

GROWER FIELD GUIDE, June 2008

June is finally here. The cold of April has taken a toll on the cherry crop around the Wenatchee area. Cherry tonnage will be lighter than last year and there are some very light areas around. Apples seem to be ok, but the large crop that was predicted early will be smaller. Cold springs usually mean slow growing conditions during cell differentiation and smaller fruit. Make sure that you are paying attention to the things that you can do to help that fruit to develop to the best potential possible. That leads me right into the point!

Technical advances in post harvest fruit handling, marketing consolidation and management of the retail produce departments will, in my opinion narrow, perhaps dramatically the range of fruit size, quality and condition that you will be allowed to send to the most profitable markets. The application for you as a fruit grower is this, you will have to target your production and harvest to a narrow range of marketable sizes, uniform and acceptable eating quality with storage and possible shelf life adequate for orderly marketing, retail selling and possible kitchen or dining room display before finally being eaten. Everybody else involved with your fruit will be measuring, testing and analyzing it at least from harvest to shipping to see if it has what it takes to satisfy the marketing process. I think you should beat them to the punch and begin the process before the fruit is even born. You've heard the saying "you are what you eat", what you feed your fruit and when will affect the quality and quantity you harvest and successfully market.

The foundation of your high tech, precision farming will be the soil your fruit factory (the tree) obtains its raw material from. Then you have to know if the delivery system (irrigation water) between the raw materials deposit and the factory is functioning properly. It doesn't really matter how much of anything you've got stockpiled in the soil if your irrigation water can't bring it into solution and deliver it to the tree. You can find out how efficient this delivery system is by using a 'paste analysis' i.e., your soil and water instead of your soil and the soil lab's standard acid solution.

The next 'let's see what we've got' opportunity is when the fruit is about golf ball size (50g or 1 ¾ oz.). At this stage cell division is complete, the mineral content is essentially fixed so it is possible to closely estimate what the harvest ratios of calcium/magnesium/nitrogen, etc will be. The good news is that you still have time to do something about it if they are badly out of range. The best fruit is fruit that is 'correct' at the end of cell division with mineral ratios in a proven acceptable range.

Use the information you gain this year from your soil and fruit testing to begin next year's fruit quality program. Do you have adequate levels of the major nutrients already in your soil, properly balanced or do you need to apply corrective elements? Do you need to amend your irrigation water to increase the availability of essential elements? Do you need to alter or implement an early season (prebloom through cell division) foliar program to 'fine tune' the available essential elements for better fruit quality? The ability to understand and manage these details successfully along with everything else you already do may well determine success or failure.

Northwest Wholesale has spent the past several years gaining hands on experience with programs to objectively measure and adjust soil, water and nutrition balances to improve and enhance your ability to consistently grow high yields of tasty, long shelf life crops. Make our knowledge, products and services part of your management plan; we are up to the challenge.



The difference between the two pictures to the left could be \$1,500! That's according to Matt West, WSDA field investigator. He related to me that both the DSHS and L&I have been receiving inquiries/complaints about individuals or crews working in orchards that are posted as restricted entry. That is in violation of EPA Part 170.120(c)(6): The signs shall: (i) Be posted no sooner than 24 hours before the scheduled application of the pesticide. (ii) Remain posted throughout the application and any restricted-entry period. (iii) Be removed within 3 days after the end of the application and any restricted-entry interval and before agricultural-worker entry is permitted, other than entry permitted by §170.112

There is only one commonly used pesticide that requires posting, which is Guthion or AzinphosMethyl. Matt told me that on first contact with a grower who's signs are out of

compliance i.e., permanently in place or with crews working behind them, he assumes the grower is not aware of the regulations and simply tells him what is required. If the signs are still out of compliance the next time Matt is by the orchard he assumes the grower simply forgot and will issue a formal warning. If Matt sees the signs a third time he says he has to assume the regulations are being ignored and will issue a \$200 citation. But Matt also tells me that L&I is not reluctant to issue a \$1,500 citation on first contact.

I think there is also a public credibility issue here. If we, as an industry are continually assuring the regulatory agencies and the general public that we are responsible stewards of pesticides and the environment, that we are not endangering water, wildlife or people, how credible are we if we maintain signs at the edge of our orchards stating that the environment inside that orchard is dangerous to your health? Manage your posting correctly, avoid possible penalty and improve the public image of your business.

Usually by late June I'm beginning to have discussions with growers and other fieldmen about the inability to control cherry mildew, or Psylla, mealybug, etc. My first question will always be "How good is your coverage." The most commonly answer I get is that it's good because the sprayer is calibrated to either 200 or 400 gallons per acre.

Gallons per acre and coverage are **NOT** related. Coverage is directly related to the ability of the fan on your sprayer to replace the air in tree canopy with air from your sprayer carrying the material into the tree. The smaller your fan or the lower your horsepower or the higher the wind speed or the farther your tree rows are apart, the slower you will have to drive to get complete air replacement in the center of the tree canopy. And the smaller the droplet size of whatever it is that you want in the center of the tree, the more likely it is to stay in the air stream all the way in and settle on your target rather than splat against the outside limbs and leaves nearest the sprayer and drip to the ground.

Most insect and disease problems originate and spread from the center and upper portions of the tree where your spray coverage is the poorest. Improve your coverage of this problem area by slowing down to 1 ¼ to 1 ½ mph and calibrating for smaller droplet size, i.e., use the boom with the most nozzles for your concentrate application instead of the one with the least number of nozzles. Use #25 swirl plates and a larger disc orifice instead of #45 swirl plates and a small disc orifice.

Call us if you need help with recalibration. We will ask you for an accurate driving speed, operating pressure (is it adjustable), tree row width, the gallons per acre you want to apply and the number of nozzles on one side of your sprayer. It's that simple.

I have freely copied and adapted information from various Research and Extension personnel and publications plus the experiences of the Fieldstaff at Northwest Wholesale for the information presented in this Grower Field Guide. Any errors in presenting that information are entirely mine; please notify me of any errors so that they will not be repeated.

All material usage information supplied in this bulletin is believed to be in compliance with current labels. It is the responsibility of the grower to insure that use of any material is in compliance with the label on the product in his possession! All material rates in this bulletin are shown per acre except those products where concentration of material is important.

All of the monitoring aids mentioned in this bulletin and research information on most of the insects and diseases mentioned are available through any Northwest Wholesale warehouse.

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Read Grower Field Guide a week sooner!

I will have this GROWER FIELD GUIDE posted to our website about the same time as I take it to the printer. I will gladly notify you as soon as it is posted if you will furnish me with your email address. Email me at nates@nwwinc.com and put "notify" in the subject line.

Container Recycling

Your response to Northwest Wholesale's decision to be a collection point for empty plastic chemical containers has been impressive. Keep 'em comin'. Properly rinsed of course! There is a poster on display with pictures and detailed instructions on cleaning containers at all participating locations. Five gallon buckets cannot be recycled with the handles or lids attached.

If you're generating lots of empty jugs and need to store them briefly, here's an easy way to do it. After you've rinsed them, remove all of the excess labeling (plastic sleeve and booklets, etc;) labels glued to the jug are OK. Put them upside

down in an old apple bin. They will drain clean and stay dry and clean even if you have to leave them in the orchard under the sprinklers for a while. No second rinsing or draining needed with this method. Just load the bin in your pickup and bring'em in.

Another easy method to handle lots of jugs quickly is to tie them on twine like fish on a stringer. Then you can pick up 15 or 20 at a time. Just store these where they will stay dry until you can get them to us.

Return Bloom

Most fieldmen are reporting good results from their chemical thinning programs this year. Based on that return bloom should not be a general problem. But if you are dealing with a variety that is chronically bi-annual or are still trying to take off lots of fruit at 10 – 12 mm, return bloom could be questionable. You may be able to thin your fruit adequately well past the 10 to 15 mm size and still not have bloom for the following year. If less than half of the spurs bloomed this year, return bloom should not be a concern. On trees that had good bloom and thinned late i.e. larger than 10 mm size, return bloom can be increased with one or more applications of **Ethephon** (Ethrel) beginning 45 to 50 days after full bloom. Cell division is over by this time; fruit shape will not be affected. Don't apply Ethephon to a light blooming orchard; you will increase the risk of bi-annual bearing.

When using Ethephon, wet the trees to an easy drip, 200 gallons per acre is probably adequate in most orchards, less volume may be used on smaller trees. Application under slow drying conditions will increase the absorption of the Ethephon. Use the lower rate of Ethephon if temperatures are expected to exceed 85° in the three days following application. Do not use on low vigor trees, small fruit and no growth will be the result. On very high vigor young trees you want to bring into bearing and varieties that are chronically bi-annual bearing, a second application should be made 10 to 15 days later.

Bitterpit

Frequency and duration of your calcium spray program is more important than the amount applied with any single spray. Start your calcium program early and include some calcium in every spray where it is compatible. If you plan on using summer oil applications this year, do not mix calcium chloride at more than 3 lbs. per 100 gallons of water to avoid potential injury.

MIRACAL^{sp}, a non-salt containing soluble formulation may be combined with a wide range of other materials at higher rates than Calcium Chloride. It will not increase sunburn in hot weather, as Calcium Chloride has been known to do.

Calcium Management

Calcium has been recognized for more than 50 years as an important element for reducing fruit disorders and improving fruit quality of apples and pears. To better understand calcium behavior the following points must be considered.

Calcium soil reserves are usually adequate, but will not be readily available at low soil pH values (soil balance).

Calcium moves into the tree passively with water movement only on new roots, directly behind the growing tip before the bark suberizes (active root growth needed).

Calcium moves in the tree with water to the actively transpiring leaves and passes the less actively growing fruit (moves to a nutrient sink).

Calcium concentration in the fruit drops as the fruit enlarges (dilution).

Calcium may move out of the fruit to the growing tips under stress conditions (removal).

Calcium can't compete with excess Potassium or Magnesium in the tree (antagonism).

Calcium applied foliar will be absorbed into the fruit just below the peel, it will not move through to the other side of the fruit (coverage).

Calcium applied foliar throughout the season has been proven more effective in reducing bitter pit and cork spot than either early or late season applications alone (frequency).

Calcium Chloride moves through the apple cuticle faster than any other formulations of calcium that were lab tested in 1983 (efficiency). *(That is the reason we recommend beginning with MIRACAL prebloom before there is a waxy cuticle on leaf or fruit)*

Considering the points of calcium behavior above, how do you manage your orchard for the best long-term benefits from calcium?

Maintain a nutrient balance in the soil that doesn't block the uptake of calcium (see Queen of Hearts analogy)

Promote early season root growth by letting your soil warm up as soon as possible in the spring. Do not irrigate until the shallow rooted cover crops are showing distress, then only irrigate long enough to rewet the soil profile, do not waterlog the root zone with long irrigation sets, especially on heavy soils.

Don't promote vigorous shoot growth on bearing trees. Highly vegetative trees have an excessive number of growing points that will always win any competition with the fruit for calcium.

Maintain adequate soil moisture during hot weather. Soft vegetative growth stressed by heat will draw moisture from wherever it can get it, including the fruit. Some calcium will go with the moisture, it won't come back.

Do not apply Potassium or Magnesium fertilizers unless soil or tissue samples indicate a need. Both materials compete with calcium for a place on the dinner table and will always win the competition.

Calibrate your sprayer to insure uniform coverage of the fruit throughout the tree. Removing vigorous growth from the center of the tree early to mid-summer will aid spray coverage for both calcium and pesticides. This also removes some of the demand for calcium by the growing points and helps improve the finish on red coloring varieties of fruit.

Begin adding light to moderate amounts of calcium early and continue as close to harvest as possible.

Is the Queen of Hearts in Control of your Nutrient Program?

This is an analogy; so use your imagination. You have been invited to an Alice-in-Wonderland dinner party. You hungrily eye the heavy laden table of delicacies, roasted meats of every description, steaming vegetable, rich exotic desserts, drinks of every color and taste imaginable. Then you hear the rules. The mad Queen of Hearts has instructed the servants to decide what food you will get. They will bring it to you and put it on your party plate. You have no say in what or how much you may have.

Imagine your disappointment when the largest portions on your plate are over-salted meat, overcooked brussel sprouts (you hadn't even seen those on the table) and huge helpings of some other items you don't recognize and don't like the smell of. Little or none of the good stuff you had seen earlier seems to come to you, what does is quickly mixed into the obnoxious mess already on your plate so it's difficult to pick out. The drink isn't what you wanted either. You're definitely not having a good time!

If your fruit trees are not growing as they should, and you're doing everything you can think of to get them to grow, maybe it's because you are treating them just like the mad Queen of Hearts would!

Most soil analysis are quite good at telling you what nutrients are in the soil (on the party table), what they don't tell you is what the servant (your irrigation water) is bringing to the tree. The standard soil analysis, using an acid nutrient extraction solvent, is designed to predict what nutrients will be available to your crop throughout the course of the growing season based on rainwater. In our part of the world that's not the way it works. And your irrigation water, depending on it's source may be less than a perfect servant, it may even be malicious.

Snowmelt water, which is the major source of the water flowing into the Columbia from the west (Stemilt basin, Wenatchee, Entiat, Chelan and Methow rivers, etc;) is relatively pure and a strong solvent. It will remove calcium and other minerals from your soil as it passes through instead of giving them to your trees. This water leads to a rather rapid drop in soil acidity (low pH).

At the other extreme is water coming from wells. It frequently carries large quantities of carbonates and bicarbonates that combine with a number of other minerals to produce undesirable precipitates. (That's the white deposits on your low hanging fruit and tree trunks.) These minerals will be left behind as the water moves through your soil, overloading the tree with the equivalent of over-salted meat and mushy brussel sprouts, hiding the good stuff your tree needs. This water leads to an alkaline soil (high pH).

Water pumped directly out of the Columbia River falls between these two extremes. It is generally good quality and rarely causes problems with medium to heavy soils. On lighter, sandier soils however, the free calcium contained in the water can suppress magnesium and potash affecting tree performance.

Staying with my crude analogy, you are in charge of this banquet, it's up to you to instruct your irrigation water to respect your trees and treat them properly. Before you can do that you need to know what your trees are actually being served. For your next soil analysis, send a pint of your irrigation water along with the soil and request a "saturated soil analysis" in addition to the standard soil analysis. The soil lab will use your irrigation water as the nutrient extraction solvent. Then you will know what nutrients are in the ground and which are actually being supplied to your trees with your soil and water combination.

The standard soil analysis shows you what is on the plate to eat – the saturated soil analysis shows you what your trees are actually being allowed to eat (or for the analogies sake, what the servants are feeding them). If the situation is not as it

should be, it is usually less expensive to change the water into an obedient servant, delivering what the tree needs, than it is to mix enough “good stuff” into several million pounds of soil per acre so the tree is able pick it out of the mix for a short time before it becomes fixed again.

A crude analogy I know, but it was the best I could come up with. If I aroused your interest, ask your fieldman or call me for more information. We supply the bags and bottles you need for collecting samples.

For most varieties what you get paid will still depend mostly on the amount of color your fruit has.

For many years I’ve listened as growers and industry organizations talked about apple color, generally red color. And which strain was darkest — or brightest — or more fully colored. And how poor the fruit flavor of the newest strain was compared to the parent variety. But that darker, brighter, redder strain was what most growers planned to plant — as soon as they could get the trees — because those were the apples making the most money.

And nothing has changed. Two major criteria still determine what you will be paid — color and size. We could have a long discussion about what ought to be, but that wouldn’t change anything, at least for this harvest. The most valuable Red Delicious will still be 90% or more red color and between 80 and 100 box size. The most valuable Gala, Fuji, Braeburn, Jonagold, etc; will also probably be the ones with the most color.

Private consultants working in Yakima have been using summer copper applications to increase red color for 15 years or more. They found that color response was most consistent for them when leaf tissue levels of copper were 12 ppm or higher. The major problem they faced was that the soluble forms of copper they commonly used were also prone to mark fruit and had to be applied very carefully.

In response to the demand for a safe foliar nutrition copper, Dr. McNall, owner and founder of NUTRIENT TECHNOLOGIES, formulated *Tech-Flo COPOCAL* and introduced it into the market in 1995. This wettable powder suspension is completely safe when applied at a neutral pH. Dr. McNall has included calcium and phosphate to make the copper safe for the fruit finish without reducing its efficiency as a nutrient.

Tissue analysis has shown that 1 gallon per acre of *Tech-Flo COPOCAL* will increase the copper levels by up to 4 ppm. Generally two or three applications of *Tech-Flo COPOCAL* are required to raise the copper high enough to get consistent response. The target level is 14 – 16 ppm. If copper levels are known to be extremely low more applications than that may be needed.

CASCADE ANALYTICAL’S area wide, long-term database of tissue analysis shows the copper levels in the Columbia Basin and North Central Washington to be between 7 and 8 ppm. At least 4 ppm below the minimum considered necessary for consistent color development.

With copper at 14 to 16 ppm, a potassium level of 1.4% is considered adequate. Potassium is an abundant material the tree can easily extract from the soil. It also moves rapidly in the tree and is quickly available to all parts of the tree including the fruit. Unless you have a known potassium deficiency (below 1.4%) I suggest you focus on the copper and not apply additional potassium. Very few orchards we sampled in the last four years have required additional potassium.

We will take the sample (or tell you how to do it) about 50 days after full bloom (early to mid June) to determine your existing nutrient levels. Then you will know before you start how much copper and potassium you will need to make the program succeed. One quart of *Tech-Flo COPOCAL* per acre will raise the copper level 1-ppm. I expect most orchards will require 6 to 8 quarts per acre over two or three applications.

Call your fieldman now and schedule the sample, he is going to be very busy if you wait until the last moment!

Fruitlet sampling could improve your harvest quality

When cell division is complete (approximately six weeks after full bloom) the mineral content of the fruit is determined. Sampling and analyzing the fruitlet when it is about the size of a golf ball will provide you with a very accurate picture of what your trees have available to them from the soil solution, plus whatever early season foliar nutrients you have applied. If the fruit does not have the mineral ratios commonly associated with good eating quality and good storage you still have time to make some adjustments before harvest. The information can also be used to adjust your fertility program for the following year to improve fruit quality.

The fruit-let sample should be taken when the fruit is roughly 50 grams, about golf ball size. Each sample should be 25 fruitlets, as representative as possible for the block being sampled. Do not mix problem areas with good areas, do not mix varieties, the databases are based on specific varieties.

My goal is to begin correlating the early season leaf samples taken for copper levels with fruitlet samples to determine which can be more effectively used to improve and maintain fruit quality in the orchard before harvest. If you are interested call your fieldman or myself.

First Generation Codling Moth

Control of the first generation is critical to avoid problems and higher costs later in the summer. If you're not using mating disruption you will need at least three covers to completely blanket the first generation. Four if the weather is cooler than average.

The second cover and third covers must take into account a higher possibility of needing control of aphid and possible leafroller (**see post bloom leafroller section**). Leafminer should be considered separately if possible (**see leafminer section**). Spider mite populations should be monitored, most orchards are well controlled by predatory mites, but surprises should be avoided whenever possible. (**see spider mites**)

Aphid control is **Provado** @ 3 - 5 oz. per acre with 2 - 4 oz. of **Silwet** per 100 gallons, the higher rate of Silwet normally lets you use the lower rate of Provado. **Assail** with ½ to 1% oil will control aphid, and also provide codling moth control. Check with your fieldman for rates and timing.

If you are not familiar with most of the predator insects in your orchard, **PNW 343, Beneficial Organisms Associated with Northwest Crops** has good color pictures of some the critters you need to know. It's available on-line.

Post bloom Leafroller

Now (early June) is a very good time to assess how good your early season controls were and how much control you may need during the rest of the year. Remember the female Leafroller does not fly very far from where she emerges so low pressure populations are usually very spotty, you must look at several locations in the orchard to determine what surviving populations you have.

If you had damage last year at harvest, that is the place to look first! Less than the best control of the overwintering generation (you could still find an occasional larva or pupa) means that you will probably need to start monitoring the first summer generation about the time of your second cover codling moth spray sometime in late June. If you applied a petal fall Intrepid, you may be able to find surviving larva, but Dr. Jay Brunner reports very few of them will successfully pupate for a second generation. You or your fieldman should watch closely and wait until new larva are found before applying summer controls.

If you achieved very good control (you can see where they were but can't find any live ones) your timing for potential damage will be later and is probably closer to the second generation of codling moth in July.

Unfortunately there is no reliable method of trapping to monitor for either population levels or emergence timing for small (20 - 30 acre) locations. Unlike the female Leafroller the male will move long distances in response to a pheromone lure, the catch in your trap could be from any one of your neighbors. Keep looking for the first larva to begin showing up on the back of terminal leaves in the upper center of the trees.

It is very time consuming to search for newly hatched Leafroller larva in the center of the tree. My method is to walk slowly along the row looking at the upper terminals against a bright sky. Any thin spot in the leaf caused by the feeding of the young larva will be very easy to see, down to match head size. You need to carry a pole pruner or some other means of getting some of the terminals down where you can examine them, there are other conditions and insects that will tatter or make holes in the terminal leaves. A Leafroller larva will have a shelter of webbing built against one of the major veins of the leaf before it is large enough to roll the leaf. When you find these it is time to begin your control program.

Summer generation control materials include **Success** @ 6 - 8 oz./acre, (add oil ¾% to 1% to improve control) **Intrepid 2F** @ 12 oz./acre (add Nufilm 17 at 1 pt/acre to improve residual), **Proclaim** @ 4.8oz./acre (add oil ¾% to 1% to improve control) and **Bt** formulations @ 1 - 2 lbs./acre. If you used Success at petal fall I recommend you use something different for the summer generation.

San Jose Scale

This pest is usually first noticed at harvest in isolated locations by the red spotting on the fruit or at pruning when the overwintering scales are noticed on the bark of the tree. On cherries the dried leaves will stay on the tree all winter. The crawler stage may be spread to other trees by the wind, being carried on the feet of birds, on orchard equipment or even on the clothing of workers.

The best approach to orchard protection is to prevent scales from becoming established. Spray the orchard every year before bloom (delayed dormant oil & Lorsban) when buds are beginning to open and good spray coverage is easy. Summer sprays directed at the crawler stage help protect the fruit but usually do not control infestations. For this reason

they are a supplement to the early season sprays, not a substitute. It is difficult to sample for population density or potential for fruit infestation. If damage was noticed the previous harvest or reported on the cull analysis from the warehouse you should consider summer control until damage is no longer found. The crawlers of the first generation normally time closely with the second codling moth cover in mid to late June. Without a long residual material such as PennCap, application timing is important. If you have an uncontrolled site (riverbank willows etc.) that you can relate to your orchard, monitor that site on a regular basis. Double sided tape wrapped around a few branches will capture the first crawlers and let you time your orchard protection.

Esteem used post petal fall for supplemental leafroller and codling moth control will also control San Jose Scale.

Spider Mites

Only a minority of the apple orchards in North Central Washington have to control for spider mites in any given year so sometimes we forget to watch for the critters until the damage begins to show in July and early August.

By June you should be able to find some European red mite scattered throughout the tree. Look on the older leaves. If you easily find leaves with several adults, many eggs and very few or no predators, monitor on a weekly basis until you decide who is going to win, the good guys or the bad guys. Be especially vigilant if you used Assail for codling moth and did not combine it with oil.

The twospotted mite and the McDaniel mite populations will start in the center of the tree as they move up from the orchard floor and then out onto the branches as the population develops. Just a few predators will control a relatively large population of these mites, but if you find more than just a few adult mites per leaf you should also monitor them on a weekly basis.

There are two major predators of spider mites in the orchard; the most common is the **Western predatory mite** (*Typhlodromus occidentalis*). It feeds on spider mites and rust mites. The egg is oval, transparent when laid turning translucent white after a couple of days. When populations are low early in the season most eggs are laid singly on the back of the leaf along the mid vein. The oval eggs are easy to distinguish from the eggs of the McDaniel or twospotted mites, which are round, smaller and lay randomly on the exposed areas of the leaf. When twospotted or McDaniel populations are high, predator eggs will be laid among the mite eggs and in the webbing. The body of the mature predator mite is broad at the rear and tapers toward the head. They are opaque white unless they have fed recently then they take on the color of whatever they are eating. They avoid direct sunlight and will be found on the back of the leaves, usually sheltered against the mid rib of the leaf.

The other major predator of mites is *Zetzellia mali*. It feeds mostly on rust mite and European red mite. It may not be able to control high populations of mites but will maintain control of low populations if not disturbed by toxic pesticides. The eggs are round, lemon yellow and smaller than spider mite eggs. The adult is lemon yellow to reddish and slow moving. It is almost oval but more pointed at the rear and slightly smaller than a spider mite.

There are no absolute numbers for deciding at what levels to spray for mite control, experience is the best guide. Weather, time of year, tree vigor etc., are all factors to consider. If you can see that the predator mite population is building, enduring a slight bronzing of the foliage should not affect the crop, especially a light crop, and should result in establishing or reestablishing fully integrated mite control.

Leafminer

(a reminder from May)

This is a mostly cosmetic, sometimes pest. This year you have it, next year you don't. The first generation is usually unnoticed unless populations are very high. Most of the eggs are laid on the primary leaves; the rapid expansion of the foliage covers these before the mines become visible from the top of the leaf. The second generation will be more visible as the female prefers to lay eggs on the young expanding leaves of the growing shoots. By the time this generation has reached the late tissue feeding stage (the mines are tenting up), parasitism should be fairly easy to find. You can tolerate 4 - 6 mines per affected leaf at this stage if you can find either parasite larva or pupa or dead leafminer pupa in 25% or more of the mines and will not be using a material that will destroy the parasite population. Full control with a single spray is difficult after the second generation because of the overlapping of generations and the resulting mix of all development stages later in the season. If you have some predators available and target your sprays to preserve them you won't need full direct control.

To preserve the most predators, time the spray when a majority of the adult leafminers has emerged (60% or more) and egg laying is beginning. The parasitic *Pnigalio* wasp will be just beginning to emerge and most of them will survive to attack the next generation. There are several materials that may be used to control adults. **Vydate L** at 1 pint per acre or

petroleum spray oil at 1%, wetting the trees thoroughly. The oil damages the wings and renders the adult flightless, plus it will suppress any mite or leafhoppers present.

If you need to control mines in the sap feeding stage, use **Success** at 6 oz. per acre with ¼% oil, or **Agrimek** @ 10 oz. per acre with 1 gal. of oil per acre, or **Vydate L** at 1 qt. per acre. None of these materials will provide good control of the tissue feeding stage; apply them as early in the egg hatch as possible. Vydate may disrupt integrated mite control.

Monitor the leafminer from the back of the leaf. The eggs are very small, nearly transparent and lime green. As they hatch the larva will begin to tunnel in the leaf making a thin white line beginning at the edge of the egg and rapidly expanding into an easily visible white spot. The mine will not be visible from the top of the leaf until the tissue feeding stage and the leaf begins to pucker up. To search for the **Pnigalio** larva you must open the mine. A pair of tweezers works well for this. Just pinch the edge of the mine and peel the loose cover off. The **Pnigalio** larva is white to cream colored and spindle shaped. It feeds on the exterior of the leafminer larva and is easy to see with a hand lens. The pupa begins very light gray and darkens to a shiny black, it is ½ to 2/3 of the size of the leafminer larva. If you open flat mines and find discolored or very lethargic leafminer larva, that is a pretty good indication that the **Pnigalio** wasp is active in the orchard.

If you need aphid control at second cover time and would like to increase the chances of predator control of a light to moderate leafminer population, use **Provado** at 2 ounces per 100 gallons with **Silwet** (a silicone surfactant) at 1 ounce per 100 gallons in enough volume to wet the tree to an easy drip. This will suppress a leafminer population by killing most of the sap feeding stages and allowing a high number of the **Pnigalio** wasp to survive.

Grape Mealybug in Apples

Very little research has been done on the second generation of mealybug in apples; I could not find any published articles in my files. The insect biology supplement to the 1992 WSU Spray Guide noted that there might be a complete second generation on apples beginning in early to mid July.

If you have a population in your orchard you probably know about it from previous fruit damage or the presence of the cottony overwintering egg masses. Begin to monitor the suckers originating from spray-sheltered areas of the tree in late June and early July to time the emergence of the crawlers and direct the sprays against this stage. It seems that you can only kill what the spray contacts, you will probably need two applications 10 - 14 days apart to control this second generation. The larger, wax covered stages are not controllable.

Assail @ 3.40z. with oil is probably the best material currently available. **Sevin, Guthion, Imidan, Diazinon,** and **Provado** plus oil all seem to give adequate control if the material contacts the insect. Rotate materials to delay insect resistance.

APRICOT

Peach Twig Borer (PTB)

If you have monitored for PTB in any area and have a catch date, please call myself or Tim Smith at Cooperative Extension so timing models can be run for your area. We will update you weekly on the progress of the current generation. Check with the counter at your nearest warehouse to see what areas have models being developed. The earliest areas around Wenatchee will begin egg hatch about June 1st, continuing through the month. The East Wenatchee airport elevation is about one week later.

The alternative is to apply Imidan 70WSB, Intrepid 2F or Success 14 days before you expect to pick the apricots. If you plan to use a different material you must watch the preharvest interval.

NOTE: Azinphos Methyl (Guthion) is no longer legal to use on Apricots.

Lecanium Scale

Lecanium scale feeding nymphs begin dripping honeydew down through the tree. By now they have matured and the female scale are very conspicuous bumps on the smooth bark of the younger limbs. Remove some of these and look to see if there are still eggs present. Soon after egg hatch the young nymph will move to the underside of the leaves to feed. Warm areas around Wenatchee reported eggs beginning to hatch about mid May; I expect them to require two to three weeks to complete the hatch. Apply Diazinon to the crawlers for control, preferably dilute. Be sure to allow for a 21-day preharvest interval. This will also serve as your PTB control if you're under light pressure.

Plan on applying oil prebloom next spring to prevent a repeat of the problem next year.

Perfection Spot

Perfection Spot is aggravated by rain, your past history has a strong bearing on how much protection you may need. **Rally 40WP @ 5 ounces per acre**, or **Orbit @ 4 ounces per acre** both work well on Perfection Spot. Combine either one with **Captan 50WP @ 5 lbs. per acre** for Coryneum Blight or Alternaria.

Weather conditions that favor either apple scab or cherry mildew also are conducive to the development of Perfection Spot, Alternaria (Apricot Freckle) and Coryneum Blight, keep your guard up.

CHERRY

Cherry Viruses

It is rare not to find a few trees in a block of cherries that are not doing well. Especially if the trees are more than 20 years old. In most instances these trees are infected with one or more viruses. There are several cherry viruses, some quite dangerous to the future production of the block. Cherry Mottle leaf, Cherry Rasp leaf and Cherry Twisted leaf are the viruses that I see most. The best time to patrol your orchard for virus symptoms is between shuck fall and your GA application before mildew becomes visible on the leaves to confuse the identification of a virus. Look at all sides of the tree; frequently virus symptoms begin in a single branch. It becomes very difficult to identify viruses after harvest except for extreme symptoms.

Always ask your pickers to let you know when they find unusual looking fruit. There are two genetic disorders, Crinkle leaf and Deep Suture, that can be found by noticing abnormally shaped leaves and fruit. These disorders may be pruned out if they don't affect large portions of the tree. In young blocks you might want to top work these trees. Small, slow ripening fruit could be an indication of one or more serious disorders such as X-disease, Little cherry, or Cherry leafroll.

Extension Bulletin 1323, **Field Guide to Sweet Cherry Diseases of Washington** is a good reference to help you identify these disorders plus some others that I haven't mentioned. It may be seen at any Northwest Wholesale warehouse, or contact me. Copies are available at Cooperative Extension.

Mildew

Petroleum spray oil is very effective as an early season mildew eradicator/protectant. We recommend that you do not apply oil much past pit hardening to avoid possible fruit damage. If the trees clean are kept free of mildew prior to GA time there should be less need to use other chemicals during the ripening and harvest periods.

If the temperature is below 90° and is expected to remain for the following 5 to 7 days, you may tank mix any of the Sterol Inhibitor materials with Kumulus Sulfur. Keep oil and Sulfur 10 to 14 days apart. If the weather is warm and or you prefer not to use sulfur, combine **Kaligreen** with the SI material for increased eradication effect. None of the materials currently being used are systemic. If the foliage has not been directly sprayed it is open season for any new mildew spores that lands on it, thorough coverage is essential for mildew control!

Continue to protect yourself at infection periods. Once mildew is established on the foliage and fairly easy to find it will spread rapidly with warm weather. 7 to 10 day intervals must be maintained into harvest, especially on the Rainier variety.

Abound (strobilurin) is extremely phytotoxic to some varieties of apples, even from the residue left in the sprayer. This has resulted in the label for the material requiring a separate sprayer for stone fruit use only. Avoid any drift onto apples. A sprayer used for applying **Abound** must be thoroughly clean prior to selling. Thorough cleaning is a 24 to 48 hour procedure. The complete caution and cleaning statement is available at any Northwest Wholesale warehouse, please read it before you decide to use the material.

Gem, Cabrio or Pristine (also strobilurin or strobilurin based) do not have the phytotoxicity concerns of Abound. Strobilurin materials will not clean up an established mildew infection, use them as a protectant before the mildew becomes established.

Quintec, a completely different mode of action. Quintec is also mostly a protectant, tank mix with an eradicator if mildew is already established.

Cherry Fruit Fly

Emergence of the first fly typically happens about the same time as GA is applied, when the fruit becomes light green to straw colored. The potential number of Cherry Fruit Fly increases as the fruit ripens, peaking during or shortly after Bing harvest. Most markets have a zero tolerance for fruit fly infested fruit so a rigorous prevention program is required. The list of acceptable materials is short.

Diazinon 4E or Diazinon 50 WP is not accepted in most export markets, most warehouses request that you do not use it. For local marketing or home use Diazinon is acceptable and works well. Rainier or other light skinned cherries may be marked by the liquid formulation. The preharvest interval (PHI) is 21 days.

Guthion 50WP or Azinphos Methyl must have a 14-day interval between sprays and a 15-day PHI. Guthion following oil for mildew at pit hardening may cause some leaf drop if the weather has been cool. To avoid possible problems, I recommend you avoid the use of Guthion for Cherry Fruit Fly if you have used oil on the foliage post bloom.

Success should be used @ 2 oz. per 100 gallons with complete coverage. It is compatible with any of the commonly used fungicides and GA. Four ounces per acre (200 GPA) will control Cherry Fruit Fly but will only suppress leafroller if they are present in the larval stage. Two Success applications at 7-day intervals should do a reasonable job of eradicating leaf roller along with Cherry Fruit Fly. The PHI is 7 days.

Entrust is the organic formulation of spinosad. Equivalent use rate is 5/8 oz. per 100 gallons with complete coverage. The PHI is 7 days.

Sevin (carbaryl) in all forms now has a 3-day PHI. Using this material multiple times may increase your risk of post harvest mite infestation. However control of Cherry Fruit Fly is essential to protect the value of the crop, mite problems if they develop can be solved after harvest.

Actara and **Provado** both have cherry labels and will control Black Cherry Aphid when used as the first Fruit Fly cover combined with GA. Use **Actara** at 4 ½ oz, **Provado** at 4 oz. per acre.

GF-120 Naturalyte (spinosad) at 20 oz. per acre performed very well in organic orchards with known fruit fly populations



last year. The application method is different; it is bait not a spray. The fly is attracted to the bait and killed before it matures and begins laying eggs. The first application should be made while the previously applied material is still protecting the orchard. If you wait until the previous protection has run out you run the risk that a mature fly may lay some eggs before being killed. The PHI is 0; this will be an excellent material to use during harvest. It may be applied easily with a tank on the back of your 4-wheeler after the pickers have left for the day. I believe at least some of the helicopter services will be equipped to apply this material; they may no longer apply Malathion within 300 feet of salmon bearing water. For more detailed application information or a parts list if you want to build your own assembly contact your fieldman.

The **Micro Flo Dimethoate 4E** label allows for use both before and after harvest. The PHI is 21 days. Not all countries have a residual tolerance, check with your warehouse before you use it. Sensitive varieties such as Lapins may experience some leaf drop, especially if applied concentrate.

Control of Cherry Fruit Fly is based on the life cycle. It requires approximately 7 days to emerge, mature and begin to lay eggs. The ideal control schedule is to apply a material every seven days after the first fly emerges. You don't want to allow any of the flies enough time to mature and begin laying eggs. When infected fruit has been discovered at the packinghouse it is also usually discovered that the coverage interval has been extended to 10 to 12 days because of poor weather or harvest work. Keep your

coverage on time and complete until all of the fruit is harvested, then apply a clean up spray to insure that you start off the next year clean again.

The sequence I recommend to my growers begins with the GA spray and Sevin (carbaryl) or Provado, 7 days later a Success, 7 days later another Success, 7 days later another Sevin (carbaryl) if you are still spraying from the ground. This program will provide excellent Black Cherry Aphid and Cherry Fruit Fly control unless the interval is stretched out. It should also control a leafroller population. None of these materials will leave a residue that would prevent using a Vapor Gard program also.

Clean up spray

To reduce the overwintering population of Cherry Fruit Fly apply ½ pint of **Dimethoate 4E** per 100 gallons of water in a dilute spray (trees fully wet and dripping easily) 7 days after final harvest. Combine with 1% oil, (you may use dormant oil post harvest if you have some left over) to prevent mildew from forming overwintering spores. The oil will also suppress spider mites and kill most of the adult leafminers that are in the orchard. Use a minimum of 200 gallons per acre. Concentrate applications will increase the risk of leaf drop. For best results the application must be made before the fruit dehydrates or drops, do it as soon after harvest as possible.

I know that there is some concern about leaf drop from Dimethoate. I have never seen enough leaf drop from a dilute application to have an affect on next year's crop. I take the position that the risk of crop reduction is less than the troubles you'll have if the next year's crop is infested with Cherry Fruit Fly! If you still are concerned though, you can use Provado for you clean-up and have good results.

Shothole borer has historically been controlled by the cherry fruit fly programs during harvest but will need to be monitored closely beginning about two weeks after your clean up spray through early October.

Vapor Gard

(in case you have forgotten since May)

I have worked with Vapor Gard on cherries for the past several years and personally would not grow a cherry crop without using it. The benefits that I have seen are as follows; increased fruit size (5% to 7%), rain is blown out of the trees easier than untreated trees, rain cracking is reduced under slight to moderate conditions. When rain cracking is severe there is no material difference between treated and untreated. The fruit finish remains bright after application and does not dull in storage. Shelf life of the fruit is increased. I have had one grower tell me that he has less wind marking on his Rainier cherries when he used Vapor Gard in multiple applications. That is subjective, but possible.

Vapor Gard may be combined with your GA spray to save you a trip through the orchard. I also believe the GA is enhanced by the slower drying time when Vapor Gard is included.

There are some serious cautions that must be considered to use Vapor Gard successfully. The fruit must be clean when the material is applied. Mildew must be well controlled and the use of heavy residue sprays such as Kumulus Sulfur stopped at least 14 days before any Vapor Gard application. A dirty cherry treated with Vapor Gard can **NOT** be cleaned up at the warehouse. Orbit, Elite, Rubigan, Rally, Benlate, Flint, Cabrio and Sevin 4F have not caused residue problems in orchards using multiple Vapor Gard applications in the month prior to harvest. Mildew and Cherry Fruit Fly control has not been hampered by the use of Vapor Gard. No detrimental effect on the trees has been observed. No statistical difference in fruit sugar has been measured when controlled experiments were performed. The fruit retains a bright finish longer after harvest than untreated fruit.

A single application of 1 gallon per acre with the GA application normally results in about a 5% size and tonnage increase.

The most consistently beneficial program I have observed is one gallon per acre applied at the same timing as the GA treatment, followed by another 1/2 gallon either just before or just after each of the ground applied Cherry Fruit Fly sprays. There is no preharvest interval required. Complete and uniform coverage of the fruit and foliage is needed; don't use less than 200 gallons per acre. This season I am trying ½ gallon with GA and 1 quart with subsequent applications.

If you aren't using a Vapor Gard program but want some rain protection during harvest, apply one gallon 7 to 10 days prior to harvest or just before anticipated rain @ 200 gallons per acre. The material cures with about 1 hour of bright daylight and is completely rainfast after that. Vapor Gard will not set up anywhere inside the sprayer that is not exposed to bright daylight but the outside of the machine will be very difficult to clean.

Fruit pitting has become a major concern with the Lapins variety over the past two seasons. Research work done in Canada in 1979 & 1980 with Van cherries shows a reduction of pitting (65 to 84%) using Vapor Gard immediately before harvest. More work should be done locally using multiple and single applications to determine if Lapins will react the same.

Birds

Bird Shield and ReJeX-iT are similar materials in that both employ the odor and taste of concord grapes to repel feeding. They are applied at different rates, so read the label for the material you plan to use.

Both materials must be applied at the first evidence of bird feeding. It is much easier to keep birds out of the orchard than to drive them out after their feeding habits are established. Resident (nesting) birds do not normally leave the orchard. Do not over apply. In young orchards that are very open, the adjacent rows that are being resprayed could suffer some leaf

burn. Consider alternate row application under this situation. Wet the portion of the tree that you are targeting well, but do not over spray. (Saves money, too.)

The material smells and tastes like concord grapes. Birds don't like it. The flavor breaks down in bright light and must be completely undetectable before you harvest the fruit. Normally 7 to 10 sunny days are needed for this to happen. I believe you should apply it similar to a thinning spray on apples. Close off the bottom nozzles and put the majority of the material in the top and outside of the tree. That is where the initial bird feeding will begin and the high light levels there will breakdown the grape flavor quicker.

If you have nesting or roosting trees adjacent to your cherry orchard that birds are using for a staging area, spray those trees also. Use a handgun if you can to get the material as high in those trees as possible.

PEACH/NECTARINE

Green Peach Aphid

If you have a population of Green Peach Aphid post bloom, it is my opinion that you either sprayed too late, (past bud stage 3) or had incomplete coverage. Unlike apples, adult aphids do not migrate onto peaches in the spring or early summer. The population you see now has developed from eggs laid on the tree last fall. As the colonies mature they will leave the trees for alternate hosts. **Actara** and **Provado** are both labeled for Stone Fruit and will control Green Peach Aphid.

Mildew/Coryneum Blight

The first visible indications of a **Coryneum Blight** infection on the fruit will be a watery looking spot, some with a tendril of ooze curling out of it as the disease progresses. This usually doesn't happen without a few days of wet weather. **Ziram** is a good protectants, use 5 lbs. per acre applied before the disease is established. Use two **Captan 50WP** applications @ 5 lbs. per acre 10 - 14 days apart if you can see the disease developing on the fruit.

Peach Twig Borer (PTB)

See the Apricot article for information on monitoring Peach Twig Borer. The control timing if you don't use the model on Peach or Nectarine is 7 to 10 days later than on Apricots because there is no need for a pre harvest interval at this time of the year. Success is labeled for Peach Twig Borer.

PEARS

Depending on temperatures the first generation of Codling moth usually lasts for 6 - 8 weeks. A second cover will be needed 18 - 21 days after first cover, sooner if a good rain fell shortly after application. Second cover is the time to be concerned about the summer generation of Mealybug also. Use **Delegate**, **Assail**, **Calypso**, **Azinphos Methyl /Guthion 50WP** or **Imidan 70WSP** at maximum rates. Azinphos/Guthion is the stronger Codling Moth material, but it now has a 14-day PHI. (At 2#/acre). Add a calcium material.

There are too many variations of Psylla and Spider Mite control programs to address specifically in this letter. As of now I have not heard of any control failures regardless of the program used, but you will have a second generation to control!

Almost universally the growers that applied Surround multiple times pre bloom had less Psylla pressure at bloom than growers that did not use Surround. Applying more than 50 lbs./acre per application did not increase control. By two to three weeks after bloom some Psylla could be found in nearly any pear orchard.

What do you do now? This will depend on the Psylla or Mealybug pressure in your orchard and whether you are comfortable with a softer program or not. Several blocks in the upper Wenatchee River valley successfully control Psylla and Spider Mites with nothing more than a program of summer oil at approximately two-week intervals after the petal fall Agrimek. Season long control with oil/Ecozin and 10 ounces of Agrimek at peak of psylla hatch has worked for me in the past

If you prefer the conventional programs, Pyramite, Provado, Agrimek, Actara or Assail should be applied as first and second instar nymphs are found. The addition of summer oil up to 1 ½% increases control.

For additional Spider Mite control, Apollo (an ovicide) may be combined with adulticides such as Acramite, Agrimek, Pyramite, or Vendex to delay or prevent a rebuilding of the mite population.

Note on resistance management: If you used Actara, Assail or any other Chloronicotinyil on the first generation of Psylla, plan to use some other materials for codling moth, mealybug or psylla control during the summer. If we don't do this many of these materials will become ineffective in a few seasons. (Remember how many seasons Perthane, Pydrin, Baythroid, etc gave effective control?) Dr. John Dunley reported that psylla resistance to the new Chloronicotinyils has already been detected in parts of the Wenatchee Valley where Provado has been used multiple times per season for psylla

and mealybug control. Those areas must now very carefully plan their programs to insure that only a single generation of psylla are treated each year with Chloronicotinyils, using other products for earlier or subsequent generations.

Fire Blight

Secondary bloom on Bartlett begins 2 - 3 weeks after petal fall and continues for up to a month. This is the time we historically get our worst fireblight outbreaks. It will be worth your while to physically remove any open bloom within two to three days after an infection period. As Tim Smith says, that control method is 100 percent effective if done carefully.

If you choose to apply Mycoshield or Flame Out, monitor the daily temperatures and compute your risk by using the **CougarBlight** model. Managing your risk in this manner will save you time and money verses 'just in case' spraying. It will also preserve the use of the only currently effective material by slowing resistance development. Copies of the CougarBlight 2000F are available on the internet @ <http://www.nw.wsu.edu/FB2000f.htm>