Forrest Cook

News & Notes of the UCSC Farm & Garden

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An Anomalous* Fruit Year

– by Orin Martin

So, what's up with our deciduous fruit trees along the Central Coast? Some (not all) seem to be behaving poorly, displaying erratic behavior.

A sardonic cynic might reply: "Not much, not much at all," or "Hey folks, we're skipping a year with our fruit trees." A more kindly response might be: "Folks, 5 letters — R-E-L-A-X. It is what it is, and besides, there is nothing you can do…"

From sea level to 800 feet elevation, the last two winters have featured dry and warm conditions. Following a warm, wet El Niño-like December (2014), the months January through March of 2015 featured consistent daytime temperatures in the 60º's and 70º's, with an occasional reading in the 80º's. Night-time temperatures were correspondingly warm, often 40º–45º or higher. These months also featured virtually no measureable precipitation.

This seasonal weather pattern seems to align with predictions from the arena of climate change science: that climate change will lead to increases in the frequency, intensity, and duration of extreme weather patterns, with periodic catastrophic events, e.g. –

- Heavy rainfall: 18 inches in 22 days in 2014 at the Alan Chadwick Garden
- Intensity of rainfall: 8 inches in 24 hours in December 2014 at the Chadwick Garden
- Warm spells: winters of 2013-14 and 2014-15
- Drought: a fourth consecutive drought year in California
- And of course, the associated sea level rise

The Roots of Dormancy

Because most deciduous fruit trees—apples, pears, apricots, plums, peaches, nectarines, cherries, etc.—originated in the northern temperate zones of Europe, Asia, and North America, they're adapted to survive cold winter temperatures. They developed the evolutionary strategies of shedding both leaves and fruit—dropping their leaves, hardening and encasing their tender buds in leaf-like wrappings called bud scales—and thus going dormant in the winter.

Dormancy is an adaptive feature that not only prevents cold injury, but also ensures a period of rest for trees. This rest period allows trees to "spring" from rest to active growth in early spring, which features almost all components of the tree growing simultaneously: roots, shoots, flowers, and fruit. Additionally, during spring, trees initiate the following year's flower buds internally. The pomologists of the early 20th century dubbed this riotous time of spring activity "the Grand Period of Growth," or the "Royal Flush of Growth."

In contrast to this well-orchestrated "grand period," if there is prolonged warm weather in the winter, trees come out of dormancy in a slow, staggered, drawn-out fashion. This winter, with its almost unparalleled warmth, has caused just such a long, continued "scraggly" break from dormancy. Some trees have been in the process of "awakening" over a 2–3 month period, whereas the norm is 2–3 weeks (sometimes 4). Very apparently, some peaches, cherries, and apples will not "awaken" at all this summer.

Dormancy and Chill Hours

Dormancy actually begins in mid to late summer, when shoot growth extension stops. At this point the tree is allocating its resources to ripening fruit and storing nutrients for the following year's growth activities. Dormancy in deciduous trees is triggered by both shortening days and colder temperatures—the colder it is, the more rapid the onset of dormancy.

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*from the Greek *an* = not, *homalos* = even

As a tree goes into dormancy it manufactures a plant growth regulator/hormone called abscisic acid, which not only contributes to leaf drop but also acts as a growth inhibitor, moving from the tip (apical bud) of a branch downward by gravity. This hormone sends a message (anthropomorphic as this sounds) to the tree: "Don't grow yet, rest." The accumulation of absicic acid in buds keeps them from breaking from dormancy during "false spring" thaws (i.e., warm winter days), providing an evolutionary "safety net."

Over time, cold temperatures (see chill hours, below) and UV sunlight degrade the abscisic acid in buds. Dormancy is finished when the abscisic acid accumulated in buds is exhausted and no longer controls the "inner workings" of the tree. The tree will then "break dormancy" and grow anew.

The term "chill hours" refers to the cumulative number of hours in a season with temperatures between 32–45ºF. Again, its importance reflects the origin of most deciduous trees –

- Apples and pears from Khazakstan/Uzbekistan
- Plums from Northern Europe
- Peaches and apricots from Northwest China
- Almonds from the northern mountains of Iran and Iraq

All deciduous fruit trees and all geographic areas have been categorized as per the average number of chill hours they need, or experience, to complete the cycle of dormancy and "reawakening" in the spring. That's why it's important to match the chill hour requirements of your fruit trees with the average chill hours your area receives (see more at *Reliable Fruit Tree Varieties for Santa Cruz County*, available online: casfs.ucsc.edu/about/publications/for_the_gardener.html). Note that the Central Coast receives an average of 500–900 chill hours.

Some examples of fruit tree varieties and their chill hour requirement –

- *Apples:* Braeburn, 400 hours; Fuji, 400–500 hours; Golden Delicious, 700 hours; Jonagold, 700–800 hours; Cox's Orange Pippin, 800 hours
- *Apricots:* Blenheim, 400 hours
- *Apriums:* Flavor Delight, 300 hours
- *Pears:* Bosc, 400–500 hours; Comice, 600 hours; D'Anjou, 800 hours
- *Peaches:* Donut/Saturn, 200–300 hours; Babcock, 250–300 hours; Suncrest, 500 hours; Arctic Supreme, 700 hours; Red Haven and White Lady, 800 hours
- *Plums:* Beauty, 250 hours; Santa Rosa and Satsuma, 300 hours

Trees with higher chill hour requirements simply accumulate more abscisic acid, and thus require more chill to break dormancy.

Once a tree has gone into dormancy, it will not awaken and grow again until its chill hour requirements have been met and the temperatures begin to warm. For many tree species, that simply didn't happen this winter, with portions of the Central Coast receiving as little as 50% of the trees' required chill hours.

The Effects of a Warm Winter

Many deciduous fruit trees on the Central Coast have displayed some if not all of the telltale signs of inadequate chill this spring and early summer –

- Delayed break from dormancy
- Prolonged, scraggly flower bloom
- Small flowers with low pollen count
- Delayed foliation
- Small leaves, leading to low rates of photosynthesis
- Bare or "blind" fruit buds that never emerge from dormancy
- Poor and late fruit set
- Small, poor quality fruit
- Late fruit maturation
- Poor development of next year's fruit buds

Some examples of apple varieties most affected by the lack of chill hours at the Chadwick Garden include those that are still coming out of dormancy, such as the Golden Delicious, Spigold, Elstar/Valstar, Arkansas Black, and Ginger Gold. Some have broken dormancy but have few or small fruit and leaves, including Cox's Orange Pippin, Jonagold, Belle de Boskoop, and Yellow Newtown Pippin.

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Chadwick Garden manager Orin Martin discusses summer fruit tree care.

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In contrast, some apples look vigorous and are bearing a good crop, including Braeburn, Gala, Fuji, Fiesta Cox, Pink Lady, Chehalis, Sunrise, and Hudson's Golden Gem. Apricots and Japanese plums, along with those peaches that have <500 hours of chill requirements (July Elberta, Suncrest, Donut/Saturn, and Babcock) are in good shape, though in some cases the fruit is small. Most peaches, though, are still in the throes of winter dormancy, and as of this mid-June writing don't look as though they'll snap out of it this year. This includes Baby Crawford, Red Haven, Arctic Supreme, White Lady, Snow Giant, Frost, and O'Henry.

It's really a sad state of affairs, with cherries and peaches most affected, apples and pears variable, and fruits with lower chill requirements, such as plums, persimmons, pomegranates, and quinces seemingly unfazed by all this "global weirdness."

What does the future portend? Well, who knows? We have had years with low chill winters before (2 in 10 on average), but quite frankly, nothing to date with the severity of the winter of 2014–15. Previously, after a low chill winter, if the following winter chill was "adequate" the trees recovered. Stay tuned …

Orin Martin, Matthew Sutton, and Sky DeMuro will team up to offer a workshop on summer fruit tree care on Saturday, August 8. See page 3 for details.

Postscript

Perhaps we can take solace from a quote from John Steinbeck's *East of Eden* and a description of the Salinas Valley:

"I have spoken of the rich years when the rainfall was plentiful. But there were the dry years too, and they put a terror on the valley. The water came in a thirty-year cycle. There would be five or six wet and wonderful years when there might be nineteen to twenty-five inches of rain, and the land would shout with grass. Then would come six or seven pretty good years of twelve to sixteen inches of rain. And then the dry years would come, and sometimes there would only be seven or eight inches of rain. The land dried up and the grasses headed out miserably a few inches high and great scabby places appeared in the valley. The live oaks got a crusty look and the sagebrush was gray. The land cracked and the springs dried up and the cattle listlessly nibbled dry twigs. Then the farmers and the ranchers would be filled with disgust for the Salinas Valley. The cows would grow thin and sometimes starve to death. People would have to haul water in barrels to their farms just for drinking. Some families would sell out for nearly nothing and move away. And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way."