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To Bee or Not to Bee

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Cover Page Footnote

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Michael Davids[†]

I.	INTRODUCTION	3
II.	BIOLOGY OF THE EUROPEAN HONEY BEE, <i>APIS MELLIFERA</i> LINNAEUS	8
	A. <i>Anatomy</i>	8
	B. <i>Caste System</i>	9
	C. <i>Foraging Habits</i>	14
	D. <i>Life Cycle</i>	16
	E. <i>Honey Bee Stressors</i>	18
	1. Pests: Varroa Destructor	18
	F. <i>People</i>	22
	1. Inadequate Hives	22
	2. Poor Nutrition	26
	3. The Honey Bee Industry	27
	4. Pollination Services	30
	G. <i>Effects of Interstate Migration on Bees</i>	37
III.	LEGAL FRAMEWORK	38
	A. <i>Are Honey Bees Wildlife or Domesticated Animals?</i>	39

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B.	<i>Bees Categorized: 18th-19th Centuries</i>	40
C.	<i>Bees Categorized: 20th-21st Centuries</i>	41
D.	<i>How are Honey Bees Currently Protected Under Federal Schemes?</i>	44
1.	<i>Importation and Transit</i>	44
E.	<i>Pesticides</i>	47
F.	<i>How are Honey Bees Currently Protected Under State Schemes?</i> ...	50
G.	<i>Importation and Transit</i>	51
H.	<i>Quarantine</i>	53
I.	<i>Pesticides</i>	55
IV.	WASHINGTON STATE HONEY BEE LAW	56
A.	<i>Importation and Transit</i>	57
B.	<i>Quarantine</i>	57
C.	<i>Pesticides</i>	58
D.	<i>The Honey Bee Commission and Regulations</i>	59
E.	<i>Disconnected from the Science</i>	60
V.	WHAT COULD LEGISLATORS DO TO PROTECT HONEY BEE HEALTH?	62
A.	<i>Listing Honey Bees Under the Endangered Species Act</i>	63
B.	<i>Congressional Intervention</i>	66
C.	<i>Agency Intervention</i>	69
D.	<i>Potential Issues with Regulations Mandating Stressless Transportation</i>	72
VI.	CONCLUSION.....	80

I. INTRODUCTION

What is all the buzz about bees? Honey bees gather in large colonies to rear their young and produce the liquid gold that we pour into our oatmeal and bake into our cakes. Not only do honey bees make honey, they also provide an invaluable ecological service—pollination. Many important crops, such as apples and almonds, require bees, among other pollinators, to bear fruit successfully.¹ After pollinating crops, honey bees also produce food for other animals. However, if they had their way, other animals would not eat them or their honey. Bears famously crack hives open to steal honey, although their main interest is the brood.² Additionally, honey bees comprise many animals' diet, such as birds, spiders, and frogs, to name a few.³ Bees are also one of the best bioindicators of environmental pollution. Bees' fine hairs, which evolved to collect

¹ See *infra* note 152, Robert Crassweller, *Pollination Requirements for Various Fruits and Nuts*, PENNSTATE EXTENSION, (June 9, 2016) <https://perma.cc/5DZY-4PQG>.

² Kathy Keatly Garvey, *Bears Raiding Bee Colonies: They're Seeking the Brood*, <https://perma.cc/R8VZ-WYSG> (last visited Mar. 17, 2019).

³ MAAREC, *Pests of Honey Bees*, (Feb. 2000), <https://perma.cc/X3EL-MXGT>.

pollen for honey production, also pick up airborne pollutants.⁴ Bees can also detect the presence of certain heavy metals that are harmless to them.⁵ While the ecosystem significantly benefits from honey bees, humans profit handsomely off these powerhouse pollinators and their honey. This profit, however, is not painless and bees suffer. Bees are not only besieged from climate change, pesticides, and suburban sprawl—but also unwittingly from those tasked with caring for them—beekeepers.

Societies have long understood honey bees' importance.⁶ Ancient societies considered bees as nurturers closely linked with

⁴ Giorgio Celli & Bettina MacCagnani, *Honey Bees as Bioindicators of Environmental Pollution*, 56, 1 BULLETIN OF INSECTOLOGY 137 (2003).

⁵ *Id.* at 138.

⁶ Rachel D. Carlson, *The Honey Bee and Apian Imagery in Classical Literature* 42 (2015), <https://perma.cc/DH3G-X5B7>; Kori Nadine Armstrong, *Being with Bees: An Anthropological Study on Human-Animal Relations in Southern Beekeeping* 8 (Aug. 2016), <https://perma.cc/52GP-89Z>. The ancient Mayans and Egyptians kept honey bees. *Id.* The honey bee was so important to the Egyptians that they carved them into sarcophagi. *Id.* Coins in ancient Greece depicted honey bees. *Id.*; Ella Weber, *Apis Mellifera: The Domestication and Spread of European Honey Bees for Agriculture in North America*, 9 UNIV. OF MICH. UNDERGRAD. RES. J. 20, 21 (SPRING 2012), <https://perma.cc/S7KY-WWBK>.

reproduction, birth, and the gods.⁷ For instance, in ancient Greek mythology, bees were surrogate parents to Zeus, thus inextricably linked with the divine.⁸ One story recounted how Zeus rewarded bees with a hardy constitution and their bronze coloring for the care they provided him.⁹ Another tells how a bee offered Zeus a comb and was so impressed that he granted bees their stinger.¹⁰ This close relationship between Zeus and bees evolved into a narrative that bees were enactors of Zeus's will on Earth.¹¹

The honey bee is an amazing insect that deserves stronger legal protection that would protect their health. However, society and the law view bees as stinging pests that produce liquid gold. Due to this view, current legislation focuses little on their health even though stronger bee health is essential to not just their productivity, but also humanity and the ecosystem. Honey bees are, in the eyes of the law, a means to an end.

⁷ Carlson, *Supra* note 6. Primarily, the gods of the Greek Pantheon and their (demi-) god children.

⁸ *Id.* at 40.

⁹ *Id.* at 43.

¹⁰ *Id.*

¹¹ *Id.*

While the law treats honey bees as a means to an end, society somewhat evolved to “save the bees.”¹² Environmental organizations such as Greenpeace have started a campaign under the slogan “Save the Bees” to ban pesticides that harm pollinators, preserve bees’ wild habitat, and “[r]estore ecological agriculture.”¹³ This movement provides much-needed education to those who might otherwise be terrified of bees, and it offers simple solutions, such as planting bee gardens, creating bee baths, and buying local honey, that can mobilize people to save the bees.¹⁴

The purpose of this article is to identify the issues plaguing honey bee health, discuss the current legal safeguards, and then provide solutions to issues that the law fails to address. Section I discusses honey bee biology and their stressors: pests, pesticides, and people. Section II discusses how honey bees have been classified in early and modern America, the current legal

¹² *Save the Bees*, GREENPEACE, <https://perma.cc/BC5C-BYMV>.

¹³ *Id.* Ecological agriculture refers to a traditional agricultural practice that would end genetically-modified crops and avoid insect damage by avoiding monoculture farms.

¹⁴ *How to Save The Bees: 10 Things You Can Do*, HONEY BEE CONSERVANCY, <https://perma.cc/38P3-RBWB> (last visited Apr. 10, 2019).

framework, and highlights the glaring disconnect between the science behind honey bee health and the law. Section III proposes solutions to remedy that disconnect and speculates how these proposals might affect the environment and the market and concludes by discussing how the public's perception must change for any proposal to move forward.

Many stressors negatively impact honey bee health, but none are so enduring as the beekeeper. These seemingly benevolent caretakers stress bees by housing them in uninsulated hived and transporting them thousands of miles to pollinate monoculture crops.

To combat these apicultural stressors, the Secretary of Agriculture of the United States Department of Agriculture (USDA) and/or the Administrator of the Animal and Plant Health Inspection Service (APHIS) must address the various issues plaguing honey bees' health immediately since honey bees are essential to the ecosystem. To address these issues the USDA and/or APHIS should adopt a multifaceted approach that includes both increased scientific research and development resulting in tougher regulations. The USDA and /or APHIS should task scientists to research and develop

less stressful methods to transport honey bees across the country to pollinate crops and research and develop hive designs that mimic bee's natural hives. Once this research and development concludes, these agencies should mandate that beekeepers, and consequently their third-party drivers, use whatever new transportation methods are developed. These agencies should also incentivize beekeepers to stop using current hives in favor of the new hive design. Additionally, these agencies should mandate breeders to no longer selectively breed bees to produce less propolis: an essential substance honey bees produce to improve their hives. Furthermore, these agencies should require beekeepers to plant diverse flower beds on apiary property to increase pollen diversity; thus, supplementing honey bees' lacking diet. Finally, society must reevaluate its relationship with and perception of the honey bee.

II. BIOLOGY OF THE EUROPEAN HONEY BEE, *APIS MELLIFERA* LINNAEUS

A. Anatomy

Apis mellifera Linnaeus, the European honey bee (honey bee), is a member of the Kingdom *Animalia*, Phylum *Arthropoda*,

Class *Insecta*, Order *Hymenoptera*,¹⁵ Family *Apidae*,¹⁶ Genus *Apis*.¹⁷ The honey bee originates from Europe, the Middle East, and Africa.¹⁸ The “European” honey bees in the United States (U.S.) are the result of complex interbreeding among European subspecies.¹⁹

B. Caste System

Bees are separated into three castes within their complex society. Each caste is, in a manner of speaking, one part of the greater whole—each interdependent, so when one caste is injured, the other two feels the effects.²⁰ The first, or ‘breeding’ caste is the many male Drones that develop from unfertilized eggs, which

¹⁵ Common. Sci. and Indus. Res. Org., *Hymenoptera: ants, bees and wasps*, <https://perma.cc/K37W-NDG5> (last visited Apr. 4, 2018). *Hymenoptera* means “membrane wings” in Latin.

¹⁶ Int’l Union for Conservation of Nature and Nat. Resources, *Apis mellifera*, <https://perma.cc/D6W4-SRA3> (last visited Mar. 31, 2019).

¹⁷ Michael S. Engel, *Fossil Honey Bees and Evolution in the Genus Apis (Hymenoptera: Apidae)*, 29 *APIDOLOGIE* 265 (1998), <https://perma.cc/QA6V-E72F>.

¹⁸ Ashley N. Mortensen, Daniel R. Schmehl, & Jamie Ellis, *European Honey Bee – Apis Mellifera* 1 (August 2013), <https://perma.cc/68CC-U7W7>.

¹⁹ *Id.*

²⁰ *See Infra* note 71.

means that parents did not make genetic contributions.²¹ Drones are exclusively male, and Drones only exist to mate with virgin queens from other colonies.²² The second, or ‘working’ caste comprises females that develop from fertilized eggs.²³ Adult worker bees are female larvae that were fed a diet of pollen, nectar, and “brood food.”²⁴ The non-reproductive, female worker bees (worker bee/workers) are the smallest of the three castes.²⁵ Workers’ hind legs have two specialized “pollen baskets” called corbicula that collect enormous quantities of pollen and nectar for the hive.²⁶ Additionally, workers produce wax scales that are used to construct the hexagonal combs in the hive.²⁷ Workers use their barbed stinger connected to a poison sac to sting their would-be attackers.²⁸ Once a worker stings its target, the stinger and poison sac are torn from

²¹ Mortensen, Schmehl, & Ellis, *supra* note 18.

²² *Id.*

²³ *Id.*

²⁴ *Id.* at 1-2.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.*

their tiny bodies, effectively killing the worker.²⁹ The final caste contains queen bees, which are female larvae that were fed a regal course of pollen, nectar, and royal jelly.³⁰ Queen bees, moreover, are the only reproductive females in the hive and lay about 1,500 eggs per day.³¹ Queen bees are about the same size as workers, but their abdomens are longer and plumper, and their stingers have fewer barbs, so they do not die after stinging their target.³²

Honey bees divide labor based on age as well as caste. Worker bees perform all colony-maintenance tasks, which are further divided based on the bees' age.³³ The youngest, or nurses, tend the brood; middle-aged workers build combs, manage food storage, and guard the hive's entrance;³⁴ and the oldest are foragers.³⁵

²⁹ *Id.*

³⁰ *Id.* at 2.

³¹ *Id.* Under extreme circumstances, worker bees can lay unfertilized eggs.

³² *Id.*

³³ *Id.* at 3-4.

³⁴ *Id.*

³⁵ *Id.* The youngest workers are called nurses. *Id.*

Pinpointing how bees developed their highly-socialized (eusocial) behavior is difficult and has resulted in competing theories.³⁶ The well-known “multi-level selection” theory lays out a five-stage path for bees’ eusocial behavior.³⁷ First, bees formed groups.³⁸ The individual insects gathered near food sources and remained together because cooperation benefitted all individuals.³⁹ Second, “minimum and necessary” combinations of preadaptive traits occurred.⁴⁰ A trait is preadaptive if it already exists or is accidentally present.⁴¹ These combinations at least includes a valuable and defensible nest.⁴² Another preadaptive behavior is the ability of solitary bees to behave like eusocial bees when forced to cohabitate a nest.⁴³ This suggests that bees can cohabitate when

³⁶ Martin A. Nowak, Corina E. Tarnita, & Edward O. Wilson, *The Evolution of Eusociality*, NATURE 1057 (Aug. 26, 2010), <https://perma.cc/SG9M-GVAP>.

³⁷ *Id.* at 1062.

³⁸ *Id.* at 1060.

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ Paul Rozin, *The Power of Preadaption in Biological and Cultural Evolution and in Development*, UNIVERSITAT POMPEU FABRA BARCELONA (May 20, 2016), <https://perma.cc/J2EC-WB6Q>.

⁴² See Nowak, Tarnita, & Wilson, *supra* note 36.

⁴³ *Id.*

nature decides to make that behavior advantageous for survival.⁴⁴ Third, eusocial alleles, or alternate genes created from random mutations, form.⁴⁵ For preadapted bees, this can happen as a single mutation when environmental pressures warrant.⁴⁶ Fourth, these preadaptations become permanent due to natural selection.⁴⁷ Finally, “[m]ultilevel” selection drives colony social structures to elaborate extremes.⁴⁸

Honey bees undergo a “complete metamorphosis,” which entails distinct developmental stages: egg, larvae, pupa, and adult.⁴⁹ Adult honey bees’ bodies are divided into three regions: head, thorax, and abdomen.⁵⁰ Their heads sport antennae and compound eyes.⁵¹ The thorax has two pairs of wings and three pairs of legs.⁵²

⁴⁴ *Id.*

⁴⁵ Wayne W. LaMorte, *DNA, Genetics, and Evolution*, B.U. (Apr. 23, 2018), <https://perma.cc/C3CJ-AC7J>.

⁴⁶ See Nowak, Tarnita, & Wilson, *supra* note 36.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ Mortensen, Schmehl, & Ellis, *Supra* note 18, at 1. Development time varies from caste to caste. Drones take 24 days, workers 21 days, and queens 15 days.

⁵⁰ *Id.* at 3.

⁵¹ *Id.*

⁵² *Id.*

The abdomen is attached to the thorax by a slender “waist.”⁵³ Only female honey bees wield a stinger because they originate from a modified egg dispenser, or ovipositor.⁵⁴

C. Foraging Habits

Foraging is the link between the colony and the environment.⁵⁵ Foraging tasks are divided between scout workers and reticent workers.⁵⁶ Scout workers leave the colony to gather food and resources whereas reticent works congregate near the hive where they wait until scouts return.⁵⁷ These tasks are further divided by resources such as water, nectar, pollen, and resin.⁵⁸ Foraging

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ H.F. Abou-Shaara, *The foraging behaviour of honey bees, Apis mellifera: a review*, 59 VETERINARNI MEDICINA 1 (2014).
<https://perma.cc/3QUJ-LRX4>.

⁵⁶ *Id.* at 2. The scouts relay the information about food sources by performing a complex dance—the famous “waggle dance.” Researchers understand little about how reticent workers function. Byron N. Van Nest, Ashley E. Wagner, Caddy N. Hobbs, & Darrell Moore, *Dance floor clustering: food-anticipatory behavior in persistent and reticent honey bee foragers*, 70 BEHAVIORAL ECOLOGY AND SOCIOBIOLOGY 2 (2016).

⁵⁷ Abou-Shaara, *supra* note 55, at 2.

⁵⁸ *Id.*

happens during the early morning in most regions.⁵⁹ The foraging distance for honey bees ranges from 620 meters to 2,850 meters.⁶⁰ Importantly, foraging bees prefer certain sources of food and water over others.⁶¹ Several in-colony factors affect bees' foraging behavior, such as queen presence and case (virgin or mated), beehive type, and pest infestation.⁶² The out-colony factors are nearly all environmental, such as temperature, electromotive fields, pollution, presence of predators, and insecticides.⁶³

⁵⁹ *Id.* Foragers typically leave around 0600 whereas desert bees leave the hive around 0800-1000. Foragers can also remember what time of the day higher food resources are available.

⁶⁰ *Id.* Specifically, mean foraging distance in July for is 670 meters for small colonies and 620 meters for large colonies. In August, small colonies forage out to 1,430 meters and large colonies forage out to 2,850 meters.

⁶¹ *Id.* Water foragers prefer continuous water sources over stables ones. They prefer large water containers to small ones. Additionally, water foragers prefer to gather water from unusual sources, such as cow dung, over clean water sources. Nectar foragers prefer some food sources over others and they even prefer certain positions of some flowers over others.

⁶² *Id.* at 4.

⁶³ *Id.* at 5. Sublethal doses of imidacloprid delays visits to feeding sites.

D. Life Cycle

A typical worker bee lives about six weeks during the summer—foraging season.⁶⁴ A worker born during fall, however, can live up to six months to help the colony survive winter and rear the new generation come spring.⁶⁵ All the colony's work and life synchronization depends on communication between bees, which is primarily accomplished via pheromones.⁶⁶ These pheromones are chemical messages animals and insects produce that affect other animals' and insects' behavior, and in bees they communicate everything from the location of the queen to the presence of invaders.⁶⁷ Since bees are highly socialized, scientists consider a single honey bee colony to be a single biological unit—or “superorganism.”⁶⁸ Because colonies are superorganisms,

⁶⁴ Mid-Atlantic Apiculture Research and Extension Consortium, *The Colony and its Organization*, <https://perma.cc/9P8X-DLFR>.

⁶⁵ *Id.*

⁶⁶ Mortensen, Schmehl, & Ellis, *supra* note 18, at 4. Pheromones are chemical messages produced by animals and insects that affect the behavior of other individual animals or insects. Smithsonian, *Pheromones in Insects*, BugInfo, <https://perma.cc/4UCC-ZL5H>. Pheromones convey different signals based on their combination and concentration.

⁶⁷ Mortensen, Schmehl, & Ellis, *supra* note 18, at 4.

⁶⁸ Ashley N. Mortensen & Daniel R. Schmehl, & Jamie Ellis, *European Honey Bee – Apis Mellifera* 1 (August 2013), <https://perma.cc/68CC-U7W7>.

reproduction focuses not on individual bees, but rather creating colonies—a process called “swarming.”⁶⁹ Swarming initiates in spring or early summer when the colony produces 10 to 20 daughter queens.⁷⁰ The “mother queen” and two-thirds of the adult workers coalesce while scout workers find a suitable location for a new colony.⁷¹ When the daughter queens emerge as adults, they jockey for dominance until only one queen remains.⁷² However, if a queen is born earlier than her sisters, she hunts them down and kills her unborn sisters.⁷³ The surviving queen mates with 15 drones and store the sperm within her spermatheca until she dies.⁷⁴ Swarming ends once the queen begins laying eggs.⁷⁵

Once swarming has finished, honey bees spend the remainder of the spring and/or summer collecting and storing pollen and nectar necessary to survive the fall and winter.⁷⁶ Honey is

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² *Id.* at 5.

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ *Id.*

produced by bees by transforming nectar through enzymatic processes and dehydration.⁷⁷ The honey is then capped inside the combs for storage.⁷⁸

E. Honey Bee Stressors

1. Pests: Varroa Destructor

Varroa destructor (varroa/ varroa mite) is to the honey bee what the black plague was to Medieval Europe.⁷⁹ The adult female mites cause nearly all the varroa-related damage⁸⁰ and are ectoparasites⁸¹ that feed on honey bee fat tissue⁸² of immature and adult honey bees.⁸³ Varroa mites feed by puncturing bees' soft

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ James D. Ellis & C.M. Zettel Nalen, *Varroa destructor* 4 (June 2010), <https://perma.cc/5AS6-57SK>.

⁸⁰ *Id.* at 2.

⁸¹ *Id.*; University of Kentucky College of Agriculture, *External Parasites or Ectoparasites*, <https://perma.cc/ML9L-5L8M> (last visited Mar. 29, 2018). Ectoparasites live on the skin of animals. Houseflies, mosquitoes, ticks, and fleas are examples of ectoparasites.

⁸² Samuel D. Ramsey, Ronald Ochoa, Gary Bauchan, Connor Gulbranson, Joseph D. Mowrey, Allen Cohen, David Lim, Judith Joklik, Joseph M. Cicero, James D. Ellis, David Hawthorne, & Dennis vanEngelsdorp, *Varroa destructor feeds primarily on honey bee fat body tissue and not hemolymph*, 116 PNAS 1792, 1792 (Jan. 29, 2019).

⁸³ Ellis & Nalen, *supra* note 79, at 3.

abdominal tissue.⁸⁴ The mites have insidiously evolved to hide in plain sight with a curved body that fits flush against bees' abdomens, claws that cling onto bees, and a cuticle that exudes a chemical pattern like bees' pheromones to avoid detection.⁸⁵

Varroa mites were first discovered in colonies of Eastern (Asian) honey bees.⁸⁶ However, varroa mites have since spread to Western (European) honey bees, which have not developed natural resistances to the mites.⁸⁷ Varroa mites are not currently present in Australia or the Democratic Republic of Congo thus both countries enacted strict quarantines to prevent its introduction.⁸⁸ The U.S.

⁸⁴ James D. Ellis & C.M. Zettel Nalen, *Varroa destructor* 4 (June 2010), <https://perma.cc/5AS6-57SK>.

⁸⁵ *Id.*

⁸⁶ Yves Le Conte, Marion Ellis, & Wolfgang Ritter, *Varroa mites and honey bee health: can Varroa explain part of the colony losses?*, 41 *APIDOLOGIE* 353 (Feb. 13, 2010), <https://perma.cc/TG8Z-8PJS>.

⁸⁷ *Id.* This spread happened around the 1950's. Michel Solignac, Jean-Marie Cornuet, Dominique Vautrin, Yves Le Conte, Denis Anderson, Jay Evans, Sandrine Cros-Arteil, & Maria Navajas, *The invasive Korea and Japan types of Varroa destructor, ectoparasitic mites of the Western honey bee (Apis mellifera), are two partly isolated clones*, *PROC. OF THE ROYAL B SOC'Y* 411 (Feb. 21, 2005), <https://perma.cc/D6GF-H74V>.

⁸⁸ Ellis & Nalen, *supra* note 79, at 1.

actively aims to prevent the introduction and spread of varroa mites.⁸⁹

Scientists estimate that varroa mites are responsible for losses exceeding billions of dollars.⁹⁰ Despite these heavy losses, scientists do not concretely understand how varroa mites decimate bee populations, but they have several theories.⁹¹ One theory is that varroa mites shorten their hosts' lifespan and alter their behavior.⁹² Another theory is that varroa mites transmit viruses to bees that end their lives, such as the devastating deformed wing virus (DWV).⁹³ Research suggests that varroa mites suppress bees' immune systems, which then opens the floodgates to viral and bacterial infection.⁹⁴

Much like their insidious bodily adaptations varroa mites have ingeniously evolved to live and reproduce off bees. A varroa mite's lifecycle proceeds in two stages: phoretic and reproductive.

⁸⁹ See *infra* pp. 26-27, 29-32.

⁹⁰ Ellis & Nalen, *supra* note 79.

⁹¹ James D. Ellis & C.M. Zettel Nalen, *Varroa destructor* 4 (June 2010), <https://perma.cc/5AS6-57SK>.

⁹² *Id.*

⁹³ Conte, Ellis, & Ritter, at 354.

⁹⁴ *Id.*

Female mites feed on, and spread from, bees during the phoretic phase.⁹⁵ Varroa mites reproduce on developing bee larvae or pupae.⁹⁶ These mites are spread by several methods. Varroa mites jump from bee to bee as they pass each other in the colony.⁹⁷ Bees may “drift” to the wrong colony and spread varroa mites to new colonies.⁹⁸ Varroa mites also spread during swarming.⁹⁹ Varroa mites are also introduced by “robber” bees that steal honey from weaker colonies.¹⁰⁰ Beekeepers can unwittingly spread varroa mites by introducing new bees or brood to weaker colonies.¹⁰¹

Acaricides are initially effective in controlling varroa mites, but the mites become resistant soon thereafter.¹⁰² A more effective method is breeding.¹⁰³ Scientists isolated a form of hygienic

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ *Id.*

⁹⁸ *Id.* Research suggests that bees from infested colonies will drift more often than bees from less infested colonies.

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.* at 356. Acaricides are pesticides that kill mites and ticks. Merriam-Webster, *acaricide*, <https://www.merriam-webster.com/dictionary/acaricide> (last visited Apr. 28, 2019).

¹⁰³ Ellis & Nalen, at 7.

behavior call “Varroa Sensitive Hygiene” (VSH), which allows VSH bees to detect and abort varroa-infested.¹⁰⁴ This is too specific, however, so scientists seek to introduce the European honey bee to the genetics of bees generally resistant to varroa mites, such as the Russian bee.¹⁰⁵

F. People

1. Inadequate Hives

While “colony” and “hive” are interchangeable in the common parlance; the distinction between the two words is important when discussing bees. The “colony” refers to the superorganism—that is, all of the individual bees as a whole working together as a single biological unit.¹⁰⁶ The “hive,” however, refers to the object inside, which the colony resides.¹⁰⁷ A hive can be anything from a rock crevice to a tree cavity to man-made

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* This method is so effective that the Department of Agriculture (DOA) imported Russian bee queens. This method is not widespread but is gaining popularity.

¹⁰⁶ Mortensen, Schmechel, & Ellis, *supra* note 18, at 4.

¹⁰⁷ *See infra* note 161.

boxes.¹⁰⁸ The standard man-made hive in modern apiary management¹⁰⁹ is the Langstroth hive (Langstroth(s)), which was patented on October 5, 1852.¹¹⁰ The frame is commonly made of any durable wood no thicker than a standard kitchen cabinet. Optional attachments excluded, the hive has a lower section, boxes, and an upper section.¹¹¹ The lower section contains a bottom board where bees enter and exit. Beekeepers will place this on a stand to allow increased air flow and protect bees from pests. Frames are added and the boxes to provide bees an area to build their combs, rear young, and produce honey. The upper section provides an additional opening and a space for an optional feeder.

Dr. Eric Erickson, a seminal figure in the field of apiculture, vehemently criticized the Langstroths as a significant honey bee

¹⁰⁸ See *infra* note 161.

¹⁰⁹ Perfect Bee, *A Detailed Look at the Langstroth Beehive*, <https://perma.cc/LDX6-JAYV> (last visited Mar. 31, 2019).

¹¹⁰ Social Networks and Archival Context, *Langstroth L. L. (Lorenzo Lorraine)*, 1810-95, <https://perma.cc/66G5-4A98> (last visited Mar. 28, 2019).

¹¹¹ Perfect Bee, *A Detailed Look at the Langstroth Beehive*, <https://perma.cc/UWZ5-T8KM> (last visited Mar. 29, 2018).

stressor.¹¹² Natural hives occur in trees or rock crevices, which provide insulation and humidity control whereas Langstroths are uninsulated.¹¹³ Therefore, the temperature inside the Langstroths is almost the same as the ambient temperature.¹¹⁴ Bees can still survive harsh winter and summer temperatures, but they must expend additional hive resources, which lowers their productivity the following spring.¹¹⁵

Dr. Erickson argues that the increased airflow inside the Langstroths alters the concentration of necessary bioregulators, such as pheromones.¹¹⁶ Beekeepers argue that colonies must be ventilated to prevent the buildup of moisture; however, that moisture is a

¹¹² Eric H. Erickson, *Stress and Honey Bees*, BEESOURCE, <https://perma.cc/75XZ-ZEEK> (last visited Mar. 31, 2019).

¹¹³ *Id.*; A. J. Siegel, J. Hui, R. N. Johnson, & P. T. Starks, *Honey bee workers as mobile insulating units*, 52 *INSECTES SOCIAUX* 242 (2005) <https://perma.cc/MRX6-UAPW>. To lower hive temperature, bees will spread water and fan their wings. Hives maintain an internal temperature of 32-35 degrees Celsius.

¹¹⁴ Erickson, *supra* note 112, at 13.

¹¹⁵ Eric H. Erickson, *Stress and Honey Bees*, BEESOURCE, <https://perma.cc/75XZ-ZEEK> (last visited Mar. 31, 2019).

¹¹⁶ *Id.*

product of the uninsulated walls of the Langstroths¹¹⁷ and bees must compensate for this moisture.¹¹⁸

Beekeepers prefer to keep aged combs rather than replacing them because they believe that if bees produce more wax, they produce less honey.¹¹⁹ The comb regulates toxins that enter the hive, thus essentially functions as the colony's liver.¹²⁰ Pesticides and organic molecules are usually lipophilic (fat-loving), and beeswax, being lipophilic, is incredibly efficient in absorbing these substances since the combs are composed of lipids (fats).¹²¹ Beeswax, however, will eventually reach capacity and the environment inside the hive will become toxic much like a cirrhotic liver.¹²² Moreover, beekeepers see propolis as a nuisance and thus breed bees that produce very little.¹²³ Propolis, while the bane of beekeepers, acts as bactericides, fungicides and miticides that are likely beneficial to

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

bee colonies.¹²⁴ Propolis is a term used in apiculture to refer to the plant resins that honey bees collect, return to, and use in, the hive.¹²⁵ Resin-handling bees mix the resin with wax.¹²⁶ Once a swarm finds a suitable hive location, these specialized bees line the cavity with propolis.¹²⁷ The propolis lining serves several purposes, such as waterproofing, reducing hive entrance and cracks, preventing fungal decay, and environmental control.¹²⁸ Environmental control includes stabilizing humidity and temperature and reducing microbial loads.¹²⁹

2. Poor Nutrition

Not all pollens and nectars are created equal.¹³⁰ Every strain of pollen and nectar has distinct characteristics that contribute to a

¹²⁴ *Id.*; Michael Simone-Finstrom, Renata S. Borba, Michael Wilson, & Marla Spivak, *Propolis Counteracts Some Threats to Honey Bee Health*, 2017 INSECTS 1, 2 (2017). <https://perma.cc/WMT4-Q23R>. Resin-handling bees mix the resin with wax.

¹²⁵ Erickson, *supra* note 112, at 13; Finstrom, *supra* note 124, at 13.

¹²⁶ Erickson, *supra* note 112, at 13; Finstrom, *supra* note 124, at 14.

¹²⁷ Erickson, *supra* note 112, at 13; Finstrom, *supra* note 124, at 14.

¹²⁸ Erickson, *supra* note 112, at 13; Finstrom, *supra* note 124, at 14.

¹²⁹ Erickson, *supra* note 112, at 13; Finstrom, *supra* note 124, at 14.

¹³⁰ Zachary Huang, *Honey Bee Nutrition*, EXTENSION (Feb. 20, 2012) <https://perma.cc/C8M4-6TG9>.

properly balanced bee diet.¹³¹ However, farmers use honey bee colonies to pollinate a single crop, forcing bees to only collect a single pollen strain.¹³² Feeding on the same protein source does not allow bees to obtain all the ten amino acids they require since animals cannot create their own amino acids.¹³³ Poor nutrition leads to a decrease in brood rearing, and a shorter lifespan, which can lead to colony collapse.¹³⁴ Furthermore, better nutrition can reduce varroa-related damage.¹³⁵ Poly-floral diets can increase honey bee life expectancy and boost immune functions because pollen is bees' only protein source and diverse pollen strains provide all essential amino acids.¹³⁶

3. The Honey Bee Industry

While bees are important for the ecosystem, they also comprise an important part of the U.S.' economy. The honey bee

¹³¹ *Id.*

¹³² *Id.*

¹³³ *Id.* Coincidentally, other animals, including humans, require the same ten amino acids.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ *Id.*

industry contributes \$2.1 billion in added value to the economy and 22,084 jobs.¹³⁷ As of April 2018, the U.S. housed 2.69 million colonies.¹³⁸ Each colony can contain anywhere from 20,000 to 80,000 female workers, thus there are at least anywhere from 53.8 million to 215.2 million female worker.¹³⁹ This does not even begin to count the wild honey bee colonies or the colonies from hobbyists and operations with less than five hives, so the number is potentially much higher. Additionally, all “domesticated” hives, at least in the states discussed *infra*, are regulated in some form or another—even hobbyists with a single hive.¹⁴⁰ Apiaries generate revenue from three major sources: honey sale, pollination services, and selling miscellaneous products, such as beeswax and queens, *inter alia*.¹⁴¹

¹³⁷ William A. Matthews, Daniel A. Sumner, & Tristan Hanon, *Contributions of the U.S. Honey Industry to the U.S. Economy*, 42 (2017), <https://perma.cc/26JD-FEDF>.

¹³⁸ U.S. Dep’t of Agriculture, *Honey Bee Colonies*, 1 (Aug. 1, 2018). <https://perma.cc/Z2SJ-69RU>.

¹³⁹ *Honey Bee Biology*, UNIV. OF GA. HONEY BEE PROGRAM, <https://perma.cc/A3RF-5KKH> (last visited Mar. 17, 2019).

¹⁴⁰ *Infra* notes 202; 272.

¹⁴¹ William A. Matthews, Daniel A. Sumner, & Tristan Hanon, *Contributions of the U.S. Honey Industry to the U.S. Economy*, 15 (2017), <https://perma.cc/2CVK-R95Q>. From 2015-2017, honey sales represented 38 percent of the market, with pollination services representing 43 percent.

Honey is the most public part of the industry, but pollination services provides the largest revenue stream—around \$435 million in direct output.¹⁴² Honey consumption increased 65 percent from 2009 to 2017.¹⁴³ Despite this increased consumption, honey production in 2017 was “at the same level as in 2007” and honey yield per colony fell.¹⁴⁴ Researchers explain that this decline is partly explained by “a shift amongst beekeepers . . . toward pollination service as their main business.”¹⁴⁵ This stagnation caused United States honey production, about 150 million pounds in 2017, to fall precipitously behind imports, which sits at 450 million pounds.¹⁴⁶ The largest honey importers are India, Vietnam, and Argentina, but Canada is also a consistent honey source.¹⁴⁷ Honey is still liquid gold since retail prices rose from \$4.50 per

¹⁴² *Id.* at 41.

¹⁴³ *Id.* at 16.

¹⁴⁴ *Id.* at 17.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

¹⁴⁷ *Id.* India brings in about 17 percent of the US’s supply, while Vietnam and Argentina represent about 13 percent.

pound in 2008 to \$6.70 per pound in 2017,¹⁴⁸ but pollination services will soon be the honey bee industry's new face.

4. Pollination Services

Pollinators such as honey bees play a significant role in ensuring that crops are pollinated.¹⁴⁹ Pollination is the process of transferring pollen from a plant's anther to its stigma¹⁵⁰, which results in the fertilization and formation of seeds.¹⁵¹ This process is absolutely integral for the health and yield of many crops,¹⁵² such as almonds¹⁵³ and blueberries.¹⁵⁴ These insects contribute to 35% of

¹⁴⁸ *Id.* at 18.

¹⁴⁹ Katie Lee, *The Importance of Pollinators*, UNIV. OF MINN. DEP'T OF ENTOMOLOGY, <https://perma.cc/HQ8P-N4WQ> (last visited Mar. 31, 2019).

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.* Symptoms of low pollination include, but are not limited to, misshapen crops and lower crop yields. Bees and plants need each other to survive. Perfect Bee, *What is Pollination?*, <https://perma.cc/LQC2-GMDH> (last visited Mar. 31, 2019). Bees have evolved fine hairs on the back of their legs to collect pollen. The hairs hold pollen loosely enough that some pollen falls into other flowers' stigma, thus pollinating that flower.

¹⁵³ *Infra* note 187.

¹⁵⁴ Dr. Hannah Burrack, *Blueberry Pollinators*, NC STATE EXTENSION BERRY INSECT BIOLOGY & MANAGEMENT (2015), <https://perma.cc/S4HJ-QADN>.

global food production¹⁵⁵ and more than \$24 billion to the U.S. economy annually, of which honey bees contribute \$15 billion.¹⁵⁶

In the past twenty years, pollinations services have become big business for apiaries because many popular crops need numerous hives to pollinate vast fields of various crops. The process of renting, preparing, and shipping honey bee hives is intricate, yet may be informal depending on the circumstances.¹⁵⁷ Much like most of the honey bee industry, the rental process differs state to state. For example, the process of renting honey bees between Florida farmers and Florida beekeepers is a very informal process due in large part to the few apiaries that operate in the state.¹⁵⁸ Many of the apiaries know each other well and many deals are informal, handshake agreements that are not memorialized in contract and rely

¹⁵⁵ Alexandra-Maria Klein, Bernard E. Vaissiere, James H. Cane, Ingolf Steffan-Dewenter, Saul A. Cunningham, Claire Kremen, and Teja Tscharntke, *Importance of pollinators in changing landscapes for world crops*, PROC. OF THE ROYAL B SOC'Y 306 (Oct. 27, 2006), <https://perma.cc/Z5MC-Q73H>. To a lesser extent birds and mammals pollinate plants. Two well-known examples are humming birds and bats.

¹⁵⁶ *Id.*

¹⁵⁷ Interview with Colby Sadler, Third-Generation Beekeeper and Member of the Commercial Beekeeping Committee (sub-committee of the Florida State Beekeepers Association), Sadler Honey Farm in Lakeland, Florida (Jan. 4, 2019).

¹⁵⁸ *Id.*

on the goodwill of the parties.¹⁵⁹ Generally, an apiary will contact a farmer who grows a target crop¹⁶⁰ and request that hives be placed on the farmer's property at little to no cost to the farmer, depending on the parties' prior relationship.¹⁶¹ In fact, the beekeeper may pay the farmer with a case of honey in exchange for the target crop and for the mutually beneficially service.¹⁶²

However, in states like California, renting and shipping hives--specifically among almond farmers -- is a much more formal process involving brokers and contracts. This process demands formality as the almond industry is immensely profitable for both farmers and the beekeepers, who send their bees west because California requires two million hives to pollinate nearly one million

¹⁵⁹ *Id.*

¹⁶⁰ *Id.* For example, an apiary interested in making orange-blossom honey will contact a farmer who runs an orange grove.

¹⁶¹ *Id.* Sometimes, apiaries will contact landowners with some acreage that contains certain flowers or crops. In some cases, traditional barter will suffice. For example, a beekeeper may agree to place hives on the farmer's fields for oranges or access to orange blossoms. Additionally, a beekeeper will simply charge the going rate for a hive on an acre of whichever crop the farmer grows.

¹⁶² *Id.*

acres of almond trees.¹⁶³ Typically, a beekeeper will contact a broker, who is also a beekeeper, to fly to California and seek out farmers who are interested in pollination services.¹⁶⁴ The broker will then ask the farmer how many hives they need, at what hive strength, and by what date the hives must be “dropped” onto the acreage.¹⁶⁵ This process is very lucrative for brokers since the price per colony to pollinate almond fields settled around \$200¹⁶⁶ and they will take anywhere from \$10 to \$15 per hive to load and unload the bees.¹⁶⁷ These brokers will provide their services for beekeepers all across Florida.¹⁶⁸

¹⁶³ Brittney Goodrich & Rachael Goodhue, *Honey Bee Colony Strength in the California Almond Pollination Market* 6 (2016), <https://perma.cc/RG95-MZ2L>.

¹⁶⁴ *Supra* note 157. These brokers become travelling sales people who pound pavement late in the year to knock upon the doors of farmers and initiate negotiations.

¹⁶⁵ *Supra* note 157. Dropped is a term of art in the beekeeping community that means ‘placed.’ In a sentence, ‘I dropped a hive every quarter acre of almond trees.’

¹⁶⁶ U.S. Dep’t of Agriculture, *Honey Market for the Month of February, 2018* 3 (Mar. 23, 2018), <https://perma.cc/PX88-UL78>; Jennifer Bond, Kristy Plattner, & Kevin Hunt, *U.S. Pollination-Services Market*, USDA ERS (Sept. 26, 2014), <https://perma.cc/7T3X-3TZR>.

¹⁶⁷ *Supra* note 157. Interestingly, it is so lucrative to beekeepers to ship hives to California that there is now a shortage of hives in Florida.

¹⁶⁸ *Id.*

Getting the bees to California, however, is no easy feat.¹⁶⁹

The Mid-Atlantic Apiculture Research & Extension Consortium (MARREC) created guidelines for transporting bees long distances. This process typically involves using a bee smoker to pacify bees for transport, tying their hives down, and hosing them with water so they do not overheat.¹⁷⁰ Travelling long distances requires serious preparation, such as ensuring the truck is sufficiently fueled and roadworthy, because “[s]topping for *any* reason can cause problems” since tow trucks and mechanics are less likely to assist a truck filled with bees.¹⁷¹ Additionally, the trip to California from Florida involves driving through much of the American Southwest, which is scorching during the morning and freezing during the

¹⁶⁹ The trip to California is anywhere from 2,400 miles to 2,600 miles, takes 40 hours, and can last up to four and a half days. This trip takes a long time because of labor laws that ensure truck drivers are not on the road for more than eleven hours per day.; *Summary of Hours of Service Regulations*, FED. MOTOR CARRIER SAFETY ADMIN. (Mar. 9, 2017), <https://perma.cc/7UJ4-HB25>. This was not enforced previously, and it was implicit that truck drivers logged their hours on the honor system; but with electronic logbooks, companies can enforce this restriction.

¹⁷⁰ Dewey M. Caron, *Moving Bees*, MID-ATLANTIC APICULTURAL RESEARCH & EXTENSION CONSORTIUM (Feb. 2000), <https://perma.cc/H2NK-23NZ>.

¹⁷¹ *Id.* (emphasis added).

night.¹⁷² Bees cannot mitigate these temperature fluctuations since their hives' entrances are sealed inside generally uninsulated truck trailers, thus they cannot leave the hive to fan air into the entrance to maintain a stable internal hive temperature.¹⁷³ MAAREC's guidelines are just that, however: guidelines and some beekeepers have not heard of them.¹⁷⁴

The hives are staged before shipping, which involves working eight to ten hours the day before pressure washing the hives so that no dirt or grass is found on the exterior of the hives.¹⁷⁵ Hives must be inspected by both the beekeepers and state agencies for pests such as bagworms, hive beetles, and fire ants.¹⁷⁶ Florida specifically then issues a certification that the colonies are healthy and fit for export.¹⁷⁷ Beekeepers do not drive their own bees to

¹⁷² *Supra* note 157.

¹⁷³ *Supra* note 157.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*

¹⁷⁶ *Id.* In the words of the interviewee, "If it ain't a honey bee on a honey bee palette, they will stop your truck at the border, and they will make you unload them."

¹⁷⁷ *Id.*

California,¹⁷⁸ but rather hire third-party drivers.¹⁷⁹ Finding third-party drivers may be difficult since, much like mechanics and tow trucks, they are concerned about hauling thousands of stinging insects that require more maintenance than inanimate cargo.¹⁸⁰ The truck is prepared somewhat similarly to what the MAAREC guidelines instruct—a smoker may be placed in the truck and the beekeeper will install a sprinkler system in the trailer of the 48-foot flatbed and request that the driver run the system for ten minutes before sleeping, which prevents hives from overheating.¹⁸¹

California is very concerned with ensuring that these pests do not enter the state and has even flagged Florida as a high-risk state due to the presence of fire ants.¹⁸² If the inspectors at the California border find more than one fire ant, they will force the driver to unload the bees from the truck, regardless of the temperature outside, and have a third party servicer pressure wash

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

¹⁸⁰ *See Id.*

¹⁸¹ *Id.*

¹⁸² *Id.*

the hives at the apiary's expense.¹⁸³ The combined effects from this forced migration decrease honey bees' productivity and shortens their already small lifespan.

G. Effects of Interstate Migration on Bees

While money is honey and vice versa, moving bees is no sweet deal for these fuzzy bugs. Within 24 hours after a three-day trip, honey bees have an immediate reduction of the glands that nurses use to produce brood food.¹⁸⁴ Normal metabolic processes create a byproduct called reactive oxygen species (ROS).¹⁸⁵ DNA mutation, irreparable protein damage, and membrane instability may occur when cells cannot remove excess ROS.¹⁸⁶ Oxidative stress can cause cellular damage or death—both of which are closely linked to aging.¹⁸⁷ The body produces helpful antioxidants that extend lifespans when subject to acute stress.¹⁸⁸ Subjecting

¹⁸³ *Id.* This pressure washer is stationed at the inspection station and will charge \$2,000 to \$3,000 for the service.

¹⁸⁴ Michael Simone-Finstrom et al., *Migratory management and environmental conditions affect lifespan and oxidative stress in honey bees*, 6 SCI. REPORTS 1 (Aug. 24, 2016), <https://perma.cc/822W-C29A>.

¹⁸⁵ *Id.* at 2.

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ *Id.*

organisms to severe or chronic stress, however, shortens their lifespan.¹⁸⁹ In studying the effects of commercial migratory operations, researchers found that overall, bees reared in stationary colonies had a longer lifespan than their migratory counterparts.¹⁹⁰ Researchers detected significant impacts on rearing environments caused by oxidative stress.¹⁹¹ Researchers concluded that the migratory workers' shortened lifespan evidenced the increased stress level.¹⁹² While workers' lifespans were only shortened by a day, which seems insignificant, that day represents 5 percent of the workers' lifespan and up to 20 percent of their foraging lifespan.¹⁹³

III. LEGAL FRAMEWORK

The current legal safeguards that protect honey bees merely focus bees' economic power, and attempt to prevent the spread of honey bee pests and unwanted species, without any regard to the bees' health. These laws do not address the problems of poor hive

¹⁸⁹ *Id.*

¹⁹⁰ *Id.* at 4. The difference in lifespan was about one day.

¹⁹¹ *Id.* at 6.

¹⁹² *Id.*

¹⁹³ *Id.*

design and stressful, forced migrations. Laws and regulations should focus more on honey bee health since bees are not only integral to our agricultural industry, but also integral to basic ecological health.

A. Are Honey Bees Wildlife or Domesticated Animals?

Bees are unique not only in their biology, but also in how the law categorizes them. Unlike cattle or sheep, which are easily corralled and penned, bees go where they please. Bees fly off into fields of wildflowers or crops of their own accord and defy fences through flight. Bees also drift from their hives to other hives.¹⁹⁴ The differences between traditional livestock and bees go further than simple control to ownership. Cattle, sheep, and other livestock can be branded or tagged, and thus are easily identifiable to other livestock owners if the animals wander into neighboring fields. How the law categorizes honey bees is important in determining protection under the Endangered Species Act (ESA). This subsection analyzes the historical and modern categorization of honey bees.

¹⁹⁴ Ellis & Nalen, *supra* note 86.

B. Bees Categorized: 18th-19th Centuries

So, what type of animal are honey bees categorized under the law? William Blackstone, in his famous *Commentaries*, answered that honey bees are “*ferae naturae* (wild animal);¹⁹⁵ but, when hived and reclaimed, a man may have a qualified property in them.”¹⁹⁶ Blackstone continued that under the Charter of the Forest¹⁹⁷ ownership of bees is *ratione soli*.¹⁹⁸ *Ratione soli*, or “by reason of the soil,” is a property law doctrine that gives a landowner ownership over wild animals and natural resources on their property.¹⁹⁹ The 19th Century saw very little change in this categorization. In fact, most courts were quite comfortable with this exact categorization of honey bees. For example, one of the earliest

¹⁹⁵ *Wild animal*, Black's Law Dictionary (10th ed. 2014). Black's defines a “wild animal” as one that is not used to benefit humans. Notably, this definition includes animals that are commonly known to be untamable, unpredictable, dangerous, or mischievous; and includes animals that are not statutorily defined as a domestic animal.

¹⁹⁶ 2 William Blackstone, *Commentaries on the Laws of England*, 389, 392 (1979).

¹⁹⁷ Dr. Graham Jones, Charter of the Forest, The Charter of the Forest of King Henry III, (March 24, 2019), <https://perma.cc/YC95-B48W>. (The Charter of the Forest was issued in the second year of Henry III's reign).

¹⁹⁸ 2 William Blackstone, *Commentaries on the Laws of England*, 389, 393 (1979).

¹⁹⁹ *Ratione Soli*, Black's Law Dictionary (10th ed. 2014).

instances of a court categorizing honey bees as a wild animal was in 1810, in the case of *Gillet v. Mason*.²⁰⁰ In *Gillet*, the Supreme Court of New York perpetuated Blackstone's categorization of bees as wild animals.²⁰¹ Other courts of the 19th Century added conditions to this categorization. For example, the Supreme Court of Rhode Island added that trespassers cannot take bees from another's property and gain title through subsequently hiving them on their own property.²⁰²

C. Bees Categorized: 20th-21st Centuries

Like honey, how bees are categorized under both federal and state laws is fluid yet viscous. Although the honey bee is still categorized as a wild animal,²⁰³ courts recognize that bees are so

²⁰⁰ *Gillet v. Mason*, 7 Johns. 16 (1810), (Mason carved his initials into a tree on his deceased father's land containing a swarm of bees, felled the tree, then took the honey and the swarm).

²⁰¹ *Id.*

²⁰² *Rexroth v. Coon*, 15 R.I. 35, 23 A. 37, 37–38 (1885) (the language the court uses here is essentially the same as both Blackstone's and *Gillet*'s but is more succinct: "Bees are *ferae naturae*, and the only ownership in them until reclaimed and hived is *ratione soli*").

²⁰³ *Lenk v. Spezia*, 95 Cal. App. 2d 296, 302, 213 P.2d 47, 51 (1949).

useful that they are “all but domesticated.”²⁰⁴ Therefore, bees are close to, if not straddling, the dividing line between wild and domesticated. Honey bees’ place near that line is heavily intimated under federal and state statutes and regulations.

Federal statutes and regulations, read under *ejusdem generis*, strongly indicate that honey bees are separate and apart from livestock and other forms of domesticated animals.²⁰⁵ *Ejusdem generis*, or “of the same kind,” is a canon of statutory interpretation used when a statute lists a class of things.²⁰⁶ For example, if a statute refers to weapons as knives, daggers, stilettos, and swords, then a court would rule that handguns or rifles would not be considered weapons since the list only includes bladed weapons. The clear separation of “livestock” and “bees” in the language of some statutes²⁰⁷ demonstrates that Congress intended to categorize bees

²⁰⁴ *People v. Kasold*, 314 P.2d 241, 241 (Cal. App. Dep’t Super. Ct. 1957).

²⁰⁵ 7 U.S.C. §1471 (2) (A) (West, Westlaw through P.L. 116-5 (Title 26 current through 116-9)) (defining “livestock” as “cattle, . . . horses, . . . poultry, . . . and other animals [designated by the Secretary of Agriculture] that are part of a foundation herd”).

²⁰⁶ *Ejusdem Generis*, Black’s Law Dictionary (10th ed. 2014).

²⁰⁷ 7 U.S.C. § 1626 West, Westlaw through P.L. 116-5 (Title 26 current through 116-9) (defining ‘agricultural products’ as includ[ing]. . . *livestock* and poultry, *bees*”) (emphasis added).

close to the dividing line between domesticated and wild. However, honey bees could be considered livestock for organic certification purposes.²⁰⁸

Furthermore, honey bees are separated from other livestock in the Code of Federal Regulations,²⁰⁹ which indicates that honey bees are not livestock, but rather wildlife that is all but domesticated. So, how do states define and categorize honey bees?

Unsurprisingly, many states do not stray far from the federal separation of honey bees and livestock.²¹⁰ Interestingly, however, some states brush with the idea that bees are domesticated animals in limited circumstances, such as when the designation is necessary to deal with dangerous pests or diseases.²¹¹ Additionally, bees could

²⁰⁸ 7 U.S.C. § 6502 (11) (West, Westlaw through P.L. 116-5 (Title 26 current through 116-9)) (defining “‘livestock’ [as] . . . *other nonplant life*”).

²⁰⁹ *See generally*, 7 C.F.R. §§322.1-322.35 (West, Westlaw through 2019 84 FR 10720).

²¹⁰ *See, e.g.*, Fla. Stat. Ann. § 570.02 (West) (“‘[a]griculture’ means the science and art of production of plants and animals useful to humans, including. . . *livestock*, poultry, [and] *bees*”) (emphasis added); Cal. Food & Agric. Code §§ 18663, 18943 (West, Westlaw); Fla. Stat. Ann. § 588.13 (West, Westlaw); N.D. Cent. Code Ann. § 36-01-00.1 (West, Westlaw); Wash. Rev. Code Ann. § 16.50.110 (West, Westlaw); Fla. Admin. Code Ann. rr. 5C-3.001, 5C-24.001.

²¹¹ Fla. Admin. Code Ann. r. 5C-24.001 (the diseases or pests must “threaten the agricultural interests of the state [of Florida]”; This regulation likely affords a temporary designation to these animals, thus

be considered “[n]ontraditional livestock” under North Dakota law, but a court would need to interpret the meaning using accepted science.²¹²

D. How are Honey Bees Currently Protected Under Federal Schemes?

This subsection discusses how the federal government already protects honey bees with regard to importation, transit, and Pesticides. This subsection also shows the shortcomings in current federal safeguards, such as the failures to address poor hive design and stressful migration of bees.

5. Importation and Transit

The Honey Bee Act is the primary enabling statute through which APHIS regulates honey bees. Its sole purpose is to prevent the introduction of honey bee pests, diseases, and unwanted species

once the disease or pest is controlled or dealt with, the wild animal would then return to its traditional designation).

²¹² N.D. Cent. Code Ann. § 36-01-00.1 (West 2019) (to be considered “nontraditional livestock” the wildlife must be confined in a manmade enclosure that limits its movement within definite boundaries or the animal must be physically altered to limit movement and facilitate capture; Since honey bees generally stay within a certain range of their hives and the hives are manmade, their movement is necessarily limited thus honey bees are nontraditional livestock).

of honey bees.²¹³ These regulations attempt to prevent the spread of *varroa destructor* among other pests into pest-free areas.²¹⁴ To conform with this general aim, federal regulations list what honey bee-related items may be imported into the country.²¹⁵ The regulations even detail how honey bees must be packaged.²¹⁶

Moreover, the Administrator of the APHIS (Administrator or APHIS, where necessary) can designate restricted organisms and regulate their importation.²¹⁷ However, restricted organisms may be

²¹³ 7 U.S.C. §281 (a) (West, Westlaw through P.L. 116-5 (Title 26 current through 116-9) (“[t]he Secretary of Agriculture is authorized to prohibit or restrict the importation. . . entry of honey bees. . . into or through the United State. . . to prevent the introduction and spread of *diseases and parasites* harmful to honey bees.”) (emphasis added); 7 C.F.R. §322.2 (West, Westlaw through 2019; 84 FR 10720).

²¹⁴ *See id.* Hawaii is “considered a pest-free area[.]” Hawaii is the only state where interstate movement of honey bees is prohibited. Hawaii is listed as a “pest-free area[.]”, however, additional states could be added to this list. 7 C.F.R. §322.2 (West, Westlaw through 2019; 84 FR 10720).

²¹⁵ 7 C.F.R. §§322.2, 322.4 (West, Westlaw through 2019; 84 FR 10720) (Bees, honey bee germ plasm, and beekeeping by products may be imported into the country, but only in compliance of the general requirements in Subpart B. However, pollen from bee colonies used as bee feed and used beekeeping equipment that encounters indigenous bees; or “[c]onsists of bee boards that contain live brood of bees” from Canada may be imported).

²¹⁶ *Id.* at §322.8. Which mandates that honey bees must be packaged so they cannot escape. Live broods, interestingly, “may only include packing material that were grown or produced in the exporting region.”

²¹⁷ 7 U.S.C. §281 (West, Westlaw through P.L. 116-5 (Title 26 current through 116-9); 7 C.F.R. §322.13 (West, Westlaw through 2019; 84 FR 10720) (“restricted organism” are honey bee brood in comb; adult

imported for research purposes with a proper permit.²¹⁸ To prevent spread of pests, diseases, and unwanted honey bee species, APHIS pays close attention to how restricted organisms are packaged.²¹⁹ Additionally, APHIS promulgates substantial permitting requirements and special forms used to permit or deny entry of restricted organisms.²²⁰ APHIS will refuse any shipments that fail to meet these regulations and will either immediately export the shipments or destroy the shipment at the importer's expense.²²¹

Finally, APHIS regulates the importation and transit of restricted *articles*.²²² Restricted articles - as opposed to restricted

honey bees or their germ plasm from unapproved regions; and bees at any stage in their life from unapproved regions).

²¹⁸ *Id.* “Federal, State, or university researchers” may import restricted organisms if the importation is for “research or experimental purposes” and must meet the subsection (a) requirements. *Id.*

²¹⁹ *Id.* at §322.16. Packaging must prevent organisms from escaping and leakage. The containers must be “clearly marked with the contents of the shipment.” The packing materials are likewise limited.

²²⁰ *Id.* at §322.14. Which mandates that an applicant must supply: applicant information; application type; type of movement; scientific name of organism; life stage; number of specimens per shipment; media or species of host material; source (region) of the organism; shipment method; ports of entry, among other information.

²²¹ 7 C.F.R. §322.19 (West, Westlaw through 2019; 84 FR 10720).

²²² 7 C.F.R. §§322.28-35 (West, Westlaw through 2019; 84 FR 10720).

organisms - are dead bees,²²³ beeswax for beekeeping, and honey used as bee feed.²²⁴ Like restricted organisms, APHIS will refuse any shipments that fail to meet these regulations and will either immediately export the shipments or destroy the shipment.²²⁵

E. Pesticides

No discussion about dead bees is complete without discussing pesticides. Neonicotinoids—one of the honey bees’ most recent antagonists—are the focus of this subsection.²²⁶ Neonicotinoids means “new nicotine-like insecticides” and they are popular because they are water soluble which allows them to be easily taken up by plants.²²⁷ Neonicotinoids bind to certain receptors

²²³ Dead bees have their own strict importation requirements. For example, dead bees must be “[i]mmersed in a solution containing at least 70 percent alcohol,” immersed in liquid nitrogen, or pinned and dried like scientific specimens.

²²⁴ 7 C.F.R. §322.28.

²²⁵ 7 C.F.R. §322.24.

²²⁶ This article does not focus on banning the use of neonicotinoids, so it should suffice to say that they are lethal to honey bees. Jennifer Hopwood, Aimee Code, Mace Vaughn, David Biddinger, Matthew Shepherd, Scott Hoffman Black, Eric Lee-Mäder, & Celeste Mazzacano, *How Neonicotinoids Can Kill Bees: The Science Behind the Role These Insecticides Play in Harming Bees* vii, (2d ed. 2016). <https://perma.cc/L2UD-6SU8>.

²²⁷ Texas A&M AgriLife Extension, *What is a neonicotinoid*, *Insects in the City* (last visited Apr. 15, 2018), <https://perma.cc/D37Q-3Y3D>.

on nerve synapses, thus killing the ingesting insect.²²⁸ The primary federal statute that regulates pesticides is the Federal Insecticide Fungicide and Rodenticide Act (FIFRA).²²⁹ FIFRA generally concerns itself with registering and labeling pesticides, using registered pesticides properly, and delegating functions to the Environmental Protection Agency (EPA) and State governments, *inter alia*.²³⁰ FIFRA prevents any person in any state from distributing or selling any pesticide not registered under the Act.²³¹ FIFRA grants state governments the power to more strictly regulate pesticides.²³² Moreover, the savings clause and the preemption clause of the selfsame section both indicate that Congress designed the statute to give the states “expansive powers to ‘regulate’ pesticides.”²³³ FIFRA itself, however, does not mention

Neonicotinoids include: acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, and thiamethoxam.

²²⁸ *Id.*

²²⁹ 7 U.S.C. §§136a-y.

²³⁰ *Id.*

²³¹ 7 U.S.C. §136a.

²³² 7 U.S.C. §136v. However, States cannot be more lenient than FIFRA. §136v(a) is both the savings clause and the preemption clause.

²³³ *Burke v. Dow Chem. Co.*, 797 F. Supp. 1128, 1140 (E.D.N.Y. 1992).

neonicotinoids or pollinators.²³⁴ To find any mention of pollinators, one must look to 40 C.F.R. §§156.80-156.85.²³⁵

Federal regulations mandate that pesticides must show “hazard and precautionary statements for environmental hazards, including hazards to non-target organisms.”²³⁶ The EPA may require a precautionary statement under certain circumstances.²³⁷ For example the EPA may require an appropriate precautionary statement if a pesticide is applied to crops, forests, or mosquito treatments, and contains a pesticide toxic to pollinators.²³⁸ States are permitted to register a new pesticide under FIFRA if local areas have a special need, necessary tolerances cover the use, the registration

²³⁴ 7 U.S.C. §§136a-y.

²³⁵ *Pollinator Stewardship Council v. U.S. E.P.A.*, 806 F.3d 520 (9th Cir. 2015) (a procedural case answering whether the Environmental Protection Agency (EPA) properly studied sulfoxaflor and its effects on pollinators under the Pollinator Risk Assessment Framework. The Ninth Circuit Court of Appeals determined that the unconditional registration was unsupported by the record and then vacated the registration and remanded back to the agency.).

²³⁶ 40 C.F.R. §156.80(a) (these hazard statements describe the type of hazard, while precautionary statements inform the user how to “avoid the hazard or mitigate its effects”).

²³⁷ 40 C.F.R. §156.85(a).

²³⁸ 40 C.F.R. §156.85(b)(5).

does not try and preempt federal registrations, and the registration follows FIFRA.²³⁹

F. How are Honey Bees Currently Protected Under State Schemes?

This subsection discusses how state governments protect honey bees through their regulations of importation and transit, quarantine, and pesticides. Generally, this subsection refers to the laws of Florida, California, North Carolina, and South Dakota because the laws of these states are representative of honey bee law throughout the country.

Current state statutes and regulations also aim to prevent the importation and spread of honey bee pests, diseases, and unwanted species of honey bees.²⁴⁰ However, the similarities between state and federal law generally ends there and state law becomes robust.²⁴¹ California, for example, also regulates registration,

²³⁹ 40 C.F.R. §162.152(a).

²⁴⁰ See West's Ann. Cal. Food & Agri. Code §§29000-29322; West's F.S.A. §§586.01-.161; N.C. Gen. Stat. Ann. §106-634; S.D. Codified Laws §§38-18-1 through -37; S.D. Admin. R. 12:41:02:01-07:12; Tex. Agric. Code. Ann. §131.021 (West).

²⁴¹ See 7 U.S.C. §§281, 282, and 284; See Cal. Food & Agric. Code §§29000-322; See West's F.S.A. §§586.01-.161; See N.C. Gen. Stat. Ann. §§106-634 through 645; See S.D. Codified Laws §§38-18-1 through -37; See 7 C.F.R. §§322.1-.35 almost all of which deal solely with importing

identification, and intrastate movement of apiaries, use of pesticides, quarantines, and sanitation, *inter alia*.²⁴² This subsection will show the shortcomings in the current state safeguards which generally mirror the shortcomings in federal safeguards.

G. Importation and Transit

Mandating inspection certificates is one method states employ to limit honey bee pests, diseases, and unwanted species from spreading.²⁴³ These certificates require that imported colonies be free of any pest designated by the respective state.²⁴⁴ If shipments of bees or beekeeping equipment are not accompanied by the proper

and transporting honey bees; *See* 2 N.C. Admin. Code 48A.0242-.0265; *See* S.D. Admin. R. 12:41:02:01-:07:12.

²⁴² Cal. Food & Agric. Code §§29000-322. California is arguably the state with the most robust legislation protecting honey bees. However, many of the laws still conform with the federal aim to prevent introduction and spread of pests, diseases, and unwanted bee species.

²⁴³ Cal. Food & Agric. Code §29120 (West) (“no person shall import or transport into the state any comb. . . hive or used appliance, unless each load. . . is accompanied by a valid certificate.”); S.D. Codified Laws §38-18-23; Fla. Admin. Code Ann. r. 5B-54.006 (“[a]ll regulated articles . . . entering the state shall be accompanied by a current Certificate of Beekeeping Registration . . . or apiary inspection documentation . . . certifying that such regulated articles were inspected and found to meet department entry requirements.”); 2 N.C. Admin. Code 48A.0246; S.D. Admin. R. 12:41:07:07, :09, :10, :11.

²⁴⁴ Cal. Food & Agric. Code §29122 (West); S.D. Codified Laws §38-18-23; Fla. Admin. Code Ann. r. 5B-54.006(1); 2 N.C. Admin. Code 48A.0250(1)(c); S.D. Admin. R. 12:41:07:07, :09, :10, :11.

certificate, then the importing state reserves the right to seize the colonies, and then decide whether to return them or destroy them.²⁴⁵

Generally, infested bees or hives are not allowed to travel in intrastate commerce.²⁴⁶ However, states vary greatly in how they maneuver around this general rule. California, for example, permits transporting contaminated hives for burning when the bees are dead and the hives are sealed.²⁴⁷ Infested bees can only be transported for abatement or research.²⁴⁸ In Florida, “regulated articles”²⁴⁹ cannot move in intrastate commerce unless accompanied by a certificate of inspection, or it meets the other standards of the chapter and are

²⁴⁵ Cal. Food & Agric. Code §29124; S.D. Codified Laws §38-18-25; Fla. Admin. Code Ann. r. 5B-54.006 (“whether certified or not.”).

²⁴⁶ Cal. Food & Agric. Code § 29071; Fla. Admin. Code Ann. r. 5B-54.006; 2 N.C. Admin. Code 48A.0246. Interstate commerce is “[t]rade or other business activities between those located in different states.” *Commerce*, Black's Law Dictionary (10th ed. 2014). Intrastate commerce, on the other hand, is “[c]ommerce that begins and ends entirely within the borders of a single state.”

²⁴⁷ *Id.* at § 29071.

²⁴⁸ *Id.* at § 29072.

²⁴⁹ Fla. Admin. Code Ann. r. 5B-54.003 which defines regulated articles as: “[h]oney bee,” “[r]egulated honey bee pests,” “[u]nwanted races of honey bees,” “[u]sed beekeeping equipment,” “[a]ny other article capable of transporting a regulated honey bee pest or an unwanted race of honey bees.”.

identified pursuant to another rule.²⁵⁰ North Carolina has thorough regulations that differentiate between honey bees simply passing through the state and bees already in North Carolina—each has different standards.²⁵¹

H. Quarantine

States will initiate quarantines when restricting importation and transit of honey bees fails to prevent the introduction and spread of honey bee pests. Quarantines are initiated when state apiary inspectors discover unwanted species of bees or bee pests.²⁵² The quarantine distance varies by state and can be as small as a distance prescribed by state officials or as big as the border of the entire

²⁵⁰ *Id.* at 5B-54.006(3).

²⁵¹ 2 N.C. Admin. Code 48A.0246(4), (5). The passers-through can be transported if: the hives are secure; the bees are maintained at a constant temperature of below 45 degrees Fahrenheit; the transporting vehicle must “travel on and remain within one mile” of the interstate; and the vehicle operator must report “any accidental or intentional release of bees.”

²⁵² Cal. Food & Agric. Code §29110 (West); S.D. Codified Laws §38-18-19; Fla. Admin. Code Ann. r. 5B-54.017(3); *Id.* at 0257-.0258. States differ in how permissive they are in initiating quarantine and enforcement. Some states mandate that quarantine be initiated (“shall”-states) while other states are permissive (“may”-states). Both California and South Dakota are “may”-states, whereas North Carolina and Florida are “shall”-states.

state.²⁵³ Quarantine procedures typically involve state officials holding apiaries until eradication or abatement of honey bee pests or unwanted species.²⁵⁴ Any item under quarantine cannot cross or be removed from the quarantine area until lifted.²⁵⁵

North Carolina takes an interesting alternative path to quarantining by allowing for “clean-up” areas.²⁵⁶ This path takes a less restrictive approach than interior quarantines by designating

²⁵³ *Id.* Adding further to the differences between state quarantine laws, states initiate interior and/or exterior quarantines. An interior quarantine means that the quarantine area is within the state and covers the infested colony or apiary. An exterior quarantine means that the quarantine covers the state border. California is either because the director can “establish, maintain, and enforce a quarantine *at the boundaries of, or within, the state.*” (emphasis added). South Dakota is an interior state because, “[t]he secretary [of agriculture] may place any apiaries . . . where regulated pests are found. . . under quarantine.” North Carolina enforces interior quarantines “within a radius of two miles around the diseased apiary or colony of bees” and exterior “areas outside of North Carolina when. . . a bee of the genus other than *Apis*. . . or a bee disease. . . that is not established throughout North Carolina exists in that area and that importation of honey bees. . . present an introduction hazard.” Florida is exterior only because the area covers only “a distance prescribed by the department of the infested apiary.”

²⁵⁴ Cal. Food & Agric. Code §29114 (West); Fla. Admin. Code Ann. r. 5B-54.017; S.D. Codified Laws §38-18-19; 2 N.C. Admin. Code 48A.0257-.0258.

²⁵⁵ Cal. Food & Agric. Code §29111 (West); S.D. Codified Laws §38-18-19; Fla. Admin. Code Ann. r. 5B-54.017; 2 N.C. Admin. Code 48A.0257.

²⁵⁶ 2 N.C. Admin. Code 48A.0256(a).

areas as “clean” or under “clean-up campaign.”²⁵⁷ Bees and equipment are prohibited from moving into, or out of, clean-up areas.²⁵⁸

I. Pesticides

Only a handful of states have exercised their “expansive power” to regulate pesticides by curbing the sale and use of neonicotinoids.²⁵⁹ These states differ in their regulations, but most recognize that neonicotinoids are harmful to honey bees.²⁶⁰ Some states prohibit applying neonicotinoids and pesticides harmful to bees to blossoming or flowering plants.²⁶¹ States require that beekeepers are notified before neonicotinoids or other pesticides harmful to pollinators are applied.²⁶² Minnesota simply mandates

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ *Burke v. Dow Chem. Co.*, 797 F. Supp. 1128, 1140; Conn. Gen. Stat. Ann. §22a-61a; Md. Code Ann., Agric. §2-1801 (West); Md. Code Ann., Agric. §5-2A-02 (West); Minn. Stat. Ann. §18H.02 (West).

²⁶⁰ *Id.*

²⁶¹ Conn. Gen. Stat. Ann. §22a-61a through 61b (West); Idaho Admin. Code r. 02.03.03.400; 2-3 Vt. Code R. §300.

²⁶² Cal. Code Regs. tit. 3, §6654; 2 N.C. Admin. Code 9L.1009; 2-3 Vt. Code R. §300.

that certain pesticides be labeled as harmful to pollinators.²⁶³ Maryland and Oregon are currently the only states that have banned the sale and/or use of neonicotinoids in certain cases.²⁶⁴ Other states simply have added provisions that their pesticide regulators can restrict pesticide sale and use to protect pollinators.²⁶⁵

IV. WASHINGTON STATE HONEY BEE LAW

Like many other states, Washington State lacks meaningful honey bee health regulations. However, unlike Florida, California, South Dakota, and North Carolina, Washington has weaker laws concerning importation and transit, quarantine, and pesticides. Furthermore, Washington's administrative framework concerning honey bees is focused solely on promoting the honey bee industry rather than honey bee health.

²⁶³ Minn. Stat. Ann. §18H.02 (West).

²⁶⁴ Md. Code Ann., Agric. §5-2A-02 (West). Which allows using neonicotinoids in pet-care products, personal care products “used to mitigate lice and bedbugs” and indoor pest control. Persons who sell “restricted use pesticide” could continue to sell neonicotinoids. Certified applicators, farmers, and veterinarians are still allowed to use neonicotinoids.; Or. Admin. R. 603-057-0388 which prohibits the application of “any product containing dinotefuran, imidacloprid, thiamethoxam, or clothianidin. . .to linden trees, basswood trees or other *Tilia* species”.

²⁶⁵ See Cal. Food & Agric. Code §12838 (West); N.C. Gen. Stat. Ann. §143-440; Vt. Stat. Ann. Tit. 6, §1104 (West).

A. Importation and Transit

Although Washington requires that beekeepers register their hives with the State, state officials are not required to conduct yearly inspections.²⁶⁶ Instead, the Washington State Department of Agriculture director, “*may . . . cause to be inspected while in transit or after arrival at their destination*” products that likely carry pests generally.²⁶⁷ Interestingly, this same section does not require certification that hives are pest-free or within a minimum acceptable level.²⁶⁸

B. Quarantine

Washington differs from the other States because it does not mandate quarantines when inspectors discover unacceptable pest levels in hives.²⁶⁹ Instead, the Washington Administrative Code orders emergency adjudicative proceedings before quarantining an apiary.²⁷⁰ These emergency adjudicative procedures mandate that

²⁶⁶ Wash. Rev. Code § 15.60.021; *See* Wash. Rev. Code § 17.24.021.

²⁶⁷ Wash. Rev. Code §17.24.021 (emphasis added).

²⁶⁸ *See id.*

²⁶⁹ Wash. Rev. Code §§15.60.005-15.60.901.

²⁷⁰ Wash. Admin. Code §16-08-151.

the situation be an “immediate danger to the public health, safety, or welfare requiring immediate agency action.”²⁷¹ The agency must then enter an order that includes a brief statement that delineates fact findings, legal conclusions, and policy reasons for the decision justifying a determination that there is an immediate threat and validates the agency’s specific plan.²⁷² The agency then notifies any apiary involved in the proceeding and allows the apiary to challenge the proceeding.²⁷³ Interestingly, the Washington State Legislature has repealed the specific quarantine and treatment procedures for honey bee pests.²⁷⁴

C. Pesticides

Washington aims to destroy plants and pests that harm honey bee productivity,²⁷⁵ yet the state provides no pesticide regulations

²⁷¹ Wash. Rev. Code §34.05.479.

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ Wash. Admin. Code T. 16, Ch. 16-470., Disp Table. The legislature repealed all statutes concerning *varroa destructor* 27 years ago even though the mite remains an issue in Washington.

²⁷⁵ Wash. Rev. Code § 17.10.145.

that are designed to protect bees or pollinators generally, such as limiting neonicotinoid application.²⁷⁶

D. The Honey Bee Commission and Regulations

In 1989, the Washington legislature created the “Honey Bee Commission” (Commission), which attempts to “advance the public welfare and education and to promote the interest, products, services, and stabilization of Washington’s honey bee *industry*.”²⁷⁷ While attempting to promote the honey bee industry, the Commission does little to promote honey bee health.²⁷⁸ In effect, the Commission markets Washington’s honey bee industry products within the state and across the country.²⁷⁹

Moreover, Chapter 15.62, which created the Commission, is mostly procedural—delineating how members are elected and the Commission’s powers and duties, *inter alia*.²⁸⁰ The Commission’s

²⁷⁶ Wash. Rev. Code §§ 15.58.010-.901.

²⁷⁷ Wash. Rev. Code § 15.62.010 (emphasis added).

²⁷⁸ Wash. Rev. Code §15.62.010-.900 (1989).

²⁷⁹ *Id.*

²⁸⁰ *Id.*

powers and duties include promulgating regulations to promote the honey bee *industry*, but not promote honey bee *health*.²⁸¹

Furthermore, the Washington Administrative Code chapter that regulates apiaries is bereft of regulations concerning honey bee health.²⁸² In fact, the legislature has repealed many regulations under this chapter.²⁸³ For example, in 2001, the legislature repealed the section regulating colony strength.²⁸⁴

Overall, Washington has much room to improve because existing laws are insufficient to protect honey bee health. Yet, by empowering the Honey Bee Commission to promulgate regulations concerning honey bee health, Washington can adequately protect honey bee health.

E. Disconnected from the Science

Federal laws and regulations mostly focus on the importation and transit of honey bee items and do not address the reality that national honey bee migration threatens their health. Furthermore,

²⁸¹ Wash. Rev. Code §15.62.040 (1989).

²⁸² Wash. Admin. Code § 16-602-025 through 16-602-050 (2001).

²⁸³ 01-11-146 Wash. Reg. 153-154 (June 6, 2001).

²⁸⁴ *Id.*

the federal scheme does not contemplate how poor hive design can harm honey bee health. In fact, legislators seem to openly prefer bees' capitalistic success over environmental health. The legislative history of the 1976 amendment to the Honey Bee Act shows that "[hybrid African and European honey bees] would seriously interfere with the use of bees for crop pollination."²⁸⁵ Additionally, the legislature was not concerned with honey bee health, but instead voiced concerns about losing \$1 billion in crops that would not be pollinated, \$6 billion in seed production, and the millions from honey and beeswax.²⁸⁶ Federal laws and regulations consider how hives should be packaged, while neglecting humane hive designs. Finally, federal law mentions nothing about breeding bees to produce less propolis nor poor pollen diversity.

State laws and regulations are not much better. By building upon the general federal framework, they neglect to address gaps within the framework. While inspections and quarantines may have an ancillary effect on honey bee health, these processes are utilized

²⁸⁵ H.R. REP. NO. 94-1160, at 3, (1976) *as reprinted in* 1976 U.S.C.C.A.N. 1289, 1291.

²⁸⁶ *See id.*

to protect different aspects of honey bee health. These laws and regulations protect honey bee homogeneity and freedom from pestilence but are insufficient to address the health issues stemming from forced migrations, poor hive design, and poor nutrition. To date, federal and state governments focus solely on preventing the spread of pests and unwanted bee species, however, do not to protect honey bee health—but to protect bees' economic clout.

V. WHAT COULD LEGISLATORS DO TO PROTECT HONEY BEE HEALTH?

Lawmakers must consider honey bee health because honey bees are vital to U.S. agriculture and thus the economy, but mostly because honey bees are necessary for humanity and the ecosystem. This section addresses two major problems affecting honey bees: poorly designed Langstroth hives (Langstroths) and the stressful interstate movement of bees. In addition, this section also addresses propolis production and poor bee nutrition.

Honey bee health can be protected through several methods, with mixed efficacy. First, the Secretary of the Interior could list honey bees as threatened or endangered under the ESA. Second, Congress could regulate interstate travel of honey bees and the design of honey bee hives. Third, the Secretary of Agriculture of the

USDA and/or the Administrator of the APHIS (Administrator or APHIS, where necessary)²⁸⁷ at the federal level, and the Departments of Agriculture at the state level, could task scientists to research and develop less stressful methods to transport honey bees, to research and develop more natural hive designs, prohibit selectively breeding bees to produce less propolis, and require beekeepers to plant diverse flowerbeds on apiary property.

F. Listing Honey Bees Under the Endangered Species Act

The ESA aims to protect wildlife from “development untampered by adequate concern and conservation.”²⁸⁸ To accomplish this, the ESA affords protection to fish and wildlife which are triggered once the organism is listed.²⁸⁹ *Apis mellifera* Linnaeus (Honey bees) are eligible for protection under the ESA because honey bees are considered *ferae naturae* (wildlife) under the law.²⁹⁰ Even if honey bees were considered domesticated,

²⁸⁷ 7 C.F.R. §2.80 (2010) (Under Secretary for Marketing and Regulatory Programs delegated the power to promulgate regulations under the Honey bee Act (7 U.S.C. §§281-286) to the APHIS Administrator.).

²⁸⁸ 16 U.S.C. §§1531-1544 (2006).

²⁸⁹ 16 U.S.C. §1538 (2000).

²⁹⁰ 7 U.S.C.A. § 1626 (West 2019); Cal. Food & Agric. Code § 18663 (West 2019); Cal. Food & Agric. Code § 18943 (West 2019); Fla. Stat. Ann. § 570.02 (West 2019); Fla. Stat. Ann. § 588.13 (West 2019); N.D.

wildlife under the ESA specifically includes any invertebrate “without limitation.”²⁹¹ Moreover, the idea is not unprecedented since other bee species, although not traditionally captured for use in apiculture, are protected under the ESA.²⁹²

At the beginning of the listing process, the Interior Secretary uses a variety of factors to determine whether the species is endangered or threatened and²⁹³ must cooperate with the States and

Cent. Code Ann. § 36-01-00.1 (West 2019); Wash. Rev. Code Ann. § 16.50.110 (West 2019); *Lenk v. Spezia*, 95 Cal. App. 2d 296, 302 (Cal. Dist. Ct. App. 1949); *People v. Kasold*, 314 P.2d 241, 241 (Cal. App. Dep’t Super. Ct. 1957); Fla. Admin. Code Ann. r. 5C-3.001 (2019); Fla. Admin. Code Ann. r. 5C-24.001 (2019).

²⁹¹ 16 U.S.C. § 1532 (2006) (emphasis added).

²⁹² 90-Day Finding on a Petition To List the Franklin’s Bumble Bee as Endangered, 76 Fed. Reg. 56381 (Sep. 13, 2011); 90-Day Findings on 29 Petitions, 81 Fed. Reg. 14058 (Mar. 16, 2016); Endangered Status for 49 Species From the Hawaiian Islands 81 Fed. Reg. 67786 (Sep. 30, 2016); Endangered Species Status for Rusty Patched Bumble Bee, 82 Fed. Reg. 10285 (Feb. 10, 2017); U.S. Fish and Wildlife Service, *Rusty patched bumble bee* (*Bombus affinis*), <https://perma.cc/Q8VK-DKVN>; US Fish and Wildlife Service, *Franklin’s bumblebee* (*Bombus franklini*), <https://perma.cc/4CHB-M679>; U.S. Fish and Wildlife Service, *Yellow banded Bumble bee* (*Bombus terricola*), <https://perma.cc/XV8J-PT67>; U.S. Fish and Wildlife Service, *Hawaiian Yellow-Faced bee* (*Hylaeus mana*), <https://perma.cc/6LSH-L7Q5>.

²⁹³ 16 U.S.C. § 1533 (2006). Relevant factors may include: “overutilization for commercial. . . purposes;” “disease;” “inadequacy of existing regulatory mechanisms;” or “natural or manmade factors affecting its continued existence.” Any determinations or designations the Secretary makes must be based on “the best scientific data available.”

other federal agencies to determine an animal's status.²⁹⁴ Once a species is listed as endangered, the ESA prohibits any person from importing, exporting, taking, possessing, selling, or offering for sale any endangered species.²⁹⁵ The Interior Secretary may also require beekeepers to release their bees or to at least stop taking feral bees from their natural habitat. The ESA defines "tak[ing]" as "harass[ing], harm[ing], . . . trap[ing], captur[ing], or collect[ing]."²⁹⁶ In addition, beekeepers could not capture feral beehives and put them into hives. Under this definition, listing honey bees under the ESA would prevent beekeepers from housing bees at all for commercial use since the increased airflow in Langstroth hives alter pheromone concentrations that significantly affect bees' lifecycle and foraging behavior.²⁹⁷ Additionally, even if beekeepers could continue to keep their honey bees after listing, queen breeders could no longer breed bees to produce less propolis since the increased infection risk would harm bees.²⁹⁸ However,

²⁹⁴ 16 U.S.C. §§ 1535, 1536 (2006).

²⁹⁵ 16 U.S.C. § 1538 (2006).

²⁹⁶ 16 U.S.C. § 1532 (2006).

²⁹⁷ Mortensen et al., *supra* note 66, at 4.

²⁹⁸ Erickson, *supra* note 112.

listing honey bees under the ESA, is not perfect and has issues that may outweigh any benefit conferred.

The ESA's purpose is to protect species from extinction—not to protect their overall health. This protection likely does not apply to honey bees because they are kept and bred; thus, maintain a relatively stable population despite increasing death rates—40 percent.²⁹⁹ The extinction issue may not be relevant for years to come and honey bee health must be addressed now because honey bees are vital for humanity's continued existence and ecological balance.

G. Congressional Intervention

An outright ban on the interstate movement of bees, which is the likely consequence if honey bees are listed under the ESA, could have potentially catastrophic consequences. For example, an outright honey bee ban would cast a pebble into the market pond

²⁹⁹ Alan Bjerga, *Honey bees May Be Dying in Larger Numbers Due to Climate Change*, Bloomberg (May 23, 2018), <https://perma.cc/3U3C-HNKU> (Last visited Mar. 29, 2019). The number is up 33% from 2017. Managers are adapting to climate fluctuations by cutting their total hives to focus on the remaining hives. However, as of April 1, 2018, the United States had 2.69 million colonies, which is down slightly from 2.85 million in October 2017. U.S. Dep't of Agriculture, *Honey Bee Colonies, 2018* 1 (Aug. 1, 2018). <https://perma.cc/YX8Q-8SCG>.

and likely create ripples that create unintended waves. Bees contribute up to 35% of pollination services, let alone the millions in pollination services.³⁰⁰ Effectively banning their use outright would lead to lower crop yields, and may even cause many to fail, thus crippling large sections of the agricultural market. Crippling the agricultural market would affect farmers, beekeepers, and consumers. In the best-case scenario, the price of food may rise. In the worst-case scenario, banning bees may lead to a food scarcity crisis. However, the price of not acting increases as more bees die.

Legislators could provide a lighter touch than banning honey bees from commercial use to mitigate any unintended effects. Congress could use its commerce clause power to regulate the transportation of bees in interstate commerce.³⁰¹ Furthermore, Congressional regulation of the intrastate movement of bees may withstand judicial scrutiny, because even slight movement affects bee health, thus becomes an “intrastate [activity] which so affects interstate commerce.”³⁰² Correspondingly, Congress could regulate

³⁰⁰ *Supra* note 177.

³⁰¹ U.S. CONST. art. I, § 8, cl. 3.

³⁰² *Wickard v. Filburn*, 317 U.S. 111, 124 (1942); *but see United States v. Lopez*, 514 U.S. 549 (1995) (explaining that purely local activity

beehive design using the same power since Langstroth hives are sold in interstate commerce. Even when sold in intrastate commerce, regulations could withstand judicial scrutiny since Langstroths affect bee health, consequently affecting the interstate commerce of bees. Because Congress has previously regulated the humane transport of animals and there is no reason why Congress could not regulate bee transportation.³⁰³ This solution, however, is still inappropriate.

While congressional intervention would balance market and environmental concerns better than an outright honey bee ban, which is likely if listed under the ESA, this option is unwise since Congress is notoriously slow moving and already delegated its rulemaking authority for this matter to the Secretary of Agriculture.³⁰⁴

cannot be regulated by the commerce clause if its effect is too far away in degree from interstate commerce).

³⁰³ 49 U.S.C. §80502 (2006).

³⁰⁴ 5 U.S.C. § 301 (2006); 7 U.S.C. § 2143 (2012); *see* 7 C.F.R. § 2.80 (2010).

H. Agency Intervention

The USDA and APHIS are the appropriate authorities to promulgate new honey bee regulations because Congress explicitly authorized them to do so,³⁰⁵ the agencies act quicker than Congress,³⁰⁶ and are experts in their field. Moreover, the USDA is authorized to develop animal health and disease research programs with accredited colleges.³⁰⁷ While these agencies are explicitly focused on eradicating honey bee diseases, pests, and unwanted species,³⁰⁸ shifting that focus to bee health generally is hardly a stretch.

Since the USDA and APHIS are the appropriate authorities, what should they do? The answer involves balancing the interests of the beekeeper, the farmer, the manufacturer, the consumer, and the honey bee.

³⁰⁵ See 7 U.S.C. §§ 281-286 (2006); 7 U.S.C. § 2143 (2012); 7 U.S.C. § 3193 (2011); 7 C.F.R. §2.80 (2010).

³⁰⁶ 5 U.S.C. §553 (2006) provides that general notice of the proposed rule will be published in the Federal Register. The notice must be public, and each agency must give interested persons an opportunity to comment on the proposed rule. Compare this to Congress, which sends bills through committees and subcommittees, then the bill must pass the House of Representatives, then the Senate, then signed by the President.

³⁰⁷ 7 U.S.C. §§ 3191-93, 3195, 3196 (2011).

³⁰⁸ *Id.*

1. Proposed Regulation: Researching and Developing Stressless Transportation

The USDA should research and develop less stressful methods of honey bee transportation and then create regulations mandating the chosen method. Currently, the private market is the force regulating interstate and intrastate methods for transporting honey bees.³⁰⁹ Beekeepers contract with third-party truck drivers to haul bees across to California rather than driving the bees themselves.³¹⁰ Beekeepers then fit the trailer with a sprinkler system and request that the driver run the system for a few minutes before sleeping to prevent hives from overheating.³¹¹ While these methods may be effective for beekeepers to make relatively easy money with pollination contracts,³¹² they also stress out honey bees and shorten the lifespan of worker bees.³¹³

³⁰⁹ Caron, *supra* note 170.

³¹⁰ *Supra* note 205.

³¹¹ *Id.*

³¹² Bond et al., *supra* note 166.

³¹³ Simone-Finstrom et al. *supra* note 184, at 4.

USDA research could focus on developing specialized semi-tractor trailers that trick bees into believing that they are stationary or otherwise accommodate them to reduce their oxidative stress levels. These new trailers should also be equipped with a sprinkler system to douse the bees with water and include an electronic timer that automatically activates the system to stop bees from overheating.

MAAREC suggests, in their guide on transporting bees, that stopping for any reason is a problem since mechanics and tow trucks are less willing to help trucks filled with bees.³¹⁴ New trailers should include some mechanism with which to contain the bees. Containment may make interstate travel less risky for third-party truck drivers since mechanics and tow trucks would be more willing to help a truck with securely-contained bees.³¹⁵ Consequently, finding third-party truck drivers willing to haul bees will be easier since there would be less active maintenance and the bees would be securely-contained, thus facilitating more efficient hive rentals.³¹⁶

³¹⁴ Caron, *supra* note 170.

³¹⁵ *Id.*

³¹⁶ *Id.*

When this research has concluded, and a trailer design is selected, the USDA should promulgate a regulation mandating the use of the new trailer design when transporting honey bees. The regulation should prescribe trailer specifications within certain ranges to accommodate apiaries with any number of hives that may be placed on a trailer at once. Moreover, this regulation would provide a standard design that could be used across the country so beekeepers could rest assured that their trucks conform to state guidelines.

2. Potential Issues with Regulations Mandating Stressless Transportation

One issue with reduced transportation stress regulation is a theoretical increase in overhead that might give regulators, beekeepers, and farmers pause. Any new regulation restraining freedom to choose may increase overhead for beekeepers which is passed to farmers and ultimately the consumer. However, an increase in overall bee health will increase worker bees' productivity and lifespan, thus increasing overall profit to offset any increase in overhead.³¹⁷ Another issue with this new regulation is

³¹⁷ Simone-Finstrom et al., *supra* note 184, at 6.

how agencies will inspect the trailers. In Florida, the state maintains several “Agricultural Inspection Stations” where trucks are required to stop and submit to inspection from state law enforcement officers.³¹⁸ Illegally bypassing these stations is difficult because there are inspection stations on “every paved highway going into and out of the state.”³¹⁹ Semi-truck drivers would have to use dirt roads to avoid the stations. While possible, this option seems unlikely because a dirt road would jostle bees too much to keep them pacified and healthy.

At the stations, there are no specific bee inspectors. Instead, officers at these stations are generalists who check to see that drivers leaving the state have a certification that the honey bees are pest-free.³²⁰ However, with regulation, the trailers would be easy for agents to inspect since the design will be standardized across the country. Inspectors will simply determine whether the interior of the trailer conforms to regulatory standards.

³¹⁸ *Agricultural Inspection Stations*, Fla. Dep’t of Ag. and Consumer Services, <https://perma.cc/7BGC-XMFY>.

³¹⁹ *Id.*

³²⁰ *Supra* note 157.

Finally, how will agencies enforce the regulations? They could be enforced by fines or turning bees back at the border. Fines can range depending on both the number of hives and how far they are shipped. For example, if 4,000 hives are shipped from Florida to California, then the noncomplying apiary would be fined at a higher rate than if 100 hives were shipped from Florida to Georgia. The fine must be high enough to discourage efficient noncompliance, which can occur when paying the fine is cheaper than complying with the regulation. For example, rather than paying to buy a complying trailer, beekeepers or third-party drivers could simply pay the fine and continue using current transportation methods.

3. Proposed Regulation: Researching and Developing More Natural Hive Designs

In addition to transportation methods, agencies should task scientists with researching different hive designs that mimic bees' natural habitat. After a new hive designs are finalized, agencies should incentivize beekeepers to utilize them. The science behind Langstroth hives suggests that they are inadequately designed to

provide bees with a proper environment.³²¹ Designs more closely resembling natural hives will provide proper temperature, airflow, and humidity.³²²

While a new hive design may initially increase overhead, that higher overhead will be offset by heightened productivity that results reduced bee stress because, after all, honey is money.³²³ Moreover, Langstroth hives do not last forever; they must be replaced. So, once a hive is no longer fit for honey bee habitation, beekeepers can simply replace their old hives with the new hive model.

If the USDA or APHIS wishes to save money, they could alternatively hold a contest for any creative innovators to create new hive designs.³²⁴ These agencies can then test the hives for their effects on bee health and effective honey retrieval before picking the

³²¹ Siegel et al., *supra* note 113 at 242; Erickson, *supra* note 112.

³²² *See id.*

³²³ Erickson, *supra* note 112.

³²⁴ Contests like this are not new and inspire enterprising minds to solve basic issues creatively. The Bill and Melinda Gates Foundation held a contest called “Reinvent the Toilet Challenge” that helped third-world countries with their sanitation problems. Bill Gates, *And the Winners of the Reinvent the Toilet Challenge Awards are ...?*, Gatesnotes (Aug. 14, 2012), <https://perma.cc/MH5S-QE64> (Last visited Mar. 29, 2019).

most effective design. The hives must have movable frames to comply with state law.³²⁵ Any federalism issues, however, should not occur since most states only regulate hive design through mandating that hives comprise movable frames, but fail to mention other hive aspects, such as insulation.³²⁶

The contest should, additionally, add a stipulation that contestants use easily-obtainable materials and create blueprints so that beekeepers can build their own hives. Finally, the contestants should draft manuals on the new design's operation. This will allow both veteran and novice beekeepers a chance to easily adapt to what may be the new dominant hive design. Holding a contest may prove to be a good incentive to create innovative and effective hive designs.

After the contest concludes and the new hives are manufactured, agencies should provide grants to apiaries to purchase the new hive design. Change is difficult for anyone but grants to test something new may lessen that difficulty. This would

³²⁵ Cal. Food & Agric. Code §29179 (West 2019); S.D. Codified Laws §38-18-8 (2019); Fla. Admin. Code r. 5B-54.011-.012 (2019).

³²⁶ Cal. Food & Agric. Code §29179 (West 2019); S.D. Codified Laws §38-18-8 (2019); Fla. Admin. Code r. 5B-54.011-.012 (2019).

require some agreement between the agencies and the contest winners as to quantity and price. Conversely, agencies could purchase the patent rights from the contest winners and set their own, reasonable price for the hives. Regardless, agencies would need to train inspectors on the new design's operation.

4. Proposed Regulation: Prohibiting Selective Certain Breeding

Agencies should prohibit beekeepers from selectively breeding bees to produce less propolis since propolis has many beneficial effects on hives.³²⁷ Rather than performing expensive genetic testing, agencies will inspect whether honey bees are bred to produce less propolis by measuring the amount of propolis present in the hive. Inspectors can measure the amount of propolis produced in the hive during normal hive inspection. Adding one more criterion to the list would hardly take more than a few minutes which saves all parties involved time.

If beekeepers show good faith in purchasing queens that produce more propolis, then those beekeepers will not run afoul of

³²⁷ Erickson, *supra* note 112.

the regulation. Good faith would be assessed annually during normal inspections and so long as beekeepers continually replaced dead colonies with higher-propolis colonies, then enforcement shall not be an issue. If, however, a beekeeper breeds their own queens that continue to produce less propolis or continues to purchase noncomplying queens, then that beekeeper should be subject to enforcement. This enforcement would come in the way of fines. A small fine per nonconforming hive should provide an excellent stick for recalcitrant apiaries to conform to the regulation.

5. Proposed Regulation: Requiring Apiaries to Plant Diverse
Flower Beds

APHIS should encourage farmers and require apiaries to plant other pollen sources near beehives to improve bees' nutrition.³²⁸ For farmers who utilize honey bees for pollinating their crops, this could be accomplished through education programs teaching them that adding greater pollen diversity through planting diverse flower beds is not only in honey bees' best interest, but in farmers' best interest in the long run. Requiring, and possibly fining

³²⁸ Huang, *supra* note 130.

farmers to ensure pollen diversity would make balancing all the competing interests difficult.

Unlike apiaries, which generally house bees on their property and allow them to collect whichever pollen sources are available,³²⁹ farmers utilize honey bees to pollinate specific crops, which is integral for the crops' health and necessary for society's food production.³³⁰ Additionally, it may be poor optics to force farmers, through regulation and threat of state action, to plant sundry flowers on their property like a totalitarian Eastern-bloc country.

Because it may be inappropriate to require farmers to add greater pollen diversity, APHIS should instead require apiaries to plant diverse pollen sources near beehives. Balancing all the competing interests is easier, however, if agencies require and possibly fine beekeepers to ensure pollen diversity. While beekeepers do try and have their bees pollinate target crops, those crops are usually off apiary property.³³¹ Thus, agencies can require beekeepers to plant diverse flowerbeds near the apiary without

³²⁹ *Supra* note 157.

³³⁰ Lee, *supra* note 149.

³³¹ *Supra* note 157.

harming the nation's food production. It may, however, be difficult to accurately market honey as produced from orange blossoms if bees also collect pollen from zinnias, daisies, or marigolds. Taking this risk, however, may be necessary in the long run to bolster honey bee health and thus colony strength.

VI. CONCLUSION

Before any of these regulations are implemented, people should examine how they think about bees. Based on the scientific data and the statutes and regulations in effect today, the reader should see that society cares about the profit bees generate and not the bees themselves.

Bees are incredibly important insects that provide humans with a cornucopia of benefits, yet society views them as bugs to be trampled underfoot. They are nuisances that colonize the outer walls of our houses. They might as well be wasps or hornets—violent antipredators that sting at the slightest provocation. However, they were once a link between the human and the divine and represent a collective unconsciousness that some could conflate with a paradisaal afterlife.

Current federal laws and regulations focus on the importation and transit of honey bee items and, to a lesser extent, how pesticides harm pollinators. These laws and regulations do not address the reality that hive rentals that force bees to traverse the expanse of this great land threatens their health and longevity. The federal scheme also fails to address how poor nutrition, less propolis production, and poor hive designs contribute to this issue. The States are not much better since, while they build upon the general federal framework, they do not address these issues either.

The above proposed regulations offer solutions to these neglected issues. Federal and state agencies can and should find a way to improve semi-tractor designs to accommodate bees on their necessary migrations across the country. Federal and state agencies can create a new hive design that addresses the issues the Langstroth hives cause, and breeders should breed bees to produce more propolis. Finally, these agencies can educate farmers and beekeepers to understand that, in the long run, more pollen diversity will benefit their crops and their hives. Honey bee health requires lawmakers' immediate attention not only to provide ancillary benefits, such as

increased productivity, but mostly to maintain humanity and the ecosystem, to which honey bees are vital.