

Environmental Consequences of Honeybee Apiaries on Public Lands

for Forest Planning scoping period comments

Thomas Meinzen and Mary O'Brien, Grand Canyon Trust

Potential Desired Condition in Native/Non-Native Species:

Native bees dominate over honey bees in all vegetation communities.

Suggested Standard:

Commercial, non-native honey bee apiaries are not permitted.

- Honeybees introduced on public lands compete with—and outcompete—native bees and other pollinators for floral resources.¹
 - With hives 10,000-40,000 bees strong, honeybees consume large amounts of pollen and nectar needed by native bees to raise their young. One honeybee hive consumes enough pollen in a single summer to raise 33,000 native bees.²
- Competition with managed honeybees has been shown to reduce floral visitation,³ fecundity,⁴ diversity,⁵ and nectar foraging success⁶ in wild, native bees.
- Honeybees on public lands can transmit deadly infectious diseases and parasites to native bees, since they both land and feed on flowers.⁷
 - 24 viruses have been identified in managed honeybees,⁸ including deformed wing virus⁹ and black queen cell virus,¹⁰ both of which have been transmitted to native bees. These diseases

¹ Victoria A. Wojcik et al., "Floral Resource Competition between Honey Bees and Wild Bees: Is There Clear Evidence and Can We Guide Management and Conservation?," *Environmental Entomology* 47, no. 4 (2018): 822–833.

https://www.researchgate.net/profile/Victoria_Wojcik2/publication/325627761_Floral_Resource_Competition_Between_Honey_Bees_and_Wild_Bees_Is_There_Clear_Evidence_and_Can_We_Guide_Management_and_Conservation/links/5b2915694585150c63dcccde/Floral-Resource-Competition-Between-Honey-Bees-and-Wild-Bees-Is-There-Clear-Evidence-and-Can-We-Guide-Management-and-Conservation.pdf

² James H. Cane and Vincent J. Tepedino, "Gauging the Effect of Honey Bee Pollen Collection on Native Bee Communities," *Conservation Letters* 10, no. 2 (2017): 205–10, <https://doi.org/10.1111/conl.12263>. <https://conbio.onlinelibrary.wiley.com/doi/epdf/10.1111/conl.12263>

³ Anna Torné-Noguera et al., "Collateral Effects of Beekeeping: Impacts on Pollen-Nectar Resources and Wild Bee Communities," *Basic and Applied Ecology* 17, no. 3 (2016): 199–209. <http://iranarze.ir/wp-content/uploads/2016/10/E2243.pdf>

⁴ Dean R. Paini and J. Dale Roberts, "Commercial Honey Bees (*Apis Mellifera*) Reduce the Fecundity of an Australian Native Bee (*Hylaeus alcyoneus*)," *Biological Conservation* 123, no. 1 (2005): 103–112.

https://www.researchgate.net/profile/Dean_Paini/publication/241436264_The_Impact_of_the_European_Honey_Bee_Apis_mellifera_on_Australian_Native_Bees/links/59f926d5458515547c26b133/The-Impact-of-the-European-Honey-Bee-Apis-mellifera-on-Australian-Native-Bees.pdf

⁵ Ernesto I. Badano and Carlos H. Vergara, "Potential Negative Effects of Exotic Honey Bees on the Diversity of Native Pollinators and Yield of Highland Coffee Plantations," *Agricultural and Forest Entomology* 13, no. 4 (2011): 365–372.

https://www.researchgate.net/profile/Carlos_Vergara4/publication/260001574_Potential_negative_effects_of_exotic_honey_bees_on_the_diversity_of_native_pollinators_and_yield_of_highland_coffee_plantations/links/5b55ebc945851507a7c1eb04/Potential-negative-effects-of-exotic-honey-bees-on-the-diversity-of-native-pollinators-and-yield-of-highland-coffee-plantations.pdf

⁶ Mickaël Henry and Guy Rodet, "Controlling the Impact of the Managed Honeybee on Wild Bees in Protected Areas," *Scientific Reports* 8, no. 1 (2018): 9308. <https://www.nature.com/articles/s41598-018-27591-y>

⁷ M. A. Fürst et al., "Disease Associations between Honeybees and Bumblebees as a Threat to Wild Pollinators," *Nature* 506, no. 7488 (2014): 364.

<https://www.ontariobee.com/sites/ontariobee.com/files/Disease%20associations%20between%20honeybees%20and%20bumblebees%20as%20athreat%20to%20wild%20pollinators.pdf>

⁸ Anja Tehel, Mark JF Brown, and Robert J. Paxton, "Impact of Managed Honey Bee Viruses on Wild Bees," *Current Opinion in Virology* 19 (2016): 16–22.

⁹ Fürst et al., "Disease Associations between Honeybees and Bumblebees as a Threat to Wild Pollinators."

¹⁰ Wenjun Peng et al., "Host Range Expansion of Honey Bee Black Queen Cell Virus in the Bumble Bee, *Bombus Huntii*," *Apidologie* 42, no. 5 (2011): 650–658.

have severe effects on honeybees, yet their impacts on native bees have been largely unstudied.¹¹

- Migratory beekeeping operations using public lands can spread diseases and parasites between and among managed and wild bee populations.
 - For example, when honeybees concentrate in agricultural crops for pollination services, they can spread diseases and parasites acquired from native bees on public lands to other honeybee hives. Beekeeping on public lands thus has serious consequences for commercial honeybee populations as well as wild pollinator populations.
- Honeybees have both direct and indirect effects on wild plant communities. Direct effects include increasing seeds sets of invasive plants and overexploiting native plant resources, causing reduced fitness in native plants.¹²
 - Honeybees target abundant, concentrated flowers,¹³ and co-evolved in Europe with many invasive plants. By preferentially pollinating noxious weeds like yellow star thistle, honeybees increase the spread of invasive plants.^{14,15}
 - Because honeybee colonies visit nectar-rich flowers at such high rates, they can actually harm some native plants which have not evolved with this rate of visitation. At high densities, such as those in commercial apiaries, honeybees can damage flowers and consume more nectar and pollen than their pollination services are worth, causing net harm to native plants.¹⁶
- Honeybees also impact plant communities by displacing native pollinators.
 - As an exotic species, honeybees are less efficient pollinators of many native plants than the native bees they displace, reducing reproduction in these plants.¹⁷
 - When honeybees outcompete and displace native bees from an area, plants that rely on native bees for pollination may no longer be able to reproduce. Honeybees do not pollinate many plant species,¹⁸ including important genera like *Solanum* and *Vaccinium*, which require buzz pollination by bumblebees.¹⁹
 - Displacement of native bees particularly endangers rare, range-restricted plants, which honeybees are less likely to visit.²⁰

¹¹ Tehel, Brown, and Paxton, "Impact of Managed Honey Bee Viruses on Wild Bees."

¹² Carolina L. Morales et al., "Disruption of Pollination Services by Invasive Pollinator Species," in *Impact of Biological Invasions on Ecosystem Services* (Springer, 2017), 203–220.

https://www.researchgate.net/publication/313791325_Disruption_of_Pollination_Services_by_Invasive_Pollinator_Species

¹³ Keng-Lou James Hung et al., "Non-Native Honey Bees Disproportionately Dominate the Most Abundant Floral Resources in a Biodiversity Hotspot," *Proceedings of the Royal Society B* 286, no. 1897 (2019): 20182901.

¹⁴ John F. Barthell et al., "Promotion of Seed Set in Yellow Star-Thistle by Honey Bees: Evidence of an Invasive Mutualism," *Ecological Applications* 11, no. 6 (2001): 1870–1883. [https://doi.org/10.1890/1051-0761\(2001\)011\[1870:POSSIY\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2001)011[1870:POSSIY]2.0.CO;2)

¹⁵ Dave Goulson and Lara C. Derwent, "Synergistic Interactions between an Exotic Honeybee and an Exotic Weed: Pollination of *Lantana Camara* in Australia," *Weed Research* 44, no. 3 (2004): 195–202.

¹⁶ Marcelo A. Aizen et al., "When Mutualism Goes Bad: Density-Dependent Impacts of Introduced Bees on Plant Reproduction," *New Phytologist* 204, no. 2 (2014): 322–328. <https://doi.org/10.1111/nph.12924>

¹⁷ C. L. Gross and D. Mackay, "Honeybees Reduce Fitness in the Pioneer Shrub *Melastoma affine* (Melastomataceae)," *Biological Conservation* 86, no. 2 (1998): 169–178. <https://www.sciencedirect.com/science/article/abs/pii/S000632079800010X>

¹⁸ Keng-Lou James Hung et al., "The Worldwide Importance of Honey Bees as Pollinators in Natural Habitats," *Proceedings of the Royal Society B: Biological Sciences* 285, no. 1870 (2018): 20172140.

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2017.2140>

¹⁹ Dave Goulson, "Conserving Wild Bees for Crop Pollination," *Journal of Food, Agriculture and Environment* 1, no. 1 (2003): 142–144. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.420.7326&rep=rep1&type=pdf>

²⁰ Olivia Norfolk, Francis Gilbert, and Markus P. Eichhorn, "Alien Honeybees Increase Pollination Risks for Range-Restricted Plants," *Diversity and Distributions* 24, no. 5 (2018): 705–713.

https://www.researchgate.net/profile/Olivia_Norfolk/publication/322759094_Alien_honeybees_increase_pollination_risks_for_range-restricted_plants/links/5a6ef4870f7e9bd4ca6d9ba5/Alien-honeybees-increase-pollination-risks-for-range-restricted-plants.pdf

Other possible consequences of apiaries:

- Vegetation changes directly and indirectly caused by honeybees, as described above, will have unpredictable consequences for wildlife and forest ecosystems. Although gradual, these ecosystem-wide impacts may be significant.
- Apiaries pose a risk to some public land users. Recreationalists on public lands suffer increased risk of potentially-fatal anaphylactic reactions if they encounter and accidentally disturb honeybee hives present on public lands.