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Fruit Handbook for Western Washington

VARIETIES AND CULTURE







WASHINGTON STATE UNIVERSITY EXTENSION

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INTRODUCTION

The ***Fruit Handbook for Western Washington*** is intended as a guide for both home growers and commercial orchardists.

The information in this bulletin is based on fruit evaluation trials conducted during the past 40 years at Washington State University Mount Veron's Northwestern Washington Research and Extension Center (WSU NWREC) located in the Skagit Valley, several miles west of Mount Vernon, a coastal area west of the Cascade range. The coastal maritime climate of western Washington, particularly the Puget Sound region, is characterized by mild wet winters and relatively dry summers with moderate daytime temperatures and cool nights. While the various climatic zones within western Washington may favor different varieties of fruit, most of those listed here will bear reliably year after year. Although a hard frost in February or March can damage early flowering fruit kinds like apricots, it is rarely cold enough to do permanent harm to temperate-climate varieties.

This bulletin covers the selection and cultivation of standard tree fruit kinds generally found in temperate zone orchards: apples, pears, Asian pears, plums, cherries, peaches, nectarines, and apricots. Also discussed here are some of the fruiting shrubs (currants, gooseberries, aronia, sea buckthorn or seaberry) and vines (grapes,[1] kiwis) that have been tested over the years at Mount Vernon. Other fruit kinds such as figs, quinces, persimmons, pawpaws, and berries that have potential as alternative fruit crops are mentioned as well, and covered in greater detail in another bulletin.[2] This handbook does not discuss blueberries, strawberries, raspberries, and blackberries, all of which are covered in detail in another previous bulletin.[3]

Whether you are choosing two or three favorite varieties for a small urban backyard or have a larger orchard for family and even farmers-market production, you will find useful information here on variety selection and basic factors of orchard culture, as well as references to further information in other WSU Extension Bulletins. A glossary and a calendar for planning your fruit culture activities appears at the end of this handbook.

[1] See **EB2001** ***Growing Wine Grapes in Maritime Western Washington***, available online at http://cru.cahe.wsu.edu/CEPublications/eb2001/eb2001.pdf.
[2] See **EB2002** ***New Alternative Fruit Crops for Western Washington*** available online at http://cru.cahe.wsu.edu/CEPublications/eb2002/eb2002.pdf.
[3] See **EB1640** ***Growing Small Fruits in the Home Garden*** for detailed information; available online at http://cru.cahe.wsu.edu/CEPublications/eb1640/eb1640.html.

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Fruit Handbook for Western Washington: *Varieties and Culture*

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SECTION I: SELECTING VARIETIES AND ROOTSTOCKS

Variety Descriptions

The varieties described in this Fruit Handbook are proven favorites; however, other unlisted varieties will grow well in our western Washigton area. We have focused on the best ones currently available and mention some promising introductions that have not yet been fully evaluated.

Some of these varieties are commercially grown and others are of special interest primarily to home gardeners. Most can be found in nurseries that specialize in tree fruit. Types of fruit are listed according to ease of growing, and varieties are listed in approximate order of ripening. At the end of each section are listed some trial varieties that have performed well initially, but haven't been established long enough for a full evaluation. These are worth trying for their future potential as they become more available at the nurseries.

Apple terminology

Apples that are primarily for fresh eating are categorized as "dessert apples," those used for any cooking purpose are "culinary," and those special varieties used in making hard (fermented) cider are called "cider apples."

Apples

There are several thousand known varieties of apple (*Malus domestica Borkh*), some dating back 300 years or more. Since apples tolerate many different soil and climate conditions, they have adapted to orchard culture in many areas of the globe. Most varieties will grow and produce fruit in the Puget Sound region, but fruit quality in some varieties may be less than best, and some are more subject to diseases or not as grower-friendly. A few very late varieties do not get enough heat in our climate to ripen properly in most years.

Apples also have a wide range of flavors, tartness, and types. Because flavor, tartness, use, and type are such important components of fruit selection, we have classified the varieties subjectively by these characteristics.

Sweet—low to moderate in acid, moderate to high in sugar

- **Sunrise**—Ripe early to late August. Red stripe over yellow, attractive, variable ripening of fruit requires multiple pickings, good flavor, tender flesh disappears in the mouth, very productive.
- **Gala strains**—Ripe mid September. Standard Gala is bicolor; most commercial strains are from 70–100% red. All are characterized by very firm dense flesh with sweet flavor. Gala strains are very productive and need considerable early thinning for best fruit size and quality.

Japanese introductions are mostly sweet, since sweet flavored apples are preferred in that cultural area:

- **Sansa**—Ripe late August to early September. Cross of Gala is an attractive bicolor with complex flavor, firm texture, below medium in size.
- **Tsugaru Homei**—Ripe early to mid September. Large, mostly red bicolor, very crisp and juicy, mild sweet flavor, very low acid.
- **Early Fuji strains**—Ripe mid September to early October. Very firm, sweet flavor, excellent keeping quality. **Beni Shogun** shows some tendency to skin russeting.

September Wonder (**Jubilee**) usually has less russet and better finish than **Beni Shogun**. Not yet tested at NWREC, **Auvil Early Fuji** is a similar early strain from central Washington.

Sweet-tart—moderate in acid, moderate to high in sugar

- **Honeycrisp**—Ripe mid September to early October. Large bicolor, red stripe over yellow, needs selective harvesting for best storage quality. Popular for its very crisp, firm texture that seems to disappear in the mouth.
- **Jonagold strains**—Ripe late September to early October. Standard **Jonagold** is bicolor red blush over yellow. Commercial strains are redder, either "blush" color pattern (**King Jonagold, Rubinstar, Jomured**) or "stripe" (**DeCoster, Jonagored**). Preference depends mainly on the target markets. **Jonagold** is a high quality apple used for dessert, culinary and cider. All strains of **Jonagold** tested at Mount Vernon will produce good quality fruit with proper attention to their cultural needs.
- **Melrose**—Ripe mid October. Mostly red color, skin tends to russet. A standard dual purpose apple for fresh eating and culinary use, excellent late keeper, well adapted to regional climate, flavor similar to old **Tompkins King** variety.

Japanese introductions that are more tart in flavor:

- **Akane**—Ripe early to mid September. Bright red apple with distinctive flavor, productive, uniform, below medium size. Keeps better on the tree than in storage, can be picked for a month without losing crispness and quality. Similar to **Jonathan**.
- **Shizuka**—Ripe early to mid October. **Golden Delicious** cross from Japan, large, productive, more attractive than **Mutsu** and ripens earlier, good quality, stores well.
- **Mutsu**—Ripe late October to early November. Large yellow fruit with rather uneven shape, good flavor and excellent long term storage. Trees are vigorous and productive. Ripens best on dwarfing **M9** rootstock in our area.

A number of crosses of **Cox's Orange Pippin**, a famous English apple noted for its complex gourmet flavor, are characterized as Cox types:

- **Alkmene**—Ripe early to mid September. Yellow striped with red, below medium size, firm and crisp with good flavor. Trees are productive and moderately vigorous.
- **Rubinette**—Ripe early October. Yellow striped with red, light russet in streaks and patches. Below medium in size, productive and fairly uniform, complex flavor; stores very well. Used also in cider.

McIntosh types, mostly sweet-tart, derived from the historic Canadian variety popular in the Northeast, are aromatic with tender-crisp white flesh, wine red skin color, and powdery "bloom" (wax finish) on the skin. Storage length for most McIntosh types is moderate and they are best used by Christmas. Many do very well in cool maritime climates.

- **McIntosh sports**—Usually variations selected for better red color. Most are ripe in mid September. Trees are moderately to very productive.

Figure 1. DeCoster Jonagold

Figure 2. McIntosh

- **Jonamac**—Ripe mid September. Cross of **McIntosh x Jonathan**, well adapted to western Washington conditions, reliable, productive, good flavor, fair keeper.
- **Spartan**—Ripe mid to late September. Cross of **McIntosh x Newtown Pippin**, it is a longtime standard variety in our area. Dark red with crisp, cream-white flesh. Productive, but may overcrop; needs to be thinned for good size. Stores well.
- **Redcort**—Ripe early October. Red sport of **Cortland**, a cross of **McIntosh x Ben Davis**. Productive vigorous trees seem to have less fruit drop than standard **Cortland**. Good flavor and fair keeping quality, cut apples are slow to discolor, good for salads.
- **Empire**—Ripe mid to late October. Cross of **McIntosh x Delicious**, reliable and productive, good flavor with firm crisp flesh, good long term storage. Needs early thinning to size well. Red strains **Royal Empire** and **Thome Empire** have solid dark red color that is very attractive. Stores well.

Tart—moderate to high in acid, moderate to high in sugar

Cox types, derived from **Cox's Orange Pippin**:

- **Elstar**—Ripe mid to late September. **Elista** and **Valstar** are red sports of **Elstar**. Productive though fruit size may be medium or below; fruits are flavorful, tart at harvest and mellowing in storage, high quality.
- **Karmijn de Sonnaville**—Ripe early to mid October. Unattractive color, often russeted, strong, sharp flavor at harvest. A gourmet special best adapted to home orchards. High in both sugar and acid, fruit develops distinctive spicy flavor after 3–4 weeks in storage.

A late ripening variety from New Zealand also fits this category:

- **Braeburn**—ripe late October to early November. Late season storage apple of very high quality, firm, crisp. Look for earlier ripening strains such as **Hillwell**, which has more attractive color, and ripens slightly earlier than standard **Braeburn**.

Culinary varieties

Culinary varieties are primarily used for cooking (e.g., sauce, pie, baked apples, etc.). Not all culinary apples can be used for every purpose; some are best for pies, others for sauce, and others for baking whole.

- **Gravenstein strains**—Ripe early September. Both **Red** and **Common** strains are widely grown in western Washington. Fruit is top quality for sauce, producing a sweet-tart product with strong apple flavor. Problems of alternate bearing sometimes develop, especially when trees are not thinned in heavy bearing years.
- **Bramley's Seedling**—Ripe early October. Old standard English culinary apple, red stripe over yellow, large to very large, firm and crisp. Excellent pie apple, also used for baked apples and sauce. Good natural resistance to apple scab and mildew.
- **Ashmead's Kernel**—Ripe early to mid October. Classic russet apple used for dessert, culinary use (desserts and hard cider), originating in Gloucester, England, about 1700. Sweet-tart flavor with some spicy overtones. Good natural resistance to scab. Stores well.
- **Belle de Boskoop/Red Boskoop**—Ripe mid to late October. Dual purpose apple excellent for culinary uses (particularly pies and sauces), with firm, crisp flesh; remains tart even after storage. Fruits are large to very large and the trees vigorous and productive. **Red Boskoop** is a red sport of the old **Boskoop** variety.

Disease resistant varieties

Disease resistant apples are immune to most races of apple scab, and some have good natural resistance to other diseases. However, they can

Figure 3. Gravenstein

still be damaged by insect pests and affected by cultural factors such as soil fertility and water stress. Although these varieties are less demanding of growers' attention than most, no apple orchard can thrive if pest and disease problems are totally neglected.

- **Pristine**—Ripe early to mid August. Clear yellow skin is very attractive. One of the earliest disease resistant varieties, with a refreshing flavor and firm crisp flesh. Moderately tart, holds well on the tree.
- **Williams' Pride**—Ripe early to mid August. Attractive red stripe over yellow, good flavor but susceptible to mildew.
- **Chehalis**—Ripe early to mid September. Yellow apple with good natural resistance to scab but susceptible to mildew. Thin skin bruises easily. Good dual purpose for fresh eating and sauce but too soft for pies.
- **Prima**—Ripe early to mid September. Attractive bright red over yellow, at its best when fresh from the tree but texture softens rapidly in storage. Good mildew resistance.
- **Dayton**—Ripe early to mid September. Trees are vigorous and crop well, but may need a year or two in production to reach good quality. Fruit is unattractive dark orange red over yellow. Flesh is crisp, juicy, with sweet-tart flavor. Stores better than **Prima**.
- **Liberty**—Ripe early to mid October. Attractive, uniform red fruit with good flavor, very similar to **Spartan** in appearance and quality. Trees are very productive and need effective thinning for good fruit size. Well adapted to western Washington conditions.
- **Enterprise**—Ripe mid to late October. Mac type, flavor fair to good, firm, crisp. Moderately productive. Stores well until December, then flavor starts to decline.
- **Belmac**—Ripe late October. Late season Mac type, good flavor, firm and crisp. Productive, vigorous trees. Fruits store well until February.

Heirloom apples

Heirloom apples are those older varieties that have been grown since early days of settlement in this area. Apples were a major crop, especially in the islands and communities bordering the Puget Sound. Much of the fruit was shipped out to market in barrels. Today many of these old trees can still be found in abandoned orchards, not uncommonly over 100 years old. Identification of these varieties is becoming a lost art. A few, like **Gravenstein**, are still in commercial markets, but most have been superseded by newer introductions that are more grower friendly, have improved harvest and storage characteristics or better resistance to diseases. Some are still worth growing for enthusiasts who are looking for that "old time apple" taste.

Most are sweet-tart to tart. Varieties that were commonly planted in earlier times are: **Yellow Transparent, Tydeman's Early, Tompkins King, Roxbury Russet, Yellow Bellflower, Wolf River, Hudson's Golden Gem, Rhode Island Greening, Golden Russet, Northern Spy, Baldwin, Newtown Pippin,** and **Esopus Spitzenberg**, to name just a few of the many to be found in old area orchards.

Apples specifically used for producing hard cider are in a category of their own. Most specialty cider apples with the higher levels of tannin and/or acid needed for blending quality cider can be quite inedible from the tree and are grown only for use in cider pro-duction. Some general-purpose varieties such as **Bramley's Seedling**, **Golden Russet**, and **Roxbury Russet** are also used in cider making.

For more information on varieties and cider making, see the Mount Vernon link at http://mtvernon.wsu.edu/frt_hort/ciderapples.htm and check the Northwest Cider Society web site at http://www.nwcider.org/.

Figure 4. Golden Russet

What is apple cider?

In common American usage, "fresh cider" or "sweet cider" is the apples' raw juice that has not been filtered to remove the pulp and sediment. The term "apple juice" indicates that the juice has been filtered to remove those solids, whereas raw apple juice that has been fermented is called "hard cider," and may or may not be filtered.[1] Both fresh cider and apple juice may or may not be "pasteurized"—a process by which the liquid is heated to kill bacteria and cooling it quickly to prevent a "cooked" taste. To differentiate between the levels of alcohol in fermented apple juice, the term "hard cider" is used for the lower levels of alcohol content, while "apple wine" is reserved for the higher levels of alcohol content.

[1] Definition of apple juice and apple cider from the Massachusetts Dept. of Agricultural Resources at http://mass.gov/agr/massgrown/cider_juice_difference.htm.

Recent apple introductions

- **Zestar!**—Ripe early to mid August. Cross of **State Fair x MN 1691** from Minnesota, attractive red stripe over yellow, productive, good flavor, holds well on the tree.
- **Silken**—Ripe mid August to early September. Cross of **Honeygold x Sunrise**, introduced from Summerland, B.C. Attractive yellow, size medium or below, holds very well on tree and retains firmness; good quality, not for long storage.
- **NY 75414-1**—Ripe mid September. Scab immune selection from Geneva, NY, cross of **Liberty x Macspur**. Very attractive dark wine red with conspicuous pale dots, crisp white flesh, good flavor. Not yet named but trees available from some nurseries specializing in tree fruit.
- **Rajka**—Ripe late September to October. Cross of **Champion x UEB** 1200/1 from the Czech Republic; scab immune, bright red, very firm, sweet-tart flavor, holds well on tree, productive.
- **Millenium (NY 460)**—Ripe mid to late October. Cross of **Schoharie Spy x Empire** from Geneva, NY. Attractive dark red, excellent late keeper with **McIntosh** characteristics.

Pears

European Pears

Many different varieties of pears (*Pyrus communis*) are well adapted to western Washington and can be grown very successfully in most locations. They can tolerate heavier soils. Fireblight (*Erwina amylovora*), though a serious disease, is rarely seen in maritime western Washington. The following list includes those that have shown the best overall performance in long-term trials.

Fall pears—pick in August–September, store for 4–6 weeks

- **Red Clapp's Favorite** (**Kalle strain**)—Pick late August. A red-skinned sport of the old American variety, productive, light sweet flavor, not highly aromatic. Unlike many red-skinned pears, its leaves are green.
- **Orcas**—Pick early September. Local seedling selected for disease resistance, fruit is large, uniform, good for canning and drying as well as fresh eating, sweet mild flavor, resistant to pear scab.
- **Rescue**—Pick early to mid September. Local seedling selected for disease resistance. Fruit is large to very large, often with a red blush up to 50% of skin surface. Sweet mild flavor, good for canning and fresh eating.
- **Bartlett**—Pick early to mid September. Standard commercial pear, distinctively aromatic, used widely for both fresh eating and canning. Susceptible to pear scab.

Winter pears—pick in September–October, store for 3–4 months

- **Seckel**—Pick mid September. Classic old American variety, sweet rich flavor, small size. Shorter storage than later winter pears, best if kept no more than 8–10 weeks.
- **Concorde**—Pick mid September. Cross of **Conference x Comice** from England, fruit is similar to **Conference**; good flavor, stores well, productive.
- **Comice**—Pick mid to late September. **Comice** is an old French variety. Excellent dessert quality, sweet and very juicy. Stores until Christmas.
- **Conference**—Pick mid to late September. English variety known since 1895, standard quality dessert pear in Europe for many years,

Figure 5. Bosc

Figure 6. Mishirasu

less familiar in the U.S. Long pyriform fruit with russet skin patches, sweet flavor, used for cooking as well as dessert, excellent late keeper.

- **Bosc**—Pick late September. Old French variety, classic late dessert pear; russet brown skin, rich buttery flavor, firm almost crisp flesh and pleasant aroma, also good for culinary use (baking, poached pears); excellent late keeper.

Recent pear introductions

- **Stutgarter Gieshirltle**—Pick early to mid August. Very early ripening, small roundish fruit, sweet and firm. Can be eaten right off the tree. Fruits hang well on the tree without much internal breakdown. Trees are small and very productive, needs branch support.
- **Blake's Pride**—Pick early to mid September. Attractive light russet, uniform, good flavor; recently introduced from USDA after selection for disease resistance.
- **Honeysweet**—Pick early October. Similar to **Seckel**, but larger; sweet, good flavor, trees productive.

Asian Pears

Cultivated historically in China, Japan and Korea, originating from several pear species in eastern Asia, Asian pears (*Pyrus pyrifolia*) have gained recent popularity for fresh eating and for use in salads. Several varieties are well adapted to western Washington. They bloom earlier than European pears, so trees tend to be more sensitive to frost damage in early spring. Varieties are susceptible to bacterial infection (*Pseudomonas syringae* pv. *syringae*), so avoid pruning during rainy periods. Asian pears can be eaten fresh from the tree. They do not need storage to ripen out, and most varieties will not store longer than two months without loss of flavor. Fruit is usually roundish with yellow, tan, brown, or russet skin. The flesh is crisp and crunchy, unlike the smooth melting texture of ripe European pears. Most varieties set too much fruit, so thinning in early summer is usually needed for good fruit quality.

- **Hamese**—Ripe early August. Yellow skin, reliably productive, bears very sweet, juicy fruit, easily bruised in picking. Fruit tends to be small and needs careful thinning.
- **Shinseiki**—Ripe in early to mid September. Yellow skin, high quality with crisp, white, juicy flesh, a mild, sweet flavor. Trees are productive and fairly disease resistant.
- **Kosui**—Ripe in early to mid September. Russeted tan skin, flesh is crisp, juicy and very sweet. A high quality pear but susceptible to bacterial infection in western Washington. Thin early and hard to produce large size fruit.
- **Mishirasu**—Ripe in late September to early October. Rough brown russet skin, large to enormous fruit, some weighing a pound or more. Unattractive appearance, but good flavor. The crisp, crunchy flesh makes it a good choice for salads as well as fresh eating.
- **Chojuro**—Ripe in mid to late September. Russet tan skin, crisp juicy flesh with a hint of spice especially eaten with skin on. A proven producer, well adapted to western Washington.
- **Atago**—Ripe in mid October. Recent introduction, attractive russet tan skin, productive and late ripening, it stores very well. Crisp juicy flesh with a hint of spice, especially eaten with skin on.

Plums and Prunes

European types (*Prunus domestica*) and some Japanese types (*P. salicina*) are consistently successful in our area. Most plums require cross-pollination. European types may be partially self fruitful, but yield better with cross-pollination. Japanese, American hybrid (*P. institia*) and European plums can cross pollinate but their bloom times do not normally overlap, as European types tend to bloom much later; however, in some areas, early-blooming plums may set poorly due to cold weather at bloom time. Aphids are common on new growth, particularly the European types, requiring timely delayed dormant spray for control.

Japanese and hybrid types

Japanese and hybrid types tend to have a more spreading tree habit, with very juicy fruit that is cling stone, not well adapted to drying or canning. Some make excellent jelly.

- **Methley**—Ripe mid to late July. Dark red skin, red flesh, small round fruit, juicy and sweet, very productive. Makes beautiful wine-red jelly.
- **Beauty**—Ripe mid July to early August. Red skin, yellow flesh, fruit medium size, ripens over 2-week period. Very juicy and a good substitute for **Santa Rosa** which usually does poorly in western Washington.
- **Shiro**—Ripe late July to early August. Yellow skin and flesh, large very juicy fruit, sweet, very productive. Most reliable Japanese type, well suited to western Washington.

Figure 7. Beauty

- **Hollywood**—Ripe mid to late August. Dark red skin, red flesh, medium size oblong fruit, good quality. Good ornamental—edible, with abundant pink flowers and purple foliage, less productive than some.

European types

European types tend to have an upright tree habit, with firm-fleshed fruit that is free stone, often used for drying and canning.

- **Early Laxton**—Ripe mid to late July. Yellow skin, blushed pinkish orange, yellow flesh, dense, sweet, fruit small. Productive, with spreading habit well suited to home gardens; vigorous tree.
- **Imperial Epineuse**—Ripe late July to mid August. Purple-blue skin, greenish yellow flesh, excellent flavor, fruit medium size, productive, reliable.
- **Early Italian types** (**Richards' Early**)—Ripe mid to late August. Blue skin, greenish yellow to yellow flesh, medium or slightly below in size, dense sweet flesh, suited for both drying and canning as well as fresh. Most Italian prune types do well in western Washington, though some may need thinning if they set too heavily.
- **Mirabelle**, **Geneva Mirabelle**—Ripe late August to early September. Yellow speckled skin, yellow flesh, small, round, and sweet. Classic variety often used for culinary (tarts, jam), very productive and reliable, well suited to backyard gardens.
- **Seneca**—Ripe mid August to early September. Reddish purple skin, yellow flesh, fruit large, completely free stone, high quality, either eaten fresh or used for drying and canning.
- **Victory**—Ripe late August to mid September. Blue skin, greenish yellow flesh, fruits medium large, dense, sweet, very productive, upright growth habit. Tree habit with large fruit, very ornamental.
- **Victoria**—Ripe early to mid September. Well known English variety. Purple-blue skin, yellow flesh, medium size, flavorful, productive; fruit usually needs thinning.
- **Valor**—Ripe mid September. Blue skin, yellow flesh, medium size, good flavor, reliable and productive.
- **Stanley**—Ripe mid September. Blue skin, yellow flesh, medium size, uniform, good flavor. An old standard for late season prune plums.

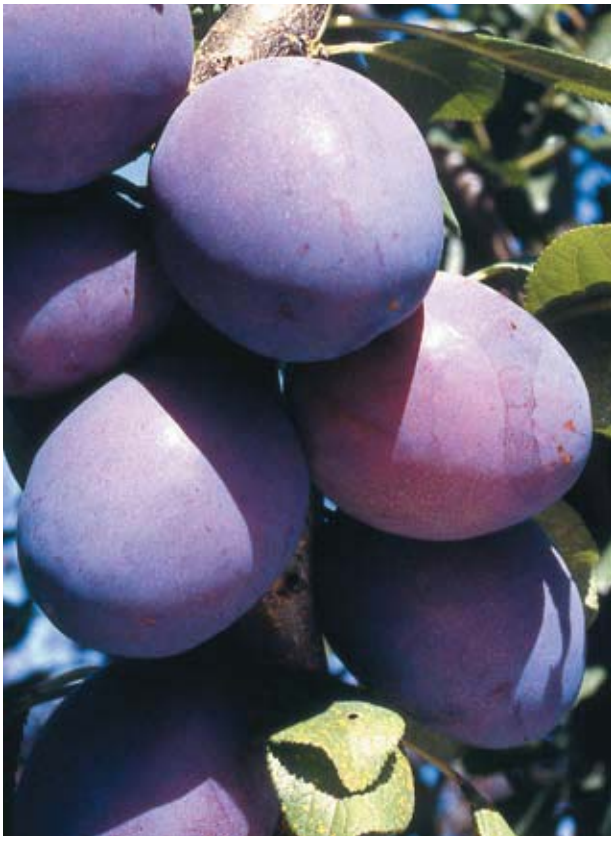

Figure 8. Victory

Recent plum and prune introductions

- **Obilnaja**—Ripe mid to late August. Red skin, yellow and red flesh, small, round, juicy and sweet. Trees vigorous and productive, early blooming. Good for jam and jelly as well as fresh eating.
- **Purple Gage**—Ripe late August. Purple-red skin, yellow flesh, medium size, roundish, firm, sweet and juicy, productive.
- **Longjohn**—Ripe early to mid September. Blue skin, greenish yellow flesh, large, attractive, distinctive oblong-pointed shape, free stone. Productive but trees often have areas of "blind wood" with no side branches or spurs.
- **Silver Prune**—Ripe early to mid September. Purple-red skin, yellow flesh, medium size, very sweet, productive.
- **Schoolhouse**—Ripe mid September. Yellow skin and flesh, large to very large, oblong shape, sweet, free stone, very productive. May need thinning some years.
- **Vision**—Ripe mid to late September. Blue skin, yellow flesh, medium size, very sweet flavor, excellent late season plum.

Cherries

Two major developments in cherry culture in recent years are the introductions of self-fruitful cherry varieties and very dwarfing cherry rootstocks (see ***Rootstocks***, below). High quality self fruitful cherries offer a number of benefits, particularly when grafted on dwarfing rootstocks to keep the tree small.

Since self-fruitful varieties need no pollinizer, they can be successful as single trees in areas where space is limited. Fruit production is more consistent than for cross-pollinated varieties, and in some cases trees are so productive that fruit thinning is needed. Crop loads can also be reduced by pruning out extra fruiting limbs.

Sweet cherries (*Prunus avium*) are subject to some potential problems. Rain cracking, caused by absorption of water through the skin of the ripening fruit, can damage much of the crop and provide entry for fungus rots. Later ripening varieties (ripe late July–August) are usually less subject to cracking because chances of heavy rain at that time are lower than in June. Trees of sweet cherry are also susceptible to bacterial canker, a potentially destructive disease. Bird damage to the ripe fruit is also a major problem.

Cherry trees grafted on highly dwarfing rootstocks such as **Gisela 5** are small (about 40% of standard) and can be kept below 10' in height. This allows trees to be netted for more effective bird protection, or even fitted with rain shelter to prevent cracking. The small trees can be pruned and harvested almost entirely from the ground, while producing high yields per unit area of orchard. When self fruitful varieties are

Figure 9. Lapins cherry on Gisela 5 rootstock

Cherry types

Most **sweet cherries (*Prunus avium*)**, when fully ripe, have dark red flesh with black or dark red skin. Some sweet cherries, called "white" cherries, have light yellow flesh and yellow skin with a bright red or pink blush that may cover up to 80% of their surface. In contrast, "gold" types have yellow flesh and skin with no blush.

Tart (pie) cherries (*Prunus cerasus*) are usually bright to dark red with either yellow flesh and clear juice (amorelle type) or red flesh and red juice (morello type). In Europe, most tart cherries are of the morello type, while in North America, amorelle type tart cherries predominate.

Duke cherries are considered to be a hybrid between sweet and tart cherries.

(Source: Childers et al., 1995. Modern Fruit Science.)

combined with a dwarfing rootstock, the result is ideal for urban yards where a standard cherry tree would not fit in.

Sweet cherry varieties that are not self-fruitful need cross-pollination between different varieties to set fruit. Some are not compatible with each other or may not overlap sufficiently in the blooming period. Tart cherries are all self fertile and do not need a pollinizer. They are capable of fertilizing sweet cherries but generally bloom too late to be dependable pollinizers.

Sweet cherries

***Self fruitful* cherry varieties** that do well in a cool maritime climate:

- **Black Gold**—Ripe early to mid July. New black cherry introduction from the Geneva, NY breeding program. Less productive than **Hartland**, of interest to backyard growers with room for only one variety.
- **White Gold**—Ripe early to mid July. White flesh cherry with red blushed skin. New introduction from the Geneva, NY, breeding program. Rainier type, productive, and sweet flavored. The only currently available self fruitful "white" cherry variety.
- **Lapins**—Ripe mid to late July. Introduced from the Summerland, B.C., research station. Sweet black cherry, very productive on **Giesela 5**, with commercial potential in the late niche market. This variety has been a winner in western Washington.
- **Sweetheart**—Ripe late July to early August. Recent introduction from the Summerland, B.C., cherry program. Sweet dark red cherry, not as productive as **Lapins** in our trials but good quality.

Other varieties that *require a pollinizer*, but also do well:

- **Early Burlat**—Ripe mid to late June. Old French variety, deep red fruit similar to **Bing** but softer in texture. Frequently attacked by birds before other cherries are ripe.
- **Hartland**—Ripe early July. Recent introduction from the Geneva, NY, breeding program. A very productive black cherry with good flavor; softer texture than **Bing**.
- **Kristin**—Ripe mid July. Winter hardy black cherry from the Geneva, NY, breeding program, well adapted to cool climate conditions. Low cracking; fruit tends to be small, sweet, firm and of good quality.
- **Bing**—Ripe mid July. Commercial standard for dark sweet cherries and still top rated for quality; can crack badly with rain at the wrong time, but sets well on **Gisela 5** in our western coastal climate.
- **Rainier**—Ripe mid July. Commercial market high quality white flesh cherry. Sometimes sets poorly in a maritime climate, but has done well on **Gisela 5** and **7** in Mount Vernon trials. Skin color is a bright red blush over yellow.
- **Angela**—Ripe mid July. Sweet dark red cherry, very reliable producer with softer flesh and generally low rates of cracking. Fruit size tends to be small for commercial market, better suited to home gardens.

Figure 10. White Gold

Figure 11. Surefire

- **Hudson**—Ripe early August. A late dark red cherry well established in eastern U.S. orchards. Tends to be slow to get into production, but on **Gisela 5** it may improve. One of the last varieties of the season.

Recent introductions

- **Vandalay**—Ripe early July. Dark red sweet cherry recently introduced from the Vineland, Ontario, research station. Self fruitful, very productive.
- **Tehranivee**—Ripe mid to late July. Blackish red sweet cherry from Vineland, Ontario. Self fruitful, very productive.

Tart (pie) cherries

Tart (pie) cherries were originally native to central Europe, usually bloom later than sweet cherries, and are all self fertile, needing no pollinizer. They are capable of pollinizing sweet cherries but generally bloom too late to be of use with most varieties. The fruit is much less susceptible to rain cracking and rot than sweet cherries, and trees are generally more resistant to diseases such as bacterial canker.

- **Surefire** (morello)—Ripe early to mid July. Recent introduction from the Geneva, NY, cherry program. Trees begin bearing at a very young age and are very productive. Bright red fruit is medium size and quite tart.
- **Montmorency** (standard, amorelle)—Ripe mid July. Classic pie cherry known in America for more than a century. Reliably productive.
- **Balaton** and **Danube** are morello type cherries developed in Hungary that have recently been introduced in the U.S., they appear rather promising and worthy of trial.

Peaches and Nectarines

Peaches and nectarines (*Prunus persica*) have been known and cultivated for some 4000 years. A nectarine is a fuzzless peach; the seed from a peach can produce a nectarine and vice versa. Flesh color is generally yellow, but white fleshed varieties are known and are becoming popular. *Peen-tao* or flat "doughnut" peaches from China are another novel type that is drawing attention both for home and market gardeners. They, as well, can be either yellow or white fleshed. In trials to date, these peaches (e.g., **Saturn**) have yielded high quality fruit but have not been very productive.

In western Washington most peach varieties are subject to leaf curl, coryneum blight and brown rot, diseases which require fungicides or other methods for prevention and control. Low productivity can also be a serious problem, since cold wet weather at bloom time often results in poor fruit set. Nectarines tend to be even more susceptible to these problems and in addition often suffer from skin cracking and rot. Most peaches and nectarines are self fertile. The following varieties have been the most reliable over several years of trials:

Figure 12. Peach harvest

Peaches

Currently available peaches

- **Harbelle**—Ripe early August. Free to semi-free stone, yellow flesh, medium size uniform fruit of fair quality, some split pits, very reliable and productive.
- **Harken**—Ripe early August. Semi-free stone, yellow flesh, good quality, productive and reliable, some split pits.
- **Starfire**—Ripe early to mid August. Free stone, yellow flesh, good flavor, uniform, attractive, consistently productive, some tendency to split pits.
- **Frost**—Ripe mid August. Semi-free stone, yellow flesh, fair to good quality, productive, rather unattractive color, some split pits. Natural resistance to leaf curl develops in older trees. Good home orchard peach.
- **Redhaven**—Ripe mid August. Semi-free to free stone, yellow flesh. Standard commercial peach, attractive, good quality, generally reliable, slight tendency to split pits.

Recent peach introductions

- **Scarlet Pearl**—Ripe mid July. Semi-cling, white flesh, very sweet, juicy, good quality, but many internal split pits.
- **Juneprince**—Ripe mid to late July. Free stone, yellow flesh, skin rather tough, moderately productive, very few split pits, promising.
- **Avalon Pride**—Ripe mid to late July. Semi-free stone, yellow flesh, good quality and quite resistant to leaf curl but productivity can be variable.
- **Risingstar**—Ripe late July. Semi-cling, yellow flesh, flavor highly rated, some split pits. Not good for canning, as the flesh is hard to separate from the stone.
- **HW 272**—Ripe early August. Free stone, yellow flesh, flavorful, uniform, reliably productive, very few split pits. Selection from Harrow, Ontario, worth general introduction, promising.
- **Blazingstar**—Ripe early August. Free to semi- free stone, yellow flesh, few split pits, promising.
- **Redstar—**Ripe early to mid August. Semi-free stone, yellow flesh, good flavor and color, productive, some split pits, but highly rated overall.
- **Contender**—Ripe mid August. Free stone, yellow flesh, good color and flavor, highly rated, very productive, very few split pits.

Nectarines

- **Hardired** (yellow flesh) is the only nectarine recommended as consistently productive for our cool maritime climate conditions. Fruit is semi-free stone, good quality, but has some skin russeting. Very susceptible to leaf curl.

Apricots

Apricots (*Prunus armeniaca*) are difficult to grow in our conditions because they bloom early and are susceptible to many diseases. They are very sensitive to frost at bloom time and require sprays to control brown rot both at bloom and pre-harvest. Even when the trees are healthy they may produce a good crop only about one year in three. Research is continuing to find varieties less subject to these problems. We suggest trying these varieties:

- **Puget Gold**—Ripe in late July to early August.
- **Harglow**—Ripe early to mid August.
- **Westley**—Ripe in mid to late August.

Figure 13. Puget Gold

Vine and Bush Fruit

A number of vine and bush fruits tested at the WSU Mount Vernon research station are well suited to home and potential commercial production. They include grapes (*Vitis* spp.), hardy and fuzzy kiwi (*Actinida* spp.), currants and gooseberries (*Ribes* spp.), aronia (*A. melanocarpa*), and sea buckthorn or seaberry (*Hippophae rhamnoides*).

Figure 14. Grape harvest

Grapes

Both table grapes and wine grapes (*Vitis* spp.) can be grown in western Washington. Table grapes in particular need a site that is warm enough to develop good sweetness. Some of the proven varieties include:

- **Lynden Blue**—Very early, dark blue/black grape, large berries, sweet, some seeds.
- **Interlaken Seedless**—Earliest white seedless grape, reliable and productive.
- **Reliance**—Very early red table and juice grape, productive.
- **Canadice**—Very early pinkish red grape, small berried, used for wine and table.
- **Vanessa**—Early red flame seedless type, medium size berries.
- **Campbell Early/Island Belle**—Mid-late season blue/black grape used for table, juice and wine; ripens well only in warmest areas.

Newer seedless table grapes that look promising are **Jupiter** (red) and **Neptune** (green). **Agria** is a wine grape, very productive and early ripening, producing sweet, deep red juice with a pronounced boysenberry flavor. It would be an excellent variety for home growers interested in either juice or wine making.

Kiwis

The hardy kiwis (*Actinida arguta*) are about the size of a very large grape, with smooth brown or greenish skin, often with a red blush, and can be eaten whole like grapes. The flavor has been described as a touch of berry with pineapple overtones. The variety **Ananasnaja** (**Anna**) has been very productive but newer varieties, some with red flesh instead of green (e.g., **Ken's Red**) are also suited to home gardens.

Correct timing of commercial fruit harvest is measured by testing the brix (soluble solid content) of sample juice, so that fruit can be ripened off the vine and yet retain good quality. If harvest is delayed until all fruit are soft, the skin can tear and shelf life is very short. For home gardeners, when some of the fruit begins to soften, most of the fruit can be harvested, and the harder fruits can be stored in the refrigerator, to be taken out later and ripened at room temperature as needed.

Vines of the hardy kiwi will survive temperatures down to -25°F in the winter. However, in Oregon it was found that the flowers are susceptible to spring frost damage. In milder climates near the Puget Sound, no problem with frost was seen on these plants in the last ten years. In addition, the fruit attains a very high quality in our cool climate. The vines need to be grown on a strong support system and several different trellis designs can be used. We have not as yet seen any major pest problems and therefore anticipate very good adaptability to organic cultural methods.

A. kolomikta (also known as Super-hardy kiwi or Manchurian gooseberry) is an extremely cold hardy species that produces edible fruit similar in flavor to *A. arguta* but smaller in size with an elongated shape. The vines are much less vigorous, but the plants are reported to thrive in our region, tolerating partial shade, and are

Figure 15. *A. arguta* 'Ananasnaja'

characterized by very fragrant but inconspicuous flowers and ornamental variegated leaves in colors of red, white, pink, and green. *A. kolomikta* varieties do not cross pollinize with *A. arguta*, so if you are interested in producing fruit, plant one kolomikta male to every 7 or 8 female plants. If they are to be used in an ornamental-only situation, prefer the male plants, which display better color.

Fuzzy kiwis (*A. deliciosa*) also grow well and are very productive in most years; however, because the plants are sensitive to freezing in colder years, plants can be damaged. In addition, the fuzzy kiwis ripen much later than most of the hardy kiwis, with some varieties ripening as late as November.

Male and female plants

A number of plant species, including several edible kinds, are **dioecious**. This means that some plants of a given species bear female flowers and produce the fruit, while other plants of that species bear only male flowers. These male flowers provide the pollen, but do not bear fruit. For dioecious plants to produce, a minimum of one male and one female plant is necessary; however, one male plant can provide pollen for as many as 8–10 female plants. Common dioecious plants include most kiwis, seaberry, and holly.

Currants and gooseberries

The genus *Ribes* is native to the high latitudes of the northern hemisphere. Europe, Asia, and North America all have native species. A trial plot including 15 different varieties of black, red, and white currants was planted at Mount Vernon in 2001. Certain varieties from Scotland look promising, and so far a few of the black ones are resistant to mildew and the currant sawfly. Several show good productivity and disease resistance. Among the black currants which have produced well are **Ben Alder**, **Ben Lomond**, **Ben Nevis**, **Ben Sarek**, **Ben Tirran**, **Magnus**, **Titania**, and **Tsema**. Red currants producing well include **Minnesota 69**, **Rovada**, and **Viking**. All the white currant varieties tested produced well; they were **Blanka**, **Mason's**, and **Primus**.

Figure 16. Red currant

Gooseberries, especially the larger, sweeter cultivated varieties, are well suited to home garden production. **Invicta**, **Hinomaki Red**, **Hinomaki Yellow**, **Leepared**, **Sylvia**, and **Jahn's Prairie** are some of the varieties that are grown in our area. (For more information on the specific culture of these plants, see EB1640 *Growing Small Fruits in the Home Garden*.)

Sea buckthorn (seaberry)

Sea buckthorn (*Hippophae rhamnoides*)—also called seaberry—is a very thorny shrub or small tree native to Eastern Europe and Asia. This plant is dioecious, with one male plant able to pollinate up to 8 female plants. It has nitrogen fixing properties, is very tolerant of drought and poor soils, and has been introduced as a shelter belt plant in some of the plains States and Canada. Berries are small, oval and bright yellow orange to orange, with a citrus-like flavor. In

Figure 17. Sea buckthorn (seaberry)

Eastern Europe and the former Soviet Union the berries are commonly harvested for their juice, which is very high in vitamin C and which has nutritious and other healthful properties. Medicinal uses of extracted plant oils are also well documented in Europe and Asia.

Plants on trial at Mount Vernon have fruited very productively since 1999, and appear quite well adapted horticulturally. No problems with pests have been observed, indicating a high potential for organic growing. The commercial potential of this plant is being pursued by the British Columbia Sea Buckthorn Growers' Associ-ation, in the Okanagan Valley, where several different cultivars are being tested and evaluated.

Harvesting sea buckthorn (seaberry) is a challenge for either home or commercial growers. Due to the small fruit and thorny branches, current methods of harvesting (i.e., cutting off and threshing the branches or hand picking) are difficult. Plants are very invasive, so controlling root suckers can be a problem.

Aronia

Aronia (*A. melanocarpa*) is a native North American plant which was popularized as a crop in Eastern Europe and the former Soviet Union, particularly after World War II. The mature plants are similar in size to large blueberry bushes, and bear showy flat clusters of white bloom in spring, followed by pea size black berries, ripe in late fall. The dark berry clusters often contrast strongly with colorful red leaves.

Figure 18. Aronia berries

In Eastern Europe, varieties were developed for fruit production and the fruit was designated as a "healing plant." The fruit is valued for its juice which is very high in anthocyanins, blends well with other fruit juices, and is reputed as a source of phenols, leucoanthocyanins, catachines, flavonoles, and flavones that are considered to be bioactive in humans. The juice also has very strong red colorant properties, and is used in natural food coloring and also as a *teinturier* (literally, a "dyer") to impart a deeper color to red wines.

Specimen plants of aronia have been established at Mount Vernon since 1998. The plant does well but productivity has been only moderate. The crop will need to be protected from birds because they devour the berries even before harvest. Other than that, we have observed no major pest problems thus far. Look for plants that have been specifically chosen for fruit production, because some of the plants available in nurseries are selected as ornamentals, not for their high yield potential.

Other Fruit

In recent years, specimen plants from a number of different species and varieties of fruit-bearing plants and trees have also been tested at the Mount Vernon research facility. They include pawpaws (*Asimina triloba*), American persimmons (*Diospyros virginiana*), oriental persimmons (*Diospyros kaki*), figs (*Ficus carica*), quince (*Cydonia oblonga*), elderberries (*Sambucus canadensis*), mountain ash and other Sorbus species, and cornelian cherry (*Cornus mas*).

Quinces

Quinces (*Cydonia oblonga*) are very productive, and the varieties **Van Deman** and **Aromataya** have both performed very well in trials at Mount Vernon. Quinces are a staple of Mediterranean cuisine and apparently a very specific niche market exists for this fruit in supplying ethnic restaurants and markets. Quinces are used almost exclusively for culinary purposes, since the fruit is too dense and hard to be eaten until cooked.

Figs

Figs (*Ficus carica*) can also be grown here, particularly with careful selection of varieties, but again they are sensitive to freeze damage

Figure 19. 'Desert King' fig

particularly when young, and productivity is limited. In western Washington successful varieties produce a "breba" crop that overwinters as a pea size fruit and ripens in August. **Desert King** is one of the most reliably productive varieties, and **Brunswick** (**Vashon Violet**),[4] **Neveralla**, and **Brown Turkey** have consistently produced summer crops. Typically, most varieties produce a substantial fall crop that frustratingly does not ripen in our climate. Covering the plants with a clear plastic roof or tent would help to ripen the fall crop by holding in the radiant heat of the sun. Otherwise, it is best to remove these unripe fruits at an early stage.

Other fruit

Pawpaw (*Asmina triloba*) varieties currently available are not highly productive and information on their culture is lacking. Persimmons (*Diospyros virginiana* [American]; *Diospyros kaki* [Oriental]) can be very productive but the biggest challenge is getting them to ripen. Oriental persimmons do not need a pollinizer. Early oriental varieties **Great Wall** and **Saijo** have ripened in some trial years. American persimmons are hardier than the Japanese type, and many—including **Garretson**, **Early Golden**, and **Meader**—will ripen and have good flavor. Fruits remain astringent until very soft. This soft pulp could be used for fruit leather or for flavoring in baked goods, for example. All American persimmons except **Meader** need a male American persimmon for pollination.

Shipova (*x Sorbopyrus auricularis*) is a cross of pear and mountain ash first found about 1834 growing in the grounds of the Museum of Natural History in Paris, France. The yellow-blushed fruit, resembling a small roundish pear, has dense sweet flesh, very flavorful when fully ripe. Its primary drawback is that trees often take 6–7 years before they begin to produce fruit.

Cornelian cherry (*Cornus mas*), a relative of the dogwood, is an excellent ornamental shrub or small tree, covered with bright yellow flowers in late winter to early spring. Two varieties are needed for pollination. Productivity is very good, and fruits have a strong pungent flavor. In most cases fruit is used for jams and sauces.

Mountain ash (*Sorbus* spp.) varieties we have tested are very good as ornamental trees, fast growing, with attractive bloom, airy leaf texture, and colorful fall fruit. The fruit may have some use by home canners and processors though the mealy texture is not appealing when eaten right from the tree.

Rootstocks

A fruit tree is really made up of two varieties: the top variety produces the fruit we eat and the bottom variety, called the rootstock, is mostly underground. The rootstock determines, among other things, the vigor and size of the top variety as well as the tolerance to various soil conditions, root anchorage, and how soon the tree will come into bearing. Selecting the right rootstock for specific spacing and conditions is just as important as finding the right top variety to produce fruit.

Dwarf to semi-dwarf rootstocks are highly recommended for both backyard and commercial orchard planting. Trees on very dwarfing root-stocks are much easier to maintain and care for due to their smaller size. Fruit can be thinned and harvested mostly from ground level, and pest management is both easier and less expensive when the total tree volume is smaller. A high-density mini-orchard can fit into limited areas such as patios and courtyards or can be narrowly espaliered along a fence line.

Some trees can even be grown in large pots or containers. Although they can be started in a smaller pot, trees grafted on the smallest rootstocks (e.g., apple trees on **M 27** rootstock) will thrive permanently in a 25-gallon pot or

half barrel. These trees can be very fruitful for their size and add an attractive artistic element to yard design. Small trees grown in containers can be more easily moved under cover during wet periods to avoid infection by rain-borne diseases such as apple scab, anthracnose, peach leaf curl, and brown rot.

In areas where deer damage the trees and eat the fruit, it may be beneficial to plant on larger rootstocks to raise the fruiting area out of reach of the deer, even though it does make it harder for the grower to prune, thin, and spray the trees. It is still critical, however, to protect trees with fencing or netting for several years after first planting, until they are tall enough so that the upper canopy is out of range of the deer browsing. Alternatively, a completely fenced "fruit cage" with many smaller trees on dwarfing rootstocks might prove more effective in the long term for preventing deer damage.

Training and support for trees is a factor in rootstock selection, since rootstocks with smaller, less vigorously growing roots need permanent support to keep the trees upright and maintain their fruit load. Also, some top varieties have a highly vigorous growth habit, while others are less vigorous. Even on a very dwarfing rootstock, a tree with highly vigorous habit will result in a larger tree at maturity than a less vigorous variety on the same rootstock. The combination of top and rootstock should be vigorous enough to provide good long-term fruit production, but not too vigorous to manage effectively. Optimum spacing for trees is determined by size of mature trees, the major consideration in rootstock selection.

Figure 20. High-density row of apples on M9 rootstock

The rootstock variety determines how large the mature tree will be. Therefore, when selecting trees to plant, it is important to know the specific rootstock variety as well as the top (fruit) variety. Just because the label says "semi-dwarf" doesn't mean the tree will be small. Invest your money in trees grafted on the right certified rootstock—one that is suited to the space available and to your soil conditions.

The following is a list of some preferred rootstocks for each type of fruit tree.

Apples

- **M 27**—Extremely dwarfing habit, 6'–9' tall at maturity, use for espalier, trellis, in patio pots, needs support.
- **Bud 9** and **M 9**—strongly dwarfing habit, 8'–10' tall, used in densely planted commercial orchards, espalier, trellis, can be kept in large pots; needs permanent support of post or wire.
- **M 26**—Semi-dwarf habit, 10'–14' tall, common in home orchards, free standing when mature, but early support on post is recommended, particularly for early fruiting varieties.
- **M 7**—Somewhat dwarfing habit, 12'–18' tall, free standing but leans with some varieties, may produce a lot of suckers from the base which should be pruned off each winter.
- **M 106**—Somewhat dwarfing habit, 12'–18' tall, free standing trees well anchored, good in home orchards grafted to less vigorous top varieties that may be too small on M 26; avoid poorly drained soils.
- **M 111**—Somewhat dwarfing habit, 14'–22' tall, free standing trees well anchored.

Pears

- **Quince C**—Most dwarfing habit of all pear rootstocks, 8'–12' tall, but also produces smaller fruit.
- **Quince A**—Somewhat dwarfing habit, 10'–14' tall, tends to be shallow rooted, trees may lean over after they begin cropping if not supported.
- **Provence Quince**—Somewhat dwarfing habit, 10'–14' tall.
- **Pyrodwarf**—Recently developed cross from

Germany, said to be about 40% the size of seedling rootstocks; worth testing.
- **OHXF series**—Crosses of **Old Home X Farmingdale**, size varies with the different clones. **OHXF 97**, **OHXF 87**, and **OHXF 333** are the most commonly available and used in western Washington.

Asian pears

- **OHXF series**—Asian pears need vigor so they should be grafted on the more vigorous clones such as **OHXF 97** or **OHXF 333**.
- **Bartlett seedling**—fairly vigorous, deep rooted; some tend to produce suckers.
- ***Pyrus betulaefolia*** or "**Betch**"—More vigorous than seedling rootstocks, but tends to be slow to begin bearing and somewhat more susceptible to cold damage.

Plums/Prunes

- **Citation**—Semi-dwarf habit, more dwarfing effect on *Prunus domestica* (prune type plums), but does not consistently dwarf Asian plums.
- **St. Julien A**—Semi-dwarf habit, compatible with European and Japanese plums, some suckering.
- **Mariana 2624**—Large semi-dwarf habit, cross of **Myrobalan** and native American plum, compatible with most varieties.
- **Myrobalan**—Large to very large habit, slightly delayed ripening, widely used standard rootstock, compatible with most varieties; strong, well-anchored tree, tolerates heavy soils.
- **Lovell**—Somewhat dwarfing habit, compatible with most varieties, better resistance to bacterial canker than **Myrobalan**.

Cherries

- **Gisela series—Gisela 5** is the most dwarfing of the currently available rootstocks, about half the size of trees on **Mazzard**; **Gisela 12** is about three-fourths as large as **Mazzard**; and **Gisela 6** is just slightly smaller than **Mazzard**.
- **Krymsk series—Krymsk 5, 6, 7** and **8** are cherry rootstocks from Russia, with very little testing locally, but reported to be compatible with both sweet and tart cherry; reduced tree size compared to standard rootstocks, and tolerant of wet soils.
- **Mazzard**—Full size tree, 20' tall or more; the most popular cherry rootstock in current plantings, good on wet or heavy soils.
- **Mahaleb**—Not recommended on most western Washington soils; somewhat dwarfing, about 90% as large as **Mazzard**; very cold-hardy, begins fruiting sooner than trees on **Mazzard**; needs good drainage, does poorly on heavy soils or areas with high water tables.

Genetic dwarf varieties

Some trees are small in size because of an inherent genetic characteristic of the scion variety, and unrelated to the rootstock. The recessive gene for dwarfness produces buds that are much more closely spaced along the branches, resulting in naturally compact trees. Genetic dwarf peaches and columnar apples are examples of this characteristic. Because genetic dwarfs can be propagated on standard rootstock, anchorage is good and tree support is not necessarily required.

Peaches/Nectarines

- **Citation**—Somewhat dwarfing habit, 6'–8' tall.
- **Lovell**—Full size trees, 10'–12' tall or larger, vigorous.
- **Nemaguard**—Needs dry soils, not recommended in the Pacific Northwest.

Apricots

- **Citation**—Semi-dwarf habit, about 25% less in size than peach (**Lovell**) rootstock.
- **Lovell**—Full size trees, grows well but may be too vigorous for smaller areas.
- **St. Julien A**—Avoid this rootstock for apricots, as it seems to produce trees with more bacterial canker (see above, under **Plums/Prunes**).

Figure 21. Genetic dwarf peach

This handbook gives some of the basic concepts of fruit culture, but is not all-inclusive. While whole books have been written on the subject of how to prune fruit trees, for example, this publication gives only the basics, though it includes some in-depth references. When dealing with living plants there is always something new to learn, even for the experts. Footnotes and ***References*** (below) provide listings of relevant bulletins and other publications with more details on the various topics introduced here.

Site, Soils, and Fertility

The first step in planting an orchard, whether commercially or in your backyard, is to plan and locate a suitable site. Look for a location that is well drained, with no standing water after a rainy period, and that is in full sunlight. Fruit trees generally need good drainage, so in areas where the water table is high, trees can be planted on hilled rows (in orchards) or raised beds (home gardens).

Home gardeners should take advantage of any sun pockets and sheltered areas. The warmest areas, like the south side of a garage or wall, should be reserved for plants that need extra heat to ripen fully, such as persimmons, figs, or late ripening grapes. A south or southwest facing slope is good, provided that the slope is not too steep. Cold air is heavier than warm air so it tends to flow downhill and concentrate in "frost pockets" at the foot of the slope or in other low spots.

Soil testing is a worthwhile step whether you are a backyard or a commercial grower, because to get the most out of your fruit garden you need to make sure that the proper nutrients are available in your soil. Knowing more about the soil composition helps to determine when and if fertilizers or soil amendments are needed, and avoids unneeded applications.

Remember that any sample is just a limited snapshot of the soil profile. The recommended

Figure 22. Taking a soil test

sampling method is to take a 1/2-inch diameter soil probe and push it down into the soil about 12". If you don't have a soil probe, simply dig a hole with a narrow trowel and include a scoop of soil from each level in your sample.[5] Take several samples around the yard (or the field in a larger orchard), combine samples in a bucket, mix, and put in the sample bag to send for analysis.

Analysis of the soil tests will indicate what, if any, essential elements are needed for soil amendment. Preplant soil applications provide the best opportunity to amend the entire soil profile. This may be the only time that you can significantly alter the subsoil.

Maintenance of soil fertility is important, because nutrients are depleted annually and carried away with the fruit crop or incorporated into the woody tissue, so they need to be replaced for continued good tree vigor and fruit production. Nutrients can also be leached away over time by water runoff. Some nutritional elements are slow to move through the soil, and others are washed away by rain, so correct timing is important when applying fertilizers.

- While the tree is growing and roots are actively taking up nutrients, quick-leaching fertilizers such as nitrogen [N] should be

[5] See **EB1595** ***Orchard Soil Sampling*** for full details.

applied. Many soils in western Washington are high in organic matter, so little or no additional nitrogen is needed in most years. As the soil temperature rises in the spring, increased activity by soil microbes releases nitrogen during the growing season, particularly after spells of heavy rain.

- In an established orchard, most nutrients such as potassium [K], phosphorus [P], magnesium [Mg] and calcium [Ca] are applied after harvest, since they move slowly and need rain to wash them down to the trees' root zone.

The following table shows recommended guidelines for each element, noting the preferred levels in the soil for preplant and established applications.

Table 1. Soil Fertility Guidelines

Element	Preplant	Established Orchard
Ca (calcium)	67% CEC	58% CEC
Mg (magnesium)	13% CEC	12% CEC
K (potassium)	200 ppm +	200 ppm +
P (phosphorus)	At least 40 ppm	At least 40 ppm
B (boron)	1–2 ppm	1–2 ppm
Zn (zinc)	2 ppm	2 ppm
Cu (copper)	2 ppm	2 ppm
Mn (manganese)	5 ppm	5 ppm

(Source: based on Stiles and Reid, 1991. Orchard Nutrition Management)

After testing the soil, consult your local extension office or a commercial fertilizer supplier to help you interpret the results of the soil analysis before deciding on any needed amendments.

Irrigation

Even under optimum conditions, the amount of soluble nutrients available to the tree may be limited, especially during dry periods. Supplemental water through irrigation will help ensure that the proper nutrients are available when the soil is too dry. Soil moisture in commercial orchards and vineyards is usually monitored using soil moisture meters such as a tensiometer, but home gardeners can test the soil by digging a small hole with a trowel to check when the topsoil seems dry. Does the soil form a ball and hold together when it is squeezed in your hand? If not, and the soil feels dry and crumbles, then you will probably need to water. Monitor soil moisture frequently to avoid both over- and under-watering. Watering in the evening or night is most efficient because it reduces water loss by evaporation.

Drip lines or low-profile "micro-sprinklers" are the most effective ways of watering in the fruit garden because they place the water where it is needed, reduce evaporation, and avoid the wetting of leaf surfaces, which can contribute to disease infection. Also, such a system is well adapted to using automated timers to turn the water on and off, saving time and trouble in watering, especially over a larger garden area.

It is a good idea when starting a new garden or orchard planting to install the irrigation before planting (especially if planting later in the spring), because the system is ready to begin watering the new plants as soon as they are in the ground. For orchards in full production it is very important for good fruit quality and size to be sure there is plenty of water available during the period (July–September) when the fruit is maturing. Western Washington may be famous for its wet weather, but rain does not necessarily fall when it is most needed, especially at the end of a dry summer.

In late August, reduce the amount of water to the trees to encourage them to set terminal buds, thus stopping the vegetative growth cycle and preparing the tree for winter dormancy. Over-watering in the late season can produce rank growth of shoots (that will be more easily damaged by winter frost) and can contribute to lower fruit quality.

Planting

After properly amending the soil and incorporating the materials, you are ready to plant the trees. Bare root trees should be planted when they are fully dormant, from November through April on the Westside, the earlier the better. Earlier planted trees get a better start in the spring because some root establishment takes place during the winter months. If at all possible, plant before the 15th of March; but if done afterward, be more attentive and water during dry periods.

Native soil should be used as backfill; however, materials such as compost, fertilizer, and mulch can be mixed with it. Use caution to avoid burning the roots with "hot" fertilizers. When planting, make sure that the graft union of the variety and rootstock is at least 2"–4" above ground level to prevent the grafted variety from rooting in the soil.[6] Plant the tree high enough to allow for soil settling.

Pollination

Pollination is the transfer of pollen from the anthers of a flower to the stigma of the same or other flowers to set fruit. *Cross pollination is required or recommended for most apples and pears, and many sweet cherries and plums. Most peaches, nectarines, apricots, sour cherries and several newer sweet cherries are self-fertile, but there are a few that require cross pollination.*

For adequate cross-pollination, the varieties' bloom periods must overlap. With our relatively cool spring temperatures, the window for cross pollination in most varieties may be as much as 10 days. Usually only the very earliest and very latest blooming varieties may not pollinate each other. Bloom time does not necessarily equate to fruit harvest time; for example, an early blooming apple may actually ripen later than a mid blooming apple.

Some fruit varieties are cross-incompatible (e.g., certain cherries will not cross pollinate with other varieties in a specific group), self sterile (pears, plums, and some apples), or pollen sterile (e.g., apples such as **Gravenstein** and **Jonagold**). In planning for variety selection, be sure each tree you plant has a suitable source of pollination.

One solution for areas of limited space is to plant a multi-variety tree where 3–5 varieties are grafted on a single trunk, each variety becoming a major "scaffold limb." This solves the pollination problem very neatly, though such trees demand greater attention to pruning and training to make sure that all of the limbs remain in balance and that the more vigorous varieties do not take over the whole tree. To control vigor, bend the more vigorous limbs down in a more horizontal position to decrease vigor and tie the less vigorous limbs up more vertically to increase growth.

The charts below[7] cover apples, pears, Asian pears, plums and cherries. It is usually true that all varieties of any one fruit kind (for example, all apples) that are in bloom at the same time will pollinate one another. In most years, only the earliest and latest blooming varieties may not share an overlapping bloom period. From year to year there may be some variability but on a cumulative basis these charts are a useful guideline. (See special notes with each chart to indicate varieties that are pollen sterile or poor pollinizers for certain specific varieties.)

Blossom types

When selecting peach and nectarine varieties, a further consideration is that the blossoms may be **"showy"** (large petals extending well beyond the sepals) or **"non-showy"** (small inconspicuous petals held within sepals). It is likely a showy bloom is more attractive to bees, in which case better pollination of showy-blooming varieties could result in greater overall productivity.

Figure 23. Non-showy (L) and showy (R) blooms of peach

[6] Master Gardeners may refer to ***Basic Training Manual***, Chapter 12: "Plant Installation."

[7] Charts are based primarily on bloom data collected at WSU NWREC (Mount Vernon, WA), supplemented with information on pollen fertility from the NY State Agricultural Experiment Station (Geneva, NY) and other sources.

Apples

Apples that are pollen sterile (usually genetic triploids), as indicated in pink on Table 2, below, will not pollinate other apples; therefore, if you plant a pollen sterile variety you will need two other pollinators. Most white flowering crabapples are excellent pollinizers and they are often used as pollinizer trees in orchards because of their abundant, long lasting bloom. Some commonly used crabapple varieties are **Manchurian** (for early blooming varieties), **Snowdrift** and **Evereste** (mid to late bloom), and Golden Hornet (late bloom). **Evereste** is particularly suitable in a maritime climate like western Washington because it is immune to apple scab.

Pears and Asian pears

Pears and Asian pears are genetically compatible, so they can cross-pollinate just the same as any varieties whose bloom periods overlap. It is, however, important to note some limitations. Asian pears (in pink, below) tend to bloom earlier as a group; furthermore, not all European pears are suitable pollinizers. As examples, **Conference** is a good early blooming pear that can pollinate Asian pears in most years; and the varieties **Seckel** and **Bartlett** will not pollinate each other. Additionally, pear flowers are not particularly attractive to bees; so, for good pollination when growing pears and Asian pears, try to minimize the availability of other flowers (e.g., dandelions) when pears are in bloom.

Table 2. Apple Bloom Dates (Pollen sterile varieties are shown in pink.)

VARIETY NAME	BLOOM	VARIETY NAME	BLOOM
Williams' Pride	Early	Braeburn	Mid
Gravenstein	Early	Chehalis	Mid
NY 75414-1	Early	Liberty	Mid
Sunrise	Early	Mutsu	Mid
Alkmene	Early	Millennium	Mid
McIntosh	Early	Belmac	Mid
Pristine	Early	Karmijn de Sonnaville	Mid
Silken	Early to Mid	Elista/Elstar	Mid
Zestar	Early to Mid	Melrose	Mid
Empire	Early to Mid	Rubinette	Mid to Late
Rajka	Early to Mid	Tsugaru, Homei	Mid to Late
Prima	Early to Mid	Sonata (Pinova)	Mid to Late
Belle de Boskoop	Early to Mid	Bramley's Seedling	Mid to Late
Akane	Early to Mid	Enterprise	Mid to Late
Shizuka	Early to Mid	Spartan	Mid to Late
Dayton	Mid	Sansa	Late
Ashmead's Kernel	Mid	Gala strains	Late
Jonagold strains	Mid	Beni Shogun	Late
Jonamac	Mid	September Wonder	Late
Redcort	Mid	Honeycrisp	Late

Table 3. Pear and Asian Pear Bloom Dates (Asian pears are shown in pink.)

VARIETY NAME	BLOOM	VARIETY NAME	BLOOM
Shinseiki	Very Early	Kosui	Early to Mid
Conference	Early	Red Clapp's Favorite	Mid
Stutgarter Gieshirltle	Early	Honeysweet	Mid
Chojuro	Early	Seckel	Mid
Atago	Early	Concorde	Mid
Hamese	Early	Orcas	Mid to Late
Mishirasu	Early to Mid	Comice/Taylor's Gold	Mid to Late
Bartlett	Early to Mid	Bosc	Late
Blake's Pride	Early to Mid		

Plums

Japanese and American hybrid plums usually bloom early, and are finished blooming before the European plums have begun to flower, so most do not reliably cross pollinate. Some plum varieties are partially self fertile, but usually set more fruit if cross pollinated.

Cherries

Pollination of cherries is complicated by the fact that some varieties are genetically incompatible and will not pollinate each other even when they bloom at the same time. The **self-fertile** sweet cherry varieties (in pink, below) are universal pollinizers which can be used as universal pollen donors for other varieties that bloom at the same time.

Table 4. Plum and Prune Bloom Dates (Japanese and American hybrid plums are shown in pink.)

VARIETY NAME	BLOOM	VARIETY NAME	BLOOM
Methley	Early	Stanley	Mid
Beauty	Early	Longjohn	Mid
Hollywood	Early	Victory	Mid to Late
Shiro	Early to Mid	Silver Prune	Mid to Late
Obilnaja	Early to Mid	Schoolhouse	Mid to Late
Italian Prune	Early to Mid	Vision	Late
Valor	Early to Mid	Imperial Epineuse	Late
Purple Gage	Early to Mid	Seneca	Late
Early Laxton	Mid	Mirabelle	Late
Queen Victoria	Mid		

Table 5. Cherry Bloom Dates and Compatibility (Self-fertile varieties are shown in pink, tart varieties in cream.)

VARIETY NAME	BLOOM	INCOMPATIBILITY (Varieties listed are NOT compatible pollen sources)
Lapins	Early	Self fertile, universal pollinizer
Rainier	Early	Hudson, Viscount, Republican
Vandalay	Early to Mid	Self fertile, universal pollinizer
Sweetheart	Early to Mid	Self fertile, universal pollinizer
Bing	Mid	Kristin, Emperor Francis, Royal Anne, Napoleon
Kristin	Mid	Bing, Emperor Francis, Ulster, Lambert, Napoleon
Early Burlat	Mid	Chelan, Tieton
Hartland	Mid	Summit, Attika, Gold
Angela	Mid	unknown
White Gold	Mid	Self fertile, universal pollinizer
Tehranivee	Mid to Late	Self fertile, universal pollinizer
Montmorency	Mid to Late	Self fertile
Hudson	Mid to Late	Rainier, Viscount, Republican
Black Gold	Late	Self fertile, universal pollinizer
Surefire	Late	Self fertile

Figure 24. Male (L) and female (R) flowers of fuzzy kiwi (*A. deliciosa*)

Kiwi

Kiwi varieties, both the hardy and the fuzzy species, are mainly dioecious (see above). To produce fruit most kiwis require a minimum of one male and one female plant. One male plant of hardy kiwi will provide enough pollen for up to 9 females. Fuzzy kiwis (*A. deliciosa*) also require at minimum one male and one female plant for pollination. *A. kolomikta* varieties do not cross pollinize with *A. arguta*, as noted in the section on kiwis. The hardy kiwi variety **Issai** is an exception to the rule; it is generally considered to be self-fruitful.

Other fruits and berries[8]

Like the kiwi, sea buckthorn (seaberry) is dioecious and requires at least one each of a male and female plant. Figs are unusual in that most edible varieties produce fruit (the breba crop) without needing pollination; they are parthenocarpic. American persimmons (*D. virginiana*) are usually dioecious, rarely self-pollinating. Both male and female trees are required to produce a full crop. Oriental persimmons (*D. kaki*) may produce male, female and/or perfect flowers on the same tree and do not need cross-pollination to set fruit. American and oriental persimmons will not cross-pollinate. Pawpaws are usually self-incompatible, so two trees are needed for cross-pollination. Quinces are considered to be self-fertile.

Blueberries are self-fertile, but plant at least two different cultivars near one another to ensure optimum fruit set and size. Since all raspberry flowers are considered self-fertile, no additional cultivar is needed for pollination. The same is true for blackberries, marionberries and other Rubus species such as tayberry. Most currants have self-fertile flowers, but a few cultivars are partially self-sterile, and will set more fruits with cross-pollination. Aronia are self-fertile.

Orchard Mason bees

For home gardeners, their answer for pollination of fruit may be the Orchard Mason bee (*Osmia lignaria*). It is a nonsocial native bee that pollinates spring fruit trees, flowers, and vegetables. This gentle, blue-black metallic bee does not live in hives. In nature it nests within pre-existing holes, hollow stems, woodpecker drillings, and insect holes found in wood. The female lays individual eggs in a mud-walled cell that she has provisioned with pollen and nectar. Orchard mason bees are completely non-aggressive and perfectly safe to raise in the backyard. However, they do not produce honey.

Mason bees are particularly important for pollination in cool climate areas, because they are active in early spring weather when it is too cold for honeybees. Also, populations of wild honeybees, which most home gardens relied on for pollination in the past, have been severely reduced by parasitic mite infection.

If a suitable nest for egg laying is provided, these bees are easy to propagate at home. The optimum size for nest holes is 6" deep and $^{5}/_{16}$" in diameter. Bare wood holes are acceptable to Mason bees, but over time the holes become fouled with debris and mites. If not cleaned, the hole loses its attractiveness as a subsequent nest cavity. Mason bees tend to "go away" from such nest blocks after the first year or two. Diseases and parasites may build up in unhygienic nest blocks. The best nest systems for Orchard bees are those which can be cleaned on an annual basis and inspected regularly.[2]

[2] See Dogterom, 2002. Pollination with Mason Bees: A Gardener and Naturalists' Guide to Managing Mason Bees For Fruit Production.

[8] See **EB1640** ***Growing Small Fruits in the Home Garden*** at http://cru.cahe.wsu.edu/CEPublications/eb1640/eb1640.html.

Figure 25. Pruning

Pruning

Pruning fruit trees is a topic that is covered in great detail in a number of books, bulletins, and videos (see **Additional Sources,** as well as the note below).[9] A few basic essentials to keep in mind:

- Start out young trees with a sound framework of scaffold limbs. Spreaders or weights can be used to position the limbs.
- Maintain good exposure to light throughout the tree.
- Don't let the top of the tree outgrow and shade the lower limbs.
- Use thinning cuts that remove entire shoots, branches, or limbs, always making the most of your cuts.
- Avoid heading cuts that remove only a portion of the branch and often result in re-growth of a cluster of new shoots that may shade out other parts of the tree.
- When in doubt, thin it out!

Pruning is often regarded as a difficult art, but most trees are forgiving and will respond well to any basic pruning system that maximizes light exposure and takes into account the natural growth habits of the tree. When starting a new young tree, it is advisable to begin training right away, with small spreaders to set the future main scaffold limbs at wider angles (approximately 45°). Do not allow narrow weak crotches to develop because later on they will be more likely to break off with the weight of fruit when the tree reaches full production.

Pest Problems

In western Washington there are a number of disease and insect problems that may affect tree foliage or fruit. In this handbook we list the most serious of these and provide references to bulletins and other information that will help growers to decide what control methods are needed in their orchard or garden and when to apply them.

The single most useful regional resource for individuals interested in fruit tree pest control is **EB0419**, ***Crop Protection Guide for Tree Fruits in Washington***. This publication covers management recommendations for identifying what types and quantities of pesticide are needed for specific insects and trees, proper timing and coverage of sprays, and alternatives to chemical control. Annually updated information is provided for apples, pears, cherries, peaches, nectarines, apricots, prunes, and plums. Another useful resource is **EB1015E**, ***Insect and Disease Control for Home Gardens: Small Fruits and Berries***, which provides a similar range of information on pests of blueberries, strawberries, cane berries, and other small fruits.

It is important for the grower to take advantage of "windows of opportunity" in applying preventive sprays, particularly in the dormant season. Most of the pests, both disease and insects, that are on the trees over winter can be controlled for the whole season by early spray applications between Stage 1 (dormant—mid January) and the time that young fruitlets reach approximately 15 mm. diameter (June). After that, be on the lookout for pests that may invade—particularly insects such as apple maggot and codling moth—and take action promptly.

For small backyard plantings there are options for control, such as simply cutting out diseased areas, bagging individual fruits, and applying sticky traps, that are not practical for larger numbers of trees. There is no "silver bullet" for either diseases or insects. Varieties that have natural genetic resistance to one disease may be severely affected by others, or the immunity may apply to most strains of a disease but not to a mutation.

In general, a tree that is nutritionally sound, healthy, and well maintained will stand up

[9] Master Gardeners may refer to ***Basic Training Manual***, Chapter 12: "Plant Installation."

better to pests than a weak, poorly nourished tree. A home gardener can do a lot with "TLC" (looking over your trees often and catching problems early) to reduce spray applications and adopt a more organically conscious approach to growing.[10]

Diseases

In our trials we have included disease resistance as a critical factor in evaluating tree fruit varieties. The most serious disease problems for tree fruit in western Washington are:

- Apple anthracnose (*Crytosporiopsis curviospra*)—apples.
- Apple scab (*Venturia inaequalis*)—apples.
- Leaf curl (*Taphrina deformans*)—peach, nectarine, cherry (rarely).

Somewhat less serious are diseases that usually will not kill a tree but are still potentially damaging to either fruit or foliage if not controlled.

- Powdery mildew (*Podosphaera leucotricha*)—apple, pear, occasionally peach.
- Bacterial canker (*Pseudomonas* spp.)—Asian pear, most stone fruits.
- Pear scab (*Venturia pirina*)—pears.
- Brown rot (*Monolinia fruiticola*) and coryneum blight (*Wilsonomyces carpophilus*)—stone fruits, particularly cherry and apricot. Brown rot may attack any fruit but is most common in soft-skinned fruits like cherry, peach and plum. Coryneum is usually seen as dark spots on the skin of apricots and peaches and may cause cankers on branches of peach and cherry.

Insects

Insects that do the most damage in home fruit orchards are apple maggot (*Rhagoletis pomonella* [Walsh]) and codling moth (*Cydia pomonella*) in apples. Apple maggot is by far the most serious both because it completely destroys infested fruit, and because it is very difficult to control without the use of chemical pesticides. The responsibility of home orchard growers to prevent the spread of apple maggot is crucial.

[10]Master Gardeners may refer to ***Basic Training Manual***: Chapter 16, "IPM;" Chapter 17, "Diagnosis of Stress;" Chapter 18, "Pesticides;" Chapter 19, "Plant Disease;" and Chapter 20, "Entomology."

Figure 26. Anthracnose in diseased apple

Figure 27. Apple scab

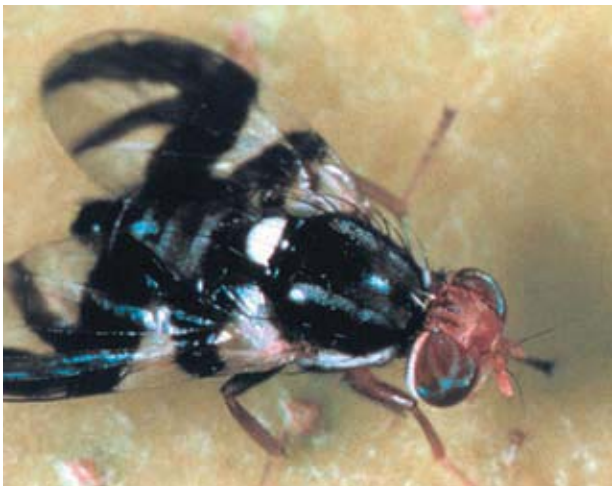

Figure 28. Apple maggot fly
(Photo courtesy of B.L.P. Ohlendorf. 1999. *Integrated Pest Management for Apples & Pears*. UC Davis Statewide IPM Project.)

Aphids (various species) can attack any tree, usually damaging the fast-growing young shoots, especially on plums. Cherry bark tortrix (*Enarmonia formosana* [Scopoli]) will attack any woody shrub or tree in the rose family, though its preferred host is Prunus, particularly cherry. Tent caterpillar (*Malacosoma californicum pluviale* Dyar) and fall webworm (*Hyphantria cunea*) are also often found and sometimes exhibit peak infestations. In the home orchard it is usually sufficient to cut caterpillar nests out of the tree and destroy them as they appear. (For a list of bulletins on disease and pest control, see **Additional Sources**, below.)

Thinning Fruit

Thinning fruit improves the size and quality of the current season's fruit and also improves the tree's productivity in the year to come. Most people don't realize that if just 5% of the spring flowers on a given tree set fruit, it will be enough to provide a full crop. Leaving too many fruits on a tree means fewer cells for each fruit, which translates into smaller fruit that is often of poor quality.

Timely thinning of excess fruit increases the number of cells per fruit and maximizes the potential fruit size.

- **Early thinning tends to increase fruit size more than later thinning.** In the 30–40 days immediately after flowers are pollinated, the newly set fruit undergoes rapid cell division and growth. Since the total number of cells determines the potential size to which the fruit can grow, it is important to thin fruit early, so the ones that remain will have more cells and can grow bigger as they mature.

- **Early thinning promotes the development of fruit buds for the following spring's bloom**. The fruit buds that develop during this summer will determine next year's crop. The presence of seeds, even the immature seeds in the current year's fruit that is just forming, will inhibit the formation of flower buds for next year. By thinning early and heavily, the total amount of hormone produced by immature seeds is greatly reduced.

- **Thinning helps to even out crop load from year to year**. Trees can get into a cycle of alternate bearing, overloaded with fruit one year, and cropping very poorly in the year following. Some varieties such as Gravenstein are very prone to this. In a heavy bearing year, removing half or more of the blossom clusters at bloom time can help reduce the problem in varieties with this tendency. Blossom thinning should be used only when the tree is producing a heavy bloom, since thinning before the fruit is set risks a poor crop if later conditions such as bad weather have an adverse effect.

The basic guidelines for effective thinning are:

- Thin early for maximum effect, when fruits are about marble size.
- Remove the smaller fruits and leave the larger ones, because the smaller fruit have fewer cells and will remain relatively smaller even after thinning.
- Remove fruit with disease spots, hail damage, or other defects.
- Aim for an even spacing as much as possible. Keep in mind the size that fruits will be at maturity and leave enough room so that fruits won't crowd each other along the branch. Some varieties, called tip-bearing, often have fruit clustered at the ends of long shoots. In this case it may be necessary to keep two fruits together in the end cluster if the rest of the branch is bare.

Finally, all thinning procedures should be adapted to the kind of fruit being thinned.

Apples and Asian pears

Apples and Asian pears almost always need heavy thinning. Apple varieties that bear heavily year after year can be thinned at the bloom stage. The "king bloom," in the center of the blossom cluster, is the first to open and produces the biggest fruit. Remove all the other flower buds on that spur, then after fruit has set, check back and thin again where spurs are too close together. A good spacing for apples and pears is one fruit per 6" of branch. Asian pears should be spaced at one per 6–8".

Other tree fruit

Peaches and **nectarines** should be spaced at one per 6–8" and fruits that are joined together

should be removed. **Plums**, especially European plums such as Italian or Stanley, often need thinning when fruit set is heavy. They can be spaced somewhat closer, depending on the size of fruit. **Apricots** rarely need thinning, but in good years it is sometimes necessary to thin where fruits are too densely clustered. **Cherries** usually do not need thinning except for some self-fruitful varieties. The recommended method for thinning cherries is to wait until the fruitlets are about pea size, then go along the branch and rake off with your fingers the ones growing on the top and bottom, leaving those that are out to the sides. Thinning can be done quickly, using a snapping motion. This promotes increased fruit size and also helps to remove dense clusters of fruit underneath the branches where rot can easily develop.

Harvesting Fruit

Determining the right time to harvest fruit is important to maximize flavor and quality. Keep a log of ripening dates from year to year so that you have an idea of harvest timing. Observe the fruit in the tops of the trees and on the south side of areas with the best sun exposure, where fruits will normally ripen first. Fruits in young trees with open branches also get more sun and tend to ripen earlier.

Stone fruits

In the case of most stone fruits, fruit is ripe for picking when it is beginning to soften and background color begins to "break," that is, to change from greenish to golden yellow. The "blush" color goes from dull to bright. A taste test will usually tell you when a given variety is ready.

Figure 29. Harvest fruit display

Apples

There are a number of methods used to check harvest maturity in apples, but only a few are practical in home orchards. No single test is completely reliable for every variety, since results can vary in different years and at diverse locations. These methods only provide guidelines, so for reliable results use several methods for comparison. Commercial orchardists test fruit firmness using a hand-held penetrometer (pressure tester), and determine the sugar content (soluble solids) of juice using a refractometer. These devices are rather expensive for small home orchards, though a garden club or similar group might decide to share one.

One basic indication of ripeness is color. Observe the background color as well as the sun-exposed "blush" side. The green background changing to golden yellow is one indicator. A quick check is to cut a sample fruit horizontally and look at the seeds. Usually, in later ripening varieties when the seeds become brown the fruit is approaching ripeness, but early season apples may be ready to eat before the seeds turn completely brown.

The starch conversion (iodine) test is one of the easiest and most useful harvest indicators available.[11] During the growing season, the leaves of the tree photosynthesize (take in carbon dioxide plus water plus sunlight) to produce sugars, which are transported to the fruit and stored in the form of starch. As the fruit begins to ripen, usually from the core outward, the starch is converted back to sugar. When a sample is cut horizontally through the core and sprayed with a mild iodine solution, the iodine turns the cells containing starch dark, but does not color those cells containing sugar. This makes the stage of ripeness that a fruit has reached easy to see. If only the area of the core is clear of starch, and the rest is dark, the fruit is

[11] For further information on the starch test, see C. L. G. Chu. 2002. "Evaluating Maturity of McIntosh and Red Delicious Apples" or visit the Ontario Ministry of Agriculture, Food, and Rural Affairs "Fact Sheet" online at http://www.omafra.gov.on.ca/english/crops/facts/00-025.htm.

immature. Apples for long storage (three or more months) should be picked when about one-half of the cross section area is clear of starch. Shorter storage fruit (less than 3 months) can be picked when about two-thirds of the cross section is clear. If most or all of the cross section of the fruit is clear of starch, it is too ripe for storage and should be used at once. Pre-mixed iodine solution for testing can be ordered from orchard suppliers. **Remember that IODINE IS A POISON: discard all fruit treated with iodine and keep away from children or pets.**

If the apple you sampled tests ripe, go *once* around the tree, picking only the fruits that look like the one you first sampled. Don't pick any fruit that is greener than what you tested. Early apples (those ripening before late September) usually do not store well. Most late ripening apples, however, will store well. The fruit that keeps the longest is the first fruit harvested of that variety, *not* the last ones left on the tree, because the later harvested fruit has gone farther in converting its starch to sugars and will not hold up as long in storage.

Pears

Asian Pears can be eaten right off the tree and do not need a storage period to complete their ripening cycle. Color break, when the under-color changes from green to yellow, is the primary visual cue for ripeness. In some Asian pear varieties with dark brown or russet skin, it may be harder to see the change from greenish brown to a yellowish tan under-color. Look on the shaded side rather than the sun-exposed side to check maturity. Taste test of a likely-looking fruit will indicate if the fruit is sweet and ripe for harvest. Dark brown or black seeds are also an indicator.

European pears are divided into two basic categories: 1) fall pears that do not need a

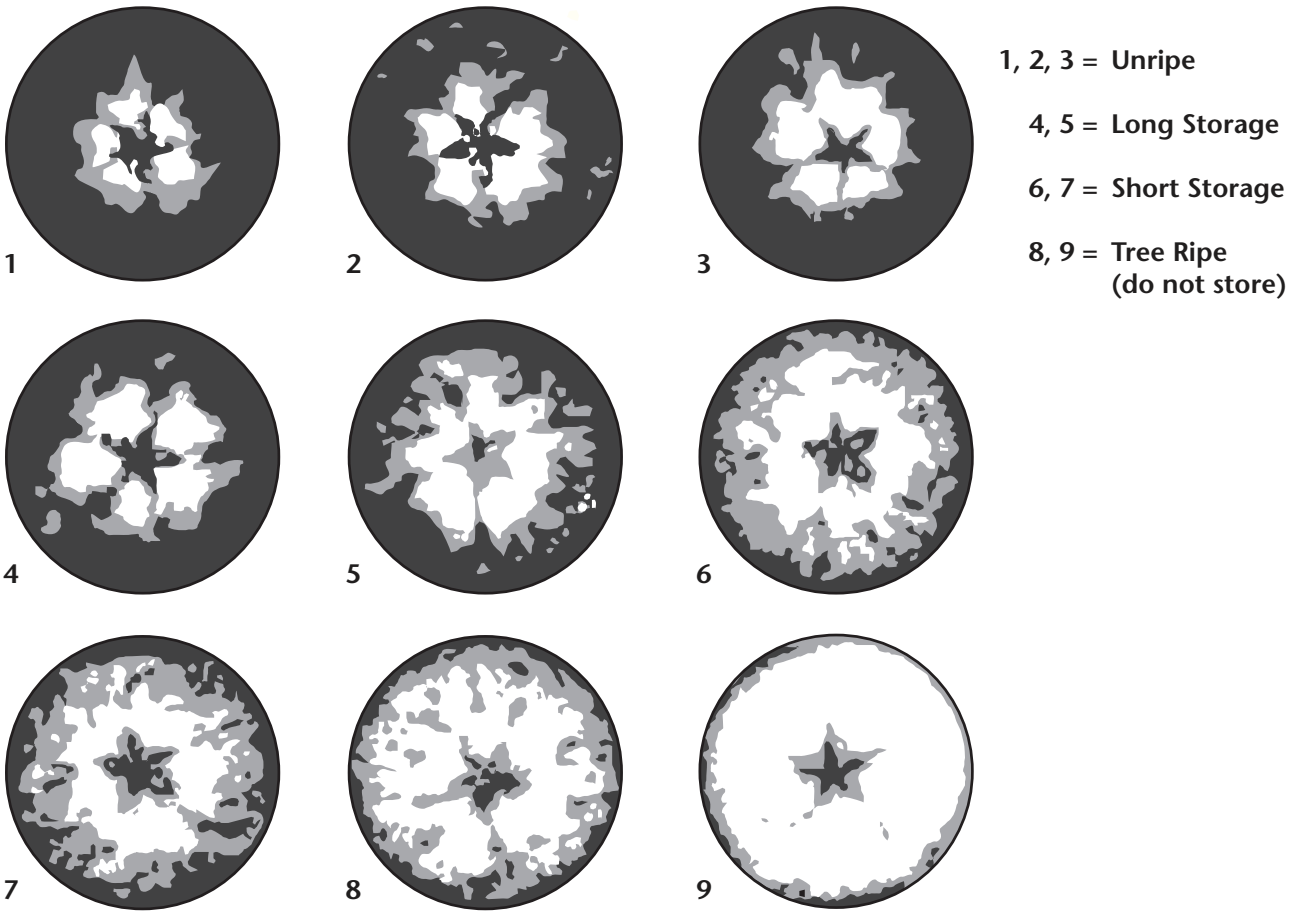

Figure 30. Starch conversion chart for apples

storage period before they are ready to ripen and use, and 2) winter pears that benefit from a resting period in cold storage immediately after picking, a process which promotes more uniform ripening of the fruit. Both fall and winter pears are picked when they are *mature* (harvest ready) but not yet *ripe* (eating ready). Fruits will still look "green" at the time they are ready to pick. If left on the tree too long, internal browning may result.

Commercially, pears are tested for harvest using the hand-held penetrometer mentioned above. Most test kits come with a wide pressure foot for apple testing and a narrower one for pear testing, since mature but unripe pears have a firmer texture than apples. A less precise guide that can be used by home gardeners is the "lift test": when pears are mature, the stems will separate easily from the spur as the fruit is lifted gently. Immature fruit will cling firmly to the spur and should be left for a few days before trying again. Keeping good harvest records from year to year will help to identify the harvest window for each variety.

Storage

Stone fruits

The so-called "summer fruits"—cherry, plum, apricot, peach, and nectarine—can only be stored for a limited time after picking, even with refrigeration. If they are picked after the background color changes from green to yellow, most stone fruits will continue to soften and ripen after picking. If picked too early, while the background color is still green, fruits will soften but the quality is often poor. Tree ripened is the best quality for stone fruit. Even ripe fruit stored at 32°–36°F will retain good quality only for 1–2 weeks. Enjoy stone fruits fresh while in season and preserve them by canning and drying for longer keeping.

Apples and pears

For long-term storage, the key words are "cool" and "ventilated." Storage in a refrigerated cooler at 32°F is best for most varieties. Cooling slows down fruit respiration and ventilation keeps ethylene and carbon dioxide from building up to damaging levels. If a refrigerated cooler is not available, use the coolest area to be found—a basement, unheated garage, or shed. Choose a storage area out of direct sunlight. Fruit can be packed in boxes, using newspaper to separate the layers. Commercial fiber pack trays can be obtained from orchard supply centers, or by recycling from supermarket produce departments. If plastic bags are used, be sure there are holes for ventilation to prevent buildup of ethylene or excess moisture. Check periodically for rotten fruits and remove them at once.

After picking, fall pears can be kept on a shelf at room temperature until ready to eat—when yellow color develops and the fruits begin to soften. Be sure that the area isn't too warm or internal browning may occur. Even in refrigerated storage, fall pears usually do not keep for more than 4–6 weeks. Many people use their fall pears for canning and drying. Winter pears benefit greatly from being put into cold storage (below 40°F, down to 33°F) for about 3 weeks. After that period, you can start to bring out fruit as needed to soften up at room temperature. With good storage around 32°F, winter pears can be kept for 3–4 months.

Figure 31. Apple picking

REFERENCES

Works Cited

Anderson, R.L., J. Freer, K.G. Livermore, and C. Choi. May 2002. Sweet cherry pollination: based on compatibility groups and bloom time. http://www.nysaes.cornell.edu/hort/faculty/andersen/Pollination_Information/Pollination%20information.html.

Childers, N.F., J.R. Morris, and G.S. Sibbett. 10th Ed. 1995. Modern Fruit Science: Orchard and Small Fruit Culture. Gainesville: Horticultural Publications.

Chu, C.L.G and Ken Wilson. March 2000. Evaluating maturity of McIntosh and Red Delicious apples. Ontario Ministry of Agriculture, Food and Rural Affairs, Bulletin 00-025. http://www.omafra.gov.on.ca/english/crops/facts/00-025.htm.

Chu, C.L.G and Ken Wilson. March 2002. Evaluating maturity of Empire, Idared and Spartan apples. Ontario Ministry of Agriculture, Food and Rural Affairs, Bulletin 00-027. http://www.omafra.gov.on.ca/english/crops/facts/00-027.htm.

Dogterom, M. 2002. Pollination with Mason Bees: A Gardener and Naturalists' Guide to Managing Mason Bees for Fruit Production. Beediverse Books. Coquitlam, B.C., Canada.

Massachusetts Dept. of Agricultural Resources. Apple juice and apple cider: What's the difference? http://mass.gov/agr/massgrown/cider_juice_difference.htm.

Stiles, W.C. and W.S. Reid. 1991. Orchard Nutrition Management. Cornell Cooperative Extension Bulletin 16228. Ithaca: Cornell University.

ADDITIONAL SOURCES

Most bulletins are available from your local county Extension office, Washington State University Extension Publishing and Printing, or online at http://pubs.wsu.edu.

Culture

EB1595 ***Orchard Soil Sampling*** (Dow, Rushmore, Halvorson, and Tukey)—How to obtain and test good representative soil samples. http://cru.cahe.wsu.edu/CEPublications/eb1595/eb1595.html.

EB1640 ***Growing Small Fruits in the Home Garden*** (February 1992)—Information on site selection, planting, pest control, pruning, and harvest for raspberry, blackberry, blueberry, and strawberry cultivars. Colored diagrams show trellis training systems and pruning tips. http://cru.cahe.wsu.edu/CEPublications/eb1640/eb1640.html.

EB1804 ***Growing Jonagold in Western Washington*** (Moulton)—Contains information on site selection, culture and maintenance relevant not only to Jonagold but to general orchard establishment in western Washington conditions.

EB1971E ***Home Gardener's Guide to Soils and Fertilizers*** (Cogger)—This guide gives detailed information on soil structure, fertility, and irrigation in your garden. Instructions on the appropriate use of both organic and synthetic fertilizers are provided, as well as information on creating and using compost. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1971e/eb1971e.pdf.

EB2001 ***Growing Wine Grapes in Maritime Western Washington***. November 2005. G.A. Moulton and J. King. http://cru.cahe.wsu.edu/CEPublications/eb2001/eb2001.pdf.

EB2002 ***New Alternative Fruit Crops for Western Washington***. March 2006. G.A. Moulton and J. King. http://cru.cahe.wsu.edu/CEPublications/eb2002/eb2002.pdf.

PNW0341 ***Choosing Pear Rootstocks for the Pacific Northwest*** (Stebbins)—Discusses the characteristics of major available pear rootstocks with respect to size, disease susceptibility, and soils. Available online at http://eesc.orst.edu/AgComWebFile/EdMat/PNW341.pdf.

PNW0400 ***Training & Pruning Your Home Orchard*** (Stebbins)—Fruiting habits, tools, and proper training are discussed. Two-color illustrations show which shoots and limbs to cut. Available online at http://eesc.orst.edu/AgComWebFile/EdMat/PNW400.pdf.

PNW0496 ***Grafting and Budding Plants to Propagate, Topwork, Repair*** (Larsen)—This handbook, illustrated with clear photographs and drawings, covers tools and materials, growth and budding factors, kinds of grafts, budding methods, top-working, and repair. Available online at http://cru84cahe.wsu.edu/cgi-bin/pubs/PNW0496.html.

PNW0507 ***Growing Kiwi Fruit*** (Strik and Kahn)— An evaluation of kiwi species tested in Oregon. Site selection, vineyard planting and establishment, maintenance, harvest, and storage are covered, including trellis systems and vine training through the second year. Available online at http://eesc.orst.edu/AgComWebFile/EdMat/PNW507.pdf.

Alternative Fruit Crops for Western Washington (Moulton, King, and Price)—Online only at http://mtvernon.wsu.edu/frt_hort/altcrops.htm.

Apple Varieties and Culture for Hard Cider (Moulton, King, Price, and Peterson)—WSU Mount Vernon NWREC, Washington. Online only at http://mtvernon.wsu.edu/frt_hort/ciderapples.htm.

Easy Steps to Fruit Tree Pruning (Moulton)—55-minute video on practical pruning of apple, pear, peach and plum from first planting to mature orchard and problem trees. Cedardale Orchards. Order online at http://pruning.com/default.htm.

Tree Harvest and Storage Tips (Moulton and King)—WSU NWREC Mount Vernon, Washington. Online only at http://mtvernon.wsu.edu/frt_hort/harvest_and_storage.htm.

Pests—Diseases and Insects

EB0419 ***Crop Protection Guide for Tree Fruits in Washington*** (Smith, revised February 2007)—Outlines registered pesticides for insects, diseases, and weeds that impede Washington tree fruit production and health. Available online at http://cru.cahe. wsu.edu/CEPublications/eb0419/eb0419.pdf.

EB0940 ***Apple Anthracnose*** (Davidson and Byther)—Common canker disease of apple trees and some pear, quince, and wild crabapple trees, primarily found in the wet coastal regions of the Pacific Northwest.

EB1015E ***Insect and Disease Control for Home Gardens—Small Fruits and Berries*** (Adams and Antonelli, revised September 2004)—Treatments for home garden blueberry, strawberry, raspberry, blackberry, caneberry, grape, currant, and gooseberry crops, by growing stage or portion of season. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1015/eb1015.html.

EB1044 ***Apple Scab (Xiao)***—Fungal disease common in areas of high rainfall and relative humidity. Apples develop spots and lesions on leaves and fruit. Illustrations describe fungus life cycle and tables describe cultivars affected.

EB1047E ***Brown Rot of Stone Fruits*** (Byther)—Disease caused by the fungi *Monilinia fruiticola* and *M. laxa* can destroy blossoms, fruit, and stems of peaches, plums, cherries and apricots. Symptoms include brown rot cankers and mummified fruit. Control involves sanitation and fungicides. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1047e/eb1047e.html.

EB1072 ***Codling Moth Control: A new tool for timing sprays*** (Brunner, Hoyt, and Wright)—Bulletin discusses timing of sprays for codling moth control.

EB1075 ***Aphids in Apples*** (Youngs, Peterson, and Retan)—Discusses the life cycles of each species and includes photographs of active infestations. Covers advantages and disadvantages of control by natural predators.

EB1266 ***Coryneum Blight of Stone Fruits*** (Maloy and Grove)—Discusses symptoms and control of the Coryneum blight fungus common to peaches, apricots, and sometimes cherries. Color photographs exhibit its appearance on both fruit and branches.

EB1323 ***Field Guide to Sweet Cherry Diseases of Washington*** (Eastwell, Grove, et al.)—Helps growers identify diseases from viruses, bacteria, fungi, and other nonparasitic diseases, including herbicide disorders, revised November 2005. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1323e/eb1323e.pdf.

EB1369 ***Pear Slug*** (Antonelli)—This insect, related to bees, ants, and wasps, favors pear and cherry, but attacks plum, hawthorn, quince, buttonbrush, and mountain ash. Bulletin sketches life history and chemical control.

EB1448 ***Cytospora Canker of Stone Fruits*** (Grove, Regner, and Johnson)—The Cytospora canker, also known as peach canker or perennial canker, is found in stone fruits such as peach, nectarine, prune, plum, and sweet cherry. Bulletin with color photographs covers disease cycle, symptoms, and management. Available online at http://cru.cahe.wsu.edu/CEPublications/eb1448/eb1448.html.

EB1928 ***Protecting Backyard Apple Trees from Apple Maggot*** (Bush, Klaus, Antonelli, and Daniels)—By using sticky traps, learning to recognize apple maggots, and using other management strategies, homeowners can help protect their own trees and the apple industry.

GLOSSARY

Bloom—A naturally occurring powder-like coating on the skin of some fruits such as certain varieties of apple and plum; may be white, pale blue, or grey; rubs off easily.

Breba crop—The over-wintering crop of figs produced parthenocarpically, without pollination.

CEC (Cation Exchange Capacity)—The sum total of exchangeable cations that a soil can adsorb, expressed in centimoles per kilogram of soil, used in interpreting soil test results.

Cider apple—Apple variety used in making cider. Specifically, the category "cider apples" are those special varieties used in making hard (fermented) cider, with generally higher levels of acid and tannin in their juice.

Cross—The production of a new variety by genetic combination in the breeding of two separate varieties.

Culinary—Designates fruit used primarily in cooking, such as for making pie, cake, sauce, jam, or jelly.

Cultivar—Synonym for "variety," refers to a specific introduced clone—i.e., "Rubinette, Rafzubin cultivar" designates the variety's exclusive patent name under which it was introduced.

Dessert apple—Apple variety most commonly used for fresh eating rather than for cooking.

Dioecious—Refers to plants, such as kiwi, in which male and female flowers occur on different plants, requiring both a male and a female plant to produce fruit.

Dwarfing rootstock—A rootstock that has the effect of reducing the vigor and size of trees grafted onto it, usually compared to the size of the same tree on its own roots or grafted to a seedling rootstock.

Macroclimate—Regional climate, typically measured in square miles, depending on geographic factors.

Mesoclimate—Climate of a particular location; for example, an orchard, which may differ within the regional climate because of factors such as elevation, slope, and aspect.

Microclimate—Climate within and immediately surrounding a plant canopy, or differences between small areas within the canopy due to factors such as sunlight exposure and humidity.

Parthenocarpic—Term used to describe the ability of some plants to produce fruit without fertilization.

Penetrometer (Pressure Tester)—A device, usually hand-held, for measuring the firmness of fruit as a means of determining when to harvest.

pH—A numerical measure of the acidity or hydrogen ion activity of a substance—e.g., fruit juice or soil.

Pollinator—An agent (bees, insects, people) of pollen transfer.

Pollinizer—The plant species or variety that produces the pollen.

Refractometer—An instrument for measuring the percentage of soluble solids (sugars) in fruit juice or other liquids, also known as brix (pronounced "bricks").

Selection—Refers to a specific clone from a breeding program that has not yet been named, usually numbered for evaluation purposes—i.e., "NY 460" was an apple selection later named and introduced as "Millennium."

Sport—Mutation of an already existing variety, usually occurring spontaneously, with similar but not identical characteristics—e.g., redder skin color, earlier ripening, spur type growth habit (see Cross, above).

Triploid—Apple varieties having three chromosome sets instead of the usual two, making their pollen sterile. Triploid apple varieties are also often characterized by highly vigorous growth habit.

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Dr. Robert A. Norton
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WSU

Dr. Eric "Bill" Pihl

Western Washington Fruit Research Foundation members gather for a fall tour of Washington State University Mount Vernon's Northwestern Washington Research and Extension Center (NWREC) orchards.

Western Washington Fruit Research Foundation (WWFRF) educational display.

Board members of the WWFRF presenting the plan for their Demonstration Fruit Garden at the WSU Mount Vernon NWREC.

FRUIT CALENDAR—JANUARY TO JUNE*

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Check for winter moth (cherry) and apply control if needed. Apply control for peach leaf curl at leaf bud break.		(Stage 2–3) Delayed dormant control for aphids, scale, mites (plum, cherry) and for scab, mildew (apple, pear)	Check for tent caterpillars, leaf rollers, apply control if needed (safe for bees such as BT)		Monitor apple maggot Codling moth control
		(Stage 2–3) Delayed dormant control for scab and mildew (apple, pear)		Scab and mildew control	Scab control
Anthracnose monitoring and control		(Popcorn stage to petal fall) Control for brown rot and coryneum in stone fruits			
Apply herbicides—contact plus residual			Check weed control, mow	Check weed control	Mow
Planting					
	Plant rootstock for budding				
		Cut back rootstock on fall budded nursery trees as soon as growth starts			
Pruning				Train young plants, tie to stakes, cut suckers	
Collect and store scionwood for grafting		Grafting and topworking			
Apply fertilizers, lime					
	Check beehives (Orchard Mason bes and honeybees)		Check bee pollination		Net cherries
			Thin early fruits	Thin fruit	
			Check/install irrigation	Begin irrigation	Irrigate
			Repair trellis/support systems	Walk the orchard and check for problems	
					Harvest—currants, early brambles
					Harvest—early cherries

FRUIT CALENDAR—JULY TO DECEMBER

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Codling moth control Monitor apple maggot	Apple maggot control				
			Monitor for anthracnose and begin control after harvest		
Mow					
					Planting
	Bud rootstocks			Begin digging and transplanting nursery trees	
Tree training, spreading					Pruning
					Collect scion wood
		Take soil samples if needed for testing		Calculate fertilizer needs and apply	
Irrigate	Irrigate—may reduce if tree is growing vigorously		Drain irrigation lines and winterize		
Walk the orchard and check for problems					
Harvest—brambles, currants, gooseberries	Check ripeness and harvest—figs, sea buckthorn, cornelian cherry, aronia		Check ripeness and harvest—pawpaw, hardy kiwi, table grapes	Harvest—fuzzy kiwi, persimmons	
Harvest—cherries, early peaches, plums, apricots	Harvest—apricots, plums, peaches, nectarines	Harvest—late peaches, late plums			
	Harvest—early pears, early apples, Asian pears	Harvest—Asian pears, pears, apples, quinces, Shipova			

* NOTE: This calendar is intended primarily as a guideline to alert home orchardists as to the timing windows for certain important cultural activities in the orchard. Every activity for every crop is not necessarily included. Also, every pest may not be present during the specific time period, but be on the alert during the time a pest is most likely to occur. The calendar is *not* a recommendation for specific pesticide applications. For detailed information on disease control, see **EB1015E**, **EB0419**, and bulletins on specific pests listed in **References** and **Additional Sources**.

Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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