An accepted practice for many years has been six-foot by six-foot spacing. When Christmas tree farms were started, this spacing arrangement was generally followed by tree farmers. Experience has shown that altering this accepted standard may be advantageous in specific managment plans. As previously suggested, where mowing between rows or mechanized spraying will be necessary during the crop rotation, the trees might be planted at seven-foot spacing between rows to facilitate the movement of the equipment.

Exact spacing is more easily controlled with machine planting as the supervisor will have to instruct only the tractor driver. Hand planting with a crew of workers will require the foreman to devise a method which will ensure establishment of straight rows, and acceptable spacing between and within the rows of trees. Success will depend a great deal on the ingenuity of the planting supervisor and the interest of the workers.

Suggested methods include the erection of guide stakes in the field and the use of twine or rope marked at regular intervals for the guidance of the workers. Experienced tree planters often achieve acceptably accurate within-row spacing by pacing the distance between the trees as they plant.

The importance of good planting, whatever the method, cannot be overemphasized in successful Christmas tree farm management.

MANAGEMENT OF THE CHRISTMAS TREE FARM

When the plantations have been established, the work of good management begins. The ultimate goal is the production of top-quality trees for market. Many tasks are involved in effective management. Neglect of any of them will result in an inferior product and could contribute to a failure of the enterprise.

Soil, plants and weather are factors with any crop, and nothing is absolutely predictable. The owner must be prepared to cope with problems as they arise. The farm manager must have an alert eye and an inquiring mind to recognize problems at an early stage and take appropriate action.

Christmas tree farming takes both immediate and long-range planning. Organization is extremely important as much of the work must be accomplished within a very specific time frame through the crop rotation from planting to harvest.

Tree farm management involves a number of different procedures. These are discussed under sub-headings for ease of reference.

Pruning and Shearing

Christmas trees must be pruned and sheared annually from the first growing year through to the harvest. The objective of this cultural treatment is the development of increased foliage density and improved shape.

In the work schedule of operating a tree farm, pruning and shearing is perhaps the most demanding and difficult task. The work is always done by hand. Depending on the size of the operation it may require large numbers of workers to complete the job within the optimum shearing period.

For the purpose of this manual the terms "pruning" and "shearing" should be defined. "Pruning" refers to the selective removal of whole branches and twigs. "Shearing" means trimming and shaping the entire crown of the tree.

The basic tools usually used for the work are hand clippers, hedge trimmers and tree shearing knives.

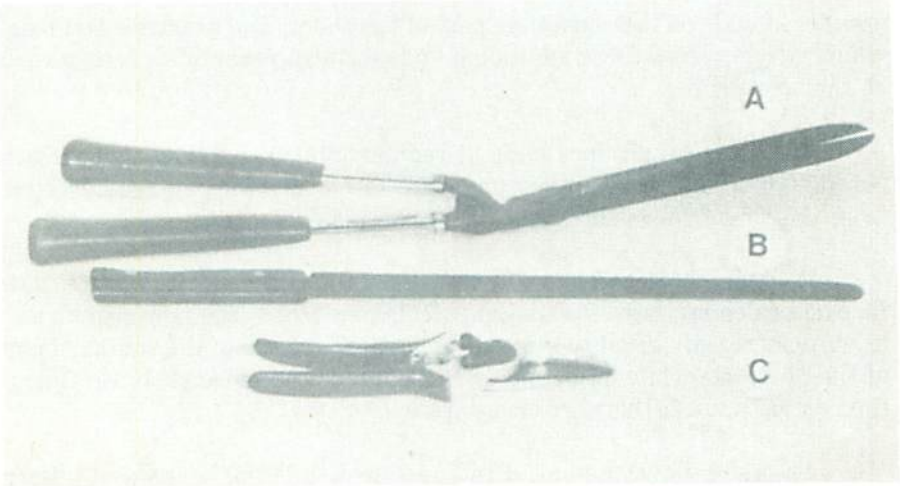

Figure 12 — Basic tools used for pruning and shearing Christmas trees — A. Hedge trimmer, B. Tree shearing knife, C. Secateur.

The hand clippers and hedge trimmers are used for pruning. Knives and hedge trimmers are employed in shearing. This advice is intended as a general guideline only. In the final analysis the preference of the manager will decide the most effective combination of tools for the work.

The new grower should understand the reasons for pruning and shearing trees and how this treatment achieves the objectives of acceptable quality.

Simply stated, trees grown specifically for the Christmas tree trade must be pruned and sheared to produce a product which meets current market demand. Cultural techniques developed by tree farmers have continued to improve the quality of Christmas trees and the open, natural tree is no longer acceptable to the consumer.

Scots pine and spruce, Ontario's popular Christmas tree species, grow rapidly. If uncultured, the trees will be tall, spindly and open, quite unsuitable for the Christmas tree market. (Ontario Department of Lands and Forests 1969).

In general, pruning and shearing procedures are similar for both species, but differ in the timing of the operation. Scots pine must be trimmed when the new growth is well developed yet still succulent. The job should be completed before the shoots harden and become woody.

Spruce trees are usually pruned during the dormant period of late summer, autumn and early winter, when the new growth is fully developed and mature.

Clipping the new growth of Scots pine produces a greater-than-normal number of buds on the remaining part of the shoot. The branches and twigs which develop from these additional buds form an acceptably dense crown as the tree grows.

Spruce trees produce buds at regular intervals on the new growth. No additional buds result from pruning the shoots, and the new growth begins from the first bud on the shoot below the point where it was cut off.

Regional differences in climate across Ontario make it impractical to fix exact calendar dates for shearing Scots pine trees. The new growth may be sufficiently advanced to start shearing at mid-June in the southern part of the province, while late June or early July is the more probable time in the central and northern growing areas.

Assessing development of the new growth is the best way to determine when to start shearing. The new growth should be developed to at least three-quarters of the mature length before shearing begins. With earlier

treatment, some of the shorter shoots will be missed entirely in the trimming process. These shoots will continue to grow, resulting in trees with an irregular, ragged crown requiring additional corrective work later on. For best results, shearing of Scots pine should be completed within three weeks of the time the work is started. Late shearing, after the shoots have hardened off, usually results in very poor bud development.

The farm owner or manager confronted with the task of pruning and shearing a plantation of Christmas trees for the first time is often concerned with the apparent magnitude of the job. A common mistake, made in the interest of expediency, is to adopt an "assembly line" method of work. Every tree has different characteristics and faults and must be given individual attention in the early years of crop rotation. On first view, this may seem a waste of time and money, but it is well justified and will pay dividends in the final analysis.

The new grower can read all the available literature pertaining to pruning and shearing trees, but the best method is to "learn by doing". The most profitable learning experience open to the beginner is actually working at the job with an experienced grower or tree farm manager.

A Scots pine plantation will not usually require any cultural treatment in the first year. Growth is slow until the trees' root systems become established. The planting should be carefully inspected in the second growing season when double tops and other obvious faults can be corrected with hand clippers. Individual trees may display unusual vigour at this age and produce long leaders. When they occur, these should be trimmed back to about ten inches in length.

Starting with the third growing season, every tree in the plantation will require annual treatment until harvested. The cultural work in the third and fourth years is extremely important, as the framework or structure of the tree is developed at this time. Growers should not attempt to achieve merchantable density at this early stage, but work toward development of a symetrical shape with good branch structure and a straight trunk or stem.

Hand clippers and hedge trimmers are the best tools for trimming young trees. The grower should avoid the common tendency to overprune Scots pine at this stage. Severe pruning in the early years tends to restrict height growth unnecessarily, resulting in an extended time to harvest.

The worker should take the time to examine the tree carefully before starting to prune it. The first step is the selection of a leader, which is the longest and most vigourous shoot in the top whorl of branches. If there is a choice, the shoot most closely aligned with the main stem should always be selected, as this will promote the development of a straight stem or trunk

as the tree grows. Any other dominent shoot aligned with the selected leader should be removed completely to avoid later development of a double-stemmed tree. The leader should be clipped back to approximately twelve inches in length by cutting the shoot off at a 45-degree angle. Maintaining this angle when trimming the leader is important to the development of a dominant apical bud, which will form the leader in the next year.

Lateral shoots in the top whorl should be trimmed to about one-half the length of the leader. The object of this first step is to develop an inverted cone shape at the top of the tree from which an imaginary line may be drawn for guidance in trimming the side shoots of the crown. When trimming side branches, hedge trimmers or shears should always be held at an angle conforming to the slope of the crown. If trimming is done with the shears in a flat or horizontal position the trees will develop "shoulders" and an irregular outline.

Taper is an important factor in determining the grade of Scots pine Christmas trees. The crown of a tree when viewed from any side is shaped like a cone or triangle. Therefore the term "taper" as applied to Christmas trees refers to the width of the base in relation to the total height. Under Ontario grading regulations for pine Christmas trees, the acceptable range in taper falls between 40 and 80 per cent. Consumer preference surveys indicate that a taper factor of 60 to 70 per cent is the most popular. Reference is made to taper at this time, because in the early years of cultural treatment, the taper of the crown can be defined. If the correct taper is developed at an early stage, this form can be readily maintained during annual shearing until harvest age.

This is an appropriate time to mention basal pruning in young Scots pine plantations. The procedure involves clipping off all of the lower branches from ground level up to a dominant lower whorl of growth. It is most easily and economically accomplished in the third and fourth growing years.

Established growers are about equally divided in acceptance of basal pruning as a management practice. The benefits cited by those using the method are reduced shearing costs, easier cutting, reduced handle diameter and a more clearly defined lower crown. Crop trees are cleaner, as the annual needle drop falls to the ground, rather than lodging in the lower branches.

Growers who do not practice basal pruning reason that branches at ground level provide stability for the growing tree against wind whipping and the bending influence of heavy snow and ice in winter.

The work can be done at any season of the year, except during winter when the stems are covered with snow. The owner or manager must con-

sider the pros and cons of basal pruning and decide whether to employ the procedure.

A small percentage of the trees in any Scots pine plantation, because of inherent characteristics, do not respond well to pruning and shearing. These potential "culls" can be identified by the fourth growing season and may be economically removed during the regular shearing operation. The owner or farm manager should mark the trees designated for removal in advance of the work crew.

Tree shearing knives are commonly used by Ontario growers for trimming Scots pine from the fourth or fifth year through to harvest age.

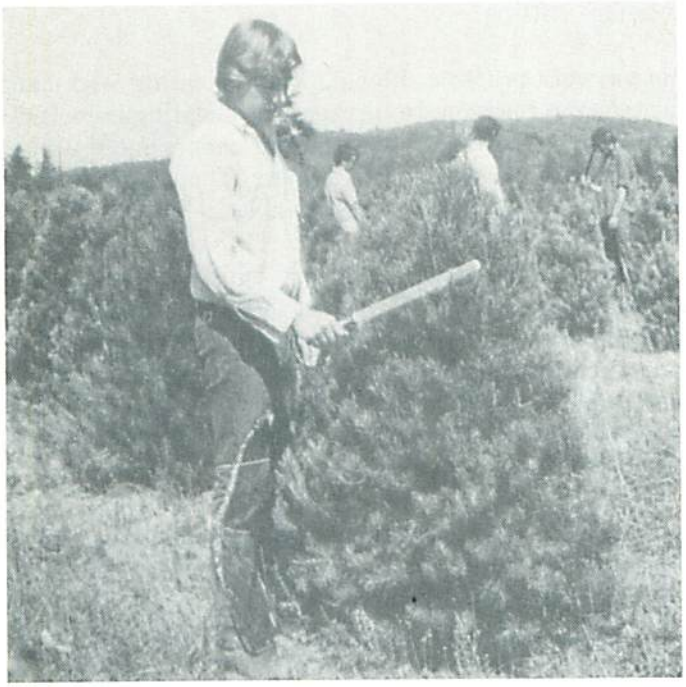

Figure 13 — Shearing Scots pine tree with a tree shearing knife. Note protective leg guard worn by worker.

The standard shearing knife has a thin blade of high-quality steel, about fourteen inches in length. The knives are readily available at forestry supply houses or hardware firms that sell tree farming tools.

Safety precautions must be demonstrated and strictly enforced by supervisors of knife-shearing crews to avoid accidents. Safety equipment for knife shearing is discussed later in this manual under "Safety in the Tree Farm Operation".

Using shearing knives is not complicated, but the supervisor must be prepared to accept something less than perfection until workers become dextrous through practice. A common fault when using knives for the first time is the tendency to "over-shear" and workers should be made aware of this probability during the instruction and training period. The knife is swung with a full-armed slanting motion downward from the top while moving counterclockwise around the tree in the case of a right-handed worker. A left-handed worker would move clockwise. The knife should never be swung upward or across in front of the worker's body. The free hand must be kept clear of the path of the knife at all times and must never be used to hold any part of the tree while shearing. This natural tendency can be avoided if the worker carries a stick in the free hand. The stick may be used to separate shoots, and serve as a measuring guide to standardize the length of leaders before cutting.

Some growers prefer combining knife shearing with hand clipping throughout the crop rotation. In this case the shearing crew is divided into two working groups. Some workers trim the leaders and top whorl of branches with hand clippers and hedge trimmers. The rest of the crew follows and shears the sides of the crown with knives.

Scots pine should be trimmed very lightly in the year of harvest. Marketable trees can usually be identified with a fair degree of accuracy just before the start of the normal shearing operation. Growers can mark potential crop trees at this time and bypass them when shearing the plantation. These trees can be trimmed later when the new shoots and needles are fully developed. The work should concentrate on retaining a pleasing natural appearance.

Spruce plantations are relatively slow-growing in the early years, and tend to develop dense, symetrical crowns naturally. Until the trees are three to four feet high, the only work necessary will be corrective pruning, which will include removal of double leaders and cutting back branch tips that do not conform to the desired conical shape. Vigorous trees can produce excessive leader growth which should be trimmed back when the trees receive the required annual inspection. When trimming leaders, the cut should always be made slightly above a strong internodal bud. The bud will produce a dominant leader in the following year.

Basal pruning, discussed earlier in relation to Scots pine management, has the same application in the tending of young spruce plantations.

The average spruce plantation will require the most attention from the time the trees are three to four feet high through to market size. The annual growth rate of terminal and leading shoots usually accelerates dur-

ing this period. They must be trimmed to maintain acceptable taper and density.

Shearing knives are useful for trimming the lower crowns, but the work is somewhat more selective than is the case with Scots pine, and hand clippers and hedge trimmers are the preferred tools for spruce trees.

Spruce trees should be trimmed very lightly in the harvest year. It is important to complete any pruning well in advance of the cutting date. Spruce twigs exude resin on the ends of cut shoots and this resin should have sufficient time to dry and harden before the tree is handled by the customer.

Earlier, this manual mentioned other species which may be cultured as Christmas trees. These include jack pine, red, white and Austrian pine. The cultural treatment of any of these species is not sufficiently standardized in Ontario to offer informative directions for pruning and shearing. Growers who contemplate production of any of these species should contact a tree farmer who is successfully producing the variety for advice and guidance in managing the crop.

Fertilization of Christmas Trees

A survey of owners and managers of operating Christmas tree farms in Ontario shows limited use of fertilizer in their management plans. The general opinion was that except for certain problem areas, tree growth was satisfactory and the additional cost of fertilization was unwarranted.

In Christmas tree production, vigorous growth and rich foliage colour are desirable. However, accelerated growth through fertilization will contribute to additional pruning and shearing costs.

If fertilization is considered, soil testing to determine the nutrient deficiences should precede any decision.

Scots pine is particularly efficient in searching for nutrients and grows well on impoverished soils. Research studies have shown negligible response to fertilization by this species.

Some growers recommend fertilization to stimulate growth of spruce trees on poor sites. They suggest application in conjunction with herbicidal control of competing vegetation. Otherwise the growth of grass and weeds will be accelerated by the fertilizer and create additional problems.

The nutrient requirements of trees is a complex study, and new growers are advised to consult an experienced tree farmer in their area for advice on fertilization.

Grass and Weed Control

Control of competing vegetation is an important aspect of Christmas tree management. Good control of grass and weeds will improve tree quality, cut the time required for a crop rotation, and reduce problems with insects and rodents.

A heavy crop of vegetation suppresses the early growth of young trees by shading them and competing for moisture. The crop rotation is extended, because the tree must grow above the level of competition before it can develop a strong whorl of branches to form the base of the crown.

Uncontrolled ground cover provides ideal habitat for mice and small mammals which girdle the trees by eating the bark off the stems in winter. Dead and dry vegetation create a serious fire hazard in the autumn and early spring. Dense grass and weeds impede workers when pruning, shearing and harvesting the trees, and make difficult and disagreeable working conditions at any time, especially when wet.

Many plants commonly found in plantations are the primary hosts for insect pests which do not normally feed on trees. Where a suitable environment is provided by uncontrolled vegetation, the insects will move from the plants to the succulent new growth of the trees during the late feeding stages and damage the new shoots. Controlling the vegetation will prevent the insect problem.

Vegetation can be controlled in Christmas tree plantations by mechanical treatment or the application of herbicides. A combination of the two methods is usually employed by established tree farmers.

Mechanical control involves mowing between rows as required, or cultivation before planting, followed by cultivation or mowing through the crop rotation. Cultivation of rolling fields with light soils may predispose the site to washing and erosion, and on these areas a controlled vegetative cover may be desirable. Rolling fields with abrupt or steep slopes may be difficult to mow with tractor-powered equipment, and herbicidal treatment is the best alternative for this type of site.

Many makes and models of tractors can be equipped with mowing and cultivation attachments suitable for vegetative control in Christmas tree plantations. Before purchasing a particular unit, a grower should consult with established tree farm managers, study their equipment, and request a demonstration of units by farm machinery dealers.

Mechanized control of vegetative competition achieves good results, and is a suitable alternative for tree farmers who have reservations about using chemicals because of environmental concerns.

The use of chemical herbicides is effective and economical. (Ahrens 1981) Chemical firms that produce and market herbicides provide a consultation and advisory service to potential customers through their sales representatives. A tree farmer who plans to develop a herbicidal control program should consult a specialist in the field.

The Second Crop Rotation

When all the merchantable trees in a plantation have been harvested, the land must be prepared for planting the second crop in the rotation. The first step is removal of cull trees left on the site after the final cut.

The most economical way to dispose of culls will vary according to the situation. On larger, highly mechanized operations, the culls are usually cleared from the site by tractor-powered "brush-hogs". Smaller operators may cut and pile the trees where they can be safely burned, if local environmental laws permit burning. Passing cull trees through a chipping machine is one method of disposal, but it is slow and costly.

Managers of established tree farms who are into a second or third crop rotation appear to favour complete and repeated cultivation as the most effective method of preparing a site for the next crop of trees. Improvement of soil condition and fertility can be accomplished at the same time by planting a green cover crop such as peas, rye or buckwheat in the spring and plowing the crop under in late summer. When a green crop is turned under it is wise to cultivate lightly through the next season to allow time for the crop to decay and mix with the soil.

Some managers feel that where adequate and efficient control of vegetation has been maintained through the first crop rotation, cultivation for replanting is unnecessary.

The new grower should take the time during the first crop rotation to observe and evaluate the methods used on established tree farms in the immediate area. The owner can then make an informed decision on the most suitable second crop site preparation.

MANAGEMENT OF NATURALLY SEEDED BALSAM FIR AND WHITE SPRUCE TREES

In those parts of Ontario within the natural range of balsam fir and white spruce, it is possible to produce good quality Christmas trees by managing natural regeneration on private land. Young trees of both species often are abundant as a result of natural seeding on abandoned farm fields, rough

pasture land or along the edges of woodlots. With proper cultural care and attention they can be developed into top-grade Christmas trees.

Figure 14 — A stand of naturally seeded white spruce trees which has been managed to produce Christmas trees.

Tree farmers should be aware of the potential and investigate the possibilities. If landowners have no personal interest in Christmas tree production, it may be possible for the tree farmer to lease the land, or enter into a simple agreement with the owner to manage the stands and pay a specified price for each tree harvested.

In searching for land with natural regeneration that has potential for Christmas tree production, the first consideration is accessibility. Wet weather and snow often prevail at the season when balsam fir and white spruce are harvested. The terrain should be suitable for hauling out the trees in bad weather. The location of the area in relation to an all-weather road is also an important factor.

The first step in managing naturally seeded balsam fir and white spruce will be thinning the young trees to a proper spacing. Initial thinning should aim for a spacing of about six feet between trees at market size. Planning the work requires considerable judgement, because of the range in age and height classes which occur in a natural stand.

Control of the thinning operation is easier if the area is laid out in grids or strips. The blocks can be delineated with twine or string to guide workers.

Selection of potential crop trees requires judgement, and if the thinning is done by hired help, the workers should not be expected to make the decisions. The manager should take the time to mark the crop trees before the work commences.

Suitable hand tools for thinning include axes, machetes, long-handled shears, hand clippers and small bow saws. In dense stands the initial thinning can be done quickly and economically with a power brush saw.

When thinning a stand, every effort should be made to remove the trees at ground level. The stumps often have small living branches which continue to grow vigorously after the tree is cut. These create problems for the manager at a later date. Thinning in winter, under snow conditions, is not recommended because it is almost impossible to cut low enough. Moreover, selection of the crop trees is extremely difficult when the trees are weighted with snow.

After the initial thinning of the stand, the crop trees can be cultured by annual pruning and shearing in much the same way as a plantation.

A properly managed stand of naturally seeded trees will produce an annual crop of good quality trees. Where the opportunity exists, this method of Christmas tree production should not be overlooked by an enterprising tree farmer.

PROTECTION OF PLANTATIONS

The protection of plantations is a necessary part of Christmas tree farm management. Owners or managers should be aware of the probable hazards and be prepared to take preventive or control action as required. Damage to plantations may occur by:

1. Fire
2. Insects
3. Tree diseases
4. Mammals and birds
5. Trespass, theft and mechanical damage
6. Weather

Fire

The fire hazard in plantations is highest during dry periods in the spring and fall when dead grass and vegetation are highly flammable. Early detection and quick suppression are necessary if a fire occurs. Therefore, the owner should develop a fire emergency plan. Well maintained access

roads on the periphery of the plantations and at regular intervals through the stand are effective firebreaks.

Kits of tools for the suppression of grass fires should be kept at readily available locations on the tree farm. The farm owner or manager should be aware of fire-fighting services in the municipality where the farm is located.

Insects

Insect pests are a common problem in Christmas tree farm management. Christmas trees are no more susceptible to damage by insects than other trees, but their value is dependent on appearance. Even minor damage, which may not affect the health of the tree, will reduce the grade and may extend the crop rotation.

Figure 15 — A colony of red-headed pine sawfly larvae feeding on a pine tree.

Even-aged plantations of one species provide ideal conditions for a rapid buildup of insect populations, so early detection and control of outbreaks are necessary. The farm owner or manager should inspect plantations weekly from early spring through late summer for insect injury. Because of differing life histories, feeding insect populations occur at various times during the growing season.

Insects damage or injure trees during the worm or larval stage of the life cycle when feeding occurs.

Tree farmers should learn to recognize insect damage, as the injury is usually more evident than the insects themselves in the early stages of feeding. Defoliation of twigs and branches, or wilting and dying shoots are indicators of a probable insect problem.

Identification and control of forest insects is a specialized field and the owner of a tree farm should seek professional advice if an insect problem is suspected. Information and advice on insect problems is available at no charge from the Ontario Ministry of Natural Resources and the Great Lakes Forest Research Centre at Sault Ste. Marie, Ontario. Research technicians from this centre work throughout the province and are available for consultation on reasonable advance notice.

INSECT PESTS OF CHRISTMAS TREES IN ONTARIO

INSECT	STAGE				REMARKS		
	EGG	LARVA	PUPA	ADULT	DAMAGE	CONTROL	HOSTS
Pine False Webworm Acantholyda erythrocephala	Early May	Late May - early July	July - May Overwinter in soil	Early May	Larvae web & feed on previous year's foliage	Contact or stomach poison applied as soon as eggs have hatched; Sevin works well.	Most species of pine
European Pine Sawfly Neodiprion sertifer (Geoffroy)	September Overwinter	Late May - mid-July Consume previous year's foliage	Golden-brown cocoons in duff. Late July - Aug.	Late August to September.	Larvae feed on old foliage. May completely defoliate but seldom kills trees.	Spray with contact or stomach poison or with virus.	Most species of pine but particularly Scots pine.
Redheaded Pine Sawfly Neodiprion lecontei (Fitch)	June and July	Mid-July to early October	August to June. Overwinter as cocoon in soil	June and July	Larvae feed in large colonies and consume old foliage. May kill trees in one year.	Spray with contact or stomach poison or apply virus spray.	Most species of pine, but particularly red pine.
Pine Spittlebug Aphrophora parallela (Say)	Sept. - May Overwinter	Young feed to July and then become adults. Feed on sap. Usually covered with spittle mass.	-- --	Adults feed through July and August.	Damage is caused by both young and adults sucking sap from small twigs and branches eventually killing them.	Contact insecticide should be applied with enough force to penetrate the spittle mass.	Particularly Scots pine but also white, jack and pitch pine.
European Pine Needle Midge Contarinia baeri (Prell)	Late May to early June	Tiny pink larvae inside needle fascicle, early to mid-August	Inside fallen needles on ground or in duff. Overwinter as larvae, pupate in early spring.	Emerge and lay eggs late May to early June.	Needles droop and die - usually heaviest on upper part of crowns; some branch tips may die if infestation is heavy. Trees present a thin, bare appearance.	Usually controlled by natural enemies after 1 - 3 years; if control necessary a systemic insecticide is probably best.	Scots pine and red pine primarily.
White Pine Weevil Pissodes strobi (Peck)	Laid in feeding holes in bark on leader of tree usually during May	Late May - June, white grub-like found under the bark.	Late July, in chambers in the pith of infested shoots.	Aug. & Sept. to April & May. Overwinter in duff.	Leaders destroyed on infested trees thus causing deformed tops. Adult feeding may also damage leading shoots.	Infested leaders may be clipped and burned. Chemical control using a stomach poison with a fairly long residual effect applied in early spring.	All pines and spruces.
Pales Weevil Hylobius pales	Laid in stumps of trees cut the previous fall	Feed in stumps and tunnel into roots. Will invade roots as	In chambers in infested stumps. Late August to September.	Emerge from stumps September and October. Feed on twigs and branches and overwinter	Mainly caused by adult feeding on twigs and branches which girdles and often kills them. May	Remove stumps, slash or weakened trees which serve as a source of brood material, or treat	All pines, occasionally spruce and fir.

	in late June and July	small as ¼ inch in diameter. July to August.		in duff. Emerge from hibernation in spring and again feed on twigs and branches, laying eggs in in June and July. A few larvae will overwinter but main population overwinters as adults.	also kill young seedlings in heavily infested areas.	with chemical to render unsuitable as breeding sites. Soil fumigants might be a possibility.	
Pine Root Collar Weevil Hylobius radicis	Laid from early May to Sept. in inner bark at base of tree.	Feed in inner bark at base of trunk and may form galleries in resin-drenched soil. Can be found all year and may overwinter.	Usually found from June to Sept. in cells in the soil near the base of trees. May overwinter.	Emerge from August to Sept. Overwinter and lay eggs the following spring and summer. May overwinter a second time and become active again in spring and early summer.	Most damage caused by larval feeding at root collar, girdling and killing trees. Some damage to twigs and branches may be caused by adult feeding.	Very difficult due to nature of insect and feeding habits. Sanitation and removal of infested trees. Soil fumigant may be effective.	Most pines but Scots pine most susceptible.
European Pine Shoot Moth Rhyacionia Buoliana (Schiffermuller)	Late June and July. Laid on needle sheaths or buds.	July to May. Overwinter. Larvae feed in needle sheaths until fall, then hollow out buds in which to overwinter. In spring they feed and hollow out new expanding buds and shoots.	Late May to July in silk-lined sites in hollowed out buds and shoots.	Emerge in June and July	Mainly caused by larval feeding in new shoots and buds which results in severely deformed trees.	Shearing and burning of infested shoots if necessary in company with application of a contact or stomch poison in early spring.	All pines but prefer red and Scots pine.
Jack Pine Budworm Choristoneura pinus pinus	Laid in late July to early August in flat clusters on needles.	August - overwinter and feed from early spring to late June	Pupation occurs on the foliage in late June or early July	Emergence is usually in July and adults mate and lay eggs shortly after.	Larval feeding damage occurs on male flowers and developing shoots and needles. Heavy infestations can kill or seriously deform trees.	Application of a contact or stomach poison about the time trees are flowering should provide adequate foliage protection.	Jack pine, red pine and Scots pine.
Spruce Budworm	Laid in late July on underside of needles	Overwinter in hibernacula on foliage, feeding on new growth in early May through June.	Pupae on foliage of trees	Moths in late July or August	Defoliation of new and old foliage	Application of a contact or stomach poison in late May or early June.	Spruces and firs
Yellow-Headed Spruce Sawfly	May - June	Late June through July	Overwinter in soil	May - June	Defoliation of new shoots	Contact or stomach poison in early larval feeding stage.	Spruces

Disease

The study of tree diseases, or forest pathology, is a highly specialized field. If disease is suspected, the owner should immediately consult a forest pathologist for identification of the problem and advice on controls.

The symptoms of disease in plantations include brown or discoloured spots on the needles, dead or dying branches and excessive resin flow from lesions on the trunk or branches. Retarded growth and yellow, off-colour foliage, or sudden complete tree mortality, are also evidence that a disease problem might exist in the stand.

Information and advice on tree disease is available from the government agencies noted for insect problems.

Mammals and Birds

Mammals damage or kill trees by girdling the stem or trunk, or browsing on the needles or twigs. Mice, porcupines, rabbits, hares and deer are all capable of inflicting serious damage on a Christmas tree plantation in one season.

If a heavy grass cover is allowed to accumulate in a plantation, it provides ideal conditions for a rapid buildup of mouse populations. Mice will girdle the stems of trees below snow level in the winter. Distribution of poison bait is an effective method of controlling mouse populations, but should be done only under well controlled conditions, in consultation with a biologist from the Ontario Ministry of Natural Resources.

Porcupines tend to establish themselves in one area of a plantation during the winter. They will feed on the bark of a tree until it is completely stripped, and then move systematically to the next tree. If the damage is undetected, a porcupine will kill a number of trees in one season. Trapping or shooting the animals must be considered where the problem occurs.

Rabbits, hares and deer will browse on the needles and new shoots. Damage occurs more frequently on the edges of plantations which are adjacent to natural forest stands or woodlots which afford cover for the animals. Some success has been reported in the use of repellents to prevent browsing by these animals. Hunting during the open seasons is the most effective way of reducing populations in areas where problems occur. Good relations with a responsible group of sportsmen can be a valuable asset to a tree farmer. By allowing hunting on the property, mammals which might cause damage to the trees can be kept under control.

The many small buds produced by Scots pine trees after pruning and shearing are a most attractive winter food for the pine grosbeak and, to a lesser extent, the evening grosbeak. Removal of the buds does not kill the trees, but it extends the crop rotation. Damage in consecutive years will reduce the overall grade of the crop. The grosbeaks do not follow any predictable migratory pattern and damage might occur in any part of Ontario in any year.

Experiments with "scare" devices and chemical repellants have not proven effective in protecting trees from grosbeak damage. At present, the most effective protection is the installation of plastic mesh sleeves on the leaders of the trees in the autumn. The sleeves provide a mechanical barrier to bird feeding during the winter season.

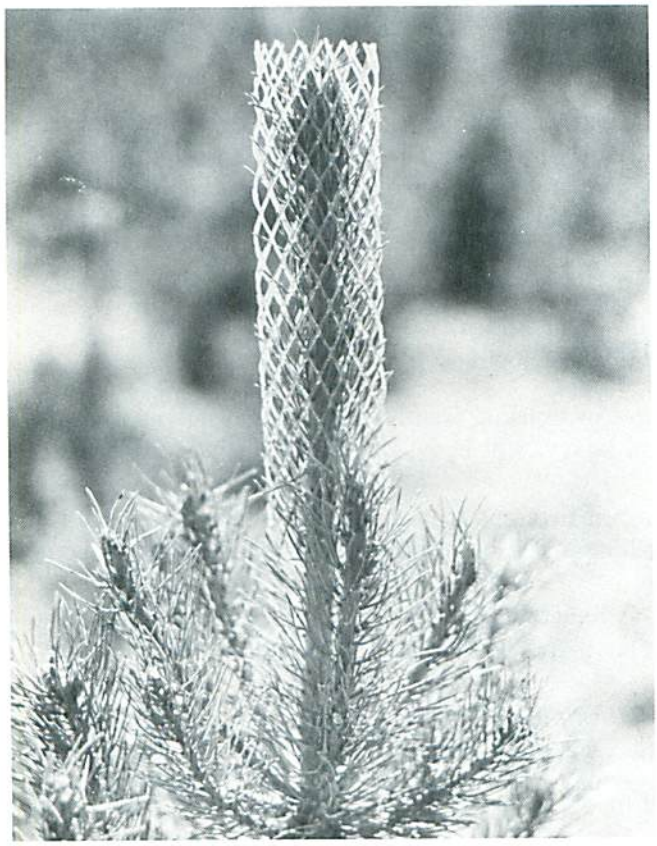

Figure 16 — Plastic mesh sleeve installed on the leader of a Scots pine tree protects the buds from winter feeding by grosbeaks.

The sleeves must be removed before the new growth starts in the spring.

Trespass, Theft and Mechanical Damage

Good fences, locked gates, and signs along property lines forbidding entry without the owner's permission, are the best insurance against trespass and theft. The co-operation of neighbours in reporting any suspicious movements of people and vehicles near the tree farm will help to discourage thieves. In areas of high population where substantial tree losses by theft are more likely, employment of a watchman to patrol plantations in November and early December may be practical.

A new Ontario "Occupiers Liability and Trespass Act" was passed in 1980, providing important new protection for rural landowners in general, and Christmas tree growers in particular. No specific boundary markers are required to prohibit access without owners' permission. Trees under six feet tall and growing in rows are all that is required to identify a tree farm. (Ministry of the Attorney General 1980).

Plantations of young trees that are completely snow-covered can be damaged seriously by snowmobiles running over the fields. The operator of the machine may not be aware that the area is planted and signs should be posted along property boundaries warning against snowmachine travel.

Weather Damage

Adverse or unusual weather conditions such as drought, late frosts, hail, ice, and heavy, wet snow can damage Christmas trees.

Prolonged drought may cause a high mortality rate among newly planted seedlings. The only remedy is replanting in the next year.

A heavy hailstorm can seriously damage new growth if the storm occurs when shoots are in the soft and succulent stage.

Late frosts will kill the tips of the new shoots on balsam fir and white spruce trees. Frost-damaged trees will recover, but production is delayed and the trees may need corrective pruning after heavy frost injury.

The accumulated weight of ice from freezing rain or a heavy, wet snowfall can break branches and deform trees. Heavy snow and ice cover can be very destructive to young trees. The weight bends them over, and stems that remain prostrate through the winter seldom recover without corrective action. Staking the stems in an upright position before spring growth starts is the best remedy for snow and ice damage.

HARVESTING AND MARKETING THE CROP

A tree farmer should investigate the potential market and establish a sales plan well before the first harvest. Unsold crop trees can be carried over to the following year if left standing in the field, but an unsold pile of cut trees is a total loss to the producer.

Christmas tree crops may be marketed in a number of ways and the sales method will be determined to some extent by the volume of production and location of the farm in relation to urban centres. Farms producing large numbers of trees generally establish wholesale market outlets. The smaller grower located reasonably close to a large city may find it profitable to retail the trees, or use a "choose and cut" system with the customer visiting the farm to select and cut the tree. In some instances, it may be advantageous for a group of small producers to pool their crops and supply one large wholesale order. Christmas tree crops are occasionally sold on the stump.

Wholesale Sales

It is good policy for the buyer and seller to inspect crop trees in the field before a sales contract is made. This will enable them to come to an agreement on quality and size and thereby avoid differences of opinion after delivery. Sales contracts should clearly specify the species, numbers of trees by grade and size, method of transport and delivery dates. A reasonable deposit (at least 25 per cent) should be required at the time the contract is made to confirm the intention of the buyer.

The initial step in planning for sale and harvest is preparation of an inventory of the merchantable trees in a field. The records taken should include species and numbers of trees by grade and size class. The crop trees should be tagged at the same time as the field count is made. Tree sizes and grades can be identified by using various colours of plastic flagging tape. Some growers prefer tags printed with their name and address, as these tags are effective advertising for the farm. Scots pine trees should be cut, baled and piled before the first week of November to preserve the blue-green foliage colour, as early frosts tend to yellow the foliage. The spruces and firs are usually cut from mid-November onward into December if weather conditions permit access to the plantations.

Depending on the size of the operation and the preference of the manager and workmen, Christmas trees may be cut with a small, hand bow saw, a lightweight chain saw, or a circular saw affixed to a boom, usually referred to as a "brush saw". After the tree is cut, the weak branches at the base should be trimmed off flush with the stem, to form a clean "han-

dle". The accepted grading standard in Ontario requires that one inch of clean "handle" should be provided for each foot of tree height; thus a six-foot tree should have a six-inch "handle".

The trees should be dragged to roadways as soon as possible after cutting for pickup by truck or tractor and farm wagon, and delivery to piles in the yarding area.

Figure 17 — Trees are moved from the plantation to the yarding area for grading and baling.

Cut trees should be moved to piles with a minimum of delay to avoid loss of foliage moisture.

Loose, unbaled trees are bulky and difficult to handle and load. Therefore, some growers prefer to bale the trees along roadways in the field before transporting them to piles in the storage area.

It is important to clean the trees of dead needles and other debris which may accumulate in the foliage. Usually dead needles will shake out of the trees during handling between the field and yarding area. Where trees are baled in the field with a minimum of handling, it may be necessary to clean the trees by vigorous shaking, or striking the butt sharply on a solid block of wood or cement. Mechanized tree cleaners are available for use in a large operation if accumulated debris is a problem.

Baling of trees protects the foliage and branches from breakage or damage in handling and shipment and permits loading of greater numbers

on trucks, transports or railway cars. Basically the work involves pulling the tree through a funnel to compress the branches and wrapping with twine or encasing it in a sleeve of plastic netting. Mechanized tree balers can be adapted to use either twine or mesh in packaging the trees for shipment.

Both netting and twine wrapping are acceptable methods of baling trees for shipment. Twine is cheaper than netting, and twine-wrapped trees are easier to handle for the loading crews. Netted trees look better and the trees are protected better during handling and shipment. Some buyers prefer netted trees and specify them in sales contracts. Ontario growers often use both methods of tree baling in their operations.

Figure 18 — Packing trees in plastic netting for shipment to market.

Figure 19 — Baling trees in twine wrapping for shipment.

A small grower planning to market the crop from a retail sales lot near the farm might move the trees from the farm to the lot without baling or wrapping.

Baled trees are segregated into piles by species, grade and size to await shipment and delivery to sales lots. The trees should be piled tightly top-to-top with butts out, in a location which is sheltered from prevailing winds to minimize moisture loss during the storage period. If the weather is unusually warm and dry, the piles of baled trees should be covered with plastic sheeting, tarpaulins, or boughs to conserve moisture.

Shipping and delivery of Christmas trees usually begins about mid-November and continues through early December. Christmas trees may be shipped or delivered by transport, truck, air freight or railway cars. Light trucks and trailers are often used for small orders or delivery to local markets.

Christmas trees become very brittle at low temperatures and are easily damaged in loading and handling when the weather is cold. The grower should always allow sufficient flexibility in shipping and delivery schedules to take advantage of mild temperatures for loading trees.

The number of trees that can be loaded on a unit for shipment will vary with the size of the trees and the skill of the workmen in arranging the trees on the load.

Seven to eight hundred trees of the six-to-eight-foot size will form a load for a tractor-trailer unit.

Figure 20 — A transport load of trees ready for shipment to market.

Platform body trucks with stakes or side racks will carry three to four hundred. Railway cars differ in capacity, and a rail carload could range from eight to twelve hundred trees. Enclosed vans protect the trees well during transit, but are difficult to load to capacity, as the closed top prevents workmen from packing the trees on top of the load.

An exact count must be recorded as the trees are being loaded. Counting can be done by workmen on the ground calling the number loudly as a tree goes up on the load. But this system is subject to error because of conversation or an interruption in the work. The surest method is to have a tally man who is not involved in the work record the count as the trees are loaded.

Before a load of trees leaves the farm or yarding area, the owner or manager should check for the following:

- The exact number of trees by species, grade, and size, for the order, has been loaded.
- The load conforms in height and width to highway laws and regulations.
- The load is well bound and secured to prevent loss or damage in transit.
- The trees are protected from damage or discolouration by diesel exhaust smoke, road salt and slush.
- The driver possesses all the papers necessary to expedite delivery.
- The driver is well informed of the destination of the load and the name and telephone number of the buyer.

Christmas trees are a perishable, fragile product and harvest and shipping routine should be directed toward moving the trees from the farm to the consumer in the best possible condition.

"Choose and Cut" Sales

If a tree farm is located within reasonable driving range of cities or population centres, the owner might decide to market all or part of the crop by "choose and cut" sales. The buyer is offered the opportunity to visit the farm, choose and cut the tree, pay for it and haul it home. This is increasingly popular with urban dwellers as it provides an enjoyable family outing.

"Choose and cut" sales have both advantages and disadvantages to the grower. Harvesting and shipping costs are eliminated, but increased supervision and management costs are incurred. Control of the harvest is more difficult, since the owner cannot accurately predict the number of trees that will be cut during the sales period.

Figure 21 — Buyers bring the tree they have chosen and cut to the sales area at a "choose and cut" tree farm.

Figure 22 — Customers at a "choose and cut" tree farm have trees measured and priced at sales area.