



Apple Growing

• IN THE MARITIMES

630.4
C212
P 1159
1967
c.3

CONTENTS

MARKETS	4
PLANNING A COMMERCIAL ORCHARD	4
CHOOSING A LOCATION	5
ORCHARD SIZE	5
CLIMATE AND ELEVATION	6
DRAINAGE	7
SOIL	7
SUPPLEMENTARY CROPS	7
SELECTING VARIETIES	7
Pollination	8
SELECTING AND GROWING PLANTING STOCK	9
Seedling Rootstocks	9
Clonal Rootstocks	11
Hardy Tree Building	12
Nursery Trees	12
Growing Your Own Trees	12
PLANTING THE ORCHARD	13
Planting Plan	13
Preparing the Land	14
Staking the Area	15
Planting	15
CULTURE	16
Chemical Weed Control	16
FERTILIZING	16
Deficiency Symptoms	16
Use of Fertilizers	17
PRUNING	18
TOP-GRAFTING AND FRAMEWORKING	20
PREVENTING AND TREATING INJURY	21
FRUIT THINNING	22
Hand Thinning	22
Chemical Thinning	23
STOP-DROP SPRAYS	23
HARVESTING	24
Harvesting Date	24
Harvesting Method	24
Spot Picking	24
CONTROL OF PESTS AND DISEASES	25
Mice	25
Deer	26
Insects and Diseases	26
HOME GARDEN TREES	26
DESCRIPTIONS OF VARIETIES	27

APPLE GROWING IN THE MARITIMES

R.P. Longley

Research Station, Kentville, Nova Scotia.



Canadian apple production has averaged about a bushel per person per year since the late 1920's. As the population of the country continues to rise, the apple industry of the Maritimes can help meet the increasing demand for fresh and processed apples.

The Maritime Provinces produce about a sixth of the total crop of apples in Canada. At one time, in the 1930's, almost half of the Canadian crop and over 60 percent of the apples exported came from Nova Scotia. Since then, only British Columbia, which gained control of both domestic and export apple markets during the 1940's, has surpassed Nova Scotia's record 1933 crop of over eight million bushels. New Brunswick's annual crop averaged half a million bushels in 1961-63, compared with 90,000 in 1925-30.

Nova Scotia, New Brunswick and Prince Edward Island have many advantages over other fruit-growing areas of Canada. As they are on the Atlantic coast, they are relatively near European markets. Land is generally less expensive than elsewhere, and occasionally good orchards can be purchased for less than it would cost to develop new ones. Also, the topography of the land, the medium sandy soil and the climate are all conducive to apple growing. In recent years, use of superior, high-yielding varieties and improvements in production methods have increased yields. This trend is likely to continue.

New Brunswick orchards are found mainly in the Saint John River Valley. In Nova Scotia, most of the apples

are grown in the Annapolis-Cornwallis Valley, about 5 miles inland from the Bay of Fundy, where low mountains protect them from north winds. Large bodies of water near the apple growing areas in both provinces temper the cold and the heat. Trees are rarely damaged in winter.

In 1961 the number of apple trees in Nova Scotia was 585,000; in New Brunswick, 116,000; and in Prince Edward Island, 8,000. These numbers are small by comparison with 1,252,000 in Quebec, 1,371,000 in Ontario, and 1,416,000 in British Columbia.

Nova Scotia produced large quantities of apples in the 1930's but many orchards were too small for economic production. In 1939, 1,964 of the 2,509 growers had less than 14 acres of orchard, and only 68 had more than 45 acres. Since then, the industry has been reorganized to get rid of old trees and poor varieties. The number of trees was cut from 2.2 million in 1931 to 585,000 in 1961. The reorganization was also remarkably effective in increasing yield per tree. The average annual yield per tree of 10 years or older was less than 3 bushels for 1931-40, and about 5 bushels for 1961-63.

New Brunswick started growing apples in volume later than Nova Scotia but has increased both the number and quality of its orchards in recent years. Production averaged 90,000 bushels in 1926-30 and 500,000 in 1961-63.

The United Kingdom market before World War II promoted the early development of the Nova Scotia indus-



Queen Annapolis and princesses from towns in the Annapolis Valley.

try. Most New Brunswick apples, on the other hand, have been marketed inside the province. Now production is being adjusted to changing export needs and an ever-increasing demand for both fresh and processed apples in Canada.

MARKETS

Like most other apple-growing areas in Canada, the Maritimes produce more than they can sell locally. Some exports are necessary. There is little chance of correctly forecasting the market in 8 years' time, when trees planted now will start to produce moderately; or in 20 years, when they will be producing heavily. The marketing of apples in any year may be affected by:

- The size of the local crop and of crops in the other apple-growing areas of the world.
- The carry-over of processed apples and the production of other fruits, especially citrus.
- Economic conditions that may direct more money into the apple market or cause a shift to other fruits.

No one method of marketing will give to all growers equally high returns. Generally, established wholesale-retail organizations distribute the fruit efficiently to consumers. Some growers have the location and the personnel to sell on a "pick-it-yourself" plan or at a roadside fruit market. Others favor sales to processors or find it convenient and profitable to supply a grocery store or chain.

A grower improves his bargaining position by having cold and controlled-atmosphere storage warehouses, and facilities for grading and packaging fruit.

PLANNING A COMMERCIAL ORCHARD

Before investing money to develop an orchard, consider the following:

- The availability of suitable land and its cost.
- The size of operation involved.
- The need for about \$1,000 per acre for bringing the orchard into bearing and for storage facilities.

- The probability that you will lose money if you must sell the property before annual income exceeds operating expenses.
- The prospect of suitable market facilities.
- The availability of water, electricity, labor and highways.

CHOOSING A LOCATION

If you are starting a commercial orchard for the first time, try to find good land in an already prosperous apple-growing area. Do not choose the fringe of one of these areas where you might have lower yields and profits, or even lose your crop, because of unproductive land, poor drainage or frost. Let experienced growers discover new areas that are suitable for apples.

Where the apple industry is successful, you can assume that climate, soil and marketing arrangements are satisfactory. In these areas you are also likely to find experienced labor, as well as readily available machinery and supplies, storage and packing facilities, highways and transports. Furthermore, you will usually benefit from

being among experienced growers and from taking part in their educational and business organizations. Because of these advantages it is generally more important to be in an established fruit-growing area than to be close to a market.

Be very careful about the kind of land you choose to turn into an orchard. Too often land considered marginal for other crops is made into an orchard. What the grower loses as a result is more than the extra cost of better land. Bear in mind that the best areas for hay, grain and pasture are not usually the best for apples.

ORCHARD SIZE

The best size for an orchard depends on a grower's aims, his other interests, and his market. A small orchard is not necessarily inferior to a large one.

What size of orchard is the most profitable? First, consider the market: will you sell your apples to an established roadside stand, a store in a nearby town, a processor, or a general market outside the area? Economy of



An orchard in Nova Scotia.

marketing a large quantity of fruit may depend on storage, on packing and shipping facilities, and on how well they are organized. Keep in mind that conditions vary from grower to grower as well as from year to year. Profits depend not only on the size of your orchard but also on how efficiently you operate the business.

The 1964 Nova Scotia census of apple trees indicates that growers with fewer than 800 trees planted relatively few new trees. The 23 growers (including partnerships and corporations) of the 798 in the survey, with 3,201 trees or more, planted 75 percent of the new trees set in 1964. Thus, 3 percent of growers with about one third of all the trees are the ones who are rapidly expanding their orchards. It would appear as if there is a rapid trend towards fewer and larger orchards.

CLIMATE AND ELEVATION

Sunshine and Temperature

Sun and heat have a marked effect on the growth of trees, the size of crops and the quality of fruit. Frost has damaged apples by October 21 at the Kentville Station in eight of the 50 years since it was established.

In much of New Brunswick, as well as in parts of Prince Edward Island and central and eastern Nova Scotia, low winter temperatures limit the choice of varieties and rootstocks.

A large body of water near an apple orchard moderates the climate. The effect on an orchard is to retard spring growth until the danger of frost is past, extend the period of ripening in the fall, and reduce variations in temperature during dormancy.

Most apple-producing areas are subject to low temperatures that can

injure blossoms, leaf buds and fruitlets in the spring; the fruit of late varieties in the fall; and the trees in winter. Damage is usually done by temperatures only slightly below the critical point.

Injury usually occurs on clear, still nights when heavy, cold air flows under warm air into low-lying areas. On such nights, temperatures may vary as much as 20°F within 2 miles; and differences of several degrees are common within a few hundred feet. Frost is not so hazardous on windy nights when the wind keeps temperatures almost uniform.

You can avoid some damage by choosing a rolling and sloping field, where the downward flow of air is not blocked by trees or hedges. Frost damage is also less likely in flat areas near tidal water, as in the Minas Basin of Nova Scotia.

Wind

Winds can cause great harm to orchards. They have a bad effect on the shape of trees, and they dry the soil, reduce yields and make spraying difficult. They also restrict the movement of bees, blow off large numbers of apples, damage fruit by causing it to rub against the limbs of trees, and break limbs. They desiccate twigs, thereby increasing the chances of winter damage.

The prevailing winds of the Maritimes are westerly, but hurricane winds often come from the south. Windbreaks are useful on the west and north sides of orchards unless they create frost pockets. If windbreaks occupy good land, or are likely to take moisture and nutrients needed by orchard trees, they may not be worth their cost.

Rain

The amount of water needed by an apple orchard during the growing season depends partly on the depth of the soil and how well it holds moisture, and partly on evaporation, which is affected by temperature, ground cover and wind.

Humidity affects the water requirements of apple trees, the development of apple scab and, probably, fruit russetting. Also, hormone-type thinning sprays are more effective when humidity is high.

The rainfall in the fruit-growing areas of the Maritimes is usually sufficient for good growth. Watering improves the size and color of fruit if rainfall is much below normal; and irrigation during a drought may be profitable. However, a shortage of water rarely does permanent damage to any but new trees. When young trees need extra water, this can be applied without special equipment.

DRAINAGE

Apple trees sicken and die on poorly drained soils. The ideal is good surface drainage on natural slopes, and a soil that allows excess water to seep away while retaining plenty of moisture.

You can improve surface drainage with open ditches and sometimes by leveling. Tile properly installed, at least 3 feet deep, provides satisfactory drainage around tree roots. In some areas, the cost of a complete drainage system may equal the value of the land. But usually you need to drain only small, low areas.

SOIL

A deep, sandy loam soil is best for apples. A good, gravelly loam subsoil

provides natural underdrainage. The necessity for good drainage and freedom from frost limits the choice of sites for orchards more than the type of soil.

Medium to light soils are best for some dessert apple varieties. Apples develop a brighter red color when grown in these soils rather than in heavy clay or clay loam soils.

Do not plant trees in soils underlain with hardpan because it holds water that may damage the roots. As hardpan often disappears during the winter, look for it during hot, dry weather.

SUPPLEMENTARY CROPS

Some growers add to their income by finding other uses for land unsuited to apples, or by intercropping orchard land while the trees are young. Success probably depends on each grower's interests and on how well he can produce several crops or handle livestock. The most successful farmers usually specialize in apples only, or in apples and other tree fruits.

An intercrop should lower the cost of establishing an orchard but it has disadvantages. Spray used on apple trees may damage the intercrop; lack of spray may ruin the orchard; and late cultivation or heavy fertilizing of the intercrop may cause winter injury to apples by promoting immature, soft tree growth in the fall. However, the risk is usually worth taking.

SELECTING VARIETIES

Of the many problems facing an orchardist, selecting the right varieties for new plantings is probably the most important and yet the most difficult to solve. For best results, choose varieties that have proved to be of top quality in your locality. Good color

and flavor, early ripening and high yields are important. In some parts of the Maritimes, particularly in northern New Brunswick, ability to withstand winter cold is also essential. Commercial orchardists usually concentrate on only a few varieties at any one time. It is also wise to plant trees of new varieties in limited numbers until their worth has been proved.

The consuming public is much more exacting now than 30 years ago, and with increasing competition, due to greater production, an ever-superior product will be demanded. No matter how good the soil, or the skill used in growing, if varieties are unsuited to climate and markets, failure will result.

Some of the varieties that have been in existence a long time remain the foundation of the industry. Several of them have been improved over the years by the discovery of highly colored mutants. McIntosh, the most important variety in Canada, was discovered in 1796, Northern Spy nearly as long ago, and Red Delicious in 1885.

Apple varieties recommended for the Maritimes are listed in Table 1. For detailed descriptions of these varieties see page 27.

Pollination

Apple varieties are either self-fruitful or self-unfruitful. A self-fruitful variety pollinates its own blossoms. A self-unfruitful variety does not.

Also, varieties may be either cross-fruitful or cross-unfruitful. A variety is cross-fruitful with another if it pollinates that variety satisfactorily. If it does not, it is cross-unfruitful. Only a few varieties are completely self-unfruitful or cross-unfruitful, but there are many combinations that give very poor results.

Close and Gravenstein are probably the only cross-unfruitful dessert varieties that are likely to be planted in the Maritimes. The new variety Mutsu, which is attracting some attention, is also cross-unfruitful. I.R. Greening, King and Ribston are three excellent processing varieties. They are self and cross-unfruitful. They present a problem as the only cross-fruitful processing variety recommended for planting is Northern Spy, and it blooms too late to be a satisfactory pollinator for these varieties. Until such time as a midseason-blooming cross-fruitful processing variety becomes available, use a dessert variety as pollinator for these varieties. Do not depend on commercially prepared pollen except in emergencies because a mixture of good pollinating varieties is more satisfactory.

Grafting to secure sufficient cross-fruitful bloom can quickly improve pollination in an established orchard. Grafting single branches will be of some assistance but grafting whole trees has distinct advantages. If single branches are grafted, use contrasting varieties, such as Golden Delicious on trees of red varieties, to avoid mixtures at picking time.

Normally bees in quest of pollen and nectar transfer pollen from flower to flower. Apple pollen is rarely, if ever, distributed by wind. Use hive bees where wild bees are scarce or absent. One strong hive per acre should provide ample pollination. Hives should be moved into the orchard a day or two before full bloom for best results, but not earlier than this because bees often scatter widely after a very few days. Honey bees usually work the closest blooms when first moved.

The blooming periods of most recommended varieties overlap sufficiently to give satisfactory pollination.

Northern Spy is somewhat later than most varieties but Cortland, Delicious, Golden Delicious and Spartan can be used as effective pollinators for it. Blooming dates of some good varieties are given in Table 1.

SELECTING AND GROWING PLANTING STOCK

Most apple trees are grown from rootstocks. Scions or buds of desired varieties are grafted to the rootstocks. Orchards are rarely propagated from cuttings; and ungrafted seedlings are not used because they lack uniformity and practically always produce inferior fruit. Budding or grafting is, therefore, necessary to maintain and propagate apple varieties.

A rootstock is selected mainly for its ability to form a hardy root system of the desired vigor. Its influence on early and heavy fruit production is also important. Soil and other factors play a part, but much of the variation in trees depends on the rootstocks used. In Nova Scotia, size-controlling clonal rootstocks are favored and in recent

years they have largely displaced apple seedlings.

Seedling Rootstocks

There are several advantages to using seedling rootstocks. The trees grown from them are free from virus disease; they rarely require supports to keep them upright; and they are strong enough to survive and grow even under difficult conditions. They make good replacements in an established orchard, and they give extra vigor to weak varieties such as Wagener and Idared.

Diploid varieties such as McIntosh and Northern Spy make the best seedlings for rootstocks. Triploid varieties such as Gravenstein, Greening R.I. and King are useless for this purpose. Triploid varieties are poor pollinators and diploid varieties are good pollinators (see Table 1, page 10).

The seedlings of Beautiful Arcade and early season Russian variety, produce semivigorous, early and heavy fruiting, well-rooted, very hardy trees. In recent years, the Research Station



An apple rootstock stool bed.

Table 1. Some characteristics of apple varieties recommended for orchards in the Maritimes

Variety ¹	No. of Strains	Date of full bloom	Picking date ²	Season for use	Use	Fruit color	Fruit size
Close ³	0	May 30	Aug. 5	Soon after picking	Dessert (fair), cooking	Red, striped.	Medium
Cortland	0	June 3	Oct. 10	Nov.-Jan.	Dessert (good), cooking, processing	Red, striped.	Large
Crimson Beauty	2	May 29	Aug. 9	Soon after picking	Cooking	Red, some strains striped, some blush.	Medium
Delicious	60	June 2	Oct. 15	Dec.-May	Dessert (good),	Red, some strains striped, some blush.	Large
Early McIntosh	0	June 1	Sept. 12	Sept.	Dessert (good), cooking	Red, blush.	Small
Golden Delicious	3	June 3	Oct. 20	Dec.-March	Dessert (excellent), cooking	Yellow, thin blush.	Medium
Gravenstein ³	15	May 30	Sept. 15	Sept.-Nov.	Dessert (good), cooking, sauce	Red, some strains striped, some blush.	Large
Greening R.I. ³	0	June 2	Oct. 10	Oct.-Dec.	Cooking, solid pack, pie fill	Green.	Medium
King ³	1	June 1	Oct. 10	Oct.-Dec.	Cooking, solid pack, pie fill	Red, some strains striped, some blush.	Very large
Lodi	0	May 31	Aug. 20	Soon after picking	Dessert (fair), cooking	Yellow.	Medium
Macoun	0	May 31	Oct. 10	Nov.-Jan.	Dessert (excellent)	Red, blush.	Small
McIntosh	16	May 31	Oct. 4	Nov.-Jan. ⁴	Dessert (good)	Red, some strains striped, some blush.	Medium
Melba	3	June 1	Sept. 8	Sept.	Dessert (good)	Red, blush.	Medium
Northern Spy	6	June 4	Oct. 20	Nov.-Jan.	Dessert (good), cooking, solid pack, pie fill	Red, some strains striped, some blush.	Large
Quinte	0	May 31	Aug. 20	Soon after picking	Dessert (good)	Red, blush.	Medium
Red Astrachan	0	May 29	Aug. 20	Soon after picking	Cooking	Red, blush.	Medium
Ribston ³	1	June 1	Oct. 5	Oct.-Jan.	Solid pack, pie fill	Red, striped	Small
Spartan	0	June 3	Oct. 12	Nov.-Feb. ⁴	Dessert (excellent)	Red, blush.	Medium

¹ Includes Sports.

² Date of middle of picking season at Kentville.

³ Poor pollinator.

⁴ For apples kept in controlled atmosphere storage, season lasts until May.



Rooted shoots being removed from stool of *Malus Robusta* No. 5.

at Kentville has produced and distributed to growers and nurserymen half a million seedlings and seeds of this variety for rootstock production.

Clonial Rootstocks

Clonial rootstocks are rooted stems that can be multiplied indefinitely. They are produced in stool beds in the following way. Trees that are at least 2 years old are cut off at ground level in the early spring. Suckers grow from these stumps and develop roots in soil mounded around them. The following spring the rooted shoots are ready to be removed from the parent stump and are planted in a nursery. Stool beds will produce annual crops of uniform rootstocks.

There is now a good selection of rootstocks to choose from. About 50 years ago East Malling Research Station in England selected and numbered 16 rootstocks designated EM 1 to EM XVI. In a joint project with the John Innis Horticultural Institute, East Malling has also bred and selected another series, the Malling Merton

(MM) group numbered MM 101 to MM 115. Over the years, 10 more rootstocks, EM XVII to EM 26, have been added to the East Malling series.

The Central Experimental Farm at Ottawa has produced a very hardy and valuable clonial rootstock for the colder areas, *Malus robusta* No. 5. Sweden has also produced an excellent hardy rootstock, Alnarp 2.

The vigor of trees grown on different rootstocks varies slightly with the soil and varieties. Rootstocks usually have the following ascending order of vigor: EM IX, EM 26, EM VII, EM IV, EM II, MM 106, Alnarp 2, MM 111, Beautiful Arcade, EM I, MM 104, MM 109, EM XVI and EM XII.

Actually, few rootstocks, except seedlings, have been fully tested under the growing conditions of the Maritimes. It is known that the colder areas need hardy rootstocks such as *Malus robusta* No. 5, Alnarp 2 and Beautiful Arcade seedlings.

You should plant trees on the dwarfing EM IX rootstocks only on good land and only if you are a good grower. The trees require support and special attention throughout their lifetime. Trees on EM IX produce large fruit. It is expected that EM 26 rootstocks, being slightly more vigorous, may be preferable to EM IX for dwarf trees.

EM IV rootstocks are highly valued in many areas. Trees grown on them bear early and heavily. They, too, need support. Use semivigorous or vigorous rootstocks for spur-type trees as they are less vigorous than normal trees.

Four of the new Malling Merton series, MM 104, MM 106, MM 109 and MM 111, were planted in a test at the Research Station, Kentville, in 1958. Trees on MM 106, although the smallest, bore more heavily than those on the other three. The mean yields per tree of McIntosh and Cortland on MM 106 up to 1964 were 416 and 406 pounds respectively.

Present indications are that the MM 106 rootstock is a good stock for use in Nova Scotia. Trees on this stock, when grown on the best soils, may be larger than desired by some growers.

Be careful when you buy clonal rootstocks. Although seedlings are usually free of virus diseases, some stool beds are virus-infected. Remember, too, that the more dwarfing the rootstock, the more care the orchard will need.

Hardy Tree Building

The use of very hardy rootstocks and tree trunks to increase hardiness in trees of favored varieties is known as "hardy tree building." The procedure is to plant trees of a hardy variety on the favored hardy rootstock. The fruiting

variety is then grafted or budded into the young tree when the scaffold branches have grown to the desired size. Hardy tree building should be practised where the hardiness of favored varieties is marginal. Gravenstein and King are occasionally damaged even where the climate is favorable, and cold hardy varieties, such as Crimson Beauty and Astrachan, are sometimes damaged in colder areas. *Malus robusta* No. 5 is a satisfactory stem-builder, as well as rootstock, being hardy and compatible with other varieties.

Nursery Trees

A good place to get your trees is a reliable nursery if you can find one that has the particular type of tree you want. Unfortunately, this is not always possible as nurserymen have no way of accurately forecasting the demand for particular rootstocks, varieties or ages of trees. When purchasing trees, large one-year-old trees are preferred. They are the best of the crop. Grade No. 1 trees should be straight, clean and free of disease, and they should have a good fibrous root system. Two-year-old trees are usually satisfactory. Trees over 2 years old are too large or are culls. It is doubtful if they have any value. The area where trees are grown has no effect on their hardiness. To avoid heavy losses from planting incorrectly named trees, purchase only those that are certified true to name stock.

Growing Your Own Trees

If you cannot buy exactly what you want from a nurseryman, you can grow your own trees. This is most convenient when you want to plant a particular variety or strain and you know the required rootstock is available.

Order clonal rootstocks at least six months before the planting date, or a year before if the desired stocks are likely to be in short supply. In ordering, make allowances for losses from deaths, failures of buds to grow, accidents and poor growth. These losses usually reduce the numbers by about 20 percent and occasionally by 50 percent.

You can propagate apple trees in the nursery by any of three methods :

- Budding is the most widely used method. More of the grafts take than when other methods are used, and more satisfactory trees are usually obtained.
- Root grafting has been used widely in the past and is still practised. It is done in late January and early February.
- Crown grafting is a valuable method when buds have failed to take. It is done on rootstocks early in the spring in the nursery before growth starts, thereby saving a year that is lost when other methods are employed.

A well-drained, highly fertile sandy loam is best for a nursery. As snow drifts can cause serious tree breakage, select a site where drifting is not a problem. Prepare the land by heavy manuring, and grow an intertilled crop the year before planting to eliminate weeds. Plant the rootstocks as soon as the soil is fit to work in the spring, while the ground is still cool and moist. Set them 12 inches apart in rows 2½ to 3 feet wide, depending on the tillage equipment available. Hoeing, fertilizing, spraying, labeling, disbudding, budding, pruning and pest and disease control all require attention.

The choice of budwood will affect the success of an orchard throughout its life. You will have no opportunity

to select sources of budwood after the rootstocks have been planted. Select normal, disease-free, heavy-bearing trees that have produced high-quality apples over a period of several years. Examine the trees and the fruit several times. Carefully mark the trees selected and record their location.

Probably more home-grown nursery trees are damaged by neglect than from lack of knowledge. Here are some things to remember :

- Bud high (up to 12 inches) to avoid scion rooting of the trees on clonal rootstocks.
- Follow a full program of spraying, at least until early August.
- Stop cultivation by early August so that trees will stop growing and harden off before winter.
- Do not cut back one-year-old nursery trees. If you do, several narrow angled shoots will grow near the cut. This will result in serious weakness, winter damage and branch breakage.

If you need only two or three trees and are willing to wait for them to develop, you can often find good hardy wild trees that you can transplant. After a year or more, when they are well started in their new location, graft them to the favored variety.

PLANTING THE ORCHARD

Planting Plan

Before establishing an orchard, make a thorough study of the general layout of your farm. Then prepare a planting plan. The more accurate your plan, the easier it will be to stake out the orchard and plant the trees.

In the plan indicate varieties and strains of apples, rootstocks, distances between trees and rows, routes of travel, means of conserving soil where necessary, headlands, water supplies,

Table 2. Recommended distance between permanent trees and numbers to plant per acre for different soils

Tree size ¹	Distance between trees, feet		Trees per acre, ² including fillers	
	Fertile soil	Less fertile soil	Fertile soil	Less fertile soil
Standard (100%)	35 x 40	30 x 35	124	166
Semistandard (70%)	29 x 34	25 x 30	177	232
Half size (50%)	24 x 29	21 x 26	125	160
Semidwarf (35%)	20 x 25	17 x 22	174	232
Dwarf (20%)	15 x 20	12 x 17	290	427

¹ Standard : Most seedlings, EM XII, EM XVI. Semistandard : Beautiful Arcade seedlings, EM I, MM 104, MM 109, MM 111, Alnarp 2. Half sizes : EM II and MM 106. Semidwarf : EM VII and EM IV. Dwarf : EM IX and EM 26. Percentages refer to the size of a tree in a percentage of the standard type.

² Numbers include three filler trees for every permanent tree in standard and semistandard plantings, and equal numbers of fillers and permanent trees in the others.

position of drains, arrangement of pollinators and, possibly, location of wind-breaks. Draw the plan to scale to show where each tree will be planted. If you are going to use home-grown trees, the plan should accommodate the number of trees you will have available. Keep in mind that trees will have to line up in all directions unless contour planted.

It is best to allow one filler tree for each dwarf or semidwarf permanent tree, and three filler trees for each of the larger sizes. Planting distances depend on variety, rootstock and soil fertility. Use Table 2 as a general guide.

Many varieties planted in solid blocks and in good vigor will yield well when the weather during the bloom period is ideal. But do not depend on these varieties being self-pollinating every year. You need at least two cross-pollinating varieties, and no more than 50 or 60 feet between any tree and its pollinator. Cross-pollinating varieties should reach full bloom within 2 days of each

other. Planting every third row to a pollinator variety reduces the risk of unsatisfactory fruit set. The efficiency of orchard operations is increased by having two solid rows of each variety side by side.

Preparing the Land

See that the soil is in first-class condition before you plant young trees. Their shape and vigor are determined during the first 4 or 5 years. Time and money are much better spent on plant food and on putting the soil in good condition before planting than after trees have struggled along indifferently for a while. Here are the main points to remember :

- Prepare the land a year ahead unless it is already in good tilth.
- Plow first, preferably in the fall, and then work the land thoroughly with a disk harrow.
- Level any minor depressions with a grader, or fill them in, to promote surface drainage and avoid pockets of water. Install surface drains as needed.
- Plant a cultivated crop, such as corn, potatoes or roots, if possible. This

should eliminate serious perennial weeds.

Staking the Area

If your planting plan is accurate you will have no trouble in staking out your orchard. Most areas have a convenient boundary that can serve as a guide in establishing a base line. Put the base line far enough away from the guiding boundary to leave ample space for normal travel after the trees are grown. Also, if you plan to cultivate and spray in both directions, remember to allow room for turning at the ends of rows. The rows and block should be on the square.

From the base line set up a line at right angles. Do this by measuring from A, the corner, 80 feet along the base line to B; also 60 feet along what seems like a right angle at A to C. Adjust this spot so that it is 100 feet from B. These distances can be changed to 40, 30 and 50 feet. This will establish a right angle which may be continued by sighting right across the field. Repeat the procedure at the other corners.

Determine the spaces between the rows and the locations of the trees by measuring and sighting. Recommended distances are given in Table 2. Drive in a stake at the exact spot where each tree is to be planted. If the field is too hilly or too large to sight from one side to the other, run a line across the center and stake off the two parts separately.

Use a planting board so that you can remove the stakes when digging the holes where trees are to be planted. The planting board is a light piece of lumber about 6 feet long with a notch cut at the center and a hole bored at each end. Set it so that the notch fits around the stake and the board is lined up with the other stakes

or trees; then drive a small peg through each end hole. Remove the board to dig the hole and then replace it so that the notch will show the exact location for the tree. If you repeat this procedure at each stake, the trees will line up as accurately as the stakes.

Planting

Move your trees from nursery to orchard with a minimum of shock. Transplanting in the fall is an advantage because trees become established before the beginning of the growing season, but the shock of moving makes trees subject to winter injury. Do not transplant trees in the fall in the colder apple-growing areas. Never transplant trees when the temperature is at or below freezing. Plant trees in the early spring while the ground is cool and moist. They grow faster than late-planted trees. If it is necessary to delay planting, handle the trees with even more care than usual. Holding them in cold storage or in a shady place with the roots and lower parts of the trees well covered with wet soil keeps them dormant and helps to prevent their drying out.

When trees are brought from a distant nursery they may lose considerable moisture, which should be replaced as quickly as possible. Instead of soaking the trees for a few days in clear water, which removes all soil from the rootlets, place them in a trench filled with a muddy mixture of soil and water.

Avoid all chances of the trees becoming dried out. Set the trees in water and cover them with damp soil, moss or sacks when moving them or waiting to plant them. The cut or broken ends of roots of trees held in storage over winter will have begun to heal by planting time. Do not prune the roots of these trees except to shorten

any that do not fit easily into a hole of reasonable size.

Holes for commercial planting are usually dug with a large-bore post hole digger, though holes dug with a shovel are just as good or better. Always use topsoil to surround the roots and to fill in spaces between them. Trample the soil firmly to finish the job. Be careful not to dig holes too deep for dwarf and semidwarf trees as the loose soil will settle considerably and the young trees will move down with it.

Plant trees on seedling rootstocks slightly deeper in the orchard than in the nursery. When planting trees on dwarfing rootstocks, do not cover the union of the root and scion. If the union is covered, the scion very often sends out roots that produce a standard-size tree. In a test at the Kentville Research Station, seedlings in which there was no possibility of scion rooting grew well when planted 12 inches deeper than in the nursery. Adding 2 gallons of water to each hole as it was being filled helped trees get started, and dissolving $\frac{1}{2}$ an ounce of starter solution in the water made them grow even better. The water helped the soil settle and filled the small spaces around the roots, and also watered the trees. As much as an ounce of starter solution could probably be used, but larger amounts are not safe.

CULTURE

Shallow cultivate an orchard for at least 5 years after planting or until it produces a bushel of apples annually per tree. Use small machines or hand hoes around trees to avoid trunk and root damage. Avoid deep cutting with heavy implements close to trees. To prevent erosion on hillsides, cultivate within a radius of 3 or 4 feet around each tree. The extra cost of such care is justified.

Seed a cover crop in late July to reduce late tree growth and to help the wood mature properly. Buckwheat at 3 pecks per acre is one of the most reliable cover crops because it can be successfully seeded even during hot dry periods.

Mature orchards should be in grass. The kind of grass is important. A change to heavy grass often causes a severe nitrogen deficiency. To correct a nitrogen deficiency, seed with a small amount of white Dutch or ladino clover and allow native grasses to fill in. After seeding, double the annual nitrogen applications until the trees no longer show deficiency symptoms (see below). You should cut the grass at least twice a year.

Chemical Weed Control

Contact your nearest Agricultural Research Station or extension specialist to obtain information on chemical weed killers.

FERTILIZING

All soils in the Maritimes need fertilizing for apple orchards. Fertilizing influences the growth, yield and appearance of trees, as well as the appearance, size and quality of fruit. The elements normally applied to correct or avoid deficiencies are nitrogen, phosphorus, potassium, calcium, boron and magnesium.

Deficiency Symptoms

Shortage of nitrogen, the most common deficiency in orchards, would be widespread and severe if extra nitrogen were not added to the soil. Trees moderately or highly deficient in nitrogen have light green or yellowish leaves. They grow slowly and produce small crops. The fruit is small and highly colored. Trees surrounded by grass are more likely to be deficient in nitrogen than those in cultivated

soil. An excess of nitrogen, other factors being equal, causes large, dark green leaves, excessive growth, heavy fruit set and poor fruit color. Fruit production is delayed in some varieties when young trees are over vegetative. This condition can be caused by heavy pruning or heavy nitrogen fertilizing.

Excesses or deficiencies of phosphorus and potassium are rarely severe enough to cause noticeable symptoms in orchards in the Maritimes.

Boron deficiency in some varieties causes die-back of twigs, and drought spot and corky core on the apples. Corky core is the most common symptom of boron deficiency. McIntosh and Cortland are particularly subject to this disorder.

Magnesium deficiency causes severe leaf scorch. The scorch is usually preceded by a yellowing on the leaf edges which progresses between the veins toward the midribs. Magnesium deficiency usually shows its greatest effect on leaves of the current year's growth. It is noticeable in late July and, when severe, causes leaf and fruit drop. The apples of deficient trees mature early, are of low quality and are often highly colored. Occasionally tree growth is seriously retarded.

Examine trees carefully and frequently to assess their nutritional status; test the soil to find out what it contains; and send leaves to be analyzed. Leaf analysis gives early warning of the onset of symptoms of deficiencies and also helps avoid expenditure on unneeded fertilizer. Take leaf samples according to directions supplied by the laboratory conducting and interpreting the tests.

Use of Fertilizers

Practically all orchard soils in the Maritimes are improved by the addition of ground limestone. Have or-

chard soils tested occasionally for acidity. If such tests are not available, apply 500 pounds of limestone per acre per year at convenient intervals of 4 to 8 years. Dolomitic limestone is recommended as it supplies magnesium. There are good, productive orchards on soils of widely varying acidities, but a pH of about 6.0 is considered best. If the pH reading is under 5.5, more limestone is required.

Apply nitrogen at a rate that will result in about 20 inches of growth on some terminals of young trees and about 8 inches on older bearing trees. Remember that fruit color is a guide to nitrogen level: lack of good red color on mature fruit is an indication of too much nitrogen. Apply fertilizer in the spring, as soon as most of the danger of excessive loss from heavy rain and runoff has passed.

A 10-10-10-1B mixture generally provides satisfactory nutrient levels. The rate of application depends on soil fertility, type of culture, size of trees and varieties. Red Delicious and Spartan appear to require more than most other varieties. Orchards of large trees or thickly planted smaller trees on poor soil may require annual applications of 800 to 1,000 pounds per acre. Cultivated orchards on good deep soil may need less than half as much.

Young trees usually require $\frac{1}{2}$ pound of 10-10-10-1B fertilizer applied a month after planting, with yearly increases of nearly a pound, depending on tree growth and the fertility of the soil.

Most orchard soils require boron. On the moderately acid soils of the Maritimes it can be very conveniently applied by using the 10-10-10-1B fertilizer referred to above. An alternative method is to apply $\frac{1}{4}$ pound borax around large trees and half this a-

mount around small trees each year. Trees may be damaged by heavier applications of boron.

If an orchard is heavily limed, the probability of boron deficiency is increased. Under these conditions it is more effective to apply boron to the leaves than to the soil. Use a soluble form of boron such as Soluber at 1 to 1½ pounds per 100 gallons of spray as a pre-pick spray.

Animal manures are very satisfactory and well-balanced fertilizers. A ton of good cow manure supplies approximately the same amount of plant food as 100 pounds of 9-5-7 and valuable organic matter as well. Limit applications of chicken manure to 5 tons per acre. It varies greatly in nitrogen content and can damage young trees if applied near their trunks.

Very little if any fertilizer should ever be applied near tree trunks. In sod orchards, apply the fertilizer under the outer ends of the branches and not more than 3 feet beyond the ends of branches. In sod strip orchards, put the fertilizer on the cultivated area. Roots often spread to more than twice the diameter of the tree.

Organic mulches are valuable and can replace cultivation and use of fertilizers when liberally applied. However, hay of good quality, when cut late in June and applied immediately, sometimes gives an excess of nitrogen late in the season. This excess can cause late growth and soft, poorly colored apples. It is much better to apply hay mulch in the fall and early spring. Mulch attracts mice, which can be a problem (see page 25).

PRUNING

Pruning is a major expense for the apple grower. In a cost study of apple production in Nova Scotia in 1939

and 1940 it was found that 23 percent of the time spent on growing and harvesting was spent on pruning. In a similar study conducted in British Columbia in 1939 the proportion was 17.8 percent.

Pruning increases the strength of trees, although unpruned young trees grow faster, begin bearing earlier and yield more heavily than pruned trees. Cultivation, fruit thinning, spraying and picking are all made easier by proper pruning, and fruit size and quality are improved.

There are differences in the way branches of different apple varieties grow. Gravensteins usually have excellent branches whereas Delicious and Northern Spy are often difficult to prune.

Pruning should start in the nursery if two-year-old trees are to be planted. Trees left full height the first year in the nursery usually develop good laterals the second year unless they are severely crowded. You have no control over trees grown in commercial nurseries but you should always buy well-developed trees from a nurseryman with a reputation for reliability.

The art or science of pruning has been developed in Europe and Asia over the centuries. The cordon, the espalier, the dwarf pyramid and the fan are all interesting pruning forms for apples, pears and other tree fruits, and there is a great variety of decorative forms for ornamentals.

There appears to be little uniformity in pruning practices in this country. Trees grow and yield well with many different systems being used. The instructions given below apply to the central leader type of tree, which is recommended for the Maritimes.

Examine a good mature tree to see how many scaffold branches it has.

Limiting branches on young trees to the small number required on mature trees would hinder growth and delay fruiting. Instead, remove unwanted laterals as trees develop. On young trees these branches should be about 6 inches apart.

One-year-old trees, known as whips or maidens, are often unbranched. How much pruning you will have to do when you plant these trees will depend on the height of head you want. If the desired height of the lowest branch is under 24 inches, cut the tops back to about 4 feet. Leaving them full length will, nevertheless, improve branch angles. Trees that are somewhat dried out may be stimulated back into growth more quickly if headed back.

Many two-year-old nursery trees have only four or five laterals very near the top. The laterals of these trees often have narrow angles between them like spread fingers. These branches with narrow angles between them may weaken the tree if allowed to remain, especially when two branches of equal size form a major part of the top. Retain the best one, preferably on the windward side, and remove the others. Occasionally you may have to retain a branch that is not ideal, but you can reduce the possibility of breakage by shortening it.

In the spring, a year after trees are planted in the orchard, remove branches that grow in the wrong direction, or close to or parallel to an important lateral in narrow-angled crotches. Leave more branches than appear necessary as the angle of crotches narrows on young trees that are heavily pruned.

Until a tree has produced one or two crops of apples, limit pruning to cross branches, a few low branches,



A strong tree with branches well spaced.

and branches growing up through the tree. Sometimes a branch can be encouraged to fill a gap by heading it back to a bud in the proper place.

If you wish to have a vase-shaped or open-center tree instead of a center-leader type, use five scaffold branches to form the different sections of the tree. Heavy cutting will be necessary to keep the center open. If one of the five scaffold branches of an open-center tree is lost it is more serious than if one is lost from a center-leader type tree.

The shape of young growing trees can often be improved by carefully increasing crotch angles and spreading their branches. You can do this in two ways. You can force branches to the desired position by inserting pieces of board between them. Take a board

about 2 inches wide, $\frac{1}{4}$ to $\frac{1}{2}$ inch thick and of the proper length; then make notches in the ends to hold the board between the branches. You can achieve much the same effect by tying down the branch to the trunk of the tree or to a stake or stone. The board method is usually better for small trees and the tying method for larger trees. You can also use the latter method to induce fruit bud formation by pulling down upward-growing branches of young rapidly growing trees a few days after they bloom.

It is preferable to control tree size and height by choosing the right rootstocks rather than by using pruning tools. If you intend using a pruning saw, allow trees to grow normally as long as possible. Control of insects and diseases on the tops of trees will encourage high yields which help to hold trees down. This is very important. Cutting encourages watersprout growth which is difficult to control.

Older trees constantly need to have broken and dead branches removed. It is good to anticipate the death of shaded, useless weak branches. Some varieties have many small twigs and branches which should be thinned by removing the slow-growing weak ones.

Watersprouts can sometimes be used to develop natural braces to strengthen weak branches. When nature has produced a watersprout on a weak branch, and a conveniently located one on a strong branch, they can be twisted around one another and securely tied. When they grow together they become an excellent brace. Sometimes you can graft a watersprout into another branch with a similar effect. This procedure is sometimes useful to replace broken branches, and it increases the bearing surface of the trees. Remove other upward-growing water-

sprouts in trees of all ages.

If possible, have the same person prune young trees for the first 4 or 5 years so that one general plan of development is followed. The time required to prune trees that are newly set or which have one year's growth is very short — probably no more than a minute per tree — although more time is required for problem trees. Remove branches by means of cuts that will heal as quickly as possible in order to reduce the possibility of organisms entering the wound and causing decay. You can avoid trunk splitting when removing large limbs by making two cuts, the first one a foot or more distant from the trunk. When using loppers or long-handled saws, be careful to avoid small stubs.

Knives, saws, pruning shears, loppers and long-handled saws all have their place in pruning. Compressed air and electric pruners and saws are valued by large growers.

TOP-GRAFTING AND FRAMEWORKING

By top-grafting you may make a tree bear a different variety of apples from the one it would normally bear. You keep the trunk and larger branches of the original tree and simply change the fruit-bearing branches. In this way you can replace branches that bear unwanted varieties and strains with branches of valuable varieties. You may also wish to top-graft trees to improve the pollination of your orchard by substituting branches of useful pollinators for branches of poor pollinators.

Framework grafting is usually preferred to hub grafting. It is more expensive to do, requiring more labor, scions and wax. But trees that have been framework grafted quickly re-

turn to profitable production. They also retain their good shape.

The most difficult task in grafting is to decide which branches to remove in order to leave a well-arranged framework for new branches. With young trees it is best to cut off all the top branches at once. With older trees, leave some branches for a year or two to help them survive the shock of heavy cutting. The tip end branches are usually the best ones to retain. You can also reduce shock by using an excess of scions.

It is important not to remove the wax around framework scions. This wax is more likely to crack in framework grafting than in hub grafting. Check the waxing around the scions frequently, and if cracking occurs re-wax before damage results. More scions are lost from poor waxing than from poor setting.

Careful pruning is necessary to remove suckers from original branches and to train new growth from scions. You should start pruning when the suckers are 4 to 6 inches long. A combination of hub and framework grafting is sometimes useful to shorten tall trees. Before grafting a large tree, however, you should consider whether it would be better to remove the tree entirely and plant another.

To avoid excessive shoot growth on newly grafted trees, use only half the normal amount of fertilizer for 2 years after grafting.

PREVENTING AND TREATING INJURY

It is better to prevent damage than to treat broken trees. Keep trees well pruned, trained and propped, and fruit thinned. Build windbreaks wherever possible to avoid wind damage; and

use cultivating methods that reduce the possibility of winter injury.

It is difficult to evaluate accurately the worth of individual trees in an orchard. When a tree produces 20 bushels of fruit of a superior variety each year, the tree is very valuable. If it becomes damaged, considerable expense is justified to save it or at least parts of it. There are several methods of treatment, and you must be careful to choose the right one.

Painting with grafting wax or commercial emulsified asphaltic materials to promote healing and to prevent wounds drying out is often all that is required. Small trees may need bridge grafting or inarching to help them overcome the effects of girdling by rodents, winter injury or fire. Staking will keep trees upright and improve anchorage. Supporting branches with wood screws and wires, although not completely satisfactory, is often useful to prevent or repair breaks in heavy branches.

When the bark on a tree trunk is separated from the wood by winter cold, tack it down with large-headed tacks as quickly as possible and cover the wound with grafting wax. If conditions are favorable, the bark and wood will reunite as the tree grows, and in any case this treatment will promote healing.

If a section of a valuable tree produces small apples or grows poorly, examine the trunk for injury. You can supply extra life-giving nutrients to a damaged tree by planting a small tree close to it and inarching its top into the ailing branch or into the trunk of the damaged tree just below the branch.

If trees are blown down in a storm, pull them upright and brace them securely within a day or two. Practi-



Trunk of tree showing severe winter injury.

cally all the trees blown over by Hurricane Edna at the Kentville Research Station were saved in this way.

FRUIT THINNING

Thinning, or removing part of the crop from trees in early summer, improves the growth, color, quality and rate of maturity of the remaining fruit. It is the final step in growing a quality crop.

The object of thinning is to obtain a satisfactory balance between crop load and healthy foliage. A good balance improves not only the grading characteristics of apples but also the concentration of those carbohydrates that influence flavor.

Although thinning, which includes culling, reduces the total yield, it increases the number of high-quality apples. This is important, as the re-

turn from culls and low-grade apples is often barely enough to pay picking, storage, packing and packaging costs. Furthermore, overloads of fruit increase the possibility of branch breakage and winter injury, and tend to make trees bear biennially instead of annually.

It is not difficult to keep most popular dessert varieties producing annually. To improve annual production of good-sized fruit, thin late-maturing varieties within a month of full bloom, and thin earlier ripening varieties still sooner.

Some varieties need more thinning than others. However, it is usually necessary to thin some trees of each variety every year. King is the only one that does not need thinning. Golden Delicious and Spartan varieties of superior quality have been planted only lightly in Eastern Canada, probably because heavy thinning is needed to develop good-sized fruit and high quality, as well as the bright-yellow color of the Golden Delicious. Practically all pre-Gravenstein varieties require heavy thinning, otherwise they bear biennially and set heavily when they bloom.

The fruit size of most varieties can be improved by thinning; heavy fertilization may have the opposite effect because of increased fruit set.

Hand Thinning

Hand thinning of early varieties can be done very soon after petal fall, although it is best to wait until you can pick out the apples that will drop by themselves in early shedding. Fruit-lets, or small fruit, are easiest to remove when small. Grasp the stem by the thumb and forefinger and push the fruit from the stem with the other fingers. The stem will remain on the twig and removal of the apple will not

loosen other apples on the same fruit spur. When fruit are a bit bigger you may find it handy to use light shears for thinning, especially for short-stemmed varieties, but it is usually quicker to use your fingers.

Chemical Thinning

Considerable research has been done on chemical thinning of apples, but experimental results have varied so much that no general recommendations can yet be made. In some areas of Western Canada and the United States caustic dinitro sprays have been found effective if applied when trees are in full bloom or shortly afterwards. They are not recommended for use in Eastern Canada, where they cause too much damage because of unfavorable weather.

Hormone-type sprays have been used almost exclusively in Eastern



Tree showing bark eaten by mice *above* the wire protector.

Canada for chemical thinning. They must be used with care to prevent excessive thinning, which occurs when leaves absorb too much chemical — usually when leaves have been recently damaged by frost or when they have been made succulent by high humidity or a long period of damp weather. Very little thinning results when hormone sprays are applied during rapid drying, breezy weather. This is probably because the leaves do not absorb the hormone.

Naphthaleneacetamide (amid) is probably the most frequently used hormone spray. It is generally preferred to naphthaleneacetic acid (NAA) which often causes leaves to droop for about a week. Follow manufacturers' directions when using chemical thinning sprays. Do not treat any trees under 10 years of age. Hormone sprays are not recommended for Red Delicious as they often cause the fruitlets of this variety to stop growing and yet remain on the trees until harvest.

The insecticide, carbaryl (Sevin), has a thinning effect on apple trees when applied at about 1 pound per 100 gallons, and with care it can be used successfully on Red Delicious. Do not spray trees under 15 years of age with this chemical, and on older trees experiment by applying it to only a few trees at first.

Fruit thinning with hormone sprays at the right time very often increases the amount of bloom the following year. It may also completely break the biennial bearing habit of some varieties.

STOP-DROP SPRAYS

Many varieties of apple trees drop a lot of their fruit before it reaches maturity. The drop of McIntosh apples is serious in the Maritimes. There

are several "stop-drop" sprays that are effective in reducing this loss from healthy trees. NAA is most commonly used. Another chemical, known as 2,4,5-TP, although a bit slower acting, is effective over a longer period. Follow manufacturers' instructions when using either of these sprays. Spray the trees in warm weather for best results. Apply 2,4,5-TP about a week before the harvest drop is to start. Do not use more stop-drop spray than directed as it may hasten maturity and reduce the storage life of apples.

HARVESTING

Harvesting Date

Several criteria have been used to predict the best picking dates for different varieties. These include the number of days from full bloom, the degree days accumulated between full bloom and fall picking, calendar date, iodine test, ground color of fruit, and ease of picking. Generally, the most workable method is to pick according to recommended calendar dates and to bear in mind that some of the other factors may warrant picking slightly earlier or later.

If foliage on trees is good, fruit continues to grow at the rate of about 2 percent per day almost until the fruit drops. Picking the crop when it is either immature or overripe will reduce quality. Red color improves as long as the fruit remains on the trees, except that some varieties turn too dark when past maturity. If harvesting is delayed until apples are over-mature, the storage life of the fruit will be shortened.

Harvesting Method

Careless picking can seriously reduce the value of a crop. Sometimes the value of fruit lost through picking damage equals the cost of picking.

There can also be as much loss from poor picking as from insect damage or apple scab. With some pickers, up to one third of all fruit picked will have the stems pulled out. Under proposed regulations for European markets apples without stems will all be classed as culls.

If bushel crates are used, pick the lower branches into them to keep bruising to a minimum. Use 3-foot-high stools to hold the crates while they are being filled. To further avoid fruit damage, do not drop crates even half an inch when loading or stacking. It is also important to keep farm roads carefully graded and potholes filled to avoid bumping and consequent bruising of apples being moved to storage. It is best to remove apples from your orchard quickly after picking to prevent sun scald and loss of storage life.

Spot Picking

An increasing number of growers, realizing how much they can lose by storing and handling low-quality fruit, are adopting spot picking. Both the size of yields and the quality of fruit are increased by harvesting apples as they mature.

Most early apple varieties mature over a period of about 2 weeks. You can avoid heavy losses from immature culls picked too early, or from drops picked too late, by making several spot pickings. Spot picking is particularly good for roadside stands, as early apples quickly lose quality when held at normal summer temperatures after harvesting.

Valuable results are also obtained by spot picking later varieties. In the first picking it is usual to remove apples that will grade Fancy (2½ inches and over) and leave the others. After 2 more weeks of growth and develop-

ment, many of those that are left will meet grade requirements.

CONTROL OF PESTS AND DISEASES

Mice

Mouse damage to trees during winter is widespread, and may be severe in orchards planted with sod or intercrops. When vegetation is heavy, damage is often done as early as September. Damage in clean cultivated orchards is rare. Removing vegetation from the area around trees within about a 2-foot radius helps control mice.

Guards of ¼-inch mesh galvanized wire are effective in protecting trees. Strips of this material 18 x 18 inches or 18 x 24 inches in size give still greater protection. Sink the guards a few inches into the ground to hold them steady and prevent mice from going underneath. As the tops of wire guards sometimes chafe very small trees, it is often better to use tarred felt building paper for the first 2 years.

But any paper that has tar in it should be removed early in the spring to prevent heat and tar injury. Aluminum foil and commercially manufactured guards are also satisfactory.

At the Research Station in Kentville, poison bait prepared according to the following formula has been used successfully for many years: 100 pounds cracked corn, 2 pounds zinc phosphide, 1 quart vegetable oil and ½ ounce methyl green dye. The corn, zinc phosphide and methyl green dye are mixed thoroughly in the dry state so that the poison covers the corn completely and evenly. The oil is then added and the mixture again carefully mixed. Because the fumes of this poison are lethal, mix it out-of-doors, label it carefully and keep it in a tightly covered container. Always handle it with care. Scatter one dessert spoonful of the poisoned, green-dyed grain near the trunk of each tree each fall.

The poison bait method will keep mouse damage to a minimum, but no



Spraying to control apple scab and insects.

method of mouse control yet devised is perfect. Foxes and cats that eat poisoned mice will also be killed.

Deer

In some areas deer damage to young trees is so serious that it is difficult to start an orchard. The damage is more serious in summer than when trees are dormant. You can usually prevent deer damage by putting several moth balls in a cheesecloth bag that is hung from a tree. In hot weather the moth balls will last nearly a month, and in cooler weather at least twice as long. Bone and blood meal used in the same way work just as well and last somewhat longer.

Insects and Diseases

An orchard business would fail if the grower did not control diseases and injurious insects. To grow apples free of the injurious and unsightly apple scab fungus, you have to apply 8 to 10 fungicide sprays annually during May, June and July. As insects frequently cause economic damage, you must be constantly on the lookout for them and apply control measures whenever they get numerous. The pest situation changes from year to year. It is affected by weather conditions, by the life cycles of insects, and by fluctuations in numbers of insects. New control methods and chemicals are constantly being developed. For the latest information, consult spray calendars each year and heed spray warnings issued by local specialists.

HOME GARDEN TREES

In practically every community there are gardeners who are interested in growing one or more apple trees. When it comes to choosing a site for his apple orchard the home gardener hasn't much choice, but with care he can grow apples in almost any well-drained garden soil in the Maritimes.

The backyard orchardist grows apples more for his own satisfaction than for profit.

Very dwarf trees on EM IX rootstock, although they require special attention to give them proper support, are ideal for the gardener who has fertile soil. When they mature, bush-type trees grown on this rootstock are less than a quarter the size of standard trees and rarely over 7 to 8 feet high. If desired, they can be planted close together and carefully pruned to keep them smaller still. As cordons, they have been planted 2½ x 6 feet apart and as dwarf pyramids at 3 x 7 feet. They should be headed very low, perhaps 12 inches or even lower. Pruning will depend on the type of tree required. They will stand heavy pruning into special shapes much better than standard trees. Dwarf trees need special cultivation, or a mulch such as lawn clippings or hay. Spraying and fertilizing are as necessary as for commercial trees.

If extra varieties are desired, one or more other varieties can easily be grafted into these trees. The added varieties should increase both the usefulness of the trees and their general interest. A scab-immune crab apple such as Dolgo, or the scab-resistant good-quality, general purpose variety Tangowine should have a place in a home garden, as should ornamental crab apples. Red Fleshed Crab is one of the good ornamental crabs for both bloom and fruit. Larger trees on semi-dwarf, semistandard or standard rootstocks require less attention than dwarf trees on EM IX.

Usually, the most difficult problem for home growers is the control of the apple maggot or railroad worm. This insect, which may fly half a mile, moves beyond the boundaries of large orchards as well as gardens. Then,



The author in front of a Gravenstein tree growing on Malling IX rootstock.

probably without further feeding, the flies deposit eggs beneath the skin of fruit. When the maggots hatch and feed, they cause the characteristic damage. Control is impossible without the cooperation of all nearby neighbors who have bearing apple trees. The application of the necessary two or three sprays and the gathering and destruction of drops over the area, is neither possible nor economic in many instances.

DESCRIPTION OF VARIETIES

CLOSE (Parentage unknown, introduced by the U.S.D.A. in 1938) This is the earliest ripening apple at Kentville. It is ready for picking a few days before Crimson Beauty. The apples ripen unevenly and drop seriously unless sprayed with a stop-drop spray. They have better quality than Crimson Beauty. The trees are cross-unfruitful.

CORTLAND (Ben Davis x McIntosh, a New York State Agricultural Ex-

periment Station introduction) The fruit ripens at the same time as McIntosh, or later, and has a longer harvesting period. Apples cling better but do not keep longer. The fruit is larger and flatter than McIntosh and fully as attractive. The flesh is firmer but is sometimes considered not so high in quality. The tree is an annual bearer and heavy feeder. It is commercially grown in Eastern Canada. Present plantings are considered adequate.

CRIMSON BEAUTY (Also known as Early Red Bird, originated in New Brunswick) This is one of the earliest varieties. It is a highly colored striped apple of good size and sprightly flavor, but as a culinary apple it has value only for local markets. The tree is hardy and vigorous but often biennial in habit. It is recommended for limited commercial planting in all the apple-growing districts in Eastern Canada where adequate local and roadside markets exist. Banks Crimson Beauty

is a very attractive solid red strain.

DELICIOUS AND RED SPORTS (Parentage unknown) This apple has probably been produced more widely and in greater volume than any other variety. No doubt its distinctive shape and name have contributed to its rapid increase in popularity. The original variety was not popular in the Maritimes as it lacked sufficient red color. Many of the red sports or strains are almost completely covered with red and most of them are very attractive. The number of strains of Delicious is rapidly increasing. It has not been determined if deep red or bright red, solid color or striped strains are superior. Markets will usually accept them all. Only Richard and Starking strains have been well tested in the Maritimes. Both are very good. Dauber and Hi Early strains are very dark in color. Several spur-type strains are now being propagated. Only two of these, Okanoma and Starkrimson, have been fruited at the Research Station at Kentville. The quality of the red color of Okanoma has not been good enough. The Starkrimson on very young trees appears very promising when spur-type trees are desired. Stark Brothers' Nursery, which holds the plant patent on Starkrimson, controls its distribution.

Delicious is very susceptible to red mite. Hormone spray thinning is not satisfactory on this variety since it causes fruitlets to remain on the trees and many fail to grow properly. When fruit are thinned, most apples of the dark-red sports grown on well-tended trees will grade Extra Fancy. The trees yield well when given good care, including attention to pollination. They respond to heavy fertilization. The trees are not sufficiently hardy for planting in areas where winter frost damage is a serious problem. The

apples are inferior for cooking and processing.

EARLY MCINTOSH (Yellow Transparent x McIntosh, a New York State Agricultural Experiment Station introduction) This vigorous grower ripens with or a little later than Melba and is equal to it in hardness. It tends to overbear in alternate years. When thinned heavily it may produce commercial crops annually. The fruits are uniform in size and more attractive than Melba, but their quality is not so good and they are inclined to drop readily. This variety may be grown in any district where Melba succeeds.

GOLDEN DELICIOUS (Originated in West Virginia) Great care is required in growing, harvesting and storing this superb quality, high yielding, attractive apple. It needs very heavy thinning, a special spray schedule, careful handling to avoid bruising, and excellent storage to prevent withering. It requires a long season. The trees are not hardy in the colder areas of the Maritimes.

GRAVENSTEIN AND RED SPORTS (Originated in Germany or Denmark) This attractive blushed apple is of good commercial size and quality. It is ready for picking before McIntosh but must be marketed by late fall. The tree is a heavy producer and a vigorous grower, but it lacks hardness and is subject to crown rot. It is grown commercially in Nova Scotia. Sports of this variety such as Washington are better in appearance than the original variety. It is a superior cooking apple.

GREENING R. I. (Rhode Island) The fruit of this very old, yellowish-green variety is valued for solid-pack processing. It is excellent for cooking. The tree is a vigorous grower and productive, but it is not particularly hardy

and can be grown only in the more favored regions.

KING OF TOMSKINS COUNTY AND RED SPORTS This old American variety is valued in Nova Scotia for processing. The trees are vigorous with long branches. They are difficult to prune. The fruit is very large and of distinctive flavor. The trees are not hardy in the cooler fruit-growing districts of the Maritimes.

LODI (Montgomery x Yellow Transparent, originated at the New York State Agricultural Experiment Station) This early summer variety is the best early yellow apple known for the Maritimes. It resembles Yellow Transparent in tree and fruit characteristics but the fruit ripens slightly later and is larger. Careful thinning is required to keep it bearing annually.

MACOUN (McIntosh x Jersey Black, a New York State Agricultural Experiment Station introduction) The fruit of Macoun ripens at the same time as McIntosh or a bit later. It is very dark red and has superior quality. Fruit often requires thinning; by careful thinning annual production is attained.

MCINTOSH AND RED SPORTS The original McIntosh was found growing as a seedling near Dundela, Ontario, by John McIntosh in 1796. Today it is the most popular variety grown in Canada. Many red sports of this variety that have been selected on the basis of high color are being grown at present. McIntosh is recommended for commercial planting in all the apple-growing districts of Eastern Canada. Only blushed red sports should be planted.

MELBA AND RED SPORTS (McIntosh seedling, originated at Ottawa) Undoubtedly the highest quality early variety grown in Canada, this apple has been planted heavily. It is a short-

season variety desirable for local market and roadstand trade. The attractive fruit resembles McIntosh, being washed and streaked with red, and it is medium to above average in size. The tree is vigorous, hardy and an early bearer. It gives a good crop but is often biennial in habit. This variety ripens unevenly and spot picking is necessary. The fruit bruises easily and should be moved to market as soon as possible.

Several bud sports of Melba are available and are superior to the original variety in appearance, firmness of flesh and keeping qualities, but they ripen a few days later. They do not bruise so easily as Melba. Melba and red sports are commercially grown in most of Eastern Canada.

NORTHERN SPY AND RED SPORTS (Originated in New York State) In Ontario this variety ranks second only to McIntosh in popularity. It grows especially well in certain apple-growing regions in Ontario and is also recommended for the Maritimes. It is a late winter apple which is not harvested until just before the heavy frosts occur. The tree has many faults, being notoriously slow in coming into bearing, being tender in the colder regions, and having weak crotches. Mature trees yield heavily. The fruit is large and attractive when well finished and is excellent for processing, dessert and culinary use. The fruit bruises easily and must be picked and handled with care. In light crop years, and when trees are young, the apples are subject to bitter pit.

Many red sports of Spy are now being propagated. All of them are more highly colored than Northern Spy but many of them do not have the colored striped appearance of the original; nor is their quality so good. Northern Spy

and red sports are commercially grown in the Maritimes.

QUINTE (Crimson Beauty x Melba, named in 1964 by the Canada Department of Agriculture, Ottawa) This new early season variety matures about midseason between its parents. The tree is above medium in size. The fruit is attractive, being well covered with a bright solid red color. Its quality is good.

RED ASTRACHAN This is a Russian apple. In common with many early-season varieties, it is not of high quality. The fruit ripens unevenly and keeps only a very short time. The variety deserves mention only because of lack of better ones that ripen in the same season, following Crimson Beauty. Quinte may replace it.

RIBSTON AND RED SPORTS In Nova Scotia this high-quality English varie-

ty is valued for processing. It makes a very good solid pack and is excellent in blends of apple juice. The spur-type trees are semivigorous and annual bearing. The variety would be more valuable for processing if the fruit were larger.

SPARTAN (McIntosh x Yellow Newtown, originated by Dominion Experimental Station, Summerland, B.C., and introduced in 1936) This apple is highly colored and attractive, and has excellent quality. When taken from the same storage as McIntosh, it is invariably crisper and of finer quality. It is slightly later than McIntosh. The fruit set is often very heavy, and the fruits are small or even very small if not thinned. Biennial bearing may result from overbearing. The market acceptance of this variety has been excellent.

CAL/BCA OTTAWA K1A 0C5



3 9073 00207324 7

Copies of this publication may be obtained from:
INFORMATION DIVISION
CANADA DEPARTMENT OF AGRICULTURE
OTTAWA