



Posted 26 Jan, 2017 by Gordon Wardell

Almond Pollination: The Big Dance

Almond pollination is a big investment for the grower and the beekeeper alike. The growers want the best bees possible for their pollination dollars, and the beekeepers want to supply the best bees possible to secure the top pollination fees. Good summer forage makes a huge difference for bees to replenish, but beekeeper inputs including feeding, medicating and population management, begin preparing the colonies for almonds in August. It's a long, costly road to get bees ready for almond pollination, and I don't mean just money. See our photo series of the Herculean efforts beekeepers are in the middle of right now on our Facebook Page [here](https://www.facebook.com/ProjectApis/): <https://www.facebook.com/ProjectApis/>. It's not easy to build colonies to pollination strength in the middle of the winter, but that is what beekeepers have to do; they must have the strongest colonies possible in early February because that is when almonds bloom.

After all the feeding, medicating and colony management, out-of-state beekeepers have the added effort of loading their colonies on semi-trucks to transport the bees to California and that means preparing the colonies to go through the border inspection stations. Prior to shipping, one of the last big efforts the beekeeper makes is to clean and sanitize the colonies to remove weeds, mud, ants and any other hitchhiking insects. Annually, about 4,000 truck loads of honey bees come to California to support the almond pollination effort. This volume of trucks coming through the California Border Inspection Stations can severely tax the system and result in log jams of trucks at the border awaiting clearance to enter California.

Beekeepers typically prepare their colonies for inspection prior to shipping to make the inspection process go more smoothly. The California Department of Food and Agriculture (CDFA) border inspection stations are mandated with the task of protecting California's vast agricultural holdings from outside threats and exotic pests. It's a monumental undertaking to inspect all trucks entering California. So, you might ask, what are inspectors looking for when a truck reaches the inspection station? Basically, they are looking for anything that isn't a honey bee or from a bee colony, including many bee pests and a myriad of other hitchhikers including ants and especially red imported fire ants. Anything found on a hive or on the truck deck that isn't a bee has to be identified before the truck can be cleared to enter California. Insects unknown to the inspector or potentially serious pests will be photographed and the image will be electronically sent to Sacramento for identification. This can cause delays of a few minutes to several hours or even days if the truck arrives at the border on a weekend. It may seem excessive but this is an important step to help protect California's agriculture. This is why it is so important to keep the load as clean as possible prior to shipping. The most common problems that delay trucks at the border are small hive beetle larvae, hive beetle adults, fire ants, other miscellaneous ants and mud on the pallets or hives. Loads can also be rejected for serious pests like cereal leaf beetles or gypsy moth egg masses, bag worms or even weeds stuck between boxes or pallets. Time spent by the beekeeper checking the load

prior to departure can only improve his or her chances of getting through the border inspection without a hitch.

Once a driver gets to the border inspection station, it's important to have all the paper work in order. Project Apis m. publishes a helpful brochure with important details and contacts: <http://projectapism.org/wp-content/uploads/2016/12/Brochure-2.pdf>, and this [video: https://youtu.be/k3DJ00v4sjg](https://youtu.be/k3DJ00v4sjg) is also full of good information about preparing bees for almonds. If the state of origin provides fire ant certification certificates, the forms should be presented to the inspectors upon arrival. The driver also needs the precise location where the bees will be placed in California, P.O. boxes, range, township or GPS locations are not acceptable. Drivers should try to arrive at the border inspection station between 8 AM and 5 PM as this is when pest IDs can be done more quickly in Sacramento.

After the colonies clear the border inspection station, they're off to the orchard where they will be taken off the semi-truck and moved to the individual drop sites in the orchard via smaller trucks. Typically 24 to 36 colonies are placed in each drop, or they might be scattered around the orchard in smaller sets depending on the orchard design or the growers' preferences. But bees have wings so they can spread themselves out around the orchard even if put in larger concentrations.

So now the big dance begins. Almond bloom will begin soon, and the largest commercial pollination event in the world will be underway. None of this would be possible if it weren't for the dedication of beekeepers, growers, regulators and, of course, the bees. In next month's newsletter we will examine the pollination event itself. Watch for more photo updates of the largest pollination event on earth on our [Facebook Page \(https://www.facebook.com/ProjectApis/\)](https://www.facebook.com/ProjectApis/)!

Posted 26 December, 2016 by Gordon Wardell

The Holiday Season is a joyous time of year and yet a nervous time of year for beekeepers. This is the season when all of the efforts since the summer are realized. If not managed correctly earlier in the fall, colonies will begin crashing this time of year for a number of reasons making the Holidays less than festive. Wintering success starts in late summer. The most obvious challenge is mite control. If mites go unchecked too far into the fall the bees that make up your winter cluster are compromised. The bees' life expectancy will have been shortened by Varroa mites and the viruses they vector; reducing a bee's potential life by as much as half. Summer bees have a life expectancy of approximately 6 weeks, they literally work themselves to death but healthy bees destined for the winter cluster are different. A winter bee's life expectancy can be as great as four to five months. You can see why mite management in the fall is so critical. Shortening a winter bee's life expectancy by half would predict its demise in December instead of February or March. Early loss of population will make the colony susceptible to chill and even starvation because they can't move to the food when temperatures drop.

The greater longevity of winter bees is largely due to a storage protein sequestered in the bee's abdomen called vitellogenin. This protein, carbohydrate, lipid complex is

the currency that keeps the colony going and rearing brood even in the middle of the winter.

This buildup of vitellogenin doesn't happen by accident; it's a delicate balance between colony population, available food stores, the queen's egg production and emerging workers. In the fall, as days begin to shorten, the queen's egg production begins to decrease, soon the nurse bee to brood ratio shifts; there are still numerous workers emerging from brood cells, eating stored pollen (or protein supplement), becoming nurse bees and producing royal jelly as nurse bees do so well. But alas, there aren't enough larvae to accept all the royal jelly being produced because the queen is shutting down egg laying, so the surplus royal jelly is passed around the colony and internalized by the newly emerged bees. They "fatten up" much like a bear preparing for winter, but instead of hibernating, the bees are active, calling on the vitellogenin as added food stores, and it proves an essential resource when the queen resumes egg-laying in January.

Too many times we hear about the doom and gloom of what is wrong with our colonies but no suggestions about what we can do to help remediate the situation. So I'll take a stab at what we can do to help colonies that are sliding backwards this time of year. It's not easy and there is no guaranteed fix. There are so many factors that could be playing into the colony's drop in population, but we do know a few things that can help. You can reduce the colony down to a size the remaining bees can manage. Help them conserve heat. Feed them and make the food available to the cluster. A high carbohydrate (sugar) protein supplement patty or candyboard placed near the cluster can provide the energy needed to keep the cluster warm, and the small amount of protein in the mix helps extend the life of the bees in the cluster. In bees, as in most animals, protein equals longevity. You can combine colonies as well if you are worried about their survival. Stacking weak colonies over stronger colonies separated with a double screen can help the weaker colony by sharing heat with the stronger colony. Later in the spring they can be split apart again.

Another thing to watch for this year is starvation. The central and eastern parts of the country are currently experiencing unseasonably cold temperatures. This may sound counter intuitive, but cool temperatures are good for a wintering colony. It keeps the bees in the colony--in cluster and not out flying--burning resources while looking for forage that isn't out there. As long as there is adequate honey in the colony and the bees can move to that honey, the colonies will survive cold spells just fine. After all, our bees evolved in a temperate climate and have adapted to these conditions. The only problem comes if they should get low on honey. So, monitor your colonies closely and feed if necessary. Practice lifting the back of the colony to judge the weight of the colony and stores inside without having to open the colony.

Many experienced beekeepers will say that a colony is weak for a reason and there is not much you can do to bring them back especially this time of year, but when we are able to bring that colony back from the brink it makes us feel like the stewards of the

bees that we want to be. I hope you all have a great Holiday Season and prosperous colonies in the New Year.

Posted 27 November, 2016 by Gordon Wardell

A quote from W.J. Vogel, “To shorten winter, borrow some money that is due in the spring.” This is the time of year when commercial beekeepers begin holding their breath, time is flying, the colonies look good today but we really don’t know how the bees are going to look tomorrow. Most reports from across the country are that the bees are looking good; populations are strong, the bees look healthy and stores are good. Many of the Midwest colonies have already been moved to holding yards in the Central Valley or on the coast, and that is why the beekeepers are holding their breath. If anything can go wrong, it will happen between now and February.

So why is it so difficult to maintain healthy colonies prior to almond pollination? In short, it’s winter--a time of year when the bees are typically hunkered down until spring...a time when they don’t normally raise a lot of young bees. But that is what is needed to replace the bees lost during the warm winter days in California. The next challenge is when almonds bloom. Almonds are the first commercial crop of the year, beginning to bloom in mid- February. And, as it so happens, almonds are the largest commercial bee pollinated crop in the country--demanding three quarters of the nation’s commercial colonies to pollinate a crop worth more than 4 billion dollars. Building colonies up to pollination strength in the middle of the winter is a difficult task to say the least. We have to remember, our bees evolved in a temperate climate where their natural instinct is to call a halt to brood rearing (young bees) in the fall as the day length gets shorter. The energy they would normally put into rearing brood is instead stored in their bodies in the form of fat. That, along with less flight activity, extends their longevity until the queen starts laying eggs again in January as the day length increases. So, because the bees are slowing their growth and there is little or no natural forage (pollen and nectar), it makes them vulnerable to problems that otherwise wouldn’t be a problem: pests, parasites, and pathogens being the most obvious challenges. Like most animals, bees are healthiest when they are growing rapidly. So most beekeepers will begin feeding their colonies through the winter and prior to almond bloom to have the strongest colonies possible. While that may build colony population, it doesn’t come without risk, because colonies in a growth phase don’t store as much fat in their bodies and consequently aren’t prepared for cold weather. A hard freeze could damage the population and the expanding brood nest. You can see that beekeeping is really a study in colony population management. It is absolutely a fascinating undertaking that never gets boring.

So to wrap it up, bee supplies in the coming year appear to be adequate for the needs of the almond industry. Most beekeepers are optimistic that their bees will be ready come February. Like all farmers, we are always optimistic about the coming year. Happy Holidays.

Posted 25 October, 2016 by Gordon Wardell

Last month, I had the opportunity to attend the International Congress of Entomology in Orlando, Florida. Researchers and academics from all over the world convened to share their research and most recent developments. As an entomologist, there was nothing better than being surrounded by my peers and listening to the most fascinating talks and conversations throughout the week. At the end of each afternoon I was

literally exhausted from zipping from one lecture hall to another to hear talks that interested me. There were so many great discussions both in the lecture halls and in the hallways afterward and a surprising amount which focused on bees: talks on solitary bees, bee nutrition, bee behavior, pesticide and fungicide interactions with bees and so much more.

By far, the most fascinating symposiums and presentations were on Varroa mites. While it is still the number one problem facing beekeepers today, we don't have many more answers than we did ten years ago. Mites continue to ravage our colonies and we are limited to a small number of treatments. What has become clear over the years, and was hammered home during the conference, is that it is going to take Varroa resistant breeding and selection to get us, the beekeeping community, out of this dilemma.

It was encouraging to hear about continuing efforts to improve the mite resistance of the Russian stock and to push forward with Varroa sensitive hygiene (VSH). This is where the adult bees detect infected pupae under the cappings and eject the pupae and mite from the brood nest before the mite can complete a life cycle (see Danielle's video link: https://www.youtube.com/watch?v=uFNiVLX_bgE). Other researchers have identified lines of bees that attack and chew the legs off of the mites...a fitting end for the little parasite. Yet other researchers have identified lines of bees that groom the mites, and other bees that (as adults) don't put up with a mite crawling on them. The adult bees are clearly disturbed by the presence of a mite on their bodies. When a mite attaches itself to a bee it begins a series of gyrations, flicking and dancing until the mite falls off the bee...a good trait to have to reduce phoretic mites. To see a video of this behavior was most impressive. It is a wonder that all bees don't react to mites in that manner considering the relative size of mites to bees.

Where this brings us is to the understanding that we still have a lot of work to do before we can put Varroa concerns behind us and address the myriad of other issues facing beekeepers today. Over a year ago, Project Apis m. put out a request for proposals to address Varroa mite control. We should soon be getting reports back on these projects. Many of the ideas were novel approaches to controlling mites such as modified spider venom, new delivery systems for organic acids, stock and breeding programs and so on. I would love to celebrate Varroa's 30th anniversary in North America with a footnote that its days are numbered. I'm sure it can happen with the help of the impressive worldwide body of researchers working tirelessly on colony health issues.

Posted 24 September, 2016 by Gordon Wardell

Autumn, the year's last loveliest smile. - *William Cullen Bryant*

The autumnal equinox has arrived in the northern hemisphere, derived from the Latin *aequus* or equal and *nox* for night, an appropriate term for a word that describes the day of the year

when the daytime and nighttime are of equal length. Soon the days will become appreciably shorter and our bees will respond by shutting down brood production and begin to hunker in for the coming winter. Hopefully, all management preparations have been made. Surplus honey has been removed, mite treatments have been done, and entrance reducers have been placed on the colonies. In the late fall my father would always wrap our Michigan colonies in black tar paper. I really don't know if it did much for the colonies but it made us feel better. There are a lot of rituals we have, especially in beekeeping, that we do and are not really sure if they do much good but it makes us feel better. Last fall my mother asked me to wrap her two colonies in Michigan, I started to discuss the physiological pros and cons of wrapping colonies but then I stopped and said "sure, let's do it". We worked together to cut, wrap, secure the cumbersome black stuff around the colonies, cut entrances and when it was done we both felt so much better. For me it was as much about being able to do this chore together as it was for the bees. I'm not convinced that wrapping the colonies does much for their wintering ability in Michigan. And I'm sure you are wondering, yes, the bees made it through the winter just fine that year.

That's what the autumn is to me, a time to share, to marvel and to rejoice in the abundance of the summer and prepare for the coming winter. But that is not necessarily the case in all parts of the country at least the part about the bees hunkering down for the winter. This week I'm in southern Florida where the Brazilian pepper and melaleuca trees are in bloom and beekeepers are making their last splits of the year from their colonies. The bees are growing like crazy. With care and nurturing these colonies will be ready for California almond pollination in February, meaning they will have 8 to 12 frames of bees by that time barring major weather calamities. It's just amazing to think that in one part of the country bees have finished their brood rearing and in another they are ramping up for one more big push. The diversity in American apiculture is truly amazing.

So, enjoy the autumn harvest, prepare for the coming winter and we will see you next month.

Posted 22 August, 2016 by Gordon Wardell

"Summer's lease hath all too short a date." - William Shakespeare

Every year at this time I say the same thing. "Where did the summer go?" Almond bloom is just six short months away. Although beekeepers are getting their honey crops off right now, they also have one eye looking down the road toward almond pollination. Most beekeepers I speak to are cautiously optimistic about the bees after this summer. PAm board member John Miller reports that BIP teams found mite levels to be lower than in 2015. This is definitely a good sign and one that seems to be repeating around the country when I speak to beekeepers. Though most commercial beekeepers are treating for mites three and four times a year, the control measures seem to be working adequately. We still desperately need more commercially sound control measures for Varroa mites, as relying largely on one product is certainly a scary proposition. A new, effective product couldn't happen too soon.

While queen losses continue to be a problem, beekeepers I spoke with are not reporting as big a problem with queens this year as they experienced last year. Queen acceptance during requeening seemed to be improved this year as well.

Most regions around the country are reporting moderate honey yields--not great yields, but not disastrous results either. Beekeepers in the Dakotas report dry conditions in the western part of the states, resulting in spotty production; and the eastern sides of the Dakotas had a little more moisture and are reporting better yields. Though, unfortunately, slumping honey prices aren't helping.

Bloom wise, it was a pretty good year across the South. Chinese tallow and titi produced well into late spring giving the bees a strong buildup following almond pollination. Later, in Florida, the palmetto, cabbage palm and melaleuca all produced strongly providing nice buildup for the bees and even producing a modest surplus. The Brazilian Pepper is just starting to bloom denoting the beginning of the late summer splits. Most beekeepers indicate they have recovered from any losses they encountered last year and are optimistic about this coming year's almond pollination.

This time of year both beekeepers and almond growers try to look forward in time to prognosticate what bee supplies will be like during almond bloom. While it is far too early to be certain, indications are that beekeepers have made up previous losses, the bees are looking strong, mite levels are lower than the previous year and the mite treatments that are going on now still seem to be effective. For now—a critical time of year--we keep our fingers crossed, monitor the bees' nutrition and continue to monitor Varroa mites.

Posted 25 July, 2016 by Gordon Wardell

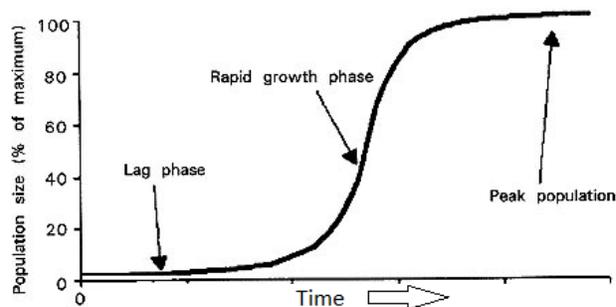
Growth

All organisms, including honey bees, go through specific phases in their growth. First is a lag phase; this is where the organism adjusts to its environment. In the case of honey bees, this occurs in late winter, when the colony is moving resources around the combs, preparing a brood nest. The workers are consuming stored pollen and honey and beginning to produce royal jelly again for the coming larvae. In the lag phase there isn't much growth, but all the preparations are being made for the rapid growth that is just around the corner. The foundation is being laid.

When all is ready and the conditions are right, the organism, or colony in our analogy, will break into exponential growth. The growth happens so fast it is hard to comprehend. In humans, the closest analogy would be our teenagers, and in our honey bee colonies it is springtime. Nectar and pollen begin coming in, the colony heats up the brood nest, the first brood cycle is welcomed into the nest and the colony takes off. It's a beautiful thing to watch: frames and frames of brood and the colony reaching for peak population. But it couldn't be done without a good foundation, a good queen, with strong healthy workers to support the growth, plenty of resources and a clean healthy environment in which to grow.

The analogy also reminds me of where we are with Project Apis m. (PAm). Recently, the PAm Board met, and we installed our new Executive Director, Danielle Downey, who brings exceptional organizational skills and a wealth of bee knowledge with her. We also welcomed new Board members, Gary Shilling and Pat Heitkam, who bring fresh perspectives and valuable skills to the Board. In the meeting, we had a detailed discussion of PAm's recent accomplishments and immediate opportunities to support the beekeeping industry and address critical research needs. PAm is poised and ready for exceptional growth. Over the years PAm's growth was often slow, but it was well directed. The growth we see today only

comes because of the foundation that was laid over the last decade by former Chairman Dan Cummings and Executive Director Christi Heintz. Chris, Dan and a strong Board of Directors has put in place a foundation that has allowed PAm to become one of the most influential honey bee research funding institutions in the United States. Project Apis m. is entering a new phase of growth, and it is exciting. Hold on tight, because PAm is poised for exponential growth. Great things are just around the corner!



Posted 18 June, 2016 by Gordon Wardell

How often do you get to talk about Dads and pollen in the same article?

Around beekeepers and others, my father would refer to himself a “bee-haver” not a beekeeper. I would smile and say “sure dad” because I had a different perspective. Yes, he was a hobbyist but he knew his colonies like pets. He could tell you how old each queen was, which colonies had poor brood patterns, which colony was runny and who was a little too hot. Most importantly, he knew the local forage, when local plants would bloom and how they figured into his management schedule. That knowledge comes from living on the family farm his entire life. I remember once he wrote to me, “spring is here; the bees are working the skunk cabbage in the valley.” Only beekeepers watch that sort of stuff. Just before my dad passed away, he told me the bees weren’t building up in the fall the way they used to. We hypothesized about a dry summer, the mites, Nosema, or just his getting older and not paying as much attention to the bees. He and I both figured it was the latter, but then recently I read an article in Bee Culture’s Catch the Buzz, See [“Changes in Goldenrod, a Key Source of Honey Bee Nutrition,”](#) and remembered our conversation. The article cites climate change and rising atmospheric carbon dioxide levels as the root of a decrease in protein levels in a major fall build-up crop for bees, goldenrod. Researchers believe that as CO₂ levels increase, plants produce more starch and sugars and less protein. It is certainly conceivable that poor fall nutrition could impact winter survivability.

At the core of this study is USDA, ARS researcher Lewis Ziska from Beltsville, Maryland. He has been looking at the effects of rising CO₂ levels and climate change on plants and their communities since 1988. He has been monitoring both critical agricultural crops and weeds alike. Turning to honey bees and plants critical to bees prior to winter, Ziska was able to obtain goldenrod pollen from herbarium specimens at the National Museum of Natural History dating back as far as 1842. He examined goldenrod protein levels over a 150-year period and correlated the results to atmospheric CO₂ levels. The largest decrease in protein levels occurred in the 1960s when CO₂ levels began increasing dramatically. He didn’t stop there.

He went on to conduct controlled atmosphere studies where he grew goldenrod in chambers and systematically increased CO₂ levels to observe the impact to the plants and their pollen. Results demonstrated a corresponding decrease in pollen protein as CO₂ levels increased. Certainly there are a number of factors impacting bees prior to winter, but this study surely makes us stop and consider the colony's nutrition going into winter and really any other time of year for that matter. For more reading see "[Will plants and pollinator get out of sync?](#)" and "[Climate change threatens bees](#)".

Few commercial beekeepers manage their colonies today without using protein supplements. Soon protein patties may be more important than ever if protein levels in pollen continue to decrease. Monitoring whether bees have pollen coming into the colony is important but now we need to stop and ask, what are the bees able to do with the pollen they are getting? The only way to know for certain is to monitor what is going on in the brood nest. What stages of brood are present, are they healthy, do we have a sufficient number of young healthy bees going into winter?

For years, PAm has been promoting supplemental forage for honey bees prior to and after almond pollination, and the results have been awesome. Good beekeeping is anticipatory not reactionary. Supplemental plantings may help your bees overcome any paucity encountered from decreasing protein levels or simply lack of plant diversity. Also, check out the [PAm forage link](#) on the website for ideas on supplemental plantings. More than ever, we have to be "bee-keepers" today!

Dr. Gordon Wardell
Chairman, Project Apis m.

Posted 23 May, 2016 by Gordon Wardell

And Yet Another Dance

Dawn is just breaking on a steel gray morning. As the predawn mist begins to dissipate, the sun's warmth starts to feel good. Though the bees are peeking out of the entrances of their colonies, they're still not flying. Temperatures are in the low 50's but the weatherman promises mostly sunny conditions and 70 degrees today. Soon the bees will be on the blueberry flowers setting a crop that could approach last year's amazing 100 million pounds, the second largest crop in a decade. These aren't the high bush blueberries of New Jersey, Georgia or Michigan; we're in the wild blueberry barrens in Maine where I spent the week with thousands of bee colonies, blueberry growers, and Project Apis m.'s Science Advisor, Dr. Frank Drummond. It was an amazing educational process. Frank is a professor of Insect Ecology and Insect Pest Management at the University of Maine and Apiculture Specialist with the Cooperative Extension Service.

Blueberry pollination is an important revenue source for many commercial beekeepers bringing in rental fees second only to almond pollination. It's another one of those crops that demands large numbers of strong colonies. Sure, native bees are effective pollinators of wild blueberries but the acreage has grown beyond the capability of local

bees to cover the vast acreage. Commercial bumblebees and even leafcutters have been used in the barrens, but honey bees still do the heavy lifting when it comes to blueberry pollination. Much like almonds, growers are contracting for 8-10 frames of bees and brood in the colonies, but unlike almonds some growers may put more colonies per acre than we typically find in almonds. The average stocking rate is said to be around 2 to 3 colonies per acre but some growers may contract for as many as 8 or 10 colonies per acre to insure optimum fruit set in Maine's less than ideal pollinating weather. Colony densities that high require the beekeeper to continually monitor and feed the colonies to prevent starvation.

Maine has over 47,000 acres of wild blueberries growing naturally in fields and barrens across the southern and central part of the state. Over 90,000 commercial hives are brought in to pollinate the crop. Like almonds, Maine's blueberry pollination was originally a local phenomenon, first using native pollinators around the barrens. As the acreage grew, colonies came from Maine, Massachusetts, New York and even New Jersey, but today colonies come from all corners of the nation to pollinate this crop that is so important to Maine's economy.

I found the cultivation practices of low bush blueberries fascinating. Some of the fields have been in production since the 1840's and very likely even longer. Maine's Native Americans cultivated the tiny blue berries for dried and fresh consumption. Much like the growers today, the native people used fire to maintain the fields and keep out competing plants. Looking across the barrens you see a low growing carpet of vegetation but when you look closer you will note differences in the clumps of plants. The entire field is a patchwork of different looking clusters of plants called clones. Each clone is a single plant growing 8 to 12 inches tall connected by underground rhizomes and may reach a size of 25 square yards. When the forest is cleared, the naturally occurring blueberry plants begin to spread and eventually fill in the available surface area. Unlike high bush blueberries they can't be grown in a nursery and planted. Stems can be rooted and planted but for some reason they won't form the necessary rhizomes and spread. So, the farmers clear the forest, remove the boulders deposited by the last glacier, create an ideal growing substrate, fertilize and water minimally and the bushes eventually spread and cover the fields. The genetic diversity of the plants reduces pest and pathogen pressure; meaning little spraying needs to be done during bloom. The difference between clones also spreads out the bloom period over several weeks. Standing in the field you can see some clones in full bloom while others within a few feet are still in early bud stage. It's amazing to have this much diversity in a cultivated crop that is so immense in size. Besides the sheer enormity of the fields, bees are essential because they move the pollen from flowers in one clone to flowers in a different clone providing cross pollination. Not all clones are self fertile so for best yields bees are needed to move pollen between the plants just like almond varieties.

The bees in the barrens are looking good this year. Plenty of pollen is coming from native blooming trees and shrubs in the woodlots surrounding the fields as well as blueberry pollen, of course. Most beekeepers feed supplemental protein and sugar syrup during bloom to keep the colonies healthy and growing in case inclement weather keeps the bees from foraging. The challenge, like always, is to feed the colonies enough to prevent starvation but not to overdo it and inadvertently promote swarming.

When blueberry pollination is complete, some of the colonies will leave Maine and go to cranberry pollination in Massachusetts while others will travel to the Dakotas or their home yards to hopefully put on a crop of honey. The remainder will go on to a myriad of other pollination services. As it turns out, wild blueberries are an interesting step in the amazing dance performed by beekeepers every year while Mother Nature calls the tune.



Photo of the barrens, note the different colors of the plants depicting the different clones



Low bush blueberries in full bloom

Posted 22 APR, 2016 by Gordon Wardell

I'm very fortunate to live on the Central Coast of California, especially this year. El Nino didn't deliver all that was promised, but at least we received some good rains on the coast and may even get a little more rain as spring wears on. The bloom on the coast is better than we have seen in several years. The coastal hills are vivid with the pastels of the mustard, the bluish purple of phacelia and the orange of the California poppy...all on a backdrop of the green hills. Definitely a pleasant site after the dry spring we encountered.

My daily commute takes me east to Lost Hills on the western edge of the San Joaquin Valley across Highway 46, a major thoroughfare between the valley and the coast. During my commute I don't see a lot of traffic but what has been noticeable recently are the number of trucks hauling bees from the valley to the coast. Almond bloom came early this year and finished even earlier. Some growers were releasing their contracted bees at the end of February, just an unheard of event. Usually the bees are in the orchards until at least the middle of March, some areas even later. So, the "big dance" of moving two million colonies of bees to pollinate the almond bloom quickly moved into reverse. Colonies were put back on trucks, and the process of shipping them home or to the next pollination event began a month ago. Though the almond bloom was short this year the trees produced good nectar toward the end, and the colonies were heavy with honey coming out of the orchards. Some California beekeepers moved to orange blossoms if they had locations, and others went to locations where they could make splits. Unfortunately, the fertile San Joaquin Valley is a bee desert this time of year; there are plenty of irrigated orchards and vineyards but nothing blooming for the bees. It's too early for alfalfa and cotton, so California beekeepers that have the locations move their bees to the coast to take advantage of the wild flowers or move to locations to pollinate avocados. Hence, it requires the migration I am seeing every morning and night from the valley to the coast.

There is no doubt that migratory beekeeping is stressful to the colonies, but modern agriculture couldn't survive today without the ability to move valuable pollinators where they are needed and when they are needed. Studies have shown that giving the bees a rest on natural flora following intensive pollination is significantly beneficial to the colonies. The bottom line is that we need more open forage for our colonies in this country...places where bees can rest while getting clean, safe forage to rebuild their numbers and colony vitality. It is for that reason Project Apis m. is partnering with other sponsors in our Seeds for Bees and Honey Bee Monarch and Butterfly Partnership projects to increase available forage for honey bees and other pollinators. PAm is seeking to improve the health and survival of honey bees by reversing the loss of high quality pollinator habitat in geographic regions that are critical to bee health and survival. Our purpose is to increase and improve pollinator habitat and to develop affordable, high-diversity seed mixes for critical habitat components for honey bees and all pollinators.

So, I'm comforted by the migration I see to the Central Coast of California because it means there is nearby forage for our bees this year, a little more than we have seen in years past. Like all livestock managers we still need to move our "herd" to better pastures ... but this year it is just a little closer.

Posted 21 Mar, 2016 by Gordon Wardell

To call the 2016 almond bloom an unusual year is an understatement. We were expecting the bloom to be a little bit early but when we started getting eighty degree days in early February the trees couldn't hold back any longer. Many areas went from 5% bloom to full bloom in just a few days. Flight weather for the bees was perfect with only one minor rain event during bloom in the southern part of the San Joaquin Valley and slightly more rain up north. Varietal overlap was perfect and by rights a good almond crop should be set this year. Bloom came on early and finished early as well with some growers releasing beekeepers by the end of February; an unprecedented event to be released from almonds so early.

This year's almond pollination turned out much like 2014, great flight weather during bloom, little rain, in general a good year to set a crop, but unfortunately in 2014 over 80,000 honey bee colonies were killed or severely damaged due largely to tank mixed chemicals applied during bloom. This year we are getting reports of poisoned colonies as well. Hopefully, we won't see nearly that number of colonies damaged but reports are still coming in. Some facts about fungicides: in much of California, fungicides are a necessity during bloom to protect the nut crop from a variety of fungal pathogens. Studies have shown that the judicious application of fungicides during bloom has had little or no impact on the bees, but when those same fungicides are tank mixed with insect growth regulators, and possibly other adjuvants, a combination is formed that may not impact the adult bees but has been shown to be severely detrimental to the brood population. Because the sprays impact the larvae and developing bee population, consequences of the spray are not seen immediately but rather two or three weeks post application. Often the damage isn't noticed after the beekeeper has left the orchard and returned home or gone to the next pollination contract. Typical damage is the lack of larvae in the colony or missing brood cycles, deformed and dying pupae, and many times the bees are unable to emerge from the cells and die with their tongues sticking out. Eventually these dead pupae will be ejected from the colony and the ground in front of the colony will be littered with partially developed pupae.

Following the spray damage in 2014, the Almond Board of California in collaboration with the California State Beekeepers Association, the California Department of Pesticide Regulation and Project Apis m. worked to develop a series of best management practices for safe bloom-time sprays during almond bloom. Reprints of these recommendations are available through the Almond Board of California and can be found on their website (www.almonds.com/BeeBMPs). The principles are simple: (1) Communication - beekeepers should notify the county of where bees are located and communication between beekeepers and growers will eliminate any misunderstandings. Growers and beekeepers should agree on treatment products and methods. (2) Spray only what is needed when it is needed, avoid tank mixes and putting anything unnecessary in the spray program. Avoid applying insecticides until more is known about their impact on brood populations in the colony. (3) If a fungicide application is deemed necessary, it should be applied in late afternoon or evening when bees are not present.

Following the development of these Best Management Practices, a statewide effort was made to raise awareness of these points. These efforts had an appreciable impact in 2015, reported bee poisonings were down significantly and fewer than 500 colonies were reported to have been severely damaged. This was a huge improvement over the 80,000 colonies damaged the year before. Unfortunately, the trend didn't hold. Numerous reports are coming in reporting damaged colonies following almond pollination this year. The cause of the poisoning remains to be determined. The Bee Informed Partnership has sent investigative teams to take samples for analysis. Hopefully, pollen and brood samples will give us some clues as to what is impacting the bees so dramatically and give us a chance to refocus our efforts to protect the

bees during almond bloom and all other pollination events. I will be sure to report the results of the studies in a later edition of the PAm Newsletter.

Posted 20 Feb, 2016 by Gordon Wardell

Just when I thought the year couldn't get any stranger - it does. The threat of a strong El Niño year has produced good snow pack in the Sierras but not much rain in the San Joaquin Valley yet. Last week a high pressure center parked itself over the region and temperatures soared to as much as 20 degrees above normal. Almond bloom came on so fast it was hard to comprehend. The warm temperatures make great flying weather for the bees which is important in a compressed bloom. Good flight weather and varietal overlap should set a good crop this year if everything holds.

Most beekeepers I have spoken with report that their bees are having problems of one sort or another this year. Holding yards are stacked with piles of equipment where the bees looked good early in the season but they started going backwards in January and just didn't make it to bloom. Reports of failing queens and colonies that just wouldn't brood up were common. Normally, bees from the South--and in particular Florida--have thriving populations and big brood nests for pollination. Not this year. Mites, hive beetles and inconsistent forage took their toll. Even with supplemental feeding, the bees didn't respond with the normal big brood patterns. When asked, it's hard for the beekeepers to put their finger on the cause. It is certainly a strange year.

In the last PAm newsletter, I prognosticated that the bee supply might be tight this year but should be sufficient. In the last couple weeks, I've given several talks at grower meetings, and at each one I asked if anyone had trouble finding colonies, nobody raised their hands. While there are reports of almond growers not able to find bees for their ranches, I would have to say it's the exception not the rule. The reports I've heard of shortages came from the central and northern part of the San Joaquin Valley. Neither the Almond Board of California nor Blue Diamond report growers calling to report their inability to secure colonies. Again we have to take our hats off to the American beekeepers who managed to provide colonies for the largest commercial pollination event in the world. Two million colonies in one place (California) at one time. Pollination is not something that can be outsourced; we can't rely on other countries to do this job for us, our borders are closed to bees on combs. All of those bees come from this great country. It's truly amazing when you consider the scope of the undertaking. While our beekeepers may have had difficulties with their bees this year, I'm certain they will identify the problems, bounce back, and continue to provide honey, hive products and pollination that is an inspiration to our agriculture industry and the world.

Posted 28 Jan, 2016 by Gordon Wardell

One million acres. It's not a Dr. Evil quote from an Austin Powers movie; it's the number of acres of almonds in California needing pollination this year. This is a huge production opportunity and at the same time a huge pollination demand. Never before has the industry needed to deliver an estimated two million pollination-strength colonies to California by the first week in February. This is certainly a testament to the proficiency and tenacity of our nation's commercial beekeepers.

Most certainly this is not an easy year to accomplish this feat. Record losses are being reported across the country - some estimate losses in their operations as high as 40% to 60%. Earlier this winter we knew that the Upper Midwest was experiencing heavier than normal losses that were most likely due to mite pressure that just never let up, and now we are getting reports of colonies out of the Southeast that aren't building populations as would normally be expected. A warm fall and winter seemed to throw off the typical floral patterns, and the customary winter forage just wasn't available. Simply put, the colonies didn't grow like they normally would. Beekeepers in Florida, Georgia and Louisiana all are reporting the same phenomenon. Everyone's numbers are down.

What does this mean for the bee supply for almond pollination? At present, while individual beekeepers' numbers appear to be down, there doesn't appear to be a shortage of colonies for almond pollination this year. While the supply might be tight, I don't foresee major shortages. Rental prices are up this year, averaging \$170 to \$185 per colony. This is \$10 to \$15 over rental prices last year. These prices are fair increases considering the amount of feeding needed to ready the colonies for February pollination and the increases in transportation costs.

After the severe colony losses of 2005 and 2006, beekeepers in Florida and the Southeast stepped up to fill the growing need for colonies in California almonds. Increasing almond rental fees coupled with relentless sprays in Florida citrus to control the Huanglongbing, also known as citrus greening disease, beekeepers began shipping more colonies to California instead of staying in Florida to make orange blossom honey. The increase in rental fees made it cost effective for beekeepers to ship colonies across the country. These additional colonies were welcomed in California almond orchards, and their numbers and frame counts have been consistent for the past ten years. This year, however, colonies out of the Southeast are experiencing many of the health challenges as seen across the country. Culling heavily this year, beekeepers are recognizing that inconsistency is one of the consistent trends seen this year. While individual beekeepers are experiencing higher than normal losses many had planned for losses by making more splits. This coupled with new beekeepers entering the industry has eased the shortfall for this year's almond pollination. With bloom just around the corner, colonies are starting to show up in orchards, and the greatest commercial pollination event in the world is getting started. Good luck beekeepers and growers alike.

Dr. Gordon Wardell
Chairman, Project Apis m.