

EB1694

GROWING TREE FRUIT AT HOME IN EASTERN WASHINGTON



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GROWING TREE FRUIT AT HOME IN EASTERN WASHINGTON

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In general, growing fruit requires adequate water and a suitable soil and climate. These conditions are all met in eastern Washington. The long, warm summer days and cool nights and a relatively dry growing season make much of eastern Washington a superior tree fruit growing area. The high rainfall and humidity in other areas that contribute to disease problems aren't a problem in this region.

CLIMATE

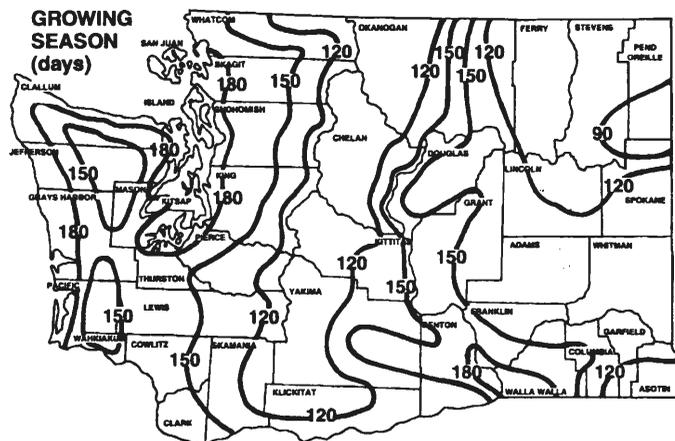
One of the most important considerations in determining the suitability of your area for fruit production is temperature. While fruit trees require freezing or near freezing temperatures during the winter for proper dormancy, severely cold temperatures (less than 0°F) at any time and frost during bloom in early spring are two of the most common reasons trees fail to bear fruit.

Most fruit trees need at least 150 frost-free days. This is the number of days between the last killing frost in the spring (28°F) and the first killing frost in the fall. The frost-free period must start early enough in the spring so that fruit blossoms are not damaged. It must also continue long enough into the fall so the fruit will mature and the leaves, twigs and branches will acclimate to winter.

PLANTING PLAN

Before you purchase or plant any fruit trees, carefully consider your planting sites. Fruit trees perform best in full sunlight and in good soil conditions. An ideal soil is well-drained, fertile, slightly acidic sandy loam, at least four feet deep. Trees can be raised successfully on poorer soils but this requires more intensive management. Trees located in partial shade may grow well but will not produce much fruit. Frost damage to spring blossoms may be a problem if your site is located on low ground where heavier cold air settles. It is better to plant trees on high or sloped ground (5 to 10 percent slope) so blossoms can

Length of growing seasons (frost-free days)



escape spring frosts. Avoid windswept hilltops. If your planting sites are situated in frost pockets, you may want to avoid planting fruit trees that blossom in early spring, especially apricots, plums, peaches and nectarines.

After climate, soil, and exposure to sunlight have been considered, draw a planting plan that includes arrangement, spacing, variety selection, cross-pollination requirements and pest and disease control. Home orchardists with limited space may be tempted to plant trees too closely together or to plant them throughout their ornamental landscape design. Planting trees too closely together does not allow them to develop properly and hampers disease and insect control. Scattering fruit trees throughout the landscape makes management, especially insect and disease control, more laborious.

The need for pest control in producing quality fruit is very important. Fruit trees, especially apples and cherries, may require 4–6 timely sprays a year or more for adequate pest control. For this reason, it is best not to locate fruit trees in areas where you'd like to limit pesticide usage, such as a children's play area or the vegetable garden. Having a separate area for fruit trees is the easiest situation to manage and maintain.

VARIETY SELECTION

There are many different cultivated varieties of each kind of fruit tree. Many are well-established varieties for eastern Washington, consistently producing good fruit. But new varieties are always being developed and becoming available. They may do as well or better than the older, established varieties.

The three main considerations in selecting fruit tree varieties for your planting are:

1. Hardiness
2. Pollination requirement
3. Tree size.

Hardiness refers to a tree's ability to withstand cold temperatures during winter. In eastern Washington, that means trees must be hardy to 20°F or 30°F below zero. Winter temperatures in most areas of eastern Washington don't always dip that low, but every few years they do, and the trees must be able to survive.

Most apple and pear varieties are hardy enough for eastern Washington. Most sweet and sour cherries and plums are also hardy. Several peach varieties are hardy. Apricots and nectarines are the least hardy of the fruit trees, but people in some areas with milder winters can grow them. If you grow stone fruits, expect some winter damage and occasional crop losses from late spring frosts.

Tree size is another important consideration in selecting fruit tree varieties. We encourage you to plant dwarf or semi-dwarf trees. They begin bearing fruit two to three years earlier than standard trees and they yield enough fruit for family use. Also, dwarf and semi-dwarf trees are easier to prune, spray and harvest.

A limited number of varieties are listed here, but don't feel constrained by these suggestions. Others may do equally well.

POLLINATION

In order for fruit to grow, pollination must occur at blossom time. Pollination is the transfer of pollen from the male part of the flower (stamen) to the female part of the flower (pistil). Some types of fruit

trees may be pollinated with their own pollen and are considered self-fruitful or self-pollinating. Other types of trees require pollen from a different variety of the same type of tree and are considered self-unfruitful. The transfer of pollen from one variety to a different variety of the same type of tree is called cross-pollination. Cross-pollination is essential for apples, pears, most sweet cherries, and plums. Cross-pollination is not essential but does improve the number of fruit that form on apricots, tart cherries, and peaches (see Cross-Pollination Chart).

In nature, the transfer of pollen in the cross-pollination process is accomplished primarily by honey bees. A small amount of pollen may be transferred by wind, rain, and other insects. To obtain a good fruit set (successfully pollinated blossoms and subsequent formation of fruit), the bees must be active and the pollinating trees should not be spaced too far apart. Anything that interferes with bee activity or pollinating trees situated more than 100 feet apart may result in poor pollination and a lighter crop. Bees work best when temperatures are above 65°F (18°C). Cool weather, rain, or heavy winds will interfere with bee activity. Only two to three days

CROSS-POLLINATION REQUIREMENTS
Require Cross-Pollination
Apples
Pears (exceptions: Kieffer, Duchess)
Asian Pears (some exceptions)
Japanese Plums
European Plums
Sweet Cherries (exceptions: Stella, Lapins, and Starkrimson)
Self-Pollinating
Peaches (exceptions: J.H. Hale)
Nectarines (mostly)
Apricots
Sour Cherries

CHARTS OF RECOMMENDED VARIETIES

APPLES		
Early	Mid-Season	Late
Lodi	Prima*	Cortland
Summerred	Royal Gala	Jonafree*
Akane	Elstar**	Jonamac
Redfree*	Liberty*	Jonagold
Gravenstein	Empire	Melrose
Paulared	McIntosh	Red Delicious
Tydemans Early		Golden Delicious
Gingergold	Priscilla	Idared
Earligold	Chehalis	Mutsu
	Spartan	Braeburn
		Fuji
		Granny Smith
		Newtown Pippin
PEARS		
European	Asian	
Barlett	Shinseiki	
Seckel	Kosui	
D'Anjou	Hosui	
Bosc	Chojuro	
Comice	Nijisseiki (20th Century)	
CHERRIES		
Sweet	Sour	
Bing	Montmorency	
Lambert		
Rainier		
Royal Ann (Napoleon)		
Van		
Stella (Self-fruitful)		

PLUMS/PRUNES		
European	Dessert	Japanese
Earliblue	Reine Claude	Santa Rosa
Stanley	Damson	Shiro
Italian		Burbank
Green Gage		Satsuma
		Elephant Heart
PEACHES NECTARINES		
Red Haven	Juneglo	
New Haven	Nectared	
Hale Haven	Flavortop	
Golden Jubilee	Fantasia	
July Elberta	Sunglo	
Early Hale	Red Gold	
Early Hale		
Early Elberta		
Elberta		
Rosa		
APRICOTS		
	Tomcot	
	Goldrich	
	Goldbar	
	Goldcot	
	Rival	
	Tilton	
	Rival	
	Tilton	
	Perfection Wenatchee	
	Moorpark	
	Moorpark	

*Scab resistant **Heat intolerant

of good weather is needed for good pollination and fruit set. Using insecticides during bloom can harm bee populations and significantly reduce pollination. Most pesticides are highly toxic to bees and should not be used during blossom time.

Commercial fruit orchards are situated in many areas of eastern Washington. Beehives are placed in these orchards to increase the honey bee population and ensure adequate pollination. Small home orchards situated near these commercial orchards benefit from this and have plenty of honey bees working in the trees at bloom time. If you have more than 100 fruit trees or trees in isolated areas, consider placing a beehive in your orchard. In residential areas, check zoning laws and covenants for restrictions on the use of beehives.

Fruit tree varieties bloom at different times. Some varieties blossom early in the season, others blossom late. During many seasons their blooms will overlap and result in adequate cross-pollination. However, in cool springs the period of overlap may be too short. When planting cross-pollinating varieties it is important to plant two varieties that bloom at approximately the same time. Also check for a variety's pollen quality. Sometimes two varieties do not cross-pollinate because they produce poor pollen, incompatible pollen, or no pollen.

Cross-pollination charts for fruit trees are found in commercial fruit tree catalogs, in EB0937—Tree Fruit Varieties for Western Washington, and at most nurseries and garden centers.

SIZE-CONTROLLING ROOTSTOCKS

Home orchardists rarely need to be concerned about choosing rootstocks. Retail nurseries purchase trees that are already grafted on rootstocks. Often, the nursery buyers don't know which rootstocks were used. But this information will help you understand why they are important.

The rootstock is the root system (or stock) to which the fruiting top portion (scion) of a tree is grafted or budded. Trees are grafted to different rootstocks primarily for size control and occasionally for increased hardiness or disease resistance.

Scion and rootstock combinations result in trees of varying size and vigor. Seedling rootstocks produce the largest trees. These are used as a standard by which the size of trees on dwarfing rootstocks are compared. A standard-sized tree may reach a height of 20 to 25 feet.

Fruit growers in the Pacific Northwest were the first to notice that some Delicious apple trees were less vigorous than others. The stems on such trees were shorter and the leaves were closer together on the stem. Such trees produced more spurs on which the fruit was produced. These less vigorous trees are called "spur-type." Since the time of this discovery, various experiment stations have worked to develop spur-types of other varieties. Today there are spur-types of many different apple varieties. The spur type of a given variety is smaller (usually about two-thirds the size) than the non-spur type of the same variety.

Apple Rootstocks

More dwarfing rootstocks are available for apples than for other fruit trees because of the extensive research and work done on apple rootstocks at the East Malling Research Station in England. The apple rootstocks are designated by the letters EM or M (for East Malling) or MM (for Malling Merton) followed by a number.

M9 is the most popular apple rootstock among home gardeners because it results in the smallest size tree (a third or less the size of a standard tree). However, the M9 rootstock is somewhat brittle and weakly rooted. You must stake the tree to keep it from breaking or blowing over. M9 does best in fertile, consistently moist ground.

MM106, M26, M7 and MM111 are other dwarfing rootstocks for apples with the following characteristics:

M111—Semi-dwarf tree about 80-90% standard size. Well-anchored and tolerates drought.

MM106—Tree up to 90% standard size. Somewhat susceptible to crown rot, needs good drainage.

M26—Tree about 50-60% standard size. May need staking, especially in windy locations.

M7—Semi-dwarf tree about 60-70% standard size. May require staking.

Other Rootstocks

Other fruit tree types are also grafted to rootstocks. Some are dwarfing. New dwarfing rootstocks are always being developed. Listed here are some of the rootstocks currently available for other types of fruit trees.

Pear

Winter Nelis or Domestic Pear Seedling are the standard sizes. OHxF (Old Home x Farmingdale) is also a commonly used rootstock for pears. Quince rootstock is less hardy than seedling rootstocks, but may be suitable for use as a pear rootstock in some eastern Washington locations.

Peach, Apricot, Plum, and Nectarine

The standard peach rootstocks are Lovell or Halford peach seedlings. Siberian C, st. Julien A, and P. besseyi are semi-dwarfing and hardy. Besseyi is not recommended because of graft incompatibility problems that can lead to a short-lived tree.

Cherry

Mazzard rootstock is used for most sweet and sour cherry varieties. Maheleb rootstock is hardier than Mazzard and produces a tree 70-80% the size of Mazzard. Colt is a relatively new rootstock similar in size to Mazzard. Gisela is a true dwarfing rootstock for cherry trees.

PURCHASING TREES

Some experts feel that it is best to purchase trees from reliable local nurseries or garden centers rather than through the mail. When you purchase trees locally you can get them when you're ready to plant and you can inspect the trees before you pay for them.

If you purchase fruit trees through the mail, order from a reputable nursery. You may be able to order trees of the desired variety and rootstock combinations.

If mail-ordering your trees, find out when the nursery plans to ship them so you will be ready for them. Before ordering, check the nursery's replacement policy. If the trees are not healthy, or have dried or frozen roots when they arrive, contact the

nursery immediately. Don't plant the trees and wait to see what will happen.

Whether purchasing trees directly from a retail outlet or by mail order, look for quality trees of acceptable varieties, rootstock, and health. Young trees of inferior quality and health usually lack the vigor to become productive trees. Don't waste your time and money on bargains. Inspect tree trunks, graft unions and roots for signs of problems or damage. Don't accept anything less than high quality, healthy young trees.

PLANTING

Always purchase young trees. Young trees are one-year-old whips with a single stem or two-year-old trees with two or more side branches along the main stem. Older, larger trees with more branches and a small root system are more difficult to train and will take longer to recover from transplanting if not planted early and properly cared for. To increase success, select four well-spaced branches and remove all others.

Young trees often come packaged as bare-root trees with no soil around the roots. These roots are tender and must be kept moist and protected from temperature extremes. The sooner trees can be planted after shipping, the better condition their roots will be in. It is important to purchase trees soon after they are available in the local nursery or to plant mail-order trees immediately after they are received. If you are not able to plant them right away, unpack the roots and temporarily plant or "heel-in" the trees in a shady location. Keep the roots moist. The trees may be placed closely together in this temporary location.

Trees are best planted in early spring while they are still dormant, before the buds start to grow. Plant your trees as early in the spring as soil and weather conditions permit. Early planting allows the root system to develop a little before it is required to sustain top growth.

To plant a bare root tree, dig a hole large enough for all the roots to fit in a natural position, without any curling or folding. The sides of the hole should be rough, not smooth. Fill the hole with water and

let it drain away. If water does not drain within several hours, find a location with better soil drainage for planting.

Remove the wrapping and packing from the root system of the tree and examine the roots. Prune off any broken, injured, encircling, very long, or spindly roots. Soak the roots in a pail of cool water for no more than 6 to 12 hours. Place the tree in the prepared hole, spreading the roots as much as possible and begin refilling the hole with the original soil. Do not add any amendments, such as peat moss or fertilizer. When the hole is about 1/4 full, gently move the tree up and down to settle the soil around the roots and prevent air pockets. When the hole is refilled, firmly but carefully tamp the soil about the roots. After firming the soil, water the tree immediately. This will help settle the soil around the roots.

The depth of the hole and the position of the bud union on dwarf fruit trees in relation to the soil surface is very important. The bud union is a small crooked point on the trunk of the tree where the scion variety has been grafted onto the rootstock. If the bud is planted below the soil surface, the dwarfing effect of the rootstock may be lost because the scion could form roots.

Plant trees deep enough for good anchorage but with the bud union about 2–3 inches above the soil surface. Trees on M26 rootstocks are an exception. Plant their graft unions only an inch above the soil surface.

FERTILIZATION

It is seldom necessary to fertilize a newly planted tree. Dry fertilizer or manure are high in salts and can burn tender new roots. It may be helpful to apply a water soluble transplant solution immediately after planting a tree but this is optional.

Most of the twelve nutrients needed for tree growth are available in our eastern Washington soils. Your tree's growth will tell you in which ones it is deficient. Nitrogen is the nutrient most often needed. A tree deficient in nitrogen will have light green to yellowish leaves and reduced shoot growth. When shoots grow less than 12 to 18 inches a year, a nitro-

gen fertilizer is needed. Apply 1/4 pound of actual nitrogen per tree multiplied by the number of years the tree has been planted, up to a maximum of 1 pound per tree. Fruit trees respond to any form of nitrogen. If your pH is above 6.5, use ammonium sulfate (21-0-0) as your nitrogen source. If your pH is 6.5 or below, use another source of nitrogen.

Scatter fertilizer under the spread of branches and just beyond the dripline of the outermost branches. To prevent fertilizer burn, do not apply fertilizer closer to the trunk than 8 inches. You may apply fertilizer any time from late fall to early spring. Water thoroughly to carry the nitrogen down into the root zone. Remove competition for nutrients and water by keeping the ground bare under the tree using shallow cultivation, herbicides, or organic mulches.

Don't apply excessive amounts of fertilizer. Too much nitrogen causes excessive branch growth, inhibits fruit set, causes poor fruit color and flavor, delays ripening and may subject the tree to more severe winter injury. Also, late application of nitrogen, after mid-July, can prevent the proper "hardening off" of the tree for winter dormancy.

When planting on the site of an old orchard, have a soil test performed to determine the nutrient status and pH of your soil. Check for zinc and boron because these are commonly deficient on old orchard sites, especially on sandy soils in the Yakima area and Central Columbia Basin. The pH should ideally be 6.0 to 6.5 for most fruit trees. If the pH is low, incorporate lime into the soil before planting the trees. Check with your local extension agent for instructions on soil testing and interpretation of the results.

IRRIGATION

Regular irrigation is needed to grow tree fruit in most areas of eastern Washington. Uniform soil moisture is important in maintaining tree vigor, productivity, and fruit size. It is especially important to provide the tree with adequate water during the first year after planting to help develop a good root system. Irrigate from the onset of growth in the spring through the growing season to mid-to late September.

Avoid frequent shallow irrigation with sprinklers. Frequent, light watering encourages a shallow root system and can cause the development of wood rot which attacks the trunks and roots, killing the tree. Less frequent and deeper watering are preferable. Irrigate your tree with a good deep soaking every 7 to 15 days, depending on the season and weather. (Seven-day intervals are better for many dwarfing rootstocks.) Drip irrigation, a soaker hose, or a slow trickle of your garden hose will provide a good deep watering without drowning your tree. Most of the roots are concentrated in the upper two feet of soil extending outward slightly beyond the spread of limbs. It is this area of soil you want to moisten during irrigation.

It may be helpful to make a depression or basin around trees to collect water and aid in summer irrigation. However, excessive irrigation or excessive precipitation can create a problem with rot around the trunk collar. It is also important to level the soil surrounding the tree in the fall. This prevents water from collecting and freezing around the trunk during the winter and causing injury to the tree.

Mulches are beneficial to young fruit trees. Mulches of any plant material, such as shredded bark, grass clippings, straw, or sawdust conserve soil moisture, moderate extreme soil temperatures, and help reduce competition from weeds and turf. Apply a mulch 3 to 4 inches deep, but keep the mulch several inches away from the trunk.

In early fall, remove the mulch. This lets the roots know that temperatures are getting cooler and winter is on its way. The tree will begin to harden off

or get physiologically ready for winter. Removing the mulch also prevents mice and other rodents from hiding in the mulch and chewing off the bark during the winter.

FRUIT THINNING

When all factors are favorable your tree may actually set too many fruit. An overabundance of fruit on a tree may weaken it and result in fewer buds, leading to a smaller crop for the next season. A heavy crop also can result in small-sized fruit of poor quality. To avoid these problems, thin fruit trees two to three weeks after bloom. To thin a tree by hand, remove all but the largest fruit in each cluster (apples and pears). Remove small, insect- or disease-injured fruit first and follow recommended average spacing distances. These recommended spacing distances (see below) are an average spacing for each branch. Thinning should be done to allow a closer spacing near the base of the branch and a wider spacing near the tip of the branch. This is done to avoid the branch bending or breaking off from too much weight at the tip.

HARVESTING AND STORING

One good reason to grow your own fruit is having tree-ripened fruit. Deciding when to harvest your fruit is not always easy. Harvest dates vary from year to year because of bloom time and weather.

Fruit maturity and ripeness are not the same thing. A mature fruit has reached a stage of development that will allow it to ripen. A ripe fruit is in maximum edible quality. Some types of mature fruit will ripen off the tree and other types will not.

THINNING (Recommended Average Spacing)		
Fruit	Spacing	Comment
Apricot	3-4 inches	-----
Cherry	-----	Impractical to thin by hand
Peach	4-8 inches	Early varieties at the wider spacing
Apple	4-6 inches	One fruit every 3rd or 4th spur
Pear	6 inches	-----

As a home orchardist, use your senses to determine maturity and ripeness through color, firmness and flavor. Experience will be your best teacher.

Handle the fruit gently when harvesting. Place soft fruit into shallow containers to minimize bruising. Bruising reduces both fruit quality and storage life. Most fruits are highly perishable, so plan to use or process the fruit promptly. Proper storage extends the usable life of the fruit.

Apples

Harvest apples when fruit becomes fully colored for the variety. The surface skin color depends on the variety, age, and exposure to light. For apple varieties which are not solid red in color at maturity, the ground color or that part of the apple that doesn't turn red, is a good indicator of readiness. The ground color on mature apples changes from a bright green to a softer green or yellow.

Color alone is an unreliable harvest indicator, especially in warmer areas. Go by texture, crunch, and flavor. Tasting the fruit definitely helps determine maturity. Apples should be firm, juicy and sweet with some tartness. Immature apples taste sour or astringent and have a fibrous or cottony texture when chewed. Seeds of most apple varieties turn brown as the apple matures, but some varieties change seed color before maturity.

Apples picked too early will remain spongy instead of becoming crisp and mellow. They will not develop good quality even after storage. Once the apples reach maturity they can be picked and stored or they can be left on the tree for a few more days to give them more flavor and better eating quality. Fruit left on the tree too long will become overmature and store poorly. Summer apple varieties, such as Yellow Transparent, Lodi, and Akani, tend to ripen over a two-week period. Several pickings may be needed. Later varieties tend to ripen all at once.

Summer apples last only a few weeks in cold storage. Fall apples, such as Golden Delicious, can be picked at several different stages of maturity, depending on how the fruit will be used. Apples picked mature but not ripe store longer than ripe, mature apples, making them good for fresh eating.

Pears (European)

Harvest pears when they are mature but before they're actually soft. They should just be beginning to turn from a bright, leaf-green to a light greenish yellow or chartreuse. Normally, the seeds become brown. The flesh becomes somewhat springy, as opposed to the rock hard consistency of immature fruit. The flesh should give slightly when squeezed in your hand. Stems should separate easily from the spurs with an upward twist of the fruit. If the spurs come off the tree, the pears are not ready to pick.

FRUIT STORAGE				
	Temperature	Humidity	Storage Life	Ripens off Tree
Apples	31–32°F	85–90%	Depends on variety	Yes, if fully mature
Pears	30–31°F	85–90%	50 days—depends on variety	Yes, ripen at 60–70°F
Asian Pears	32°F	---	1–6 months, depends on variety	Not well, best eating quality if ripened on the tree
Peach	30–32°F	85–90%	2 weeks	Yes
Plums	31–32°F	90%	2 weeks	Yes, and mature Japanese varieties break down quickly
Apricots	31°F	85–90%	1–2 weeks	Yes, and will lose flavor in storage
Cherries	31–32°F	85–90%	10 days	No

If allowed to ripen on the tree, pears become gritty and the inner flesh becomes soft and brown. If picked too early, they do not develop good flavor and will shrivel in storage.

To store pears and retard ripening, refrigerate them until you are ready to ripen them. Once ripe, pears may be stored under refrigeration for only a few days. To ripen picked pears for best quality and full maturity, store them at 65° to 68°F and in high humidity.

Asian Pears

All Asian pears ripen on the tree. Some varieties are yellow when ripe, others are greenish or golden brown and russeted. Pick when the pears detach easily from spurs with an upward twisting pull. The fruit will be sweet, crunchy, and juicy when ripe. Soft fruit is overripe.

Peaches

Peaches should be ripened on the tree if they are to be eaten fresh or canned. Watch for the ground color or background color of the skin to change, not the amount of red blush. The ground color should be yellow. The ground color of white-fleshed varieties varies from yellow to whitish. The flesh should give somewhat under gentle pressure. To test for pressure, place the fruit in the cup of your hand and gently press the flesh with your fingers. The fruit should separate easily from the branch with a slight twisting motion. A taste test is also helpful.

Nectarines

Same as peaches.

Plums-Prunes

It is difficult to tell when a plum is ripe by color alone. Watching ground or skin color on European varieties may be helpful. In mature fruit, the ground color will become yellowish instead of the dull green color of the immature stage. Color is usually not helpful in determining the ripeness of Japanese plums. They are often highly colored before they are ripe. The best guides for testing plum ripeness

are pressure and taste. The plums should be just beginning to soften and should taste sweet and juicy.

Apricots

Pick apricots when completely yellow and just beginning to soften, but still fairly firm. If picked too early they will not develop optimum sweetness.

Cherries

Cherries do not ripen after being picked. Pick them while they're still firm and have developed full size and color. Sweet cherries will be sweet and juicy, tart cherries will be juicy and fully flavored. The taste test is your best guide. (See fruit storage chart).

PESTS AND DISEASES

Home fruit production is an excellent and rewarding hobby. But fruit trees require a significant amount of care to keep them healthy and pest-free so that they do not become a source of infestation for others. They need yearly pruning, fertilization, irrigation, weed control and a sound pest management program. Likewise, home orcharding is not cheap. Besides saws, loppers and other pruning equipment, growers usually need insecticides, fungicides and spray equipment. Power sprayers with the pressure and volume to provide adequate coverage of larger trees start at over \$500. Even hand-powered sprayers are expensive, many costing \$100 or more. Hose-end sprayers, while much less expensive, often do not apply accurate rates of pesticides. To have an effective pest control program, you must identify and manage the major local and regional pests and diseases.

Most spray guides are confusing because they list every possible pest and what can be sprayed to control it. Also, many guides are published with large geographic regions in mind. They may cover problems that we don't even have in eastern Washington.

Using Pesticides

The first step in controlling a health problem in your orchard is determining the cause. Is it a disease, insect, or cultural problem? Once the cause is identified, you can take control measures.

You should not apply pesticides unless a specific insect or disease problem has been positively identified. Unnecessary sprays are a waste of time and money and pose a hazard to you and the environment.

For help identifying home orchard problems, contact your local WSU extension office.

You must apply sprays to control pests at the proper stage of tree and bud development. Sprays can't be applied based on calendar dates, since the tree's condition depends on the weather.

A diagram on the Home Orchard Spray Chart, which is available from county extension offices, shows the different stages of bud development and makes spray recommendations. Check the development of buds on your fruit trees to determine when to spray.

Tips for Applying Pesticides

1. Apply pesticides at the right time. Chemicals formulated to be safer products for homeowners to use are not as effective as those used by commercial orchardists. Because of this, it is especially important to use the proper pesticide at the recommended time.
2. Thoroughly cover the tree with the spray. Concentrate on spraying the top half of the tree first, the lower will usually be adequately covered. Spray the trunk, limbs, fruit and both sides of the leaves. Spray just to the point of runoff.
3. Spraying during adverse weather conditions may injure the tree or fruit. It may also diminish the effectiveness of the spray application.
 - * Do not spray in hot weather (above 85°F).
 - * Do not spray in the spring when temperatures are low.
 - * Do not apply dormant oils when the temperature is below freezing or will go below freezing before the spray has a chance to dry.
 - * Reapply an insecticide spray if a heavy rain or overhead irrigation, 3/4 inch or more, occurs shortly after the spray is applied. You do not need to reapply the spray if it had a chance

to dry on the leaves before the rain occurred. If a heavy rain or a prolonged rainy period occurs, spray again in a day or so for continuous protection.

4. Apply fungicide sprays prior to or up to 12 hours after rainfall. For optimum disease control, prune out dead twigs and branches on fruit trees while the trees are dormant. In the fall and summer, rake up and destroy the leaves and fruit that fall from the diseased tree by burning or burying it.

Chemical pesticide sprays will control, not eliminate pests. Good cultural practices that produce a healthy tree are the best way to prevent pests in your orchard.

DISEASES

Home orchardists in eastern Washington are lucky because the dry climate and abundance of sunshine usually hamper the spread of many diseases. Still, you may have an occasional problem.

Apples

Apple scab: Scab is generally not a major problem in home orchards in eastern Washington except in those areas of higher rainfall, such as Spokane. Scab is a fungus disease that overwinters on dead apple leaves on the ground beneath the trees.

Primary infections of new foliage occur in the spring and early summer during prolonged rainy periods. Secondary infections can develop from spores originating from primary infection sites, and again, they develop only during rainy periods.

CONTROL: Apply fungicidal sprays within 24 hours of a scab infection period to control scab. You cannot simply spray after symptoms begin to appear and effectively stop the disease. Normally, an infection period will occur only during rainy periods that last 24 to 48 hours or more with air temperatures above 60°F.

In the relatively dry climate of eastern Washington, the best control steps for scab are to rake up and destroy fallen apple leaves in the autumn and to avoid irrigating for periods of 12 hours or longer during warmer weather.

Powdery Mildew: This is a fungal disease of many apple varieties. The fungus overwinters in infected buds, most commonly at the ends of vigorous new shoots. As growth of these buds resumes in the spring, the new foliage becomes infected and the leaves and twigs become covered with a white, dusty or mealy coating.

Secondary spread of the disease also occurs and it can infect other leaves, twigs and even fruit. Secondary spread may continue until mid-summer when temperatures become too hot for disease development. It may reoccur in late summer after temperatures moderate.

CONTROL: Apply fungicidal sprays at the first sign of mildew. Additional sprays are often needed at 12- to 14-day intervals until the onset of hot weather.

Prune and destroy infected shoots during the winter or in early spring before growth starts. A wide range of susceptibility occurs among apple varieties. For example, Granny Smith, Jonathan, Rome Beauty and Jonagold are very susceptible, while Red Delicious is quite resistant.

Pears

Fire Blight: This bacterial disease makes the tree look black, as though it had been scorched with flame. The disease spreads rapidly down infected twigs to major branches. This is the worst disease of pears in eastern Washington. Occasionally, it also infects apples.

The bacteria that cause the disease usually overwinter at the margin between the live and dead tissue in trunk and branch cankers from the previous season. In the spring, the bacteria become active again and may be spread by splashing rain, wind, insects, or pruning tools.

Rain during the late blossom period is the most common means of spread. The bacteria normally enter through blossoms, but fast-growing, succulent shoots and fresh wounds also are susceptible.

CONTROL: No chemical controls are available for the home orchardist. Sprays with a fixed copper product may provide some protection, but the tim-

ing of the application is so critical that this seldom works. Pruning out infections is the most practical way to control fire blight. Cut out and destroy infected twigs and branches during late winter or early spring. Make pruning cuts at least 18 inches below the last visible sign of infection and disinfect loppers or pruning shears with a 10% solution of bleach and water between each cut so that you will not spread the bacteria.

If you detect an infection after growth resumes in the spring or in early summer, prune it out immediately, disinfecting tools between each cut.

Fire blight causes less damage on trees that are not overfertilized and producing an abundance of succulent new growth. In areas where fire blight is a severe problem, avoid growing highly susceptible varieties such as Bosc, Bartlett and Clapp's Favorite.

Other Diseases: Occasionally, pears may become infected by powdery mildew, pseudomonas or false fire blight infections, and phytophthora rot. These disease are rare.

Stone Fruit (Peaches, Nectarines, Apricots, and Cherries)

Coryneum Blight and Canker: This is a fungus disease that attacks all stone fruit in eastern Washington, although it is primarily a problem in peaches and apricots. The organism overwinters in cankers on stems and twigs and in infected leaf scars. Under favorable conditions in spring and early summer, it can cause heavy losses of fruit and severely damage young trees, especially peaches.

The fungus causes gumming and death of buds on fruiting wood and may cause the bark to split on the branches of the current year's growth. In older branches, large gummy cankers may form. Small, purple or reddish purple spots develop on twigs, while "shot holes" develop on leaves. These small holes usually have a red or purple border. Fruits develop clusters of small reddish purple spots that look like measles and may produce small globs of gum from infected sites.

CONTROL: Eradication of well-established coryneum infections are difficult. It requires a sustained con-

trol program over a period of several years to eliminate the disease, although a regular, yearly effort can keep coryneum from becoming a serious problem.

Prune your trees to remove old cankers (reducing the source of spores) and to open up trees for better light and air penetration.

Fall and spring applications of recommended fungicides are very effective. Apply a fall spray when about 90% of the leaves have fallen. Apply spring treatments before bloom.

Peach Leaf Curl: This fungal disease is primarily a problem on peaches and nectarines during wet springs. Infection takes place as the buds first begin to swell, often as early as late January or early February in warm winters. It appears in the spring as thick, puckered, twisted and curled leaves. They are often a reddish or pink color and have a distinctive smell.

CONTROL: Spray trees in November or in late winter with a fungicide before buds swell. Since infection often takes place very early in the spring, just as the bud scales begin to split, delayed dormant sprays are totally ineffective.

Hand removal of curled, infected leaves may reduce the number of spores for infection the following year, although infected leaves generally drop by themselves.

Powdery Mildew: This disease differs from powdery mildew on apples. The fungus overwinters in the buds and grows out onto the leaves in the spring, although it isn't noticeable until late spring or early summer.

The symptoms are a white to buff-colored fuzz on both leaves and fruit. It generally appears in early summer. Severely infected twigs and leaves become stunted and curled.

Circular patches of mildew will enlarge to cover the surface of infected fruit. Later, fruit may crack and otherwise become misshapen.

CONTROL: Control powdery mildew on peaches and nectarines by applying fungicide sprays when spent

blossoms split and fall as the young fruit begin to enlarge. Spray again 14 to 17 days later. Some nectarines may require a third application. Effective pruning, which opens up trees for better light and air penetration, is also helpful.

Powdery mildew also differs on cherries. The symptoms are similar to those of other mildews; however, the disease is almost never a serious enough problem in home fruit orchards to warrant treatment.

Bacterial Canker: This disease is becoming a serious problem in eastern Washington home and commercial orchards. It usually occurs as enlarging lesions or cankers on trunks and scaffold limbs of young vigorous trees, especially sweet cherry. Great amounts of gum are usually associated with active cankers, although gumming is not always present.

Bacterial canker margins are usually irregular with brown-colored streaks extending into the healthy tissue.

CONTROL: Recommended fungicide sprays applied in late fall (when about 90% of the leaves have fallen) may help prevent bacterial canker. If lesions occur, scrape them to expose the inner bark beyond the discolored area. Disinfect the dark area either with a flame, such as a propane torch, or with a water and bleach solution.

Cytospora Canker: This canker disease is rare, but serious in the home orchard. The symptoms are similar to those of bacterial canker (above), including gumming and the development of lesions. However, the border between the diseased and healthy tissue of cytospora canker is distinct, and the infected tissue may have a "zonate" or bull's eye appearance where the canker has gradually enlarged.

Dieback of limbs is common. Often the bark near the infected site is rough and bumpy, and spores will appear as black spots.

CONTROL: There are no effective chemical controls for cytospora canker. Prune out infected limbs and burn them or take them to a landfill. Do not cut them up for firewood as this will spread the spores.

INSECTS AND MITES

Insects generally cause some problems in eastern Washington orchards. But many insects in home fruit orchards are not troublesome every year. Except for codling moths and aphids, most insect pests are best managed by spraying only when absolutely necessary.

Apples

Codling Moth: This is the most serious pest of both backyard and commercial apples. It causes the common "worm in the apple." In isolated country gardens it may not be much of a pest, but in town where many backyard trees go unsprayed, codling moth control is a serious matter.

In an average year two generations of codling moth adults occur, but in warm seasons there may be a third generation. Adult moths lay eggs on the fruit and nearby leaves about 14 to 21 days after full bloom. Immediately after hatching, the young larvae eat their way to the core of developing apples.

CONTROL: It is critical to apply sprays at this time, and then if codling moth has been a yearly problem, to reapply sprays about every 7 to 10 days through the summer.

Commercial orchardists depend upon a temperature-based computer program to accurately forecast adult moth emergence so that they can apply sprays at the proper time. In some localities, the National Weather Service broadcasts these predictions on the radio.

Mites: European red mites or McDaniel and two-spotted mites are occasionally a problem. Mites are very tiny, spiderlike creatures that produce a sort of browning or bronzing of the foliage.

CONTROL: Usually control is unnecessary as natural predators do a good job of containing mite populations. However, sprays for other pests, such as codling moth, may hurt predator mite populations and lead to difficulties. No effective miticides are approved for home orchard use. If mites become a problem, spray with an insecticidal soap or a high-pressure water stream.

Scale: San Jose scale are very small sucking insects. They look like tiny grey or brown bumps the size of pinheads on branches and twigs. They feed by sucking sap from all parts of the tree, including the fruit. Where infestations are severe, they can kill trees.

CONTROL: Spray San Jose scale with dormant or delayed dormant oil. There are normally two generations of juvenile scale crawlers a year, the first appear early in June (depending on the weather). Good coverage with an insecticide spray at this time will give some control, but these treatments are not nearly as effective as thorough coverage with a dormant or delayed dormant spray.

Tentiform Leaf Miner: The larvae of these tiny moths feed between the upper and lower epidermal layers of apple leaves and cause whitish to brown blotches on the leaves. Only in the most severe attacks has any effect been noticed on tree health or yield.

CONTROL: No effective sprays are available for the home orchardist to control this pest.

Aphids: Several species of aphids can be a problem on apples. The primary species include the green apple aphid and the rosy apple aphid. They are sucking insects. Their damage appears as twisted and rolled leaves. Usually noticeable amounts of honeydew are present because aphids drink more plant sugar than they can digest.

CONTROL: Aphids tend to concentrate on new succulent shoots. If you notice large numbers of aphids, insecticidal sprays usually give good control. However, in some cases apple aphids have become totally resistant to chemical sprays. If this happens, spray with an insecticidal soap followed by a coarse spray of water from a hose.

Since aphids overwinter as eggs on the apple trees, applying a heavy spray of dormant oil (which smothers the developing eggs) is a good practice.

Pears

Codling Moth: This insect is usually not a pest on pears but can be a problem where moth populations are heavy.

CONTROL: Spray in much the same manner as for apples.

Pear Psylla: These minute torpedo-shaped insects are the most common pest of pears. They are sucking insects that feed on plant juices and exude large amounts of honeydew. Sooty mold may begin to grow on the honeydew and seriously damage the appearance of the fruit. Likewise, severe infestations may weaken trees and cause premature leaf drop. Psylla are very small, so the first sign of their feeding is honeydew droplets on the leaves and fruit.

CONTROL: Most homeowner insecticide sprays do not control pear psylla well. Sprays with insecticidal soaps followed by a thorough washing of the tree with a stream of water will kill or wash off the insects. It also removes most of the honeydew. Dormant or delayed dormant applications of oil will kill pear psylla eggs and immature nymphs.

San Jose Scale: See control on apples.

Mites: Infestations of McDaniel and two-spotted mites can cause severe damage to pear leaves. Almost overnight, a major buildup of mites can cause a rusty browning of the foliage and rapid leaf drop. However, they rarely become a problem in backyard trees because natural predators usually control them.

CONTROL: As with apples, there are no effective miticide sprays. Insecticidal soap applications followed by a water rinse may give some measure of control for a severe outbreak.

Peaches, Nectarines, Apricots, and Prunes

Insects on these home orchard fruits rarely require spraying. The major pests to watch for are aphids, scales and peach tree borers.

Aphids: The primary aphid pest of this group of fruit is the green peach aphid. Its life cycle is extremely complex, but we can use two key features for control. Green peach aphids usually overwinter as eggs laid near the buds on peaches, nectarines and sometimes prunes. In early summer they leave fruit trees to feed on other plant species.

CONTROL: A thorough application of an oil spray, preferably a delayed dormant spray just as the first few green tips of leaves appear from the buds, will give almost total control. If some aphids escape and begin to curl new foliage and produce honeydew, an insecticidal spray may be needed.

Prunes and plums are often attacked by the prune leaf curl aphid in late spring and early summer. Usually one spray is all that is needed to clean up this pest. But as with peaches, a thorough application of dormant oil will kill most overwintering aphid eggs.

Scale Insects: Both San Jose scale and lecanium scale (large, brownish, soft-bodied scales) can become a problem on soft fruit trees.

CONTROL: The best control is a thorough application of a delayed dormant oil spray.

While summer insecticidal sprays to control the juvenile crawler stage are recommended in many spray schedules, good coverage with sprays is difficult at this time of the year because of the dense foliage. More than 95% of the adult scale insects can be killed with a single delayed dormant oil treatment.

Peach Tree Borers: The damaging stage of this insect is its larva. Adult peach tree borers emerge about the first week in July. They are black-bodied moths with clear wings, about the size of a yellowjacket. They begin laying eggs about the middle of July on the lower trunks of peaches, nectarines, apricots and prunes.

After hatching, the young larvae crawl down near the soil line and bore into the trunk of the tree. Often the first sign of damage is the appearance of "sawdust" and perhaps sap exuding from the wounds. Left untreated, borers often kill young peach trees.

CONTROL: Two treatments are highly effective. First, a recommended insecticide applied thoroughly to the bark on the lower portion of the trunk in early July will kill newly hatched larvae before they bore into the trunk. Second, a few moth balls placed on the ground next to active borer holes and then covered with a small mound of a porous material like

peat moss or sawdust to concentrate the fumes from the moth balls into the worm tunnels will kill older larvae. This can be done almost any time that borer damage is noticed. After a few days, remove the moth balls and spread out the mound of sawdust, so that children or pets won't be accidentally poisoned.

Other Pests: Reports of damage to home peaches from peach twig borers and oriental fruit moths are rare. These pests damage fruit and young twigs. If the tips of young shoots suddenly sag and wilt and if chewing damage on the surface of the fruit appears, particularly where leaves rest on the fruit, one or the other of these insects may be involved.

On very late varieties of peaches, such as Elberta, walnut husk flies have laid eggs in peach fruits.

Cherries

Cherry Fruit Fly: This pest is the most serious insect problem of cherries, both for home and commercial cherry growers. The fly is closely related to the apple maggot and has a similar life cycle.

Adult emergence begins in late May or early June and continues for about a month. They lay eggs under the fruit's skin at about the time the cherries begin to turn pink and ripen. Small maggots quickly develop from the eggs.

CONTROL: Spray every 7 to 10 days to kill the adult flies before they lay eggs inside the fruit. If cherry fruit flies are present in your area, use a yellow sticky trap, available at garden stores, to help determine when adults emerge. The flies have a distinctive black-colored pattern in their wings.

Aphids and Scale Insects: Green peach aphid and San Jose Scale are occasionally a problem on cherries. Use the same control employed for peaches and nectarines, primarily a thorough application of dormant oil.

PRUNING

When to Prune

The dormant period is the best time to prune out broken, damaged, diseased, and weak wood, wa-

ter sprouts, limbs crossing over other limbs and to eliminate narrow angled crotches. The absence of leaves gives better visibility, making pruning easier.

Trees may be pruned anytime after the leaves fall in the autumn and before bud break in the spring. Avoid making saw cuts over 3 inches in diameter until hazardous severe winter temperatures are over.

Cutting back shoot growth during the dormant period tends to stimulate vegetative growth and tree vigor. The objective of pruning less vigorous trees at this time is to stimulate more growth. Trees that are already vigorous don't need this type of pruning.

Prune trees during the growing season as needed. This decreases shoot growth and therefore is a common control practice. Summer pruning is very useful when pruning espalier or trellised trees. Remove water sprouts and suckers that shade the inner parts of the trees, fruits, and spurs during the summer.

Fruiting Habits
This chart indicates the position on the branch where fruit will be produced and the type and age of wood that bears fruit.
Previous Season's Shoots
Peach
Nectarine
Previous Season's Spurs and Shoots
Apple - minor
Sour Cherry
Pear - minor
Long-Lived Spurs (up to 15 years)
Apple
Pear
Short-Lived Spurs (1 to 5 years)
Apricot
Sour Cherry
Sweet Cherry
European Plum
Japanese Plum

Pruning after the first of September or before the trees become fully dormant can be hazardous. Pruning may stimulate growth, making the trees more susceptible to winter injury during early fall freezes.

How to Prune

The objective of pruning young fruit trees is to establish the essential structure of the tree and to help the tree bear fruit. The objective of pruning older fruit trees is to open the trees to sunlight. Prune back the overhanging limbs in the upper part of the tree so that sunlight reaches the lower and inner portions of the tree to maintain fruiting. Basic knowledge of the fruiting and growth habit of your trees is essential.

The only practical way to become a good tree fruit pruner is with lots of hands-on experience under expert guidance. You may supplement this by reading reliable references. Refer to PNW400 *Training*

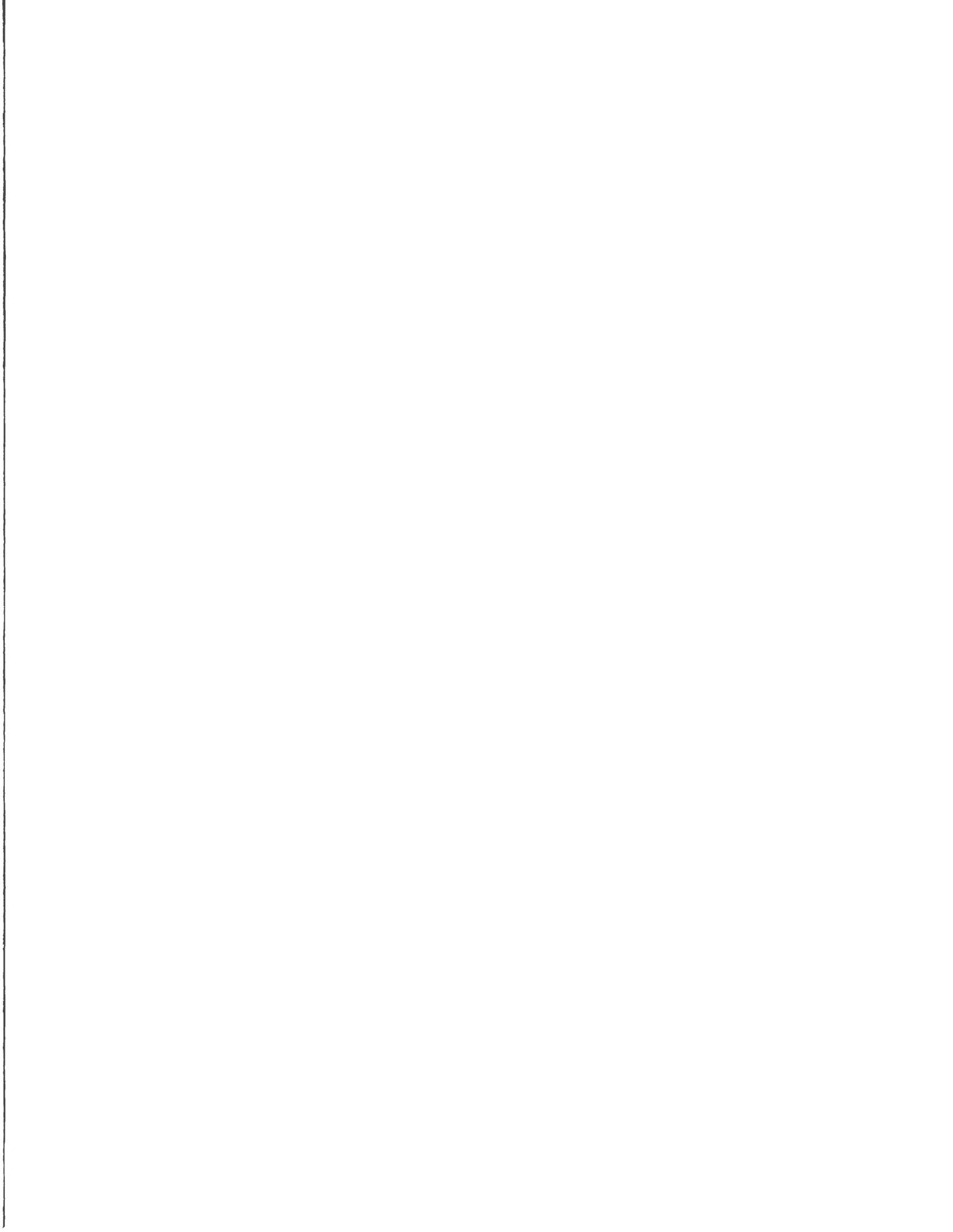
and Pruning Your Home Orchard, PNW402 *Training Apple Trees in Commercial Orchards*, PNW403 *Training Pear Trees in Commercial Orchards*, PNW404 *Pruning Apple Trees in Commercial Orchards*, and PNW405 *Pruning Mature Pear Trees in Commercial Orchards*.

You may find the following Cooperative Extension publications helpful:

Refer to the county publications: Home Orchard Pest Management Chart and the Spray Guide for Home Orchards in the Yakima Valley and Columbia Basin.

EB0918—*Disease and Insect Spray Schedule for Home Orchards in Eastern Washington: Peaches, Apricots, Plums, Cherries, Flowering Prunus*

EB0932—*Insect and Mite Control in the Home Orchard Tree Fruits and Nuts*



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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 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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