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The power of technology: the nose knows

Technology will lead us to the answers for continued success and survival in the face of constant threats from invasive pests and diseases.

These days, it seems that we are bombarded by advancements in technology that constantly go beyond our wildest dreams. Just look at the use of mobile communications with Smartphones, Smartpads, Smartwatches, and all. When are they going to release a Smarthelper to do all our other thinking for us. We may continuously hit information overload, but there are times when the new technologies actually work for us.

This is the case with a new device emerging from our research program known as the EZKnows. This is a catchy name for a system that can actually “sniff” a tree and analyze the presence of diseases and pest populations. CRB is in the process of field-testing the device by searching for trees with HLB in the Los Angeles area.

Currently, the device is programmed to detect the presence of HLB, *Citrus tristeza virus*, and citrus stubborn disease. The equipment is capable of being programmed to detect pest populations as well, and ACP is the first pest in the queue. One of the beauties of this system is that it does not require re-manufacturing to add a new target. It is a simple matter of adding the target signature to the base program, and away you go.

The system is based on the detection of Volatile Organic Compounds (VOCs) that are emitted by the tree or the pest. Previous scientific studies have shown that the tree will respond to the presence of a pathogen by emitting a specific signature based on the host plant response. These signatures can be sorted out by the EZKnows system and fed to a computer that will analyze the signatures and give a presence/absence signal. A specific tree can be identified by its GPS (Global Positioning System) coordinates, its VOCs analyzed, then charted for further action steps. *Citrograph* reported on the basic system in the March-April 2012 issue in an article written by Dr. Cristina Davis, the originator of the system.

Deployment of this kind of technology will give citrus growers a mechanism for early detection of HLB and other serious diseases. From this information, response plans can be executed to protect the groves, and ultimately the industry, from catastrophic losses in the future.

This is just one of the many reasons I believe that the California citrus industry will be the world leader in fresh citrus production for many years to come. Technology will lead us to the answers for continued success and survival in the face of constant threats from invasive pests and diseases. Now, it will be up to all of you to deploy the tools and be successful.
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Citrograph asks: “How are you coping with water problems in your area, including availability concerns and water quality issues?"

As an irrigator in the California desert located in the Imperial Valley, we are blessed that we have a very good water right to 3.1 million acre-feet annually of Colorado River water. However, that comes with a bevy of thirsty neighbors to our west, in the coastal areas north of the Mexican border. We have been under the microscope since the 70s on the use of our water and what we must do to secure the most valuable asset for our region. While the allotment of 3.1 MAF may seem like an over-apportionment, it is applied over close to 500,000 acres. On top of that, we are now in a transfer agreement that involves moving water to our neighbors at an ever-increasing rate, which ultimately will involve our Valley losing at least 20% of our water. Quality issues from the water we receive via the Colorado also comes with added components such as 1 ton of salt per acre-foot of water along with silt and sand sediments, and invasive plant species as well as Quagga mussels. With the reduced water inflows and lesser agricultural runoff, we are now seeing a shrinking Salton Sea, which will have a detrimental health impact on the exposed beach playas in our windier days as well as a change in the microclimates close to one of the largest inland bodies of water. The local farmer here is now more determined than ever to make it work with what we have and becoming more and more involved politically to ensure that the agriculturist is not left outside in the conversations. When it comes to water and where it belongs, I believe we will not give up without an educated, informative debate. —Mark McBroom, Calipatria

Our family has farmed citrus in San Diego County for 80 years. During the past 20 years, our groundwater resources have declined in both volume and quality. The high cost of imported water cannot be justified for citrus production. Irrigation efficiency has become a high priority. We have used all methods of irrigation over the years including some drip irrigation in the mid-70s. Micro-sprinklers have proven to be the best method of irrigating our deep sandy-loam soils. This also allows us to inject nutrients and crop protection agents into the irrigation and to provide some frost protection for our coldest areas. Our most recent upgrade was the installation of a solar power system to reduce our electric power costs for pumping. The system offsets 80% of our power bill through a net-metering agreement with the power company. By taking advantage of all of the available incentives, we will see the investment paying off in less than five years. It is nice to have at least one of our major costs of production locked in for the next 20 years. —Warren Lyall, Pauma Valley

Water is one of our costliest inputs and most variable in supply. We operate in 13 water districts throughout the central and southern San Joaquin Valley, and each district has its own supply and quality challenges. The State Water Project has delivered between 30% and 70% of contracted supply over the last few years, and the Friant system (CVP) is projecting a 45% class 1 supply this year. With such variability, we have had to rely on groundwater wells to make up for the shortfall. Much of the citrus belt lies in the area near the foothills that has limited groundwater, and many of our wells do not meet the evapotranspiration demand of the crop. To meet the shortfall, we are able to pump additional supplies where we have adequate groundwater and move our surface supplies to areas without groundwater supplies; then in wet years, we utilize our surface supply and allow the groundwater to recharge. Water quality challenges are becoming apparent on southern valley properties where groundwater is slightly saline and districts are blending high boron water into their system to expand supply. Additional water applications as well as amendments are needed to move the salts through the root zone. We are also continuing to evaluate and maintain our irrigation systems to improve efficiency and minimize any loss or runoff. As we look to expand our operations, or purchase property, we focus on property that has multiple water sources with good surface and groundwater supply. —Keith Watkins, Farming Manager, Bee Sweet Citrus, Inc.
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California has a multibillion-dollar citrus industry, supplying fresh citrus across the country and around the world. And that’s not our only connection to citrus. Our cities and streets are named after citrus varieties, and our yards and parks are planted with orange and lemon trees. Citrus is a part of California’s heritage. However, a threat is looming with the potential to devastate that heritage.

The citrus disease huanglongbing (HLB), also known as citrus greening, was recently detected in the Hacienda Heights section of Los Angeles County – the first time it has been found in California. Huanglongbing is a fatal disease of citrus. There is no cure. Infected trees must be removed to help prevent spread of the disease. An insect called the Asian citrus psyllid is responsible for its spread. Psyllids were first detected in California in 2008 and are now present in most of Southern California.

In response, the California Department of Food and Agriculture, in partnership with the citrus industry, the USDA, and county agricultural commissioners throughout the state, is pursuing a strategy of controlling the spread of Asian citrus psyllids and huanglongbing while researchers seek a cure for the disease.

To help achieve this, regulations on the movement of citrus fruits, plants and trees are in place, including a 93-square mile quarantine in the Hacienda Heights area of Los Angeles County. Citrus nursery stock in that area may not be moved, and residents are not permitted to move homegrown citrus fruit from their property. However, commercially cleaned and packed citrus will still be available from retailers, and this fruit may be moved freely.

Local residents and industry can help ward off, or contain, huanglongbing disease in a number of ways, including:

- Not taking or moving cuttings from backyard citrus plants from one property to another.
- Buying citrus trees only from reputable local nurseries.
- Cooperating if County (or State) inspectors ask to place insect traps on their land (traps are to find and test Asian citrus psyllid, the insect that can carry citrus greening bacteria).
- Reporting citrus trees and plants that seem to be sick or dying even though they also appear to be well-watered and well-maintained to the California Department of Food and Agriculture hotline at 1-800-491-1899.

To date, within the 800-meter HLB survey area in Hacienda Heights, we have surveyed 1,442 properties and identified properties containing host material. 478 ACP samples and 109 tissue samples have been taken, and only the original tree and ACP have been confirmed with HLB. Within the 800-meter HLB treatment site, we have treated 878 properties, a 99.9% completion rate.

In addition to the 800-meter treatment and survey area, we are also proceeding with a transect survey that goes out 10 miles in the four cardinal directions from the find site. To date, 780 properties have been surveyed with 479 ACP samples submitted and 56 tissue samples submitted; all came back negative for HLB.

Concurrently with the treatment and survey activity, regulatory activity has begun. Of the 100 nurseries within the HLB quarantine area, host nursery stock has been identified at 20 production nurseries and 16 retail locations. Certified producers are under compliance to sell and distribute host fruit without leaves, stems or plant parts.

Below is a brief HLB incident chronology:

March 22, 2012 – CDFA was notified that ACP samples from Los Angeles County tested positive for the bacteria that causes HLB. CDFA convened a Command staff meeting to begin a Situation briefing and to formulate a response strategy. It was determined that the HLB incident will be

March 23, 2012 – CDFA re-sampled the detection site and four adjacent properties. ACP and plant tissue were submitted from every site whether they were symptomatic or not. CDFA briefed the Los Angeles County Agricultural Commissioner.

March 24, 2012 – Plant tissue from the detection site tested positive for HLB by the CDFA’s Plant Pest Diagnostic Center (PPDC). Plant tissue was sent to the USDA Beltsville lab for further analysis and identification.

March 24-29, 2012 – Survey work continues 400 meters around the detection site collecting ACP and symptomatic plant tissue. ICS Planning meetings held; PPDC continues to test plant tissue and ACP.

March 30, 2012 – USDA notified CDFA that both ACP and plant tissue tested positive for HLB bacteria. A series of calls to stakeholders took place, and CDFA sent out a press release announcing the detection of HLB in CA. Residents in the HLB treatment area were mailed an information packet including a map to the public open house meeting.

March 31-April 5, 2012 – Hold notice was issued at the find site; PPDC continues to test plant tissue and ACP. USDA Smuggling Interdiction and Trade Compliance (SITC) initiated an investigation, which includes trace forward and trace back. ICS Planning meetings held.

April 5, 2012 – Activities continue, and the HLB-positive tree was removed from the Hacienda Heights location. A public open house meeting was held in the City of Industry to notify residents within 800 meters of the HLB detection site of upcoming ground treatments and to answer any questions. Several different agencies attended the meeting and were made available to the residents to answer questions.

April 6 – present – Activities continue. No additional HLB detections to date.

Overall, California is by far the leading agricultural state in the U.S. The California Department of Food and Agriculture works closely with the Administration, California Legislature, the University of California, your local county agricultural commissioners, industry, and other state and local agencies to protect the state’s agricultural economy from disease and invasive pests. Without the commitment and support of the citrus industry, this program would not have been successful.

Due to increased trade, travel, and commerce, new exotic invasive species enter California every year. The establishment of any of these invasive species can result in huge economic and environmental damage to our state. The Asian citrus psyllid and huanglongbing are examples of this threat.

To learn more about the ACP insect and HLB disease, visit the California Department of Food and Agriculture’s website: www.cdfa.ca.gov/plant/ACP. If you suspect you have seen this insect or symptoms of the disease, please call the CDFA at 800-491-1899.

To find out about ACP and HLB detection and control efforts in your area, locate your county Agricultural Commissioner at: www.cdfa.ca.gov/exec/county/county_contacts.html.

Dr. Robert Leavitt is Director of the California Department of Food and Agriculture’s Plant Health Division.
Dear Jim,

I was dismayed to hear HLB was discovered in California, and thought I’d offer some perspective based on my own experiences, because the likelihood is that it will pop up somewhere else and eventually be found in a commercial orchard.

Psyllid control alone will not stop HLB spread in commercial orchards, although it’s certainly a cornerstone of the management strategy. I also believe infected trees must be removed aggressively, immediately upon discovering them, by everyone without exception. Based on Florida’s experience, this is a conversation you all may wish to have before it becomes necessary. We spent way too much time debating the strategy instead of pushing trees, so now we’re stuck. You all don’t have to be.

The Asian strain of HLB spreads fast, but if you remove infected trees religiously and control psyllids on an area-wide basis, the trees that remain will be free of HLB, which means they’ll grow, produce fruit, and behave in a normal manner. If all of you remove trees quickly, the chances are you’ll only lose a few percent each year because you’re controlling the inoculum as well as the vector — the growers in Florida that were big enough to determine their own destiny actually proved this with good success.

Florida is primarily a processing industry, which can accommodate some fruit that is affected by HLB. The fresh fruit industry, though, is a different story. Although we can keep the trees pumped up with foliar nutritional sprays, the effects of HLB on the fruit are significant. We actually have to train pickers and pay extra to leave the greening fruit on the trees, which is sometimes over half the crop. Gross returns to the grove plummet, and the costs of harvesting and packing skyrocket.

The grove looks perfectly fine the day the first tree is found, and it’s impossible to imagine what will happen if you don’t yank it out right away. My experience is that it’s one of the hardest things you’ll ever do. The trees look great, with a nice crop of fruit and only a few leaves showing symptoms. The challenge is to have logic win out over emotions.

-Pete Spyke

Thank You, Pete, for taking the time to share your thoughts.
Jim Gorden
We all know the familiar phrase, “Proper Prior Planning Prevents Poor Performance”. (OK, so I took a little editorial license…) This saying is quite common among former military personnel and others. The point is that planning is essential to being ready for the next crisis to hit.

Such is the case of being prepared for the Asian citrus psyllid and now for huanglongbing (HLB). As you know, HLB has been detected in California in a residential area of Los Angeles County. Do you have a plan for what you will do if it shows up in or near your grove?

I recently gave a presentation that addresses the steps growers should take to prepare a contingency plan for your organization. It includes the following steps:

1. Follow the 80/20 Rule
2. Have a Basic Plan in Place
3. Know Who to Call
4. Discuss This with Your Entire Management Team

The 80/20 Rule:

This can take many forms, but the basic premise of the rule is that 80 percent of the action steps in a crisis can be planned for and systems put in place before the crisis hits. This process of preparedness has worked well for emergency response programs in agriculture including the Medfly invasions. The remaining 20 percent of the steps cannot be determined before the crisis hits, and those will require “on the fly” decisions based on the circumstances of your particular situation.

Have a Basic Plan in Place:

Sit down and decide what you would want to have happen should you “get the call” that HLB or even ACP is found in or near your grove. Think about potential outcomes. The immediate threat is that ACP will be found in or near your production grove and will require some very quick action.

The Citrus Pest and Disease Prevention Committee (CPDPC) is funding a very aggressive detection program throughout the state. This is intended to provide an “early warning” alert to the presence of ACP in citrus production areas. It will be critical for growers to take quick action to reduce or eliminate the populations from their groves. The ultimate threat is from the bacteria that the psyllid may carry and what will happen to your trees should they become infected. HLB is the most devastating citrus disease. It significantly weakens a citrus tree, affected fruit tastes bitter and is misshapen, and trees will eventually die. Where there may be area-wide programs in place to help with this, you must still be prepared with your own set of action steps to meet the overall objectives of protecting your own property and the property of those around you.

Know Who to Call:

Have the phone numbers of the action agencies and companies that you will need to execute your plan posted in an easy and conspicuous location. Do not have the information buried in some file drawer or computer file that is difficult to access. An example of a list is:

- Your local Pest Control Advisor (PCA)
- Your County Agricultural Commissioner’s Office
- Your Pest Control Applicator
- Anyone else in your action plan

These numbers should be prominently displayed at your office or place of business (pickup windshield, etc.) so that anyone who needs to make the call can respond as soon as possible.

Discuss This with Your Management Team:

Make sure you have a written plan in place. Staff meetings alone will not solve the problem. You must continuously discuss the issue with your management team to keep everyone updated on the issue.

A recommended approach to this is to hold practice drills for action items to ensure that everyone knows their individual responsibility and can execute it on a moment’s notice. This may sound trivial, but believe me, it can save hours of angst when the problem does come up.

Finally, be sure that everyone knows where everything is located. You do not want to go running around looking for things when the crisis hits. The worst case would be to need to have a particular phone number and no one knows where to look for it. Equipment should also be readily available should emergency treatment become necessary.

The industry leadership is working on large-scale programs to help with coordination of emergency response programs. However, it will be each grower’s responsibility to respond and execute. Please do not rely on someone else to do the preparation and planning for you.

Ted Batkin is President of the Citrus Research Board.
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A “Save Our Citrus” iPhone application launched by USDA-APHIS in April allows users to quickly and easily report possible finds of infected trees. Available in English and Spanish, the app is a free download on iPhone, iPad and iPod touch mobile devices.

The content is focused on the four leading diseases—citrus greening (huanglongbing), citrus canker, citrus black spot, and sweet orange scab—and there are illustrations of symptoms for reference.

In just a few simple steps, anyone suspecting that they may be looking at one of these diseases on their own citrus can upload photos and describe what they’re seeing. They will get a response back from an expert with specific knowledge of these diseases.

At www.SaveOurCitrus.org, the “call-to-action” message for the app reads, “Make sure your citrus is healthy and help stop the spread of these incredibly destructive citrus diseases.”

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For most of my 35-year professional career, I have been engaged, in one form or another, in the California “Water Wars” — the seemingly never-ending debate about the use of California’s limited water supplies.

For much of this time, the effort has been a “rear guard” action, trying to limit the loss of water to my primary constituents and clients in the agricultural sector of the southern San Joaquin Valley. This loss of water has occurred primarily as a result of changes in our society’s priorities whereby, through legal battles and the (mis)application of regulations involving the Endangered Species Act, the Clean Water Act and/or other environmental law, water has been reprioritized from one use to another.

Unfortunately, the losses have out-numbered the wins, and available surface water supplies to this region have been considerably diminished.

Agriculture’s influence and “leverage” as the number one industry in the state has vacated us as a result of the increasing influence of the major metropolitan areas and the different economies and priorities that have grown up elsewhere.

I have also been involved in a West-wide organization of farmers and irrigators that have as their mission the “defense of irrigated agriculture” which largely revolves around engaging and communicating with policymakers and others about the value of irrigated agriculture throughout the western United States.

Forum for western irrigators

The Family Farm Alliance (http://www.familyfarmalliance.org/) has been in existence since the early 1990s serving as a forum for western irrigators to share their issues and coordinate their strategies for maintaining their ability to access much-needed irrigation water supplies.

Agricultural industry leaders from throughout the West, including citrus industry leader Harvey Bailey, the focus of this issue’s Grower Profile, have been involved with this organization from its inception and help to provide

Thus, I can attest that the “water wars” are not unique to California and represent a real threat to our nation’s ability to continue to produce the food and fiber we need as a country.

The Family Farm Alliance board of directors came to the conclusion a few years ago that the tide of the debate over the need for irrigated agriculture was not going to change until there was a more widespread recognition of the importance of agriculture, in particular irrigated agriculture, as a valuable asset to be preserved and protected. As long as people could go to the grocery store and have shelves full of a variety of good quality food at reasonable prices, the need to do anything but take this cornucopia for granted, was going to wane for attention.

In some respects, it was a defeatist attitude that was becoming pervasive. The Alliance Board wondered, “How could we effectively create and engage in that needed debate?” Fortunately, as my father was fond of saying -- (one of his many “lectures” my brother, sister and I fortunately endured as kids) -- “things are never as bad nor as good as do they seem.”

Thank goodness for leadership. The leadership of the Family Farm Alliance, primarily the efforts of Patrick O’Toole, the Alliance president and a rancher from Wyoming, and Dan Keppen, the Alliance executive director from Klamath Falls, Oregon, did not accept the defeatist attitude and continued to engage policymakers, including those in the environmental community and elsewhere, on the need for reliable water supplies for Western irrigators because of the importance of the food resource to our national economy and our national defense.

Their message has resonated with others, especially with those with concerns about the vulnerabilities created

It does appear that there is a reawakening of the perspective that there is tremendous value in the agriculture of this country and the need to protect it and its related resources.

—Dick Moss

It appears that the “on the ground” feel of the organization that has resulted in it becoming a well-recognized and sought-after voice on policy that may affect irrigated agriculture.

While California is often the “bellwether” state for issues involving irrigated agriculture, the balance of the West also suffers from very similar issues (often identical, especially where federal law and policy are concerned).
for our nation as a result of being dependent on foreign sources of oil who saw the parallel dependence on foreign sources of food being equally, if not more, treacherous.

But an even broader scale of interests have now been engaged, those that are becoming more and more concerned about our ability to feed the number of people projected to be on this planet within the next couple of generations (within my lifetime if I’m lucky enough to live to be 100 years old).

**Domestic and global water supply issues**

Dan Keppen recently testified before the U.S. Senate Committee on Energy and Natural Resources, Water and Power Subcommittee, on the critical need to address domestic and global water supply issues. He made a number of key observations and recommendations (excerpted and/or summarized from Keppen’s testimony) that I found particularly compelling:

- We are in danger of losing a generation of farmers. The median age of farmers in America has never been higher. More than half of today’s farmers are aged between 45 and 64, and only 6 percent of our farmers are younger than 35.
- The number of farms is declining throughout the West. The farmed acreage in the nation and especially in the West is dropping as well as the number of farms. USDA attributes the decline in the number of farms and land in farms to a continuing consolidation in farming operations and the diversion of agricultural land to nonagricultural uses.
- Americans pay a substantially lower amount of disposable income on food. According to the World Bank, families in 28 other high-income countries pay 10.2 percent of their disposable income on food compared to 6.2 percent for families living in the United States. For the average American, that’s a difference of $3,820 per year. This abundance of low-cost food and the loss of the last generation to face food shortages (the “Greatest Generation” and their living in periods of world war and the Great Depression) has left us with an easy complacency.
- Agriculture holds the most senior water rights in the West and is considered a likely source of water to meet growing municipal and environmental demands. Yet the only large potential for moving water from agriculture to other uses will come from fallowing large swaths of farmland.

We can always be more effective and efficient in our water use, but for agriculture, that seldom translates to more water for other uses. The only large potential for moving water from agriculture to other uses will come from fallowing. When transfers of water from agriculture result in farmlands being permanently fallowed, there is a loss of a resource that is largely irreplaceable, and thus significant bigger-picture issues need to be addressed.

- Growing domestic and global food security and scarcity concerns must be considered as federal water policies are developed and implemented. The U.S. needs a stable domestic food supply, just as it needs a stable energy supply. The post 9/11 world of terrorist threats makes the
stability of domestic food supply even more pressing.

Other signs point to the hard truth of a very real food crisis in the world today. The Food and Agriculture Organization of the United Nations (FAO) in June 2009 reported that over 1 billion people worldwide go hungry every day. And the problem will only get worse. The world’s population is growing by 79 million people each year. The FAO estimates that the world needs to produce 70 percent more food by 2050 to keep pace with population growth and increased demand for calories.

- The U.S. must adopt an overriding national goal of remaining self-sufficient in food production. Food security is homeland security. The time has come – indeed, it’s long overdue – for the United States to adopt an overriding national goal of remaining self-sufficient in food production. Policy decisions on a wide range of issues ranging from taxation to the management of natural resources should then be evaluated to be sure they are consistent with that goal. It’s hard to imagine a simpler or more important step to safeguard the American public.

- New water supplies must be developed to provide for recreational and environmental needs, allow for population growth, and protect the economic vitality of the West. There must be more water stored and available to farms and cities. Maintaining the status quo simply isn’t sustainable in the face of unstoppable population growth, diminishing snowpack, increased water consumption to support domestic energy, and increased environmental demands.

We need to mitigate for the water that has been reallocated away from agriculture towards growing urban, power, environmental and recreational demands in recent decades. If we don’t find a way to restore water supply reliability for irrigated agriculture through a combination of new infrastructure, other supply enhancement efforts, and demand management, our country’s ability to feed and clothe itself and the world will be jeopardized.

The Family Farm Alliance has also engaged on other fronts of promise with the same message. Pat O’Toole is a member of the Advisory Committee of a new group called AGree (http://www.foodandagpolicy.org/). Staffed by researchers (the Meridian Group), this organization was formed by former U.S. Secretary of Agriculture Dan Glickman and others to address federal policy that affects our ability to feed ourselves and the world.

They see the pressures on American agriculture and note, “The traditional policy approaches to food, nutrition, agriculture and rural economic issues will not be sufficient to deal with the changing demands we will experience over the next few decades.”

They intend to engage a broad array of stakeholders and seek insights, guidance and ideas that lead to meaningful, long-lasting solutions. Pat O’Toole is there as the “voice of irrigated agriculture” and has already shown his ability to be effective in getting our message heard.

It does appear that there is a reawakening of the perspective that there is tremendous value in the agriculture of this country and the need to protect it and its related resources such as water.

Importantly, it appears the timeframe for action is within years, not decades. As agriculture, we will never again have the outright control to compel our way in this debate and thus will need to engage the broader community in why we are so important.

We need to take full advantage of the new opportunities to engage that are happening on a number of fronts as a result of the consumers’ renewed interest in the origins and safety of their food supply and from this growing and real concern about our ability to be able to feed ourselves and the world.

People want to eat good, wholesome food — our “ultimate leverage” as American farmers and ranchers.

Dick Moss is a civil engineer practicing in Visalia, California, with the regional engineering and planning firm of Provost & Pritchard Consulting Group. He specializes in water resource planning, water supply, water transfers and project funding. He also farms navels and mandarins and is a member of the Board of Directors of California Citrus Mutual.

We need to take full advantage of the new opportunities to engage.
As you sit there reading this, if you serve on the board of a local water district then you know firsthand that being involved with water in California in any official capacity is not for the faint of heart.

The complexities, the conflicts, the politics, the controversies, the litigation, the responsibility. People looking in from the outside might wonder why anyone would want to take that on.

And yet, we have Orange Cove citrus grower Harvey Bailey who is not only very involved with local water issues — and has been for 20+ years — but who is also engaged at the regional level and even nationally.

In fact, Bailey is much more than “involved” in water issues because currently he serves as either the chairman or the president of five separate entities.

- At the local level, Harvey is President of the Orange Cove Irrigation District, a position he has held since 2004. He was elected to the OCID board in 1993.
- At the regional level, he is in his eighth year as Chair of the Friant Water Authority, which came into being in 2005 and has since replaced the Friant Water Users Authority. (As the representative of the OCID, Bailey also served as a director of the Users Authority.)

The Friant Water Authority is a public agency formed by its members to operate and maintain the Friant-Kern Canal and to represent its membership in various water supply, financial, legislative, legal and other policy matters. The current members are 20 irrigation, water, water storage, and public utility districts.

The Friant Division of the Central Valley Project irrigates more than a million acres along the east side of the San Joaquin Valley — between Chowchilla on the north and Arvin on the south — through the Madera canal and the Friant-Kern canal. San Joaquin River water is diverted at Friant Dam, which is northeast of Fresno.

- Also at the regional level but involving the entire range of the Central Valley Project, Bailey is President of the watchdog organization Central Valley Project Water Association. CVPWA is an independent organization, funded by its members, which represents various water users (including irrigation and water districts, mutual water companies, cities, municipal utility districts, water authorities, etc.) that have long-term contracts with the Bureau of Reclamation. Bailey has served on the board of the CVPWA for more than 15 years and has been President since 2005.

The CVPWA is focused primarily on regional Bureau activities that are financial in nature and that directly impact Central Valley Project contractors.

- Still within California, Bailey is Chairman of the Friant Water Political Action Committee.

- Finally, in a much larger arena, Bailey is a director and founding member of the Family Farm Alliance, an association of volunteers from the ag community who have a single mission, which is to “ensure the availability of reliable, affordable irrigation water supplies to Western farmers and ranchers”.

His work with the Family Farm Alliance actually dates back to the late 1980s. He was one of a small group of family farmers in the central San Joaquin Valley and in Arizona who formed the Alliance when Rep. George Miller
began pushing for major changes to CVP operations. Bailey and the others in the group realized that as “farmer lobbyists”, they would be their own best representatives in communicating with lawmakers.

Today, the Family Farm Alliance has members in 17 western states with federal water contracts.

To give you at least some idea of the scope and the magnitude of what Bailey and his colleagues have been dealing with, we turned to water writer J. Randall McFarland who edits the FWA publication *Friant Waterline*.

McFarland provided a rundown of the major issues that have affected the Friant Division of the CVP during the past two decades. He added a cautionary note about it being just a partial listing and pointed out that, of course, there is considerable overlap with Bailey’s work with the Orange Cove Irrigation District, the CVPWA, and the Family Farm Alliance.

That partial list included:
- Central Valley Project Improvement Act implementation and debate over proposed alternative legislation to reform the CVPIA.
- Valley debate and protest to development of a San Joaquin River Comprehensive Plan as mandated by the CVPIA.
- Endangered Species Act and Delta issues.
- Friant Division contract renewals.
- San Joaquin River litigation (the NRDC case), its many legal issues and court actions, the Settlement, enabling federal legislation and Restoration Program Implementation.
- Westlands Water District’s San Joaquin River area-of-origin water claims.
- Other water rights and supply issues, including out-of-area transfer proposals.
- Maintaining activity in long-term development of new surface water storage facilities.
- Development of a new Friant-Kern Canal conveyance contract for operation and maintenance with the U.S. Bureau of Reclamation, and extensive (and efficient) major maintenance work on the canal by the Authority.

“Thank goodness we have a lot of good managers and engineers and consultants for the different districts, and they work well together,” Bailey says. “We have managers who are really sharp, and they can work with each other very effectively, and with the Bureau, and with the guys who have water on the Westside or coming down the California aqueduct. It’s imperative to work together, always, and especially so in years like this.”

Bailey notes that the Friant board does a lot of the political work for the districts, and has a lot of interplay with the Bureau.

When you meet Harvey Bailey for the first time, the clear impression you take away is that this is a man who is strong and steady. You can see it in his demeanor and in how he carries himself.

Attorney Gary Sawyers, who was General Counsel for the Friant Water Users and is now General Counsel for the Family Farm Alliance, says, “There is nobody in agriculture I respect more than Harvey Bailey. First and foremost, Harvey is a true gentleman. He’s fair, he’s calm, and he listens before reaching conclusions.

“He doesn’t raise his voice, he reflects on what he’s been told, and he never takes things personally. When he speaks, you’d better listen because he will have synthesized the issue down to its essence and will have something insightful to say.

“Harvey invariably ends up in a leadership role in any organization with which he’s involved. He leads by example, and finds ways to resolve differences. He looks for creative solutions.”

Ron Jacobsma, General Manager of the Friant Water Authority, adds that, “Harvey brings a wealth of experience. He is thoughtful and pragmatic and not easily ruffled. He is a consensus builder and a superb ambassador. Plus, he is a truly good guy and a gentleman in every sense of the word.”

Fergus Morrissey, who is OCID’s Engineer-Manager, sums it up this way: “Harvey is without question the steadiest, most even-keeled person I have known. Although water issues at times create contentiousness among parties and individual tempers flare, Harvey is always fair and reasonable, and by his example he encourages dust to settle, promoting vision for a clear path forward.”

Why, after so many years, does Harvey continue to devote so much of his time to this? He is dedicated, obviously, to making whatever contributions he can in the interest of securing water for agriculture. But he answers by saying,
The Bailey brothers

It take just a glance at their record of activity through the years to see that giving generously of their time and effort is a very big part of what Lee Bailey and Harvey Bailey are all about.

And, it’s rather interesting to see how they’ve channeled their energies as far as service to the industry goes because it’s almost as though they sat down one day and decided how to divvy up the work: Lee would focus mainly on packinghouse operations and related matters while Harvey would tackle issues affecting the industry as a whole.

One thing Lee and Harvey definitely have in common when it comes to their industry service -- and their community service for that matter -- is how motivated they are. When there is work to be done, if it’s in an area of interest where they think they can make a difference, they’ll take it on.

Harvey was a member of the Citrus Research Board for six years (1982-1988) and an alternate member for another six years (1988-1994). He has been a member of the Tulare County Pest Control District board since 1980, and he also served for seven years on the board of the Central California Tristeza Eradication Agency including three years as chairman.

Harvey is also one of the founding members and a past chairman of California Citrus Mutual. He served on the board from 1977, when CCM was organized, until 1987 when he was termed out. He was Chairman in 1984-85 and 1985-86.

Lee has served on the board of directors and been President of the Orange Cove-Sanger Citrus Association “going back to when my father was General Manager,” says current packinghouse GM Kevin Severns. Lee remembers starting as a director there in the early 70s. He represents OCSCA on the board of the Mid-California Citrus Exchange (which he chairs), and as a representative of Mid-Cal he served for 16 years (from 1993 to 2009) as a member of the Sunkist Growers board and also as a director of Fruit Growers Supply Company.

“I have known the Bailey brothers for 41 of my 51 years,” Severns says, “and I now have the privilege of working with both Lee and Harvey as growers and with Lee continuing as President. Lee has always encouraged my involvement in our industry beyond just duties as the packinghouse manager. He has never taken the well-being of the citrus industry for granted. He is not only deeply involved personally but also is keenly aware of the need to consider the well-being of generations to come, beyond our own lifetimes.”

Apart from their industry service, Lee and Harvey have each put in untold hours of volunteer work in the local community. Lee has been on the volunteer fire department “for umpteen years”, they have both been members of the Lions Club for some 50 years -- serving as president several times each -- and both have been active in the Chamber of Commerce.

For 20 years, Lee has been chairman of the Sequoia Safety Council, a non-profit ambulance company serving Reedley, Parlier, Orange Cove and Sanger, and Harvey was a reserve officer in the Tulare County Sheriff’s Department for almost 20 years until he moved out of the county.

Most importantly, Kevin Severns says, “These two gentlemen don’t just occupy positions in organizations, they make things happen.”

“It’s interesting, and it’s educational. You get to work with a lot of very astute people. It’s stimulating and intriguing. It’s constant learning because every meeting there is something different.

“And a major plus is the satisfaction that comes from some of the accomplishments and the situations that have turned out well, when you see people working together, and when you can help.”

As an example, he mentions a situation “the year before last, when OCID had extra water and we made arrangements through trades to districts on the Westside that really needed water, and we sold it to them at a fair price. That deal was fair for everyone, and it’s that kind of thing that really feels good.”

Does he encourage other growers to work in water issues? “Absolutely,” he says. “I feel you get a lot more back than what you put in. And it has always been my philosophy that you can’t bitch about something if you can’t be involved.”

The Backstory...

We sat down with Harvey and his brother Lee and learned that their citrus heritage goes back a little over 100 years to their great uncle on their mother’s side, Elmer Sheridan. Sheridan was a developer from Ohio who had come to California to make his fortune, and around 1910 he started subdividing the area that today is the city of Orange Cove.

“We were told growing up” Lee said, “that when he began promoting Orange Cove, he sold it as ‘sitting on an underground lake’ and told everyone that there would be ‘no problems with water’. A lot of pits were dug for centrifugal pumps, and evidently they only had to go down 28 or 30 feet, so the level was way up.”

Right away, people started planting citrus in the area, and that included Sheridan. On their father’s side of the family, their grandfather Benjamin Bailey and his family moved to Orange Cove in 1913 and put in oranges and olives. Figs and tobacco were planted in the area as well.

Then, about a decade later came the realization that there was no “underground lake”. “During the 20s, the wells pretty much dried up,” Harvey said.”After the centrifugals, they used jack pumps, and those were predomin-
A handwritten caption on this print describes “a party of Reedley boosters inspecting pumping plant in Orange Cove”. Photo circa 1911.

When the Friant-Kern Canal went in, for a period of time before pipelines were installed by the Orange Cove Irrigation District, David Bailey and Harvey Chase were able to pump water to their adjacent property via a turnout. Left to right: David Bailey, Billy Green, Charlie Lamb, Andy Larson, Harvey Chase, and Jack Young. Green, Larson and Young worked for Chase and Bailey, and Lamb was a neighbor. This photo was taken around 1949.

About this photo, Harvey smiles and comments, “Lee and I got started early”. He was two or three years old here, and Lee was about five.

Water gushing from the Orange Cove area’s “underground lake” around 1910.

About this print describes “a party of Reedley boosters inspecting pumping plant in Orange Cove”. Photo circa 1911.
nursery while I spent a lot of time on the tractor leveling and ripping.”

After Orosi High School, Lee went to Reedley College and then served in the Navy. Harvey went to the College of the Sequoias and then studied briefly about going on to medical school. But it wasn’t long before each decided to make his livelihood in citrus.

They formed Bailey Bros. as their farming partnership, and for the last 30 years they have also owned and operated the grove care management and land development business Experienced Care, Inc.

A full-service management company for citrus, Experienced Care has resident growers as clients as well as absentee owners, mainly in the area that runs from the Stone Corral district to north of Orange Cove. A substantial chunk of the total acreage planted to citrus in that area today was developed by the Baileys, and at one time the company handled about 5,000 acres of citrus and also managed cattle. Today they oversee around 2,000 acres.

As Bailey Bros., on their own ranches in Reedley and Orange Cove — roughly 1,100 acres in all — they grow oranges (mainly navels), lemons, and mandarins (including Tangos, Gold Nuggets, and Pixies). They also have a few olives. Lee and Harvey have purchased some acreage over the years, but most of what they’re farming today was at one time the Chase and Bailey property.

Lee’s wife, Roberta, and Harvey’s wife, Judith, are “totally involved” in both Bailey Bros. and Experienced Care, handling the office work. Lee and Roberta have two sons working in the business, Lee Jr. and Eric, and a third son, Kirk, is with USDA; all three of them also farm citrus on their own. Harvey and Judy’s daughter Peggy is married to Rick Cochran who owns and manages a commercial spraying operation and equipment maintenance shop, and their daughter Kim is married to Reedley dentist Mark Soares.

“What citrus growing area in California was chosen by legendary film director Frank Capra to depict the enchanted paradise Shangri-La in the 1937 classic Lost Horizon? (Do You Know, page 5.)

Well, the answer is the Ojai Valley, but it’s not exactly an undisputed fact. There are many accounts of the making of that movie, some questioning whether Ojai was ever involved at all. But David Mason with the Ojai Valley Museum says credible reports have it that Capra did in fact shoot film of the Valley from an overlook on Hwy 150, but eventually it all ended up on the cutting room floor. Evidently, the movie was drastically reworked after the preview version, which was over three hours long, met with terrible reviews due to its length.

Regardless, the people of Ojai rather liked the idea of being thought of as Shangri-La, and so today you’ll find many references to it and even a mention on the City of Ojai ‘s official Web site.

What is definitely not in dispute is that Ojai really is a “verdant valley” with its citrus groves playing a major role, and that visitors do see it as an idyllic refuge.
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The evolution of water quality regulation for California’s farms

From nonpoint source pollution to every-farm-is-a-discharger (polluter)

Water is vital to every aspect of our lives and is California’s lifeblood. California’s history has been shaped by water battles that have raged almost continuously since inception of statehood in the mid-1800s including battles over who is responsible for polluting our state’s water supplies.

There is an amendment to California’s Constitution declaring that users of our water resources “shall put water to the highest beneficial use possible and shall not waste or use it unreasonably.” The amendment was passed by voters through a ballot initiative in the early 20th century. Subsequent changes in federal and state law regarding the protection of the quality of our water resources followed.

The recent focus on nonpoint source pollution

In 2003, the California Regional Water Quality Control Board, Central Valley Region (Regional Water Board) for the first time adopted Conditional Waiver of Waste Discharge Requirements for discharges from irrigated agricultural lands (historically known as nonpoint source pollution).

As part of the 2003 waiver program, the Regional Water Board directed staff to prepare an Environmental Impact Report (EIR) for a long-term irrigated lands regulatory program. The 2003 interim waiver program was set to expire in 2006. California Water Code states that waivers of waste discharge requirements adopted by Regional Boards not exceed five years but may be renewed.

In 2006, the Regional Water Board adopted a new conditional waiver for discharges from irrigated agricultural lands that continued the 2003 interim program until June 30, 2011.

The waiver was amended, establishing a deadline for irrigated lands operations to join water quality coalition groups and required submittal of a management plan when more than one “exceedance” of a water quality objective occurs.

In addition to amending the waiver, the Regional Water Board began working with stakeholders to develop a permanent long-term program for addressing discharges from irrigated lands. As part of the process, on April 7, 2011, the Board adopted Resolution No. R5-2011-0017 certifying the Irrigated Lands Regulatory Program, Program Environmental Impact Report (Final Program EIR).

As recounted on the CalEPA Website:
To better understand where this authority comes from and the complexity of the State Water Board’s charter, it is important to grasp the evolution of water rights and water protection as it evolved from gold-mining days, through the 20th century and the birth of the environmental movement in the late 1960s, to the new millennium with its increasingly complex, interrelated water issues.

The Water Commission Act of 1913 established today’s permit process and created the agency that later evolved into the State Water Board. That agency was given the authority to administer permits and licenses for California’s surface water.

California has no permit process for regulating groundwater use. Prior to 1903, the English system of unregulated groundwater pumping had dominated but proved to be inappropriate to California’s semi-arid climate.

In most areas of the state, landowners whose property overlies groundwater may pump it for beneficial use without approval from the State Water Board or a court. In several Southern California basins, however, groundwater use is regulated in accordance with court decrees (groundwater basin adjudications). In the 1903 case Katz v. Walkinshaw, the California Supreme Court decided that the “reasonable use” provision governing other types of water rights also applies to groundwater.

The early years of water pollution control

In the mid-1940s, outbreaks of water-borne diseases, degradation of fishing and recreational waters, coupled with rapid wartime industrial development and population growth, prompted a new appraisal of water pollution control in California.

While there were numerous governmental agencies with varying degrees of jurisdiction over waste disposal, public health, or water, attempts to address and solve new pollution concerns in a planned, orderly, and reasonable manner were largely unsuccessful.

Cities were faced with a need to build large capital improvement programs for pollution control. Industries, confronting unanticipated demands,
found many differing interpretations of numerous laws and overlapping authority among the various local, state, and federal regulatory agencies.¹

New industrial developments were hampered because regulators were unable to provide definite assurances about what conditions must be met or what pollution control works would be required.¹

All affected interests – urban, industrial, agricultural and recreational water users – sought both more effective and more equitable water pollution control.¹

In 1949, the California Assembly Committee on Water Pollution realized that existing laws and procedures were cumbersome and often unreasonable. Numerous jurisdictions tried to implement the laws amidst much hostility from the hundreds of agricultural, industrial, and recreational interests involved.¹

The Committee concluded that the state had reached the point where continued population and industrial growth would soon exhaust water supplies. The Committee believed California’s limited water resources could only be protected and conserved if regulators found a way to maximize water quality objectives and economic use and reuse.¹

Sweeping changes in California’s approach to water pollution control and water quality were recommended. Specifically, the Committee stated:

“Water pollution is largely a local or regional problem...but it also involves conflicting interests, though a single focal point at the local level will provide the missing link necessary to abate, control, and prevent water pollution effectively and equitably.”

Heeding the committee’s recommendations, the California Legislature enacted the Dickey Water Pollution Act that took effect October 1, 1949.¹

**Dickey Water Pollution Act: creation of the State Water Pollution Control Board**

The Dickey Act created a “State Water Pollution Control Board” consisting of nine gubernatorial appointees representing specific interests and four ex officio State officials. Its duties included: (1) setting statewide policy for pollution control, and (2) coordinating the actions of those State agen-
cies and political subdivisions of the State in controlling water pollution.1

The Legislature realized that California’s water pollution problems were primarily regional and depended on precipitation, topography, and population, as well as recreational, agricultural, and industrial development, all of which vary greatly from region to region.1

The Dickey Act established nine Regional Water Pollution Control Boards located in each of the major California watersheds. The Boards have primary responsibility for overseeing and enforcing the state’s pollution abatement program. Five gubernatorial appointees, representing water supply, irrigated agriculture, industry, and municipal and county government in that region, served on each Regional Water Board. (That number has since grown to nine members.)1

Continuing evolution of water policy

While water pollution control remained the principal purview of the State Board and nine Regional boards, new sensitivity for the impact of water quality on the lives of Californians evolved in the 1950s and 1960s.1

Several measures were proposed to strengthen the then-existing Water Pollution Control Board. It was renamed the “State Water Quality Control Board” and was charged with the broader field of water quality (rather than the limited field of sewage and industrial waste control).1

The continuing question of how best to administer water quality programs occasioned further work by the Assembly Water Committee. Paul R. Bonderson was then chair of the Water Quality Control Board and recalled, “I thought [what] should be done was to combine the Water Rights Board and the Water Quality Board, so we would have an overall water regulatory agency that would concern itself with both quality and quantity. There is a direct inter-relationship.”1

There was a proposal at the time for the functions to be absorbed by the Department of Water Resources. Bonderson saw DWR as a “study/planning unit and water purveyor” and believed his idea would achieve “an appropriate separation of powers, and you would eliminate the conflict.”1

Recognizing that so many water issues in California involve both quantity and quality, the Assembly’s 1966 and 1967 reports proposed a coordinated water regulatory program. These reports included statutory changes that were subsequently enacted, and in 1967 the “State Water Quality Control Board” and “State Water Rights Board” were merged and the “State Water Resources Control Board” (SWRCB) came into being.1

Porter-Cologne: California’s cornerstone of water protection law

The State Assembly then asked a panel of industrial, agricultural, and state and local government members to report on needed revisions to existing water quality laws. In 1969, the State Legislature enacted the Porter-Cologne Water Quality Control Act, the cornerstone of today’s water protection efforts in California.1

Porter-Cologne, named for the late Los Angeles Assemblyman Carly V. Porter and then-Senator Gordon Cologne, was soon recognized as one of the nation’s strongest pieces of anti-pollution legislation. Through it, the State Water Board and the nine Regional Boards have been entrusted with broad duties and powers to preserve and enhance all beneficial uses of the state’s immensely complex waterscape. The new state law was so influential that Congressional authors used sections of Porter-Cologne as the basis of the Federal Water Pollution Control Act Amendments of 1972 (commonly known as the Clean Water Act).1

The Clean Water Act required the states or the U.S. Environmental Protection Agency (EPA) to set standards for surface water quality, mandate sewage treatment, and regulate wastewater discharges into the nation’s surface waters. It established a multi-billion dollar Clean Water Grant Program that, together with Clean Water Bond funding, approved by California’s voters, assisted communities in building municipal wastewater treatment facilities.1

Rather than operate separate state and federal water pollution control programs in California, the State assumed responsibility for implementing the Clean Water Act. This involved melding state and federal processes together for activities such as setting water quality standards, issuing discharge permits, and operating the grants program.1

Today the five-member State Water Board allocates water rights, adjudicates water right disputes, develops statewide water protection plans, establishes water quality standards, and guides the nine Regional Water Quality Control Boards located in the major watersheds of the state.1

The Regional Boards, each comprised of nine members, serve as the frontline for state and federal water pollution control efforts. A Basin Plan, tailored to its unique watershed and providing scientific and regulatory basis for each Regional Board’s water protection efforts, guides each Board.1

Additionally, the State Water Board will continue to throw its regulatory energy at a most vexing problem
nonpoint source pollution, or polluted runoff – which, unlike industrial pollution of the latter half of the 20th century, cannot be easily categorized, isolated or resolved.¹

From the Web site of the California Environmental Resources Evaluation System (CERES):

Under the Porter-Cologne Water Quality Act (Porter-Cologne), the State Water Resources Control Board (State Board) has the ultimate authority over State water rights and water quality policy. However, Porter-Cologne also established the nine Regional Water Quality Control Boards (Regional Boards) to oversee water quality on a day-to-day basis at the local/regional level.²

Regional Boards engage in a number of water quality functions in their respective regions. One of the most important is preparing and periodically updating Basin Plans (water quality control plans). Each Basin Plan establishes:

1) Beneficial uses of water designated for each water body to be protected;

2) Water quality standards, known as water quality objectives, for both surface water and groundwater; and

3) Actions necessary to maintain these standards in order to control nonpoint and point sources of pollution to the state’s waters.²

Permits issued to control pollution (i.e. waste-discharge requirements permits) must implement Basin Plan requirements (i.e. water quality standards), taking into consideration beneficial uses to be protected.²

Regional Boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater.²

The nine Regional Boards differ somewhat in the extent they choose to apply waste discharge requirements and other regulatory actions. The SWRCB has interpreted State law (Porter-Cologne Water Quality Control Act) to require that implementation be addressed when total maximum daily loads (TMDLs) are incorporated into Basin Plans (water quality control plans).²

The Porter-Cologne Act requires each Regional Board to formulate and adopt water quality control plans for all areas within its region. It also requires that a program of implementation be developed that describes how water quality standards will be attained.

Current Irrigated Lands Regulatory Program (ILRP)

There are about 25,000 landowners/operators, with a total of nearly 5 million acres of land who are cur-
currently regulated by the Central Valley Regional Water Board as members of water quality coalition groups. The coalition groups conduct surface water monitoring and prepare regional plans to address water quality problems, which would otherwise have to be done individually by each landowner.

The Long-term Irrigated Lands Regulatory Program (ILRP), Program EIR certified by the Board on April 7, 2011, expanded the program to include discharges to groundwater. Staff was instructed to develop waste discharge requirements (WDRs) to establish the ILRP, for approval by the Board prior to the end of the 24-month waiver extension.

The Board recognized that it was not feasible to adopt individual WDRs to regulate discharges from 25,000 individual owners and/or operators of irrigated lands who discharge waste from irrigated lands. Rather, General Orders for WDRs will be drafted for each of the Central Valley coalitions.

The WDRs will be similar in many respects but may vary in order to tailor requirements to the setting and issues relevant to specific geographic areas or commodities. This will result in the Board issuing seven to eight general waste discharge requirements. Growers who are not members of a coalition are required to develop their own WDRs for submittal and approval by the Board.

The WDRs will likely require growers to conduct evaluations of their management practices to ensure they are protecting groundwater and surface water. In areas impacted, or potentially impacted, by nitrates, growers will be required to develop individual nutrient management plans that minimize the risk of increasing nitrate levels in groundwater.

**Piling on?**

In March 2012, UC Davis released a report documenting nitrates in groundwater. The report, compiled by a team lead by Dr. Thomas Harter, confirmed that the high levels of nitrates found in groundwater in many parts of California is a legacy issue that took decades to develop. Unfortunately, the report did not present any new information, it contains assumptions and -- by the author’s own admission -- data gaps.

It should be of concern to the agricultural community that the report points to agriculture as the major contributor of nitrates to groundwater but makes no mention of the technological advances and improved farming practices over the last 10 to 15 years that have in all probability greatly reduced, if not eliminated, the addition of nitrates to groundwater. Nor does the report address nitrate contribution from a high concentration of aging septic systems in rural areas or the contribution of nitrates due to runoff and leaching from heavily populated urban areas.

Of greatest concern is that the report points to agriculture as the most appropriate place to fund expensive infrastructure improvements needed for small rural communities, while not acknowledging the uncertainty in pollution source contribution – (Ag is a great big target) – and the benefits that society has derived in general from accessing cheap and abundant food and fiber from California agriculture.

If there is a benefit to be gleaned from the release of the UC Davis report, it would be that it points out how much is not known and highlights the need for research to determine whether advances in fertilizer technology and improved application, utilization of micro- and drip irrigation, and foliar-applied nutrients are making a difference. Scientific data is needed to document how current practices are qualitatively and quantitatively helping to reverse the nitrate problem. Moving forward, this data should then mitigate the regulatory burden that will surely get more cumbersome if agriculture remains an easy target.


Bob Blakely is Director of Industry Relations for California Citrus Mutual.
Citrus trees sprayed with mineral oil show lower levels of transpiration - a sign of greater stress levels - when compared with trees treated with OROCIT.

Mineral oil is known to induce stress in plants when applied as a foliar spray. In an attempt to quantify the level of stress induced, trials were conducted in which a single spray of mineral oil and OROCIT were applied to citrus trees.

Stomatal conductance (a measure of transpiration) readings were taken using a Decagon SC-1 Leaf Porometer.

Both transpiration and the exchange of CO₂ for photosynthesis depend on the extent to which the leaf stomata open.

A lower stomatal conductance, as was found with the mineral oil treatment, indicates that the stomata were less open and the leaves had less potential for photosynthesis compared with the OROCIT treatment.

Higher transpiration levels resulting from the stomata being more open indicate that there was greater potential for photosynthesis in the trees treated with OROCIT than in those sprayed with mineral oil.
Did you see the April issue of *Sunset* magazine? If not, you missed a wonderful article on the Ojai Pixie Tangerine Growers.

It was a beautifully written piece with gorgeous photos, and to get that kind of coverage must have been tremendously satisfying for the growers involved. After all, *Sunset* is one of the most highly regarded lifestyle publications, and according to the Audit Bureau of Circulation it reaches more than one million households.

For a grower in California who has specialty fruit to sell, that magazine is arguably the perfect place for your product publicity. And you will really think that when you go online and see taglines for *Sunset* saying “savor what’s fresh from the West” and “daily inspiration for celebrating goodies made and grown in the West”.

But there is more to report here because at roughly the same time as *Sunset* was hitting mailboxes, the 10th Anniversary edition of *Edible Ojai & Ventura County* came out with profiles of not one but two Ojai Pixie growers. Emily Thacher Ayala of Friend’s Ranches and the husband-and-wife team of Jim Churchill and Lisa Brenneis were featured alongside eight other local farmers (including fellow citrus producers Leslie Leavens-Crowe and Richard Pidduck).

*Edible Ojai & Ventura County* is a very classy magazine that reaches an upscale demographic which is obviously an important target market for Ojai Pixies.

And, being showcased in an *Edible* publication would seem to be a huge plus for growers looking to emphasize their local roots and wanting to express their desire to really communicate in a meaningful way with the people who are buying their fruit.

If you haven’t come across it yet, Edible Communities, Inc. is described on its Web site as a publishing and information services company that creates “editorially-rich, community-based, local-foods publications in distinct culinary regions” in the U.S. and Canada. “We connect consumers with family farmers, growers, chefs, and food artisans of all kinds... We believe that every person has the right to affordable, fresh, healthy food on a daily basis and that knowing where our food comes from is a powerful thing.”

*Sunset* and *Edible* are just two examples of the well-placed publicity that the Ojai Pixie Growers enjoyed this season.

Actually, having a fairly high profile and a presence in the media isn’t something new for these growers. For years, they’ve been written about in magazines and newspapers and featured on radio and television.

For instance, in 2010, the California Farm Bureau Federation chose Ojai Pixies as the lead story for the March-April issue of its widely distributed consumer publication *California Country*. (Since then, CFBF has replaced *Country* with a new magazine, *California Bountiful*, to tie directly to its California Bountiful Foundation.)

(To be perfectly honest, that example from two years ago is included here in part because of that outstanding cover with young Oliver Ayala. But the article inside is terrific, and it’s accessible at www.californiacounty.org with the keywords “Pixie magic”.)

So, how has this grower group managed to garner such attention from the media and be seen in such influential magazines? They are not branding experts, and none of them is a trained public relations practitioner. They are, for the most part, professionals in other fields who have a lot of savvy, and they
Tony Thacher makes his point during a breakfast meeting of the Ojai Pixie Tangerine Growers. Listening at center is Emily Thacher Ayala, and at left (partial view) is Jim Churchill.

have managed to do a masterful job of marketing communications.

It has to be acknowledged that part of the appeal – at least for the high-end market – has to be the connection with Ojai itself which does, after all, have a certain cachet.

Ojai is a self-described “village” of only about 8,000 in population, but it’s famous. The Valley is a mecca for fine artists and authors; it draws visitors seeking spiritual and physical renewal at well-known spas and retreats; it boasts the nation’s largest amateur tennis tournament and one of the most prestigious music festivals. It’s north of Ventura about 90 miles away from Los Angeles. There are horse ranches and prep schools and pricey boutiques and fine restaurants. Hollywood celebrities escape there. A number of people in the entertainment industry live there full time. The storyline for the TV show “Brothers and Sisters” centered around a fictional Ojai Foods produce company.

Ojai has a certain specialness

There is a lot that is special about Ojai, and that specialness attaches to whatever is associated with it, including its citrus fruit.

And who are the Ojai Pixie Tangerine Growers? They are, as described in the Sunset piece, “mom and pop” producers—representing around 40 small-scale farming operations in the Ojai Valley—who have opted to join forces to promote the fruit they’re so passionate about. They meet regularly over breakfast at a local coffeehouse to exchange information and discuss tactics. The leaders of the group are Tony Thacher, his daughter Emily Thacher Ayala, and Jim Churchill.

The story of how Ojai Pixies came to be has been told so often and so well in other magazines that we won’t retell it here—except to say that Churchill had “an Aha moment”, as Oprah would put it, while on a visit to Thacher’s packing shed some 32 years ago. It was a serendipitous moment for sure, which you can read about by visiting the Churchill Brennais Orchard page at www.pixietangerine.com.

As the articles have pointed out, the early going in marketing was rough—pardon the pun—because Pixie fruit isn’t very “aesthetically pleasing” and it’s small. “But once people try it, they love it,” Ayala says. These days,
when Pixies are described as “bumpy” and “runt” and “tiny” and “puny,” those are terms of endearment. They are sticking with the term “tangerine” as opposed to “mandarin” because, they say, their registered trademark “Ojai Pixie Tangerines” is such a well-established brand.

The growers in this group—who, if their separate orchards were added up, would have a total of about 240 acres of Pixies—move a lot of their fruit through farmers’ markets. They also sell direct to consumers at their own farm stands and by mail order via their Web sites and also through brokers. They have a long-standing and very successful relationship with Melissa’s World Variety Produce, Inc. in Los Angeles.

(Ayala notes that, “Melissa’s deserves a lot of credit for helping us make a name for ourselves while they were getting our fruit in wider distribution. One of their most creative ideas was also a fun idea, and that was selling Ojai Pixies in New York City during ballgames at Yankee Stadium–Small Pixies in the Big Apple!”)

They also sell wholesale, “to any customer who can manage a full pallet,” Churchill says. “We have a relationship with Whole Foods in which we sell directly to some stores, to regions through their national office, and also through third parties.”

Churchill adds that some of their wholesale customers “we inherited from Tony’s father-in-law, Elmer Friend, who also had other citrus, and some have come on-board just for the Ojai Pixies.”

Around 30 percent of Ojai Pixie Crop is marketed through Sunkist.

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It might have been through a guest spot that a grower did on a radio show, because Melissa’s often makes arrangements for interviews, Churchill says.

Or, it may have been through social media or some other tool via the Net. In addition to their Web site, Ojai Pixies has a Facebook page, they send email blasts on a regular basis, and they get frequent mentions on blogs.

(Ayala reports that, “Food bloggers have been writing about us a lot. At the start of our season this year, Melissa’s brought five L.A. bloggers to tour our orchards and they’ve been very enthusiastic, especially about Ojai Pixies being wonderful in chicken and fish dishes and, of course, cocktails.”)

**Being there in person**

At several points during one of their meetings, Thacher stated, “We’ll need a Pixie Presence” at such-and-such event—meaning that at least one member of their group would have to be there, in person, to talk about the fruit. And...
it isn’t only for special events, because members of the group will also volunteer to do in-store sampling at retail.

They see it as a critically important part of their marketing approach to, as often as possible, make those one-on-one connections with consumers. It reinforces their selling messages of where the fruit came from—i.e., from a very special place, and grown and packed with a great deal of care by a hands-on farmer.

“From the beginning,” Churchill says, “we felt that we had the potential of a ‘brand’ in describing Ojai Pixies as being the product of a particular ‘terroir’. That is, they are Ojai Pixies, grown in a particular valley with a particular climate and exposure. We have been marketing the fruit that way since at least 1996. And it’s true. Ojai is historically a great place to grow sweet citrus, whether oranges or tangerines.

“We’ve also felt it important to stress that we are not a faceless corporation but a group of family farmers who are selling our own fruit. The fact that our fruit is reliably delicious makes it easy for us to not be liars, and over the years people have come to appreciate the whole package.”

As Ayala puts it, “We are just a bunch of farmers, and we look it when we show up at food shows in our jeans and our Ojai Pixie caps and aprons. Mostly our goal at these events is to say ‘I am a farmer’ and then peel Pixies as fast as possible while people gobble them up!”

‘We pick when it tastes’

She says that in talking about their fruit, they always make the point that flavor is key. “If the fruit in a certain block doesn’t taste, we don’t pick it until it does. We don’t sell our fruit until we truly believe it tastes great. And we don’t have any qualms about throwing out fruit that just isn’t going to be good enough. We have one grade and one grade only.” Churchill acknowledges that the growers in this group are fortunate to be able to do that.

Churchill also notes that the fact they started small has been an advantage. “In the scheme of things, we’re still small, but we started out really tiny, so we were able to let customers’ appreciation of Ojai Pixies develop over time as our crop size increased.”

These days, you can even find Ojai Pixies in an export market, thanks to a Japanese customer, and Churchill had big news to announce at the April meeting.

“Our customer Ken Hanawa sells to Misuaza Seika in Japan, and Misuaza Seika in turn sells through several channels. One of their customers is Oisix, which is the largest online produce distributor in Japan. Oisix did a customer survey of favorite products/ producers, and Ojai Pixies was nominated.”

Churchill continued, “Just to be nominated was quite an honor, since here we are, non-Japanese growers, exporting to Japan a traditionally Japanese fruit. And then we won! Ojai Pixies were chosen as Best Producer - Fruit - 2012. It’s mind-boggling and truly wonderful.”

Where do they go from here? Churchill says, “Every year is different, naturally, but basically we sell a tangerine that is consistently delicious with an accompanying story that has an appeal and that fortunately is true! I think there is a hunger for authenticity out there in the world, and we’re the real deal. We know that there’s a fine line between tooting our horn and staying true, but actually I think that growing fruit keeps us grounded.”

Anne Warring is a freelance writer and editor based in Visalia. As the daughter of an orange grower, and having been raised in Ventura County, she admits to a fondness for Ojai.
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Background
Locally grown and organic food production are growing trends in agriculture in the U.S. and especially in California. Citrus is no exception, and there is increasing acreage of commercially grown organic citrus that provide citrus to farmers’ markets. These plantings are untreated or treated with “softer” pest control alternatives.

It is well known that many of the softer chemicals work only on contact and do not persist with any appreciable amount of time (at most 7-10 days). Normally, this is helpful because they allow the beneficial natural enemies to survive and help in pest control. However, the lack of persistence means that a greater number of applications are required to effectively control the more difficult pests.

A conundrum exists between an increasing demand for fruit free of conventional pesticides and the control of devastating invasive pests such as the glassy-winged sharpshooter, Diaprepes root weevil, or the Asian citrus psyllid (ACP), because the lack of effective persistent selective or organic insecticides means that a greater number of these invasives will survive and spread in organic commercial production.

The problem is made even more difficult when a pest such as ACP can transmit a deadly disease of citrus, namely huanglongbing (HLB). Short-lived insecticides are less effective in preventing disease transmission because they don’t provide continuous control of the vector population.

The goals of our research include adequately testing as many of the new and old organic products that we can, in an effort to identify those products that are most effective and persistent against ACP. Some of this research has already been initiated in Florida where organic production exists and where they are experiencing the beginnings of resistance to conventional insecticides. We need California-derived data in order to register new insecticides and so that we know how to use them properly in our environment.

A similar problem occurred when the glassy-winged sharpshooter (GWSS) was identified as the vector of a Pierce’s Disease outbreak in Temecula, and we were asked to assay as many products as possible. We were able to study about 65 pesticides or combinations of materials against eggs, nymphs and adult GWSS with good success. As you will see below, we now have the same opportunity with ACP.

However, before we could start pesticide testing for ACP, we needed an approved, contained environment to rear the ACP so that our work would not infest the area around it with psyllids. Through cooperation with the California Department of Food and Agriculture (CDFA), the San Diego County Agricultural Commissioner’s office, the Citrus Research Board (CRB), and many other agencies, we were able to retrofit the Chula Vista Insectary so that it could contain ACP for pesticide testing.

The Chula Vista Insectary was used a few years ago to study the avocado lace bug. At the time, this insect was an “A” rated pest (a known serious pest of agriculture) and required a containment facility for research purposes. This site was chosen because it is close to the Mexican border, in an ACP quarantine area, and close enough to be quickly accessed by our staff. The facility was in disrepair, and was being used as a storage facility by the County.

Dr. Joseph Morse from UC Riverside and Jim Bethke from UC Cooperative Extension met at the facility with Dr. David Kellum, the San Diego County entomologist, Dr. Kris Godfrey of the CDFA biological control program (at the time), and the State entomologist, Dr. Kevin Hoffman, to discuss the potential for conducting research at the facility on ACP.

The facility was well-suited for containment because it had a screened anteroom and a double door entry into the greenhouse once you were inside the screened enclosure. It did need a little retrofit work, however, to make it more secure and to make improvements on the cooling and heating systems. We agreed on the needed changes and initiated the process. When the changes were complete, Dr. Hoffman as well as County staff inspected the facility and approved it for containment of ACP.

KEY POINTS:

• ACP containment facility is located at the Chula Vista Insectary.
• Multiple levels of containment are present.
• Permits for plant and ACP movement have been obtained.
• Insects were collected in Boyle Heights on Oct. 27, 2011.
• Six cages in the facility are rearing ACP.
• Testing begins in spring 2012.
Protocols and containment

The structure of the Chula Vista Insectary has multiple levels of containment to prevent ACP from escaping. The whole structure is approximately 10’x30’ (Figure 1). There are three parts to the facility. There are two greenhouses approximately 10’x10’, and they are separated by a screened anteroom of approximately 10’x10’. Entrance to the facility is through a single door into a screened anteroom.

The screen on the anteroom structure was used to contain the avocado lace bug a bug of similar size to the Asian citrus psyllid, and therefore it is sufficient to contain ACP. The anteroom is not subject to any air-cooling or air conditioning. Within the screened anteroom are two doors, one to the north and one to the south. They are perpendicular to the entrance door and leading to two separate greenhouses. The entrance to each greenhouse is an enclosed double door entry (Figure 2).

The greenhouses are covered with a solid corrugated polycarbonate attached directly to a steel frame, and one of the things we did to help seal the structure was to caulk all inside edges. The only exposure to the outside is through screened vents on the lower panels and two hot air exhaust vents on the upper panels. These vents, although already screened, were re-screened inside and outside to provide double containment.

Greenhouse training

The only personnel allowed in the facility are the principle investigators, Joseph Morse and James Bethke, and their immediate staff, Marianne Whitehead and Lindsay Robinson. Others must be trained on the containment procedures and sign a visitor log. Upon entering the screened anteroom, they must cover their outer clothes with a paper spray suit and cover their hair before entering either greenhouse. They must also remove these items in the anteroom prior to exiting the facility. The intent is to dislodge any potential escapees that might get on one’s clothing. However, training all personnel and visitors prior to entering the facility will reduce the likelihood of that occurring.

All articles that enter the ACP greenhouses (pots, plants, spray suits, cages, etc.) must be sterilized prior to exiting the building. They are double bagged and placed in a freezer at -45° for four days followed by solarization for an additional four days. Plants and insects are on a schedule to be tested for the presence of HLB on a monthly basis by sending alcohol-preserved psyllids and double-bagged leaf samples to the CRB lab in Riverside.

Permit acquisition and plant and ACP movement

Following Dr. Hoffman’s approval (and later the formal State permit) to contain ACP at the Insectary, we needed to have many other approvals and acknowledgements from a variety of sources. We acquired approvals from the San Diego County Agricultural Commissioner, CRB, ACP/HLB Science and Technology Advisory Committee, and the Citrus Pest and Disease Prevention Committee (CPDPC). Once those approvals were complete, we were able to submit applications for permits to the CDFA to move plants and ACP to the Insectary. This was finally accomplished in October of 2011.

Shortly after acquiring the permit, we were contacted by
Jim Gorden, member and past Chair of the CRB and also member of the CPDPC. He happened to be passing by Boyle Heights and felt the compulsion to exit the freeway and look for ACP in the local neighborhood. Almost immediately, he was able to identify ACP-infested citrus along the sidewalks and on a hedge of murraya in front of one home (Figure 3).

The CDFA was notified, and we were able to meet the local inspector and supervisor out in front of the home with the infested hedge. The numbers of ACP on the hedge were staggering, and we were easily able to collect a great number of eggs on new flush tissue. The neighborhood immediately went on a spray schedule by the CDFA.

Small (4 inch) stems of new growth were collected from the murraya and cleaned of everything but eggs. The stems were placed in water in a capped vial (Figure 4), and the upper portion of the stems was then covered with another plastic vial that was screened for air circulation. These capped vials were then placed into a Ziploc® bag and sealed. The sealed bags were then placed into a zippered ice chest to contain them a third time so that the environmental conditions would remain stable throughout the long drive to Chula Vista.

Potted citrus and murraya plants had already been transported from the CDFA greenhouses located at the UC Riverside Agricultural Operations to the Chula Vista Insectary the day before. Three murraya plants each were placed into six insect rearing cages on the north-facing greenhouse at the Insectary. The caged ACP eggs on murraya stems were...
placed up against the potted plants in the cages so that as the eggs hatched, the nymphs would be able to move onto the new growth on the potted plant (Figure 5).

At the time of this article, ACP has populated the plants in the cages very well (Figure 6). We anticipate having enough insects to start the testing protocols this spring.

**Insecticide testing protocols**

Once an acceptable number of insects have been produced, we will begin to test a variety of products against ACP. We will be using two different protocols.

First, we will spray plants, allow them to dry, and then expose ACP adults and nymphs to the residues by caging them on the plant and recording mortality over time. If the product is effective under this protocol, we will test its persistence by placing new insects on the treated plant surfaces every week until the product’s efficacy declines. Many of these products will only work when they contact the insect; so residual effects will most likely be effective only against early instar nymphs. This means we will be able to screen many products in this manner very quickly.

The second protocol tests products against insects that are already established on the plants. We will expose a select number of plants to ACP in the rearing cages for 24 hours, allowing the adult ACP to lay eggs on the plants. The eggs will be allowed to hatch and nymphs allowed to establish. The pre-treatment number of ACP per plant will be counted followed by treatment assignments. We endeavor to have equal numbers of ACP per treatment to obtain a better handle on product efficacy. Again, if the product is effective, we will place more ACP on the plants over time to determine the product’s persistence.

The first trials we conduct will be to verify the testing protocols and make sure there isn’t something we are overlooking. We need to be able to manipulate the insects and reduce any handling mortality prior to actual organic pesticide testing. In these trials, we will test several conventional products as well as several new products. Additional data are

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<td>171.08± Stone Corral Open Land</td>
<td>$1,881,880</td>
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<tr>
<td>191.43± acres Citrus, Kern/Tulare line (Price Reduced)</td>
<td>$1,400,000</td>
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<tr>
<td>236.06± acres Young Late Navel</td>
<td>$3,000,000</td>
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</tr>
<tr>
<td>241.65± acres Nice Porterville Cattle Ranch/custom home</td>
<td>$1,300,000</td>
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</tbody>
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**For Brochure Contact:**
Roy Pennebaker #0845764 (559)737-0084 or Matt McEwen #01246750 (559)280-0015  • www.citrusboys.com
needed with these conventional products to satisfy California requirements.

From the experience we attained working with GWSS, we estimate that it will take about 6 weeks to run a trial, 2 weeks for establishment and 4 weeks to test for persistence of the insecticide effect. Many products will be excluded rather quickly due to the lack of persistence, but there will be others and/or combinations that will take longer to evaluate.

**In conclusion**

In spite of the conundrum that we face as new invasive pests begin to establish in the U.S., there is an ever-increasing need for effective and persistent organic pesticide alternatives in agriculture, especially if we are to continue to provide locally grown organic fruits and vegetables.

The days of a single spray to control a pest on a calendar basis may be over, and research projects like the one described here are going to be in more demand as the challenges of controlling multiple pests and newly invasive pests continue to grow.

Although the initial focus of this project is to try to find an effective organic pesticide to be used by organic citrus growers to control ACP, we also intend to verify systemic insecticide thresholds for effective control of ACP nymphs and develop baseline data for ACP susceptibility to key pesticides before pesticide use against this pest is widespread in California.

**Acknowledgements**

We would like to thank the California Citrus Research Board and CDFA Specialty Crop Program for funding this research, in part, and all of the many colleagues and scientists who reviewed our protocols for doing this work as safely as possible at the Chula Vista Insectary.

*James Bethke is the UC Cooperative Extension Floriculture and Nursery Farm Advisor for San Diego and Riverside counties; Dr. Joseph Morse is Professor of Entomology in the Department of Entomology, UC Riverside; Dr. Frank Byrne is an Associate Researcher in the Department of Entomology, University of California Riverside; Dr. Elizabeth Grafton-Cardwell is an Extension Specialist at UC Riverside and Director of the Lindcove Research & Extension Center; Dr. Kris Godfrey is Director of the Contained Research Facility at UC Davis; and Dr. Mark Hoddle is an Extension Specialist at UC Riverside.*

CRB research project reference number 5500-189.
The Yara Complete Citrus Crop Program

YaraMila®
15 - 15 - 15

20% of total N / 10% of total K2O

YaraLiva®
CN-9® / Tropicote®

20% of total N
30% of total N

SQM
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20% of total K2O
30% of total K2O
25% of total K2O

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**Research Project Progress Report**

**Assessment of systemic imidacloprid insecticide for the management of ACP in commercial citrus groves**

Frank Byrne and Joseph Morse

**Background**

We seem to be getting closer and closer to a situation where we will need to be managing Asian citrus psyllid on commercial citrus.

In California, the ACP was first documented in commercial citrus in 2008 in Imperial County, with further detections in 2011, when at least seven finds occurred in commercial orchards in San Bernardino, Riverside, San Diego, and Imperial counties. Efforts are underway to ensure that effective management strategies are available so that growers can deal with such outbreaks.

The citrus nursery industry has implemented several tactics to deal with the ACP problem, such as moving vital citrus stock inside insect-proof housing and pre-treating stock with pesticides before it is dispatched to retail outlets. These measures will greatly reduce the likelihood that ACP will establish within nurseries and be moved around the state on nursery stock.

But there is a great threat to the industry because of the establishment of the ACP on residential citrus. It is impossible to treat every tree in every home garden, and this essentially means that the psyllid is here to stay.

The presence of ACP on residential citrus adjacent to commercial groves presents a huge problem to the industry. The use of chemical control measures will play a vital role in controlling ACP. In particular, systemic pesticides are likely to play an important role in this effort because of their mode of action, persistence, and efficacy.

After application to the soil, imidacloprid is absorbed by the roots and transported to all tissues of the tree within the vascular system. The ACP feeds from the vascular system, and this is why systemic pesticides are such an ideal method of control, i.e. because they exploit the feeding behavior of all stages of the insect.

This project focuses on evaluating the efficacy of imidacloprid applications for the management of ACP under a number of different scenarios in California commercial groves. This report follows our previous Citrograph article (Byrne et al., Mar/Apr edition, 2011) by providing an update on some of the work we have been doing in 2011 and will continue to do in 2012.

**Research focus**

In studies published by Texas A&M researcher Dr. Mamoudou Sétamou (Sétamou et al., 2011), ACP was effectively controlled on citrus trees when imidacloprid reached a concentration of 200 ppb (parts per billion) within the leaf tissue.

If we are to rely on imidacloprid treatments to kill ACP and prevent the transmission of HLB, then it is imperative that the 200 ppb threshold be established within the youngest foliage on the trees. Although adults will feed on leaf tissue of all ages, they will only lay eggs on the young tissue because the hatching nymphs require the youngest tissues to feed upon and develop. The key to making imidacloprid effective against ACP, therefore, is to establish threshold concentrations above 200 ppb within the very young foliage.

Imidacloprid is highly persistent within plants, and a single application can provide several months of protection. The persistent nature of imidacloprid has been an important factor in the decision to use this insecticide in treatment programs aimed at eradicating ACP from residential citrus.

The key to achieving this prolonged protection, of course, is to ensure that the conditions for uptake are optimal. In our research we are trying to understand the conditions within citrus groves that are conducive to better imidacloprid uptake and persistence.

Many factors affect the uptake of imidacloprid after it is applied to the soil. Heavy soils and high organic matter content can be problematic because they can absorb imidacloprid and prevent it from becoming available for uptake. Irrigation is also important for uptake because imidacloprid needs to be dissolved in water in order to be absorbed through the roots. Root activity then becomes an issue with soil applications, so the timing of treatments is important.

**Bakersfield studies**

In 2011, we started a new project on mandarins, which we conducted at a commercial grove in Bakersfield. The project is of interest for two main reasons. First, mandarins are often planted at a higher density than other varieties; and second, we were able to compare the uptake of imidacloprid into trees that were grown under different irrigation systems — drip (average of 3 drippers per tree) versus sprinkler (placed centrally between trees) — whereas other conditions (tree
age and size, soil type, volume of water per tree) were similar in adjacent blocks with the two types of irrigation.

The significance of tree density is important when the imidacloprid application rate is taken into account. The current maximum label rate for imidacloprid is 0.5 pounds of active ingredient (AI) per acre per season. So, regardless of which formulation a grower uses, the maximum label rate for each formulation must never exceed the 0.5 pound AI threshold.

Thus, when the maximum label rates of a 4.6 pounds AI per gallon flowable concentrate (14 fl oz per acre) or a 2 pounds AI per gallon flowable concentrate (32 fl oz per acre) are applied, the amount of imidacloprid active ingredient will be the same.

The “per acre” amount of insecticide allowed does not change when the tree density is increased. In short, changing the tree density will alter the amount of imidacloprid delivered to each tree. Our study on mandarins permitted us to determine how effective field rates of imidacloprid were on a high-density citrus planting.

The impact of different irrigation systems on the efficacy of imidacloprid uptake is unclear. The manner in which trees are irrigated will likely affect the root pattern. With a drip system, the roots will be trained to a very precise area around each dripper, whereas with a sprinkler system the roots may be more dispersed.

In our study, we did not evaluate the rooting patterns for the different systems but followed the progress of imidacloprid uptake once the treatments had been applied. We also compared three application timings, beginning with the first application on June 9 soon after the honeybee netting had been removed from the trees. Additional treatments were applied on July 13 and August 24.

The trees used in our study were W. Murcott on ‘Carrijo’ rootstock, and were planted in blocks that were either drip-irrigated (11 years old) or sprinkler-irrigated (9 years old). As with all our trials, we strive to collect the youngest tissue available on the trees because this will be the target for the ACP adults to feed and oviposit on.

Figure 1 summarizes recent trial data. There is no doubt that excellent uptake of imidacloprid occurred under both irrigation systems. In all but one of our six treatments, the 200 ppb threshold was achieved within one week of the application. The exception was the June treatment timing to the sprinkler-irrigated block, which took two weeks to reach the threshold.

Overall, uptake was more rapid with the drip system, although there was little to separate the two systems with the midsummer timing. Peak imidacloprid levels were very high for all treatments, exceeding 1,800 ppb for the three drip applications and at least 1,200 ppb for the sprinkler applications.

In terms of persistence, the efficacy of the June application was 12 weeks; we are still processing data for the July and August applications, but so far we can see that the persistence of the July applications (timing 2) has extended to 8 weeks, and the August applications (timing 3) to 6 weeks.

These results show the power of imidacloprid as a systemic treatment, remaining at effective levels long after foliar applications would have diminished in efficacy. No doubt the smaller tree size had an impact on the excellent uptake, but it is clear that the high planting density did not compromise the capacity of the imidacloprid applications to deliver effective concentrations for ACP control.

Ventura studies

In 2011, we continued with a second season of trials at a commercial site in Ventura County (refer back to the 2011 Mar/Apr Citrograph article). The trees were 25-year-old lemons on a heavy clay soil (35% clay content and 5% organic matter content).

In 2010, applications of imidacloprid at the maximum label rate (applied to different sets of trees on May 20, July 12 and September 16) resulted in very poor uptake, and on no occasion during the season did imidacloprid concentrations reach the ACP threshold level of 200 ppb. Effective uptake

![Fig. 1. Profiles of imidacloprid uptake into mandarin trees at different application timings during 2011. The solid lines represent the titers of imidacloprid in trees under drip irrigation and the dashed lines the titers in trees under sprinkler irrigation. The target threshold for toxicity against ACP is 200 ppb (solid green horizontal line).](image-url)
of imidacloprid was confounded by the heavy clay soil and the irrigation schedule, which was limited to a 3-week cycle. Imidacloprid can become bound up in heavy clay soils, particularly when water is not available to keep it solubilized.

In 2011, we applied a further treatment of imidacloprid to trees that had been treated in 2010. Imidacloprid is a very persistent insecticide, and our strategy was to determine the effect of back-to-back applications of imidacloprid under such challenging conditions.

In a six-month study where we compared trees that received one treatment in 2010 (no treatment in 2011), one treatment in 2011 (no treatment in 2010), and a treatment in both 2010 and 2011, we were not able to detect imidacloprid at a level of 75 ppb (our assay lower limit of detection). Given that we need to achieve a threshold of 200 ppb for ACP control, these results were disappointing, and it was clear that imidacloprid was not an effective treatment for trees growing under these conditions.

**Imidacloprid and ACP management**

Our message to the citrus industry in our last report was that if we can get imidacloprid into the new leaves of the trees at the ACP threshold levels (200 ppb), we can generally expect good persistence. We must understand that it takes time for imidacloprid to establish within trees, especially in larger trees, and that soil type and irrigation can affect results. In this report, we have provided data to support many of these comments.

The smaller mandarin trees do not present as great a challenge to uptake as some of the larger citrus varieties, despite higher planting densities in the former. And, although we observed differences between drip- and sprinkler-applied imidacloprid, the uptake with both systems was excellent so as to provide good protection to the trees in a rapid and sustained manner. The only delayed uptake occurred with the June application to the sprinkler-irrigated trees. The weather was cooler than normal for that time of year in 2011, and we suspect that this may have slowed root development and/or uptake.

The interplay between soil type and irrigation is all too clear from our Ventura study. Imidacloprid treatments to citrus growing in heavy clay soils already face a strong challenge from the binding of the insecticide to clay particles. The problem is only worsened as the interval between irrigations increases.

Identifying the conditions where imidacloprid can best be deployed is of primary importance to the citrus industry. We must be aware, however, that total dependence on imidacloprid is not feasible because overuse of any one or several classes of insecticide chemistry can lead to the development of resistance. (Resistance is becoming a concern in Florida where imidacloprid has been used for many years against ACP).
Therefore, our research continues to focus on establishing a better understanding of the conditions that impact the performance of imidacloprid so that it is only used during times of optimal efficacy.

Acknowledgements

We would like to thank the California Citrus Research Board for funding this research in part. We are especially grateful to Paramount Citrus (mandarin study) and the Limoneira Company (lemon study) for providing citrus blocks for our research.

Further reading


Dr. Frank Byrne is an Associate Researcher in the Department of Entomology, University of California Riverside. Dr. Joseph Morse is a Professor of Entomology in the same department.

CRB research project reference number 5500-179.
Your Foundation, through the work of Tom Pulley, is compiling a list of citrus brands of each packer... A FIRST! We want to match a packinghouse photo to the majority of the packers on this list, and that is where you enter!

WE NEED YOUR HELP IN FINDING PHOTOS OF CITRUS PACKERS IN

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Dinuba	Ivanhoe	Oroville	Strathmore
Dixon	Lemon Cove	Palermo	Terra Bella
Edison	Lindsay	Porterville	Visalia
Exeter	Orange Cove	Rocklin	Woodlake
Fair Oaks

Check out our website... www.citrusroots.com

Electricity Lights the Packinghouse

Foot-powered equipment was totally out of step with the vigor of the emerging California citrus industry...

Richard H. Barker

December 31, 1892, marked the world’s first commercial long-distance high-voltage transmission of electricity by Pomona’s San Antonio Light & Power Company (SAL&P).

Dr. Cyrus G. Baldwin, the first president of Pomona College, enjoyed weekend outings in the San Antonio Canyon, and the “Hogsback” was his favorite area. There was something vibrant or dynamic about the power of the water rushing uncontrolled over the waterfall.

Perhaps it was this very sensation which suggested to him the solution to the needs of power in the area. As he stood from a high point at dusk, looking down on the darkish floor of the valley lowland, he envisioned a hydroelectric plant tapping the power of the San Antonio Creek and lighting the valley.

His mind flashed back to the critical need for a source of cheap power. Steam plants were common in the East, but the scarcity of fuel here made this option too expensive. Coal was imported from Australia or Wales, and wood fuel was also clumsy and costly.

He thought of his research which proved his original observation was correct. Water power was far more economical than steam and gas engines. He retraced back to his visit and observation of the small electric plant in Ventura generating power from a small water drawn dynamo. The idea of hydroelectric transmission was now a burning issue in his heart and mind.

A fateful day and the right man

Dr. Baldwin brought up his determined idea with a friend and fellow Congregational minister regarding harnessing the power of the San Antonio Creek through a hydroelectric plant, and, from this enterprise, endowing his young Congregational, Pomona College. The upshot of this was a resounding pledge to help. Almarian William Deck-
er, a self-taught, well-read and brilliant electrical engineer, vowed to do the engineering even though he was fighting for his life against tuberculosis.

Decker went right to work on this project, for he had already studied and focused at length on this subject. A fateful day and the right man!

Excerpts from the book “Citrus Roots ... Our Legacy - Citriculture to Citrus Culture” (Barker), p. 142:

“Confident and fortified, Baldwin carried this concept to the Pomona Board of Trade (a forerunner of the Chamber of Commerce), and his contagious enthusiasm convinced the local business people into funding this project.

“Among the men infused by Baldwin’s enthusiasm were J. Albert Dole, a businessman from Pomona; the former U.S. Senator from California, Thomas Bard; Lyman Stewart, an Upland investor and later founder of Union Oil Company; Nathan Blanchard, a Santa Paula citrus grower and later president of the Limoneira Ranch; Charles Harwood, an Upland developer of citrus acreage; and others. His next move was to secure water rights. He negotiated an option of water rights in the San Antonio Canyon through “Dr. Nichols, President of the Pomona Land and Water Company, a man who had also been active in establishing Pomona College. Everything was falling rapidly into place.

“On July 7, 1891, the San Antonio Light and Power Co. was incorporated under the laws of California with a capital stock of $240,000, divided into 2,400 shares at $100 per share. About $30,000 were subscribed at once; the following names appeared as subscribers to the stock: Chas. E. Harwood, Thomas R. Bard, John D. Hooker, J.F. Conroy, J.A. Dole, W.S. Chamberlain, Edward Hildreth, N.W. Blanchard, A.J. Cook, J.F. Baldwin, W.H. Holabird, Mrs. J.T. Ford, M.B. Campbell, G.A. Rawson, C.T. Weitzel, E.S. Williams, A.W. Burt, J.T. Ford, C.G. Baldwin, and Mrs. Mary Rawson.

“Additionally, the following were listed as incorporators: N.W. Blanchard, W.S. Chamberlain, A.W. Burt, C.G. Baldwin and Thomas R. Bard.

“At a meeting of stockholders held July 29, 1891, Thomas Bard, J.A. Dole, M.B. Campbell, J.D. Hooker, A.W. Burt and C.G. Baldwin were elected Directors. On the same day the Directors met and organized, electing Thomas R. Bard, President; J.A. Dole, Vice President; A.W. Burt, Secretary and Manager, and People’s Bank of Pomona, Treasurer. San Antonio Light and Power Company was off to an excellent start!”

The next task was to order the equipment. This was totally another experience! There were only two electric manufacturing companies in the United States: the Thompson-Houston Company and Westinghouse Company. In addition, there was the Stanley Electric Company in Pittsfield, Massachusetts, which specialized in transformers or “converters”. Being the first to make such a plant made this situation even harder since there was no comparable installation which might have served as a model.

Armed with about half of the funds thought to be needed to build the equipment and the specifications listed by Decker, Dr. Baldwin stepped on board a train to attend a missionary conference in Pittsfield, Massachusetts. His planned detour was to first call on George Westinghouse in Pittsburg and from there go to his conference.

Upon meeting Westinghouse, this overbearing man branded the venture as “a piece of foolishness.” He would not risk his reputation on “such a wild project of 10,000 volts”, for this was totally out of their line. Deflected, Dr. Baldwin left for Massachusetts.

**Encouraged and invigorated**

Stepping out of the meeting the first night in Pittsfield, he observed arc lights brilliantly illuminating the town. He asked, “Who was behind this?” He was immediately compelled to meet the young inventor.

The next day he visited Stanley Electric Company. Here, the college president found a receptive audience. He was encouraged and invigorated when the staff of Stanley Electric Company thought the transformers in a series could produce 15,000 volts.

As Dr. Baldwin was preparing to depart, Mr. Stanley pledged, “If George Westinghouse still declines to build your generators and transformers, I’ll find a way.” Westinghouse and staff, after hearing Stanley’s affirmation, immediately agreed to build a 10,000-volt plant without the three-phase proposition and would guarantee its success for one year providing they made the installation.

As a first, Westinghouse also learned from this experience. When the transformers were tested just before shipping, they broke down. This was embarrassing. They discovered that there was moisture in the “dry cotton” insulation of the coils. When the transformers became warm, this moisture transferred itself to the upper part of the coil as water and caused the transformer to shut down. This was corrected and caused no further trouble other than a compromising delay by a haughty Mr. Westinghouse.

Another excerpt from the Richard H. Barker book, “Citrus Roots ... Our Legacy - Citriculture to Citrus Culture”, p. 143:
“Back in the canyon, the plan agreed upon was to tunnel through “Hogsback”, approximately 1,200 to 1,300 feet in length and build the powerhouse a mile below. The building when completed was 30 feet by 30 feet and built right into the side of the mountain against a solid rock. It was constructed of cement that was brought around ‘the Horn’ from Liverpool, England because at that time the availability on the West was very limited (the Colton deposit had not been developed ... see picture).

“Difficulty followed difficulty due largely to lack of money, but finally the tunnel was completed. The pipeline was installed, the water wheels were set and connected directly to the 120-kilowatt generator, and the plant was ready.

“With all of the directors and other interested parties present, the water was turned into the tunnel, but not a trickle came through! The tunnel leaked like a sieve! All work was held up until the whole tunnel was lined with cement (see picture).

Not always according to plan

“When the plant and the transmission lines were complete, the Congregational Church of Pomona was selected as a place to show the ‘doubting Thomases’ that electricity could be generated at some distance away and the transmission carried out. This church was selected because J. Albert Dole, president of San Antonio Light and Power Company, was an active member. As Arthur W. Burt, a brother-in-law of Baldwin and secretary/general manager of the company, described in an article delivered before the Lions Club of Upland on November 10, 1927:

‘We were all on hand for the evening service and everything was fine except the amount of light - the twenty lamps gave about as much light as twenty fireflies. You see, we had failed to make a test... I can almost feel now the sweat of embarrassment that fairly oozed from every pore as I heard the snickers of the congregation. The only good thing about it was that it was too dark for them to see by blushes.’

“(The 10,000 volts reported at the power plant dwindled by half when the load was actually directed to Pomona.)

“The main transmission line was a two wire system. The wires were strung on pine poles set about five feet in the ground and equipped with insulators (which made great targets for...
practicing hunters, Arthur Burt wrote in an accounting). From there, a line ran east to San Bernardino and another ran diagonally to Pomona.

“The business establishments in San Bernardino had contracted for lighting, but their contracts would become null and void if the firm failed to deliver by January 1, 1893. At 5:30 p.m. on December 31, 1892, lights illuminated the Times-Index Building in San Bernardino. The contract had been met!

“These lines were the world’s first commercial application of transformers to effect long-distance, high-voltage transmission of electricity and further formed the basis for today’s modern electric utility transmission system. History was also made with the use of alternating current ... a first!”

Another interesting added enterprise associated with the electrical business was the telephone service. The lighting system ran until midnight, starting at 5 p.m. The lines during the day were used as phone lines. The telephones were cut in at a fixed hour in the morning, and cut off as earlier mentioned. Therefore, when the lighting started, there was no phone service. It is interesting to note that J. Albert Dole retained an interest in this emerging franchise and passed the resources to his son Arthur, who served on the board of General Telephone Company of California until his death in 1955.

“Old Man Winter” showed no favors to Baldwin’s San Antonio Light and Power Company. In December of 1894, the area was hit with a flood which washed out many poles. Pomona was in the dark for two days. The next year,
On Feb. 14, 1901, the Sierra Power Plant went into operation in the San Antonio Canyon. It is still generating power today for SCE.

Inside the Azusa Ice and Cold Storage Company, circa 1903.

Left to right: Mr. Pate, AT&SF; J. G. McKinney, Los Angeles Ice & Cold Storage Co.; B. A. Woodford, manager of the Azusa/Covina Fruit Exchange and general manager of the California Fruit Growers Exchange; G. H. Powell, pomologist, USDA; and, Walter Barnwell, assistant freight agent for the AT&SF Railway. Their visit was to learn the efficiencies by seeing first-hand the energy or power employed in making ice... the economical means by which ice was being produced.

they experienced a strong windstorm. The northern part was struck severely with most of the poles down.

Then during the years of 1897 to 1899, an extreme drought was felt. An oil steam plant was installed to offset some of the lost electrical power due to the creek being just a seepage. Then the knockout punch – a blizzard struck and caved in the roof of their hydroelectric plant.

Funds were depleted, and this company could not survive the forces of nature. One could only find comfort in a quote of Dowden: “Sometimes a noble failure serves the world as faithfully as a distinguished success.” This company proved to the world it could be done!

Late in 1899, negotiations for the sale of the property were begun with William G. Kerckhoff of San Gabriel Electric Company, and in early 1900 the stock and bond holders surrendered their certificates to Kerckhoff (you will learn more of this man in a coming issue of Citrograph).

To light the valley floor

Although the life of San Antonio Light and Power Company was short, it started a chain reaction of followers. It pioneered the way for long-distance transmission of electric power to be delivered to users far from the source of generation. It proved the water of the canyon could light the citrus packinghouses and citrus-linked businesses. Just as Dr. Cyrus Baldwin had dreamed, this creek could light the valley floor.

One never knows the fate of an act. On February 14, 1901, William G. Kerckhoff’s new plant, named the “Sierra Power Plant”, went into operation about 2,000 feet below the former SAL&P plant.

This plant is still generating power for Southern California Edison in the original building and using most of the same equipment (see “Citrus Roots ... Our Legacy - Citriculture to Citrus Culture”, p. 150 &151).

Again, one never knows the fate of an act. Mr. Kerckhoff began at age 23 his working career primarily as a lumberman. Now, at the age of 35, his lifetime work changed and was driven by the potential and the power of water. This event marked the direction of his life for about the next 69 years.

In January 1891, he purchased 15 acres on the Santa Fe tracks where the water of the San Gabriel River belonging to an irrigation company crosses a gulch in a flume that drops Bond and equity instruments financed the building of this power company. Dr. Cyrus Baldwin’s contagious enthusiasm impressed the investors.
60 feet and then continues in its ditch downward. Here he built the building and a hydroelectric plant solely for Azusa Ice and Storage Company. The Santa Fe system had agreed to purchase all surplus ice before the plant was even built, and within a year they were buying daily up to 100 tons of ice. This was about two years before the Union Ice Company commenced to build in Redlands. If the California citrus industry were to grow, it needed ice and a way to automate its packing facilities.

Now in retrospect, in 1899 it would appear to the contentious that SAL&P was a failure. Its failure was due to the fickle and unpredictable weather. Yes, in looking back, they had more than their share of reversals, though they were forerunners.

This company, as we know, was the first to establish the commercial feasibility of long-distance, high-voltage transmission of electric power through the use of transformers - an honor of being the “world’s first!” Probably its highest consideration to this forerunner company was that it established the primary foundation and principles of the grid system used worldwide by the electrical utility industry.

(In an upcoming issue of this magazine, we will look into the story of two other neighbors, also leading the way as “world’s firsts”. It seems unusual that these “world’s firsts” were originating from the citrus belt only a short distance apart from what today is known as the “Inland Empire”.)

Richard H. Barker is the founder and president of the Citrus Roots-Preserving Citrus Heritage Foundation. For a number of years, he has been leading a drive to bring about a higher awareness of the role citrus played in developing California. Dick is a retired investment banker and was a third generation Sunkist grower. He has published four volumes on citrus heritage.

The author wishes to credit the following: Special Collections, Honnold/Mudd Library of The Claremont Colleges; The Huntington Library, San Marino; San Bernardino Public Library; Special Collections, Cooper Regional History Museum, Upland; and the Sherman Library and Gardens, Corona del Mar.

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This 1897 scene shows a shed of the Houser Bros. Co. in Covina. They used kerosene lamps for lighting, and the equipment was powered by a treadmill device. The two men in the center standing on top of the sizing machine were the power source.

Field picking. Family members, friends and neighbors all assist in “harvesting the gold” and crating.
Ontario Fruit Association had electric lighting from Sierra Power Plant, though they did not have three-phase power as their sizing machine was powered by men. Observe the two men facing each other seated on top of the sizing machine. They operated the treadmill. The growing California citrus industry was ready for modernization! (circa 1902).

(Left) Redlands Eclipse Orange Association powered their packing shed by womanpower! Note the women seated in chairs on both sides of the area. They operated the treadle. Their electric service came from Mill Creek #1 owned by Redlands Electric Light and Power Company (circa 1898).
UCR chefs take advantage of special access

For a chef who loves citrus, it’s hard to imagine a better place to be than UC Riverside or a better friend to have than Tracy Kahn. After all, UCR is home to the Citrus Variety Collection, and Dr. Kahn is its curator.

Chef Lanette Dickerson, the Executive Chef for Housing Dining and Residential Services, says she collaborates with Tracy quite often, and “every time we work together, we come up with something that’s inspired and delicious.”

Chef Lanette has been at UCR since 1997, and over the years, she says, her conversations with Tracy and the follow-up experimenting that she and her colleagues have done in the kitchen, “have launched UCR’s citrus into many of our foodservice areas for all to enjoy and appreciate”.

The chefs at UCR have developed dozens of recipes featuring citrus, and, Lanette says, they truly appreciate their special access to some of the more exotic items from the Collection -- although, of course, they work with the widely available commercial varieties as well.

“It’s exciting for us as chefs at UCR to be able to showcase the fruit that’s so special to this campus,” Dickerson says. “We’re proud to be reminding people through our food that citrus is our heritage at UC Riverside.”

They take every opportunity they can to feature citrus at special events, and their signature dishes are much in demand.

Chef Lanette has more than 25 years’ experience in the food and beverage industry working in a multitude of diverse foodservice operations. She is a graduate of the Culinary Institute of America in Hyde Park, New York.

Chef Robert Grider

Chef Robert Grider, who’s sharing his citrus mini taco recipe with Citrograph, is the Senior Culinary Operations Manager for UCR’s Dining Services at Lothian Residential Restaurants.

Robert and his wife have half a dozen citrus trees at their home in Riverside including a semi-dwarf Meyer lemon, a standard Kishu mandarin, and a semi-dwarf kaffir lime. He’s especially fond of the uniqueness of the Buddha’s Hand citron, which he uses in his Buddha’s Hand and Ginger Preserve recipe, and when it comes to Kishu mandarins, he prefers to serve the naked juice over ice.

Chef Lanette reports that “over the past 15 years, Chef Robert has thrived in Southern California’s demanding and ever-evolving foodservice and hospitality industry and has cultivated diverse culinary programs while working for such companies as Disney, Brennan’s Restaurant Group and the Patina Restaurant Group.” He is a member of the American Culinary Federation and an officer in the Southern California Inland Empire Chefs and Cooks Association.

Chef Reuben Herrington

Chef Reuben Herrington, who created the citrus marinated Ahi tuna, has over 20 years of culinary experience and is a graduate of Le Cordon Bleu Culinary Institute.

“Reuben started at the bottom as a dishwasher,” Lanette says, “and worked his way up to executive chef in restaurants, hotels, wineries and resorts.”

She says, “Chef Reuben’s passion for food has led him to seek knowledge in other cuisines including Asian and also to honor his family’s roots of Cajun-Creole. His current position at UCR as Catering Sous Chef has him creating perfect dishes for the Chancellor and special guests.” Before coming to UC Riverside, he was an established chef in the Temecula Valley wine country.

Showing their “Highlander” spirit at a campus event are, left to right, Chef Reuben Herrington, Chef Robert Grider, and Chef Lanette Dickerson.

Photo by Spencer Kalnin, UC Riverside Alumni Office.
**Blood Orange and Tahiti Lime Marinated Chicken Asada Mini Tacos**

*By Chef Robert Grider*

**INGREDIENTS:**

- ½ cup blood orange juice
- ½ cup Tahiti or Bearss lime juice
- 1 tablespoon white granulated sugar
- 1 teaspoon cumin, ground
- 1 teaspoon oregano, dry
- ½ teaspoon kosher salt

- 16 ounces boneless, skinless chicken thighs
- 8 each 4” mini corn tortilla

1. Combine orange juice, lime juice, sugar, cumin, oregano, and salt in a bowl. Pour marinade over chicken thighs and refrigerate for 2 hours.

2. Remove chicken from marinade, grill on barbecue until fully cooked or 170 degrees internal temperature is reached on the chicken.

3. Heat corn tortillas on flat top grill until pliable; dice chicken into small pieces, evenly divide between tortillas, and top with Crunchy Spicy Slaw

**Yield:** 8 mini tacos

**Crunchy Spicy Slaw**

**INGREDIENTS:**

- ½ cup napa cabbage
- ½ cup red cabbage
- ¼ cup shredded carrot
- ¼ cup jicama, shredded
- 1 teaspoon orange blossom honey
- 1 teaspoon cumin
- 1 teaspoon Tahiti or Bearss lime juice
- 3 tablespoons mayonnaise
- salt and pepper to taste

1. Combine mayonnaise, lime juice, honey, and cumin, in a small bowl to make a spicy dressing.

2. Mix the spicy dressing and vegetables together in a medium bowl. Add salt and pepper to taste.

**UCR Citrus Mojitos**

**INGREDIENTS:**

- 4-5 each navel or Valencia oranges (you may also use Moro blood orange, Tango mandarins and Cara Cara navels)
- 8 ounces fresh Bearss lime juice
- 2 tablespoons sugar
- 10-12 fresh mint leaves
- 16 oz. Sierra Mist

**Method:**

1. Squeeze juice from oranges and set aside.

2. Combine lime juice, mint and sugar in blender and mix well until mint is chopped small.

3. Fill 8-oz. glass with ice, add 1 oz. lime and mint mixture, top with 2 oz. orange juice, and finish off with splash of Sierra Mist.

**Yield:** 8-8oz portions
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