Honey Bee Apiaries on National Forests in Utah

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Western bumblebee (*Bombus occidentalis*), a resident and current candidate for listing under the Endangered Species Act

A recent application by a private beekeeper to the U. S. Forest Service proposes pasturing enormous numbers of honey bees in apiaries on four of Utah's National Forests - The Manti-La Sal, the Fishlake, the Uinta-Wasatch-Cache and the Dixie - for four-five months. This is a very bad idea for several reasons:

1) **Utah is home to more bee species** than any other state in the union save California and perhaps Arizona and Nevada. There are 1,128 recorded native bee species in Utah, most of which are solitary rather than social. For comparison, Grand Staircase Escalante National Monument (GSENM), which is near to two of these forests, has >650 documented bee species on about 1.9 million acres (Messinger et al., paper submitted to PEERJ, 2018) not much less than the 750 species found east of the Mississippi. The three most southern of these National Forests total about 4.9 million acres and are likely to have at least as many species as does GSENM.

2) **These bee species have evolved as pollinators of our diverse native** flora and are instrumental in maintaining the integrity of our native ecosystems. They are essential for the production of fruit and seeds for wildlife and make possible future generations of the plants which feed wildlife and from which our ecosystems and watersheds arise. Many are extremely specialized in the flower species they can visit for pollen and are therefore more vulnerable to competition from honey bees because of their small population sizes and likely genetic impoverishment (Zayed et al. 2005).

3) **Honey bees, though invaluable as crop pollinators, are not native** to the Americas and have evolved social and foraging behaviors which make them fearsome competitors for the pollen and nectar all bees require as food. The honey bee behavior of recruiting nestmates to rich sources of pollen and nectar enables them to outcompete and displace many species of native bees – already

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under pressure from the removal of forage over much of these forests by livestock grazing - and will make it impossible for them to reproduce at replacement levels. Persistent pasturing of honey bees on native wildlands will greatly reduce populations of many native bee species and eventually push them towards extinction on these forests.

4) **Native bees do a better job of pollinating the native plant species** they have evolved with, while honey bees vary in their pollination effectiveness: they will pollinate some native plant species effectively but not others;. Replacement of natives by honey bees will thus result in a change in the mix of seeds produced by native plants with cascading effects throughout the community; if such honey bee pasturing persists, the species composition of forbs and shrubs in the forests will change over time in unpredictable ways. We have no way of knowing if this alteration will be positive or negative.

5) **A large land area will be required to feed enormous numbers of honey** bees for 4-5 months, as shown in several studies by honey bee ecologists. Smart et al., (2016) estimated that 80 acres of land is necessary to support a hive of bees for five months. During this period the honey bee foragers in one hive would remove enough pollen to have reared approximately 150,000 native bees (Cane & Tepedino 2017). Typical hives coming out of west coast orchards in late spring/early summer are grouped, ill-advisedly but for logistic purposes, in apiaries of 100 hives. Conservative estimates of the amount of pollen removed over 5 months by the bees in one apiary is thus equivalent to between 10 and 15 MILLION native bees. Such an apiary would require about 8,000 acres of forest service land. Ten such apiaries would require 80,000 acres of forage and would remove enough pollen for between 100 and 150 MILLION natives and so on. Seeley (2009) and Roubik (1989) found that honey bees will typically fly a median distance of 5-6 km and, under certain stressful circumstances (high densities of bees to flowers), as far as 12-13 km for forage. It is unquestionable that pasturing large numbers of honey bees on these forests would have devastating effects on the native bee fauna.

6) **Honey bees are currently under pressure from pesticides and various disease agents** which have reduced the number of hives nationwide. Although research on disease spillover between domesticated honey bees and native bees has only begun recently, already numerous studies have uncovered disturbing connections (Tehel et al. 2016). For example, it has been established that honey bees in almond orchards carry a host of pathogens (Cavigli et al. 2016; Gisder and Genersch 2017). Even more important, Singh et al. (2010) have shown that Israeli Acute Paralysis Virus (IAPV) is transferred at flowers between honey bees and bumblebees. Several studies have shown that DWV (Deformed Wing Virus) is transferred from honey bees to bumblebees and that it is pathogenic (Fürst et al. 2014; McMahon et al. 2015). There is additional evidence that DWV has infected other non-honey bee species including the bee *Ceratina smaragdula* in Hawaii (Santamaria et al. 2018); that DWV and Black Queen Cell Virus (BQCV) have been transmitted from honey bees to bees in the genera *Andrena, Anthophora, Bombus, Osmia*, and *Xylocopa* in Europe (Radzevičiüte et al. 2017) and also that these viruses replicate in those bee genera. Other studies have demonstrated that several viruses are shared by honey bees and native bees though the direction of transmission or whether the viruses are pathogenic in natives remains to be elucidated (e.g., Ravoet et al. 2014; Alvarez et al. 2017). Finally, there is also evidence that some viruses that are highly pathogenic to honey bees (Acute Bee Paralysis Virus) may spill over from native bees (Singh et al. 2010). In view of these facts, we must ask: is it prudent to contaminate our native bee fauna, already under intense pressure from a variety of stressors, with honey bee viruses and conversely, to possibly introduce new viruses from native bees to an already beleaguered honey bee pollination force?

7) **These four forests are all within the historic distribution of the western bumblebee,** *Bombus occidentalis*, a declining species which is currently being considered by the U. S. Fish & Wildlife Service for listing as threatened or endangered under the U. S. Endangered Species Act. There are recent records of its occurrence either on these forests or nearby. And, lest we forget, there is already evidence that the honey bee passes the debilitating deformed wing virus to bumblebees.

8) The positive experience of many recreationists will directly clash with large numbers of honey bee hives on National Forests. Use of all national forests by recreationists had risen to about 148 million visits in 2016 (https://www.fs.fed.us/recreation/programs/nvum/pdf/5082016NationalSummaryReport062217.pdf); FS Region 4 alone estimates 16.5 million visits. Many of these visitors will feel uncomfortable or fearful in the presence of honey bees (Schmidt 1986), and roughly 5% of visitors will be allergic to honey bee venom (Golden 2013) which is twice as painful as the venom of most native bees (Schmidt 2016).

9) Finally, **there are alternative programs to help provide forage for honey bees to produce honey and to regain strength** when they are not pollinating crops. The CRP, EQIP, WHiP and CSP programs of the USDA plus numerous other directives to numerous government agencies put forth in a Task Force formed by the Obama White House in 2014-2015 need to be encouraged, reinvigorated and improved. We should support the honey bee industry but not at the expense of our native species and their contribution to the integrity of our ecosystems.

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Note: The most important papers are denoted by two asterisks (**)

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