Why Honeybee Apiaries Should Never be Permitted on Utah Public Lands

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Private honey beekeepers are increasingly eyeing public lands as sources of flower nectar for their commercial honey operations when their spring and early summer crop pollination business winds down. Their desire for low cost public land use is due, in part, to pesticide use on private lands and in part to the withdrawal, for a number of reasons, of historic honey pasture lands in the upper Midwest (Durant 2019). However, the use of public lands for pasturage of honey bees is ill-advised for multiple reasons including the availability of alternative options such as the federal USDA Conservation Reserve Program, the NRCS Environmental Quality Incentives Program and business collaborations with private land owners. Here's why:

1. **Utah has an extraordinarily rich bee fauna of over 1,000 species, most, if not all, of which occur on public lands** (a recent study has documented over 650 species in Grand Staircase Escalante National Monument alone, many of which are uncommon, rare or new to science: Carril et al. 2018). These native bee species have evolved as pollinators of our diverse flora and are instrumental in maintaining the integrity of our ecosystems. They pollinate the native plant species with which they have evolved, thereby enabling the production of fruit and seeds for wildlife and making possible future generations of the plants from which our ecosystems and watersheds arise.

2. Honey bees (*Apis mellifera*), though invaluable as crop pollinators, are not native to the Americas and have evolved novel social and foraging behaviors which make them dominant competitors of native bees for the pollen and nectar all bees require as food. Their unique forager recruitment behavior enables **honey bees** to **outcompete and displace many native species** (e.g., Geslin et al. 2017; Henry and Rodet 2018; Portman et al. 2018; Valido et al. 2018; Hung et al. 2019), which are already under pressure from the removal of forage (including flowers) over much public land by livestock grazing. By gathering prodigious amounts of pollen, honey bees make it impossible for native bees to reproduce and replace themselves in healthy numbers, thus pushing them towards extinction. It has been estimated (Cane & Tepedino 2016) that a single average-sized honeybee hive removes enough pollen to rear 33,000 native bees/month. Requests by beekeepers for honey bee pasturage are usually for four summer months, or the equivalent of 132,000 native bees/honey bee hive. It has also been estimated that a small hive (~10,000 bees) would require 80 acres of forage over that four-month summer period (Smart et al. 2016). (It should be noted that the more common size of hives to be moved to public lands is 30,000 bees, so their acreage requirement would be much larger). Because an apiary usually contains 40-100 hives, **the honeybees in each apiary would remove enough pollen to rear between 5 and 13 million native bees over a four-month period**. Even more ominously, beekeepers typically seek pasturage for many apiaries.

3. Generally, **native bee species do a more effective job of pollinating the diverse native flora** with which they have evolved than do honey bees (Goulson 2003; Dohzono and Yokoyama 2010; Schweiger et al. 2010; Aizen et al. 2014; Aslan et al. 2016; Magrach et al. 2017). In contrast, honeybees vary not only in their pollination effectiveness from plant species to plant species but also in their flower preferences. Numerous studies have documented the **preference of honeybees for invasive flower species, i.e., weeds (**Barthell et al. 2001; Requier et al. 2015). However, honey bees, especially when present in large numbers, also visit a wide variety of flowers including most native species and thereby displace native bees. Displacement of natives by honey bees will thus change the mix of seeds produced by resident plants and increase the seeding of unwelcome invasives. If such honey bee pasturing persists, the plant species

composition of our public lands will change over time, perhaps rapidly and quite probably permanently and with effects that will cascade throughout the ecosystem in unpredictable ways.

4. **Honey bees and native bees exchange debilitating diseases.** Honey bees are currently under pressure from various disease agents which have impacted the number of hives nationwide. Although research on disease spillover between honey bees and native bees is in its infancy, already several studies have shown that pathogens can be passed to native bees at flowers and elsewhere and that some of these diseases are debilitating to natives (Tehel et al. 2016; see Koch et al. 2017 for a review). It has been established that honey bees in almond orchards carry a host of pathogens before they are moved into honey production areas (Cavigli et al. 2016; Gisder and Generesch 2017). Other studies have documented the transfer of viruses from honey bees to bumblebees (Singh et al. 2010) and have demonstrated pathogenicity (Fűrst et al. 2014; McMahon et al. 2015). There is also evidence that other viruses have been transferred from honey bees to several genera of native bees (*Ceratina, Andrena, Anthophora, Osmia, Xylopcopa*; Radzevičiūte et al. 2017; Santamaria et al. 2018) and that these viruses replicate in these bee taxa. Conversely, native bees carry diseases to which honey bees may be susceptible (Singh et al. 2010). In view of the rich and unfortunate history of disease transmission between wildlife and domestic animals both here and abroad (e.g., (Cunningham 1996; Daszak et al. 2001; Cortázar et al. 2007), we can ill afford to introduce novel pathogens into native bee and honeybee populations (the latter already beleaguered) when we have no idea of their effect.

5. Many public lands lie within the historic distribution of several rare species of bumblebees, e.g., the **western bumblebee, (*Bombus occidentalis*)** in Utah, *B.franklini*, and *B. terricola*, which are being considered for listing as threatened or endangered under the U. S. Endangered Species Act. These species are at great risk from honeybee invasion as there is already evidence that the honey bee passes the debilitating twisted wing virus to bumblebees (Fűrst et al. 2014).

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