

SHEARING BALSAM FIR CHRISTMAS TREES

by

G.F. Estabrooks

Government of Canada  
Canadian Forestry Service - Maritimes  
P.O. Box 4000, Fredericton, N.B., Canada E3B 5P7

Information Report M-X-160

1986

© Minister of Supply and Services, Canada 1986

Catalogue no. Fo46-19/160E  
ISBN 0-662-15154-2  
ISSN 0834-406X

Copies of this report may be  
obtained at no charge from

Une traduction française de ce  
rapport peut être mise sans frais  
à la disponibilité de quiconque  
en fait la demande.

Canadian Forestry Service - Maritimes  
P.O. Box 4000  
Fredericton, N.B. Canada E3B 5P7

**ABSTRACT**

The ancient art of shaping conifers by selectively removing shoot growth is used with great success in the production of balsam fir Christmas trees. Shearing is practiced by all serious producers in the Maritimes. It controls tree shape, promotes foliage density, and significantly increases both the number and quality of Christmas trees that can be produced in a given area. The best time to shear trees is late July, starting when they are about 2 m high. Corrective shearing-pruning of young seedlings, especially where abnormal top growth occurs, is an essential practice in good plantation management. Many deformities can be averted by the early recognition and treatment of injuries or atypical tree growth.

**RESUME**

La pratique ancienne de donner une forme particulière aux conifères par une coupe sélective des pousses est utilisée avec beaucoup de succès dans la production de sapins baumiers devant être vendus comme arbres de Noël. Tous les producteurs sérieux des Maritimes pratiquent l'émondage. Celui-ci permet de régulariser la forme des arbres, d'accroître la densité du feuillage et d'augmenter de façon significative le nombre et la qualité des arbres qui peuvent être produits à un endroit donné. Le meilleur moment de le pratiquer est à la fin de juillet, et il est préférable de commencer lorsque les arbres mesurent environ 2 m de haut. Les opérations correctives d'émondage-élagage des jeunes plants, surtout lorsque la croissance au sommet est anormale, sont essentielles pour un bon aménagement des plantations. La reconnaissance et le traitement hâtifs des blessures et des pousses atypiques permettent d'éviter de nombreux défauts de forme.

## TABLE OF CONTENTS

ABSTRACT . . . . .	i
INTRODUCTION . . . . .	1
The Aim of Shearing . . . . .	1
Shear Every Tree? . . . . .	1
Why Shearing Works . . . . .	1
When - During the Year . . . . .	3
When - In the Life of the Tree . . . . .	3
Shearing at its Best . . . . .	3
ABNORMALITIES . . . . .	3
Uneven Density . . . . .	4
Open Areas . . . . .	4
Uneven Symmetry . . . . .	4
Open Density . . . . .	5
Goose Neck . . . . .	6
The Atypical Branch . . . . .	7
Trouble at the Top . . . . .	7
Early Corrective Pruning . . . . .	9
TIPS FOR THE OPERATOR . . . . .	9
Butt Pruning . . . . .	11
REFERENCES . . . . .	13

## INTRODUCTION

Shearing is a proven means for increasing the quality and number of salable Christmas trees in balsam fir stands. It controls tree form and promotes foliage density, the most important characteristic determining tree grade and value. Also, many injuries and growth abnormalities can be treated by the timely application of appropriate shearing-pruning practices to prevent serious deformities and tree loss. Much time and effort are given to the art of shearing, the result of which yields high dividends for the Christmas tree producer.

This report describes how and why balsam fir Christmas trees should be pruned and sheared. It is designed to assist both the experienced and inexperienced grower.

### The Aim of Shearing

Variations exist in the specifications used by buyers and retailers to classify trees, but foliage density remains the most important characteristic. The Atlantic Canada grading rules classify trees into three grades based on foliage density as measured by the amount of visible stem. The maximum amount of stem visible is 60% for a choice grade, 40% for a fancy, and 20% for a select grade. Trees are priced according to height class within each grade; those with the greatest density have traditionally been the most highly priced. Trees are presumed to have four sides, three of which must have no major defects, such as a broken or missing whorl branch. Taper does not determine grade, but the width of the tree's base should be about two-thirds of its height. Most operators try to prevent excessive flaring, partly because of extra shipping and handling costs. A uniform, symmetrical tree with adequate or better density and high quality foliage, free of insect or other damage, is the objective of good Christmas tree culturing.

### Shear Every Tree?

A few trees in all Christmas tree lots

will attain quality status without shearing. Fir grows naturally in the form of a cone and in the absence of injury requires little, if any, shaping. Also, trees with a moderate growth rate and closely spaced branches may produce satisfactory density. However, this combination of conditions seldom occurs.

Injury from frosts, insects, competition, or other causes adversely affect form and cause imbalance or undesirable taper. Moreover, young fir on most sites is fast growing with widely spaced whorls and open density. Shearing is an effective tool both for correcting abnormal shape and for capitalizing on vigorous natural growth to create greater density.

### Why Shearing Works

Trees in their natural state increase in height and width each year depending on growth of the terminal shoot of leaders and whorl branches. Shearing limits the rate at which trees increase in size and results in more foliage within a shaped crown.

The first shearing should establish the "shear line" and thus the taper of the tree. The shear line extends with each year's growth and subsequent shearing, but under normal conditions, taper should not change (Fig. 1).

Shearing, which removes at least the bud cluster from the tip of the longest branches, stimulates greater growth of the remaining buds along the shoot. By limiting growth of the whorl branches, the tips of internodal branches "catch up" after one or more growing seasons. With the tip shoots of both the whorl and internodal branches equally exposed to sunlight, a uniform crop of new foliage can be expected along the shear line each year (Fig. 2). The central stem, clearly visible on unsheared trees, becomes increasingly hidden from view on sheared trees; subsequent shearings, which remove tips from an ever increasing number of branches, continue to promote internodal shoot development and foliage buildup.

When shoots are removed, as by shearing, the shoot-root ratio is changed in favor of the shoots that remain. The root

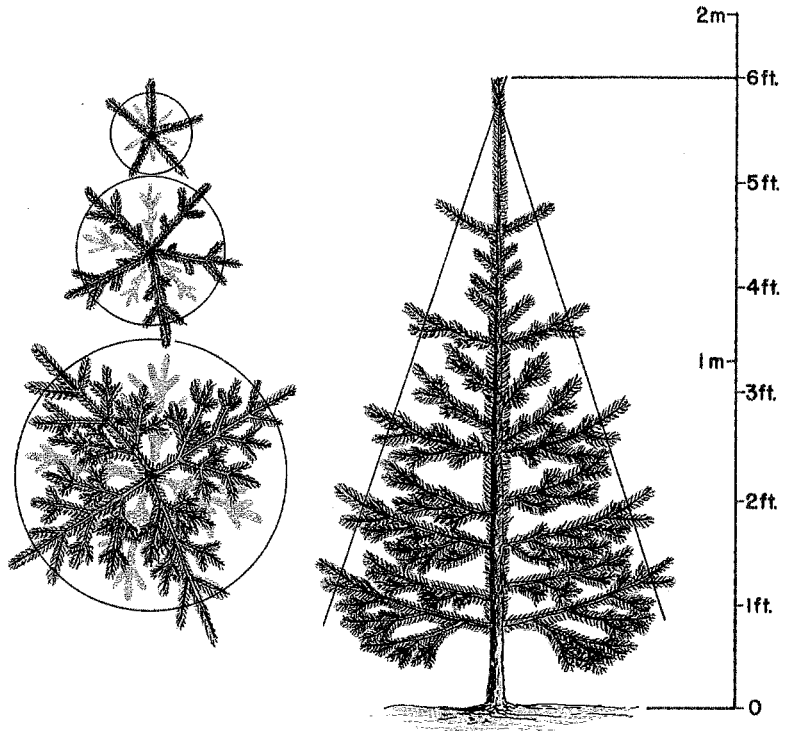


Fig. 1. First shearing of a 2-m (6 ft) tree with good form.

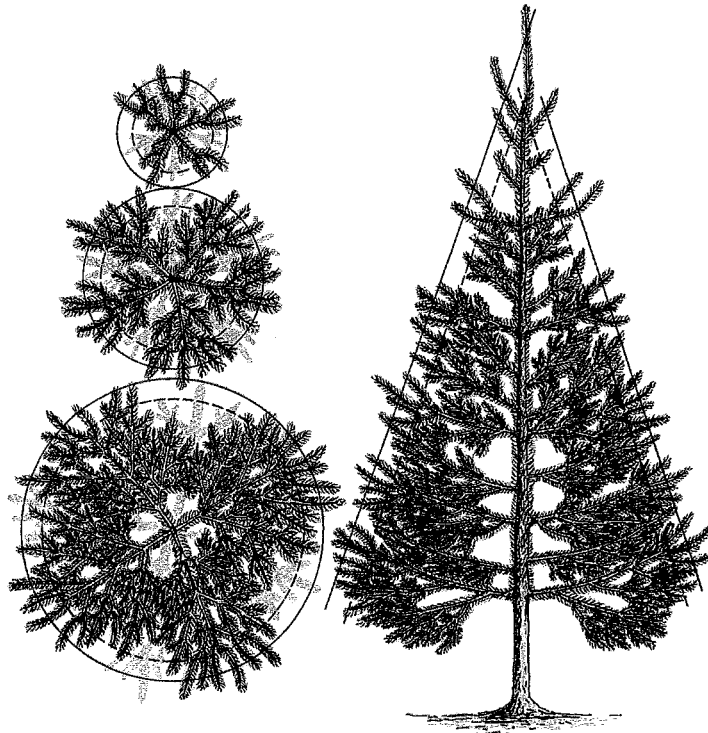


Fig. 2. Tree showing shoot growth and internodal "catch-up" one year after the first shearing. Two shear lines are indicated.

system's potential to supply water and nutrients is unaltered, therefore the remaining needles, shoots, and buds receive an added growth stimulus. This also has the effect of stimulating latent bud growth. These buds, which under normal conditions may never develop, thus stimulated, become fully formed one year and produce shoots the next (Powell 1982). Latent buds are more numerous toward the base of shoots and may be important contributors to crown density and uniformity, especially where internodal buds are lost or are few in number. Bud development and shoot growth, as well as foliage quality and the general vigor of the tree are strongly influenced by the availability of soil nutrients. Therefore, an annual application of fertilizer is beneficial to most Christmas tree stands.

#### **When - During the Year**

Mid-July to mid-August is regarded as the best time for shearing balsam fir because shoot elongation has terminated, but buds, already initiated, continue to grow. The buds left after shearing benefit from the increased nutrient supply during the remaining two to three months of development. This is the critical period during which the characteristics of the next year's shoot growth with its complement of needles are determined.

If shearing during the optimum period is not possible, it still should be done. This is especially true for successive shearings; once begun, shearing must be continued to harvest. Internodal buds on shoots throughout the tree assure new growth the next growing season regardless of the time of shearing, but the maximum growth potential may be realized only by proper timing. The second best time for shearing is the fall; late spring shearing is the least desirable.

#### **When - In the Life of the Tree**

Unlike children, fir trees should be able to look you in the eye before the "discipline" begins. Their tendency to stretch upward is welcomed in the early years; get the height growth as quickly as possible then build up the "muscle."

Proper shearing is the "discipline" needed at this stage and the muscle, density, is a natural consequence. Three shearings are usually sufficient in the life of a tree.

#### **Shearing at its Best**

Trees growing naturally without deformities make light demands on shearing skills and effort; the one objective is to increase density. The length of shoot to be removed, usually 25 to 50%, is determined by growth rate and, to a lesser degree, by tree size. If the growth rate is slow, only the branch tips are removed. For large healthy trees with open crowns, more than half of the current shoot growth may be sheared.

Leaders should be sheared to about 25 or 30 cm in the first shearing, and less in subsequent shearings to maintain the desired taper and density.

### **ABNORMALITIES**

Abnormalities come in many forms affecting most trees. Some of the conditions discussed under this general heading may not be encountered, but all do occur. Often, standard shearing is the best treatment while the tree's natural foliage production compensates for the abnormality.

Abnormalities can usually be corrected although producers sometimes find it more profitable to harvest a low or medium quality tree rather than continue the cultural practices necessary for its upgrading. The effects of some injuries may never be completely overcome, but the extra effort is warranted when, within an acceptable time period, trees are upgraded, especially from cull status. Untreated injuries invariably result in a longer rotation, which is sufficient reason for prompt corrective pruning when injuries or abnormalities first occur. In time and with proper shearing, trees demonstrate an amazing capacity for recovery from injuries. Therefore, operators should not give up easily. Where abnormalities occur, it is important to continue shearing to maintain the tree's form and symmetry.

Conditions that cannot be corrected within an acceptable time period, such as the loss of two adjacent whorl branches, early flushers that suffer annual frost damage, animal damage, or an extensive bare section of stem are occasionally encountered. Under such conditions the operator should recognize the impracticality of continuing cultural practices and destroy the tree.

### Uneven Density

Foliage of uneven density is usually the result of an injured leader or a period of slow growth. When normal growth of the leader and top development resume, following an interruption in the normal growth rate, a tree with a densely foliated middle or bottom section and an open top develops. This may occur in various degrees depending on the type and duration of the leader injury or growth retardation. One year of poor growth may cause only a short section of dense foliage on the tree, with insignificant consequences, whereas two or more years of weak or no leader growth may create an unsightly "bunching" of foliage.

**What to do** - Tip shear to promote foliage buildup in the open top section of trees not previously sheared. While shearing may not be necessary to increase density on all parts of the tree, it will be needed to develop symmetry. If leader failure was the cause of decreased height growth, the tree's width at the bottom or in the middle section may be excessive in relation to its height and recent top growth. In this situation, it may be necessary to shear off the current year's terminal branch growth to restore taper. Hand pruners may be used to remove part of or entire branches from dense sections if their length and density interfere with the tree's symmetry and uniformity. Symmetry can be maintained even when this abnormality occurs.

### Open Areas

Open areas in the foliage are also a form of uneven density, but the cause and effect are different from those described earlier. The areas are often a foot or so

in diameter, sparse or bare of foliage, and are often the result of loss of whorl buds. The loss of only one whorl bud or branch may be enough to create an open area, especially, if the whorl originally contained no more than four branches. Nodes that produce five or more whorl buds may, on the other hand, lose one bud without serious consequences. However, since bud loss may not be limited to one, open areas can occur even on genetically superior trees. The loss of internodal buds can have a similar effect and after shearing begins, the survival of these buds is increasingly important for top development and tree uniformity.

**What to do** - Prune back the long branches adjacent to the open area on trees not previously sheared (Fig. 3). This will allow lateral and internodal branches to fill in the opening gradually. For some trees, especially those already in a shearing program, normal rates of shearing over an extended time period will be the best treatment. Severe cases may require heavy shearing with follow-up for two or more years.

It is usually important to shear at similar rates over the entire tree to maintain form. Therefore, when heavy shearing to correct deformities is necessary, good tree growth must sometimes be sacrificed. This, unfortunately, lengthens the time of production.

### Uneven Symmetry

Uneven symmetry may be caused by competition in natural stands or by injuries such as frost, browsing, or insects in either natural stands or plantations. The result is the same: one side of the tree is poorly or inadequately foliated while the other is well foliated with longer branches, creating an imbalance in symmetry, or foliage uniformity, or both.

**What to do** - The wide side of the tree should be heavily sheared, after the weak side has been sheared a minimum amount, i.e., tipping the whorl or other long branches. This promotes growth where it is needed and serves to restore balance. If severe imbalance is encountered,



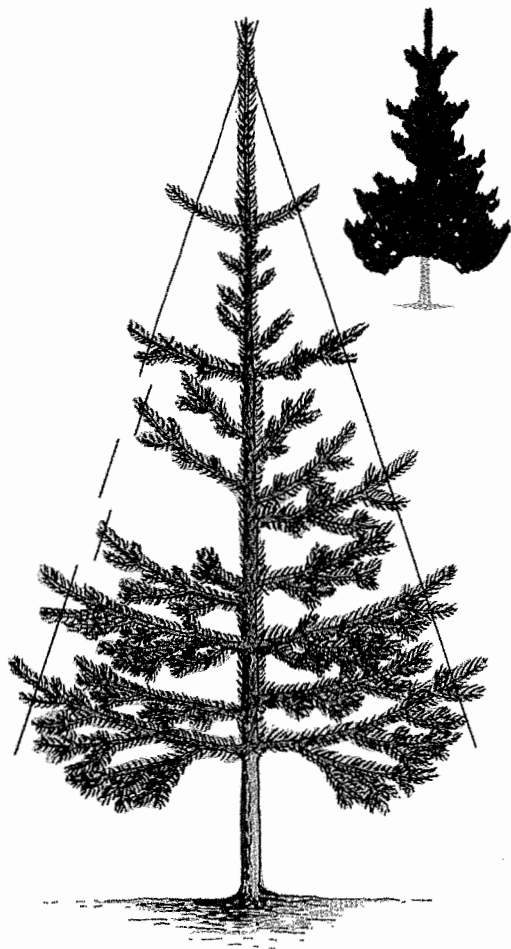


Fig. 3. First shearing of tree with an open area.

shearing to correct form should be continued over two or more years. This avoids excessive shoot loss which may result from trying to transform a misshapened tree too fast. Buds, which hold the potential for new shoot development, are formed almost entirely on the latest branch growth. Therefore, it is essential to retain some of this most recent growth on all branches to assure new growth over the tree. Since the lightly sheared areas will add more lateral growth the next growing season than will the more heavily sheared areas, the long-term option restores symmetry without creating poorly foliated areas caused by over shearing.

Where imbalance is severe, hand cutters rather than shears may be used. Long branches can be reduced in length

with hand cutters while adjacent current shoots, which supply buds for next year's growth, are retained (Fig. 4). Unless lateral branch growth is abundant and vigorous, cuts should be made at a fork, when removing more than current growth to avoid exposed bare branch stubs (Pinnock 1975). Since fork pruning may make the branch susceptible to splitting if snow accumulations are heavy it should be used only when necessary.

#### Open Density

Open density is unlikely to be a problem in managed stands when shearing begins at the proper stage of tree development. However, in natural stands of advanced regeneration, e.g., 2- to 3-m trees, widely-spaced whorls and open density are common. Under such circumstances, shearing, primarily to develop density, should not be delayed. Trees taller than this should not be considered



Fig. 4. Shearing to correct uneven symmetry, showing the shear lines for the desired taper and alternate shear points for a lopsided tree.

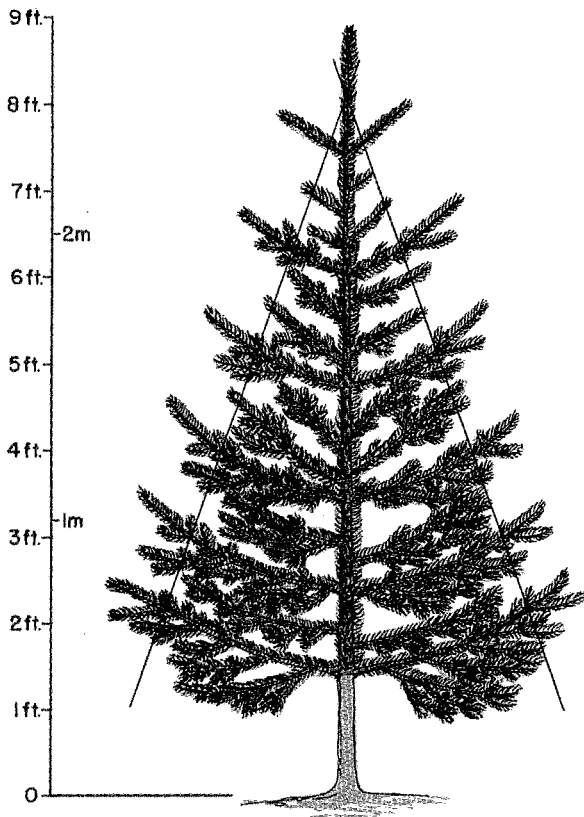


Fig. 5 An open foliated tree showing the shearline for the first shearing.

for shearing, even in recently opened areas where extra effort to improve oversized trees is sometimes warranted (Estabrooks 1982).

**What to do** - The shear line of advanced regeneration should be established by cutting the terminal and sub-terminal shoots from whorl branches (Fig. 5). Some internodal branches will probably require tipping. The leader should be cut to about 15 cm if bud size and distribution make it feasible. (Internodal buds are usually progressively smaller towards the base of the leader and many may be latent. Short leader shearing, especially in the absence of at least one strong internodal bud, is likely to activate latent nodal bud growth. This growth, beneficial in the event of leader or internodal bud loss, may under

other circumstances precipitate multiple leader growth requiring additional corrective shearing.)

Advanced regeneration with deformities in addition to open density should not be considered for tree improvement. Tall trees that do not promise to be salable within about 2 years are seldom worth the effort. However, in the absence of more manageable-sized regeneration, taller trees, 3 m or more in height, are sometimes developed. One or 2 years of stem growth can be removed from lightly foliated trees in this height class and the tops developed as for a "goose neck" condition. The sides should then be cut back to establish symmetry and the desired taper which may vary widely in trees of this height. Both fork pruning and standard shearing techniques should be used when shaping flaring trees.

When Christmas trees are developed from advanced regeneration the end product is usually a heavy tree with a large trunk.

#### Goose Neck

This term refers to a stem bare of internodal growth between two whorls. This may be the result of one of many conditions over which the producer has little if any control. Birds destroy the buds, squirrels chew the small shoots, physiological damage, environmental stress, and injury by insects are among the possible causes of growth loss on the stem. A goose neck longer than 25 or 30 cm is difficult to correct and if not treated early, in practical terms, is incurable (Fig. 6).

**What to do** - The stem must be cut to remove the bare section. If the goose neck occurs on the leader the stem should be cut below the node. This results in the loss of the previous years height growth and the top whorl of branches, but promotes an internodal shoot, the most promising alternative, to become the leader replacement (Fig. 7). If internodal growth is lacking, the top whorl of branches can be retained and sheared to

prevent upturning; new shoot growth from the node will provide a leader replacement. However, these shoots are often weak the first year. This method of top pruning is also appropriate when the goose neck occurs on a 2-year-old stem. This usually indicates an oversight or neglect in corrective shearing the previous year and always results in greater height loss. Heavy side-shearing is also necessary to maintain symmetry and taper (Fig. 8).

The culturing of an upturned whorl branch as leader replacement is an old practice of questionable merit, but is presented as another option.

A 1- or 2-year-old whorl branch will develop a vertical orientation if secured in an upright position. However, the result is usually a crooked stem with an off-center top, especially where 2-year-old branches are involved.

This practice should never be attempted unless the whorl contains five or more branches and internodal branch growth is profuse. When branch growth does not meet these standards any success in top restoration will be compromised by an "open area" type abnormality.

Latent bud growth or internodal branches will assure development of alternate leaders if no other measures are taken whenever a top section must be removed. A leader selected from these shoots usually results in about a 2-year loss of height growth; side branches must also be sheared accordingly to maintain form. However, this option is preferable, especially on trees over 2 m in height and on those lightly foliated.

### The Atypical Branch

One negative effect of shearing is the atypical lateral branch that sometimes develops. Branches on young balsam fir usually grow outward from the stem at an angle of 50 to 80 degrees. However, shoots originating especially on the top side of sheared branches sometimes become "disoriented" and grow in reverse direction to the norm, becoming vertically

oriented if allowed to remain. These shoots, called "horns," add an element of incongruity to branch formation, they are unsightly, and rarely beneficial to Christmas tree culturing. As a rule, it is advisable to remove horns when they are first discovered. The removal of buds growing on the top side of sheared shoots will reduce the incidence of horns. However, since all these buds would not produce horns and because of the additional time required, growers may question the economics of this procedure.

### Trouble at the Top

Bud failure resulting in leader loss is common on young trees before shearing begins and is always followed by abnormal development of the top branches. The subterminal shoots, originally destined to become whorl branches, may turn upward, each competing for dominance as leader. If untreated, a multiple-stemmed top develops, progressively reducing the tree's potential (Fig. 9). The whorl shoot with the strongest vertical orientation should be selected for leader replacement, preferably before shoot elongation has ceased. Usually, 25 to 50% of the length of the other shoots should be removed. Where the terminal is damaged or broken two or more equally competing terminals often develop. Some of these may be completely removed while others are cut at various lengths to give the desired taper to the tree top (Fig. 10). Some growers prefer to remove the competing shoots entirely, with the objective of developing a more normal top. This is the best alternative, if the orientation of the replacement leader conforms to the symmetry of the tree and internodal budding is adequate in number and placement to provide sufficient density (Fig. 11). Where a single leader replacement does not meet all the requirements for good top development, competing leaders may be important for additional shoot growth, some of which should be retained (Fig. 12).



Fig. 6. A goose neck for which a remedy is difficult. Only the top section has Christmas tree potential.

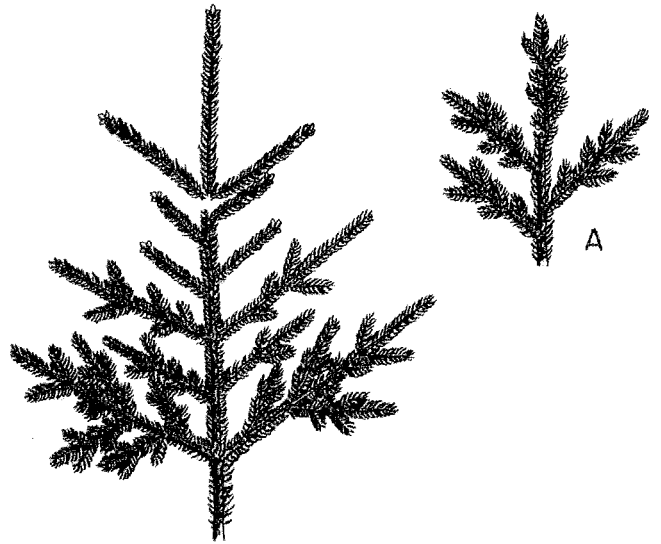


Fig. 7. Internodal bud loss on the leader results in a gooseneck. Remove the leader and top whorl branches. (A) An internodal branch should turn up and provide a new leader without seriously affecting tree form.



Fig. 8. Remove the top section, prune the whorl branches and rely on new shoot growth to provide a leader.

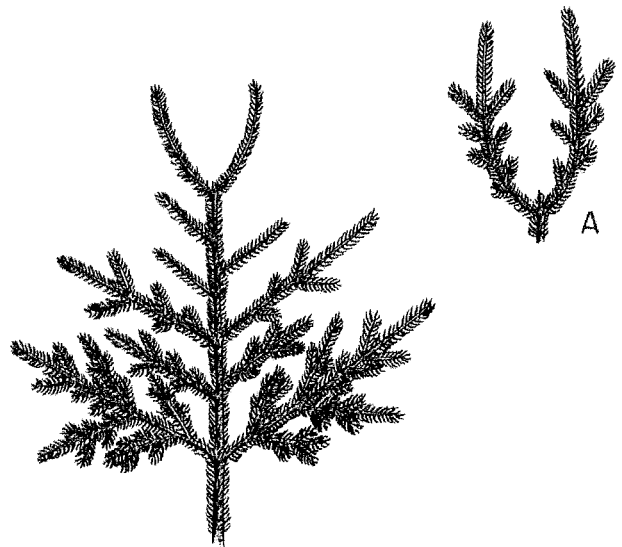


Fig. 9. Whorl branches competing equally for dominance. Four or more branches may be involved. (A) Expected development, without treatment, the next year.

Occasionally, when the terminal bud fails, one lateral branch will develop a strong vertical orientation while the others grow at an angle typical of whorl branches. Normal top shearing is then possible; but the upturned whorl branch usually results in an open or poorly developed area.

Leader failure invariably stimulates latent nodal buds to mature, producing vertically oriented shoots the following year. If there is no upturning of a lateral branch, a single leader can be selected from this new growth and the laterals, by now one year older than the leader, are sheared to regain symmetry (Fig. 13).

Difficulties in choosing corrective measures increase when lateral branch growth is somewhere between these extremes. Choice of leader replacement and the best cultural practice for managing competing leaders may not be immediately apparent. The advantage between selecting a replacement from among the upturned lateral branches versus a leader from new shoot growth often has to be weighed.

The selection of a new terminal leader to produce a straighter stem may require shearing much of the previous year's growth to maintain form. Tree size may be the determining factor in choosing the best treatment. Usually a crooked stem on a 1- to 1.6-m tree is well concealed by the time the tree reaches maturity. However, with taller trees, the option that produces the straightest stem should be the one used. Crooked or off-center top stem sections are unsightly and may constitute a major defect at harvest.

Growth of sheared leaders sometimes follow patterns similar to those described for leader loss and the same corrective measures are applicable.

New leaders that develop on sheared terminals usually have a strong vertical orientation. Double or multiple leaders occur regularly and all except the dominant one must be treated as competitors. The decision to remove all or various amounts of competing leader growth should be made on the basis of leader orientation and buds as described

earlier. Where it is appropriate to choose a single leader, succeeding growth results in a more natural top and a straighter stem.

#### Early Corrective Pruning

Small seedlings often develop deformities that can have long-term detrimental effects on tree development and form. Usually, abnormal growth results from injury which initially may seem insignificant. A second stem, with the potential of making a tree worthless, may go unnoticed on a small tree. Multiple tops and double stems are among the most common abnormalities encountered. However, corrective measures on a young tree can minimize or eliminate future deformities. If neglected, abnormalities become deformities and the difficulties of tree rehabilitation are increased. An effective treatment may be as simple as identifying the best leader or stem and removing the competing growth.

Whenever leaders are injured, trees become wide tapered with excessive branching and dense foliage. Hand pruners should be used to cut back, or remove completely, long branches below the injured area. This establishes desirable taper and uniformity early in the tree's development with a minimum of effort.

While some abnormal growth can be corrected by prompt treatment of this kind, other conditions, such as those caused by winter drying or browsing, may not benefit from immediate pruning. If an extensive portion of the tree is damaged or lost, the operator must wait for new growth and then prune and shear the whole tree. In some instances, this may involve extensive butt pruning to establish a bottom whorl, while in other cases, as new growth covers the damaged portion of the tree, normal shearing may be appropriate.

#### TIPS FOR THE OPERATOR

The operator moves around the tree while shearing, working from top to bottom, oriented with the tree at his side. From this position, rather than

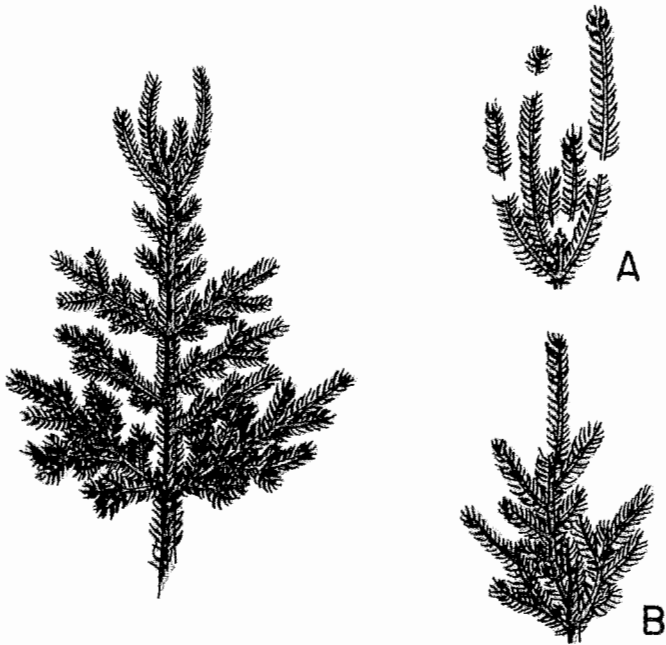


Fig. 10. Multiple tops. (A) Shear points where some shoots are entirely removed while others are partially retained to promote density and form. (B) Expected development at end of next growing season.

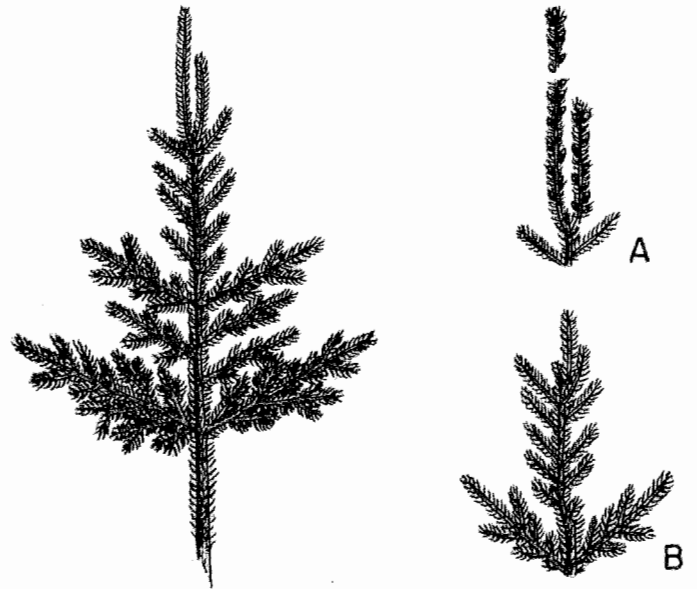


Fig. 11. Good top growth following leader shearing. (A) Shear points for vertically oriented leader replacements. (B) Expected top development at end of next growing season.

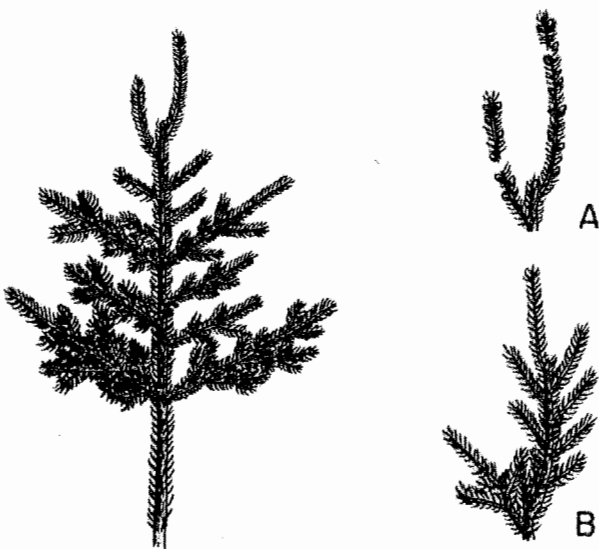


Fig. 12. Double top growth following leader shearing. (A) Shear points of double top. (B) Expected top development at end of next growing season.

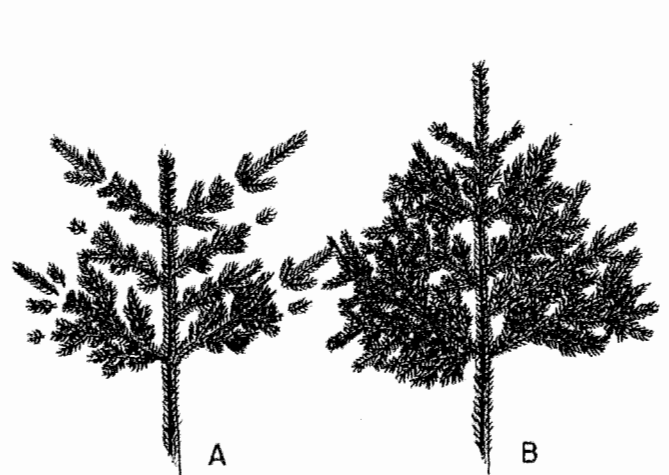


Fig. 13. Leader loss where an alternate leader grows from a latent bud. (A) Year-one corrective shearing. (B) Year-two growth after corrective shearing.

face on, an even cone-shaped tree can more easily be developed.

Both hedge shears and shearing knives are used. There is little danger of injury with two-handled shears, but when using shearing knives, protective leg and hand guards must be worn. For his own protection the operator should keep his free hand behind his back and never use it to hold a branch in position for shearing. Knives must be sharp for efficient and good quality shearing. They should be carried in sheaths when not in use. Knife shearing skills are not as quickly acquired as are hedge shearing skills, and are not widely used in the Maritimes in the culturing of balsam fir. Hand cutters should be carried at all times. Much of the corrective shearing, especially for deformed tops, broken branches, and red flagging (branch tips with dead foliage damaged usually by insects or diseases) is more efficiently done with hand cutters.

The use of motor or battery powered shearing machines with improved designs has increased in recent years and this trend is expected to continue. The number of trees that can be sheared is increased two or threefold with some machines currently in use, and a high standard of shearing is achieved. Top shearing is usually done as a separate operation using hand pruners in the traditional way.

#### **Butt Pruning**

Butt pruning to establish a handle and a strong bottom whorl is usually combined with the first shearing (Fig. 14). There appears to be no cultural gains from earlier butt pruning. However, the incidence of foliage diseases such as needle casts might be lessened by the removal of branches near the ground. These branches, especially in combination with grass or other ground vegetation, may sustain moist conditions conducive to infection buildup when foliage diseases are present. Pruned branches are cut close to the stem with hand cutters. An axe should not be used for butt pruning because of the high risk of injury to the tree trunk.

In plantations where grass is controlled, butt pruning to the first good whorl will usually provide the necessary 20 to 30 cm handle. While a full complement of bottom whorl branches is desirable, slight unevenness in the bottom ring of branches can be tolerated. An internodal branch will sometimes substitute satisfactorily for a missing whorl branch, significantly increasing the length of tree crown retained (Fig. 15). If heavy grass growth is uncontrolled, needle shedding occurs and more lower branches must be removed. One or more years of height growth can easily be lost because of grass competition (Fig. 16).

Where more extensive butt pruning is required some growers prefer only to shorten the branches immediately below the bottom whorl. This should support the bottom whorl in the event of heavy snow accumulations and provide a fresh appearing handle when the tree is ultimately harvested and the branches removed.

Butt pruning is not straightforward in wild stands where the interrelationship of trees is often a determining factor. In cultivated wild stands, pruning is sometimes limited to maintain shade, especially if stocking is light. Shade retards weed growth and contributes to cool, moist ground conditions enhancing balsam fir seed germination and seedling survival. In other instances, weak bottom branches may be removed to give space for emerging seedlings.

Shearing for symmetry and taper, whether in wild stands or plantations, is easier when the bottom branches of the Christmas tree have first been determined and the stem butt has been pruned. The exact amount of pruning necessary for a well formed tree is easier to determine while the tree is standing. Also, pruning assures a more accurate inventory of salable trees, greatly speeds up the harvesting operation, and avoids loss of revenue resulting from mistakes in selection of the bottom whorl on felled trees.

Where tree development, because of competition or other factors, makes heavy pruning necessary, the ensuing loss of foliage may be substantial. In such

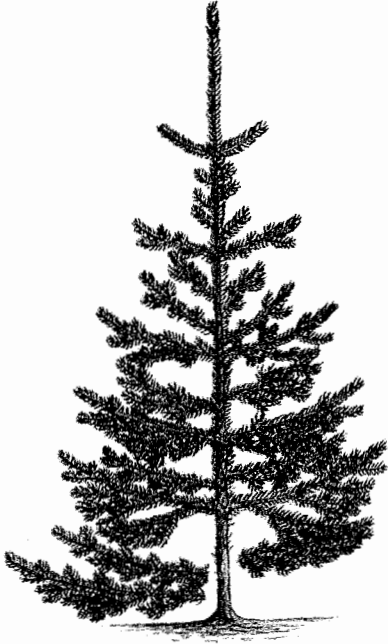


Fig. 14. Butt pruning combined with the first shearing.

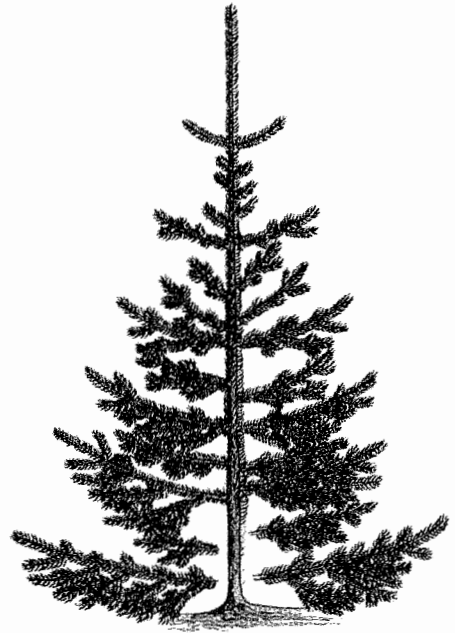


Fig. 15. Butt pruning where an internodal branch substitutes for a missing whorl branch.



Fig. 16. Extensive pruning required because of heavy grass competition.



circumstances, pruning may be done over a two-or-more-year period, or at harvest time. Foliage loss is excessive when the growth rate is slowed sufficiently to lengthen the time to maturity, or when the stem is suddenly exposed to sun scorch. Specific amounts of allowable foliage loss are difficult to define. Safe limits are influenced by tree size, vigor, and stocking. However, where foliage loss exceeds one-third of the total, tree growth may be adversely affected.

No study of manuals or written instructions alone can qualify one to use the management tools of shearing and pruning expertly as they apply to the development of Christmas trees. The

greatest proficiency in this art is developed only after many years of observation and experience.

#### REFERENCES

- Estabrooks, G.F. 1982. Thinning wild stands of balsam fir for Christmas tree production. Can. For. Serv. MFRC Tech. Note No. 52.
- Pinnock, D.F. [1975] Establishment and care of balsam fir for Christmas trees. N.B. Dep. Agric. Rural Develop. Plant Ind. Br., Fredericton, N.B.
- Powell, G.R. 1982. Shoot and bud development in balsam fir: Implications for pruning of Christmas trees. For. Chron. 58: 168-172.

