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# PRUNING FRUIT TREES

By

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VIRGINIA AGRICULTURAL AND MECHANICAL COLLEGE AND POLYTECHNIC  
INSTITUTE AND THE UNITED STATES DEPARTMENT OF  
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BLACKSBURG, VIRGINIA.

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# Pruning Fruit Trees

By ROY E. MARSHALL

Pruning probably exerts as great an influence upon the growth and fruiting habits of commercial tree fruits as any other orchard practice. However, both fruit growers and professional horticulturists have different opinions regarding some of the methods of pruning trees of the many types to produce the desired results in fruit production. Experiment station investigators and other careful observers are gradually working out various phases of pruning problems, but it will probably be many years before concrete rules can be formulated relative to the training and pruning of all kinds of fruit trees. Even then, pruning will likely continue to remain an art rather than be reduced to definite scientific rules or formulae.

While these problems are being worked out trees must be pruned and it is the purpose of this bulletin to furnish some simple and practical directions which will apply to Virginia conditions. The practices advocated, while largely empirical, have been in vogue for a number of years and will probably undergo little alteration in future years.

## SOME GENERAL PRINCIPLES AND PRACTICES OF PRUNING

*Results Are Localized.*—Generally speaking, the greatest growth response takes place in the immediate vicinity of a pruning cut. This is noticeable where a large branch has been removed, resulting in the formation of numerous water sprouts near the point of removal. In like manner, if a branch or shoot is cut back, a few lateral (side branches) will usually develop near the end of the headed back branch, although some response may be noted throughout the branch. The removal of a branch has practically no effect upon the response of the tree as a whole. If, then, it is de-

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The writer is indebted to other members of the Department of Horticulture for the use of several illustrations.

sirable to renew vegetative growth throughout the tree, the cutting must be distributed throughout the entire tree. Work confined to the outer parts of the tree will give response in those parts but will generally affect the central parts by admitting more air and light. Therefore the careful pruner should keep these facts in mind in thinning out or cutting back.

*Heading Back Develops Strong, Well-Branched Framework.*—In order that strong trees may be built it is necessary that young trees be headed back heavily to encourage the formation of a stocky, well branched framework, as opposed to rangy, spindling branches with inferior laterals. Heavy heading back during the first two to four years of the apple tree's life tends to result also in vigorous wood growth the following season. However, the heavily headed back young trees should not be expected to attain greater size,—in fact if continued for several years the gross effect is an undersized tree. In general, then, the amount of gross cutting back should be lessened after the first two or three years.



Fig. 1.—A three-year-old branch which has not been cut back. No cutting back usually results in the formation of more numerous fruit spurs and a few short laterals.

Heavy cutting back usually results in the formation of two to four rather vigorous shoots from near the end of each branch and few, if any, fruit spurs on the headed back branch. Light or no cutting back usually results in the formation of more numerous fruit spurs and smaller laterals. The amount of heading back will depend upon the age and general condition of the tree.

*Heading Back May Maintain or Destroy Balance Between Branches.*—Two branches are often found growing from a common point that have made practically the same amount of growth. If left unpruned or if headed back to the same length, the amount of growth from each the following year will be equal. If one branch is cut several inches shorter than the other, the

longer one will give rise to more growth the following years and eventually the shorter one will become a side branch of the longer, as naturally occurs if one branch is longer than the other and no pruning takes place. Thus, equal cutting back of branches arising from a common point results in equal growth, and unequal cutting back results in unequal growth.

When two branches of equal size emerge from a common place in such a way as to form a sharp "Y," a weak crotch results unless steps are taken to strengthen it. Equal cutting back of these two branches will not better the condition, but unequal cutting back, leaving one considerably longer than the other, will encourage the longer one to become a leader or main branch and the other will eventually become a lateral or side branch. The main object of this process is to strengthen the crotch and thus avoid splitting in later years.

*Conservation of Fruit-  
ing Wood.*—There is a strong tendency among pruners to remove all the fruit spurs and short shoots from the young trees, especially from the scaffold branches, as they are thought to be of no use.

However, it has been proved beyond doubt that these are productive of the first fruit of the tree. If they are removed, the tree will not come into early bearing. Other pruners think that these small twigs will only be in the way in later years, while still others are of the opinion that they

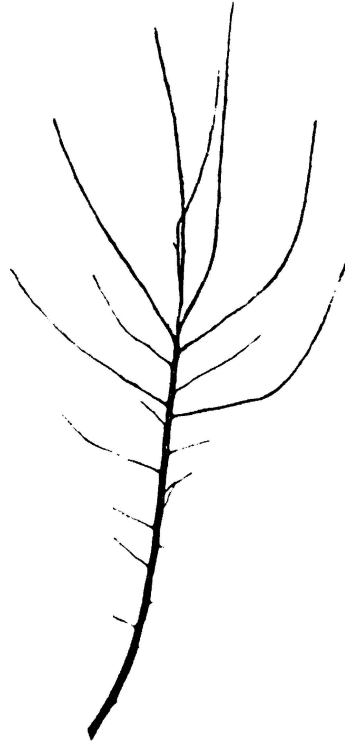


Fig. 2.—Heavy cutting back usually results in the formation of several vigorous shoots from near the end of the branch and a few fruit spurs from the lower part of it.

continue growth and cause the inner part of the tree to become so brushy that it would be impossible to climb into it. These fruiting branches seldom become more than a few inches in length, and if they do, they may be shortened. Even if some are broken off from time to time, it will certainly pay well to leave and preserve a liberal supply of them as long as possible.

*Vegetative, Transitory and Fruitage Periods.*—There are two distinct, and a third less pronounced, periods in the history of a fruit tree. The *first* is the formative or vegetative period in which the tree devotes its energies to the formation of wood growth. This is the time to build a framework or foundation that combines great strength, enabling the tree to withstand the elements and carry heavy loads of fruit in later years, with a form that will easily allow the best orchard practices. The number of years that should be confined to this period of “training” will depend upon the nature of the soil and treatment provided, but it will usually be about three years in the case of the peach and four to six years for the apple.

The *second*, less pronounced, but most critical period is the one during which the tree is undergoing a change from vegetative to heavy fruit production. Apple trees usually pass this period between the fifth and eighth years, although certain varieties under less favorable conditions may not have passed through it until they are much older. Heavy cutting of any kind during this period is likely to encourage vegetative growth rather than fruit production. Little cutting back should be practiced and only such thinning out of small wood as will keep the tree in good shape. Cultural practices must also be altered to meet the condition and the formation of fruit buds should be encouraged in every way possible.

The *third* period is that of fruitage and all subsequent pruning should be done with the idea of increasing fruit production by maintaining an even distribution of productive fruiting wood throughout the tree, by keeping the tree in a condition which will permit orchard operations to be thoroughly and easily carried out, and maintaining a tree environment suitable to the production of high grade fruit.

*Place to Remove a Branch.*—So much emphasis has been placed by most writers upon right and wrong methods of removing branches that it seems unnecessary to mention



Fig. 3.—This cut was made close to and parallel with the main branch. The cut is readily healing over.

these again, but some growers are still very careless in this operation. The wound resulting from the removal of a branch will heal much more rapidly if the cut is made close to and parallel with the main stem. If removed even a slight distance beyond the parent branch, the result is a slow healing wound. If a stub is left, it usually dies and heart rot eventually develops in the parent branch. It is often advisable to first use the saw for a short distance on the under side of

large branches so as to prevent the splitting down and peeling of bark from the parent branch when the branch is nearly sawed through.

*Vision Necessary.*—

Too many pruners fail to picture the tree they are pruning as it should appear in future years. When a tree is young, it is hard to realize that two branches crossing each other near the body of the tree, with some five or six inches between them, will eventually become large enough to crowd and possibly cause one or the other to split



Fig. 4.—These cuts were not made close to the main branch and decay has gained entrance to the heart of the tree through one of them.



off. The same applies to two branches starting out parallel to each other, but later diverging. Another very common matter is a case of two branches paralleling each other for some distance, and some twelve to eighteen inches apart. Certainly one of the branches could be made to develop sufficient laterals to fill the entire space occupied by the two branches. To accomplish this, one of the branches should be removed when young. The pruner should exercise a little judgment, visualizing the future of each branch and leaving the one best fitted to develop that portion of the tree. It may not always be best to remove a branch which it appears will develop or grow into another branch at some later time, because it may be that a short branch can be used to advantage to fill some space and, after it has made sufficient growth, it may be suppressed or cut back.

## PRUNING THE APPLE

*Types of Training.*—There are several methods of training apple trees. Those in common use throughout the



Fig. 5.—A double whorl of scaffold branches, resulting in a much crowded condition.

eastern states are: the "natural form;" the open center, "globe," "vase-shaped" or "tripod" tree; the central leader

or pyramidal type; and the modified leader or the modified open center type.

The *natural* form is the one in which the tree is permitted to shape itself. The pruner has no ideal in mind, but simply removes such branches as may be necessary to produce an even distribution of wood. It too frequently re-

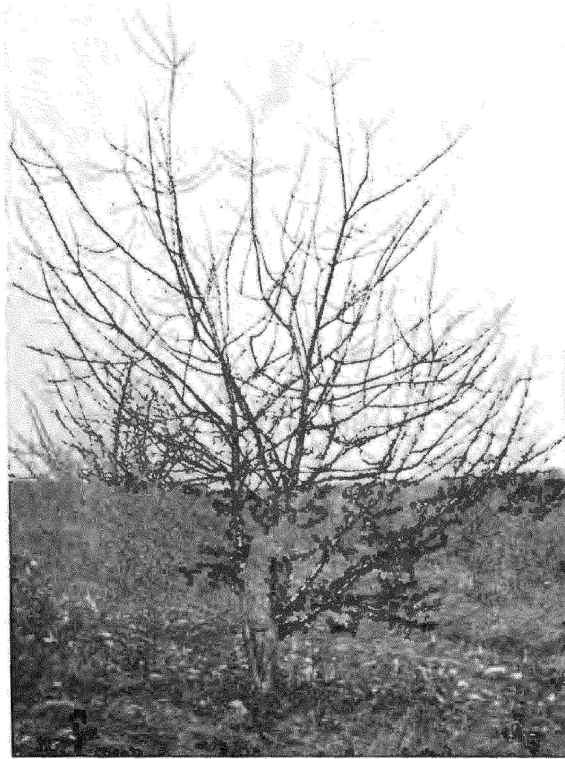


Fig. 6.—An eight-year-old tree that has never been pruned. A very weak crotch has formed and the intermingled, slender branches of the tree are so thick that the numerous fruit spurs cannot properly function.

sults in many crowded and overlapping scaffold main branches, some of which must be removed in later years. Satisfactory trees of the natural type may be built, but it will generally result in a lot of trees ill-fitted for their purpose.

The *open center* type of training was quite generally adopted by fruit growers before it had been tested suffi-

ciently to determine its serious weakness. Three to five well distributed scaffold branches extending outward and upward are usually chosen to form the framework of the tree. The leader or upright branch is removed, usually the first year. These three to five main branches are cut back to approximately the same height after the first season's growth and this equal cutting back of all branches continued until the framework is completed. In other words, each of the scaffold branches is given equal prominence and any



Fig. 7.—The work of a "tree butcher"—pruned, but with no definite ideal in mind.

tendency of one to outgrow the others is suppressed. The center is kept sufficiently open to permit the penetration of light throughout the tree. The result is a spreading tree, sufficiently open to permit good coloring of the fruit, and low enough to allow economical handling. This type of tree is easily maintained after it is once started.

The open center tree is structurally weak due to the fact that the scaffold branches issue from practically the same point, thus forming weak crotches. Frequently one of the scaffold branches splits off, leaving a big hole, and the tree is practically ruined. Many trees trained in accordance with this system in this State have met this fate. In one twenty acre orchard, fourteen trees split out during one moderately heavy fruiting season. It is quite evident that artificial supports must be resorted to in many orchards with trees trained in such manner.

The *central leader* or pyramidal tree has been in use to a certain extent, especially for certain varieties and for dwarfs. The central branch is allowed to ascend year after year until the tree begins fruiting, when it naturally be-

comes suppressed of its own accord. The lateral branches are considerably smaller than the central axis branch and crotches are formed which seldom split apart. Strong trees result, but it is very difficult to keep the trees opened out sufficiently to permit light to penetrate to the inner parts and the tops usually become too high to permit orchard operations to be conducted economically. This system is not favored by many present day fruit growers.



Fig. 8.—The very upright main branches on this open-centered tree form a seriously weak crotch. Low heading has not resulted in the formation of low branches.

The *modified leader* or semi-pyramidal is the fourth type of tree. As the terms indicate, it is a modification of the leader tree and thus combines its more important advantages and eliminates some of the disadvantages. The resulting tree is low headed, spreading, and with six to ten scaffold branches distributed along and about a central axis, thus forming a strong framework with well formed crotches. It is not possible to secure the several scaffold branches from one season's growth of the main axis and have them

properly distributed, so the selection must extend over some three or four years, starting two or three new scaffold branches each year. After the proper number and distribution of scaffold branches has been obtained, the tree should be opened by discontinuing (removing) the leader.

*Building the Modified Leader Tree.*—If a one-year-old tree has been planted and headed at 26 to 30 inches, the first year's growth, after planting, will usually consist of an al-

most upright branch produced from the uppermost bud and four or five shorter ones arising from lower buds. If so, two or three of them, well distributed about the trunk,



Fig. 9.—Equal cutting back of the two main branches after the first season's growth resulted in a weak crotch. One of the branches should have been entirely removed and the other cut back to a point about thirty inches above the ground after the first season's growth.

much as fifty per cent. of the leader and sixty per cent. of the laterals. This will also develop a stocky tree.

The following winter the leader should be treated in much the same manner as just described for the year previous. The scaffold branches will probably have produced several laterals. Two or three of these should be selected and headed back

should be selected in addition to the uppermost one, and the others removed. In cutting or heading back these branches, it should be borne in mind that the longest branch of a group has the advantage and will make correspondingly more growth the following season. Since it is desirable to develop the uppermost branch into a leader for several years, it must be left a little longer than the scaffold branches. In vigorous growing trees, it is often advisable to remove as



Fig. 10.—A strictly open-center type of tree with the three main branches arising from a common point, thus forming a very weak crotch. The tree was headed too low.

to avoid legginess. Care should be taken to prevent the formation of weak "Y" shaped crotches as previously described.

This system should be continued throughout a third and possibly to the fourth or fifth year, after which the leader should be suppressed or discontinued. This system of training results in a tree with a central axis or leader about five or six feet in height, with from six to ten scaffold branches extending outward and upward in all directions and spaced along the main axis for three to five feet, rather than all developing from approximately the same point.

Orchards in this State which are fifteen years old and older, have been trained in this manner, and many growers have unconsciously followed this plan with individual trees for years. Some of these trees have been in bearing for years and the advantages of this type of training seem to be well established.

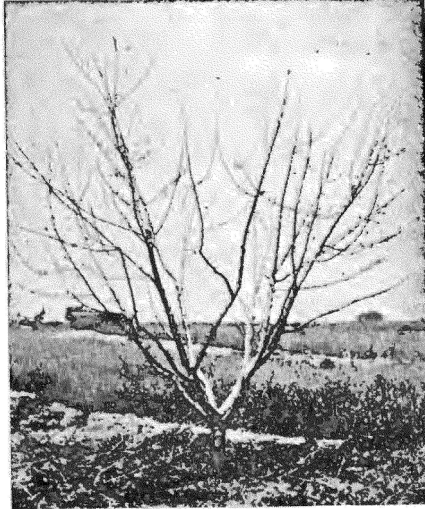


Fig. 11.—A strictly open-center tree in which the scaffold branches have been stripped of all fruiting wood. This tree has five branches arising from approximately the same point, although only four of them are in reality scaffold branches.

*Treatment of Young Trees.*—Although the grower may be attempting to train trees so that they will closely approach his ideal, he will find numerous difficulties, some of which are impossible to overcome. Trees of each variety, in fact every young tree in the orchard, may present different problems. Some of the more common problems will be briefly discussed, but the pruner must exercise his own judgment regarding the many minor ones.

After the *first season* the growth should be headed back in proportion to the vigor of the trees. If they have pro-

duced a vigorous growth of over 30 inches, about 50 per cent. of the leader and about 60 per cent. of the selected scaffold branches should usually be removed. If the growth does not exceed 18 inches, the leader should be left some 12 to 14 inches in length and the scaffolds eight to ten inches. When possible the scaffolds should be of such length that



Fig. 12.—Main branches emerging from a central axis usually form strong crotches. The distribution of the scaffolds in "A" is especially good, while that in "B" is more commonly found. The poor formation of branches in "C" made necessary the distribution shown.

secondary branches will develop not closer than a foot and not farther than 18 inches from the trunk. In case a growth of only a few inches is made, it may be advisable to cut each branch back to two or three buds with the idea of continuing their growth the following season and removing any laterals that may start to develop from the leader or scaffolds.

Following the *second season's* growth, the amount of

heading back should, in most cases, be slightly less than that given after the first season's pruning. However, it frequently happens that more growth is made the second season than during the first, and in such cases the pruner should not leave the new growth of the central leader over 20 inches in length and the leaders of the scaffolds (leader branches

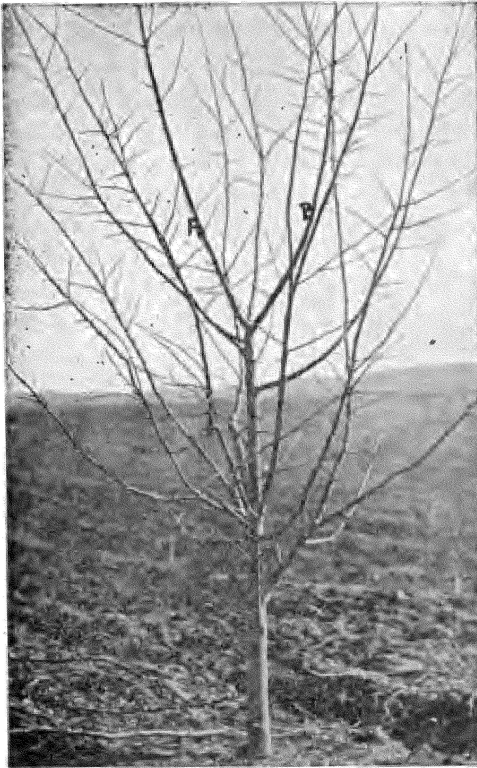


Fig. 13.—A two-story leader type of tree in which the upper main branches are becoming dominant over the lower set. The more dominant ones should be headed back or suppressed slightly so as to make all parts of the tree properly dominant. The crotch formed by branches "A" and "B" may be strengthened by heading either slightly shorter than the other.

should be selected and maintained for each scaffold branch) should be cut back to a shorter length, probably about 15 inches. Two or three more scaffold branches should be selected from the main central leader and these headed back slightly more than the previous season's growth of the leader.

During the second season, the average young tree will develop one long branch from the end bud left in heading back and two to four laterals may have developed from buds near the end of the parent branch. The branch developing from the

end bud of each parent branch should be left somewhat longer than the others so as to prevent weak crotches. This branch will become the leader and the unequal cutting will result in stronger crotches. It is seldom



advisable to leave, annually, more than two of the lateral branches on each scaffold and so distributed as to result in a well shaped tree.

The *third pruning* should be similar to that of the second year, except that the heading back should usually be less, but depending somewhat upon the stockiness of the branches and the amount of growth made. If an exceed-



Fig. 14.—A three-year-old York Imperial which is being trained as a modified leader tree. Note the number and distribution of main branches and the amount of thinning out and cutting back.

ingly long growth has been produced, the heading must necessarily be heavier, since the framework is still being built, and, if long rangy growths are left, they will not be rigid enough to carry heavy loads of fruit in later years and may not afford good distribution of lateral growth.

In many cases the third pruning will provide enough scaffold branches, but if not, another set may be left at the

time of the fourth pruning. After enough scaffolds have been provided, the leader should be removed just above the top lateral scaffold and the tree opened similar to an open center tree.

The pruner should develop the several scaffold branches carefully. The heading back should not only be done from the view-point of the tree as a whole but also with regard to the relation of the main branches to each other. If certain ones are outgrowing others, the stronger growing ones should be headed back more than the weaker growing ones.

If the lower scaffold branches are not developing sufficiently, the upper ones must be cut back more heavily, or the lower ones may be entirely suppressed as real scaffolds and the tree actually becomes high headed. Thus all main branches of the tree must be properly dominant.

Any small fruit spurs developed in the middle of the tree during this time should be left. It is seldom that growth of less than four inches found in the middle of the trees will continue to elongate to any appreciable extent. Such wood should be productive of some of the first fruit of the tree and seldom interferes with work in the tree.

*Corrective Pruning.*—The Department of Horticulture of the Virginia Polytechnic Institute is recommending the modified leader type of training for apple trees, but it *does not recommend that the form of the*



Fig. 15.—A well pruned three-year-old tree. Note the relation of the several branches to each other as regards length and dominance.

*tree be changed after it is once established.* An open center tree should be continued as such unless its form may be modified without drastic pruning. In like manner, an established leader should not be removed to develop a strictly open center tree. Wherever trees are trained in strict accordance with one system, any alteration in type, especially

after it has become well established, is likely to lead to bad results, and should therefore never be attempted.

The most common pruning difficulties in connection with young trees are due to a lack of annual pruning. The grower does not prune following a season of vigorous growth and the results are many long rangy branches which, instead of producing satisfactory laterals, continue to elongate the following season. Again, too many long, parallel and crossing branches are left and sharp "Y" crotches often result. It is seldom possible to again put these trees into the best shape and frequently one or two years additional time will be required to partially remedy the situation.



Fig. 16.—A four-year-old tree which was not properly trained during the first two years, but careful work during the past two years has resulted in a promising tree.

In pruning such trees, the first work usually consists in reducing the number of branches of this long growth, removing crossing and ill growing limbs, and correcting weak crotches by removing one of the branches or heading one of them back so as to gradually strengthen the weakness. The work other than that just outlined may vary in nature, depending upon the length of growth that was not headed back. If the growth preceding no pruning was rather light, little heading back may be necessary. However, if it was about three or four feet in length and represented the third or fourth year's growth of the tree, more drastic treatment will probably be advisable and such treat-

ment should usually be prescribed by an expert pruner. Usually it will be advisable to head back into the long leggy growth, leaving it some two feet in length by cutting, whenever possible, to a lateral branch or fruit spur. Such treatment usually results in crooked branches, and a subsequent growth requiring good judgment to handle properly. Careful annual handling of the young tree is absolutely indispensable.

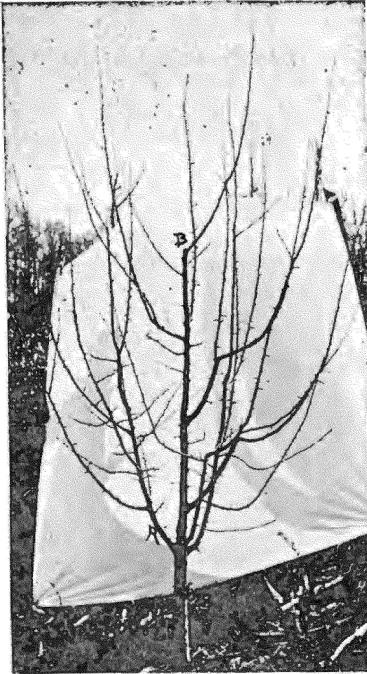


Fig. 17.—A well shaped modified leader tree in spite of the unequal distribution of scaffolds. Branch "A" must be carefully handled to keep it in its proper relation to the other parts. The leader has been removed at "B."

"Natural formed" trees frequently result in too many main branches with weak and crowding crotches, and overlapping or closely parallel branches. To remedy these conditions, it will probably be necessary to remove the superfluous main branches, leaving the stronger, better placed ones. Since these branches develop under crowded conditions and probably lack stockiness, the results, at best, may be unsatisfactory, but the general condition and future of the tree will be much improved.

*Pruning During Transition Period.*—After the tree has produced its fourth year's growth, the pruning should usually be given with the idea of en-

couraging fruit production. During the earlier years, the cutting was rather heavy and discouraged the formation of fruiting spurs.

With the framework of the tree well established, the pruning should consist in the removal of injured and diseased branches; the removal, or in some cases heading in of

crossing branches; the removal of closely parallel branches; the cutting back of rangy branches, and the thinning out of such new growth as will not be needed, so as to admit sufficient light and air to all parts. Although this treatment is light in character, it should be given annually to confine it as far as possible to the previous season's growth.



Fig. 18.—An eight-year-old Stayman before pruning. The form of this tree has been established and the tree being at the "critical age," must be carefully pruned.

With strong growing varieties, like Delicious and Stayman, formative pruning should be decreased gradually, that is, it may be necessary to head back rather heavily after the fourth and fifth season's growth to prevent the formation of long rangy branches, lacking in stockiness. In such cases the annual heading should be considerably less than that given during the formative period.

Pruning alone may not suffice in bringing the trees into a fruiting condition. It is frequently necessary to alter cul-

tural practices. It may be necessary to discontinue the growing of crops requiring inter-tillage and sow the orchard to clover, or in case of very vegetative trees, to grass. Where peach trees are grown as fillers, careful pruning must suffice.



Fig. 19.—The tree shown in Fig. 18 after thinning out. Some of the longer branches should be lightly headed back. The leader has been left slightly longer in this tree than is usually desirable. The crotch "A," at the place the leader was suppressed, should be strengthened by unequal cutting back of the three branches issuing from head of the leader.

### PRUNING THE BEARING APPLE TREE

The apple tree that has been properly trained as an open center, leader or modified leader one, and has had its fruiting system fairly well established, will require little subsequent annual pruning. Such pruning will consist in thinning out the new growth annually, sufficiently to permit light and air to penetrate to all parts; heading any unruly or wayward branches back within bounds; preventing the

formation of weak crotches; heading back branches tending to grow into others; and keeping the fruiting machinery (spurs) well distributed and functioning throughout the tree.

*Thinning Bearing Trees.*—The average more or less neglected bearing tree is so thick about the outer parts that



Fig. 20.—A well shaped modified leader tree in which the leader has been suppressed. A moderate amount of thinning out during the past two or three years has resulted in the formation of numerous fruit spurs.

an even distribution of functioning fruit spurs cannot be maintained. Thus the outer ends of the branches should be considerably thinned to permit a free circulation of air, ample light to produce fruit spurs and fruit, and to permit

more thorough spraying. The common mistake is to pursue the easiest course and remove a few rather large branches, but such a practice leaves holes and does not result in an even thinning or an even growth. Again, too much large wood is removed, resulting in a heavy vegetative growth near the base of the removed branches.

In thinning out the outer parts of trees, less vegetative disturbance will result if many small branches—seldom over an inch in diameter—are removed in such a way as to leave the outer fruiting wood evenly distributed and still open enough to permit the entrance of light and air. This type of work is best performed when the pruner climbs out near

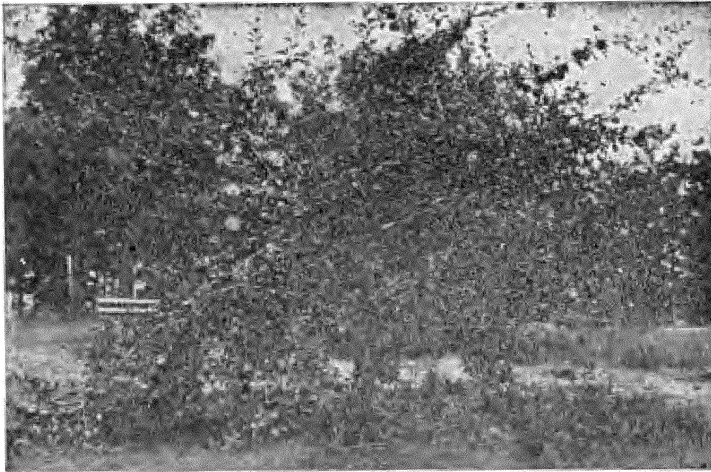


Fig. 21.—A nine-year-old Winesap tree which is unable to carry its load of fruit clear of the ground. If these branches had been properly cut back during their early development, they would have become stocky, more closely rebranched, and rigid enough to support the crops in later years.

the ends of the main branches where he is able to work with a saw and pair of hand shears. This practice requires time, but experience has proved that the extra labor required is repaid many times through better results. In case old trees are bearing too many clustered, weak or inactive spurs, it is advisable to thin them to admit light, prevent overbearing of small fruit, and to stimulate the remaining spurs.

*Treatment of Rangy Branches.*—Bearing trees frequently contain many long willowy branches which sway



about considerably, thus bruising and knocking off the fruit. These branches should usually be headed back sufficiently to stiffen them and cause them to become more stocky. In heading them back, the cut should be made close to a lateral branch or spur, to prevent the end of the branch from dying back and to determine the direction of growth.

*Lowering Tops of Trees.*—Fruit growers fully appreciate the inconvenience of too high tops. Many are bringing them down so that they may be successfully, as well as more economically, handled. However, there has been a

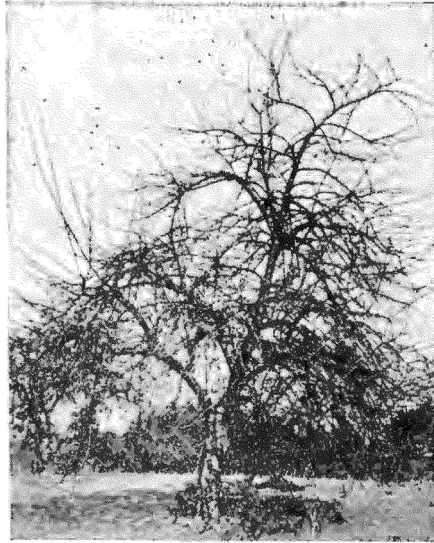


Fig. 22.—An old neglected Winesap tree which has become much too thick and the top allowed to become too high.



Fig. 23.—The tree shown in Fig. 22 after pruning. The top should be lowered to the side branch just below the white line the following year.

certain tendency to determine the height to which the trees should be reduced and then remove large branches to accomplish this. The result is that some parts of the tree which have been partially shaded are unduly exposed to the sun and scald results. In some orchards the bark on the

larger branches has been killed fully one-third the way around the branch. Again, water sprouts usually develop in profusion following such heavy cutting back.

It is usually possible to reduce the height of these tops by cutting some of the upright branches back, some two to five years in growth, to a side branch. Again, the remaining side branches may be shortened somewhat. Such measures usually bring the tops of the trees five to ten feet nearer the ground and are not especially detrimental to the tree as a whole. However, this cutting often induces growth, which should be removed in later years. If an old tree has produced little growth in the top, but the top is too high, two or three years should be taken to properly lower it.

*Treatment of Drooping Branches.*—Often old Winesap trees have branches which in earlier years were allowed to become too long and rangy, but are now unable to support their own weight, much less a load of fruit, clear of the ground. If these branches are removed, the trees become umbrella shaped, that is, too high headed, but drooping about the outer ends. This problem may be met by cutting back the main portion of the branch to some side branch or lateral, which grows out from the upper side of the main branch. This has been referred to as “undercutting,” and makes it unnecessary to remove so many large branches, which may have fruiting wood well located near the main body of the tree. It also shortens the branches, giving them more rigidity, and keeps the branches off the ground.

*Distribution and Establishment of Fruiting Wood.*—Bearing orchards are frequently seen in which trees have been stripped of all fruiting wood except near the ends of the branches. In other words, all the fruit is borne out on the ends of the branches, instead of being distributed throughout the tree. In many trees there is no fruiting wood within a radius of 12 to 14 feet from the head of the tree. It is understood that a branch can support more apples if they are distributed over its entire length, than if they are all clustered about the ends, probably six to twelve feet from the main trunk.

A scaffold branch should have several good lateral branches well spaced along its entire length, each lateral

supporting its share of fruiting wood. Such a tree can support a given load to better advantage and carry a much larger crop of fruit. When pruning the young tree always leave fruiting wood, if it is located where it will have a chance to develop. The tree will fruit earlier and heavier.



Fig. 24—Looking up into the interior of a twenty-year-old tree. The scaffold branches have been stripped of all the fruiting wood at least twelve feet from the trunk. The ideal tree would have its fruiting wood evenly distributed throughout the interior as well as the exterior.

Fruiting wood may be developed in the course of three or four years in a tree in which the scaffold limbs are bare by the use of well situated water sprouts, by cutting them back from four to twelve inches in length to encourage the development of side branches. These in turn should be headed back the following year. After this, the heading back should be lessened to encourage the formation of fruit spurs. To make this operation successful it is essential that the trees be thinned about the outside to admit light sufficient to allow the development of fruit spurs and to color the fruit.

The average man has a tendency to cut out branches which cross, or are in any way objectionable, because they have been instructed to remove cross branches. In many cases better results would be accomplished if the branch were simply shortened to a side branch. Suppose, for example, that a side branch had been left to fill in a space in a tree, and that this branch continues growth, growing across another branch some three feet from the first branch. This long

cross branch should often be cut back so as not to interfere with the branch it is crossing, but still fill the space that it was intended to fill.

*Time of Pruning.*—Pruning, in Virginia, may usually be done during any favorable weather from early November to early April. However, slight preference should be given to pruning done during late winter and early spring because the wounds heal over more readily. Some growers maintain that drying out or dying back is apt to result from early winter pruning, but the writer does not know of serious injury of this nature in bearing trees. If one has a large acreage to prune, he should start work in the older trees during the early winter and reserve the younger trees for the late winter and spring pruning.



Fig. 25.—An old tree after pruning, which consisted entirely of thinning out the thick growth about the outer parts. Note the long scaffold branches with all the fruiting wood far removed from the head of the tree, thus materially reducing the bearing capacity of the tree. Fruiting wood should be restored by the use of well distributed water sprouts.

As to the effect of pruning during periods of low temperature, it is believed that pruning done during any weather that is suitable for the pruner will result in no ill effects. However, it is possible that heart rot and die-back may result from pruning frozen wood.

*Summer pruning* has received much attention from professional horticulturists in the several sections of the country, but the results have been rather confusing to the average fruit grower. While judicious summer pruning may result in the saving of a year or more in building the framework of the young tree and in stimulating fruit bud

formation in some cases, the average grower should refrain from readily accepting such practices until a better understanding of the matter is reached. However, water sprouts and a few superfluous branches may be removed during the summer months.

*Wound Dressings.*—A great number of dressings have been used upon wounds made in pruning and with varying results. The New York Experiment Station found that undressed wounds healed more rapidly than those whose surfaces had been protected. In case a grower desires to use a dressing, white lead or white zinc should be given preference. Certainly, it is not necessary to cover small wounds.

## PRUNING THE PEACH

Thrifty one-year-old peach trees should always be insisted upon. All broken, twisted and knotted roots should be removed or cut back, leaving from three to five sound, straight roots, which should be shortened to four to six inches. After planting, the tree should be headed at a height of from twelve to eighteen inches—fifteen is a good average. Some growers prefer to have the head just above the surface of the ground, but where trees are headed lower than twelve inches considerable difficulty is experienced in removing borers. If the tree has a few side branches, they should not greatly influence the height of heading. If they occur above the point of heading, the straight branchless tree left will develop side branches that may be utilized as scaffolds. If side branches have developed from points below the height of head, four or five of them may be saved and headed back to two to four inches each.

*Form of Tree.*—The open head type of tree has been almost universally accepted as the best for commercial purposes. This results in a low, wide-spreading tree in which practically all the work may be done by men standing on the ground or low step ladders; enables the tree to produce a good supply of vigorous fruiting wood throughout the center and along the main branches of the trees, and admits air and sunlight, insuring well colored fruit.

*First Year.*—After the tree has made a season's growth

and before starting the second season's growth, it should be carefully pruned. Several branches may have developed, and from these three to five scaffolds should be chosen with a distance of two or more inches between their points of origin and so as to form a well balanced tree. However, a common point of origin is not seriously objectionable. This department prefers four main branches, but oftentimes the individual tree will result in a better shaped one if three or five are left, although the latter number will result in a somewhat crowded tree.

The scaffold branches should be cut back heavily to produce strong, stocky branches that can better carry the loads of fruit in later years. If the growth has been rather



Fig. 26.—A six-year-old, well trained and pruned peach tree. Little thinning and heading back of last year's growth was necessary in this tree.

short and stocky, less cutting will be necessary, but long, slender branches must be cut back more severely. With an ordinary amount of growth, branches of from 18 to 24 inches in length should be left. In case the branches have made an unequal amount of growth, the weaker ones should be left slightly longer than the stockier ones so as to give the weaker branch the advantage and thus balance the tree. Generally the branches should all be cut back to the same height to make a balanced tree. It will usually be possible to cut back to lateral branches. In such cases, two of these

may be left on each scaffold and tipped back. If these laterals have all developed from beyond the place where the scaffold should be cut back, the laterals should be ignored and the selected scaffolds cut back to outside buds.

*Second Year.*—During the second growing season, several lateral branches will probably develop from each of the main branches. The following winter two or three well spaced laterals, extending outward from each main branch should be selected and all the other growth removed, except a few small twigs in the center of the tree, which may be headed back for early fruit production. These laterals should be headed back, but usually not so severely as the year previous. Since the idea is to obtain a low, spreading tree, this second year's growth should be left from 18 to 30 inches in length depending upon the amount of growth produced and the direction of growth.

To produce a well shaped open center tree, one must leave approximately the same amount of wood on each of the main branches so that the top of the tree is almost in a plane after pruning. Of course the weaker growing scaffolds should be given some advantage by leaving them slightly longer.

A stronger framework will be formed if one branch of each scaffold is recognized as a leader and left a few inches longer than the others. In fact, the leader should be much more in evidence in the peach than for other fruits. Thus if three branches of the second season's growth are selected, usually the middle one should be left a few inches longer than the other two.

*Third Year.*—During the winter following the third year's growth, two or three outward growing laterals should be selected from each branch headed back the year previous. These branches, selected to continue the framework of the tree, should be headed back, removing perhaps a third to a half of their growth. Again, the pruner should try to leave the tree as a whole well balanced, but should destroy the balance of individual limbs by unequal cutting.

There will probably be a great number of twigs or branches throughout the lower parts and center of the tree. Those that are placed to receive light and air and have

plenty of room for development should be tipped back 25 to 50 per cent., depending upon the character of the growth, and saved for fruiting wood. Undoubtedly a large number of small twigs will have to be removed to admit light and avoid crowding. Although fruiting wood is desirable along the main branches and extending into the center of the tree, the pruner should attempt to keep this growth short and thus maintain the open center.

### PRUNING THE BEARING PEACH TREE

If the tree has been built along the lines previously outlined, it will be a low, spreading tree enabling the several orchard operations to be done by men or women standing on the ground and the tree will be open so as to give all parts access to a great amount of sunlight and air circulation. Future pruning should be such as will retain and encourage the formation of fruiting wood throughout the center as

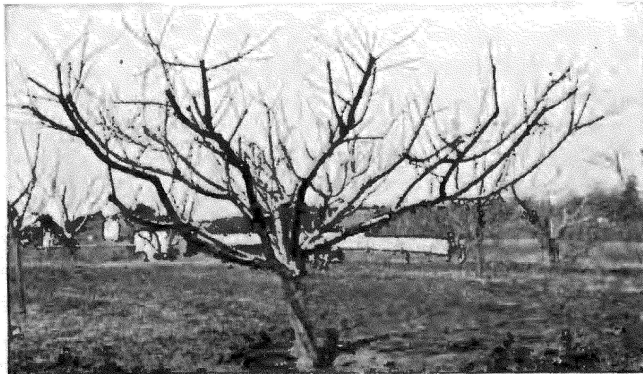


Fig. 27.—A five-year-old peach tree after being rather heavily headed back following winter injury to the buds. In this way the top of the tree has been lowered and an abundance of fruiting wood may result. This tree has been headed too high and too many scaffold branches have been allowed to form.

well as the outer parts of the tree, remembering that the peach bears its fruit on wood of the previous season's growth and that a goodly supply of new wood should be produced each season. Failure to prune the peach tree for even one season will result in a thick tree with a small amount of fruiting wood far removed from the main frame



work of the tree, and eventually in a weakened tree producing many small and inferior fruits.

If the tree is making a very vigorous growth, the main branches produced during the previous season should usually be cut back to a good lateral branch produced during the same season. Two or three of these secondary lateral branches may be selected and tipped back so as to leave most of the fruit buds, or they may be left without tipping provided the growth was not strong. If the previous season's growth did not exceed 18 to 24 inches, the selected branches should usually be headed back 25 to 50 per cent. or so as to leave many fruit buds on each branch. The grower should strive to keep the tree low and to accomplish this it is frequently advisable to cut back the larger branches into two or three year old wood and to a good, wide-spreading lateral branch of the previous season's growth.

The outer parts of the tree should be thinned out to avoid crowding and permit a free circulation of air and access of sunlight. A good supply of bearing wood should be retained throughout the centers and lower parts of the tree. This wood should be headed back and should never be allowed to develop enough to fill the center of the tree. Old twigs that have ceased to produce a goodly number of fruit buds should be removed to make room for the development of new wood.

*Pruning Neglected Peach Trees.*—Peach trees which have not been properly pruned for two or three seasons usually attain the shape of a "naturally grown" tree, that is the middles are filled up and frequently higher than the other parts of the tree and the annual growth is limited in length. These trees gradually become weaker and produce only a small amount of undersized fruit. It is usually advisable to open such trees by removing the branches from the center and then cutting back the remaining main branches into old wood and to outward growing side branches. The dead and weak wood should then be removed and the trees thinned out leaving only the most vigorous, well distributed wood. A good growth will usually result the following season, which will be well lined with fruit buds. During the following winter this new growth should be thinned out

and headed back, leaving a good supply of fruit buds.

*Renewal of Fruiting Wood.*—In many older peach trees the fruiting wood becomes scarce and far removed from the ground, and the trees seem to lack vigor. If the fruit buds have been injured to such an extent that little or no fruit will be produced during the coming season, these trees may be lowered, renewed and thus shaped to produce better crops in future years. The amount of cutting back will depend entirely upon the shape and condition of the individual tree. “Dehorning,” as generally defined, is advisable only under special conditions. If the trees have become quite upright, it will usually be advisable to head the main branches back to lateral, almost horizontal branches, probably removing some three to five years’ growth. If the trees have not attained a great height, but are lacking in vigor and the fruiting wood is scarce, some two to four years’ growth of the main branches should probably be removed. This, in conjunction with proper fertilization and cultivation, should result in the formation of a large amount of vigorous growth which may be thinned out and headed back the following winter. If the heading back is very heavy, such as might be termed “dehorning,” there is danger of a long, thick growth being produced, and the lower parts so shaded as to prevent the formation of but few fruit buds where they are most desired.

*Pruning Winter-injured Peach Trees.*—During an unusually severe winter, the peach wood may be injured as indicated by the brownish color of the sapwood. Although “dehorning” or severely cutting back such injured bearing trees has been quite generally practiced, investigations and observations following the injury during the winter of 1917-18 are conclusive enough to warrant the grower following less severe practices. Trees in which the longer branches were cut back into three and four year old wood and less prominent branches more lightly headed seemed to give the best response. In fact, it would appear that no pruning would give better results than “dehorning.” Again, better results will be obtained if the heading back is delayed until after the sap has been active for a few weeks. In this State, it would probably be best to head back winter injured trees about April 15th to May 1st.

## PRUNING THE PEAR

The pear should generally be trained and pruned in a manner similar to that recommended for the apple. Some growers prefer the open center type of training, maintaining that a lower tree will result and that blight may be more easily controlled. However, due to the upright habit of growth, the tendency to form weak crotches at the trunk is even more noticeable than with the apple. While there are advantages in both systems, and since the modified leader tree may be opened up after suppressing the leader, the latter should be given preference.

Since the pear has a strong tendency to assume an upright habit, the grower should cut back to outside buds and in many cases to outside lateral branches. In case of varieties having a decided upward tendency it may be advisable to cut to a bud just above an outside bud with the idea of cutting back to the outside lateral the following year. The grower should be particularly careful to destroy balance in cutting back branches, because of the upright habit of growth and tendency to form weak sharp-angled crotches. It is a good practice to remove spurs which may develop from time to time on the trunk or on the lower parts of the main scaffold branches to prevent blight from gaining an entrance to the main framework.

## PRUNING THE CHERRY

One year old cherry trees, which are preferable for planting, should be headed at about 20 to 24 inches above the ground. While no definite system of training seems to have been followed in this State, the modified leader type of tree seems to be preferred in the commercial growing sections of other states for both the sweet and sour cherries. It would seem to be especially desirable for the sweet cherries. Generally speaking, the sweet cherry may be trained as advocated for the apple and the sour cherry similarly trained, except that more scaffold branches, four or five, may be left each year and the leader suppressed after two or three seasons of growth. More scaffold branches are desirable for sour cherries because they seem to have a better spur habit

and in case only a few scaffolds are left, they have a tendency to grow too long and rangy.

The sweet cherry should be headed back during the formative period like the apple, but the sour cherry will require little or no tipping back, as it has a habit of freely producing lateral branches without heading back. However, if the growth should exceed 20 inches the first year, a light tipping back would be advisable.

During the formative period some thinning out of branches will be necessary to produce a well formed tree. After the third year the pruning will not be as heavy as for other fruits. It should consist in the removal of crossing branches; thinning out sufficiently to keep up a good supply of functioning fruiting wood throughout the tree, and heading back occasional branches in the top of the tree to lateral branches to prevent the trees from becoming too high.

## PRUNING THE PLUM

The plum tree should be headed at about 20 to 24 inches. The type of training will vary with the species. The Japanese plums should be trained as opened center trees and handled similar to the manner of training and pruning peach trees, except that less cutting back is advisable. The European varieties lend themselves to the modified leader type of training and may be trained like apple trees, except that less cutting should usually be practiced because of the strong tendency to produce excessive growth. The American plums tend to grow bush like and are usually permitted to assume a natural habit of growth after the head is established. However, some thinning out will be necessary to facilitate orchard operations.

The pruning of the bearing plum trees should be such as will prevent crossing and interfering branches; keep the trees properly thinned out, and in good shape. The Domestic or European plums should be pruned with especial care, as too much heading back may result in high and thick trees. Since the Japanese varieties bear much of their fruit laterally on the previous season's growth, slightly less annual heading back than is given the peach will usually be desirable. However, it must be remembered that

much of the fruit is borne on spurs similar to those of cherry trees. The American varieties should be thinned out sufficiently to encourage the maintenance of a good supply of fruiting spurs and to permit work to be done about the tree with more ease.

### PRUNING TOOLS

Two tools are absolutely essential for pruning work: a pair of small hand shears and a saw. With these two tools a pruner can do practically all of the work that will be required in bearing trees and most of the work in young trees.

The shears should be made of the best material obtainable as cheap shears are easily sprung. A good pair of steel shears will withstand heavy work for several years. The shears should be seven to ten inches in length—nine being the size usually preferred. Shears with coil springs are not desirable as the springs frequently “fly out” and are lost. Shears with a spring similar to the one shown in Figure 29 are most desirable.

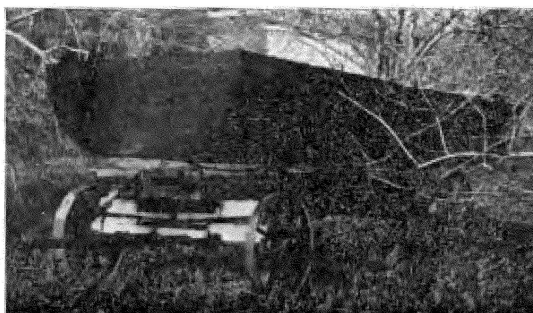


Fig. 28.—A convenient type of wagon used for burning brush in the orchard.

The saw should be so constructed as to cut rapidly; leave a smooth cut; be as light as is consistent with rigidity and good lasting qualities, and should have a hand grip that will not tire or cramp the hand or wrist. A saw on which the teeth are set to cut on the “pull” is less tiring to the pruner. Saws with teeth on both edges are objectionable as they cut slowly and frequently injure bark on the permanent branch.

A pair of lopping or wooden handled shears often facilitates the work about young trees and about the lower parts of old trees. They are somewhat awkward tools to use in the upper parts of bearing trees. Such shears should be about 20 to 26 inches in length and of the double leverage type.



Fig. 29.—Tools of these types are essential in all pruning operations. Springs of the type shown are preferable to the spiral spring shears.

The pole pruners, six to ten feet in length, enable the pruner to work the tops of trees five to ten years old to better advantage. They should not be used where it is possible to work with the other tools because work with the pole pruner is, at best, very slow and the cutting cannot be done as precisely as with other tools.