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Bee Health Is Not Just About Numbers of Hives

USDA- NASS released its annual report of honey bee losses last week (https://www.usda.gov/nass/PUBS/TODAYRPT/hcny0817.pdf). These annual bee health and honey surveys by NASS are a snapshot in time. These surveys can be confusing for the non-beekeeper. However, it shows what any beekeeper would expect to find. Varroa counts increase in the Spring as the queen begins to lay eggs again (varroa mites breed in the drone cells of hives), and beekeepers purchase packages of bees from the south. Those packaged bees are not often treated for varroa when shipped north and east, so the bees come already infected with varroa mites. "Renovated hives" (requeened or new packages of bees installed into an old and now empty bee hive) always happens in the spring, so of course the numbers will be high then. And, as such, renovated hives are never done late in the season after October, so of course those numbers would be down. This survey shows the schedule of spring hive build up and fall hive slow down, but it does not mean that bee health is improving. Bee health is just not that simple.

The degree of hive management skill and experience of beekeepers today makes it possible for a beekeeper to begin the season with 100 hives, making splits creating an additional 36 hives, but ending the season with only 36 hives; suffering a 65% overall loss having lost a total of 100 hives. For example, a beekeeper may begin the crop pollination season with 100 bee hives:

100 hives pollinate almonds
-8 hives lost to pesticide exposure from neighboring field to almond orchard
-2 hives lost to Varroa
90 hives travel to apples
-6 hives lost to weather and pesticide exposure
84 hives remaining
+16 splits are made from among the 84 hives
100 hives travel to cranberries
-30 hives lost due to fungicide applications on the crop
70 hives travel to pasture land for four weeks
+ 20 splits made from among the 70 hives
90 hives travel to pollinate row crops in the south staying for the balance of the summer
-54 hives lost while pollinating row crops
36 hives remain to go into winter

The combinations of reduced bee pasture, the lethal and sublethal mix of agricultural, garden, and lawn chemicals, the effects of Varroa, and bee diseases tax the beekeeper's skill and experience. This is the real-world of beekeeping, of crop pollination. The total number of hives do not show the whole picture.

Improving honey bee health cannot be quantified by the total number of hives. Bee health is impacted by the lack of pesticide-free forage and water, by immune systems weakened from exposure to sub-lethal levels of pesticides, which allow the diseases from the varroa mite, and other bee pests to overwhelm a bee colony. Comparing 2015 (http://usda.mannlib.cornell.edu/usda/nass/BeeColonies//2010s/2016/BeeColonies-05-12-2016.pdf) and 2016 total honey bee colony numbers from USDA-NASS shows:

Month	Five or more colonies -**2016**	**2015**
Jan. 1	2.62 M *(down from 2015)*	2.82 M
April 1	2.80 M *(down from 2015)*	2.85 M
July 1	3.18 M *(increased in 2016)*	3.13 M
Oct. 1	3.03 M *(increased in 2016)*	2.87 M

Yet, of those 3.03M colonies that went into winter in October of 2016, total colonies reported by January 1, 2017 decreased to 2.62M colonies.

The media needs to stop buying into the "mysterious malady" premise. There is no "mystery" of the factors impacting honey bee health: pesticides, pests, pathogens, and poor forage. To continue the fallacy of a single malady is a misleading and false. It does not explain what we know is happening to bee colonies, and it places all of the blame on one bee pest. Research has examined the sublethal effects of pesticides accumulating in the environment, and within bee hives. As bees are samplers of the environment, they collect in their food (pollen and floral nectar) sublethal levels of pesticides. This sublethal level of pesticide exposure across the growing

season is causing bees to die off faster than a queen bee can lay eggs to replace the early dying bees. Additionally, there can be a "blip" in bee losses due to a reduction in pyrethroid sprays in soybeans. Beekeepers tell us, last year less pyrethroids were sprayed onto soybeans, where bees like to forage, so less bee hives died from this labelled bee toxic pesticide. Pyrethroids can be applied to protect a crop and can protect pollinators by making night-time applications of the pesticide, and not tank mixing it with other pesticides that might increase the residual toxicity beyond eight hours. When examining bee health one cannot simply assess the total honey production or the total number of hives with or without mites, but every single factor, and the cumulative effects of all of the factors. Good science, that seeks correct answers in order to provide solutions, understands that all factors must be examined. The media, scientists, regulators, and NASS analysts need to expand their assessments to the collection of real-world data. Bee health is not a singular assessment—as samplers of the environment, honey bees are telling us the accumulation of pesticides make the immune system weaker, reduces the reproductive ability of the queen and drone bees, can make bees forgetful, accelerates the hive tasks of worker bees, and affects the next generation of bees. It is disingenuous for others to continue to say "more research is needed," or "the research is inconclusive," about the impact of pesticides upon honey bees, when so many of the chemicals are registered, and sold with federal pesticide labels clearly stating "this product is toxic to honey bees." (For example see this pesticide label http://www.syngenta-us.com/currentlabel.aspx?productid=721) While assessing the health of bees from the four factors impacting their health: pesticide exposure, bee pests and diseases, and loss of forage is difficult for scientists, that is no reason to discount the experience and knowledge of what beekeepers see in their hives. While it is difficult to conduct

scientific analysis when examining multiple factors, that is the real-world of our honey bees—multiple factors. We cannot continue to do research simply on one pest of the bee thinking that is the only problem. We cannot continue to ignore the other impacts upon bee health that allow the varroa mite to have such an impact. The additional factor in the US is the intense use of pesticides in industrial agriculture, and in our cities that contribute significantly to the weakened health of honey bees exacerbating the impact of the varroa mite.

Counting a few extra hives, does not mean the problem is solved, or even heading in the right direction. The sublethal accumulation of pesticides in the hive, the pollen and nectar bees collect that has been sprayed with pesticides, eating this sublethally pesticide tainted food across the growing season affects the queen and drones reproductive ability, it affects the next generation of bees, the brood, and it slowly causes the hive to dwindle in population. The bees have shorter lifespans, and the queen cannot lay enough eggs to replace the bees dying earlier than they should, and the hives simply disappear as all of the bees die too soon. They leave behind a full box of honey, but the organism called the bee hive has died. This continues to occur to beekeepers. Our honey bees have health issues: much of it due to us. Monocrops do not provide diverse pollen and nectar for bees. Exposure to pesticides in the pollen, nectar, and water impacts bees. Forage that is contaminated by pesticide drift through the air, soil, and water further impacts basic bee nutrition which would strengthen the bees' immune system in order to fight-off bee diseases. Humans can change how they manage the land, how they apply pesticides, and how their actions affect the very insect pollinating their crop or their neighbor's crop.

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