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Submitted by:

Dani Lightle

Office: 530-865-1153

Cell: 530-936-7728

Warm Postbloom Weather = Early Harvest?

Franz Niederholzer, UC Farm Advisor, Colusa, Sutter and Yuba Counties

Heat units in the first 30 days after bloom can be used to predict harvest timing in prunes. These units, called **G**rowing **D**egree **H**ours (GDH), are measured per day and totaled for the first 30 days after bloom and labeled GDH30. The warmer the first 30 days after bloom, the earlier is the predicted harvest date. The predicted 2015 harvest dates for various locations in the Sacramento Valley appear in Table 1 below. These are the earliest predicted harvest timings since 2004.

In my experience (which is entirely in the Yuba City area) the actual harvest start is consistently ahead of predicted start date, usually by a week or more. With that in mind, this could be a good year to have the harvest equipment ready early, and check your fruit pressures earlier than normal, perhaps starting in mid to late July. Don't time your last irrigation based on previous years. Finally, years with high GDH30 (warm postbloom weather) are poor sizing years. If you decide to thin, do it as soon as possible if you want to get the best chance for fruit size improvement from the thinning. If you are thinning just to ease orchard stress and maintain return bloom, then early thinning is not as crucial.

See the GDH30 model on-line at: http://fruitsandnuts.ucdavis.edu/Weather_Services/Harvest_Prediction_About_Growing_Degree_Hours/

Table 1. County locations, weather data source (CIMIS site), full bloom dates, GDH30 accumulation, and predicted harvest dates for several locations in the Sacramento Valley, 2015.

County	CIMIS	Bloom date	GDH 30	Predicted harvest
Colusa	Colusa	March 9	8052	Aug 9
Tehama	Gerber South	March 9	7856	Aug 10
Sutter	Verona	March 9	7696	Aug 11
Sutter	Verona	March 13	7660	Aug 15

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How Hot Was It at Bloom, 2015?

Franz Niederholzer, UC Farm Advisor, Colusa, Sutter, and Yuba Counties

Rich Buchner, UC Farm Advisor, Tehama County

It was hot in early March, during much of prune bloom. How hot? Below are the maximum hourly average temperatures (°F) during bloom, 2015, at different locations in north (Tehama Co) and south (Sutter Co) Sacramento Valley. Full bloom in each orchard is boxed and bolded. Temperature is the average of 12 consecutive measurements taken every 5 minutes. Full bloom is taken as 80% open flowers. Max hourly temperatures are included for all days from Mar 4-14 to show the range of temperatures that flowers were exposed to during bloom.

Despite the heat at bloom, a good to excellent prune crop appears to be shaping up in the Sacramento Valley. Check fruit for reference date and get ready to determine fruit load and shaker thin – if necessary.

-----Full Bloom Date-----

County	Location	3/5	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Tehama	Red Bluff	70	72	80	78	79	87	71	61	76	78	74
Tehama	South Red Bluff	69	72	81	76	78	84	70	61	75	77	74
Tehama	South Los Molinos	70	72	82	77	78	87	71	63	77	78	76
Sutter	South Yuba City*	69	74	77	76	79	79*	73	67	78	79[^]	82[~]

* Oil treated (4 gal/acre, Jan 22). [^]No oil in dormant. [~]Surround treated trees, 2x Jan/Feb.

Drought Strategies for California Prune Production

Allan Fulton, UCCE Irrigation/water resources Farm Advisor Tehama, Glenn, Colusa and Shasta counties

Richard Buchner, UCCE Farm Advisor, Tehama, Glenn and Butte counties

Franz Niederholzer, UCCE Farm Advisor Colusa, Sutter, Yuba and counties

Sacramento Valley prune orchards with commercial yields of 3 to 4 dry tons per acre will use about 42 inches of water per acre/year. Most of that water is transpired through the leaves, while some is lost through evaporation from the orchard floor. The sum of these losses is called evapotranspiration (ET). Leaves "trade" water to acquire CO₂ to make carbohydrates, the raw material for tree growth and fruit development. Maximum carbohydrate production occurs in leaves exposed to full sunlight when soil moisture is not limiting. When transpiration is limited by a soil moisture shortage, photosynthesis declines and tree growth, yield and fruit size may be negatively affected depending upon the severity of the stress. Figure 1 summarizes monthly evapotranspiration and crop development for prune.

Irrigating prunes when the water supply is adequate (100 % ET)

Applied irrigation water is usually less than seasonal ET due to soil moisture storage from winter rainfall. In the Sacramento Valley, annual rainfall ranges from about 12 to 24 inches and is concentrated between November and May. Therefore, the maximum annual irrigation water required for prune, when the regional water supply is adequate and no deficit is imposed, is usually about 32 to 36 ac-in per acre. For applied water to satisfy 100% of prune ET demands, irrigations should be managed to prevent the depletion of plant available soil

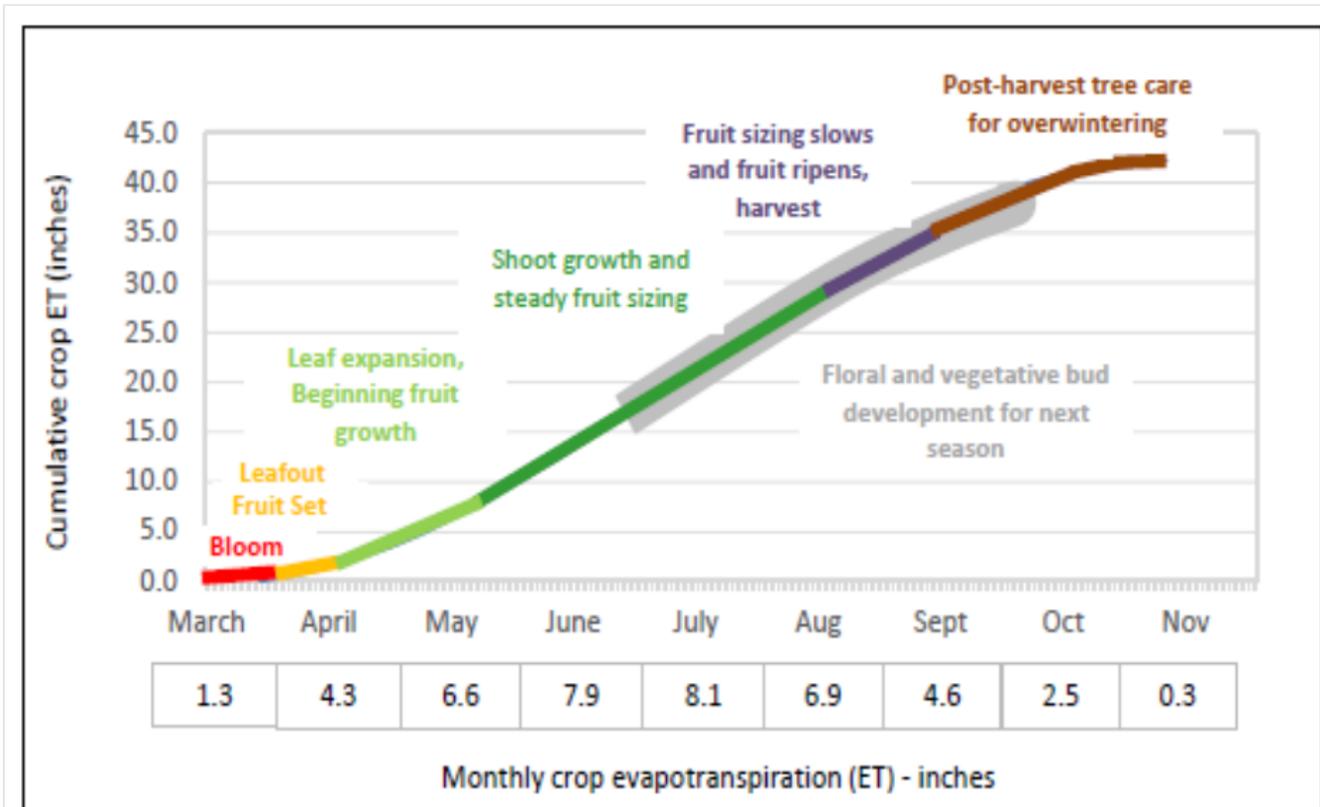


Figure 1. Cumulative and monthly breakdown of average annual crop evapotranspiration (ETc) for prune and the corresponding tree growth and fruit development stages.

moisture from dropping below 50 percent in an approximate three-foot root zone. If orchard water stress is measured using midday stem water potential (SWP), crop stress levels should not exceed -12 bars.

Irrigating prunes with a 20 percent reduction in water supply (80 % ET)

A 10 to 20 % deficit in available irrigation water equates to about a 4 to 8 inch reduction. This deficit can be managed with relatively minor impacts on prune production by applying water stress after fruit sizing is complete- usually mid to late July into early August , depending on the location and year. Research suggests that deficit irrigation during this period may increase soluble solids and reduce drying costs. ET in an unstressed prune orchard during the last two weeks of August is about 3.5 inches (Fig. 1). Imposing a regulated deficit strategy during this fruit development phase could potentially save 2 to 3 inches of irrigation water. Monitoring orchard stress with a pressure chamber and keeping tree stress in the -16 to -20 bar range is a reliable way to realize this water savings and guard against excessive tree water stress. Continuing deficit irrigation after harvest for 2 to 4 weeks presents even more opportunity to manage limited water supplies. ET in an unstressed orchard in September and the first two weeks of October (Fig. 1) will total about 6.0 inches. Post-harvest deficit irrigation could save an additional 3 to 4 inches of water without serious tree damage. Care should be taken to limit extreme post-harvest water stress to MSWP of -20 to -30 bars to discourage limb damage and compromised carbohydrate allocation.

Irrigating prunes with a 20 to 50 percent reduction in water supply (50 to 80 % ET)

A 20 to 50 % reduction in irrigation water supply equates to something like 8 to 21 inches less available water. The probability of impacting long term prune yield as well as decreasing current year fruit quality is more likely as water deprivation increases. If the reduction in water supply is closer to 20 percent, then implementing the previously described deficit irrigation strategy may be a good option. As the available water supply is reduced, the more post-harvest irrigation may need to be limited. For example, it may need to be limited to 1 to 2

inches in September following harvest and then terminated for the year. About 6 inches of water could potentially be saved during this late phase of the season (Fig. 1). For larger water cutbacks, the post-harvest irrigation may need to be completely eliminated in hopes that fall rainfall will be sufficient. The period of deficit irrigation may need to be started in late or even mid-July which could slightly reduce fruit sizing. Some research has shown no dry fruit size reduction with complete irrigation cut off, not reduction, at 30 days before harvest. Approximately, 10 to 12 inches of water could potentially be saved using this strategy (Fig. 1). When faced with water supply reductions nearer to 50 percent, earlier management decisions concerning crop load become very important to achieve marketable fruit size, prevent exposed tree branches to reduce sunburn, and avoid disease issues. As available water is severely limited, the production history of each orchard and cost of production should be evaluated to identify those orchards that consistently produce higher yields of larger prunes per acre-foot of water. Decisions could then be made to prioritize limited water supplies to the more efficient orchards.

Severe reductions in water supply (0 to 50 % ET)

Irrigation water supply reductions of this magnitude will inevitably affect orchard production. Possibly the best strategy would be to manage for orchard survival until water supply conditions improve. Fruit production would not be the main objective when faced with this severe reduction in water supply. If an orchard is subjected to this level of reduction in water supply, it will take two seasons or more of normal irrigation to restore prune production to levels prior to severe water stress.

If field research conducted in almond is a reasonable indicator, it may be possible for a prune tree to survive a season with as little as 6-8 inches of water. In the Sacramento Valley, soil moisture recharge from winter rains may provide this minimum amount of water. However, in lower rainfall regions of California, more irrigation water may be required to achieve tree survival. Any supplemental irrigation should be allocated proportionally to ET throughout the season to avoid extremely high crop stress levels. Thinning fruit more than normal is not expected to decrease ET but will likely lessen crop load and weight on tree limbs to maintain tree structure. Thinning should help shade fruit bearing wood for next season and protect against sunburn and secondary diseases.

Other drought management options

When growing prunes under a severe water supply curtailment, the best strategy may be to do nothing drastic in terms of pruning. In almonds, pruning scaffolds to reduce the canopy size and transpiration surface did not show any advantage in managing the drought and it delayed the recovery of trees to their full production potential after the drought conditions ended because new shoots and fruit wood had to be grown to return the trees to their original size and fruit bearing surface. In addition, for prune, scaffold removal could increase the risk of sunburn on the remaining scaffolds. Applications of light reflecting materials did not make a difference in almond crop stress and a similar response is anticipated for prunes, however research has not been conducted to verify prune response.

Cover crops and ineffective weed control will contribute to higher orchard ET, so orchard floor vegetation management is an important consideration when designing drought strategies. Water use can be as much as 25 percent higher when vegetation is growing vigorously on the orchard floor.

Proper irrigation system design coupled with regular system checks and maintenance are essential to managing scarce water supplies. A pressurized irrigation system that is not properly designed or maintained has the potential to apply more than twice as much water in areas of the orchard closest to the pump and filter pad than in areas of the orchard furthest away. This can potentially result in serious over-irrigation in some parts of the orchard and severe under irrigation in other areas. Monitor for pressure losses across an irrigation system, check and fix broken parts regularly, and flush hose lines often. Consider the need for chlorination to control algae and bacterial clogging and acidification to control mineral plugging if it is a concern.

Crop Load Assessment and Adjustment

Bill Krueger, UC Farm Advisor Emeritus, Glenn County (retired)

Richard P. Buchner, UCCE Farm Advisor, Tehama County

Franz Niederholzer, UCCE Farm Advisor, Colusa/Sutter/Yuba Counties

Consistent cropping of high value (large) fruit is the goal of successful prune growing. To do this, growers aim to hang a good crop –large enough to size mostly A & B screen fruit yet leaving enough resources in the tree to produce a good return bloom. In most years, reaching this balance this means shaker thinning fruit. Producing the largest yield/acre THIS year is short-sighted, as yield suffers the following year and the orchard may suffer potassium deficiency, leaf drop, sunburned scaffolds and dieback that limits yield for years.

How do you know if you need to thin? First check fruit to see if reference date has been reached. Fruit size at reference date, when the endosperm is visible in 80 to 90% of the fruit (Figure 1), can be used to help estimate fruit dry fruit size at harvest (Table 1.). Reference date in the Sacramento Valley typically occurs about one week after the pit tip begins to harden – usually the last week of April through mid-May. In 2015, early bloom and warm post-bloom temperatures may advance reference date up into the last 10 days of April.



Figure 1. Extracting endosperm at reference date.

Prune Reference Size Table

Reference Size Green (count/lb)	Harvest Size (dry) (count/lb)		
	Orchard Sizing Potential		
	Average	Good	Excellent
50	32	31	30
55	36	34	32
60	39	37	35
65	42	40	38
70	46	43	41
75	49	45	43
80	53	48	46
85	56	51	48
90	60	54	51
95	63	57	54
100	67	60	56
105	70	63	59
110	74	66	61
115	77	68	63
120	81	71	66
125	84	74	68
130	88	77	70
135	92	79	73
140	95	82	75

Table 1. Prune reference date and average harvest dry size table. Use the reference size fresh count/pound and read across for orchards with average, good or excellent sizing potential.

Crop reference size

At reference date, a random sample of sound (non-yellow) fruit – 20 fruit from 20 trees -- should be collected and the number of fruit/pound determined. Find the average number of fruit/pound of these samples in the first column of Table 1. Then, use orchard history to determine whether you should use the “Average”, “Good” or “Excellent” sizing potential column. Follow from your fruit/pound over to the appropriate column to estimate average fruit size at harvest.

Unfortunately, Table 1 is most accurate in an orchard where current year cropload isn't excessive. Dry fruit size at harvest can be underestimated from Table 1 if the cropload is excessively high. The result of relying just on Table 1 can be a large crop of smaller fruit size than desired. To avoid this problem, estimate of the number of fruit/tree at reference date and compare that to the number of fruit/tree at harvest needed to produce the crop you want. If there are far too many fruit/tree, regardless of what Table 1 predicts, thin the orchard.

Counting fruit/tree

Follow these steps to determine average fruit number/tree:

- Figure out the target number of fruit/tree in a particular orchard by multiplying your target yield in pounds/acre by the harvest fruit/pound from the reference size table, and dividing by trees/acre.
- Use a shaker (prune, almond or walnut) to remove as much of the fruit as possible from a representative tree. Place a tarp under the entire tree before shaking. Bring out a few ladders to help reach and remove by hand the fruit remaining after shaking.
- Weigh all the fallen fruit after removing twigs and leaves.
- Take a one pound subsample of fallen fruit. Count the sound fruit in that sample, ignoring any leaves and yellow or shriveled fruit.
- Multiply the weight of the total fruit removed from the tree by the sound fruit subsample count/pound to determine the number of sound fruit/tree.
- Adjust this number to allow for fruit drop from reference date until harvest – 40% if you are conservative, 20% if you think there will be limited drop -- to estimate the fruit/tree at harvest.
- Repeat for a total of at least 3 separate representative trees per block. Calculate an average fruit/tree for the orchard.

If the number of fruit measured in your orchard far exceeds the needed number of fruit at harvest then you should thin. For example, if your orchard trees should carry 2,400 fruit to produce a solid crop of 3 dry tons of 60 count fruit and your trees have 10,000 fruit/tree at reference date – regardless of what Table 1 predicts - - you should thin.

How should you decide on the target cropload at reference date?

Say your target crop – based on actual crop history of the orchard -- is 3 dry tons of fruit/acre with an average fruit size = 60 ct/pound. If you have 151 trees/acre (16' x 18' planting), then approximately 2,400 fruit/tree at harvest should yield that desired crop:

$6,000 \text{ lbs/acre} \times 60 \text{ fruit/lb} = 360,000 \text{ fruit/acre}$; $360,000 \text{ fruit/acre} \div 151 \text{ trees/acre} = 2,384 \text{ fruit/tree}$

There will be some drop between thinning and harvest. If you expect a 20-40% fruit drop between thinning and harvest, then 2860-3338 fruit should be left on each tree at reference date to account for the drop and still hit the target fruit number/tree at harvest. Multiply the target crop number/tree by 1.2 or 1.4 to get the adjusted fruit/tree number that accounts for the 20-40% drop between thinning and harvest. Some growers use cushion of 50-100% more fruit/tree so they don't over thin, leaving a target of 3500-4600 fruit/tree at reference for the example orchard and crop target used here. Note: In the Yuba City area, growers have been most successful with leaving more fruit on the tree (100% above the target cropload at harvest) compared to thinning to the exact fruit count desired at harvest plus 20% for drop.

Mechanical thinning with the same machinery as is used for harvest can be used to remove the desired amount of fruit. Shake a tree and, using the same methodology described above, calculate how much fruit was removed. Adjust the shaker and repeat the procedure until the desired amount of fruit is removed. Set the shaker and thin the block. The earlier thinning can be done, the greater effect it will have on fruit size at harvest. This should be especially important in 2015, as early heat is usually associated with a poor sizing year.

N Budgeting Following the 4 R's

*Katherine Pope, UCCE Orchard Advisor Yolo, Solano, & Sacramento Cos.
Bruce Houdesheldt, Sacramento Valley Water Quality Coalition*

Nitrogen management, for farm planning or regulatory compliance, boils down to one fundamental concept – matching supply with demand. When supply is greater than demand, nitrogen (N) can be lost from the root zone and leached into groundwater aquifers. Matching supply with demand relies on the 4 R's of nitrogen management – applying nitrogen at the Right Rate, at the Right Time, in the Right Place and using the Right Source. When timing or amount of supply doesn't match demand, yield can be reduced compared to yield under properly fertilized conditions.

Right Rate. UC research led by Professor Patrick Brown found 11-13 lbs N in every ton of dried prunes. Approximately 30 lbs per acre are additionally needed to tree growth in mature trees. This number would be larger with younger trees.

Right Time. Dr. Brown's group is currently working to put numbers to how much N is used when during the growing season. Much of the N used in prunes is going to the pit, so it is likely that the N use timing is similar to almond, shifted a month later because prunes bloom a month after almonds. However, there is also more early vegetative growth than in many almond orchards. Until we have exact research results, it's reasonable to estimate 30% of annual N input in April, 50% in May and 20% in June-July. If July leaf samples indicated low N, or you set a much heavier crop than expected, a small shot of N as soon as possible after harvest may be appropriate, ideally a foliar spray to minimize the risk of fall-winter leaching.

Right Place. For the trees to take up N, it needs to be kept in the root zone. Most prune roots are in the top 2-3 feet of the soil. Managing irrigation to decrease leaching below 3' soil depth also keeps N where the trees can use it. How can you do that? Irrigate to replace ET and inject fertilizers containing urea and/or nitrate (UAN32) in the middle or second half of the irrigation set.

Right Source. In experiment with other tree crops, there has been no difference in yield between equal annual amounts of N as UAN 32 or CAN17. Material choice is more a function of price per unit N, and other needs particular to your orchard, like pH impact. If you are flood irrigating, use of an ammonium N source (ammonium sulfate) will ensure that irrigation water won't push the N down in the root zone during the first irrigation.

Estimating demand

The 4 R's of nitrogen management combine to estimate crop demand. To figure out how much N your trees needs in any given year, combine (a) estimated yields with (b) N removed in the crop and used in tree growth and (c) your estimated nitrogen use efficiency.

a) To get **estimated yields**, a good approach is averaging your last 5 years of yield, then decreasing or increasing that number based on considerations like conditions during bloom, a very heavy or light crop last year, etc.

b) As discussed above, a ton of dried crop of prunes contains about 12 lbs N (0.006 lb N for every 1 lb dried fruit). An orchard that produces 3 tons, or 6,000 lbs dried fruit/acre will remove 36 lbs N/acre from the orchard in the crop, with another 30 lbs N/acre for tree growth. Thus, 66 lbs N all together.

c) Your **nitrogen use efficiency** (NUE) – how much N is taken up by the trees per lb of fertilizer N applied - depends on how closely you follow the 4 Rs. If you are budgeting 12 lbs N per ton of crop plus 30 lbs for tree growth, dividing your fertilizer N applications into the four recommended applications (30%-30%-20%-20%) and irrigating to replace ETc, you should achieve NUE levels nearing 70%. To use the percent NUE in calculations, convert percent to decimal by dividing by 100.

The three components above can be combined to produce a recommended nitrogen application for a block, using the following equation:

$$\text{N Demand (lbs/ac)} = \text{[Est. Yield]} \text{ (lbs/ac)} \times 0.006 \text{ (lbs N / 1 lb fruit)} + 30 \text{ lbs N for tree growth}$$

$$\text{N to Apply (lbs/ac)} = \text{N Demand (from above)} \div \text{[NUE Factor]}$$

Example: A 6,000 lb /acre crop contains 36 lbs N/acre. Adding 30 lbs N/ac for tree growth get you to 66 lbs N/ac. If N is delivered into the tree with 70% efficiency, then the grower should apply 94 lbs fertilizer N to meet crop N demand – assuming no other N source(s).

Estimating supply

In addition to synthetic fertilizers (urea, UN32, CAN-17, etc.) there are other potential suppliers of N, such as manure, compost and irrigation water. To figure out how much synthetic fertilizer may be necessary for your expected crop, subtract the non-synthetic supply from the estimated demand.

- A) Exactly how much **nitrogen in manure/compost** is available to plants and when it's available is complex and continues to be researched. Each soil type and climate responds differently to these amendments, so use your own experience and judgment when putting the following numbers to use. If you don't use manure or compost often, only some of its N will be available the year it's applied - 5-10% for cured compost, 15-30% for dried or aged manure (poultry or bovine).* If you apply about the same amount of the same N content manure or compost annually, it should reach a steady state of turn-over, where N in this year's application roughly equals N released from previous applications. Convert percent to decimals for calculations below. Always use dry weight of manure/compost and %N on dry weight basis.

N in Manure/Compost =

$$\text{Apply every year} \quad \text{[Dry lbs manure/compost per acre]} \times \text{[% N]}$$

$$\text{Apply just this year} \quad \text{[Dry lbs manure/compost per acre]} \times \text{[% N]} \times \text{[% Available]}$$

- B) Estimating **N in irrigation water** requires a nitrate lab test. The result then must be converted into pounds N in an acre-inch of water, and multiplied by the acre-inches of irrigation water applied (or expected to be applied). Results may come back from the lab as $\text{NO}_3\text{N-N}$ or NO_3 . These two types of reporting ($\text{NO}_3\text{N-N}$ or NO_3) use different conversion factors to get to N/acre-inch*.

N in Irrigation Water (lbs/ac) =

$$\text{NO}_3\text{N-N} \quad \text{[NO}_3\text{N-N]} \text{ (ppm or mg/l)} \times 0.225 \times \text{[Acre-inches of Irrigation]}$$

$$\text{NO}_3 \quad \text{[NO}_3\text{]} \text{ (ppm or mg/l)} \times 0.051 \times \text{[Acre-inches of Irrigation]}$$

The Nitrogen Management Plan template from the Sacramento Valley Water Quality Coalition calls for many of the numbers calculated above. If you did not receive a template, need help filling it out or have other questions about implementation of the Irrigated Lands nitrogen plans, contact Bruce Houdesheldt at the Sacramento Valley Water Quality Coalition: bruceh@norcalwater.org or (916) 442-8333. The water coalitions are still hammering out official numbers for filling out these forms. The numbers given above are a starting point. Official numbers from the Coalitions should be established by late this fall.

For more on the 4 R's, see the article "Nitrogen use efficiency in almonds" at http://ceteama.ucanr.edu/Newsletters_510/?newsitem=53482

*Based on numbers from UC ANR publication #21623, Guide to Efficient Nitrogen Fertilizer Use in Walnut Orchards (2006) by K. Kelley Anderson, J. Grant, S. Weinbaum & S. Pettygrove.

Prune Orchard Management Activities – May through July

*Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley
Franz Niederholzer, UC Farm Advisor, Colusa, Sutter, and Yuba Counties*

Nutrition:

- Plan fertilizer program for the rest of the season **after** fruit set. Split applications (several small applications of potassium and/or nitrogen) usually allow trees to more efficiently absorb fertilizer compared one “shot” of fertilizer. A heavy crop will use more potassium and nitrogen than a light crop. Schedule leaf samples for July. (*See nitrogen article in this newsletter*).

Irrigation:

- Monitor soil moisture to make sure your orchard has adequate water. Prunes should have adequate soil moisture from April through June/early July to avoid end cracking. Tracking soil water also helps you avoid over irrigating when the weather has been cool. (*See irrigation article in this newsletter*). Weekly soil water use information is available at:

http://cetehama.ucanr.edu/Water_Irrigation_Program/Weekly_Soil_Moisture_Loss_Reports/

Insects and Mites:

- San Jose Scale (SJS) populations may require in-season treatment if dormant or delayed-dormant treatments were not applied or did not provide adequate control. To time spring treatment targeting the crawler stage, use pheromone traps and degree days or sticky tapes applied in April to track crawler emergence (typically in May). Crawlers emerge 600-700 DD after biofix (first male catch in pheromone traps placed in late February). Pheromone traps are also beneficial for tracking SJS parasitoids. A dark band on the thorax near where the wings attach is present on male SJS and not parasitoids.
- Obliquebanded leafroller (OBLR) populations should be monitored using pheromone traps placed mid-April. Visual fruit inspections beginning 930 DD from biofix (moths caught on two consecutive observation dates) will indicate need for OBLR treatment. Inspect 15 fruit from 80 trees per orchard looking for larval damage – leaf rolling with webbing and leaves webbed to fruit surfaces where fruit-to-fruit contact occurs. Treatment thresholds are >2% of fruit sampled with larvae and/or larval damage present for dried plums, any evidence of larvae or damage for fresh market. Monitoring form available at: <http://www.ipm.ucdavis.edu/PMG/C606/prune-oblr-sample.pdf>.
- Monitor peach twig borer (PTB) using pheromone traps (placed by April) in all fresh market orchards and those where dormant, delayed-dormant, and bloom treatments are not routine. Conduct visual fruit inspections beginning 400 DD from biofix (moths caught on two consecutive observation dates), using same protocol as OBLR. Look for PTB larvae and damage (entries into fruit), particularly where fruit contact one another and where leaves touch fruit. Thresholds for PTB treatment are the same as OBLR. Monitoring form for PTB available at: <http://www.ipm.ucdavis.edu/PMG/C606/prune-ptbpostbloom.pdf>.
- If aphids were not treated using a dormant or delayed-dormant spray, treatment was inadequate, or aphids are a chronic problem in the orchard, monitor weekly from petal fall until July 15 or until a treatment is applied. Monitor trees on orchard edges or in known hot spots (e.g., windbreaks, near natural vegetation). Walk down tree rows, visually examining half of the tree on either side (40 whole trees), spending 15 seconds per tree (10 minutes total). Presence of aphids can be signified by live populations, leaf curling, honeydew, ants, and predator presence (lady beetle, lacewing, and syrphid fly larvae). If these signs are observed, examine branches and leaves for damaging live aphid populations (wingless aphids) and rate populations as significant or not. Significant populations are when leaf-curl plum aphids and/or mealy plum aphids occupy $\geq 10\%$ of the leaf surface. If 30% of trees have significant aphid populations, treatment is warranted. If less than 10% of trees have significant aphid populations, no treatment is warranted and continued weekly monitoring of the block is recommended. If between 10-30% of trees have significant populations, conduct additional 5-minute searches of 20 trees until the above thresholds are noted for that week. Monitoring form available at: <http://www.ipm.ucdavis.edu/PMG/C606/prune-springaphids-sample.pdf>.

- Begin monitoring webspinning spider mites by June 1 or earlier in warm, dry years. In orchards up to 40 acres, conduct two 5-minute searches in two separate areas of the orchard, examining 2-3 leaves from inside and outside the tree canopy of 10 trees in each 5-minute search. Note presence/absence of spider mites and their predators (particularly predator mites and sixspotted thrips). Monitoring form available at:

<http://www.ipm.ucdavis.edu/PMG/C606/prune-mitesample.pdf>.

Treatment thresholds are based on the combination of ratings of spider mite and predator populations.

Treatment is recommended if the ratings from at least one 5-minute search indicate either:

- Low/moderate mite rating (up to 60% of leaves with one or more spider mites) with low predator rating (less than one predator per 6 leaves).
- Moderate/high mite rating (>60% of leaves with one or more spider mites) with moderate/high predator rating (one or more predators per three leaves).

Diseases:

- Begin weekly monitoring for rust by May 1 and continue through July 15. Examine 40 trees randomly for rust symptoms (bright yellow angular spots on the tops of leaves or red-brown spore masses on the undersides of leaves). Focus on low hanging branches, trees with vigorous growth, known hot spots, and include non-bearing replants. Treat rust at first sign of the fungus in the orchard. When treatment is necessary, apply fungicides ahead of spring rains, not after. Continue monitoring weekly or twice monthly after treatment to determine the need for additional control based on increase in rust symptoms between checks. No monitoring or treatment is needed within 4 weeks of harvest.
- Fruit brown rot. Around pit hardening (roughly May 1 in the Sacramento Valley), prune fruit are more susceptible to the development of latent brown rot infections than at any other time in the season. Latent infections can become full-blown brown rot infections at harvest. Consider the current and forecast weather plus brown rot history in the orchard in late April to decide if a fungicide application is indicated in early May.
- Check trees for Cytospora canker during the growing season. The first noticeable symptom is usually wilting or flagging of a branch. Branches will have a dark-colored bark canker with a depressed center. The canker eventually girdles the branch, causing it to die. Dead limbs are evident mid- to late summer. No chemical controls are available for the disease; infected trees must be removed and destroyed. During the growing season, remove (cut out) cankers and destroy dead or damaged wood, making sure to cut several inches to one foot below any canker to ensure all the disease is removed. Maintaining tree health can help mitigate the severity and spread of the disease. Manage stress factors including potassium deficiency, sunburn (by managing defoliation caused by rust and other factors), high ring nematode populations, trunk borers, and soil moisture stress. More information is available at:
<http://www.ipm.ucdavis.edu/PMG/r606100311.html#MANAGEMENT>
- Trunk sunburn. Protect the future of the orchard by painting the trunks of replants and young trees WHITE. When painting trunks, use indoor water-based latex (not oil-based) paint. If trunk shields (nursery boxes) are used on young trees, the trunk should also be painted to avoid “box burn” around the top of the box. Box burn can girdle the tree trunk just below the top of the box. If nursery boxes are used without painting trees, the boxes should be flattened (to look like ◊ this from the top, not this ◻) to reduce risk of “box burn.”

Weeds:

- Survey weeds in late spring after summer annuals have germinated. Identify any species that escaped control from earlier management. Record weeds found in tree rows and middles separately; annual weeds in row middles may be beneficial as a cover crop. Late spring weed survey form available at
<http://www.ipm.ucdavis.edu/PMG/C606/prune-springweeds.pdf>.

Additional information on prune IPM activities and treatment guidelines are available at:

<http://www.ipm.ucdavis.edu/PMG/selectnewpest.prune.html>