PLANNING FOR VARROA

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We are in the middle of an epidemic of varroa mites (Varroa destructor). Varroa mites damage developing honey bees and transmit a number of deadly viruses, often leading to colony death. This deadly pest has become so widespread in the United States that they are present in virtually every honey bee colony, and can re-infest colonies quickly. If you are a beekeeper in the United States in 2017, your honey bee colonies are at risk from dying from varroa associated viruses.

Those of us in beekeeping education have seen a rather upsetting trend with beginner beekeepers (who aren't enrolled in good classes): they start full of enthusiasm, but will lose all or most of their bees year after year, almost always to varroa. After about 3-4 years of steady losses, many quit beekeeping all together. If you consistently have high losses, you will continue to lose bees until you give varroa the respect it deserves. The beekeepers who succeed are those beekeepers who take varroa seriously, and make varroa control a regular part of their honey bee management.

The varroa mite is one of the most serious pests we have dealt with as beekeepers, but we can take actions to keep our bees safe from it, and there is no reason to lose all or most of your bees to varroa every year. While varroa mites WILL be in your hives this year, not every colony is doomed to die from the viruses that these mites transmit. If you keep the varroa population in check, the honey bees can remain healthy. It is when the varroa population gets out of control that the colony becomes profoundly sick from injury and disease, and is at a high risk of dying.

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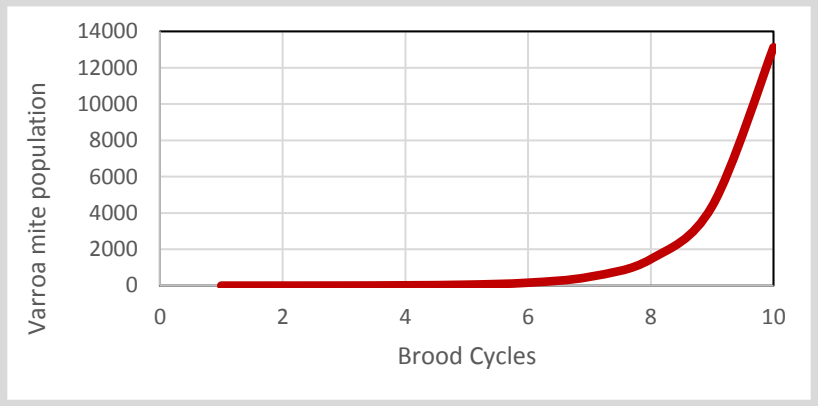
Honey bee with a varroa mite on her thorax and signs of deformed wing virus – one of the viruses transmitted by varroa destructor.

The information below is designed to explain the different tools that we have to manage varroa populations. Your goal as a beekeeper should be to develop a strategy **at the beginning of the season** that will use a variety of these tools, making sure that varroa mites never take over your colonies, and your bees stay healthy.

Varroa mite populations, when left unchecked, can grow quickly. Each female mite reproduces multiple times in her life, and each time she reproduces, she lays multiple daughters (and they all reproduce multiple times, and they all produce multiple daughters, and those daughters reproduce…). All of this reproduction is occurring under capped brood cells, which means two things 1) the more capped brood we have, the faster varroa can reproduce, and 2) we can't see the population of varroa as it grows out of control. **A honey bee colony can look very healthy and large, even when the population of varroa, hidden from our view, is about to explode.**

Figure 1. This graph demonstrates exponential growth. It is an example where a single varroa mite infests a colony and has two daughters, and each successive daughter has two offspring. There are a lot of factors that affect how varroa will actually reproduce and how quickly the population will grow in a real colony, but note how quickly a population takes off if every member can quickly become reproductive.



Even with exponential growth it takes some time for varroa populations to get to dangerous levels. In the real world, they often grow all summer and peak right when winter bees are being raised (late summer / early fall). These winter bees have to survive a period of high stress, and can't handle the extra challenge of being bitten and filled with viruses. This is one of the reasons that varroa mites kill colonies so often in the fall/ early winter.

Colony with parasitic mite syndrome. This colony has a high population of mites. Note the sick, melted looking larvae. There is a very low chance that this colony could survive the stress of winter, even if varroa was controlled at this point.

A colony that is heavily infested with varroa can act as a reservoir, and put other colonies around it at risk. When varroa mites take over a colony, bees will often drift or abscond, and neighboring bees will rob the weakened colony. When this happens, the mites very quickly get transmitted to other neighboring colonies. This means that your infested colony can affect the bees and beekeepers around you, or that your otherwise healthy colony can become reinfested quite quickly from a neighboring colony. Not only are the bees in an overwhelmed colony profoundly unhealthy, but they are a risk to other bees in their neighborhood.

So how do we keep the varroa population from getting out of control? Unfortunately, most of our bees don't naturally have strategies to keep mite populations down on their own (yet) - varroa mites are relatively new to our honey bees (they jumped over from a different bee species), and our bees haven't had enough time to evolve natural defenses. While breeders are working tirelessly to find bees that do have defensive strategies, as of 2017, most of the colonies in the United States don't have the ability to manage varroa populations by themselves. Left alone, the mite populations grow uncontrolled, and our bees get overwhelmed, very sick, and die. We don't have a silver bullet for managing varroa mites (if we had a perfect strategy, they wouldn't be a problem, and we could all go back to happy, easier beekeeping). However, even though we don't have a one-size-fits-all strategy, we aren't helpless. We do have a variety of tools that, if employed well, can help keep the population of varroa mites in check, so our bees and the bees around us can stay healthy.

There are three steps to keeping your bees safe from varroa infestation:

1. Know the level of mites in your colonies,
2. Know what level of mites is safe,
3. Know what tools we have to keep mite populations at a safe level
    a. Tools that break varroa reproduction (keeping a low mite population low)
    b. Tools to use if we have an infestation (bring a high population of mites down)

(Easy, right?).

To keep our bees healthy, we want to monitor our colonies for this pest all season long, making sure that varroa populations never reach dangerous levels. Simultaneously throughout the season, we can use an integrated set of management strategies to help break the reproduction of varroa, preventing the population from taking off. Finally, we want to make sure that we have a plan in place and the tools on hand for if/when we notice an infestation.

1. MONITORING FOR VARROA MITE POPULATIONS

There is a big difference between seeing varroa mites in your colony and monitoring for them - you could have a lot of varroa in your colony, but not actually see any mites when you inspect. This is a really important point that catches a lot of beekeepers. By the time you see mites, it is too late, and you are already at a high population. Remember, most of the varroa mites in a colony are under the capped brood, so they are out of view. You could be on the brink of a huge infestation, but not see mites, so you will not know your colony is safe from varroa by just looking. You have to use a monitoring tool such as an alcohol wash or sugar roll. These strategies allow you to sample bees to see some mites (representing the 1000s that can be in the hive).

The best way to monitor varroa mite populations is to use a sugar roll or alcohol wash, because these methods allow you to get a percent infestation. In both methods you take a known number of worker bees, dislodge the mites from them, and count the mites, calculating the mites per 100 bees (percent infestation).

* **For more details and explicit instructions on how to perform a sugar roll visit** https://pollinators.msu.edu/resources/beekeepers/varroa-mite-monitoring/
* **For instructions on making your own sugar roll kit visit the Bee Informed Partnership website (https://beeinformed.org/2013/03/19/how-to-make-a-sugar-roll-jar/).**
* **To purchase a pre-made mite check kit visit www.pollinators.msu.edu/mite-check.**

Ideally, you should monitor mites at least once/ month. Mite populations can change quickly, and you never want to be caught off guard. Remember, mites have an exponential rate of population growth, meaning that the population can really take off. Even more importantly, you could get infested from nearby colonies, especially if a neighboring hive becomes heavily infested. As heavily infested colonies go downhill, the bees often abscond, entering neighboring healthy colonies, and your foragers can bring back mites from robbing out dying colonies. You could have low levels of varroa all summer long, and then suddenly suffer a huge infestation from neighboring colonies that goes downhill. **Monitor more often in late summer/early fall when mite populations are at their highest, and your colonies are most at risk for re-infestation.**

2. KNOW THE SAFE LEVEL OF VARROA MITES

There are many factors that determine the safe level of mites in your colony, and thresholds are not set in stone. Monitor your colonies (recording their levels and how they survive) and to talk to extension agents and expert successful beekeepers in your area. If you consistently see that colonies with mite populations above a certain level do poorly, then that is your threshold. Be persistent, as thresholds can change over time as the mites or the viruses evolve. Our bees used to be able to handle a higher level of varroa mites without having problems, so you may see higher thresholds listed in older documents.

As of 2017, the general consensus is that <u>less than 3% infestation is safe</u>. This means that in a standard sugar roll test where you count 300 bees (100 ml or just under 1/2 cup), you should see less than 9 mites.

A safe level of 3% is a guideline, but there are other factors to take into consideration. For example, if you live in a northern climate with a tough winter, you want to make sure that you have varroa managed before your winter bees are developed, so those precious bees that survive the winter aren't full of cuts and viruses. You also have to keep in mind how much season is left and what is going on in your colony. If your bees have a break in raising brood, the varroa mites are not going to be reproducing. If you know your bees will still have a lot of brood for the next few months, you have to be aware that the varroa will have a lot of time to reproduce. Northern beekeepers have to work hard to make sure varroa populations are low in the late summer/ early fall to protect winter bees. Beekeepers in warm climates won't be fighting the clock as much, but can't count on a break from population growth in the winter.

3. KNOW THE TOOLS YOU HAVE TO MANAGE VARROA POPULATIONS

We have two types of tools for managing varroa:

1) Ones that are used all season to slow reproduction (management)
2) Ones that are used when we recognize we have a problem / are above threshold (intervention).

None of our management tools completely prevent varroa or can completely remove varroa on their own, so you have to have a few in your toolbox. The best approach is to go in to the season with a management strategy, where you use a variety of tools in cooperation, and you use them all season long so you prevent the mite population from ever taking off. If the varroa population does take off (for example if a neighboring colony re-infests your colony), then you may have to use an emergency measure.

The Tools - Management

1. **Screened bottom boards** – The idea behind screened bottom boards is that when phoretic mites fall off of bees, by just falling or by getting groomed off, they will fall through the screen and onto the ground, where they will be too far away from the bees to re-enter the hive. The effectiveness and cost of screened bottom boards is determined by the set-up. If the bottom is wide open, the mites will fall further (but the chance of a cold draft on your bees is much higher). If the screened bottom board has an inspection board employed, or is set on a solid surface, drafts will be much less of an issue, but screened bottom board will not be effective.

   Pros

   - No work/ not disruptive to the bees

   Cons

   - Does not remove that many mites. Best estimates are that screened bottom boards can cause a < 20% reduction in mite populations, so it has to be used conjunction with other tools.
   - May make the colony cooler during cold periods, which can affect brood rearing.
   - Does not work with some mite treatments that need the colony blocked off.

When screened bottom boards work best – Most of the time. However, because their effects are so small, you will have to use other strategies as well, and those strategies may be sufficient even without a screened bottom board. Plenty of beekeepers use solid bottom boards and can manage varroa, so if you have solid boards and you are successfully managing varroa mites, it may not be worth it to switch.

How to use a screened bottom board – Put it on the hive as a bottom board (yep, that's it).

2. **Drone Comb removal** – Varroa mites prefer drone brood, and at any one time, most of the varroa are under cappings. We can use these facts to our advantage and use drone cells like a trap – we can add drone brood to attract the mites, and once the mites are in the capped drone pupae cells, we can remove them from the hive.

Pros

- You can remove a lot of varroa mites from the colony

Cons

- It takes a lot of energy for a colony to raise a full frame of drones. This energy could be used to raise young, draw wax, or bring in honey.
- If you forget to remove the drone frame in time, you have just provided a lovely place for more mite reproduction.
- It can only be used when the colony is naturally drawing wax and raising drones (not in the fall, or not on small colonies).

When drone comb removal works best – On strong healthy colonies that would be raising drones anyway, and when you have a small enough number of colonies that you can visit each one multiple times on a schedule. Bees will not draw out wax if there is not sufficient nectar, so you can't put in a new drone frame in September as a last minute management strategy.

How to use drone brood removal - Purchase or make a frame that will promote the larger drone sized cells, and put it into the hive on the edge of the brood nest (between the brood and the outside honey frame). Make sure that the colony has sufficient room for honey storage and growth, so they don't just fill it with honey. Record the date that you put the drone comb into the colony, and remove it in three weeks. It should take about a week for it to get drawn out, the queen to lay in it, and the eggs to hatch (though this is variable), and then another week for the larvae to be capped. You have about a two week window while the cells are capped to remove the frame, and kill the larvae. Some people do this one time per year, other beekeepers will do this consistently through the summer. You can also just cut out/ remove large pieces of drone brood while you are in the colony for inspection – feed it to your chickens – they love it.

3. **Breaks in the brood cycle –** When varroa are in capped brood cells two things are happening: they are reproducing, and they are safely hidden away from grooming bees. If you can create a colony with no capped brood, then the varroa cannot reproduce during that time, and the mites that are left in the hive are all phoretic (running loose), and have a greater chance of falling to the ground and getting groomed by the bees. Many wild colonies (and colonies not well managed) can have success just because they have enough brood breaks from swarming to prevent varroa populations from ever reaching high levels.

Pros

- Very effective in stopping varroa reproduction

Cons

- Need to know enough about bee biology to time well.

When breaking the brood cycle works best – When you have strong enough colony and/or enough time left in the season for the colony to handle the loss of workers/honey.

How to perform a break in the brood cycle – Your colony may choose to use this varroa management strategy when it swarms. You can do this for them (skipping the part where you climb the tree, or cut them out of your neighbors soffit), by creating a swarm, moving the queen and capped bees into a nuc. There are many variations on breaking the brood cycle. Some beekeepers will simply remove all the capped and nearly capped brood – using them for other hives (and dealing with the mites appropriately). Others will temporarily remove the queen and eggs, and later reintroduce her. One easy way is to make a nuc with the queen, and allow the original hive to make a new queen by itself. The nuc will grow slowly (not have so much brood to build up a big population of varroa), and the original colony will get a break from having capped brood as they create a queen.

4. **Splits** – Splitting colonies works to slow varroa by preventing a colony from having a high percentage of infested bees, using a principle similar to dilution. Varroa mites reproduce faster than bees, because each colony has only one reproductive bee (the queen), but many reproductive varroa. When you split a colony into many small colonies, each with their own queen, you allow for more bees to be raised. Remember that we measure mite load as percent infestation, or mites per 100 bees. When we split, we keep the same number of mites, but increase the number of bees, so the percent infestation drops.

   Pros

   - Many beekeepers already make splits to increase numbers or make up losses

   Cons

   - Colonies have to have enough bees to raise workers/ get enough honey to survive the season.
   - Many beekeepers are limited by the number of colonies that they can manage.

   When making splits works best – When you have enough time for the colonies to build up sufficiently to make it through the winter. This often goes hand in hand with breaking the brood cycle. Making splits after the honey flow, and requeening with queen cells, causes a nice break in brood production at a time when you won't be needing so many workers.

   How to make a split – There are many ways to split colonies. The best way will determine the size of your colony, the time of year, and your needs. Many beekeepers make splits in the spring for swarm management, or in the late summer after the main honey flow. Splits can be made with various sizes (including nucs), and can be queened by introducing a mated queen, virgin, or cell, or by allowing the colony to requeen. Splits and breaks in the brood cycle often go hand in hand, and many beekeepers split colonies, and create a break in the brood cycle at the same time. One way to do this is to split the colony into two, keeping all the brood in the queenless colony (that will raise a new queen), and putting the queen into a colony with drawn comb so she can start laying. This gives both new hives a break in the brood cycle.

The Tools – Intervention

Sometimes we can have colonies that are on screened bottom boards, have had drones removed, split and allowed to requeen, and our monitoring shows that the mite levels are still high. Maybe we live in an area where there are so many colonies with unmanaged levels of varroa that our pest pressure is too high for us to manage through other methods. Or maybe, we are just starting out in our beekeeping journey, and we don't have the understanding and experience to make splits or break the brood cycle. We need to include intervention tools at this point. There are three cases when chemical interventions are recommended:

1. When you are unable to control varroa populations using only management strategies.
2. You do not have the experience to safely and effectively perform strategies like splits or breaks in the brood cycle.
3. When monitoring shows that varroa populations have already reached dangerous levels, and we need to quickly bring them down to prevent colony damage or death.

Note – Early chemical treatments for varroa were quite harsh (neurotoxins), and many of them no longer work because the varroa mites have developed resistance. Furthermore, many beekeepers were adverse to put these treatments into their hives, because of damage to their bees, concerns about the chemicals in the wax, or build-up in the honey. In this article I focus only on the newer, 'softer' chemicals, which are naturally derived, and most are labeled for organic use. I don't discuss amitraz (Apivar), which is a synthetic miticide that continues to be effective against the varroa mite.

Not all chemical tools are the same, and you need to choose the one that will reduce the varroa populations, and be appropriate to the context. Make sure that you are reading and following labels exactly, and are working with experts to make sure you are doing everything safely and effectively, before you head out to the bee yard.

When choosing an intervention tool, you must take the following factors into account:

1) How early/late in the season is it (i.e. how much time do I have before my bees raise their winter brood)?
2) Are there honey supers on the colony (or will I expect them to be on before the treatment is complete)?
3) How many times can I come back to visit this colony?

Some interventions are good only for affecting phoretic varroa mites (not in capped brood). These methods are only effective during the following two scenarios:

1) When the colony is broodless (late fall – winter, package installation)
2) When you can return every week to apply it (to account for the mites that hatch out with the bees every week).

The applications that fall under this category are oxalic acid and powdered sugar. While both are applied at similar frequencies, and are similarly gentle on the bees, oxalic acid seems to be considerably more effective, so very few people recommend using powdered sugar, except during broodless periods.

Oxalic acid is a naturally found acid (it is what gives you that dry feeling in your mouth when you eat too much spinach). It works by affecting the mites that are loose in the hive, and is applied either by dribbling a low concentration solution in sugar water onto the cluster, or by using a vaporizer. You can use the table at http://scientificbeekeeping.com/oxalic-acid-treatment-table/ to learn how to make a solution and apply the dribble, and any vaporizer that you purchase will have instructions for its safe use. Both methods kill phoretic mites equally well. The dribbling method is a bit quicker, but can't be used

when it is cold out (30-55 degrees is ideal – when the bees are loosely clustered). The vaporizer can be used all year, but requires extra equipment and extra safety precautions.

Powdered sugar is a naturally found chemical that is delicious on French toast. Even though it is delicious, it is still a chemical, and may damage the brood if you get it in uncapped cells. It is not labeled as a treatment for varroa, but many beekeepers will apply it by finely coating the bees with it using a sifter. Some people thinks that it works by causing the bees to increase grooming, and the mites lose their grip (the sugar is so fine, it interferes with their gripping ability). This will work much better if you have a screened bottom board. Many beekeepers use powdered sugar on a new package either when they install it, or after installation but before there is capped brood.

Oxalic acid dribble/drench or vaporizing only works on mites not in the brood. The upside of these methods is that they are relatively gentle on your bees. The downside is that unless you are using them in an exclusively broodless time, you would have to go in every week for three weeks to effectively cause a reduction in mite populations. You wouldn't want to use it if you already have really hive high levels of mites because in the three weeks that it takes to treat the colonies, the mites can continue to damage all of your developing bees.

Best use for oxalic acid and powdered sugar: Keep these tools in your back pocket for new colonies from packages (use after the colony is established in the hive, but not yet capped brood), and for broodless periods (fall/winter). Both are really cheap, and store well, so they are good to have on hand. Because these interventions seem to be so easy on the bees, many beekeepers use these automatically, to knock down the number of mites that would over winter with the colony. The fewer mites you have in the spring, the longer you have until the population of mites will skyrocket, so using oxalic acid in the late fall or early spring is highly recommended as part of your strategy.

Pre-Packaged interventions

Many manufacturers have developed delivery systems that make their product easy to apply, to keep the product in the hive until all the varroa are out and are affected, and control the amount applied to the colony. Three interventions fall under this category: two types of thymol and hop acids.

Thymol is the oil derived from the thyme plant (the herb). It seems to be very effective in controlling mites when used in sufficient concentrations (if you just plant thyme plants near your hives, they won't control varroa, though they will look nice). It is sold under two names: Api Life VAR and ApiGuard.

Api Life VAR comes in a wafer form, and has other essential oils mixed in (menthol, camphor, and eucalyptus). You do have to put multiple wafers in the colony to get the full dose (every 7-10 days), but they are easy and not disruptive to apply. ApiGuard is a crystal gel that is put in the colony a little tray, and lasts for two weeks. After two weeks, you put another tray on for a following two weeks. Make sure that you read the labels so that you get the timing right and apply them properly.

Best use for thymol: The biggest thing to worry about with thymol is the oil affecting the flavor of the honey. Do not use thymol when you have honey supers on. They also aren't effective against the mites unless it is warm enough, so these can't be used very early in the season. Most beekeepers use thymol in the late summer right after the honey supers come off (July). This is an excellent option for those who

monitor and find a high level in late summer, or as a go-to treatment for beginners to use in late summer, as they are learning about integrated pest management.

Hop acids come from a plant that is used in beer. Like the thymol applications, Hop Guard II strips are designed to have a sufficient concentration to affect mites, without being too damaging to the bees, so you can't just use beer in your hive (though science has shown that you can have a beer after applying the strips). The labels indicate that you can use it up to three times per year, and most beekeepers who use it do these three applications right in a row. HopGuard II is not labeled for organic use because of the formulation.

Best use for HopGuard II: You don't want to use the same thing over and over, so this is good to have in rotation. The upside is that it can be used when honey supers are on. If you want to wait until the last minute to extract honey, but you are concerned about rising levels in your colony, or you want to drop the population in the spring, but don't want to wait to add supers, then Hop Guard II would be a good option.

Make sure that you use these long-delivery methods early enough to protect your winter bees, as they all have a really long time to be effective (3 – 4 weeks). The most common mistake is to put them on too late, after your winter bees are already damaged. In years where we have a warm fall, many beekeepers think that they are lucky because they can 'get a treatment in' before winter. In reality, the bees are already damaged, and they just wasted their money and harassed their bees without benefit. Give these interventions time to work, and make sure you pay attention to when you need honey supers on and when your winter bees will be raised.

Single applications that affect phoretic and non-phoretic varroa mites

The downside to everything listed above is that they do not get all the mites in capped cells, and so they take a long time to clear the colony of mites. Formic acid, sold under the name of Mite Away Quick Strips (MAQS) has a huge advantage in that it is designed to affect all the mites in a colony, including those reproducing in the capped cells, and it does so quickly (7 days).

Formic acid is naturally found in the hive (in very small quantities), and works by affecting the cuticle of the mite. It dissipates completely and quickly after use, so you can use it when honey supers are on, and it doesn't affect the honey. The best part about using the MAQS is that they work quickly. This is especially important when you find a colony that has a really high level of mites, or if you are getting late in the season. One 7-day application can cause a huge drop in the mite population very quickly. The down side, is that there is a temperature window that has to be followed, or you can damage your bees – it is only labeled for use below 85 degrees.

Best use for formic acid (Mite Away Quick Strips): If you need to treat when you know you will have honey supers on. Because this method works so quickly, it is highly recommended to use MAQS if the varroa population in your colony is very high, or if it is getting late in the season. It can also be used as a ½ treatment, which has less risk of brood damage. You can use single strips during the summer to keep levels low (but use a full treatment if you need to knock populations back).

	Commercial Name	Application Method	Honey Supers on?	Length of treatment	Temperature

Oxalic Acid	None	Home mix vapor or dribble	Not by label	1x/week 3 weeks or during broodless	When bees are in a loose cluster
Powdered Sugar	None	Dusting	Yes	1x/week for 3 weeks or during broodless	No restrictions
Thymol	Api Life VAR	Wafers	No	3 x 7-10 days apart	65-85
Thymol	Api Guard	Gel	No	2 x 2 weeks apart	Above 60
Hop Beta Acids	Hop Guard	Strip	Yes	10 -14 days, up to 3x	None listed
Formic Acid	Mite Away Quick Strips	Wax pad	Yes	One 7-day treatment	55 - 85

Formulations (and opinions/recommendations) can change every year. Make sure that you read labels, and talk to other beekeepers and extension agents to see what they are using with success. For more information on varroa management tools, see the Honey Bee Health Coalition's 'Tools for Varroa Management' document, and Randy Oliver's website www.scientificbeekeeping.com.

There are lots of other things that you will read about that people will put in their hives, and I can't recommend any of them. An essential oil that hasn't been studied is not better than an essential oil that we know that it works and is safe. Keep in mind how sensitive bees are, especially to smell, so any time you put something in a hive, you will affect your bees. The products listed in the table above have all been tested to find the level that is effective on varroa, while not causing unnecessary damage to your bees. If you go off label, or try a different remedy, it may be completely ineffective, illegal, or it may even cause more damage than good.

GENERAL PRINCIPLES

1) Remember that **successful management is about the mite population levels and the health of your bees, not the number of treatments that you applied**. Applying a bunch of treatments does not mean your bees are healthy. If they weren't applied properly, or too late, or were not sufficient to drop the population of mites to a safe level, then your bees are still at risk. Likewise, allowing bees to succumb to varroa to remain treatment-free, is also not success. We are being successful beekeepers when we keep our bees healthy and free from pests.

2) **Monitor to make sure that your management and interventions are working and are sufficient.** Your mite populations may be kept in check with just using drone brood removal, and you can save time and money and stress to the bees because you don't have to perform further interventions. Or, maybe you applied thymol gel, but by the time you got it in the hive, your varroa population was so out of control and just the one series was insufficient to bring the population down to safe levels. The only way to know if your actions are sufficient is to monitor.

3) **Be prepared to change/ modify your strategy.** Strategies have to change from year to year, because the varroa population will grow at different rates depending on what happens in your colony, and the threat from neighboring bees will change over time. In a really long season when the bees can keep raising brood, the mites can reach enormous populations. The next season, if all your colonies swarmed early, then shut down during a drought, mite populations may hardly grow at all.

4) **What works for someone else may not work for you.** Many people who are successful with little intervention do so because they are in remote areas, and don't have a lot of pest pressure. If you live in a city with many beekeepers, then there may be constant infestation pressure, and you will have to be more watchful. Some bees can handle varroa better than others as well. Your neighbor's bees

may do just fine with just a split, but the bees in your colony may need extra help. Give the bees the help they need, then plan to get queens from your neighbor next year.

5) **Think way ahead and be proactive.** If your winter bees will be developing in the end of August, and you are planning on using a product that takes four weeks to work, then figure out the date that it needs to be in the hive, and act accordingly. While a colony can sometimes recover if it is treated during an infestation, your bees will still be damaged, and that damage can have long lasting effects on the colony. It is much better to stay ahead of varroa populations so that they never take off in the first place. One of the biggest mistakes that beekeepers make is dealing with varroa once it is already at really high levels and the brood are already heavily damaged.

The best strategy for dealing with varroa is to be prepared, and to incorporate summer management that can interrupt varroa population growth.

EXAMPLES OF SUCCESSFUL MANAGEMENT STRATEGIES FOR THE VARROA MITE.

1. Marcie is a beginner, starting out with new packages. She dusts them with powdered sugar a week after installation. She isn't planning on taking any honey off her first year, and in July applies Api-Guard at two week intervals, according to the label. She purchases a sugar-roll kit and spends the winter reading about making splits and integrated pest management so she is prepared for next year.

2. Ben's hives came through winter really well. He split them all in spring, giving them all a break in the brood cycle. After the honey flow is over in July, he split them again using queen cells. In August he monitors, and seeing that varroa populations are below threshold, waits until the colony is broodless in October and applies oxalic acid using a vaporizer to knock down any remaining varroa before next spring. Ben's apiary is growing, but his varroa population is not.

3. Bill split his two overwintered hives with walk away splits, so half of them had to raise new queens. He put two frames of drone brood in each colony, and removed them each 2 times over the summer. When he monitored in the fall, he was well below threshold in three of the hives, and one hive was higher. He put formic acid in that hive, and he stayed below threshold through September. He congratulated himself with a beer and went fishing.

4. Anita has two overwintered hives. She gave a nuc from each to her mentor as swarm control, and treated in the spring with hopguard. She monitored using her sugar roll kit all summer long, and found that one colony never had high levels of varroa, while the other colony did. She applied thymol, and tested again after two weeks. Still finding high levels, she applied formic acid. She monitored again, and found that she had gotten the infestation under control. She makes a plan to requeen that colony with a queen from the one that managed varroa better.

5. Meghan just started beekeeping last year. Her first year she didn't do anything to manage varroa (though both hives swarmed). Her hives made it through the winter, but she doesn't want to think about managing varroa, and doesn't monitor, make splits, or apply anything to keep populations in check. She wraps them up for winter, puts on a quilt box and leaves all the honey, and hopes

really, really hard that they make it through until spring. Meghan's bees die from parasitic mite syndrome, and she vows to do better by her bees next year.

The best way that you can help your bees this year is to make sure that the colony does not ever get taken over by varroa mites. A colony that is strong and thriving, and producing large amounts of bees and brood will likely succumb to varroa associated viruses in less than two years unless something is done to check the mite population. The bees in a colony heavily infested with varroa mites are profoundly sick, and are a risk to all of the bees around you. Make sure you have a strategy in place before going into the season so that you can stay ahead of this pest!

- Learn how to effectively monitor mite populations.
- Use splits, drone brood removal, and other management strategies to keep varroa populations in check throughout the season.
- Have products on hand to intervene if your bees have high levels of mites.
- Make sure that your winter bees are raised in the best conditions, and aren't getting heavily damaged by mites.

Your bees deserve to be healthy and free of pests.

Make this the year that you keep the varroa mite under control!

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Varroa management plan worksheet – EXAMPLE

New Hives Example 1 (Heavy disease pressure in area)

Month	Action
April	- Apply oxalic acid by drench 1 week after queen is released
May	- Monitor
June	- Apply Hop Guard 2
July	- Monitor - Apply Apiguard or Api Life Var
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

New Hives Example 1 (Light disease pressure in area)

Month	Action
April	- Apply oxalic acid by drench 1 week after queen is released
May	- Monitor
June	- Monitor
July	- Monitor - Apply fully MAQS
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

Over wintered Hives Example 1(Heavy disease pressure in area)

Month	Action
April	
May	- Perform walk away splits - Monitor
June	- Apply ½ MAQS Treatment - Monitor
July	- Monitor - Remove honey at end of month - Apply Api guard
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

Over wintered Hives Example 2 (Light disease pressure in area)

Month	Action
April	
May	- Perform walk away splits - Monitor
June	- Drone brood removal - Monitor
July	- Monitor - Drone brood removal
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

Over wintered Hives Example 3 (Experienced beekeeper)

Month	Action
April	-
May	-
June	-
July	- Create splits with cells - Apply oxalic acid drench after mating
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid