the BeeLine

Winter 2017

Newsletter of the Western Cascade Fruit Society

Where Have All the Apples Gone and Can These Farmers Bring Them Back? The Temperate Orchard Society, a tiny non-profit in Oregon, is working to save the most diverse collection of apples in the nation

BY LELA NARGI | Agroecology, Local Eats 12.05.16

Lovingly called "our national fruit" by Ralph Waldo Emerson, apples once proliferated in American backyards and orchards, a vital source of nutrition and a potent symbol of home. But now, most of the 15,000 named varieties grown here since 1804 are extinct, and only 15 kinds of apples (think Red Delicious and Gala) now account for 90 percent of U.S. production.

The U.S. Department of Agriculture (USDA) preserves 2,000 international varieties—some of what remains of the diversity of *Malus pumila*—in Geneva, New York. But, in northwest Oregon, a 4,500-variety private collection of fruit suited to moderate climates surpasses the government effort.

There, three apple enthusiasts—Joanie Cooper, Shaun Shepherd, and Franki Baccellieri—comprise the full staff of a minuscule nonprofit called the Temperate Orchard Conservancy (TOC). The team is in the midst of cloning each of the varieties in that collection; if they're successful, says Cooper, TOC's president and founder, "Those apples will be here for use and for study, long after any of us are dead and gone."

Possibly as soon as next year, seeds from those trees will also be sent to the Global Seed Vault in Svalbard, where they'll be preserved, according to the Vault's mission, to offer "options for future generations to overcome the challenges of climate change and population growth."

The collection was originally amassed by a man named Nick Botner. For 30 years,

Cont. on p. 2

Inside:

The BeeLine is a quarterly publication of Western Cascade Fruit Society, a non-profit 501(c)3 corporation in the State of Washington.

TOC from page 1

Botner grew an ever-larger selection of heirloom varietals in what eventually became, as he aged and ailed, an over-grown, under-tended orchard. In 2011, he put his property on the market.

The TOC team knew Botner from their mutual affiliation with another apple-related organization. They recognized the adverse repercussions on orchard fruit diversity if his collection was sold and plowed under. Together, and with Botner's blessing, they started in on what Cooper—a lifelong gardener and apple-identification buff—laughingly calls the "kind of foolish," monumental task of replicating Botner's trees.

The Botner collection—with its examples of dessert, cider, and cooking apples—provides a window onto the vibrant history of this fruit and the role it played in American home culture. But it's also a potential roadmap for the future. For example, says Cooper, "There's been a burgeoning interest in cider," which has been insipidly made in the past few decades from cooking apples. "You need bittersweet and other tastes to make a good cider, and we have them all."

Cloning the Collection

Apples can be grown from seeds, but since each seed yields a tree distinct from its mother, consistency is only assured by grafting a slim branch of the old tree, called a scion, onto a rootstock (a stump with a healthy root system) taken from another apple tree.

Walking Botner's six-acre orchard back in 2011, Cooper and company began to whittle off scions. They managed to collect about 800 varieties in each the first and second years. These they grafted onto rootstock in a warm, spacious, horticulture-department workroom at Clackamas Community College and placed in one-gallon pots.

In 2012, Cooper sold her house in Portland in order to purchase 40 acres of flat land in Molalla, two hours north of Botner's place in Yoncalla. And this, Almaty Farm, with room for 15,000 dwarf trees, is where the permanent TOC orchard will reside once the cloned trees are planted. (Almaty means "full of apples" in Kazakh, the language spoken in the region of Kazakhstan where apples originated.)

Heading into winter, 5,000 trees representing some 3,900 of Botner's varietals have been cloned. However, says Cooper, "Whenever you're grafting, you also have losses, so one of our jobs this December is to do an inventory and make a list of what we still need to complete." If all goes well, she thinks that next spring, TOC will be able to graft the last few hundred trees in the Botner collection.

Little by little, the collection has also been expanded with donations from, and trades with, other small orchards around the country—"just one or two, three or four at a time," says Cooper. "When we see people who have something we don't have, we add it. This will be going on ad infinitum."

Identification, Planting, and Eventually Feeding

After completing the cloning, the TOC's three members and their devoted handful of volunteers will start moving trees—some of which are currently planted in nursery beds, others of which are stored in pots under shade cloth—into the first two fields of the orchard.

"It's a little mind-boggling, because you can't plant them helter-skelter," says Cooper. "We'll try to put every apple into a group, deciding if it fits into the Rome group, for example, because of its color, size, basin, cavity. Or flagging summer apples [which ripen in July and August] because you don't want to walk a 17-acre field trying to find the trees that are ready *right now*."

So far, Cooper estimates that she, Shepherd, and Baccellieri have definitively identified about 800 of Botner's varieties by considering various visual and structural characteristics. They know they've got King of Tompkins County, a juicy apple with red cheeks and stripes that hails from New York. And they also have Blue Pearmain, a New England variety from the 1800s that's covered in a blue haze and offers a crisp bite. Others defy easy classification.

That's because, for many varieties, "We just have a name, and that means nothing to us," says Cooper. "When we are doing ID work, we are usually sitting at a table, surrounded by piles of reference books where we search for descriptions and pictures." Additionally, TOC has also sent leaves from 69 apples to the USDA's lab in Colorado. It's a science in its infancy, with a prohibitively high price tag, which in this instance the USDA performed gratis because it wanted to find varieties it didn't have in its own collection.

Which is part of the reason TOC is eager to set up its own genetic testing lab at Almaty Farm. Explains Cooper, "It's a very involved process, but ultimately, to be accurate in identifying the fruit, it's important to do it. Otherwise, you're relying on pictures sometimes and descriptions sometimes, but it's not enough."

Some heirlooms are more resistant to pests and scab, some are more self-reliant when left untended, and are higher in certain nutritional properties. For these reasons, identifying the varieties and their properties "is an important part of our program," says Cooper. It's also one that will require upwards of $200,000 to buy equipment and hire a specialized technician. "What it'll take," sighs Cooper, "is a big grant."

Some of TOC's future activities are incidental to its main directive to protect diversity. But they'll provide their

cont. on page 3

TOC from page 2

own benefits. When asked what will the organization do with all the fruit its trees are certain to soon bear, Cooper's smile can almost be heard through the phone. "We'll eventually be hooked up with food banks, and we want to have programs with the Future Farmers of America and 4H, so students can take a block of trees to work and learn on," she says. "It'll be such an advantage for our community."

And when additional scions from TOC's trees start becoming available for purchase in 2017, helping to re-establish varieties that haven't existed outside Botner's small acreage possibly for generations, apple-lovers far and wide will also get to reap the rewards.

Photo by Jafar Jefferson and Franki Baccellieri.

Gathering Editor Marilyn Couture urges your considering making a donation to nonprofit TOC, c/o Joanie Cooper, P.O. Box 529, Molalla, Oregon, 97038. All WCFS Chapters will benefit when fruit scions become available.

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WCFS call for Volunteers

Ron Weston reported that Randy Lee has resigned from the Research Grant Committee. Hence, we are looking for good candidates to replace him. While the person need not have any particular education or experience, it would be helpful for potential candidates to have a background making them well-suited to evaluating grant proposals and an ability to work collaboratively with the other Committee members.

WCFS is still in need of a Secretary. WCFS, our parent organization meets about four times annually, two of which are teleconferences.

Randy Lee has assumed the role of President, Snohomish County Fruit Society and has resigned as a director on the WCFS Board. Randy subsequently nominated Rebekah Jackson to fill the resulting vacancy. Rebekah has been appointed as a director.

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WCFS Webpage Update— Hartman Nursery info posted

Ron Weston noted that, thanks to the efforts of Rebekah Jackson, the information previously available on the Hartman Nursery website has been preserved on a resource page of the WCFS website. With the death of Bob Hartman and the winding down of his nursery business, there was concern that this information would be lost. Tahoma chapter has been heavily involved in helping the Hartman family wind down the business and particularly wanted to express their appreciation for Rebekah's work. With the permission of his family, we have included useful information formerly found on the Hartman Nursery website in the Resources Page of the WCFS site. We hope that Bob's love for teaching others can continue on through these pages."
http://wcfs.org/resources/hartman-nursery-bob-hartman/

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Next WCFS Board & General Membership Meetings will be hosted by SSFS and is set for March 18, 2017 from 12-2 pm at the Eastside Urban Farm & Garden Center in Olympia. Ian Stoner volunteered to make the necessary arrangements, since he is the manager for the center.

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The Falll 2016 BeeLine was produced by
Gathering Editor Marilyn Couture,
with input from membership.
Please contribute your articles for our next Spring issue!

Issue Deadlines:
Winter December 15;
Spring February 15;
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Email your articles to: **couture222@msn.com**

Biochar

John Cornell and Norman Baker PhD

Even though it's been used in agriculture for thousands of years, there's been an explosion of renewed interest in biochar for its environmental benefits, agricultural uses and its role in renewable energy. While this article will concentrate on the agronomic value, many experts believe the generation of biochar is a key component toward reducing atmospheric CO2 levels and will have a positive impact on global warming. In fact, Sir Richard Branson of the *Virgin Earth Challenge,* with its $25 million prize, challenged market forces to fight global warming. Of an initial 10,000 contest submissions in 2007, 6 of the 10 final contestants, rely on biochar as the most promising way to fight global warming. The prize has not been awarded yet but, the implications of biochar are profoundly clear for reducing global warming.

What is biochar?

Biochar is essentially charcoal made at a specific temperature (450 – 550 ° C) which is used to amend the properties of soil. It's made through a process known as pyrolysis which is essentially biomass subjected to high heat under low oxygen concentrations. When incorporated into soil, biochar can significantly increase the cation exchange capacity (CEC) of a soil rendering the soil more capable of holding on to nutrients that might otherwise be leached from the soil or released to the atmosphere through nitrification. In soils where biochar has been applied, the amount of fertilizer needed to produce a crop can be significantly lowered and the overall health and quality of the crop can be increased as nutrients are generally more available than in a soil without biochar. Scientists now believe through extensive field testing that maximum crop production, dependent on the particular crop, usually means 10% (by volume) of our soils should be biochar. Scientists have now documented about a 25% general increase in productivity.

Starting about 5000 years ago, it was the Indians in the Amazon Basin area of South America who discovered the value of biochar. Their native soils lack fertility and they started amending their soil with biochar plus compost, feces and kitchen waste. After seeing significant improvements in their crops, adding biochar became a cultural tradition. These soils, called *terra preta* by the locals, are highly sought after by today's local farmers for their agronomic value. The fact that these soils still exist today prove the long lasting soil fertility improvements and carbon sequestration are possible even under the most unfavorable conditions like the high rainfall and temperatures associated with the Amazon Basin region. Those conditions accelerate both leaching and mineralization and reduce soil fertility over time. Amazingly, entrepreneurs today dig those *terra preta* soils, remove the rocks and roots, and sell *terra preta* soils in big box stores in South America as potting soil.

How does biochar improve my crop?

As mentioned above, the incorporation of biochar into your soil increases the cation exchange capacity (CEC) rendering it more capable of holding nutrients. Biochar contains both cationic (positive) and anionic (negative) surface properties so so it's able to attract and hold both anions and cations. Imagine a magnet which was passed over some nails which spilled on your garage floor. As the magnet passes over the nails they are picked up by the magnet. In the same way these positive and negative charges on the biochar attract both cations and anions and keep them in the root zone of the plant. This concentration of biochar and plant nutrients in soils allows a well-developed microbiological community to develop. Growers everywhere are now recognizing the enormous microbiological community in healthy soils are responsible for superior crop production but it takes an average of three to five years for that microbiological community to develop. Positive results will begin to show the second year and will peak about the fifth year. Since many agricultural soils are seriously depleted by years of farming, incorporating biochar and compost often produces amazing rates of production.

Fertilizers break down into cations and anions when put in solution or applied to the soil. For example, potassium nitrate breaks down into potassium ions which are cationic and nitrate ions which are anionic. Similarly ammonium sulfate breaks down into ammonium ions which are cationic and sulfate ions which are anionic. Over time even these components often break down even further in a process called mineralization. The one common characteristic of these breakdown components is that they carry either a cationic (positive) or anionic (negative) charge. Just like the example above with the magnet and nails, these charges are attracted by the opposite charges on the biochar which has both positive and negative charge sites on them and are held by the biochar and the microbiological community just like the magnet held the nails.

It is only when in their ionic or mineralized state that nutrients can be taken up by the plant. Their availability to the plant is limited by the type and age of soil they are in. If your soil is very porous which is typical of a sandy or decomposed granite soil, there is likely very little cation exchange capacity and these nutrients are leached through the root zone of the plant because there is a very low CEC in the soil to hold them. Alternatively, if you have a soil with a lot of clay the CEC value is likely higher. Unfortunately a predominantly clay soil has other properties which are generally considered undesirable. Biochar seems to help almost all weathered acidic soils. In porous soils, it holds up to 18% more moisture. In clay soils, it reduces the density of the soil and improves the aeration and tilth or workability of the soil.

Where can I get biochar and how is it applied?

Biochar is surprisingly expensive with the current market price in large quantities going for about $1,000 per ton. Given how easy and inexpensive it can be to make, most gardeners will find it preferable to make it themselves. Any sort of biomass can be used to make biochar. Why not turn pruning waste into biochar and improve your crop?

cont. on page 5

Cont. from page 4

There are many different ways that biochar can be made and many sources available on the web to show you how it's done. One of the simplest techniques is to dig a large hole in the ground, fill it with dry wood, and build a large fire in it. Cover the fire with green limbs and leaves and just enough dirt to restrict oxygen. Once the fire has been burning for a while simply quench the flames with water and you'll have made your first batch of biochar. Ideally the time of quenching is when there is little to no wood remaining that has not gone through pyrolysis but not too long so that a significant amount of ash is created. The timing can be tricky but will likely improve over time through observation. For those more inclined to tinker, there are lots of designs available in various sizes and sophistication ranging from something made from a 5 gallon metal can to vessels holding thousands of gallons of biomass. Unfortunately, most of these "quick and dirty" methods produce a lot of smoke and environmental pollutants which are a health hazard. New technologies to make biochar are slowly coming online for smoke-free clean emissions.

Ideally biochar would be dug into the soil before planting a crop. It will also work its way into the soil over time if broadcast like a dry fertilizer. If broadcast over bare soil, a mulch should be applied to reduce erosion of the biochar from wind and rain.

Smudge-pot biochar generators?

Years ago smudge-pots were used extensively to protect citrus and avocado crops during cold weather events but this practice was outlawed due to air quality concerns. Some of the biochar devices used today are very clean burning whose emissions surpass EPA discharge levels and generate a significant amount of heat. While there are still some challenges to overcome, efforts are currently being made to develop a smudge-pot biochar device which will comply with air quality regulations, protect your crop from cold and produce biochar all at the same time. We will keep you updated on the progress of these efforts over time.

Conclusions

Biochar is a valuable soil amendment which has the potential to significantly improve your yields, reduce fertilizer usage and sequester carbon. If you have unlimited funds it can be purchased however making your own is likely a much more cost effective solution and you'll get a good feeling by sequestering all that carbon, fighting global warming and improving your bottom line all at the same time.

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Further Notes on Biochar

Judi Stewart, NOFC comments:

Francesco in Port Townsend is doing some exceptional work with biochar. Be sure to have the tools to handle his totes because they're BIG. Keep in mind that biochar tends to increase soil pH. Biochar can be dusty and breathing in biochar dust is dangerous. There's a range of biochar particle sizes which is influenced by the feedstock, feedstock moisture, pyrolysis temperature, etc. Biochar prices are all over the map.

If you'd like to experiment with biochar before going to great expense or making your own, you can buy an inexpensive bag of Cowboy Charcoal at Trader Joe's, Lowe's, Home Depot, or choose any other brand of lump charcoal which was made without petroleum or added chemicals. Never use charcoal briquettes for biochar. Remember - the source of this purchased charcoal may be other than local wood or feedstocks. Check the source of the charcoal if you can. You don't want to use anything from treated wood.

In order to reduce the size of this lump charcoal, crush it while it's still in the bag. If you're concerned that the bag will rupture, double bag it for added support. Put a board over the bag and pound it with a brick or mallet or run over the bag with your vehicle. The idea is to reduce the lumps to the size of little tootsie rolls.

Empty the bag into a bucket that's at least twice the volume of the bag's contents. Add to the bucket your choice of one or more of compost tea, compost, vermicompost, manure, fish meal, seaweed, urine, etc. and add some non-chlorinated water. This fills the pores with beneficial microbes which in turn feed your soil. If you're going to use the biochar in your orchard, it would be beneficial to add some soil from your orchard to the bucket. Now mix it up and let it sit for a few days to a few months. You've now charged the biochar. Speed up the process using an air pump with a tube in the bucket.

Don't even think about using biochar that hasn't been properly "charged" or inoculated. Doing so can set your growing efforts back two years. If uncharged, biochar with its high surface area is very porous, acts as a sponge and will suck up the nutrients from your plants/trees and surrounding soil.

I make my own biochar in various sizes from chunk to fine without grinding it and find it best to use it in the form of a slurry which minimizes dust particles.

Ken Miller, Vashon:

What Judi has stated is good information. Another formula that some of us received from Josiah Hunt is:

4 parts biochar
1 part worm castings
1 part azomite rock dust
1/2 part flour.

Mix biochar, worm castings and one half of rock dust. Mix thoroughly and then add flour, mix thoroughly. Add rest of rock dust and mix as above. Allow to sit for at least two weeks, longer is better.

Top dress around plants and/or down forrows.

I've used this formula with very good results.

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The Modern Farmer Guide to Types of Apples
By Brian Barth, October 21, 2015

Beyond Red Delicious, Galas, Fujis, Granny Smiths, and the handful of other apple varieties on grocery store shelves this fall, there are more than one thousand apple varieties grown by heirloom orchardists and backyard gardeners in the US.

Api Etoile, a star-shaped variety from Switzerland, and Apricot—you guessed it, an apricot-flavored apple—are just two examples of the diversity that's out there. With so many varieties to choose from, it's helpful to have a way to classify them so you know which to pick if you're making cider or a pie—or want to fatten your hogs.

If you're planning to plant apple trees, there are also technical details that make the difference between a successful planting and a fruitless one. Most apple varieties, for example, require pollination by another variety—not just any variety, but one whose flowers open during the same week or two in spring. Rootstock, chill hours, and fruit spurs also come into play. No idea what those terms mean? It's all spelled out here.

When Do You Want Your Apples?

Apples are not just a fall fruit. In fact, no other temperate climate fruit is available fresh for as many months of the year. By picking varieties that ripen at different times, you can extend the harvest from July to December. Variety listings typically designate one of three ripening seasons.

Early: Apples that ripen in mid to late summer. Examples: Anna, Early Gold, Lodi

Mid-Season: Apples that ripen in late summer to early fall. Examples: Honeycrisp, Macintosh, Sweet Sixteen

Late-Season: Apples that ripen from mid-fall into early winter. Examples: Newtown Pippin, Fuji, Rhode Island Greening

What Do You Want Them For?

Dessert: Apples that are recommended for eating fresh from the tree are referred to as dessert apples or table apples, which include American Beauty, Grimes Golden, Ribston Pippin, and Virginia Beauty. They are typically sweet, crisp, and juicy, but beyond that there is a world of flavor to explore. Early ripening apples are often the best dessert varieties.

Cooking: When making pies, preserves, and other baked goods, use drier, sweet-tart varieties (which match well with baking spices) with a firm texture (so they hold their shape after baking). Some good options: Honeycrisp, Jonathan, Braeburn, and Melrose.

Keepers: These are varieties that have been bred to last for months in a root cellar, extending the apple season into early spring when few other fruits are available. Late-ripening varieties like Arkansas Black, Brown Russet, and Mutsu are often the best keepers.

Hard Cider: Historically, most apples were cider apples (eating them fresh is a fairly recent development). Rather than use a single variety, cidermakers usually blend several varieties together based on their dominant flavor profiles. Recipes vary, but 50 percent sweet varieties (high brix rating), 35 percent sharp (high-acid/tart-flavored), and 15 percent bitter (high tannin content). For example, you might mix Rome Beauty (sweet), Winesap (sharp), and Red Astrakhan (bitter). There are also special cider varieties that are used alone, such as Kingston Black and Greasy.

Apple Juice: Any apple can be juiced, but the best varieties to use are a matter of personal opinion. One school of thought says sweet dessert apples are best for juicing, while others prefer the complex flavor in a blend of sweet, sharp, and bitter varieties, as for hard cider.

What Are Your Growing Requirements?

When selecting an apple for planting, it's not enough to choose based on flavor or use. Some varieties may be better suited to your climate and specific growing situation than others.

Low-Chill: Apples need a certain number of hours below 45 degrees Fahrenheit each winter to produce fruit, which is measured in chill hours. The chill hours required range from less than 100 to more than 1,000, depending on the variety, and are typically listed in the variety description in catalogs. Use a chill hours map to find the number of chill hours in your area. In mild winter climates, only low-chill varieties should be planted to ensure fruit production. White Pearmain, Winter Banana, and Dorsett Golden are among those recommended for the mild winter areas of the West Coast and the Deep South.

Dwarf: In their natural state apples grow to 25 feet or more, making harvest difficult. These are called "standards" in apple terminology and are rarely grown. Instead, most apples are grown on dwarfing rootstocks—another variety of apple that controls the size of the tree (and also determines its adaptability to soil type and resistance to particular pests and disease). Different rootstocks cause different degrees of dwarfing, from the common 15-foot semi-dwarf trees grown by most backyard orchardists to 5-foot miniature apples that will fit in a patio planter.

Self-Pollinating: Most apples require cross-pollination from a variety that blooms at the same time in spring. But a select few are self-pollinating (also known as self-fertile or self-fruitful), including Alkmene, Granny Smith, and Grimes Golden, making them a good choice if you only want to plant one tree.

Multi-Grafted: A single mature apple tree may produce hundreds of pounds of apples. Multi-grafted trees, where several different varieties are grafted onto one trunk, are a strategy to spread out the harvest with varieties that are used for different purposes or that mature earlier or later in the season. Multi-grafted trees are a way to fit multiple varieties in a small space and, if the varieties are compatible pollenizers, they function as a self-fertile tree.

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Here is a great video on **companion planting** from the Garden Planner subscription.
https://www.youtube.com/watch?v=-NLPmuXCzFY

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Chill Hours Required by Fruit Trees

The term "temperate fruit tree" refers to trees that go dormant in winter, preferring moderately cold winters without the killing freezes of the coldest zones. Dormancy begins in late fall and lasts into early winter, initiated by lengthening days and cooler temperatures; it is chemically wrought by hormones suppressing buds for next season's foliage and flowers until conditions are right for tender new growth.

What is critical is how the tree breaks dormancy. Trees listen for the signal that yes, winter has arrived. The necessary signal strength varies between species, but is officially referred to as "chill hours", or vernalization, when the temperature stays between 32°-45°F. The hormone responsible for dormancy breaks down in this range, allowing buds to develop into flowers or foliage when the weather warms up in late winter. Interestingly, temperatures below 32°F are ineffective and do not count; hours when temperatures exceed 60°F are actually subtracted from the accumulated chill hours.

When a tree does not receive the necessary signal to break dormancy, the buds tend to leaf out later, and the flower buds may appear irregularly, which can result in a longer bloom period. This may seem beneficial, but flowers are delicate things, and the longer the bloom period, the more likely they will be exposed to diseases such as fire blight and brown rot, meaning a harvest of fewer and deformed fruits.

Why all this talk about tree signals and deformed fruit? Climate change is making warm winters more frequent, resulting in poor harvests for certain fruit trees. As stated above, some require more chill hours than others, depending on species and varieties within species.

Estimated Chill Hours by Species from Raintree Nursery

Apple 400-1000

Japanese Pear 400-500

Cherry 700-800

European Pear 600-800

European plum 800-900

Japanese Plum 300-500

Peach 600-800

Fig 100-200

Quince 300-500

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Raspberry Pruning

Richard Jauron & Willy Klein, Iowa State Extension

To obtain maximum yields, raspberries must be pruned properly. Pruning produces higher yields by increasing berry size. It also helps control diseases. Pruning procedures are based on the growth and fruiting characteristics of the plants.

Growth characteristics

Raspberries are unique because their roots and crowns are perennial, while their stems or canes are biennial. A raspberry plant may survive and produce fruit for many yeears. However, individual canes live only two years and then die.

During the first growing season, the shoots of purple, black, and summer-bearing red raspberries are strictly vegetative (non-fruiting). The following year, these same canes flower, produce fruit, and then die.

Fall-bearing red raspberries naturally produce two crops. The first crop is produced in late summer or early fall at the tips of the current season's growth. The following year, a summer crop is produced on the lower portions of these same canes. After the second crop, the canes die.

Red raspberries produce new canes from buds located at the base of the previous season's growth and on their roots. Because red raspberries sucker freely, they need to be confined to a 1– to 2– foot-wide hedgerow.

Black and purple raspberries produce new canes only from buds located at the base of the existing canes. As a result, they tend to remain in their original planting area.

How to prune summer-bearing red raspberries

In March or early April, remove all weak, diseased, and damaged canes at ground level.

Leave the most vigorous canes, those approximately 1/4 inch in diameter when measured 30 inches from the ground. When finished, remaining canes should be spaced about 6 inches apart. Also, prune out the tips of the canes that have died due to winter injury. Cut back to live tissue. Maintain plants in a 1-to2-foot-wide hedgerow using a rototiller or spade.

After the last harvest of summer, prune off the old fruiting canes at soil surface. Remove and destroy pruned material.

How to prune fall-bearing red raspberries for two crops

In March or early April, remove all weak, diseased, and damaged canes leaving only the most vigorous canes. Also prune out the tips of the canes. The summer crop will be produced on the lateral (side) shoots of the remaining portions of the canes. Maintain the plants in a 1-to 2-foot-wide hedgerow. After the summer crop has been harvested remove and destroy the old fruiting canes.

How to prune fall-bearing red raspberries for one crop (total crop yield is typically larger using the one-crop system instead of the two-crop system.) In March or early April, prune all canes back to ground level. This eliminates the summer crop, but the fall crop matures one to two weeks earlier. Maintain the plants in a 1-to2-foot-wide hedgerow. No summer pruning is necessary.

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Pruning by Numbers

by Alan Haigh…Reprinted with permission—from 2007 Winter Pomona

Pruning has to be the most confusing part of caring for fruit trees. The results of this confusion are all around us. For example, where I live in southeastern NY, it is common to see century-old apple giants that were trained as open centers generations ago. They might have up to eight equal sized 100 year old scaffolds where three would have been adequate. How are you supposed to find room for lateral branching with good light exposure in a tree like this? Bad decisions made a century ago or more continue to plague the poor sap trying to bring such trees into productivity today.

Count me as one of those poor saps because I spend half the working year correcting decades of pruning mistakes and neglect in all species of fruit growing here. Because of their size and predominance, the majority of these trees are the ancient apples of the former commercial orchards that provided apples for NY City many decades past and are now the sites of grand estates in places like Greenwich CT. and the horsey hills of Westchester County.

I have extensively researched the literature of fruit tree pruning and now after many years of hands-on experience, this article is an attempt to make my own small contribution to this literature.

I am going to start with a single concept, a simple mathematically based formula that may clear up some of the confusion. My hope is that this formula contributes to a legacy of sensibly trained fruit trees. Then future generations of fruit tree care takers will suffer less frustration and be required to remove far fewer large limbs than what I do.

The basis of this formula is employed by many commercial apple and pear growers in Washington state and elsewhere. It may have been devised to provide simple guidance to minimally trained pruning crews called on to train hundreds of acres of free-standing fruit trees. A free-standing tee is defined as one at least 40% the size of standard that requires no support at maturity at most sites.

These growers instruct their workers to remove any branch that exceeds 1/3 the diameter of the trunk at its point of attachment to the trunk. Until a tree begins to bear fruit all other branches are left on the tree except rubbing or broken branches. Permanent scaffolds are not selected until trees begin to bear fruit.

For many varieties of apples and pears, this is all that is required to bring a tree into productivity as quickly and efficiently as possible. Of course, there are some exceptions which will be discussed later.

What is perhaps novel in my approach is to apply the 1/3 rule (or at least at least a ½ rule) not just to scaffolds but to secondary and often even to tertiary branches. In other words, maintain a central leader on each scaffold and remove every secondary branch that exceeds 1/3 to ½ the diameter of the scaffold at the secondary branches point of attachment to the scaffold.

A big part of the theory behind this involves the "economy of wood". Using ratios as a guideline for removing crowding wood encourages the development of a tree that uses the least amount of structural wood possible to hold the largest amount of small, fruitful, well light exposed wood. This may be a confusing concept when read off the page, but as you prune your trees it will gradually make sense over time.

You can use this formula on apples, pears, peaches, plums, apricots, cherries and even mulberries. You may elect to train peaches and most other stone fruit to a three or four scaffold open-center after about 3 years. Even if you do, selecting scaffolds from only "moderately vigorous wood" creates scaffolds that are dependably strong, precocious (early fruiting) and a relatively compact tree. Incidentally, in my experience, three scaffolds are usually all that are needed to produce the easiest to manage and most productive open center tree.

It is commonly recommended that apples and pears be maintained as central leaders because this uses space and light quite efficiently. Think of a central leader tree as two or three open-center trees growing on top of each other with each subsequent tree being about half the size as the one beneath it. Incidentally, in a home orchard where absolute efficiency isn't essential, you can train your apples and pears as open center trees if you prefer.

Note the expression "moderately vigorous wood". It is very important to understand the relationship between a branch's diameter and its vigor. The relative diameter of a scaffold branch at its point of attachment to the trunk strongly influences its access to sap. Think of a branch like a hose- the wider the diameter of a hose, the more water that can pass through it at any given pressure.

Because the pressure that pulls sap through a scaffold is provided by evaporation from leaves and the resultant capillary pull, the number of leaves and their relative exposure to the sun is the other determining factor of a scaffold's access to sap.

So how does access to sap affect a scaffold's relative vigor? Well, access to sap is the same as access to the roots and the roots provide water and most of the essential minerals for plant growth. This means that a scaffold with a smaller diameter stem functions in the manner of a dwarf fruit tree while a larger diameter stem functions more like a standard. The smaller diameter stem tends to store relatively more of its carbohydrates and sends less to the roots creating a cycle of fruit productivity at the expense of vegetative vigor.

If you're patient and give it enough room, an excessively vigorous scaffold will eventually become fruitful. But if you try to keep it in bounds and aggressively cut it back, the branch will tend to remain vegetative, probably partially because of a greater ratio of nitrogen to carbohydrate. The nitrogen is brought up from the roots and when you prune a branch the remaining buds have access to more of it and everything else brought up from the soil.

Speaking of the ratio of nitrogen to carbohydrate, it is important to realize that a branch's access to carbohydrate is strongly influenced by its relative access to sunlight.

Cont. p. 9

Cont. from page 8

This means that in order for a branch to be fruitful it needs adequate light. However, the carbohydrate-nitrogen relationship is a little tricky because greater exposure to sun also draws more sap.

Here are some notes about possible exceptions to the 1/3 rule. First, some varieties benefit from an early selection of permanent scaffolds. This would mean removing all but three or four branches of each tier of a central leader tree by the second year of their selection instead of just leaving all properly ratioed branches until the onset of fruiting. The 1/3 rule would still apply to the selected scaffolds.

In my experience, Fuji is slow to come into bearing if there are too many branches on the tree, even branches of low relative diameter. For a twiggy, hyper-vegetative variety like Fuji, it may be useful to eliminate all but the permanent scaffolds as soon as possible to help early development of flower buds. Fuji tends to excessively shade itself, apparently causing a tendency towards extended juvenility.

Lanky varieties like Ginger Gold and Yellow Delicious may also benefit from early scaffold selection to encourage greater secondary branching. They may also benefit from heading back these scaffolds by about 30% of annual growth to make scaffolds stouter. If such heading cuts are made, come back during the growing season to retrain the scaffold to a central leader by pinching back competing buds near the heading cut and allowing the straightest one to lead. You can also wait until mid-spring to make these cuts after the tree has leafed out. This will quiet the fierce vegetative response at the point of the cut. As trees get older it is best to prune scaffolds back.

Because they are determined to fruit early and profusely, varieties such as Empire, Arkansas Black, Braeburn and Goldrush will perform well with relatively larger diameter scaffolds. Scaffolds up to half the diameter of the trunk are fine in such cases, as long as the unions are strong, with no inverted bark. This larger ratio can also work for the scaffolds of open-center trees but may result in a less compact, later fruiting tree. It will not delay peach productivity, however.

Less vigorous, more fruitful varieties may also benefit from an increased number of scaffolds, particularly if secondary and tertiary branching is sparse, which is the case with spurry varieties of apples, and many pears.

When pruning mature trees, the ratio rule is very useful in deciding which of two crowding branches to remove. When oversized wood is removed in favor of wood with a better ratio to the branch it is attached to you are creating a more efficient and fruitful tree.

That completes my explanation on the use of ratios to guide the training of many types of fruit trees. I continue to use the general principles here in maintenance pruning as well. I don't automatically remove every secondary and tertiary or even quatiary branch that violates my ratio rule, but when branching becomes excessively crowded it is primarily this principle that determines which branches are removed. I won't leave a huge empty spot in the canopy to enforce this rule, however.

Distance Between Tiers Another number that might come in handy is the distance between tiers on a central leader tree. On apple trees growing on rootstocks with vigor equivalent to M7 to EMLA 111 you need about four feet between the first and second tier and three feet between the second and third. Each successive tier should extend about half the distance from the trunk as the previous tier and the branches should have about half the diameter of branches in previous tier. This will assure that higher branches are not excessively shading lower ones. This accomplishes the efficient Christmas tree shape mentioned earlier.

Because the higher you go on the tree the better the access to the sun the upper scaffolds will gradually outgrow the lower ones and will stop being fruitful if you keep trying to prune them to the desired length. If you let them grow out as far as they need to be fruitful they will shade the lower scaffolds and your Christmas tree shape will be destroyed. It is necessary to replace upper scaffolds every few years when the diameter gets too large. You should plan a couple years in advance for this and always leave some low vigor wood to form eventual replacements. For spurry varieties this is less of an issue.

The Highway Analogy of Branch Structure Consciousness of ratios will in itself lead to the development of a more efficient tree structure but it may also be useful to think of wood as a transport structure similar to a highway system. The scaffolds are like a 12 lane super highway while secondary branches are your 4 lane highways and tertiary your 2 lane roads. You can call the smallest wood down to spurs as your alleys and driveways.

Highways are expensive to build and maintain just as wood is expensive (energy-wise) to build and maintain. The least amount of asphalt or wood required to satisfy the needs of transport the better. Another ratio issue is about access to territory for each scaffold. If the first tier has three scaffolds then each scaffold should have dominion over one third of the circle that the tier encompasses. In other words, if you looked at the tier from above as a two dimensional circle, each branch should occupy one third of that circle. Before you prune you should study the scaffolds to determine where one is encroaching on another's space. When two smaller branches are crowding each other this will guide you to which one to remove- it will be the one attached to the encroaching scaffold.

So the three or four scaffolds of each tier should have approximately the same amount of small wood connected to them. This will happen just by respecting each scaffolds allotted space.

For secondary branches it's a little more difficult to determine how much tertiary wood should be on it but generally the amount of smaller wood on a branch should coincide with its relative diameter. As trees grow, secondary and tertiary branches will often become over-sized with too little space available to grow enough small fruiting wood to justify the branches access to sap. By guiding the growth with the removal of this kind of wood, the vigor balance of a tree is maintained.

Cont. on page 10

Cont. from page 9

This completes my mathematical explanations of training fruit trees. Unfortunately it still falls short of providing a complete road map. Following these guidelines you will certainly wind up with a reasonably open tree that has access to adequate light throughout the canopy, however, the issue of exactly how open the tree needs to be is not completely addressed.

I've always been fond of the old time appleman's explanation that an apple tree should be open enough that you can throw a cat through it. OK, I'm not particularly a cat lover so the image doesn't disturb me- not that I endorse heaving felines to find out if the pruning was done properly.

Exactly how open a tree should be will depend on a lot of factors. In more southern areas too much exposure may cause sunburn. Trees in relatively shady sites or further north will benefit from being pruned more openly and will also often benefit from substantial summer pruning of annual wood to allow sun to reach the leaves that serve the fruit. What I've tried to cover in this article is essentially a general explanation of structural training and maintenance of fruit trees. An extremely important issue not addressed here is any explanation of the detailed pruning required to best manage the fruiting wood.

This subject can get quite complicated as each species and many varieties within species have their own particular fruiting habit- peaches only bear (and leaf) on wood from the previous year (1-year wood)- some apples bear their best fruit on 2-year wood or even the tips of shoots formed the previous year, like peaches. Some species and varieties within species bear all or most of their fruit on older, knobby and short pieces of wood called spurs which require renewal pruning.

Because of the wide range of factors involved in making the best decisions in this kind of detail pruning I will save this general subject for another article.

To master the art of pruning you must prune and observe the results and then adjust based on the information your trees provide you. Be courageous and remember that most of us have a strong predisposition to remove too little wood. Submitted by Judi Stewart.

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Pruning Pears, submitted by Judi Stewart

If you're growing pears, don't miss this video. Dr. Stefano Musacchi, Professor of Horticulture at the WSU Tree Fruit Research and Extension Center in Wenatchee, demonstrates and explains his methods of pear pruning. Viewing is longer than most but the information is outstanding. The link to this video was in the 2016 Winter *BeeLine*.

https://www.youtube.com/watch?v=5h5aQ5DwYOo

Further explanation of concepts

http://treefruit.wsu.edu/news/bartlett-pear-pruning/

The best and biggest pears grow closer to the axis.

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Dormant sprays can help reduce pests & disease in home orchards

EUGENE – Prevention is the first step in controlling diseases and insect pests in home orchards. Many problems can be avoided by choosing resistant fruit tree varieties and providing them with proper care. That care includes removing all dropped fruit and leaves that might be harboring pests.

But even the most vigilant gardeners may need to spray their trees during the dormant season to reduce over-wintering pest and disease organisms.

Spraying fruit trees during the cool seasons, November through March, can help control pests that take up residence in the cracks and crevices, according to Ross Penhallegon, horticulturist with the Oregon State University Extension Service. Such dormant spraying is more effective than waiting until the weather warms and pests become active.

Below are some least toxic sprays and treatments for fruit trees. These products are widely available at garden centers. Always follow label directions.

Dormant Oil: Apply when trees are dormant, Nov.-Mar. after all the leaves have fallen. Mix with water as directed and spray to all surfaces of the trunk, branches and twigs. Apply when the temperature is expected to rise during the day; temperatures below 35 degrees can damage the bark. Dormant oil controls aphids, scale, spider mites, and many other insects by desiccating or smothering eggs and larvae.

Fixed Copper: Spray on apples, pears, cherries, peaches, and plums to control canker. Allow two weeks between applications of copper and any sprays containing sulfur. Add a spreader-sticker product to help copper adhere to the surface.

Latex paint: Coat the trunks of young trees with white latex paint mixed half-and-half with water. The paint reflects strong sunlight that, once the leaves fall, can cause cracking, a favorite place for pests to overwinter and can cause substantial winter damage.

Here are some tips for specific fruit trees:

Apples: Spray copper before fall rains; dormant oil once or twice from January through March; wettable sulfur just after petal fall.

Apricots: Spray copper before the fall rains and dormant oil in February.

Cherries: Use wettable sulfur applied weekly during blooming for brown rot. Information on synthetic sprays to control cherry fruit fly is available at your local county office of the OSU Extension Service.

Pears: Spray copper before the fall rains; spray dormant oil in early spring before buds open and wettable sulfur just after petal fall.

Peaches: Spray copper or a good dormant fungicide three to four times between December and bud break. Spray copper before fall rains and in spring just before bud break; apply sulfur weekly during blooming and again after all petals have fallen.

Author: Peg Herring , Feb. 1, 2006

Source: Ross Penhallegon

Regarding Dormant Spraying

OOS recommends spraying fruit trees during the dormant cool seasons, Nov. through March, to help reduce pests and disease, Apply when the temperature is expected to rise during the day; temperatures below 35 degrees can damage the bark. Dormant oil controls aphids, scale, spider mites, and many other insects by desiccating or smothering eggs and larvae.
Fixed Copper: Spray on apples, pears, cherries, peaches, and plums to control canker. Allow two weeks between applications of copper and any sprays containing sulfur. Add a spreader-sticker product (a Non-Ionic Surfactant) to help copper adhere to the tree surface. Be sure and read the label. Liqui-Cop may be used as a Copper Fungicidal Garden Spray. It is extremely weatherproof and does not require oil or a sticker. Marilyn Couture

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Workshops, Classes and Field Days

Feb. 11, STFS Grafting class by Greg Giuliani,
"winter pruning" field day in demonstration orchard,
The Brig, Magnuson Park, Seattle.
March 4, PFC scion wood Bremerton meeting site.
March 17, STFS scion wood for sale at Highline CC.
March 18, SSFS meeting and WCFS annual meeting,
Eastside Urban Farm & Garden Center in Olympia.
March 19, HOS, Canby fairgrounds, scion exchange.
March 25, OOS, Lazy J. Tree Farm, scion exchange.

March 4, WWFRF, Mt. Vernon, Winter Field Day—rootstock, scion wood sales, workshops on pruning and grafting and Fruit Garden demonstrations on pruning. This year's emphasis is on growing pears. 11:05 – 11:55 AM Panel: "Best Pears for the Pacific Northwest" (Joseph Postman, Dr. Robert Norton, Sam Benowitz, Jacky King, Gary Moulton, Jim Gerlach, moderated by Kristan Johnson.

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Bitterpit Reduction

According to the latest Fruit Growers News issue & Lailiang Cheng, a professor at Cornell Univ. incidence of Bitterpit is decreased using B9 rootstock. Fruit grown on B9 show much lower potassium levels which lead to lower Bitterpit occurrence.
This is fascinating.
Submitted by Lori Brakken

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DNA Fingerprinting and Plant Identification Services

The cost of UC Davis' Foundation Plant Services genetic profiling cost is accurate, for good measure here's a link to their website: http://fps.ucdavis.edu/dnamain.cfm

DNA testing fees: The apples were $265 per sample. The work was done at UC Davis by Gerald Dangl.
UC Davis charges $345/ sample or $265/sample for 6 or more samples. They also do plums.

DNA Fingerprinting, Plant Identification Services. Jerry Dangl manager, Plant Identification Lab Foundation Plant Services (530) 752-7540 gsdangl@ucdavis.edu

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http://fpms.ucdavis.edu/IDTesting.html

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Disinfecting Scion Wood

I use 4 teaspoons of bleach to 1 gallon of water. Dry on towel. Then dip ends in bees wax.
Lori Brakken

I apply antibacterial soap to a toothbrush and scrub to the wet cuttings.
Spray with 5% bleach solution.
-Chuck Polance

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The 18th Annual Salt Spring Island Apple Festival

Theme: Go right to the Tree that Grows your FAVOURITE apple. 1) Apple Festival Website:
http://saltspringmarket.com/salt-spring-island-apple-festival/
Sunday, Oct 1, 2017

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2016 FAIR-Entries –Experience

Annie Jackman, Tahoma chapter

Have you ever wondered about entering 'your own home-grown foods' at a Fall fair?
If not, maybe you were stumped by judges commonly ruling "3 to 6 samples of **Uniform** shape, color, + size", or related rules. Many people actually succeed. Having contributed successfully in other areas, the Uniformity-rule prevented my own attempts, because Nature seldom exactly repeats her fruits like that. Really, it is okay to participate in stages, like I did this year.

Yes, Homeschooling children who won Blue ribbons, and Grand champion is one way to get introduced. Having gardened for many years, growing flowers, veggies, and berries, finally this year I tried entering Horticulture for my 1st. time. Against countless seasoned participants who had an entire year to prepare for three weeks, and many shows, I simply spontaneously took whatever I nurtured in my **ever-expanding...R-a-i-n-b-o-w garden**, & the result ?

In Indoor plants, novice dahlia, cut flower, & other shows**,** I was awarded 11 Blue plus... for a total of **42** ribbons, see…

It gets better yet, because I received an $88 premium check. This paid for all the extra Garden watering, and moving plants back and forth to the **eight** shows, plus more seeds for next year's Fair. At the end of my 1st day, having won 3 Blue ribbons, my innate passion teamed with increased confidence to continue on with this Fun.

Now what about you? - in case you have not yet taken advantage of such wonderful opportunities to grow, I highly recommend participating in the Washington State Fall Fair, be it in Horticulture, &/or Agriculture. - You will gain new insight, & develop new skills, & there is no entry fee. Plus you receive a free admission ticket for even 1 entry, so you have nothing to lose, and so much to gain. Think highly of yourself, and best efforts, and **you too will succeed**.

Looking forward to seeing you there, to Cheer you on, and wish you all the Best,

Annie Jackman, Tahoma

Update on WCFS Research Grant status
By Elizabeth Vogt

Elizabeth noted that both Randy Lee and Patti Gotz are also on the Research Grant Committee. There are two current grants outstanding. Both projects have submitted their annual reports. They expect to get a further request for funds this year from the ongoing Adara research project being conducted by Dr. Bob Norton and Anne Woodward. The first cycle deadline is January 15th. Requests received after the January deadline will be held for the second cycle (July 15th deadline). Jerry Gehrke asked how soon funds would be released if grants are approved during the first cycle. Elizabeth explained that they would expect funds to be released as soon as possible after the WCFS Board's decision on a grant proposal at its March meeting. The Committee has not received any new applications for funding.

Look to the Spring BeeLine for further updates on Research Grant status.

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The Canadians are growing GMO apples

http://www.cnbc.com/2017/01/19/the-first-gmo-non-browning-apples-will-go-on-sale-in-the-us-next-month.html

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Attention WCFS Members

Want to know instantly what's happening in the organization? Subscribe to the WCFS Forum. It's a benefit of membership. The Forum is private and closed to the public. It keeps us together and on top of what's happening in our chapters. Click on this link and follow the prompts:
http://lists.ibiblio.org/mailman/listinfo/wcfs
Judi Stewart, Forum Administrator

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Chapter News

WCFS

Olympic Orchard Society

Feb. 4—Pruning Workshop at Peninsula Nursery.

March 25—Grafting Workshop at Lazy J. Tree Farm.

Marilyn Couture with Multnomah apple

Parentage: Red Rome x Newtown Pippen
Propagated by Couture's great grandfather, H. A. Lewis, Russellville Nursery, 1923.

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Links
Here is a list of sites on the web that may be of interest to you.

Related Organizations
Backyard Fruit Growers
www.sas.upenn.edu/~dailey/byfg.html
California Rare Fruit Growers
www.crfg.org
East of England Apples and Orchards Project
www.applesandorchards.org.uk
Indiana Nut Growers Association
www.nutgrowers.org
Midwest Fruit Explorers
www.midfex.org
North American Fruit Explorers
www.nafex.org
Northern Nut Growers Association
www.northernnutgrowers.org
Oregon Sustainable Agriculture Land Trust
www.osalt.org
Western Cascade Fruit Society
www.wcfs.org
Western Washington Fruit Research Foundation
www.wwfrf.org
Home Orchard Society
www.homeorchardsociety.org/
Seattle Tree Fruit Society
www.seattletreefruitsociety.com/
Seattle Tree Fruit Society—Apple ID program
www.seattletreefruitsociety.com/appleid.php

Fruit Research
National Clonal Germplasm Repository
www.ars-grin.gov/cor
Tree Fruit Research and Extension Center, Washington State.
www.tfrec.wsu.edu
Northwest Berry and Grape Infonet.
berrygrape.oregonstate.edu
Pedigree: A Genetic Resource Inventory System
www.pgris.com

Oregon Department of Agriculture
www.oda.state.or.us

Goverment Sites
US Dept. of Agriculture
www.usda.gov
USDA Agricultural Research Service
www.ars.usda.gov

Helpful Sites
Orange Pippin
www.orangepippin.com
Kiyokawa Family Orchards
www.mthoodfruit.com
Red Pig Tools
www.redpigtools.com
Friends of Trees
www.friendsoftrees.org
Cornell Gardening Resources
www.gardening.cornell.edu
http://www.fruit.cornell.edu/tree_fruit/GPGeneral.html
The National Arbor Day Foundation
www.arborday.org
UBC Botanical Garden
www.ubcbotanicalgarden.org
The Reckless Gardener
www.recklessgardener.co.uk
Farm & Garden
www.farm-garden.com
SeeMeGarden.com
www.seemegarden.com
GardenGuides.com
www.gardenguides.com
VitiSearch: Helpful Resources about Grapes
www.vitisearch.com
Avant-Gardening: Creative Organic Gardening
www.avant-gardening.com
The Hardy Plant Society of Oregon
www.hardyplantsociety.org
Ask the Berry Man
www.asktheberryman.com
BackyardGardener.com
www.backyardgardener.com
Tom Brown's website
www.applesearch.org

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