

Bulletin No. 64

July, 1908

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**UNIVERSITY OF IDAHO**  
**Agricultural Experiment Station**

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**Department of Horticulture**

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**Planting Apple Orchards  
In Idaho**

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**By J. R. SHINN**

# Idaho Experiment Station

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# Planting Apple Orchards in Idaho

BY J. R. SHINN

## Introduction

Idaho stands foremost among the states of the Union when rated according to its future possibilities as an apple producing state. Annually, train loads of people are pouring into Idaho chiefly because of the popularity that this state has gained through the brilliant apples that have gone to eastern markets; and the one ultimate aim of most of these newcomers is to start orchards that will produce such apples and such profits as those which have made Idaho famous. Others are attracted to the Gem state for the purpose of making homes where their families may be surrounded with the comforts and prosperity this commonwealth affords; naturally, their first impulse is to plant fruit trees for the future. Many of these people come from other pursuits or professions and are launching into the orcharding business wholly unprepared, either from the practical or theoretical point-of view. The first intimation that the Experiment Station of Idaho has of the intentions of this class of citizens is found in the inquiries received asking for explicit information regarding the various details of orchard planting. To meet the demands of this nature, a bulletin, designed to cover the various factors of this problem has seemed essential. Therefore, the main object of this publication is to give such advice as the common experience of horticulturists has demonstrated to be practical and useful; the object is not to present information of a new and startling nature as the result of conclusions drawn directly from definite individual experimentation.

## The Man First

Before planting an apple orchard the prospective orchardist should understand some of the requirements that must be satisfied if he is to be a successful fruit grower. Men are apt to enter hastily into a business that offers large returns to others, giving little heed to the factors necessary to success. Without a doubt a successful orchardist should have a general training in the sciences such as chemistry, botany and entomology for their application are intimately associated with the every-day affairs of the business. A knowledge of chemistry will aid him in preparing and applying fertilizers and in making spray mixtures. A knowledge of botany, especially that dealing with plant pathology and plant physiology, is essential; this knowledge must be used in keeping posted on plant diseases and the latest methods of handling them. An understanding of economic entomology should also form one of the foundation blocks in the apple orchardist's equipment, for he should be able to recognize every insect that infests or is likely to infest his plantation. Furthermore, he should be intimately acquainted with varieties of apples and apple trees; he should be able to quickly recognize the merits of a new variety compared with the merits and defects of older sorts. The business aspect of apple growing is such that it is necessary that the successful orchardist should be well informed in business systems and business principles, in so far that he may buy his supplies to the best advantage and reap the greatest returns from his crops. This latter point can scarcely be over-estimated for experience has shown that a good business man coming from another profession generally proves one of the most successful apple orchardists, due largely to the fact that he is familiar with business methods. Another all-essential requirement of the successful apple orchardist is that he be a good farmer, understanding the management of teams, tools, plows, harrows, etc., and the proper manner of preparing the land, seeding and cultivating. A fine appearing team will often be the first proposition toward selling the crop it cultivates or the load it pulls. Human nature seems to associate qualities of one sort with those of another; surely, then, the least that could be expected from a good orchardist is that he should be a good farmer.

To the unsophisticated this detailed account of the prerequisites of a successful fruit grower is apt to look discouraging but where there is a

willing heart and a studious mind, these various requirements may be mastered. Success will be attained to the extent that the fruit grower masters these factors.

### The Size of the Orchard

The size of the orchard to be planted will depend upon the experience and ability of the planter and the purpose for which the fruit is grown. In a commercial planting it is obvious that an inexperienced man should confine his attention to fewer acres than the man of greater training and experience, though this principle is very often reversed in practice. It is exceedingly easy for a man to argue that because certain men have made large average profits per acre, therefore the greater the acreage the more profit; but such conclusions are erroneous owing to the peculiar conditions surrounding fruit growing. The management of details, as has already been stated, is the important consideration; to do this properly, personal attention is absolutely necessary. Subordinates are usually delegated to look after much of the work where the area devoted to the orchard is large and the subordinates are generally far below the owner in their qualifications. The various operations of spraying, pruning, cultivating, harvesting, etc., should be well done and at the most opportune time. Delays of a few days in one or more of these operations may mean a failure in all. This is especially true of spraying in overcoming the ravages of the codling moth or apple scab as many growers have experienced. Chiefly because one man can give his personal attention to a small area only, it is important that the acres set to apples be few. Indeed, it may be stated that a planting of ten acres for commercial purposes is ample for the beginner. However, sufficient quantities of fruit should be produced by the Idaho grower to enable him to ship in car lots, since he is located at such a great distance from market. Furthermore, fruit growing must be regarded as an intensive method of farming and the largest quantity of salable products that can be produced with the least amount of labor and smallest investment should be the aim of the fruit-grower. Man must work to help nature in every possible way and encourage her to do her utmost. Future years will see the working out of more intensive methods with the fruit-grower's attention confined to fewer acres than is commonly found at present.

The size of a family apple orchard will vary with the number in the family, the number of visitors and their personal fondness of this fruit. For planting on the farm, space should not be the determining factor affecting the size of the orchard. The farmer should be sure to have plenty and to spare. Undoubtedly his orchard should be large enough to afford a constant supply of apples the year round. In some instances the size of the planting will be limited owing to the small amount of space available. Examples of such cases may be found on town and suburban lots.

### **Locating a Commercial Orchard**

The proper location of a commercial apple orchard within the limits of Idaho is no small task as there are many problems involved. Above all things in selecting a location for a commercial orchard it is essential that a locality is chosen where the elevation permits proper maturing of the apple. In favored sections apples are now grown at an elevation of 6,000 feet but it is rarely advisable to plant an orchard above 5,000 feet. The greater percentage of the profitable commercial orchards at the present time are in sections where the elevations are below 3,000 feet. Local markets and the family needs may be supplied with apples grown near the upper limits of elevation, but the general markets demand such varieties as are adapted to regions of lower altitudes.

Another all-essential element in locating a commercial orchard is to select a region where there will be ready transportation facilities. Many sections of Idaho grow excellent apples, but in some of these there have been no transportation accommodations developed to handle commercial quantities of this fruit. Undoubtedly, it would be unwise to locate large orchards in such sections. Locate the markets and the ways of reaching them first and then the question of the proper location for the orchard can be rationally considered.

In connection with the selection of a section where market communication is guaranteed, advantage should be taken of locating where there are two or more ways by which the fruit may be taken to market. Either two different lines of railroads or a railroad and water-way are decidedly advantageous. These competing lines tend to reduce the freight rates much below that usually maintained when one public

carrier has complete monopoly on the entire shipping facilities.

The finished product of an Idaho apple orchard will not endure rough handling if it is to be highly remunerative, hence it is desirable that an orchard should not be in a locality where long rough hauls by wagons are necessary to reach shipping points. Moreover, transportation by horses is exceedingly expensive even if the roads are not rough and should be minimized as much as possible.

Whether a location shall be selected in a newer or older apple producing district is a perplexing problem for many prospective planters. Each district has its advantages as well as its disadvantages. The former will have the great advantage of affording cheaper land. It is also likely to be more immune from the destructive insects found in the older sections. On the other hand the fruit growers of the older districts are usually more thoroughly organized and have worked out systems for producing and handling their apples which must be accomplished in every new community if the business is to prove highly successful. Labor is likely to be cheaper and more plentiful in newer communities, especially at the time of apple harvest, though a certain amount of training will be found necessary to make the laborers competent. If one has plenty of organizing and business ability and is an apt scholar in gathering and applying information, it can readily be seen that a new locality may afford the greatest opportunity.

Aside from the consideration of altitudes, markets, distance from orchard to shipping station and the comparative merits of newer and older sections, the cost of clearing the land, the comparative cost of irrigation and cultivation, and the permanency of the water supply for irrigation, should receive due attention. Thus it will be seen that the location of an apple orchard is no small task. The prospective orchardist should make careful study of the various localities from these various points-of-view, and compare the merits of each, before deciding definitely upon the section where the orchard shall be located.

## The Site

Careful attention should be paid to the selection of a site for an apple orchard. For the home planting the site is very often predetermined and the trees must be placed on the area left after house and lawn have

been provided. Where choice is permitted it is always important that the orchard should be somewhat elevated above the immediate surrounding country in order that free air-drainage may be secured and late spring frosts thus avoided. Cold air is heavier than warm air, it therefore slides down the hillsides into the valleys. This condition which permits the cold air to settle away is said to provide air-drainage,—a factor of extreme importance to the apple orchardist. For this purpose gently sloping land is preferable to level land though in irrigation sections it is more difficult to water. A fall of two or three feet to every hundred is very satisfactory, and will aid materially in keeping the plantation free from the ravages of late spring frosts. On the other hand, too steep slopes should be avoided for the reason that they cannot be tilled, irrigated, and sprayed satisfactorily. A greater factor in facilitating air drainage is a draw or gully passing through or near the orchard. This element should be taken advantage of where conditions permit. An orchard should never be placed in low-lying basins or “pockets” for such positions are devoid of proper air-drainage. Sloping land also tends to provide good water drainage which is an essential consideration. Fruit trees are short-lived, grow slowly, crookedly and often have a twisted trunk on land which is too wet.

Northern or eastern slopes are generally regarded as best for apple orchards owing to the fact that they are later in warming up in the spring than slopes in other directions. This condition results in retarding the blooming period of trees, which is often sufficient to avoid injury from frost in many seasons. In most sections of Idaho it may be desirable to select a slope away from the strong prevailing winds as such winds do untold damage to both crops and trees; slopes to the north or east generally satisfy this condition. Moreover, the soil on the northern and eastern slopes is usually deeper and richer than that found on slopes to the south or west. The reason for this condition is due to the fact that fine, rich dirt, leaves, straw and various materials are gathered from the southern and western slopes by the prevailing westerly winds and are deposited upon slopes in the opposite directions. The continued deposition of this material has added much organic matter to this leeward soil which has resulted in producing not only a rich, deep soil but also one capable of retaining moisture.

On the other hand southern slopes are earlier and therefore permit a



longer growing season. Besides trees, situated on such exposures, receive large amounts of sunshine which results in earlier maturing fruit with higher color and sometimes with better flavor. From these conditions it is obvious that, in sections where the growing season is short and where the fruit is likely to be poorly colored, a southern exposure may be preferable to all others. In the higher altitudes of the state these factors should be borne in mind as highly significant; any element that will prolong the season for late winter apples and induce them to take on their full degree of color should be favored. With the early winter varieties, grown in the section mentioned above, the northern or eastern slope usually permits the fruit to properly mature and to become well colored. However, owing to the fact that the soil on the south exposure is drier, it naturally follows that the fruit produced will be smaller unless some means be devised to overcome this obstacle. With the proper application of manure and the intelligent use of cover crops on such soils this difficulty may be largely obviated. Subjected to such treatment, a southeastern cove may be regarded as the best site for the higher altitudes, at least in North Idaho. This kind of a site properly chosen may combine not only the warmth of the southern exposure but the deeper, richer, and more moist soil of the northern slope may also be secured.

Large bodies of fresh water, either lakes or rivers, exercise an ameliorating influence upon the climate in their immediate vicinity, and orchard sites selected on slopes which extend towards the water are more immune from radical atmospheric changes. The slope on the side towards which the prevailing winds blow is preferable because the air in passing over the water becomes modified in temperature and its moisture content is increased. These latter conditions make such sites warmer in winter and cooler in summer, besides they tend strongly to prevent the occurrence of late spring frosts.

From this somewhat extended discussion of orchard sites the prospective apple grower should be able to choose the one in his locality that has the most to offer. By coupling this information with that secured from local growers no mistake should be made regarding the matter.

## Soil

Soils from which native forests have been cleared are best adapted to growing the apple. These are in good physical condition so that ample surface drainage and sub-drainage are supplied; besides they have a plentiful supply of plant food which is essential to a healthy wood growth and a finely developed, well matured crop of fruit. It has been repeatedly noted that fruit from such soils reach the highest degree of perfection both from point of quality and color. However soils which may be brought to a state similar to that found on old forest sites, may be regarded as being well adapted to the growth of the apple. Medium clay loams adapt themselves admirably to the apple and if these possess, or are made to possess, the following requisites orchards may be planted upon them successfully. These important requisites are: good water drainage, good texture and sufficient richness in plant food. As suggested in a preceding paragraph, a sloping site usually affords good water drainage but this is not always the case. Where good natural drainage is not found, tile drainage should be provided because apple trees will not endure "wet feet." The phrase "good texture" means that a soil possessing this characteristic will work up loose and mellow without being hard and lumpy. Such soils are easily worked and hold plenty of moisture. Most of the good orchard sites in Idaho are sufficiently rich in plant-food, so there is no direct need of applying plant-food at the time of planting.

## Preparation of the Land for Planting

After the site and soil have been selected the subject of the preparation of the land for the reception of the trees should occupy the attention of the orchardist. The thorough preparation of the land should be regarded as a very important element in planting out an orchard. An apple orchard is very different in its requirements than are annual crops; yet, how frequently does it occur that the land for it receives even less attention than does the land for corn or wheat. Many prospective orchardists propound as their first question, "How are we going to rid the land of sage-brush or stumps for setting our trees?" They

think when this matter has received attention that trees may be set at once. While it is true that some lands may be turned over and planted immediately, yet, most experienced growers and observers regard the practice as of doubtful value. The wiser plan is to anticipate planting two or three years in advance and devote this time to growing a rotation of crops which will bring the soil into the best state of cultivation. After the roots of the trees have taken possession of the soil, deep plowing can not be done; and as this is essential the soil should be plowed deeply before planting. For arid lands in sage-brush sections the need of organic matter in the soil is apparent to the casual observer, and no crops act so beneficial in increasing this organic matter as alfalfa or clover. After clearing new lands, alfalfa or clover may be sown, which should be allowed to remain one or two seasons, after which it is turned under. By virtue of their extensive root systems better crops than these are not known for breaking up soils underlaid with stiff clay. Where soils are sufficiently supplied with organic matter there is less need for the above practice. New ground, however rich, needs to be subdued before trees are set upon it. Such lands are apt to be full of inequalities; hence every effort should be made to discover and remedy the poor spots that need manuring and the wet spots that need drainage, so that the trees when planted may grow evenly and rapidly from the very start. The cereal crops, such as wheat and oats, serve admirably as indices for bringing out these inequalities. Immediately preceding the planting of the orchard, a crop that requires thorough cultivation, such as potatoes, is highly beneficial in putting the finishing touches upon this preparatory cropping system.

### Subsoiling

Subsoil plowing should be resorted to in all cases where the lands are underlaid by a stiff stratum of soil. This is accomplished by running a subsoil plow in the furrow left by the ordinary breaking plow, loosening the soil to an additional depth of 12 to 18 inches. Treating soils in this manner not only deepens them but promotes good drainage and increases their water holding capacity. It is not always essential that the whole area of the ground be subsoiled before the trees are set. A strip of 6 or 8 feet wide on which the trees are planted furnishes suffi-

cient subsoiling for the first year. This subsoiled area may be increased by subsoiling a strip 3 to 4 feet wide on each side of it annually until the whole space is covered. This practice stirs the ground deeply for the roots to penetrate in a way that could never be secured after the roots occupy the soil. Instead of using a subsoil plow, where the hardpan is very pronounced, holes may be blasted to considerable depth by the explosion of dynamite, though it is questionable whether a soil of such tenacious character should be used for an orchard. The use of such crops as clover and alfalfa exercises a similar effect to that produced by subsoiling.

### **Time to Prepare Soil**

The autumn months are regarded as the best time to prepare all lands that are to be planted to apple orchards. This exposes the land to the ameliorating effects of frosts allowing such soil to catch and hold the rainfall of winter, and permits the subsoil to become sufficiently settled to reestablish capillary action between it and the lower soil strata while still keeping the soil in loose condition for the deep penetration of the roots. If the autumn preparation is thoroughly done the stirring of the surface is all that will be needed in the spring.

### **Drainage**

Aside from the fact that under-drainage is desirable in carrying off surplus water from the soil, it has many other beneficent qualities, only one of which needs mentioning in this connection. Arid places under irrigation, unless possessing good natural drainage are prone to become alkaline in the course of time. This condition is due to the fact that all fertile soils contain alkaline salts to a greater or less degree. These salts are readily dissolved by the water entering such soils. As most water must pass off eventually, either through the plant or by evaporation, there is a marked accumulation of these salts in the surface layers of the soil, such material being dissolved in the lower strata and then left behind at the surface when the water is used by the plant or is evaporated. Under-drainage is the great preventive as well as the sovereign remedy for alkali. Complete saturation of the soil with water once a year and provision for under-drainage to carry away the surplus, means that the excess of these salts will be washed out and removed

entirely. Attention is directed to this point particularly because many orchardists have suffered great losses and their orchards have been ruined because they have failed to observe this factor.

As stated before natural drainage is the most desirable for orchards, but where it does not exist tile drainage should be resorted to. The orchardist should look after this matter carefully before the trees are planted. The distance between drains depends altogether upon the kind of soil. In soils that are loose and crumbly, tiles may be laid thirty to sixty feet apart, while on heavy impervious soils less distances should be allowed. All tile drains should be placed below the frost line and it is questionable whether it is advisable to place them at a depth less than three feet in an apple orchard. It should be remembered that tile drains among fruit trees are liable to become choked with tree roots, and must be dug up and cleaned out as often as a diminished flow of water is noted.

### Irrigation.

Where irrigation is practiced the method that is to be used in irrigating the orchard should be considered before the trees are planted. Of course before the ground is plowed, preparatory to planting it is essential that it be watered sufficiently to make the plowing easy, but the system thus used may not always correspond to the one to be used after the trees occupy the land. Undoubtedly in Idaho the furrow system of irrigation, modified to suit the requirements of the orchard, is the best method. Mr. Elias Nelson, Irrigationist for the Station, gives the following directions for the installation of this system: "To install the furrow system the procedure is as follows: When the conformation of the land permits it, the head ditches are located 300 to 500 feet apart and at right angles to the furrows. When they must be made on contours, they should have a grade of 1 3-4 to 2 1-2 inches to each 100 feet and their distance apart be such that the furrows are 300 to 500 feet long. Check boxes are placed in the head ditches at such distances apart that the splash board will raise the water high enough to flow readily into all the furrows. The splash boards are so adjusted that the excess water in each section flows into the next below until the whole head of water is being distributed. Each head ditch below the highest one catches the water from the furrows above it and redistributes

it. To divert the water from the head ditches small gates or lath tubes are placed in the ditch bank. Spouts 1 1/2 to 2 feet long made of lath will usually supply sufficient water for each furrow. However, when a larger stream than the lath spouts divert, is needed, tubes may be made of half inch lumber of the proper width. The spouts are placed in the ditch banks just below the surface of the water. When the splash boards are in place the water will flow through the spouts and when any section of the orchard has received sufficient water the boards are removed and the water then drops below the level of the spouts. In porous soil the furrows should be 300 to 400 feet long. In soil that does not absorb water readily they may be much longer and a smaller stream of water should be run for a longer time. The automatic feature of the system and the even distribution of water which it insures, makes it very advantageous. Flooding should never be practiced in orchards, nor should water ever be allowed to come in contact with the trunks of trees."

## Have a Plan

The beginning of most successful enterprises makes its first definite appearance on paper and such a beginning is as essential to successful orcharding as to any other business. Everyone would pronounce a contractor to be foolish who should undertake the erection of a modern dwelling without a plan. Such an undertaking may involve only the expenditure of a few months labor, while the building or growing of an apple orchard consumes many years. Obviously then, it is extreme folly for an orchard planter to begin setting trees without preparing a plan of as great details as that required of the man who builds a house.

A carefully prepared plan, drawn to scale on stiff drawing paper and inked in, constitutes an important element in orchard planting. In making a plan the planter should map out definitely the kinds of varieties, the number of each kind and the exact location for each tree for his orchard before a tree is purchased. This means that he will decide all of the details of selecting varieties, and the system and distances of planting, in a sane, considerate manner.

## Selection of Varieties

The selection of varieties of apples is apparently one of the first problems that confronts prospective fruit grower whether he expects to grow apples for home use or whether he expects to grow them for shipping to distant markets. In a new country this problem has even been a serious one, so it is not surprising that for Idaho it should be uppermost in the minds of the newer class of citizens. There are so many varieties and varying notions regarding the merits of each that this tends to make the question very perplexing. Moreover, there are so many fruit growing sections in this state that it is not always safe to conclude that because a variety does well in one section that it will do equally well in another. Furthermore varieties that may be well adapted to home uses may be decidedly lacking as commercial sorts. Tender fruits are not adapted to shipping to distant markets because they bruise easily, consequently, their keeping qualities are poor. Besides, color and size are essential in good market apples while these elements are not of as great importance as quality for home use. Naturally, then, the selection of kinds of apples depends upon the use to which the orchard is devoted, whether for producing apples for home use or for market purposes.

### Commercial Varieties

An inquiry in the markets will show that apples finding readiest sale at highest prices are fairly large and highly colored. No color seems to meet the customer's fancy quite so well as a clear bright red, although a few yellow sorts of known quality are also in demand. It does not necessarily follow that such apples are sold in greatest quantities, but it does mean that they should bring large returns to the grower. Undoubtedly, where the freight rates are high as they are on Western apples, this is an additional reason necessitating high market prices for this product. Furthermore, the people who have money for purchasing fine fruit, are also endowed with a good understanding of the merits of the leading varieties and are quite particular in their demands for certain kinds. As a general rule these people have been accustomed to apples all their lives and this experience has developed an acquaintance, not only with the merits of these varieties, but also with the season of

the year when each kind is at its prime. While they would not hesitate in paying a good round price for a box of Jonathans at Christmas-time, they would display considerable reluctance when offered the same box a month later, even at a reduced price. The same is true of other varieties. The point is that in selecting varieties, the orchardist must take a long look into the future and weigh well the bearing which the season of ripening and the present acreage now planted to a variety will have upon the returns of the orchard he is planting. The aim of Idaho orchardists should be to keep the market well supplied with the best varieties for all seasons, not to overstock the market at one season and at another furnish an insufficient supply.

At present the most popular varieties of apples produced in Idaho, and selling on Eastern and European markets are the Jonathan, Rome Beauty, Winesap and Grimes. In the warm valleys, under irrigation, in Southern Idaho, and at the lower elevations in other parts of the state, these varieties attain the highest degree of perfection. With the exception of the Winesap, which requires a long season to mature, all are adapted to the "Panhandle" section of North Idaho. It is thought by some that the Wagener, and the McIntosh Red are better adapted to North Idaho than the Rome Beauty. They are undoubtedly popular sorts and should be planted where seasons are short and where early maturing varieties are desired.

The proportion of each variety to be planted deserves careful attention. In the warm valleys it is perhaps best to devote only one-third of the orchard to early winter sorts such as the Jonathan and Grimes, with the other two-thirds equally divided between the Rome Beauty and Winesaps which are late winter varieties. In sections where the growing season is short, by virtue of which the early winter varieties really become late winter sorts, and the fall varieties such as the McIntosh Red and Wagener come into season in early winter, the same ratio should be maintained.

It will be noted that only a few varieties have been mentioned and this has been done advisedly. The most common mistake made by commercial orchardists is in planting too many varieties. Instead of confining their attention to the best of a list of varieties adapted to a locality, they plant of each kind; when harvest time comes they have more expense and trouble than is necessary to handle the same quantity of a few selected varieties.



## Varieties for Home Use

The choice of apples for home use and local market offers an opportunity for personal preference to a large degree. Most any of the varieties that have proven themselves well adapted to home use and home markets in other sections of the United States can usually be grown successfully in Idaho. If one has developed a particular fondness for special sorts those are the ones he should plant not only because their quality suits but also because they are more likely to get better attention. Select the varieties that suit best. However, for the sake of those who are unacquainted with many varieties the following list has been prepared, classing them according to season of ripening:

*Early Summer*—Early Harvest, Yellow Transparent, Red June, Red Astrachan.

*Mid-Summer*—Oldenburg, Benoni, Sweet Bough, Chenango.

*Fall*—Wealthy, Maiden Blush, Jefferis, Gravenstein, Fall Pippin, Mother, McIntosh, Tompkins King.

*Early Winter*—Jonathan, Grimes, Delicious, Yellow Bellflower.

*Late Winter*—Spitzenburg, Stayman Winesap, Aiken, Winter Banana, Rhode Island Greening, York Imperial, Roxbury Russet, Ben Davis.

## Systems of Planting

There are several systems of planting or laying out orchards, the chief of which are known as the squares, hexagons or septuple, quin cunx and contour.

*Squares.* Orchards laid out with rows equal distances apart and running at right angles to each other give a system of squares with a tree at every corner. This system constitutes the simplest method of arrangement and is very satisfactory from the point-of-view of convenience of cultivation and general appearance. Practically all the orchards in the state are laid out according to this plan.

*Hexagons.* This system gets its name from the fact that six trees are planted around a seventh in such a manner that a line drawn through these encircling trees make a hexagon. Each tree is equidistant from all of its neighbors, thereby utilizing the ground to a better advantage

than where squares are used. Aside from this point, it is claimed that irrigation is facilitated. About fifteen per cent more trees can be planted per acre by this method than by the square system. It is probably a better system than squares where land values are high or are likely to become high.

*Quincunx.* The quincunx method of laying out an orchard consists of arranging trees the same as in squares with a tree in the middle of every square. This middle tree is usually temporary and is known as a "filler," which should only be allowed to remain until the space is needed by the permanent trees. The fact that fillers can be used most advantageously by this method is the only reason why it has maintained its recognition among horticulturists. It is decidedly inconvenient when it comes to cultivating and irrigating and for this reason has little application to the orchards of Idaho.

*Contour.* The contour system of planting consists in laying out an orchard on sloping ground or on hills in such a manner that the trees of a single row are practically on the same level. Where irrigation is practiced it is customary to allow a grade of 1 3-4 to 2 1-2 inches for every 100 feet of row. Such a scheme facilitates cultivation and irrigation and is very useful on some of the best orchard sites.

### **Distances of Planting**

In this state it is not wise to plant standard apple trees closer than 33 feet each way and it is very probable that a distance approximating 40 feet will in time prove as well adapted to our needs as has been the case in Eastern orchards. Experience has demonstrated that it is poor judgment and lack of foresight that leads men to set apple trees close together. Not many crops of apples are taken from an orchard before the tops of the trees have a diameter of twenty feet. For instance orchards have been observed in this state where the side branches of Jonathan trees seven years old were touching their neighbors, indicating thereby that the battle for space had already begun. Inasmuch as the root system of apple trees are more extensive than the tops it necessarily follows that where limbs are touching, sharp competition already exists between the roots of the various trees. Where an orchard of this

description has been grown the only safe system for the orchardist to follow is to remove every other tree. Experience and observation have shown that it is far easier to say that these extra trees or "fillers" shall be removed than it is to take them out when they are apparently in their prime and seem to offer such a source for increasing the returns of the plantation. Delay in their removal, however, always proves injurious to the permanent trees. Owing to this fact that the average orchardist has not the will power to remove "fillers" when they should be removed, it is far safer to dispense with their use entirely and to place all trees in their permanent positions.

Since the root system of dwarf trees is smaller they can be planted much closer than standards. It is customary to plant dwarfs on Doucin stocks 20 feet apart each way and those on Paradise stock 10 feet apart.

### Arranging Varieties

Aside from the consideration of systems of planting, varieties to be planted, and the distance of planting, a carefully planned orchard should involve the arrangement of varieties. Shall all Jonathans be planted in a solid block or shall they be intermixed with other varieties? Owing to the fact that the flowers of some varieties are *self-sterile* it is generally considered better to intermix them than to plant single varieties in solid blocks. Furthermore, though many varieties are able to fertilize themselves, frequently the size of the fruit is much increased if pollen from other varieties serves this mission. For these reasons it is advisable to plant only a few rows of a single variety together, followed by a few rows of another variety. Arrangement of rows in pairs facilitates labor in harvesting season besides affording the best opportunity for cross-pollination. That is, with an orchard of Jonathan, Grimes, Rome Beauty and Winesap, two rows of each variety could be planted in their respective order.

### The Number of Trees Per Acre

A ready reference table showing the number of trees that are required per acre for the different distances of planting for the two most common systems is given in the following:

Distance of Planting	Trees per Acre	
	Squares	Hexagons
33 feet	40	46
35 "	35	41
37 "	31	36
40 "	27	31

## Nursery Stock for the Orchard

How to secure the best nursery stock for planting is often a very perplexing question. There are several possible avenues of procedure and it is well that each of these be considered in order to determine which has the greatest number of merits for any particular case.

### Is It Economy to Propagate Your Own Trees?

The propagation of fruit trees is a business of itself, yet prospective orchardists often reason that they are justified in venturing into this business for the sake of providing themselves with trees true to name. This condition arises from the fact that countless numbers of orchardists have been swindled by tree agents and a few have been exceedingly disappointed by careless or dishonest nurserymen. Many men have nursed and cared for trees from infancy to bearing age and the greatest fruit that they received for their labors was disappointment. This experience has been so prevalent that many have been led to believe that it is impossible to get varieties true to name from nurserymen. Without question the prospective planter should be certain that he is going to get trees true to name even at an increased cost of propagation. There are enough honest nurserymen in the country to satisfy this requirement and these same nurserymen are able to grow the trees cheaper than an inexperienced person could possibly do. Then from the

standpoint of economy with the sole purpose of getting trees true to name it would seem best that the fruit-grower let the nurseryman grow the trees. The selection of the nurseryman is a vital consideration.

### Pedigree Nursery Stock

During recent years the subject of "pedigree nursery stock" (young nursery trees whose parentage is known) has come to occupy an important place in the minds of the older fruit growers of our country. The method by which such trees are secured is by propagating them from the buds taken from mature trees of known vigor and productiveness—trees that have records of merit behind them. Acquaintance with apple trees and the fruit they produce has demonstrated that, taking the Jonathan variety for example, there are certain individual trees that produce apples of superior size, finer flavor, richer color, better quality and in larger quantities than other trees of the same variety in the same locality. Moreover, it is known that certain trees are habitually inclined to bear full crops annually and that they are resistant to certain insect and fungous pests. Since buds taken from these trees and used in propagating other trees will produce individuals of equal merit, it seems logical to conclude that such a method should be used in order to secure the best nursery stock.

Nurserymen, generally, have not accepted this idea of "pedigree trees," but still hold to the practice of using buds from young nursery trees which have never borne an apple or that have never shown any individual merit, except that of growing thriftily. While it is true that several generations may intervene between the original bearing parent without seriously interfering with the fruit-bearing habit of the trees propagated, yet the pedigree method is always preferable. Some nurserymen who claim to have pedigree stock really have nothing more than ordinary stock and this has brought the method into disfavor even with the best nurserymen. Besides, most of these men have not had ample proof that propagating directly from bearing trees produces trees of superior merit when compared with those which are propagated from the nursery trees. However, painstaking planters, especially those of experience, are going to demand trees of selected stock and are willing to undergo considerable expense to get them.

Since most nurserymen at present do not have this "pedigree stock" for sale, the question naturally arises as to methods of securing such trees. Of course, as has been said before, the prospective planter may propagate his own trees, selecting stock of merit and caring for it as the nurseryman would. This is a costly undertaking for unskilled hands so it is well to devise some means whereby the efforts of orchardists and the skill of nurserymen may be combined. Where there are local nurserymen, planters may select buds or scions from trees possessing desirable characters, take them to the nurserymen and have trees propagated. The danger of honest nurserymen getting labels confused is little more than if orchardists did the work themselves, besides the trees have the benefit of being under the management of skilled hands. Trees of this sort will cost a trifle more but fruit-growers can find no better investment. By this method a fruit-grower may insure the permanent success of his business.

### The Selection of Stocks

While emphasis has been laid upon the selection of the bud or scion, from which the bearing surface of the tree is to be grown, due attention should also be directed to securing the best kind of a seedling on which to grow the top. The root or stock, upon which a tree is grown, has a marked influence upon the growth and character of the resulting tree. This condition results because there is a definite balance between the roots and the top of the tree. Dwarf trees are secured by grafting upon slow growing roots; on the other hand vigorous trees are secured by using strong vigorous growing roots. Seeds from the Northern Spy, Ben Davis, Yellow Transparent and Red Astrachan produce hardy, thrifty and vigorous seedlings. Such seedlings used as stocks make a strong union between stock and scion, give vigor and possibly influence the character of fruit. Besides these attributes, seedlings of the Northern Spy make especially desirable stocks because of their resistance to the attacks of the woolly aphid. This is a species of the plant lice that infests the roots, trunks and tops of many varieties of the apple. On the roots of nursery stock it is especially disastrous and frequently extends its damaging influence far into the life of the tree before it can be subdued or before the tree is finally killed. This louse is one of the most

difficult insects to control in the orchard; consequently it is important that the orchardist should avoid future trouble by selecting stocks grown from Northern Spy seeds. It is thought that seedlings of the Red Astrachan or Yellow Transparent, when used as stocks, produce fruit of earlier maturity than late stocks which is a distinct advantage with late sorts grown in short-season sections.

### **Shall Dwarf Trees be Planted?**

The culture of dwarf trees commercially has not been undertaken to any large extent in the United States. However, people who have desired a few very choice apples of high quality from small city or suburban lots have grown them for many years with very satisfactory results. Unless there is a good local market for fruit, dwarfs should not be planted for commercial purposes, but for the man with the small lot they have many advantages over a standard or ordinary kind. The novelty of having something different from the ordinary appeals to many, and in this particular dwarfs are very resourceful. Moreover, it is claimed that they can be sprayed with greater care and thoroughness and that pruning and harvesting may be more economically done. Furthermore, they have a distinct advantage for raising home market apples, which require picking several times, over the standards. Owing to their small stature they lend themselves admirably to protection from late frosts.

There are two types of dwarf apple trees—those grown on Paradise stock and those grown on Doucin. The former type is strictly a dwarf as it only attains a height of eight or nine feet owing to its small root system. It is well suited to small gardens and to places where there is a limited area. In our climate they will bear a scattering number of apples one year after planting, and in two years should produce a goodly number of apples. The type of dwarf grown upon the Doucin stock is in reality only a half dwarf as it attains a height of sixteen or eighteen feet. This tree may be valuable for commercial purposes for it has sufficient capacity to produce a liberal quantity of fruit.

At the present time the Idaho Experiment Station is testing these two types of dwarfs with a view of ascertaining more clearly their adaptability to Idaho conditions. In due time the results of these tests will be published and distributed. Those desiring detailed information re-

garding the culture of dwarf trees are referred to Waugh's "Dwarf Fruit Trees" published by the Orange Judd Co., Chicago, Illinois.

### **Whole or Piece Root Trees. Which?**

The average planter is apt to be at a loss to know whether he is to plant trees grafted on whole roots or on piece roots. Certain nurserymen argue in favor of one process while an equal number favor the other method. Inasmuch as both methods are championed it would seem to indicate that under proper conditions each is good. In fact unprejudiced experimenters have come to the conclusion that grafts made on whole roots are of no greater value to the planter than grafts made on pieces of roots which are above two and one-half inches in length.

Within recent years budded trees are coming more into favor both with nurserymen and with orchardists. By this method of propagating the roots of the seedling are not disturbed and no portion is lost by digging as in the case with roots used for grafting. As a result of this more extensive and stronger root system budded trees usually make a stronger growth than the grafted trees during the first year while the trees remain in the nursery. Where yearling trees are wanted by planters, nurserymen usually find that budded trees furnish more satisfactory stock because of their stronger growth and finer appearance. It is a question, however, whether or not this advantage continues after the trees pass from the nursery to the orchard. In the process of digging nursery stock much of the root system is cut away, and this may result in the grafted trees coming to the orchardist with as extensive roots as those found on budded stock.

### **The Age of Tree for Planting**

Without a doubt, yearling trees furnish the most desirable stock for Idaho orchards. This is due, not to the claim that is very often made for them, of being able to catch and even over-reach the growth of older stock, but to the fact that a yearling tree has all the buds intact, and permits the orchardist starting the head or scaffold limbs near the ground. Trees that are allowed to remain in the nursery rows, until two years old or older, are usually headed much higher by nurserymen than experience has demonstrated desirable. While long-trunked trees



may do well in the Eastern United States, they are almost sure to succumb to the devastating influence of sunscald in the West. This trouble is due to exposure of the unprotected trunk to the hot rays of the afternoon sun. Where the limbs start near the ground the trunk will be shaded and the difficulty obviated. Besides this feature, low-headed trees have other special advantages over high-headed trees, chief among which may be mentioned the ease of spraying and pruning, the economy of harvesting, the decreased danger of strong winds, and the almost unbelievable point of greater facility in cultivating. In order to get trees of this type it is imperative that yearling trees be selected.

### **Where to Buy**

Whatever method of securing nursery trees is used, it is always better to deal with the nearest reliable nurseryman. Stock from nearby nurseries is generally regarded as better adapted to local conditions than trees from a distance though the importance of this point is often over-estimated. There are orchards in Idaho that are remarkably productive and vigorous, the nursery stock for which has been brought hundreds of miles. It will be found that trees grown under similar conditions of soil and climate will give satisfactory results. When trees cannot be secured from nurserymen, having similar conditions of soil and climate, it is decidedly better to go north than to go south in procuring them. Northern grown stock is usually hardier and consequently adapts itself to new environment better than southern grown trees. Besides freight is saved and the roots of the trees are not out of the ground so long and therefore less likely to dry out, when the planter patronizes nearby nurseries. Moreover, the prospective orchardist has a chance of inspecting and selecting his own trees without the risk of getting undesirable service from a distance. Furthermore, local nurserymen are more desirous of pleasing their home trade because upon this point their future success depends.

### **Secure First Class Trees, Only**

The best trees are none too good and it is decidedly poor reasoning that leads one to put second or third class trees in the orchard. A few cents extra in the initial cost of good trees is a meaningless trifle compared with the cost of caring for them until bearing age is reached.

One should never try to practice economy by buying cheap trees.

A first class tree should be a well grown medium sized specimen, possessing the characteristic habits of growth of the variety, besides it should be healthy, including freedom from injurious diseases and insects. Over-grown trees are not as desirable as medium-sized ones, although they are much preferable to under-sized stock.

### **Time to Buy**

Fall buying of nursery stock is the safer plan because of the assurance that the orchardist will get choice stock of the varieties desired. However, where fall buying is neglected spring buying may prove satisfactory.

### **Heel-in the Trees on Their Arrival**

Trees, when delivered in the fall, may be "heeled-in" by the planter and carried through the winter in first-class order. Care should be exercised to select a well-drained and protected place on which they are to be "heeled-in." It is best to secure this place near the area to be planted so that the trees will be convenient at planting time. This practice of "heeling-in" consists of plowing a deep furrow in which the roots are buried. Where the trees have an exceptional spread of roots it is necessary to increase the depth of the furrow by digging, in order that all the roots may be placed below the level of the surface. The trees should be arranged singly side by side, with the tops laid down almost horizontal and all tops laid in the same direction (preferably pointing to the north). After a single row of trees has been distributed along the furrow, loose moist soil must be thrown over the roots so that every root is brought in close contact with the soil excluding the free passage of the air. The topmost roots should be buried to a depth of four to six inches. Where large numbers of trees are needed rows are arranged so that the tops of each succeeding row overlap the "heeled-in" roots of the preceding. Before trees are "heeled-in," in the fall, it is usually advisable to cut away all broken and bruised roots and to thin out other roots that crowd and interlace. Trees treated in this manner will have callouses formed over all cut surfaces by spring, and will be in excellent condition for planting. Where mice

or other vermin are not present it is safer to mulch the tops of the trees during winter rather than leave them exposed.

If the roots have become dry in transit they should be thoroughly soaked with water before they are heeled-in. A tub of water may be used for this purpose and while one bundle is being heeled-in another is allowed to soak in the tub. Care should be exercised to remove all packing material from the roots for such material permits too much air. Each variety should be placed by itself, properly labelled and a record kept in a book of the position that each occupies.

While this "heeling-in" practice has been described as a method for keeping fall delivered stock, it should be said that it applies with equal importance to spring deliveries. Where the ground is not in perfect readiness for the planting of the trees upon their arrival, the latter should be unpacked at once and "heeled-in." In fact, the instances are rare in which "heeling-in" should not be regarded as the only rule to follow.

## Laying Out the Orchard

Whatever system of planting is adopted, the laying out or staking of the orchard involves considerable labor. It is well that the simpler and more satisfactory methods of practice be understood. In the beginning of this undertaking it should always be remembered that plenty of room should be left between the trees and the boundary fence so that work may be facilitated. Very often trees are crowded so near the fence that cultivation on all sides is impossible and spraying has to be done under trying and unsatisfactory conditions. Because of these conditions no tree should be planted nearer than twenty-five feet of the boundary line of the orchard area.

*The Square System.* Where the ground is comparatively level and the area small, one of the simplest methods of laying out an orchard in squares is to set stakes along the boundary lines at opposite sides of the area to be planted and then use a marked wire for locating the position of each tree. Beginning on the side boundary of the tract, the first stake is set twenty-five feet from the end. Following this stake, other stakes are set successively at the distances the trees are to occupy, these stakes to be in line along the side boundary and extending the en-

tire length of the field. The opposite side of the area is staked in like manner, beginning at the same end and staking in the same direction. After this a telephone wire which is long enough to reach across the field is secured. In one end of the wire a loop large enough to slip over the stakes is made. Twenty-five feet from this loop the wire is wrapped tightly with fine stove-wire over which a bit of bright red flannel is tied. Then, at distances the trees are to stand in the rows, other markings are made likewise along the telephone wire. By stretching the wire between opposite pairs of stakes the spot where each tree is to stand may be located. Holes may be dug and trees set at once or stakes may be driven at the various marks.

Another system of marking off squares is to use a common turning plow. First of all stakes are placed around the field along the boundary lines similar to that described for the wire method except that the ends of the field are staked as well as the sides. The first stake in each line, on its respective side, is placed twenty-five feet from the true corner of the field. Furrows are made lengthwise and crosswise in line with opposite stakes, the position of the tree being located at the intersection of these furrows. With a good steady-walking team and a firm hand to hold the reins, rows may be made comparatively straight. However, it is necessary to align the trees by sighting in order to get straight rows. The greatest endorsement that this method has is that it greatly facilitates the digging of holes.

Still another method used is to locate stakes around the field as in the preceding case and then establish a row of stakes through the middle of the field each way in line with all side and end stakes respectively, but in such a manner that none of these stakes come where trees are to be set. After this, one man may stake out the orchard by himself for he has always two pairs of stakes running at right angles with each other with which to align himself for each row of trees in the orchard. Places for digging the holes for the trees may be readily located and the latter practice of using this system is very simple as no small stakes for individual trees are needed.

*The Hexagon System.* Since an orchard laid out in hexagons has all of its trees equidistant, the first essential device for this work is a triangle the length of each side of which is the desired distance

between two rows of trees. Usually this triangle is constructed by the use of three pieces of flexible wire joined together at the three corners by rings one and one-half or two inches in diameter. Measured from the middle of each ring, each side should correspond exactly with the distance between the trees. A triangle constructed in this manner works very well on comparatively level ground but for sloping ground it is usually best to make the triangle of wood. Three well-seasoned one-by-two-inch pine strips, each two inches shorter than the distance the trees are to be planted, are nailed firmly and braced together forming an equilateral triangle. Care should be taken to have the sides of the face of this triangle on the same plane. At each corner of the triangle a pine board six by six inches is nailed, an inch hole is bored in each board in such a manner that measured from the center of the holes each side corresponds exactly with the distances the trees are to be planted.

In using the triangle it is necessary to stake out one row by line at one side of the field, after which the triangle serves to locate all other stakes. Three men must carry the triangle, one at each ring. By placing two of the rings separately over two established stakes a third stake is established. This process is repeated until the entire field has been staked. Where it is desired to use hexagons on sloping or hilly ground a plumb-line and carpenters' level must be used in connection with the wooden triangle. Each time that the triangle is moved it is leveled and the plumb-line hung at the corner where the ground is lowest. By this method the third stake may be exactly located in reference to the other stakes.

*The Quincunx System.* The quincunx system is only a modification of the square system. In placing the rows of stakes at the side of the field it is necessary to place an additional stake midway between each two stakes described in the preliminary staking for squares. The marked wire described for laying out the squares has an additional mark or loop placed upon it, which measured from the loop previously described is half the distance that exists between the permanent trees. In other words, if the permanent trees are forty feet apart then this additional mark or loop would be twenty feet from the end loop. When a "filler" row is to be staked this second loop is used and stakes or trees are set by the marks on the wire (except that the first one is

skipped).

*The Contour System.* In order to lay out an orchard on sloping land according to contour system it is well to employ a surveyor; especially is this necessary where irrigation is practiced. In this manner, each tree may be located according to a definite grade and the future management of the orchard greatly facilitated.

*Tree Locating Devices.* After an orchard has been staked it is important that some device be used that will serve to locate the trunk of the tree in the same place occupied by the stake. For this purpose one of two devices is used by orchard planters. The first and most common consists of a board one inch thick, six inches wide and six feet long. An inch hole is bored in the center of the board and one at each end at equal distances from the center. To complete the construction it is only necessary to mark out a strip an inch wide on one side of the board that will include the hole made in the middle and then saw out this piece. Stakes, twelve to fourteen inches long, are provided which will easily slip through the end holes. In using this device, the groove in the center of the board is placed tightly against the stake standing where the tree is to go, a stake is pushed into the ground through each of the holes at the end, then the bar is removed. After the hole has been dug it is only necessary to replace the board over the end stakes and bring the trunk of the tree to occupy the same position as that occupied by the stake. After the hole is practically filled the bar is again brought into service and the tree placed in its exact position.

The second common device employed for locating trees is a triangle made by nailing firmly together three strips each one-half inch thick, two inches wide and six feet long, allowing a projection of three inches of the strips at the corners of the triangle thus formed. In use, one projecting corner of the triangle is placed firmly against the stake standing where the tree is to go and a stake driven in each of the other two corners, the triangle is removed, the hole dug and the tree brought into exact position similarly to that given for the bar.

Where large areas are to be planted it is often wise to have two or four of these tree locating devices all constructed according to the same specifications. Two men proceed to locate the temporary stakes and

to dig the holes while two others follow, with the same kind of locating device, setting the trees.

Aside from the fact that the tree locaters are serviceable in putting the trees in their exact positions, they also give the planter a good idea of the depth at which the trees are being set. Without their use, trees may easily be placed in the holes and the earth filled in about them before it is discovered that the planting has been too shallow.

## Planting the Trees.

*Time of Planting.* Much difference of opinion exists between the best authorities as to the season for planting apple trees. Late fall planting is advocated by some while others are equally certain that early spring planting is better. The chief reasons advanced by the former are that roots of trees set in the fall become thoroughly established in the soil, and that all cut surfaces on the roots become calloused during the winter, which results in new roots pushing out early in the spring. On the other hand, dry falls and dry winters will prove fatal to many fall-set trees, and the stand will therefore be imperfect. Since Idaho very often experiences these latter conditions, early spring planting may be regarded as the safer rule. Moreover, if trees are "heeled in" in the fall as previously described, roots will be thoroughly calloused by early spring, thus affording such trees one of the main benefits derived from fall planting. Undoubtedly spring planting should be the rule for Idaho orchardists.

*Treatment of Trees at Planting.* The treatment of apple trees at planting time has a very great influence upon their future welfare. Many orchard planters set trees in their permanent position without applying the least amount of rational treatment to them. For example, trees are planted in the orchard in the same condition as they are received from the nursery. At the close of the first season, the owner is much troubled to learn the reason for the poor growth, and in many instances the utter failure of his trees.

*Prune the Roots.* The amount of root-surface that trees have when they leave the nursery row is usually about half as great as they possessed normally. Further than this it is always advisable to thin out all crowding and interlacing roots and to cut away all broken ends of

those remaining, as described before under the head of "Heeling-in". In the South a very severe system of root pruning is practiced, known as the Stringfellow method but this system is not practicable in the North. Nevertheless, apple trees require a certain amount of root pruning before they are planted in order to get the best results. The opportune time to do this pruning is in the fall, as stated elsewhere, but where the trees do not arrive until spring, root pruning should be administered before the trees are planted. However, root pruning done in the fall, saves labor at planting time.

*Prune the Top.* Since the tops and roots of trees are mutually dependent, there is a nice balance between these parts as they exist normally; consequently it appears reasonable to believe that where a portion of the roots has been removed, a similar amount of the top should also be pruned away. In fact, even a greater amount of the top should be removed than that removed from the roots since the latter must become adjusted to their new quarters before their activities begin while the former experience no radical difference in this respect. With yearling trees, the necessary pruning, for establishing low-headed trees, will reduce the top sufficiently. It is best to postpone the pruning of the tops until the trees have been set, at which time they are cut down within eighteen or twenty inches of the ground.

*Have Trees Convenient for Planting.* The trees should be conveniently located for the planters before planting operations begin. Some orchardists practice distributing and "heeling in" the trees in bunches near the place where they are needed. Other men puddle the trees in a tub which is placed on a low sled or stone-boat and drawn by a horse from place to place as the trees are needed. The puddle is made of loamy soil mixed with water to a slushy consistency. Heavy clay soils must not be used for making puddles. The use of this latter practice constitutes one of the safest and most satisfactory methods of handling trees in the field for the roots are not exposed to the air at all.

*Digging the Holes.* Holes for apple trees must be large enough to accommodate all the roots and deep enough to allow the tree to set three or four inches deeper than it stood in the nursery. It is believed that the best results are secured by setting dwarf trees so that the union between the bud and the stock is four or five inches below the sur-



face. The common error committed by most tree planters is to plant too shallow. Deep planting tends to develop a deeper rooting system, besides it affords a better anchorage for the young tree.

The size of a hole in hard soil should be greater than a hole dug in loose soil in order to aid the roots to get a good start. Though it is best to select a soil that is not underlaid with a hard impervious subsoil, still, many men find that the only land they have for the orchard possesses this undesirable feature. Holes for trees on such soils should be especially large. In some instances it is advisable to use giant powder to break up this hard soil. Mr. B. F. Hurst of Boise recommends that a hole be dug to a depth of two feet, and in the center of this hole another hole is bored to an additional depth of five feet. Giant powder is then exploded in the bottom of the bored hole. The exact use of the powder is described by Mr. Hurst as follows: "Use two sticks of giant powder for each hole. Drop one stick down in the hole. Loosen, at one end, the paper around the other stick of dynamite. At this end insert a sharp peg the size of the cap to be used. Attach the fuse to the cap and place the cap in the end of the powder. If there is water in the hole, cover the cap with wagon grease, then draw the paper, and tie it around the string. Place this stick in the hole where the first stick was dropped, leaving the fuse about six feet long. The hole may be filled with water, or fine earth, but must not be tamped. Touch the match to the fuse. It is probably superfluous to say that the operator should immediately remove to a considerable distance from the hole".

When using dynamite great care must be observed, for it is extremely dangerous in the hands of the inexperienced. It is very essential that the stick, to which the cap has been applied, be lowered gently into the hole or a premature explosion may result. The safer practice in using this explosive is to employ experienced help.

In removing the dirt from the hole, that taken from the topmost six inches should be placed on one side while that taken from the lower depths should be placed in a separate pile. The reason for this is that the surface soil is richer, containing more available plant food than the subsoil, and is therefore better adapted for placing in immediate contact with the roots. The bottom of the hole should be thoroughly loosened by several thrusts of the spade after which some of the surface soil is

thrown in before the tree enters the hole.

*Filling the Hole.* After the tree has been placed in its exact position, by means of a tree locator or by sighting, the roots are spread out evenly in all directions and then the hole is filled. The first dirt put into the hole should be the rich soil from the surface. This should be worked tightly under and between the roots by using the fingers. Slightly moving the tree up and down will aid in getting the soil under the roots. The hole is then filled half full of surface soil and tramped down firmly, after this the hole is filled to the top with the other soil and again tramped. A few shovel-fuls of loose dirt or a few fork-fuls of manure thrown about the tree to prevent the loss of moisture, completes the operation.

The question is very often asked regarding the advisability of placing manure in the bottom of the hole. A fork-ful of fine, well-rotted manure placed in the bottom of the hole may often prove beneficial but coarse manure should never be used in this manner because it will heat and scald the roots. Spreading the manure on the surface about the tree is generally regarded as the better practice.

Where the wind blows strongly from the south-west, and west, as it does in many localities of Idaho, unless some windbreak exists, it is very important that the tree be set so that it points strongly against the prevailing wind. Many trees that have been set on orchard sites exposed to the prevailing winds illustrate the need of using this precautionary measure, for where they were set straight they are now found to lean greatly away from the wind.

## The Wind Break.

Where orchard sites are particularly exposed, wind breaks are especially advantageous. They stop the force of the wind so that the trees are allowed to attain their normal shape instead of having their limbs on the south-west and west sides forced to grow up through the center of the trees. They prevent the loss of apples which autumn winds shake down at a time when their value is greatest. They protect the buds of winter from drying out and losing their vitality.

Evergreen trees furnish ideal wind breaks since the winds are broken at all seasons. Such barriers stop the sweep of winter winds as

well as winds occurring during the growing season. The Norway Spruce, because it possesses these qualifications, is unsurpassed as a tree for wind breaks. The Lombardy poplar is used in some sections but its roots are so extensive and its tops afford protection for only part of the season.

The windbreak should be planted in advance of the apple trees in order that it may afford protection from the start. Spruces should be set ten feet apart with the rows at least forty feet from the nearest apple trees. Since most of the strong winds of Idaho come from the west and southwest, a windbreak should occupy a position around the south and west sides of the orchard. In wind-swept places a bank of evergreens, made in this manner half-way around the orchard, should be regarded as a necessary part of good orcharding. This wall of evergreen will also add a delightful variety to the landscape in all seasons.

## Caring for the Trees the First Year.

The orchardist should be sure to keep his trees growing vigorously during the first summer, as this is the most vital period in the history of an orchard. It is highly essential that the trees have a good start before mid-summer, in sections where irrigation is not practiced, for summer drouth is likely to prove fatal to trees of low vigor and slow growth. Thorough tillage is imperative for the best success, whether the orchard be irrigated or not. Conservation of moisture in the soil and aeration of the soil are the main results to be attained by this cultivating. To this end, any crop grown in the orchard the first summer, should be one that requires frequent cultivating. Such crops as small fruits, potatoes, tomatoes, melons, etc., are, therefore, well adapted to young orchards, while the grain and pasture or meadow crops should be avoided.

Tillage should be continued until about the first of August when it is well to sow some leguminous cover-crop, such as hairy vetch or Canada field peas. Sown at this time or a little later, these crops will make sufficient growth to form a mat over the surface of the ground; and while making this growth they will aid materially in ripening the wood for the following winter. Moreover, such crops will prevent the washing and leaching of soils during winter and when plowed under the fol-

lowing spring will add as much organic and fertilizing matter to the soil as a small coating of manure would furnish.

The stubs, which the orchardist has left after planting, soon become covered with shoots issuing from every bud. The proper treatment of these shoots is an important consideration. Some rub off all the shoots as they appear, excepting four or five which are left for the scaffold limbs. A better practice consists in rubbing off only the lowermost shoots, leaving about ten shoots to form leaves and to grow throughout the year. In allowing more leaf-area a greater growth of root system is promoted since the two parts are mutually dependent. The thinning out and the selection of the scaffold limbs is a task for the following spring.

Diseases and insects are likely to make their visitation upon the young orchard during the first year. The orchardist must be ever watchful for their appearance and be ready to shorten their stay to the minimum. Anthracnose on the trunk and shoots and scab on the leaves are likely to be the most serious diseases; while the apple borer, the green aphid and the San Jose scale are most prominent insects. Timely application of the best preventives and remedies for these pests is the only safeguard. Careful and frequent observations is the rule for success in dealing with such opponents.

## **Injurious Vermin.**

During the first winter as well as in after years the orchardist must exercise every precaution to prevent injuries from mice, rabbits and gophers wherever these pests exist. Many young orchards are practically destroyed by field mice girdling the trees. Remedies of all descriptions have been recommended as repellants or poisons for these small pests; but the majority of the paints and washes so recommended are without merit and in some cases are decidedly injurious to the trees. However, it is reported that the lime sulphur wash, which is used in combating the San Jose scale, has been used effectively against both mice and rabbits. Until further trial has substantiated these reports, the orchardist must rely upon methods which experience has proven efficacious in avoiding serious loss. Bulletin No. 31 of the Biological Survey, U. S. Dept. Agriculture summarizes the important measures for

preventing the ravages of field mice as follows:

“ 1. Protection of natural enemies of field mice, particularly owls, most hawks, shrikes, snakes, skunks, badgers, and mosts species of weasils.

“ 2. Elimination of the breeding grounds of field mice by draining swamps and cleaning waste places that afford the animals harborage.

“ 3. Periodic plowing of grass and other lands for the rotation of crops.

“ 4. Clean cultivation of corn and other crops, and especially of orchards and nurseries.

“ 5. Clean mowing of grass lands and permanent meadows, so that no old grass is left over winter.

“ 6. Careful burning about orchards and gardens of weeds, trash and litter of all kinds that may serve the animals for winter quarters.

“ 7. When necessary, the burning of dead grass in meadows and pastures. This, however, should not be delayed till late spring, when ground birds are nesting.”

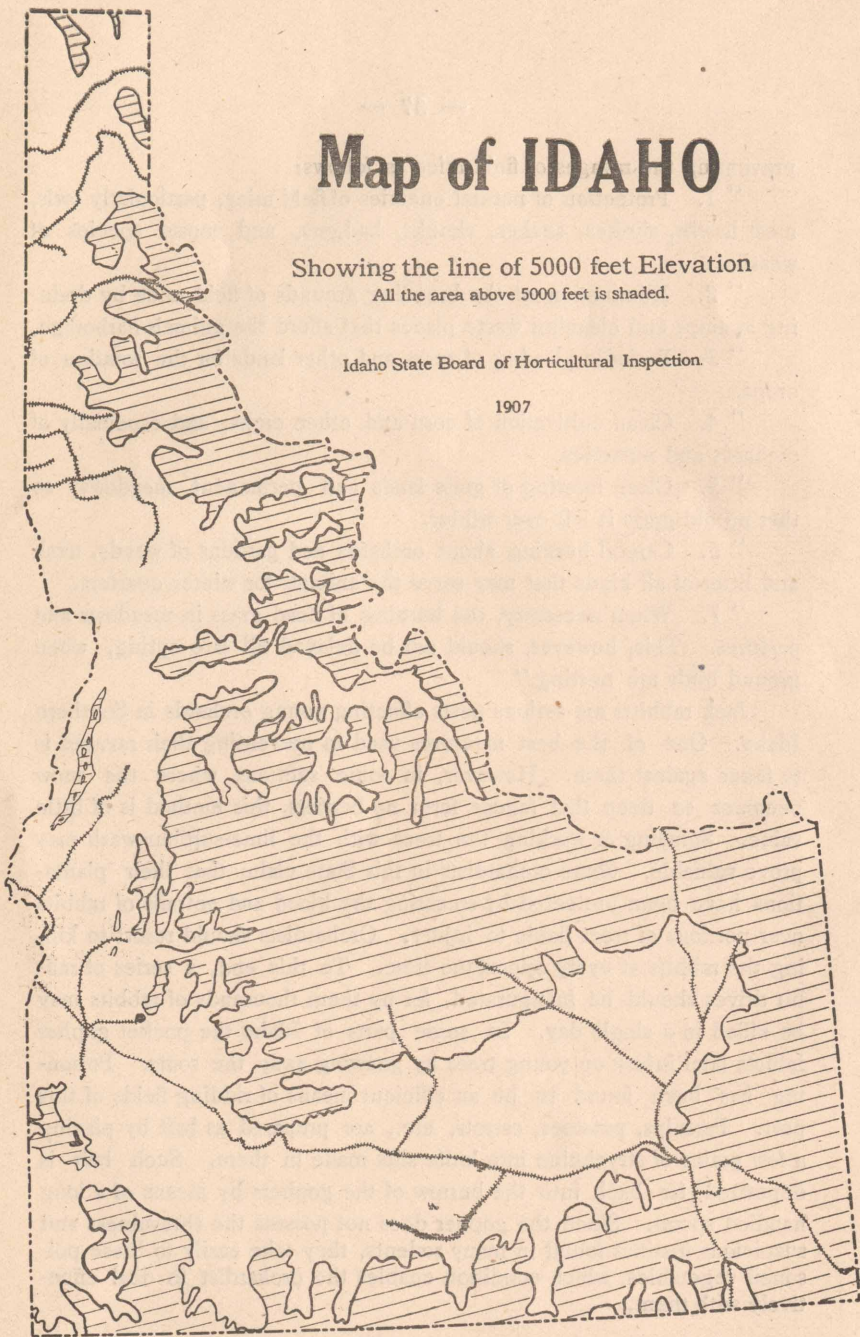
Jack rabbits are serious pests affecting young orchards in Southern Idaho. One of the best measures used in preventing their ravages is to fence against them. However, in some sections where the snow becomes so deep that fences form no barriers, this method is of little value. Spraying or washing the trees with the lime-sulphur wash may prove valuable. Some orchardists in this State claim that their plantations have been protected by smearing the blood and entrails of rabbits over portions of trees liable to injury. Orchardists should resort to killing the rabbits at every opportune time. To this end, a series of rabbit drives should be inaugurated, for by them thousands of rabbits may be killed in a single day. In some parts of Idaho the pocket gopher inflicts fatal injury on young trees by gnawing away the roots. Poisoning has been found to be an efficient means of ridding fields of this pest. Parsnips, potatoes, carrots, etc., are prepared as bait by placing a few grains of strychnine into knife slits made in them. Such bait is deposited far back into the burrow of the gophers by means of a long handled spoon. Since the gopher does not possess the shrewdness and suspicious instinct found in many rodents, they take easily to these poisoned vegetables, which condition enables the orchardist to deal effectively with them.

# Map of IDAHO

Showing the line of 5000 feet Elevation  
All the area above 5000 feet is shaded.

Idaho State Board of Horticultural Inspection.

1907

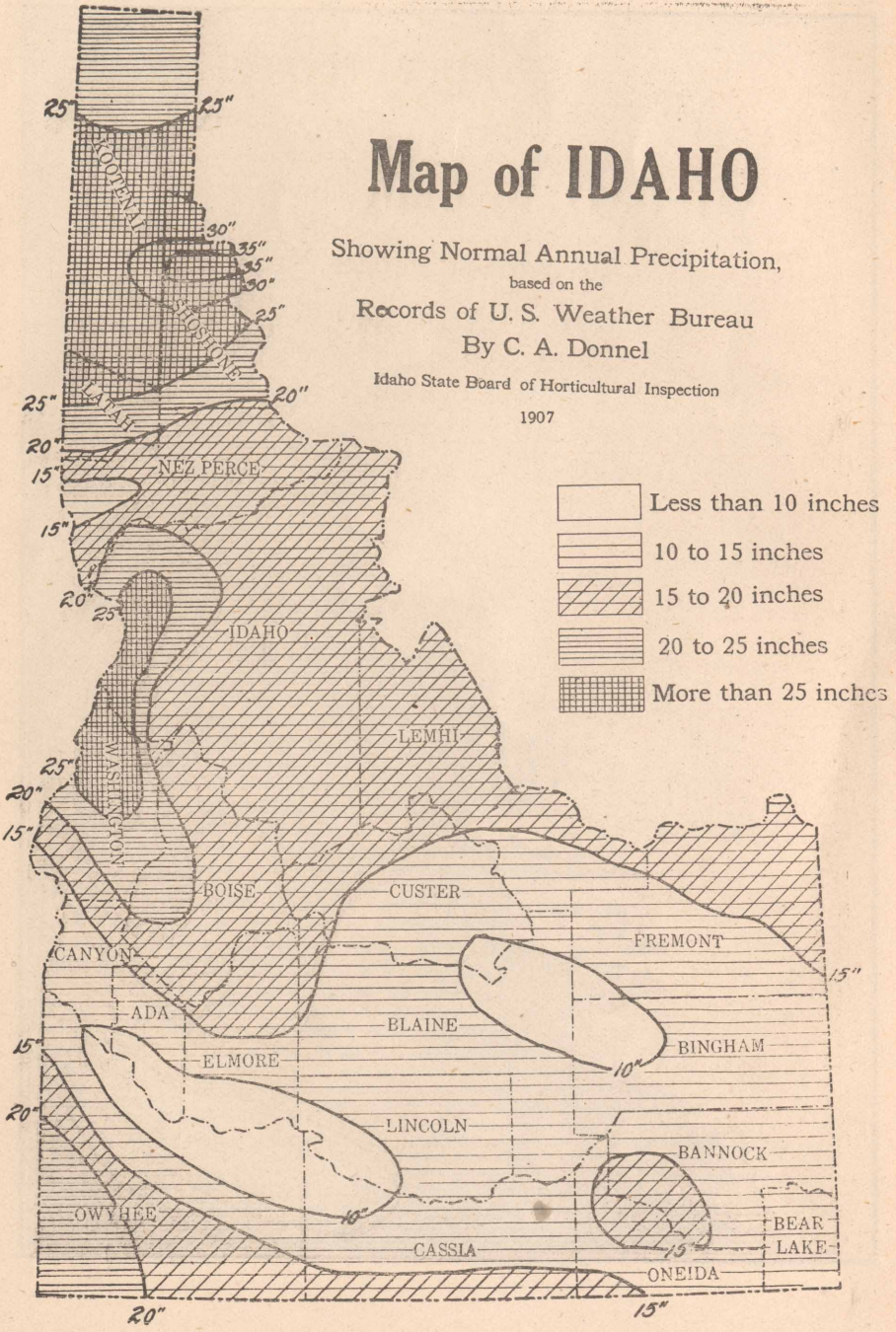


MAP SHOWING LINE OF 5000 FT. ELEVATION

# Map of IDAHO

Showing Normal Annual Precipitation,  
 based on the  
 Records of U. S. Weather Bureau  
 By C. A. Donnel

Idaho State Board of Horticultural Inspection  
 1907



MAP SHOWING NORMAL AMOUNT OF PRECIPITATION

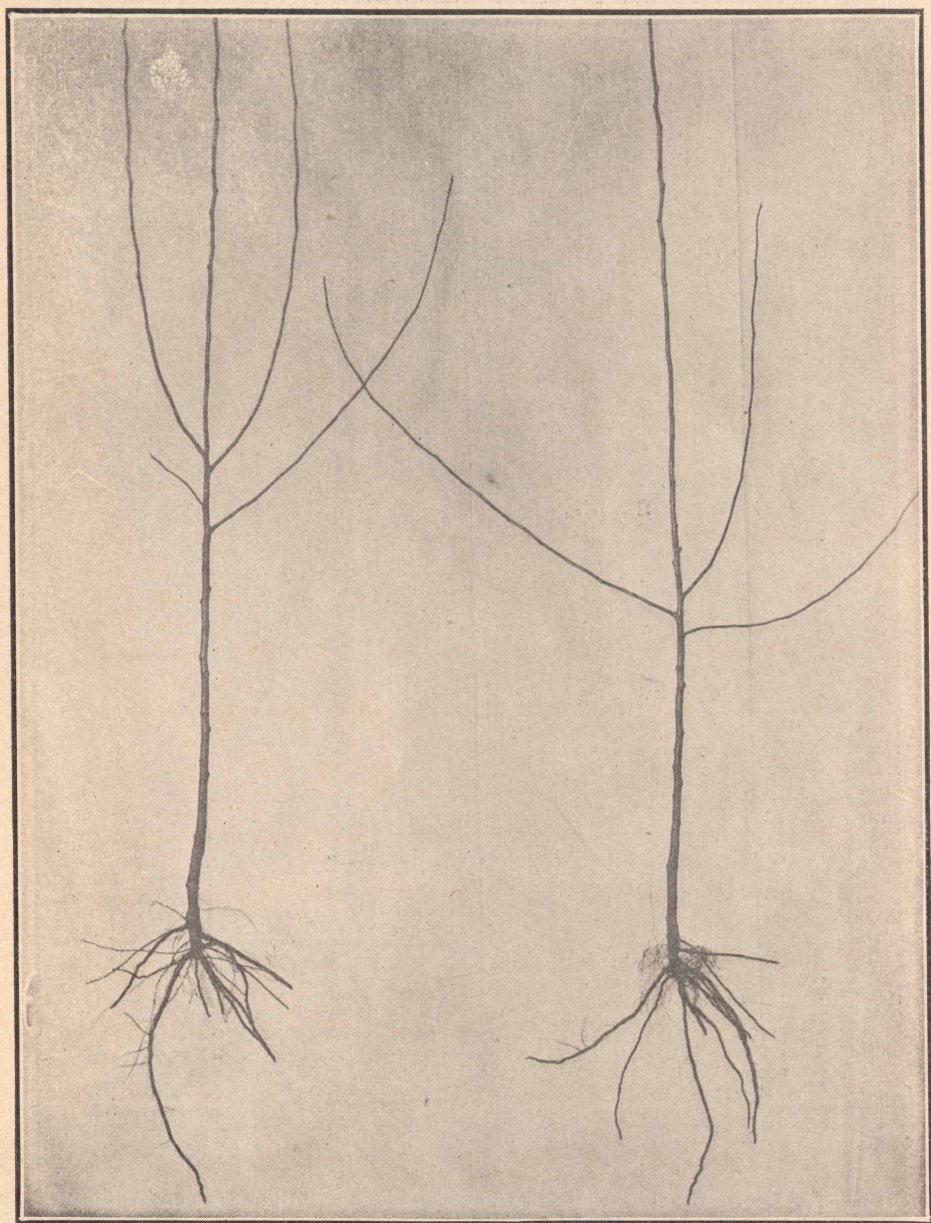


"OLD FOREST SITES ON SLOPING GROUND FURNISH TWO IMPORTANT ELEMENTS FOR GOOD ORCHARD LANDS."



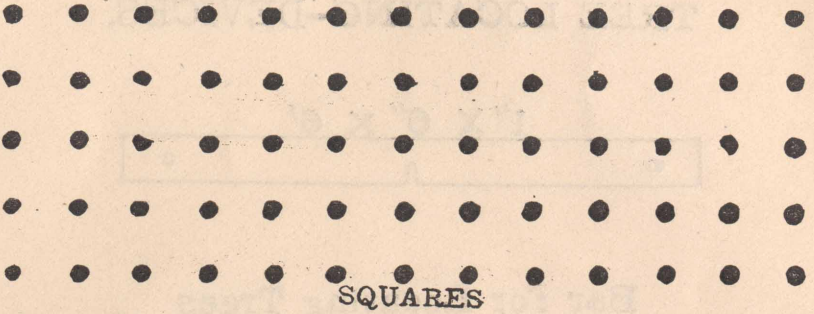
"Low-headed trees have many advantages over high-headed ones. Such trees are produced by planting nursery trees one year old."





"Two-year-old trees generally have too long trunks for Idaho orchards."

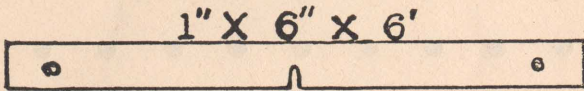
SYSTEMS OF PLANTING.



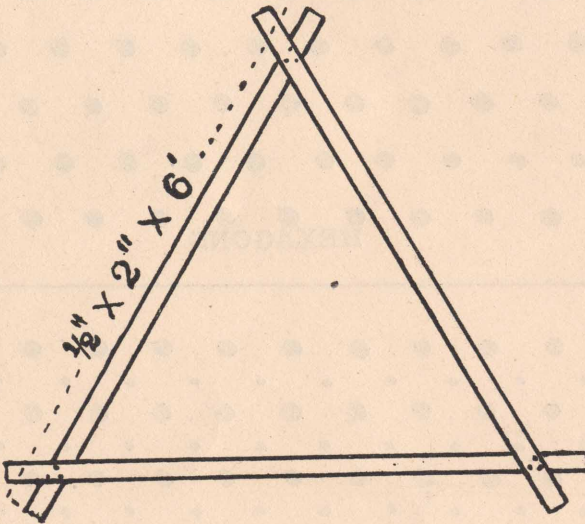
● PERMANENT TREES.

• TEMPORARY TREES.

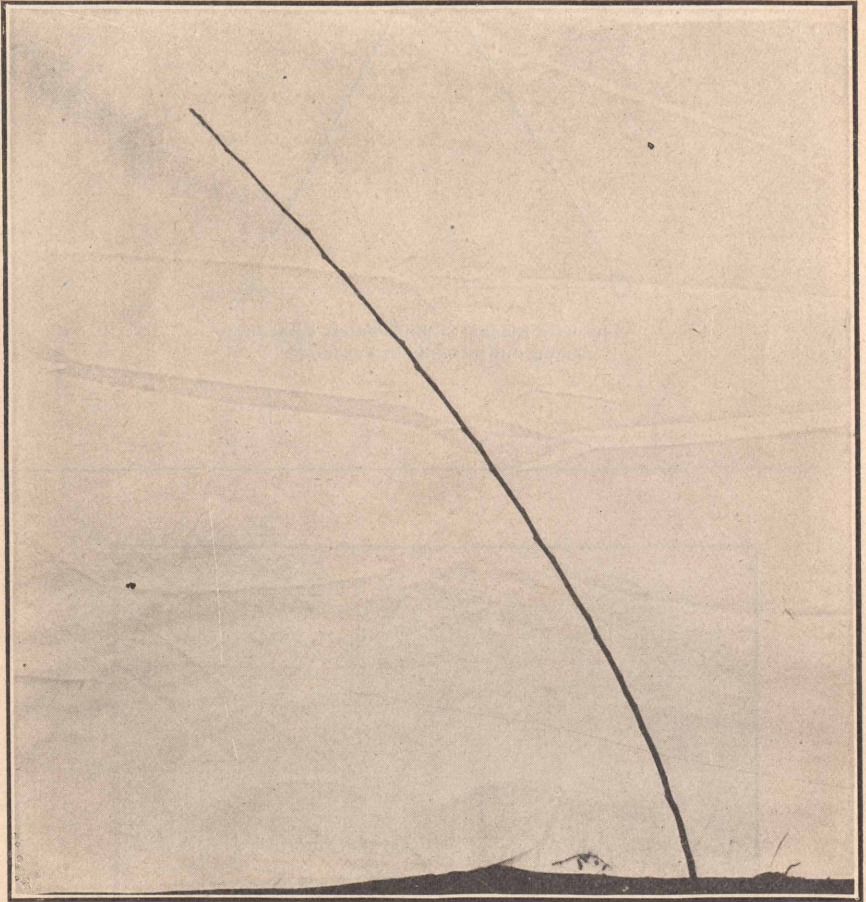
## TREE LOCATING-DEVICES.



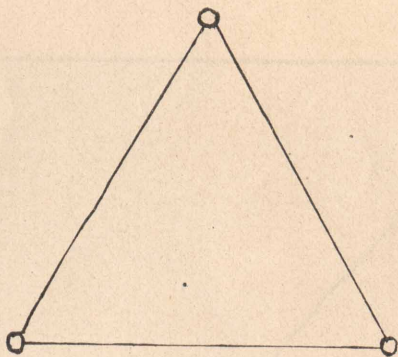
Bar for Locating Trees



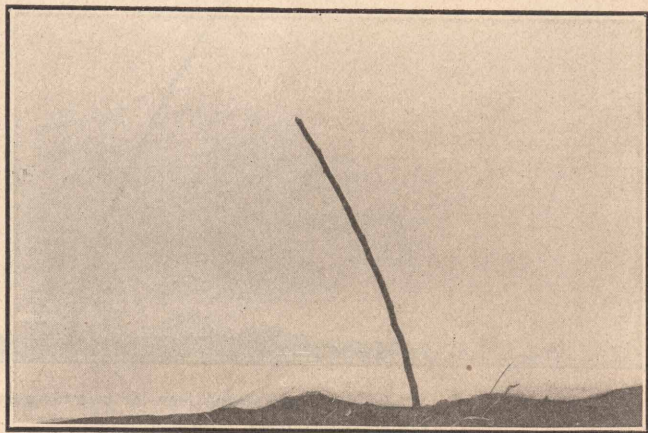
Triangle for Locating Trees



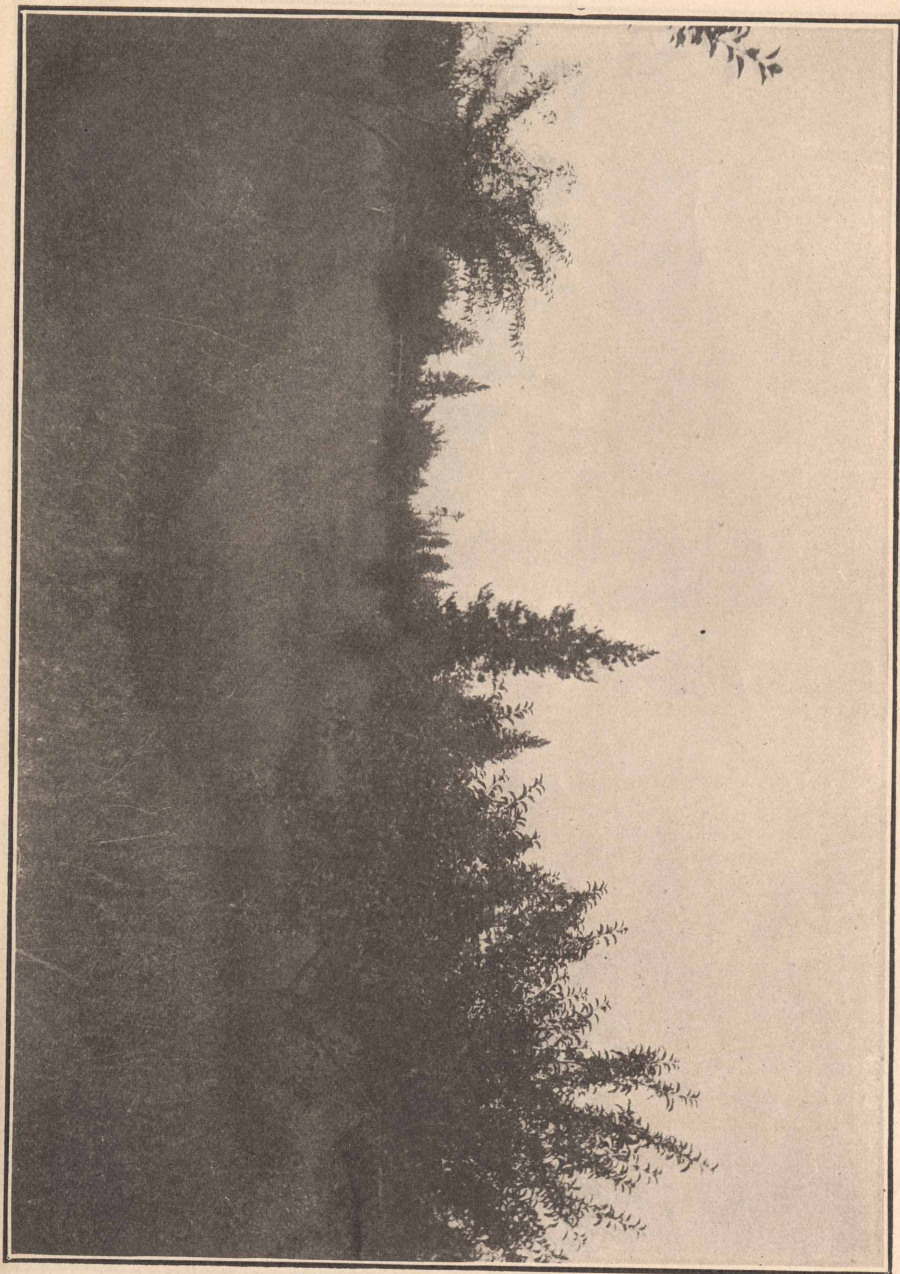
"The yearling tree set. Where winds are strong, lean the tree towards the prevailing wind."



"The wire triangle is the simplest device for laying out orchards in hexagons."



"Prune the yearling tree to a stub eighteen to twenty inches high after planting."



"Lack of proper care of young trees, before and after planting, results in great loss."

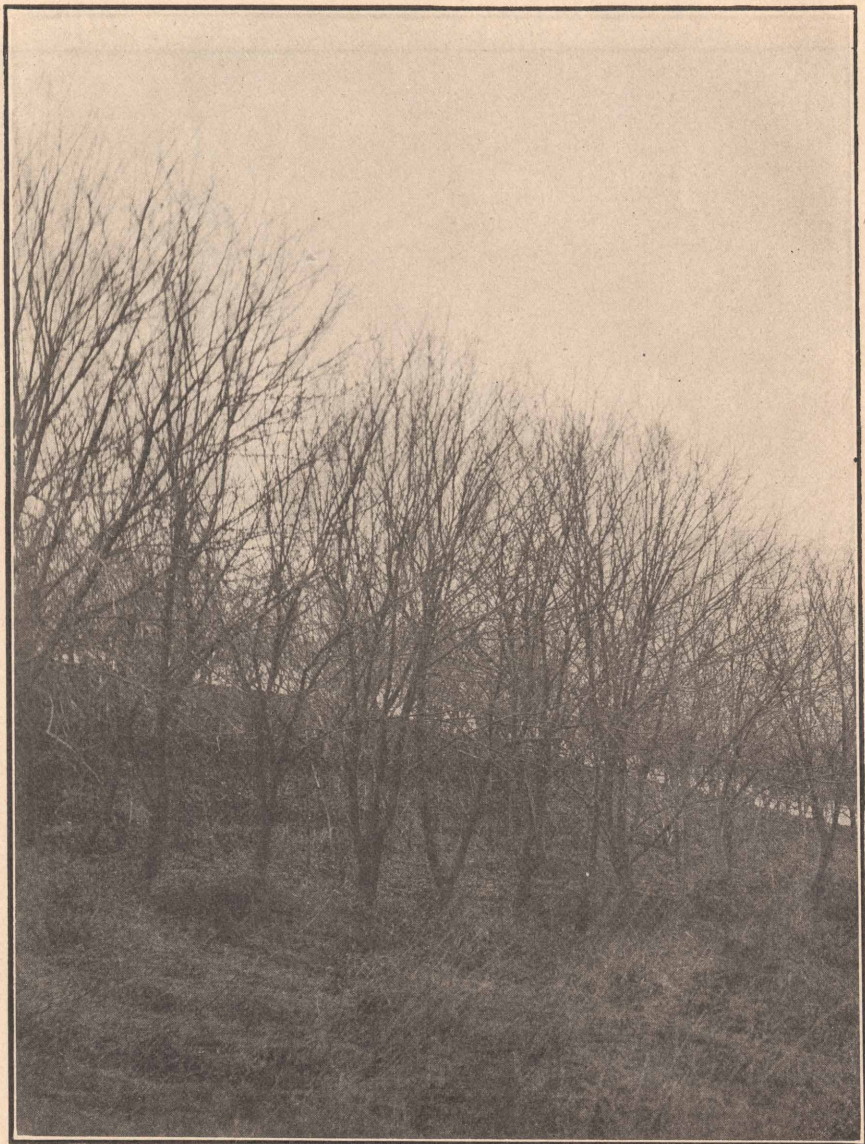


“Good care of the plantation is an absolute essential for profitable orcharding.”





"A wind-break needed."



"Wind-breaks are often made by planting quick-growing trees in single rows. These trees will greatly retard the force of high winds at all seasons."