Fruits

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MASTER GARDENER CORE COURSE
Horticulture for the Home & Garden

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FRUITS FOR THE HOME GARDEN
by Doug Foulk, Extension Educator
University of Minnesota

INTRODUCTION
Home fruit production provides the gardener with the opportunity to enjoy fresh, flavorful fruit of better quality than those shipped in from California or elsewhere. The University of Minnesota fruit breeding program continues to release cultivars that are delicious and winter hardy for the enjoyment of gardeners in colder climates.

This booklet sets forth some general guidelines for all fruits but deals primarily with tree fruit culture, as this topic is not covered concisely in current Extension publications. Almost any other fruit-related information you might want is available through University of Minnesota Extension.

LEARNING OBJECTIVES
• Understand the importance of site selection, soil preparation and proper planting for a successful fruit garden.
• Understand the importance of and identify successful cultivars and rootstocks of fruits for Minnesota.
• Understand mulching, pruning, watering, fertilization and other techniques for successful fruit production.
• Be aware of the major insect and disease problems of fruits for Minnesota.

GUIDELINES FOR PLANNING THE SMALL FRUIT GARDEN
• Locate your fruit planting as close to your home as possible in full sun. Most fruits require a minimum 6 hours of direct sun per day and 8 hours is better. Avoid the north side of buildings and tree root zones.
• In selecting a site, avoid sites that are prone to early or late frost, low wet spots, and exposure to strong prevailing winds.
• Fruits thrive best in a fertile, sandy loam soil high in organic matter, but they will give good returns on the average garden soil under adequate fertilization and good cultural practices.
• Overcrowding frequently results in weak plants and low yields. It also makes insect and disease control more difficult.
• Special attention should be given to the selection of cultivars. They must be adapted to your soil and climatic conditions. If possible without sacrificing too much yield or quality, select cultivars with the least insect and disease problems.
• Obtain the best nursery stock available. Buy only from reputable nurserymen who guarantee their plants to be true to name, of high quality, and packed and shipped correctly.
When purchasing plants, roots should be moist and have a bright, fresh appearance. Shriveled roots indicate that the plants have been allowed to freeze or dry out in storage or transit. Such plants seldom survive. Plant roots must be kept moist and free from freezing temperatures at all times.

If the plants cannot be set immediately, they should be kept either in cold storage or heeled in. Wrap them in a material that will prevent their drying out, and store them at a temperature just above freezing. Strawberry plants, in small quantities, may be held in the home refrigerator for a few days.

If refrigerated storage is not available, remove the plants from the bundle, and heel them in carefully in a trench of moist soil in a shaded location. Pack the soil firmly around the roots to eliminate all air pockets and to prevent the roots from drying out.

**Establishing and Maintaining the Planting**

Nothing causes more disappointment and failure in small fruit plantings than the lack of careful preparation and attention to detail at the time the plantings are established. For best results:

- Prepare the soil properly
- Set the plants carefully
- Create conditions favorable for new growth

If the planting is to be productive and long lived it must have:

- proper fertilization
- no competition from weeds or other plants
- control diseases and insect pests
- proper pruning

**Growing Tree Fruits**

**Planning the Planting**

Consider the mature size of the tree when designing the planting. Dwarf fruit trees lend themselves admirably to ornamental plantings as well as orchards. They come into bearing earlier than standard size trees, are winter hardy if planted with the graft union about 2 to 3 inches above the soil surface, occupy less space, and can be more easily pruned and sprayed with equipment normally available to the average homeowner. Most nurseries now carry dwarf and semi-dwarf apple trees of several cultivars that should be considered where space is at a premium.

**Size of Planting**

Space, site, size of family, available time and pollination requirements all determine size of the planting. Cover the range of fruits insofar as family preference, adaptability, and space permit. Never attempt to plant more than you can care for properly.

**Tree Spacing**

Tree spacing is an important factor, and to a large extent it influences selection of site and cultivars. They can be set farther apart if space allows, but, for best results, should not be set closer than the recommended minimums.
Site Selection
Importance of selecting the best site possible for fruit planting cannot be overemphasized. Good air drainage is essential. Cold air, like water, flows downhill. For this reason, fruit buds on plants set in a low spot are more likely to be killed than when the trees are planted on a slope. Frost pockets, low wet spots, and locations exposed to strong prevailing winds must be avoided. South facing slopes encourage early bud development and can sometimes result in frost damage.

Deep, well-drained soil with a pH of 6.0-7.0 and good fertility should be selected. A fertile, sandy loam or sandy clay loam is suitable for most tree fruits. Adequate drainage is the most important soil characteristic. Proper fertilization and cultural practices may easily improve poor soils. Improving soil with poor internal drainage is difficult and expensive. Fertile soil is desirable, and deep, well-drained soil is vital.

Cultivar Selection
Give special attention to the selection of cultivars for the home garden. They must be adapted to your soil and climatic conditions. If possible without sacrificing too much yield or quality, select cultivars with the fewest insect and disease problems. Several cultivars of the same kind of fruit maturing at different times may be planted to prolong the season. The value of certain cultivars for special uses such as freezing, canning, and preserving should be considered. Some fruit may be purchased in season from commercial growers more economically than you can grow them yourself.

Cross-pollination is necessary for satisfactory fruit set in many tree fruits. Cultivars that are cross fruitful should be selected. To be certain of adequate cross-pollination, plant at least two cultivars of apples.

Apple Rootstocks
Apples, like other tree fruits, will not produce trees with the same characteristics from seed. If you plant a seed from a Red Delicious apple; the fruit would likely be small, unattractive, and of poor quality. Therefore, apple trees are propagated vegetatively by either budding or grafting scion wood of the desired cultivar on a rootstock. The rootstock and scion cultivars both maintain their respective genetic identity but are joined at the graft union and function as a unit.

Traditionally, apple trees have been propagated on rootstocks from apple seeds. More recently, increasing use is being made of vegetatively propagated or "clonal" rootstocks that have inherent advantages over seedlings. Three major considerations in rootstock selection are:

Size control: Probably the most widely accepted reason for the use of clonal rootstocks is tree size control. By proper selection of rootstock we can determine mature tree size. For example, the same cultivar of apple will produce a 14x16 foot tree on the rootstock cultivar, Malling Merton (MM) 111, down to a dwarf tree of 7x8 feet on a Malling (M)9 rootstock. Intermediate sizes can be attained by other rootstocks such as
Unfortunately, many apple trees offered to homeowners are labeled as dwarf trees but the buyer has no idea of how dwarfing the rootstock may be. Types from smallest to largest: M27, M9, Bud 9, M26, M7, MM111, seedling.

*Precocity:* The earliness at which a tree produces fruit is also directly affected by the rootstock. Trees on seedling rootstocks usually do not begin fruiting until they are 7-10 years old. Trees on M9 rootstock will often produce crops in 2-3 years. Other rootstocks are intermediate in this regard. Usually, the more dwarfing the rootstock, the earlier the tree will bear fruit.

*Stability:* A major consideration in selecting apple rootstocks is the degree of anchorage provided. For example, trees on M9 rootstock are very small but because of brittle roots, must have some type of support. This can consist of a post, a trellis, or other means of holding the tree upright. The semi-dwarfing M7 rootstock may require support for the first few years but is often grown without support. The more vigorous MM111 rootstock does not require support and is thus like a seedling rootstock.

**Buying Trees**
Obtain the best nursery stock available. Buy only from reputable nurseries that guarantee their plants to be true to name, of high quality, and packed and shipped correctly. Beware of bargains. High prices do not necessarily mean high quality, but good, well-grown nursery stock is not cheap.

One-year-old trees are usually preferred. A common mistake made by many homeowners is to select oversized or ready-to-bear nursery trees. Experience has shown that younger trees bear almost as soon, are easier to keep alive, and develop into more healthy, vigorous trees than do the oversized stock. The older trees cost nurseries more to grow and are sold for higher prices, but are usually worth less than younger trees.

When purchasing apple trees on dwarfing rootstock, be sure to specify the root-
PLANTING THE ORCHARD

Time of Planting
Spring planting is recommended for Minnesota.

Handling Nursery Stock
Roots of nursery stock should never be allowed to freeze or dry out. When your order arrives, unpack the bundles immediately and inspect the trees. The roots and packing material should be moist. Check to see if the bark is withered. Withered bark indicates the trees have been allowed to dry out in storage or in transit.

If trees cannot be planted immediately, they may be held dormant in the original packing in refrigerated storage for a week or two. If refrigerated storage is not available, trees should be taken out of the bundle and heeled-in carefully in a trench of moist soil in a shaded location. Keeping roots in a container of water for 2 or 3 days until the tree is planted is an excellent idea.

Planting the Trees
Preparation of the soil where fruit trees are to be planted should be as thorough as preparation of the soil for a vegetable garden or ornamental plantings. If the places selected for trees are in a lawn, prepare the site by removing the sod. Loosen the soil by tilling or spading an area three to five times wider in diameter than the width of the root system, and only to the depth of the root system.

Dig a hole in the center of this circle that is one foot larger in diameter than the root ball and is exactly as deep. Maintain undisturbed (not loosened) soil beneath the root ball to prevent the tree from settling. If the tree is containerized and is somewhat pot bound, remove the pot and make a vertical slice up each quarter of the root ball to a depth of about one inch. Cut an X across the bottom of the soil ball as well. Gently loosen some of the roots.

If the tree is bare-root, prune the roots of young trees only where necessary to remove broken and damaged ones or to head back some that are excessively long. Should a tree be so badly scarred or damaged that there is doubt of its survival, it is wise to discard it.

Set the tree so the graft union is 2-3 inches above the soil line. Never set it so deep that the union of the scion and rootstock is below ground level when the hole is filled.

Backfill around the roots with the soil that was removed. Lightly pack or water the soil during this process to eliminate air pockets.

ORCHARD MANAGEMENT

Cultural Practices
Weed control is essential for young fruit trees. Weeds must be eliminated so they will not compete for available moisture and fertilizer. To accomplish this, the use of mulch is recommended. The mulched area should extend a little beyond the spread of the branches.
When trees are planted in rows, the area between the rows may be allowed to grow in sod or used for interplanting with low-growing vegetables or strawberries. There is no objection to this practice in the home orchard, provided ample plant nutrients and moisture are available for proper development of the fruit trees. Under sod culture, frequent close mowing during the growing season is desirable. This reduces competition for necessary moisture and plant nutrients, and also aids in disease and insect control.

Fruit trees, especially those on dwarfing rootstock, are becoming prominent in home landscape designs. Under lawn culture, fruit trees can be given more attention than is usually convenient under other systems of culture. Equipment and materials for watering, pruning, spraying, and other cultural practices are essentially the same as those required for landscape plantings. It is good practice to apply a mulch or cultivate lightly for the first year or two, or until the tree has become firmly established. Lawn grass, if kept closely clipped, may be allowed to grow around the base of the tree in the third year.

Chemicals for weed control should be used with extreme caution in the home garden. Careless use can result in severe injury to fruit trees and nearby ornamental plantings. See your Extension Educator for the latest recommendations.

**Fertilization**

As a rule, no fertilizer is recommended or needed at planting time. Shortly after the newly-planted tree becomes established and growth begins, apply ¼ to ½ lb. of a 16 or 20% nitrate fertilizer in a circle around the tree, about 8 to 10” from the trunk. Usually fruit trees show no increased growth or fruitfulness from the use of any nutrient element except nitrogen. The tree requires other elements; however, only in special cases are they deficient in the soil. Deficiencies are more likely to occur on light, sandy soils.

Where a good compost is applied regularly, the use of chemical fertilizer to supplement natural fertility of the soil may not be necessary. Over fertilization with either organic or inorganic materials should be avoided. Excessive vegetative growth will result, usually accompanied by delayed fruiting and possible winter injury.

Where poor growth results after the use of nitrogen only, other elements may be needed. Contact your local Extension Agent for fertilizer recommendations.

Beginning in the year after planting, fertilizer may be applied either after the leaves have fallen or in early spring about 3 or 4 weeks before active growth begins. On light, sandy soils, it is best to delay application until early spring. When trees are grown in a lawn area, delay fertilizing lawn until after trees are dormant to avoid late summer growth.

Apply one ounce of actual nitrogen at fertilization time for each tree of year age, up to 16 ounces. To calculate the amount of fertilizer to apply, divide the actual nitrogen needed by the percentage of nitrogen in the fertilizer. The usual method of application is to scatter fertilizer evenly under the tree, starting about 2’ from the trunk and extending to just beyond the tips of the branches.

Terminal growth and general vigor of the individual tree should be observed closely.
Where growth the past year was short, increase the amount of fertilizer by 25%. If growth was excessive, reduce the amount or withhold it entirely for one year.

Pruning
The general purpose of pruning fruit trees is to regulate growth, increase yields, improve fruit size and quality, and reduce production costs. Pruning is necessary to shape the trees for convenience of culture and for repair of damage. The methods for pruning fruit trees are designed to produce a strong framework and maximum yield of high quality fruit. Most pruning is done during the dormant season, preferably just before active growth begins in the spring. At this time, pruning wounds heal faster, flower buds can be easily recognized, and injury from low winter temperature is avoided. Although pruning procedures vary according to the type, age, and cultivar, all newly planted fruit trees should be pruned in the spring before growth starts. This is necessary to stimulate lateral bud development from which to select good scaffold limbs.

Thinning
Apple trees frequently set more fruit than they can mature to a desirable size. By removing excess fruit, a process known as "thinning," this difficulty can be overcome. Thinning not only allows for an increase in size of the remaining fruit on the tree, but also improves fruit color and quality, reduces limb breakage, and promotes general tree vigor. Another benefit from thinning fruits is that it permits more thorough spraying or dusting for effective disease and insect control.

Apples should be thinned as soon as possible after the fruit has set. If full benefits are to be obtained, thinning should be completed within 40 days after full bloom. A distance of 6 to 10" between fruits is recommended. The center apple of a cluster is usually the largest and the best apple to leave.

Rodent Control
Mice and rabbits may cause serious damage to the home fruit planting. They chew off the bark at ground level or below and often completely girdle a tree, causing it to die. Most of this damage takes place during winter. Keep mulch pulled away from the base of the tree, and examine it frequently for the presence of mice.

Tree guards can be used to keep mice and other rodents away from the trunk. Galvanized screen or "hardware cloth" with a ¼" mesh is frequently used. A roll 36" wide may be cut lengthwise, forming two 18" strips. By cutting these strips into pieces 14" long, guards 14 by 18" are obtained. Roll or bend the strip around the trunk of the tree so that the long side is up and down the trunk and the edges overlap. Twist a small wire loosely about the center to prevent the strip from unrolling. Push the lower edges well into the ground. This metal guard will last indefinitely and can be left in place all year.

Tar paper, building paper, sheets of magazines, and aluminum foil can also be used in a similar manner, but must be removed in the early spring to prevent damage to the tree. Perforated plastic guards are also available. Like the metal guards, these can be left in place year round.

Other methods of rodent control have been successful. Ordinary whitewash has given good results in some instances. Some commercial growers use a repellent wash recommended by the USDA, containing equal parts of fish oil, concentrated lime sulfur, and water. All these materials may be applied with a paintbrush to the trunk of the tree.
from the ground up into the scaffold limbs.

**Tree Fruit Problems**
For significant insect or disease problems it may be necessary to follow a spray program. Information on the use of chemicals for such a program is available from your county Extension office.

Apple pests and diseases include:
- apple scab
- cedar apple rust
- apple maggot
- codling moth
- plum curculio

To be successful with your spray program, spray at the proper time and do it thoroughly. Leave no portion of the tree unsprayed. To make the job easier and to ensure adequate coverage, thin out excessive growth and remove all dead and weak wood. Cut old trees back to 20’ or less, if possible. Train younger trees so they reach a height of no more than 18 feet.

Semidwarf and dwarf trees should be considered when making your planting. Their small size makes the task of spraying easier. This factor should not be overlooked in the selection of cultivars.

Two common problems that may be confused are winter injury and fireblight. The following symptoms can be used to distinguish between the two:

**Winter injury** (can also take form of sunscald on trunk)
- occurs early in growing season (first warm weather)
- growth wilts and dies shortly after bud-break

**Fireblight** - a disease caused by a bacterium
- Dieback starts at the tip and works into the tree, resulting in characteristic 'shepherd's crook'

**Sanitation**
Adopt good sanitation practices. The destruction of harboring places for insects and diseases plays a large part in the control program. Conditions that encourage mice should also be eliminated.

Practices to include in an orchard sanitation program include:
- Collect and burn debris.
- Remove and destroy all dropped fruit.
- Rake and remove fallen leaves.
(SOME) FREQUENTLY ASKED QUESTIONS (FAQs)
The following just a few of the questions asked by the general public about growing fruits in their home landscapes, and answers one offer.

Q: **What are the black growths on my cherry tree branches? Will they kill my tree?**
A: Black growths on cherry trees are usually black knot. This fungus readily infects many species of Prunus, including chokecherries, plums, peaches and apricots. Usually it occurs on branches, but may also occur on the main stem. Initial infections appear as swellings, while older infections appear as cracked, hardened, black knots. If infection reaches main stem it may eventually cause the tree to die. Control measures include pruning out infected branches and applying a dormant application of lime sulfur or Bordeaux mixture to the tree. Branches should be pruned at least six inches below the swelling or knot in late winter. Also, prune new infections developing during the growing season. Pruning alone may be effective in some cases.

Q: **My plums are swollen and enlarged. What caused them to become deformed? Can I prevent this in the future?**
A: Plum fruit that appears hollow, enlarged and swollen is probably infected by a fungus, known as plum pockets. This disease causes flesh to be thick and spongy. Control measures include sanitation (removal of infected fruit and branches), maintaining tree vigor, and possibly use of a fungicide such as Bordeaux mixture in early spring prior to bud break. However, the problem usually does not require fungicide control.

Q: **Where can I get/how can I grow hardy peaches?**
A: Peaches aren’t hardy enough for Minnesota winters.

Q: **Why do my blackberries survive the winter but don’t make berries?**
A: Blackberries aren’t hardy here. The canes will survive our winters but the flower buds will not, so they won’t produce any fruit.

Q: **Do you need more than one tree to get fruit when growing apples, plums and apricots?**
A: Yes. Use two varieties in each planting to serve as a source of pollen for the other variety. Cross-pollination is possible only when varieties bloom at about the same time. When purchasing trees, be sure to ask what variety would be a good pollinator.

Q: **Can I grow cherries in Minnesota? Which ones work here?**
A: Tart cherries and Nanking cherries grow here. They are self-fruitful so no pollinator is needed. Tart cherry varieties for Zone 4 are Mesabi, a semi-dwarf; and Meteor and North Star, both dwarf varieties.
RESOURCES

Websites

University of Minnesota Extension Publications

Publications are available on Garden Information website:
http://www.extension.umn.edu/gardeninfo

Garden Information: Fruits publications
http://www.extension.umn.edu/gardeninfo/components/info_fruit.html

University of Minnesota Commercial Fruit Growers
http://fruit.cfans.umn.edu/

Growing Fruit in the Home Garden - Fact Sheets
http://fruit.cfans.umn.edu/garden/minnesota.htm

University of Minnesota Fruit Culture webpage
http://www.extension.umn.edu/topics.html?topic=5&subtopic=152

Ohio State “Ohioline” Yard and Garden webpage
http://ohioline.osu.edu/lines/fruit.html

Books


QUICK REFERENCE: GROWING FRUITS IN MINNESOTA GARDENS
The following information covers some of the most common issues Minnesota fruit growers encounter with their crops. As always, there may be more than one factor at work, and it is best to consult University research-based information in order to best determine the reason(s) for damage and possible solution(s).

Strawberries
Three types of strawberries:
1. Junebearing: One large, concentrated crop
   • Cultivars: ‘Earliglow,’ ‘Mesabi,’ ‘Winona’
2. Everbearing: Two crops—spring & fall
   • Cultivars: ‘Ft. Laramie’, ‘Ogallala’
3. Day-neutral: Nearly continuous crop
   • Cultivars: ‘Tribute’, ‘Tristar’

Planting Strawberries
Site specifications:
• Full sun
• Good soil drainage
• Soil pH 5.3-6.5 optimum, 5-7 acceptable
• Gentle slope to allow for air drainage
• Valleys are frost pockets
• Hilltops are too windy
• Eastern exposure good for drying foliage
• Southern exposure soil warms up early and thus allows for quick start in the spring
• Northern exposure delays bloom in spring

Site Selection and Preparation
• Prepare soil the year before planting
• Remove sod
• Control perennial weeds
• Test soil
• Adjust soil pH as needed
• Add organic matter
• Add fertilizer if necessary
• Purchase virus-indexed plants
• Plant in early spring
• Keep dormant stock moist until planted
• Plant with crown above soil line

Spacing Systems:
1. Matted Row
   • Set plants 18-24” apart
   • Space rows 3-4’ apart (rows will end up 12-24” wide after plants mature)
   • Allow rows to fill in with runners
2. Spaced Matted Row
Same as above, except maintain 6” spacing between all daughter plants

3. Hill System
- For day-neutrals
- Set plants 6-12” apart
- Plant in single, double or triple rows
- Remove all runners

Preparing for Winter
- Mulch plants to protect crowns.
- Apply mulch in late fall after a few frosts, or when low temperatures near 20°F.
- Apply mulch over early snow, if necessary.
- Crown can be damaged at temperatures colder than 20°F
- Serious damage is likely at temperatures colder than 15°F
- Flowering is reduced in winter-damaged plants.
- Use 4-6” straw, chopped leaves, pine needles, etc. 2-3” wood chips also work well.

Removing Winter Mulch
- Remove mulch in spring when new growth can be seen.
- Leave mulch around plants to cool soil and protect fruit.
- If cold weather returns, recover plants with mulch or rowcover material.

Renovation
- Reduces runnering and helps maintain optimum plant density.
- Controls row width.
- Can be used to control foliar diseases.
- Renovate within two weeks after harvest is completed.

Steps in Renovation
- Remove all foliage.
- Narrow the bed width to 6-12”.
- Fertilize the planting: 3/4-lb ammonium nitrate (33-0-0) per 100 feet of row.

Common Strawberry Issues

Button berry
- Caruse by the tarnished plant bug
- Monitor in spring as buds form by tapping plants with a white paper plate underneath to check for insects falling onto the plate
- Threshold: less than 5 nymphs per 5-10 clusters.
- Pesticide of choice: Malathion.
- Spray before 10% bloom and/or after petal fall
- Avoid mowing near bloomtime.

Holes in the fruit
- Common cause may hail, rodents, birds or slugs
- Improve air circulation at ground level
- Avoid mulch
- Remove all weeds
- To manage slugs, use an iron phosphate product such as “Slug-go”, “Escar-go. Slug traps, eggshells, other home remedies are of variable effectiveness.
Rotting fruit
• Common cause: Gray Mold
• Keep the leaves, flowers, and fruit dry
• Water at base of plant with drip irrigation early in the day to allow foliage to dry
• Plant in full sun in well-drained soil or in a raised bed.
• Keep plants well spaced and rows narrow to allow for air circulation
• Control weeds
• Remove and dispose of all leaves and fruit at renovation.

Common cause: Leather Rot
• Mulch plants
• Sanitation is key - clean up leaves, old fruit, etc.
• Well-drained, uncompacted soil
• Narrow rows, good spacing

Strawberry Harvest & Storage
• Pick berries that are red to the tip.
• Pick with cap (hull) & stem on fruit and place in a shallow container.
• Store lightly covered in refrigerator with hulls intact; do not wash or remove hull until ready to use.

Raspberries
Three types of raspberries grown in Minnesota:
• *Rubus ideaus* (Red/Yellow)
• *R. occidentalis* (Black)
• *R. ideaus* x *R. occidentalis* (Purple)

Raspberries are grouped into two different fruiting types:
1. Summerbearing (Floricane-Fruiting)
   • Includes Red, Purple and Black cultivars
2. Fallbearing (Everbearing or Primocane-Fruiting)
   • Includes Red and Yellow cultivars

Site Selection for Raspberries
• pH 5.5-7.5 (6.0-6.8 is optimal)
• Well-drained soil or raised bed
• Full sun, but sheltered from direct winds
• Summerbearing types benefit from a later spring warm-up
• Fallbearing types benefit from an earlier spring warm-up

Planting Systems for Raspberries:
1. Hedgerows
   • Red or Yellow: 2-3’ apart in rows 6-8’ apart
   • Maintain 12-15” row width

2. Hills
   • Plant 4-5’ apart in each direction
   • (Optional) Set a stake at planting time in the ‘center’ of each ‘hill’
   • Maintain each hill at a 1’ diameter

Planting Raspberries
• Purchase virus-indexed plants
• Prune canes to 8” if necessary
• Set plants w/ growing point just below soil surface
• Fertilize w/ nitrogen only (ammonium nitrate, urea) when growth begins: 1/4 cup in 18” band around each plant
• Plant as early as the soil can be worked
• Earlier planting = more/larger primocanes in 1st year

Trellising Raspberries
• Minimizes wind damage
• Improves light penetration & air circulation
• Makes harvest easier

Pruning Raspberries
• Summer-bearing red and yellow raspberries:
  After the last harvest, cut all canes that have produced fruit to ground level and remove them.
• Fall-bearing raspberries:
  If you want only a fall crop, cut all canes off at the base before growth begins in spring. If you want summer and fall crops, thin canes as described for summer-bearing raspberries.

Renovating Raspberries
For Summerbearing Red Raspberries:
• Remove spent canes after crop is produced
• Remove any weak or broken primocanes.

For Fallbearing Red Raspberries:
• For summer AND fall crops: same as for summerbearing red raspberries.
• For a large fall crop ONLY: prune all canes at ground level in late winter/early spring.

Raspberry Harvest & Storage
• Ripe fruit separates easily from the plant.
• Fruit is delicate: handle gently, place in shallow containers and refrigerate immediately.

Some Common Raspberry Damage from Insects and Disease
Fungal Cane Diseases
Anthracnose and Spur Blight/Cane Blight
• Prune annually
• Prune at least 3 days before anticipated rain
• Remove or destroy all prunings
• Apply lime sulfur in spring before leaves are 1/2 inch long.
• Concentration: 1 1/3 cups per gallon water

Viruses can cause:
• stunting
• yellow, crinkled or twisted leaves
• crumbly berries
• symptoms that show up mid-season or later
• Virus-infect plantings must be removed.

Picnic Beetles (also known as sap beetles)
• Will attack other crops, including strawberries
• Attracted to overripe fruit
• Sanitation is best defense
• White patches on fruit:
  Heat Injury
• Caused by hot, sunny weather
• Causes drupelets to turn white/off-white

**Grapes in Minnesota**

Two types of grapes grown in Minnesota:

1. French Hybrid Types
   - *Vitis vinifera* X American types
   - Most require winter protection
   - For wine

2. American Types
   - *V. labrusca* in parentage
   - For table or juice

**Site Selection for Grapes**

- Provide site with sun and warmth
- South, SE, or SW slope
- South side of a structure
- Soil type: sandy to loamy; pH should be 6-7
- Avoid:
  - North-facing slopes
  - Low-lying areas
  - Poorly drained soils
  - Areas near 2,4-D use

**Training Systems for Grapes**

1. J System
   - For cultivars that require winter protection.

2. Four-Arm Kniffen
   - For cultivars hardy enough to be left on the trellis over winter.

**Training Hardy Grapes**

*First Year:*
- Prune newly planted vines to 2-3 buds.
- Train canes to grow upward.

*2nd Year:*
- Install trellis (if not already installed) before growth begins.
- Choose strongest cane for trunk.
- Allow vine to grow past top of trellis; prune just above this point when >1/4” in diameter.

*2nd Fall or Late Winter:*
- Entirely remove any canes not being kept.
- Prune remaining canes to 2 buds each.
Ongoing:
• Prune each fall or late winter to leave 4 canes
• 5-7 (wine) or 10-15 (table) buds per cane
• Also leave 4 renewal spurs at pruning

Grape Harvest
• Rely on your taste buds
• Use pruners to harvest
• Store fruit in vented plastic bags in refrigerator
• Do not wash fruit until ready to use

Common Issues with Grapes
Black Rot
• Infests shoots, tendrils, petioles, new leaves, and berries
• Berries turn brown, shrivel, turn black, & become covered with pycnidia
• American types generally more resistant
• Sanitation
• Fungicides from 4-6” stage to color change

Mildews
1. Downy Mildew
• Conditions: wet weather
• Underside of leaf
• American types generally more resistant
• Improve air circulation
• Use fungicides

2. Powdery Mildew
• Conditions: warm & humid.
• American types generally more resistant
• Top of leaf surface
• Improve air circulation
• Use fungicides

Blueberries
Two commercial species found in NE U.S.:
1. Vaccinium corymbosum (Highbush)
2. V. angustifolium (Lowbush)

Cross the two species = Half-high Blueberries

Other non-UMN cultivars: ‘Patriot’, ‘Bluetta’

Site Preparation for Blueberries
• Prepare soil and plant young bushes in late April or early May
• Acid soil is required - acidify soil the year before planting; soil pH of 4.0-5.0 is optimum
• To acidify soil, amend:
  • acid peat
  • elemental sulfur
• If soil pH is >7, acidify in stages
Planting Blueberries

**Plant two or more cultivars**
- Plant more than one variety for pollination.
- Larger berries
- Greater number of berries
- Earlier harvest
- More uniform ripening

**Plant spacing:**
- 2-3 feet for hedge
- 4 feet for max fruit

**Basic Care for Blueberries**
- Fertilize annually in spring
  - 1st 3 years: 2 oz. (1/4 cup) ammonium sulfate per plant
  - Ongoing: 4 oz. (1/2 cup) per plant
- Apply frequent, shallow irrigation
- Mulch plants
- Winter protection is beneficial especially with lack of snowfall
- It may be necessary to protect your fruit from birds - use 1/4” netting

**Pruning Blueberries**
*First 5 Years:*
- Remove dead/damaged wood only

*Ongoing:*
- Remove oldest wood annually

**Blueberry Harvest & Storage**
- Fruit will not ripen all at once.
- Hold the fruit cluster in your hand and gently roll your thumb over the berries.
- Blueberries may be placed in deep containers.

**Currants & Gooseberries**
- Half-day sun tolerant
- Tolerates wide pH range
- Prefers later spring warm-up
- Prefers moist, well-drained soils
- White pine blister rust: European black currants & wild gooseberries are main hosts
- U of Wisconsin recommends staying 1000 feet from white pines or wild currants/gooseberries

**Planting Currants & Gooseberries**
- Space at least 3 feet apart in rows at least 6 feet apart
- Plant deeply: cover 2-3 buds of lower canes
- Provide 2-4 inches of mulch at planting

**Caring for Currants & Gooseberries**
- Provide N annually (1/8-1/4 cup ammonium nitrate per plant)
- Prune in early spring
- 1, 2 & 3 year-old plants:
  - Keep 4-5 most vigorous new canes each year
- Remove only weak & damaged wood.
Ongoing:
• Prune out oldest wood & weakest wood to maintain 9-12 canes of 1-3 year old wood.

Common issues with Currants & Gooseberries
**Anthracnose & Septoria Leaf Spot**
• Sanitation—remove all fallen leaves

**Powdery Mildew**
• Maintain good air circulation
• Apply sulfur fungicide if necessary

**Apples**
• Plant apples developed for your appropriate zone and for Minnesota climate.
• Consider:
  • Intended Use
  • Flavor Preference
  • Disease Resistance
  • Season of Ripening
  • Two different cultivars necessary
  • 2nd tree within 100 feet

**Minnesota Cultivars**
‘Oriole’ (unknown parentage, 1949)
• Mid-August
• Fine fresh, great flavor in pies
• Stores a couple of weeks

‘State Fair’ (Mantet X Oriole, 1978)
• Mid-late August
• Crisp and juicy
• Classic “apple” flavor
• Stores 2-4 weeks

‘Zestar!’ (State Fair X MN 1691, 1998)
• Late August
• Great sugar-acid balance; tops in many taste panels
• Moderately resistant to fireblight
• Stores nearly 2 months

‘Chestnut Crab’ (Malinda O.P., 1946)
• Early September
• Crispy, highly flavored
• A good kid-sized apple
• Russet is part of normal appearance
• Resistant to cedar-apple rust
• Stores a few weeks

‘Sweet Sixteen’ (MN 447 X N. Spy, 1978)
• Mid-late September
• Large and sweet
• Very aromatic, with cherry/bubblegum notes
• Somewhat resistant to fireblight
• Stores about 1 month
‘Honeycrisp’ (Macoun X Honeygold, 1990)
• Late September
• Well-balanced, aromatic
• Juicy, uniquely crisp texture
• Stores up to 6 months
• Minnesota State apple

‘Honeygold’ (Golden Del. X Haralson,’72)
• Sweet, well-balanced flavor
• One of the best all-purpose apples
• Stores 3 months
• Resistant to cedar-apple rust

‘Keepsake’ (MN 447 X N. Spy, 1979)
• Mid-October
• Very aromatic
• Light yellow, firm, crisp flesh
• Flavor mellows in storage
• Somewhat resistant to fireblight and cedar-apple rust
• Stores up to 5-6 months

‘Liberty’
• Late Sept.-early Oct.
• Coarse, crisp, juicy texture
• Fine, mild flavor
• Stores up to 2 months
• Resistant to apple scab!

Rootstock Selection: Dawrf Rootstocks
• Takes up less space
• Easier to manage pests
• Bear fruit earlier
• No ladders
• Can plant multiple cultivars
• M26 a good, hardy choice; Avoid M7.
• Also: P 22 and Bud 9

Planting
• If bare-root:
  • keep cool & moist until planted;
  • soak roots 4-8 hours before planting.
• If containerized:
  • At planting, spread the roots or make several vertical cuts through roots.
• Why we still plant apple trees deeply:
  • Minimize root suckering
  • Minimize burr knots
  • Anchor plant
• Therefore: the graft union should be 2-3 inches above the soil line.
• Do NOT add fertilizer at planting time!
Staking
- M7 or larger does not require staking.
- M26: stake for 3-5 years (can use shorter stake).
- M9, Bud 9, P22: stake for the life of the tree.
- Suitable materials: 3/4” conduit, 2x2” lumber
- To secure the tree, use tape, fabric strips

Mulching
- Prevents rootzone competition until established
- A Method to Try: 2-ring mulch donut
  - Inner ring: pea gravel (2-3’ diam.)
  - Outer ring: rotted hay, wood chips, etc. (at least to dripline)

Fertilization
- Fertilize annually with N-containing fertilizer.
- Apply liquid fertilizer to mulched trees.
- Rule of thumb: Apply 1 oz. actual N for each year of tree age not to exceed 16 oz.
- Be sure to include lawn fertilizers in your annual calculations (See Soils textbook)
- Shoot growth on nonbearing trees: 12-18”
- Shoot growth on bearing trees: 8-12”
- If growth is less: increase N by 25%.
- If growth is more: withhold N for one year.

Pruning and Training
At planting time
- If unbranched:
  - Prune trunk to 30-40” tall.
  - Ensure that branch angles of newly-developing scaffold branches are wide enough.

- If branched:
  - Leave desirable branches.
  - Do not tip branches.
  - You want 4-5 branches spaced evenly around the tree.
  - If branches are poorly spaced, remove them and prune as for an unbranched tree.
  - If a branch is well placed, but has a narrow branch angle, use a spreader to widen the angle.

Ongoing pruning and training
The primary goal of training and pruning an apple tree is to maximize light penetration to as much of the tree as possible.

General Rules of Pruning
- Prune apple trees annually, in mid-late winter—just before bud break is the optimum time.
- Suckers are best removed in late summer—they are less likely to quickly regrow.
- Watersprouts may be removed throughout the summer if dry weather is forecast.
- Prune young trees to develop a strong structure and bearing trees to maintain continuous production.
- Heading cuts result in vigorous vegetative growth, delay fruiting and increase shading problems.
- Thinning cuts are preferable to heading cuts

First Dormant Pruning
- If the tree was unbranched at planting: Select 4-5 properly spaced branches.
- If the tree was branched at planting: Select second
set of “scaffold” branches.

Common issues with Apple Trees

Apple Maggot

- Manage apple maggots by trapping and spraying adult flies in July
- Once they lay eggs in the apple flesh there is no effective management.
- Trapping is less effective than spraying.
- Insecticide sprays help manage flies before they lay eggs
- Maggots overwinter in cocoons in the ground.
- Sanitation: Pick up fallen apples and bury them at least a foot deep (or make cider, cook or feed to livestock)
- Encourage neighbors with apple trees to practice good sanitation methods.

1. Management Method 1: Hang a trap and spray whenever you have trapped at least 5 flies in one week. Apply by spraying to cover all surfaces of leaves and fruit. carbaryl, phosmet or diazinon after July 1st. Or, beginning July 1, spray two days after rainfall or watering of 1/2-inch or more (less effective than trap test) OR spray every 10-14 days beginning July 1 (most effective but uses most insecticide). Do not pick apples sooner than the time indicated on the insecticide label.

2. Management Method 2: Hang a red sphere treated with Tangletrap® in the tree and begin spray program only when adult flies are caught. Trap flies (1/4-inch long with black/white banding on wings and a white spot on body) with sticky red sphere traps, hanging about five in a standard tree. Hang traps by July 1.

3. Management Method 3: Hang 1 treated red sphere per 100 apples and remove dead flies often to maintain a glossy surface. Renew treatment every 2 weeks. Least effective method

4. Management Method 4: Bagging - Enclose individual fruits in plastic bags, either regular or Ziploc, around July 1st. Staple the opening securely closed and cut off the bottom corner of bag.

For all methods: Pick up all fallen fruit immediately!

Codling Moths

Damage description:
- Tunnel from outside of fruit to the core
- missing seeds and nearby tissues
- Orange sawdust material at calyx end.

Insect description:
- Adult moths have shiny golden-brown wing tips.
- Larvae are creamy white to pinkish with a dark head. They have legs and pro-legs.
- Egg-laying occurs at about petal fall.

Control and Management:
Apply diazinon or methoxychlor (botanical altryania) at petal fall and once more 7-10 days later.
- Reduce the number of unsprayed apple, pear and hawthorn trees within 100 yards.
- Pick up and dispose of windfalls.
- Clean up brush piles.
Plum & Apple Cuculios

Damage description:
- Crescent-shaped scars

Insect description:
- Native pest with many hosts.
- Adult weevils are less than 1/4” long and are gray-brown to dark brown (reddish if A.C.).
- Larvae grow to 1/4” and are pale and grub-like.
- Curculios damage young fruit through feeding and egg-laying.

Control and Management:
- Beginning at petal fall, look for crescent-shaped scars.
- If found, treat with diazinon or methoxychlor twice.
- The same spray can control both curculio and codling moth.
- Dispose of windfalls ASAP.
- Organic methods: padded stick, chickens.

Apples Scab

Damage description:
- Apples blackened and cracked

Disease description:
- the most serious disease of apples in Minnesota
- Control includes both cultural and chemical practices. Chemical control is required during wet seasons, but may not be required during dry seasons if good cultural practices are followed
  - at 61-75º: 6 hours
  - at 52º: 9 hours
  - at 41º: 21 hours
- Daylight is necessary for initiation of infection

Control and Management
- Plant resistant cultivars such as ‘Liberty’
- Sanitation - Remove and dispose of infected apples and fallen leaves.
- Annual pruning will increase airflow and reduce moisture

Methods of treatment for less resistant cultivars:
- Begin treatment program at “pink” stage or after 3 infection periods, whichever comes first.
- Method 1: ASAP after any infection period, apply captan, thiophanate-methyl or sulfur. Maintain coverage through June, then assess.
- Method 2: Use above fungicides every 7-10 day through June, then assess.
- If no lesions are found at the end of June, discontinue sprays.

Cedar Apple Rust

Damage description:
- Bright yellow lesions

Fungus description:
- Occurs on both cedar and apple trees, and requires both hosts to survive and reproduce.
- Telial horns: orange gelatinous structures composed of fungal material growing on the cedar branches.
- The brown woody structures, from which horns appear, as known as galls.
- Appear in spring during wet periods.
- Older, nonactive galls will be brown, shriveled and woody.
• Galls typically do not damage the cedar and may be pruned out.

Control and Management:
• The disease can cause problems on apple trees and may require chemical control to prevent infection. Method 1: Plant resistant cultivars such as ‘Liberty,’ ‘Chestnut Crab,’ ‘Keepsake.’
• Method 2: Remove all galls on eastern red cedars and junipers near your trees in spring. Apply captan or thiophanate-methyl after a rain beginning at 1/2” green tip. Repeat until petal fall.

Fire Blight
Damage description:
• Apple tree wilting

Disease description:
• A problem in warm, wet weather.
• Spread by rain and insects.
• Can enter through flowers, wounds, and possibly stomata.

Control & Management:
• Plant resistant cultivars such as ‘Sweet Sixteen,’ ‘Zesta!’, ‘Keepsake.’
• Prune out infected shoots 12” below visible infection; disinfect pruners between cuts in 10% bleach solution.
• Avoid excessive N