KEEPING BEES IN THE CITY?

DISAPPEARING BEES AND THE EXPLOSION OF URBAN AGRICULTURE INSPIRE URBANITES TO KEEP HONEYBEES: WHY CITY LEADERS SHOULD CARE AND WHAT THEY SHOULD DO ABOUT IT

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"There are certain pursuits which, if not wholly poetic and true, do at least suggest a nobler and finer relation to nature than we know. The keeping of bees, for instance . . . ." – Henry David Thoreau[1]

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"What men, in heaven's name, can we set alongside these insects which are superior to men when it comes to reasoning? For they recognize only what is in the common interest." – Pliny the Elder[2]

I. INTRODUCTION

Honeybees[3] are commonly regarded as nature's hardest working creatures. This reputation is well deserved. In a worker bee's short lifetime, a mere six to eight weeks in the summer months, she flies far enough to circle the earth one and a half times.[4] Among worker honeybees, the "most common cause of death is wearing their wings out."[5] As an indirect result of their industrious nature, honeybees are responsible for pollinating[6] approximately one-third of our food,[7] and provide us with honey, wax, and other products.[8] In recent years,

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1 HENRY D. THOREAU, *Paradise (To Be) Regained*, *in* REFORM PAPERS 19, 22 (Wendell Glick ed., 1973).

2. BEE WILSON, THE HIVE: THE STORY OF THE HONEYBEE AND US 3 (St. Martin's Griffin 2007) (2004) (quoting PLINY THE ELDER, NATURAL HISTORY: A SELECTION 149 (John Healy ed. & trans., Penguin 1991) (77 AD)).

3. The scientific name for the domesticated European honeybee is *Apis mellifera*.

4. Lance Sundberg, *Honey Bee Facts*, AM. BEEKEEPING FED'N, http://www.abfnet.org/displaycommon.cfm?an=1&subarticlenbr=71 (last visited Jan. 14, 2013).

5. *Id.*

6. Honeybees move among flower blooms to gather nectar and pollen; in the process, "grains of pollen containing male gametes, or sperm, become attached to the bees' bodies and are transferred to the pistil, the female reproductive organ, of other flowers. This process enables reproduction of flowering plants." Randal R. Rucker & Walter N. Thurman, *Perc. Policy Series No. 50, Colony Collapse Disorder: The Market Response to Bee Disease*, PROP. & ENVTL. RES. CTR., 3 (Roger Meiners ed., Jan. 14, 2012), http://perc.org/sites/default/files/ps50.pdf.

7. *Colony Collapse Disorder*, UNIV. OF ARK. COOP. EXTENSION SERV., http://www.aragriculture.org/insects/bees/colony_collapse.htm (last updated Jan. 8, 2013). While in the United States domesticated honeybees help pollinate one-third of our food supply, the percentage of the worldwide food supply that is pollinated by both domesticated and wild bees is estimated to be much higher. For example, the "FAO estimates that of the slightly more than 100 crop species that provide 90 percent of food supplies for 146 countries, 71 are bee-pollinated (mainly by wild bees), and several others are pollinated by thrips, wasps, flies, beetles, moths and other insects." *Protecting the Pollinators*, AGRIC. & CONSUMER PROT. DEP'T, FOOD & AGRIC. ORG. OF THE UNITED NATIONS (Dec. 2005), http://www.fao.org/ag/magazine/0512sp1.htm.

8. *What Honey Bees Do for Us*, NAT'L HONEY BEE DAY, http://www.nationalhoneybeeday.com/whathoneybeesdo.html (last visited Jan 14., 2013). "Honey bees provide among others things: honey, beeswax, propolis, pollen, royal jelly, apitherapy, enjoyment, and an income for some beekeepers." *Id.*

however, honeybee populations in the United States and around the world have drastically decreased.[9] The cause of these deaths, which presents a serious threat to our food supply, is as yet unexplained and has been termed Colony Collapse Disorder (CCD).[10]

While bee populations in many parts of the world are rapidly declining, we are seeing a new surge in urban beekeeping.[11] The activity has become so popular that the first-ever White House Beehive was installed near Michelle Obama's White House Garden in 2009.[12] Some credit the rise in urban beekeeping to an increased interest in urban agriculture;[13] others proclaim its growing popularity stems from a desire to save the honeybee.[14] Regardless of the reason for the recent interest, many cities across the United States have enacted ordinances that legalize and promote beekeeping.[15] In other cities, including the City of Los Angeles, attempts to legalize urban beekeeping have yet to succeed.[16]

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9. CCD STEERING COMM., USDA, COLONY COLLAPSE DISORDER PROGRESS REPORT 1–2, n.2 (2012) [hereinafter 2012 CCD REPORT], *available at* http://www.ars.usda.gov/is/br/ccd/ccdprogressreport2012.pdf. Colony losses over the past five years have averaged approximately thirty percent annually. *Id.*

10. *See* discussion *infra* Part III.

11. *See generally* Andrew Keshner, *Buzz Spreads on Urban Beekeeping*, ABC NEWS (Aug. 13, 2010), http://abcnews.go.com/Technology/buzz-spreads-urban-beekeeping/story?id=11383678 (discussing increase in beekeeping activities in urban areas).

12. Paul Bedard, *Michelle Obama Goes Organic and Brings in the Bees*, U.S. NEWS & WORLD REPORT, Mar. 28, 2009, http://www.usnews.com/news/blogs/washington-whispers/2009/03/28/michelle-obama-goes-organic-and-brings-in-the-bees; *see also* Eddie Gehman Kohan, *White House Beehive Is Ready for Spring 2012*, OBAMA FOODORAMA BLOG (Mar. 19, 2012, 11:35 AM), http://white-house-easter-egg-roll2012.blogspot.com/2012/03/white-house-beehive-is-ready-for-spring.html ("In addition to being given as diplomatic gifts, honey from the White House Beehive is used for State Dinners and First Family Dinners, as well as given to Miriam's Kitchen, a community organization that provides meals for DC's homeless. Honey is also used by the chefs when they homebrew beer.").

13. Keshner, *supra* note 11. "[Urban beekeeping] allows [people] to contribute to their community. It encourages urban gardens, community gardens to flourish." *Id.* (statement of New York City Beekeepers Association founder and president Andrew Coté).

14. *See* Rob Walton, *Urban Beekeepers: As Honeybees Drop Dead in Droves, City-Dwellers-Turned-Beekeepers Swarm to Save Them*, TIME OUT CHI. KIDS (Apr. 27, 2011), http://timeoutchicagokids.com/things-to-do/features/41983/urban-beekeepers ("Almost everyone you ask . . . chalks [the renewed interest in beekeeping] up to increased awareness of colony collapse disorder.").

15. *E.g.*, MADISON, WIS., CODE OF ORDINANCES § 9.53 (2012); N.Y.C., N.Y., HEALTH CODE §161.01(b)(12) (2012).

16. *See* John Hoeffel, *Bee Fans Try to Get Los Angeles to Allow Hives in Residential Areas*, LOS ANGELES TIMES, July 14, 2012, http://articles.latimes.com/2012/jul/14/local/la-me-bees-20120715. One dedicated young couple has recently taken up the fight to legalize bees in Los Angeles by establishing a nonprofit organization, HoneyLove. *HoneyLove*, HONEYLOVE URBAN BEEKEEPERS, http://honeylove.org/team/ (last visited Jan. 14, 2013). Other concerned residents

Given our dependence on bees to pollinate our food supply, the uncertain future of the honeybee, and the recent interest in urban beekeeping, the legal and policy issues surrounding the keeping of honeybees in urban areas are topics of particular relevance. This Article will examine: 1) the life of honeybees, including life in the hive, honeybees in commercial agriculture, and honeybees in urban agriculture; 2) the disappearance of honeybees; 3) beekeeping in cities, including case studies and beekeeping regulations; and 4) liability issues pertaining to urban beekeeping. The Article will conclude with recommendations for urban beekeeping legislation and policies.

II. THE LIFE OF HONEYBEES

A. *Life in the Hive*

"Honey-Bees can flourish only when associated in large numbers, as in a colony." – L.L. Langstroth[17]

Life within a honeybee hive is a complex and orderly affair. Each bee has a role to play and all of the bees within the hive are dependent upon each other for survival. It is important to understand the dynamics of life within the hive and the relationships among the bees in order to understand how mysterious CCD is and how urban beekeeping may help to revive bee populations.

Within a honeybee hive[18] reside a queen bee, worker bees, and drones.[19] "The queen-bee is the only perfect female in the hive, and all the eggs are laid by her."[20] Drones are male bees and exist for the sole purpose of mating with the queen.[21] Worker bees are the non-reproductive females of the hive; they work until they die (at about six weeks of age), performing every function necessary to keep the hive going, with the exception of reproduction.[22]

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have organized petitions to encourage the Los Angeles City Council to change the City's beekeeping policy. Chelsea McFarland, *Legalize Urban Beekeeping in Los Angeles!!*, CHANGE.ORG, http://www.change.org/petitions/legalize-urban-beekeeping-in-los-angeles-2 (last visited Jan. 14, 2013).

17. L.L. LANGSTROTH, LANGSTROTH'S HIVE AND THE HONEY-BEE: THE CLASSIC BEEKEEPER'S MANUAL 29 (Dover Publ'ns, Inc. 2004) (1878).

18. *See* WILSON, *supra* note 2, at 13–16 (describing beekeeping basics and the movable-comb hive).

19. LANGSTROTH, *supra* note 17, at 29.

20. *Id.* (emphasis omitted).

21. WILSON, *supra* note 2, at 10–11.

22. *Id.* at 11.

The queen bee is the "mother to all [of] the bees in the colony."[23] Each beehive has only one queen,[24] and this queen has only one job—to lay all of the eggs in the hive.[25] A queen is created when a worker egg is nurtured with extra royal jelly, a nutrient-rich liquid secreted by worker bees.[26] A queen bee is longer than the other bees in the hive, but her body is less bulky than that of a drone, and her wings are proportionately shorter than the wings of drone and worker bees.[27] As the queen is fed by worker bees and does not leave the hive to forage, she will most likely only fly within the first days of her life, when she leaves the hive for her mating flights.[28] During these flights, the queen will retain enough sperm to last her entire egg-laying life.[29] A typical queen will live for two to three years.[30] During the height of breeding season she can lay two- to three-thousand eggs per day.[31] The queen does not "rule" the hive, but the worker bees

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23. Sundberg, *supra* note 4.

24. *Life in the Hive*, THE BRITISH BEEKEEPERS ASS'N, http://www.bbka.org.uk/learn/general_information/life_in_the_hive (last visited Jan. 14, 2013). Bees tolerate only one queen in the hive. *Id.* When a new queen emerges from her cell, the old queen may join a swarm of older bees and leave the hive (this is known as a prime swarm) or the new queen may lead a smaller swarm (this is known as a cast). *Id.* Occasionally, during a reproductive episode, multiple queens may temporarily coexist in a single hive. *See* MARK WINSTON, KILLER BEES: THE AFRICANIZED HONEY BEE IN THE AMERICAS 36–38 (1992); M.L. Winston, *Swarming, Afterswarming, and Reproductive Rate of Unmanaged Honeybee Colonies (Apis mellifera)*, 27 INSECTES SOCIAUX 391, 392 (1980). The hive will return to the status quo when, as previously mentioned, a swarm occurs, the new virgin queen destroys rival queens still in their cells before they mature, rival queens fight to the death, or some combination of these. *Id.*; FRANCIS HUBER, NEW OBSERVATIONS ON THE NATURAL HISTORY OF BEES 174 (3d ed. 1821); *see also* David R. Tarpy & David J.C. Fletcher, *"Spraying" Behavior During Queen Competition in Honey Bees*, 16 J. INSECT BEHAV. 425, 426 (2003).

25. WILSON, *supra* note 2, at 9. The queen "cannot make wax or honey, and depends on the worker bees to feed her and clean her. She has a sting, but uses it only against other queens." *Id.*

26. *See* ROWAN JACOBSEN, FRUITLESS FALL: THE COLLAPSE OF THE HONEY BEE AND THE COMING AGRICULTURAL CRISIS 49–50 (2008) (discussing royal jelly creation and consumption by the queen bee).

27. LANGSTROTH, *supra* note 17, at 30.

28. WILSON, *supra* note 2, at 9–10. Shortly after a queen emerges from her cell as an adult she will fly from the hive to mate with multiple drones over the course of several days. *Id.*

29. *Id.*

30. JACOBSEN, *supra* note 26, at 50. Unlike workers and drones, the queen is fed nutrient rich royal jelly throughout her entire life, which enables her to live much longer than the rest of the bees in the hive. *Id.*

31. LANGSTROTH, *supra* note 17, at 32.

exist to serve her; the queen's personality determines the personality of the hive and, without her presence, the colony will fall into a state of agitation.[32]

Drones hatch from unfertilized eggs laid by the queen.[33] The largest and stoutest bees in the hive,[34] drones make up the smallest percentage of the colony and live twenty-one to thirty-two days on average.[35] Lacking stingers for defense, suitable proboscis for gathering honey, and pouches for secreting wax, drones are "physically disqualified for the ordinary work of the hive."[36] Instead, they merely eat honey and are cared for by worker bees until mating season.[37] When mating season arrives, the drones will compete with each other in mating flights for a chance to mate with the virgin queen.[38] Drones will either fall to their death after mating with the queen,[39] will be expelled from the hive in late summer,[40] or left to starve to death; even the unhatched drones are destroyed.[41]

Worker bees are hatched from eggs that were fertilized by drones during the queen's mating flight.[42] Nearly all of the bees in a hive are worker bees.[43] Worker bees have various roles in the hive; there are nurse or caretaker bees,[44] cleaning squads, temperature-controlling teams, guard bees, comb-builders, hon-

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32. *Id.* at 31 ("If [the Queen Bee] is taken from [the colony], the whole colony is thrown into a state of the most intense agitation as soon as they ascertain their loss . . . ."); *see also Life in the Hive*, *supra* note 25.

33. WILSON, *supra* note 2, at 9.

34. LANGSTROTH, *supra* note 17, at 49.

35. *Facts about Honeybees*, BACK YARD BEEKEEPERS ASS'N, http://www.backyardbeekeepers.com/facts.html (last visited Jan. 14, 2013); *Honey Bee Life Cycle*, LIFE CYCLE HQ, http://www.lifecyclehq.com/insect-life-cycles/honey-bee-life-cycle/ (last visited Jan. 14, 2013).

36. LANGSTROTH, *supra* note 17, at 49.

37. WILSON, *supra* note 2, at 11.

38. *See* SUSAN BRACKNEY, PLAN BEE: EVERYTHING YOU EVER WANTED TO KNOW ABOUT THE HARDEST-WORKING CREATURES ON THE PLANET 23 (2009). When the queen is ready to mate, she flies hundreds of feet into the air and gets the attention of the drones by releasing pheromones. Only the fastest and highest flying drones will catch up with her and attempt to mate. *Id.*

39. *Id.*

40. LANGSTROTH, *supra* note 17, at 52 ("[The bees] sometimes sting [the drones], or gnaw the roots of their wings, so that when driven from the hive, they cannot return.").

41. *Id.*

42. WILSON, *supra* note 2, at 9.

43. JACOBSEN, *supra* note 26, at 35 ("Of the fifty thousand bees in a full hive, more than forty-nine thousand are sterile female 'worker' bees.").

44. *See* MICHAEL SCHACKER, A SPRING WITHOUT BEES: HOW COLONY COLLAPSE DISORDER HAS ENDANGERED OUR FOOD SUPPLY 4 (2008). These bees "intensively groom and decontaminate the returning workers, and generally care for the health of the hive. These caretaking bees are there to protect all members of the colony, removing dirt, debris, and mites, fighting pathogens, and helping to care for the young." *Id.*

ey-processors, and foragers.[45] A worker bee's role is determined by her stage in life,[46] and each role is essential to the survival of the hive.

Forager honeybees, the bees most commonly seen flying around, generally fly up to two and one-half miles from their hive, giving them over 12,000 acres in which to find nectar.[47] If necessary, honeybees are capable of traveling much further to gather nectar.[48] When a forager bee finds a good source of nectar, she will return to the hive and, through a "waggle dance," tell her sisters where the best flowers are.[49] Upon a nectar forager's return to the hive, she passes her load to a receiver bee, who will convert the nectar into honey.[50] On average, a worker bee will only produce one-twelfth of a teaspoon of honey in her lifetime;[51] however, a typical hive can produce more than seventy pounds of honey per year.[52] The bees store the honey to get them through the winter months when food is scarce.[53] Honeybees will also dip into the honey prior to a swarm, gorging themselves on the carbohydrate-rich food to sustain their energy while they relocate.[54]

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45. *Id.* at 4–5.

46. *See Life in the Hive*, *supra* note 25. Throughout her lifetime, a worker bee's duties will include cleaning cells (including the cell from which she was born) and keeping the brood warm (1–2 days old); feeding older larvae (3–5 days old); feeding the youngest larvae (6–11 days old); producing wax, building comb, carrying food, and performing undertaker duties (12–17 days old); guarding the hive entrance (18–21 days old); and, finally, leaving the hive to forage, pollinating plants, and collecting nectar, pollen, and water (22 days old and beyond). *Id.*

47. SCHACKER, *supra* note 44, at 4.

48. *Id.* "If a source is farther away, however, the bee will sometimes fly up to ten miles at a speed of twelve to fifteen miles per hour." *Id.*

49. *See* WILSON, *supra* note 2, at 248–49 (describing the information conveyed through a "waggle dance").

50. JACOBSEN, *supra* note 26, at 38. The nectar is converted to honey through an elaborate process: the receiver bee deposits her load of nectar into an empty cell, pumps the nectar in and out of her mouth "evaporating its water in the process and adding enzymes that convert the sugar in the nectar from crystally sucrose to syrupy fructose," and finally, along with other worker bees, fans her wings to reduce the nectar to a water content below twenty percent, at which point it is honey. *Id.* The cell is then capped with a seal of wax and the receiver returns to the hive's entrance to receive another load of nectar. *Id.*

51. Sundberg, *supra* note 4.

52. CAROL CANADA & JASPER WOMACH, CONG. RESEARCH SERV., RS20759, FARM COMMODITY PROGRAMS: HONEY 1 (2006) ("In 2005, the national average yield was 73 pounds per colony.").

53. *See* JACOBSEN, *supra* note 26, at 30.

54. WILSON, *supra* note 2, at 252.

Honeybees also forage for pollen,[55] which provides the colony with its source of protein, fats, vitamins, and minerals.[56] Approximately one-quarter of the hive's foragers collect pollen.[57] These foragers, like their nectar-foraging sisters, use the waggle dance to guide other honeybees to the prime pollen sources.[58] Upon returning to the hive, the forager bees deposit the pollen into a hive cell and cover it with nectar so that the pollen can ferment into digestible "bee bread."[59] Nurse bees take over, eating the bee bread and using its nutrients to produce royal jelly, "an easily digestible liquid protein suspension that provides numerous health benefits."[60] Royal jelly is used to feed the hive.[61] In addition to producing the royal jelly, nurse bees are responsible for regulating its supply; the queen receives the most royal jelly, followed by the developing bees in the brood, and finally the foragers.[62]

The above overview of life within the hive is provided to explain the many activities honeybees perform and to illustrate the interdependencies that exist among them. Without bees to fill the roles of queen, drone, nurse, forager, receiver, and guard, the hive cannot function or sustain itself. A hive truly is a world unto itself and all of its inhabitants exist to further the survival of the whole.[63] The human population is fortunate to benefit from their work through their honey, wax, and other products, but mostly through their work as pollinators.

B. *Honeybees in Commercial Agriculture*

Our diverse food supply is heavily dependent upon honeybees for pollination.[64] Honeybees pollinate the majority of the fruits, nuts, vegetables, and

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55. *See* Marla Spivak et al., *The Plight of the Bees*, 45 ENVTL. SCI. & TECH. 34, 34 (2011) ("Rich in protein, the pollen of many plant species serves as the principle food source for developing bee larvae.").

56. JACOBSEN, *supra* note 26, at 47.

57. *Id.* at 48.

58. *Id.*

59. *Id.* at 49.

60. *Id.* at 49–50.

61. *Id.* at 50.

62. *Id.* at 50–51.

63. SCHACKER, *supra* note 44, at 52 ("The last thing a female worker bee wants to do is abandon the hive and the brood she is feeding. It is like a human mother abandoning her baby.").

64. *Colony Collapse Disorder*, *supra* note 7.

> [T]he European honey bee, *Apis Mellifera*, performs more than 80 percent of pollination on most of our commercial crops. Approximately one third of our diet is directly or indirectly dependent on bee pollination. This includes the obvious fruits and vegetables, as well as many nuts, oil-seed crops, herbs and spices, and much of the forage that is needed

field crops we consume.[65] In addition, our supplies of beef and dairy are highly dependent upon honeybees, as cows graze on and are fed clover and alfalfa, both of which are pollinated by bees.[66] Even for crops that are not dependent upon pollination for plant growth (leafy greens and root crops), pollinators are still important for seed production.[67] Most estimates of the annual value of crops dependent upon honeybee pollination in the United States range from $5.7 to $19 billion,[68] with the USDA citing a $15 billion value.[69] The estimated annual value of insect pollination worldwide is $217 billion.[70]

While other pollinators exist in nature,[71] none are as easily transportable or as proficient as the honey bee.[72] "[A] hive of honey bees can cross-pollinate twenty-five million flowers in a single day."[73] In addition, bees, unlike most other pollinators who merely sip nectar and eat pollen, "*actively gather* large

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> for the beef and dairy industries. In addition, bees pollinate a number of non-crop plants that are vital to wildlife and to the propagation of the plants themselves. The California almond crop alone requires 1.3 million colonies of bees each year—approximately half of our Nation's managed honey bees—which must be transported into the growing area each spring.

Id.; *see also* Marcelo A. Aizen & Lawrence D. Harder, *The Global Stock of Domesticated Honey Bees Is Growing Slower than Agricultural Demand for Pollination*, 19 CURRENT BIOLOGY 915, 917 (2009). Worldwide, there has been a 300% increase in bee-pollinated crop production in the past fifty years. *Id.* at 916 fig.1(C); Spivak et al., *supra* note 56, at 34.

65. *See Vanishing Bees*, NAT. RESOURCES DEF. COUNCIL, http://www.nrdc.org/wildlife/animals/bees.asp (last modified July 25, 2008) (listing the fruits, nuts, vegetables, and field crops bees pollinate).

66. *See* JACOBSEN, *supra* note 26, at 17; *see also* SCHACKER, *supra* note 44, at 25.

67. *Protecting the Pollinators*, *supra* note 7.

68. COMMITTEE ON THE STATUS OF POLLINATORS IN AMERICA, NATIONAL ACADEMY OF SCIENCE, STATUS OF POLLINATORS IN NORTH AMERICA, 23 (2007); *see also* Nicholas W. Calderone, *Insect Pollinated Crops, Insect Pollinators and US Agriculture: Trend Analysis of Aggregate Data for the Period 1992–2009*, 7 PLOS ONE (2012).

69. *Honey Bees and Colony Collapse Disorder (CCD)*, AGRIC. RISK MGMT. AGENCY, USDA (Oct. 1, 2012), http://www.ars.usda.gov/News/ docs.htm?docid=15572 [hereinafter *Colony Collapse Disorder*].

70. *Economic Value of Insect Pollination Worldwide Estimated at U.S. $217 Billion*, SCIENCEDAILY (Sept. 15, 2008), http://www.sciencedaily.com/releases/2008/09/080915122725.htm (citing Nicola Gallai et al., *Economic Valuation of the Vulnerability of World Agriculture Confronted with Pollinator Decline*, 68 ECOLOGICAL ECON. 810 (2008)).

71. Spivak et al., *supra* note 55, at 34 ("Butterflies, some beetles, flies, hummingbirds, and even some bats provide some pollination services.").

72. *See id.*

73. JACOBSEN, *supra* note 26, at 10.

amounts of pollen."[74] In the process, bees inadvertently transfer this pollen widely between flowers.[75]

The history of beekeeping in the United States dates back to the colonial days, when honey bees were first imported from Northern Europe.[76] Early colonists kept bees for honey and wax,[77] but it was not until L.L. Langstroth's invention of the top opening, moveable comb hive[78] and several other key inventions in the mid-nineteenth century that beekeeping became a commercially viable activity.[79]

While commercial beekeeping[80] in the United States was once primarily for the production of honey,[81] two factors in the latter half of the twentieth century have resulted in a shift to commercial beekeeping for the purpose of providing pollination services. First, changes in the agricultural landscape, including the rise of monocultural farming,[82] the increased use of chemical pesticides, and the loss of habitat for native pollinators due to development created a demand for commercial pollinators.[83] Second, the sharp increases in honey imports begin-

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74. *The Important Life of Bees*, UNIV. OF MINN. BEE LAB, http://www.beelab.umn.edu/About/Life_of_Bees/index.htm (last modified June 24, 2011) (emphasis added).

75. *Id.*

76. MARK L. WINSTON, KILLER BEES: THE AFRICANIZED HONEY BEE IN THE AMERICAS 17–18 (1992).

77. *See* Everett Oertel, *History of Beekeeping in the United States*, *in* SCI. & EDUC. ADMIN., USDA, AGRIC. HANDBOOK NO. 335, BEEKEEPING IN THE UNITED STATES 2, 3 (1980), *available at* http://naldc.nal.usda.gov/download/CAT81750530/PDF. "[Early American beekeepers] increased their number of colonies each spring by capturing swarms and killed them in the fall by burning sulfur at the entrance of the hive so that the honey and beeswax could be removed. The comb, then, was crushed to squeeze out the honey." *Id.*

78. LANGSTROTH, *supra* note 17, at 13–28. "Beekeeping, as practiced today, is based on the foundation of Langstroth's hive design, consisting of frames that can easily be removed without enraging the bees or destroying the hive." Rucker & Thurman, *supra* note 6, at 4.

79. Oertel, *supra* note 77, at 3–4 (describing the development of the moveable frame hive, wax-comb foundation, centrifugal honey extractor, bee smoker, and bee veil); *see also* Tammy Horn, *Honey Bees: A History*, N.Y. TIMES (Apr. 11, 2008), http://topics.blogs.nytimes.com/2008/04/11/honey-bees-a-history/.

80. "Commercial Beekeepers are those with 300 or more bee colonies." Country of Origin Labeling of Packed Honey, 76 Fed. Reg. 251, 251 (Jan. 4, 2011) (to be codified at 7 C.F.R. pt. 52).

81. Boris Romanov, *Beekeeping History*, BEE BEHAV., http://www.beebehavior.com/beekeeping_history.php (last visited Jan. 14, 2013) ("Traditionally beekeeping was done for the bees' honey harvest, although nowadays crop pollination service can often provide a greater part of a commercial beekeeper's income.").

82. *See generally* Kathryn A. Peters, Note, *Creating a Sustainable Urban Agriculture Revolution*, 25 J. ENVTL. L. & LITIG. 203, 208 (2010) (citations omitted) (providing an overview of the rise of industrial agriculture, including monoculture farming, in the United States).

83. E.C. Martin & S.E. McGregor, *Changing Trends in Insect Pollination of Commercial Crops*, 18 ANN. REV. ENTOMOLOGY 207, 207, 208–12 (1973); *see also* Scott C. Lucas, *Halting*

ning in the 1970s[84] drove down the price of domestically produced honey[85] and made commercial beekeeping for honey production less economically viable.[86] Today, commercial pollination service fees provide the primary source of income for a significant number of beekeepers.[87]

Many commercial beekeepers live a migratory life during the pollination season, trucking their hives great distances to follow the bloom and the demand for pollinators.[88] And for good reason—commercial pollinating is big business. Pollination fees in California's almond industry have more than doubled, increasing from $60 per hive to upwards of $150 per hive since the onset of CCD.[89] Most beekeepers start the pollination season in February and March, when over half of the honeybee colonies in the United States are trucked to California[90] to

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the Downward Spiral of Monoculturization and Genetic Vulnerability: Toward a Sustainable and Biodiverse Food Supply, 17 J. ENVTL. L. & LITIG. 161 (2002) (describing the use of chemical pesticides in agricultural production); *Major Threats to Pollinators*, GREAT POLLINATOR PROJECT, http://greatpollinatorproject.org/conservation/major-threats-to-pollinators (last visited Jan. 14, 2013) (describing key factors in pollinator population decline).

84. CANADA & WOMACH, *supra* note 52, at 2; FREDERIC L. HOFF, ECON. RESEARCH SERV., USDA, AER-708, HONEY: BACKGROUND FOR 1995 FARM LEGISLATION 21 (1995).

85. *See* Ray Hansen, *Bees Profile*, AGRIC. MKTG. RES. CTR., http://www.agmrc.org/commodities__products/livestock/bees-profile/ (last visited Jan. 14, 2013) ("Inexpensive imported honey provides constant pressure on the domestic industry."). While a thorough discussion of honey price supports is beyond the scope of this Article, it is important to note that various Farm Bills have included provisions for such supports. *See generally* CANADA & WOMACH, *supra* note 52, at 5–6 (discussing price supports in anticipation of the 2008 Farm Bill legislation); HOFF, *supra* note 84 (providing a historical overview of USDA honey price support policies); Mary K. Muth et al., *The Fable of the Bees Revisited: Causes and Consequences of the U.S. Honey Program*, 46 J.L. & ECON. 479 (2003) (discussing the economic impacts of the honey program).

86. Hansen, *supra* note 85.

87. *See id.*; *see also* CANADA & WOMACH, *supra* note 52, at 3 ("[P]ollination fees can be an important source of income for some commercial beekeepers."); Alexei Barrionuevo, *Honeybees Vanish, Leaving Keepers in Peril*, N.Y. TIMES, Feb. 27, 2007, http://www.nytimes.com/2007/02/27/business/27bees.html?pagewanted=all [hereinafter Barrionuevo, *Keepers in Peril*] ("Beekeepers now earn many times more renting their bees out to pollinate crops than in producing honey.").

88. Training and Employment Guidance (TEGL) Letter No. 33-10, 76 Fed. Reg. 47,241, 47,242 (Aug. 4, 2011). The Department of Labor recognizes itinerant beekeeping as an "industry-wide standard." *Id.*

89. Adrian Higgins, *Bees Are Busier Than Ever as Disease Besieges Colonies*, WASH. POST, Mar. 15, 2010, http://www.washingtonpost.com/wp-dyn/content/article/2010/03/14/AR2010031402600_pf.html.

90. *See* Rucker & Thurman, *supra* note 6, at 5–6. A typical mobile beekeeper will carry 400 hives on a tractor-trailer combination, and the hives are covered with nets and transported at night when the bees will not fly out of their hives. *Id. See generally* Ann N. Coenen-Davis, Note, *The Mystery of the Disappearing Honeybee: Will Government Funding and Regulation Save This*

meet the demand for almond pollination.[91] From California, the beekeepers transport their bees in different directions to meet pollination demands throughout the United States.[92]

Keeping up with the demand for pollinators has taken a toll on commercial beekeepers and their bees.[93] The introduction of mites and pathogens over the past few decades[94] coupled with decreasing supplies of nectar and pollen[95] have caused beekeepers to resort to new methods in beekeeping. Many commercial beekeepers now treat their hives with chemical antibiotics and pesticides to prevent bee diseases and combat mite pests.[96] During the winter months and

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Important Pollinator?, 14 DRAKE J. AGRIC. L. 175, 182–83 (2009) (citations omitted) (discussing the challenges of trucking bees long distances for migratory commercial pollination).

91. Betty Joyce Nash, *Honeybees: Market for Pollination Services Grows*, REGION FOCUS, Spring 2009, at 20–21, *available at* http://www.richmondfed.org/publications/research/region_focus/2009/spring/pdf/feature1.pdf.

92. See Rucker & Thurman, *supra* note 6, at 5–6, for a discussion of the migratory routes of commercial beekeepers by region.

93. Alexei Barrionuevo, *Bees Vanish, and Scientists Race for Reasons*, N.Y. TIMES, Apr. 24, 2007, http://www.nytimes.com/2007/04/24/science/24bees.html?pagewanted=all [hereinafter Barrionuevo, *Scientists Race for Reasons*] ("Bee colonies have been under stress in recent years as more beekeepers have resorted to crisscrossing the country with 18-wheel trucks full of bees in search of pollination work.").

94. *See* Schacker, *supra* note 44, at 35–40; Dennis vanEngelsdorp & Marina Doris Meixner, *A Historical Review of Managed Honey Bee Populations in Europe and the United States and the Factors That May Affect Them*, 103 J. OF INVERTEBRATE PATHOLOGY S80, S92 (2010) ("Varroa mites . . . are likely one of the major causes for considerable overwintering loses documented by many northern nations over the last several years."); Spivak et al., *supra* note 55, at 35; STÉPHANE KLUSER, ET AL., UNITED NATIONS ENV'T PROGRAMME, EMERGING ISSUES: GLOBAL HONEY BEE COLONY DISORDERS AND OTHER THREATS TO INSECT POLLINATORS 4 fig.4 (2010), *available at* http://www.unep.org/dewa/Portals/67/pdf/Global_Bee_Colony_Disorder_and_Threats_insect_pollinators.pdf (considering the link between various mites introduced in the 1989s and drastic losses of colonies).

95. *See* Barrionuevo, *Keepers in Peril*, *supra* note 87. "[T]he trend of growing more and more of the same crop and the use of herbicides to ensure no weeds grow in the fields leaves bees with little variety in their diet while pollinating crops." Coenen-Davis, *supra* note 90, at 181 (citing Gina Covina, *Nobody Home*, TERRAIN (2007), http://ecologycenter.org/terrain/issues/summer-2007/nobody-home/).

96. *See* SCHACKER, *supra* note 44, at 35–36. While chemical treatments may defend a hive in the short-term, such treatments over time are not without risks, including contamination of honey and other hive products, the development of resistant diseases and mites, and potentially toxic effects on bees caused by combinations of chemical compounds. *See* Noori Al-Waili et al., *Antibiotic, Pesticide, and Microbial Contaminants of Honey: Human Health Hazards*, SCI. WORLD J., 2012, at 3, http://www.hindawi.com/journals/tswj/2012/930849/ (analyzing health and food safety risks from contamination of honey by pesticides and antibiotics); Norberto Milani, *The Resistance of* Varroa jacobsoni *Oud. to Acaricides*, 30 APIDOLOGIE 229 (1999) (discussing mite resistance to synthetic pesticides); Reed M. Johnson et al., *Synergistic Interactions Between In-Hive Miticides in* Apis mellifera, 102 J. ECON. ENTOMOLOGY 474 (2009) [hereinafter Johnson et al.,

while they are traveling and working, commercial beekeepers often must replace or supplement their hives' natural food sources with nutritionally inferior soy proteins and high-fructose corn syrup solutions.[97] The long-term effects of these practices on hive and honeybee health are the subject of numerous studies.[98]

In addition to pests, diseases, and nutritional deficiencies, commercial beekeepers also have to manage annual hive losses. Throughout the 1990s and early 2000s, commercial beekeepers experienced average hive mortality rates of approximately fifteen to twenty percent per year.[99] Due to these annual losses, hive replacement is standard procedure in the commercial beekeeping industry.[100] Commonly employed methods for replacing hives include the splitting of one healthy hive into two parts, building and replenishing hive numbers with purchased, packaged bees, and/or replacing the queen with a new fertilized queen.[101] While some level of annual hive mortality is expected, commercial beekeepers have experienced sharp increases in annual hive loss rates since 2006.[102] Colony Collapse Disorder, discussed below in Part III, primarily affects large commercial beekeeping operations, and has caused substantial hive losses since its unexplained emergence.[103] Today, beekeepers have to work even harder to maintain sufficient hive levels.

Synergistic Interactions] (analyzing impacts of simultaneous use of multiple miticides and increased bee mortality rates).

97. *See* DOUG SOMERVILLE, NEW SOUTH WALES AGRIC., DAI/178, HONEY BEE NUTRITION AND SUPPLEMENTARY FEEDING (William E. Smith ed., 2000).

98. *See, e.g.*, Blaise W. LeBlanc et al., *Formation of Hydroxymethylfurfural in Domestic High-Fructose Corn Syrup and Its Toxicity to the Honey Bee* (Apis mellifera), 57 J. AGRIC. FOOD CHEM. 7369 (2009) (discussing effects of hydroxymethylfurfural, a heat-formed contaminant and toxin to honey bees in high-fructose corn syrup, on colony health); Johnson et al., *Synergistic Interactions*, *supra* note 96 (discussing possible increases in bee mortality rates through simultaneous sublethal doses of multiple miticides); *Projects*, UNIV. OF MINN. BEE LAB, http://beelab.umn.edu/Research/Projects/index.htm (last modified June 27, 2011) (researching natural methods of bee disease and parasite resistance).

99. Kim Kaplan, Agric. Research Serv., USDA, *Colony Collapse Disorder: An Incomplete Puzzle*, 60 AGRIC. RESEARCH, July 2012, at 4, *available at* http://www.ars.usda.gov/is/AR/archive/jul12/colony0712.pdf.

100. *See* Hoy Carman, *The Estimated Impact of Bee Colony Collapse Disorder on Almond Pollination Fees*, 14 AGRIC. & RESOURCE ECON. UPDATE, 9 (2011), http://giannini.ucop.edu/media/are-update/files/articles/v14n5_4.pdf (indicating that the increased bee mortality rates have required beekeepers to replace hives in order to fulfill their pollination contract obligations).

101. Rucker & Thurman, *supra* note 6, at 7–9.

102. 2012 CCD REPORT, *supra* note 9, at 2 n.2. But note, the average loss rate during the winter of 2011–2012 dropped to twenty-two percent, though causes for the drop are uncertain. *Id.* at 2.

103. Lisa Duchene, *Probing Question: What's Killing the Honey Bees?*, PENN. ST. UNIV., http://www.rps.psu.edu/probing/bee.html (last updated Feb. 19, 2007).

Despite research efforts and the introduction of new hive management methods, the honeybee population continues to decline.[104] The lead bee researcher at the U.S. Department of Agriculture, Dr. Jeffrey Pettis, recently warned, "[w]e're not very far above a crisis or a critical situation . . . . We're operating on a very thin margin as far as meeting pollination demands."[105] Without a sufficient supply of honeybees to serve as pollinators for commercial farms, we are at risk of losing much of the diversity in our food supply.[106]

C. *Honeybees in Urban Agriculture*

"'Urban beekeeping' is not a new phenomenon."[107] In 2007, archaeologists in Israel discovered an apiary containing more than thirty beehives.[108] The hives, constructed with unbaked clay and dry straw, were found in a built-up area of the ancient city of Tel Rehov, and date back to sometime around 900 B.C.[109] The city of Paris provides a more recent historical example of urban beekeeping; 100 years ago, there were more than 1000 hives in the city.[110] The practice of urban beekeeping drastically declined after World War II, but Parisian bees have made a comeback.[111] In fact, the Palais Garnier, an opera house in the city, has been home to hives for nearly two decades.[112] Today the city has over 400 hives, and many of its hotels and restaurants cultivate their own honey.[113]

Urban agriculture,[114] including beekeeping, may be one of the fastest emerging trends in U.S. cities today.[115] Urban agriculture "includes green belts

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104. *Colony Collapse Disorder*, *supra* note 69.

105. Spencer Murphy, *Government Says Bees in Crisis and Funds Millions for Local Solutions*, WE SAVE BEES BLOG (Apr. 18, 2012, 12:00 PM), http://livebeeremoval201203.blogspot.com/2012_04_01_archive.html.

106. *See* John Roach, *Bee Decline May Spell End of Some Fruits, Vegetables*, NAT'L GEOGRAPHIC NEWS (Oct. 5, 2004), http://news.nationalgeographic.com/news/pf/9605810.html ("Unless actions are taken to slow the decline of domesticated honeybees and augment their populations with wild bees, many fruits and vegetables may disappear from the food supply, said Claire Kremen, a conservation biologist at Princeton University in New Jersey.").

107. JACOBSEN, *supra* note 26, at 26.

108. *First Beehives in Ancient Near East Discovered*, SCIENCEDAILY (Sept. 5, 2007), http://www.sciencedaily.com/releases/2007/09/070904114558.htm.

109. *Id.*

110. Hugh Schofield, *Paris Fast Becoming Queen Bee of the Urban Apiary World*, BBC NEWS (Aug. 14, 2010), http://www.bbc.co.uk/news/world-europe-10942618.

111. *Id.*

112. Craig S. Smith, *Who's Humming at Opera? Believe It or Not, Bees*, N.Y. TIMES, June 26, 2003, http://www.nytimes.com/2003/06/26/international/europe/26PARI.html.

113. Schofield, *supra* note 110.

114. Urban agriculture has been defined as

around cities, farming at the city's edge, vegetable plots in community gardens, and food production in thousands of vacant inner-city lots."[116] The increase in agricultural activities in U.S. cities is often attributed to urbanites' interest in developing a closer relationship to their food and improving the quality of life within their communities.[117] For other city-dwellers, urban agriculture provides an opportunity to become an entrepreneur.[118] Many cities across the United States promote urban agriculture as a component of sustainability plans or to address food security issues.[119] With recent severe weather patterns, rapidly growing global population, and increasing fuel prices, some believe community food systems and intensive urban food production are critical.[120] As production agriculture becomes increasingly common in urban settings, and perhaps vital, so does the keeping of honeybees in cities.[121]

> an industry that produces, processes, and markets food, fuel, and other outputs, largely in response to the daily demand of consumers within a town, city, or metropolis, on many types of privately and publicly held land and water bodies found throughout intra-urban and peri-urban areas. Typically urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land-, water-, and air-based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community.

JAC SMIT ET AL., *Cites That Feed Themselves*, *in* UNITED NATIONS DEV. PROGRAMME, URBAN AGRICULTURE: FOOD, JOBS AND SUSTAINABLE CITIES 1, 1 (2001 ed.), *available at* http://jacsmit.com/book/Chap01.pdf.

115. *See generally* Kathryn A. Peters, *Current and Emerging Issues in the New Urban Agriculture: A Case Study*, 7 J. FOOD L. & POL'Y 297 (2011) [hereinafter Peters, *Current and Emerging Issues*] (providing a review of urban agriculture and current trends).

116. KATHERINE H. BROWN ET AL., URBAN AGRICULTURE AND COMMUNITY FOOD SECURITY IN THE UNITED STATES: FARMING FROM THE CITY CENTER TO THE URBAN FRINGE 1 (Anne Carter et al. eds., Oct. 2003), http://www.foodsecurity.org/PrimerCFSCUAC.pdf.

117. *Id.* at 3.

118. *See* Press Release, City of Boston, City Seeks Proposals for Pilot Urban Agriculture Project (July 11, 2011), *available at* http://www.cityofboston.gov/news/default.aspx?id=5188. As Boston mayor Thomas M. Menino explains, "'Urban farming is a great way to encourage small scale agricultural entrepreneurism in our city . . . . It has the capacity to bring fresh fruits and vegetables into neighborhoods and corner stores while teaching Boston families and youth about where their food comes from.'" *Id.*

119. *See generally* Peters, *Current and Emerging Issues*, *supra* note 115 (discussing urban agriculture as part of sustainability plans in major cities).

120. Telephone Interview with Will Allen, CEO, Growing Power, Inc. (July 25, 2012) [hereinafter Telephone Interview with Will Allen (July 25, 2012)].

121. *See* Carla K. Johnson, *Beehives Thrive in Chicago, Other Cities as Bee Population Dies Off Elsewhere*, HUFFINGTON POST (July 29, 2011), http://www.huffingtonpost.com/2011/07/29/beehives-thrive-in-chicag_n_913030.html [hereinafter Johnson, *Beehives Thrive in Chicago*].

In order to have productive farms and gardens, urban agriculture, like its counterpart, rural agriculture, requires pollinators. Given the lack of native habitat for pollinators within cities and the fact that many of the crops typically grown in urban areas, including tree fruits, berries, and flowering vegetables, require pollination,[122] it stands to reason that urban farmers are even more heavily dependent upon managed bee populations for pollination service. Growing Power, arguably the foremost urban agriculture organization in the United States, maintains hives on its farms in Milwaukee and Chicago to ensure adequate pollination of its crops.[123] In 2012, Growing Power had over one million bees pollinating crops, trees, and flowers in its neighborhoods.[124]

In addition to pollinating, urban honeybees can supply urbanites with a significant amount of honey.[125] For Will Allen, farmer, founder, and CEO of Growing Power, honeybees are an essential component of urban agriculture.[126] Allen believes the importance of bees in urban agriculture lies in the fact that "in rural agriculture bee production has been way down and there has been hive collapse, so there has been a decreasing amount of honey."[127] According to a 2012 national honey report, honey production "from producers with five or more colonies [was] down sixteen percent from 2010."[128] At the same time, honey prices reached a record high.[129]

Declining commercial honey production coupled with record high honey prices provides a real opportunity for urban beekeepers. According to Allen, installing hives on rooftops[130] is an ideal way to increase urban honey production; cities have an abundance of available rooftop space and "rooftop beekeeping is very doable."[131] Allen is quick to point out that rural agriculture today consists

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122. *See Vanishing Bees*, *supra* note 65 (listing crops that bees pollinate).

123. *Bees*, GROWING POWER, INC., http://www.growingpower.org/bees.htm (last visited Jan. 14, 2013).

124. Telephone Interview with Will Allen, CEO, Growing Power, Inc. (Apr. 20, 2012).

125. Johnson, *Beehives Thrive in Chicago*, *supra* note 121. Urban honey may in fact have greater depth of flavor as honeybees in the city generally have a much wider variety of flowers to feed from. Sarah Elton, *Urban Hives Make Better Honey*, ATLANTIC (Sept. 1, 2010), http://www.theatlantic.com/health/archive/2010/09/urban-hives-make-better-honey/62251/. They may also be exposed to fewer chemicals. *Id.*

126. Telephone Interview with Will Allen (July 25, 2012), *supra* note 120.

127. *Id.*

128. NAT'L AGRIC. STATISTICS SERV., USDA, HONEY (2012), *available at* http://usda01.library.cornell.edu/usda/current/Hone/Hone-03-30-2012.pdf.

129. *Id.*

130. *See* Calvin Tomkins, *Up On The Roof: Stingers*, NEW YORKER, Mar. 12, 2012, http://www.newyorker.com/talk/2012/03/12/120312ta_talk_tomkins (discussing rooftop beekeeping in New York City).

131. Telephone Interview with Will Allen (July 25, 2012), *supra* note 120.

primarily of monocultural farms growing genetically-modified crops, resulting in inadequate food sources for rural bees.[132] In the city "bees have access to lots of pollen from a variety of flora available within short distances, which results in increased honey production."[133]

There is evidence that, in addition to increasing urban crop production and providing honey, urban beekeeping may help save honeybees. In 2006, a French beekeepers' study found that bees raised in the city were healthier and more productive than country bees.[134] An ongoing study at the University of Bristol found that urban bees had a more varied diet; researchers claim that early findings indicated that urban bees often fare better than bees in contemporary farmland.[135] In addition to offering a diverse diet, urban landscapes often provide bees with flowers to feed on throughout much of the year, compared with rural landscapes, where bees often only have access to flowering crops for a short period of time.[136] Abundant urban honey yields also suggest that the urban environment is suitable, and perhaps beneficial, to the honeybee.[137]

While there are indications that honeybees generally fare well in cities, urban bees, like their country cousins, do face risks. Absent a pesticide ban, urban bees may be exposed to even higher levels of pesticides than rural bees.[138] Approved pesticide-use levels are often much higher for home and garden use than the levels permitted in commercial agriculture.[139] Concerns have also been

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132. *Id.*

133. *Id.*

134. *See Bees Reared in Cities 'Healthier'*, BBC NEWS (Jan. 17, 2006), http://news.bbc.co.uk/2/hi/europe/4621184.stm. The study attributed this increased health and productivity to higher temperatures, a wider variety of plant life, and reduced exposure to pesticides. *Id.*

135. Louise Gray, *Cities Could Save Bees*, TELEGRAPH (Aug. 2, 2011), http://www.telegraph.co.uk/earth/earthnews/8676850/Cities-could-save-bees.html.

136. *Id.*

137. *See* Johnson, *Beehives Thrive in Chicago*, *supra* note 121. In the mid-summer of 2011, a beehive kept on the garden rooftop of Chicago's City Hall had already produced more than 200 pounds of surplus honey; in the state of Illinois, the average surplus is forty pounds per hive. *Id.*

138. *See, e.g.*, Schofield, *supra* note 110. Beekeeping is highly successful in Paris. *Id.* "For the past 10 years the French capital has been officially a pesticide-free zone, which may partly explain its advantage." *Id.*

139. *See, e.g.*, JENNIFER HOPWOOD ET AL., ARE NEONICOTINOIDS KILLING BEES? A REVIEW OF RESEARCH INTO THE EFFECTS OF NEONICOTINOID INSECTICIDES ON BEES, WITH RECOMMENDATIONS FOR ACTION 20 (2012).

> In a comparison between a home product approved for garden use and a professional product approved for agricultural use, a homeowner treating trees in their garden can apply 12 to 16 times the amount of imidacloprid allowed in an agricultural setting, and in certain circumstances it could be twice as much again—or more.

raised regarding whether sufficient food sources exist within cities to feed the increasing number of urban honeybees.[140] The importance of honeybees to urban food production necessitates that the potential risks to urban bees be carefully monitored and minimized.[141] Reducing pesticide use and establishing bee-friendly gardens are two steps urbanites can take to make city life hospitable for honeybees.[142]

III. THE DISAPPEARANCE OF THE BEES

"Anything that affects bees' memory, learning, senses, appetite, digestion, instincts, or life span can be enough to throw those feedbacks loops off course. Skew enough of them, and the beautiful mathematics of the hive break down." – Rowan Jacobsen[143]

Id. Bee expert Marla Spivak cautions, "pesticide use in urban environments is rampant—often concentrations applied are 100 [times] the concentration allowable in an agricultural field. So while bees have access to more flowers in cities, they are also exposed to higher dose[s of] pesticides." Email from Marla Spivak, Distinguished McKnight Univ. Professor, Univ. of Minn., to author (Apr. 12, 2012) (on file with author).

140. *See* Alex Ward, *Are Bees Under Threat from Amateur Keepers? Food Supplies Dwindle as Trend in Urban Beekeeping Sees Population Double*, MAIL ONLINE (Oct. 29, 2012, 3:36 AM), http://www.dailymail.co.uk/news/article-2224640/Urban-beekeeping-Not-food-popular-trend-doubles-population.html.

141. *See Legalize Beekeeping in NYC!*, JUSTFOOD, http://www.justfood.org/sites/default/files/Just%20Food%20Beekeeping%20Campaign%20Fact%20Sheet.pdf (last visited Jan. 14, 2013) (addressing the potential risks from urban beekeeping).

142. Debra Neutkens, *The Important Life of Bees*, WHITE BEAR PRESS (July 19, 2011), http://www.presspubs.com/white_bear/news/article_7a3fc27c-f57a-5ac5-8d65-5b5d9afe42a4.html. According to Martha Spivak, "lawns and golf courses provide nothing [for bees] to feed on" and "[h]ybrid annuals . . . [and] roses are no longer attractive to bees." *Id.*

> Basic habitat guidelines to support these insects encourage planting three different species that bloom at any given time during the growing season. A few varieties of flowers that appeal to bees are silky and smooth aster, purple coneflower, maximilian sunflower and wild bergamot. Bees like creeping charlie in lawns, dandelions, salvia and sunflowers in fall.
>
> Avoid pesticide treatment around blooming plants or areas where bees are nesting, stressed the entomologist. Look at the label or ask a nursery if it's harmful to bees. Spray in the evening when bees are less active. Better yet, eliminate the use of pesticides entirely.

Id.

143. JACOBSEN, *supra* note 26, at 56.

A. *Honeybee Health Pre-Colony Collapse*

While the recent drastic decline in honeybee populations has received attention in television stories,[144] newspaper and magazine articles,[145] scientific journals,[146] books,[147] and films,[148] it is important to note that honeybee loss is hardly new. The number of U.S. honey-producing colonies has steadily declined for decades, dropping "61% from their high of 5.9 million managed in 1947 to the low of 2.3 million reported in 2008 . . . ."[149] The steady decline in U.S. honeybee populations in the past six decades is especially concerning when one considers that during this same time period, we have grown increasingly dependent upon them to pollinate our crops.[150]

Major factors contributing to the declining health of honeybee colonies in recent decades include environmental degradation, changes in agricultural practices and hive management, and increased numbers of pests and diseases.[151] A 2010 United Nations Environmental Program bulletin attributed instability in pollinator populations to habitat deterioration, including degradation, increased

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144. *E.g.*, *60 Minutes: What's Wrong with the Bees?* (CBS television broadcast Feb. 24, 2008), *available at* http://www.cbsnews.com/video/watch/?id=4835946n; *Nature: Silence of the Bees* (PBS television broadcast Oct. 27, 2007), *available at* http://video.pbs.org/video/995224587.

145. *E.g.*, Elizabeth Kolbert, *STUNG: Where Have All the Bees Gone?*, NEW YORKER, Aug. 6, 2007, http://www.newyorker.com/reporting/2007/08/06/070806fa_fact_kolbert?currentPage=all; Bryan Walsh, *New Clues in the Mass Death of Bees*, TIME, Aug. 24, 2009, http://www.time.com/time/ health/article/0,8599,1918282,00.html.

146. *E.g.*, Spivak et al., *supra* note 55, at 34; Diana Cox-Foster & Dennis vanEngelsdorp, *Solving the Mystery of the Vanishing Bees*, SCI. AM. (Mar. 31, 2009), http://www.scientificamerican.com/article.cfm?id=saving-the-honeybee.

147. *E.g.*, JACOBSEN, *supra* note 26; SCHACKER, *supra* note 44.

148. *See* COLONY (Fastnet Films 2009); QUEEN OF THE SUN: WHAT ARE THE BEES TELLING US? (Collective Eye Films 2010); VANISHING OF THE BEES (Hive Mentality Films & Hipfuel 2009).

149. vanEngelsdorp & Meixner, *supra* note 94, at S81, S83 fig.3. Note that worldwide honeybee populations have increased during the same time U.S. and European populations have declined. Aizen & Harder, *supra* note 64, at 915.

150. *See* Aizen & Harder, *supra* note 64, at 916 fig.1(C), 917.

151. *See* Spivak et al., *supra* note 55, at 34.

> The untold story is that these [CCD] hive losses are simply a capstone to more than a half-century of more prosaic day-to-day losses that beekeepers already faced from parasites, diseases, poor nutrition, and pesticide poisoning.
>
> The larger story still is that while honey bees are charismatic and important to agriculture, other important bees are also suffering, and in some cases their fates are far worse.

Id. (citations omitted).

pathologies, invasive species, and pollution; agricultural practices, including chemical drifts from spraying and systemic pesticides; beekeeping activities, including declining health of managed colonies, chemical use, diet, transportation, and colony splitting and selection; and climate change.[152]

The introduction of several mites in the 1980s caused substantial honeybee losses.[153] The tracheal mite was first detected in the United States in 1984.[154] Tracheal mites initially caused large die-offs, but, over time, U.S. bees developed a natural resistance to these mites.[155] In 1987, the first *Varroa* mite infestation was reported.[156] *Varroa* mites are extremely harmful as they affect worker bees, male larvae, and the queen's ability to reproduce.[157] A *Varroa* mite infestation, if left untreated, can kill a hive within six months to two years.[158] Controlling *Varroa* mites has proved challenging. Typical hive treatment for a *Varroa* infestation involves the use of chemical pesticides that must be strong enough to destroy the mites without harming the bees.[159] In addition, the *Varroa* mite quickly develops resistance to synthetic pesticides.[160] Developing pesticides that eliminate mites without harming hives continues to be a challenge for the industry.[161]

B. *Mad Bee Disease*

A decade before CCD hit the United States, a similar epidemic, now known as mad bee disease, struck honeybees in France.[162] In the summer of 1994, honeybee hives in France started collapsing.[163] Beekeepers noticed that their worker bees were flying off and not returning; some observed thousands of

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152. KLUSER ET AL., *supra* note 94, at 5–9.

153. Spivak et al., *supra* note 55, at 35.

154. *Honey Bee Disorders: Honey Bee Parasites*, UNIV. GA. COLLEGE OF AGRIC. & ENV'T SCI. (last updated Mar. 8, 2012), http://www.ent.uga.edu/bees/disorders/honey-bee-parasites.html.

155. Spivak et al., *supra* note 55, at 35.

156. Wm. Michael Hood, *Varroa Mite Control in South Carolina*, CLEMSON UNIV. COOPERATIVE EXTENSION SERV., 1 (Dec. 2000), http://www.clemson.edu/extension/beekeepers/factsheets/varroa_mite_control_in_sc.pdf.

157. RENÉE JOHNSON, CONG. RESEARCH SERV., RL 33938, HONEY BEE COLONY COLLAPSE DISORDER 5 (2010).

158. *Id.*

159. *See* Milani, *supra* note 96.

160. *Id.* at 229–31.

161. *See generally id.* at 231–32 (recommending combination and rotation of treatments to combat the mites' ability to select for pesticide resistance).

162. *See* Barrionuevo, *Scientists Race for Reasons*, *supra* note 93 (describing "mad bee disease," a syndrome by which a chemical disoriented bees, causing them to "stay away from their hives," and "leading them to die of exposure to the cold").

163. SCHACKER, *supra* note 44, at 52.

dead bees in front of the hives.[164] Without workers, the remaining queen and immature bees could not survive.[165] In addition to high mortality rates, beekeepers also observed unusual behaviors among the bees, including "trembling, keeping the tongue extended, excessive cleaning of the head and the antennae, etc."[166] The affected bees were often apathetic, immobilized, and "attacked by guard bees at the hive entrance."[167]

The search to discover what was causing catastrophic hive losses in France over the course of the summer quickly revealed a prime suspect—Gaucho.[168] Gaucho is a neonicotinoid (chlorinated nicotine-based insecticide) containing the systemic pesticide imidacloprid.[169] A systemic pesticide "infiltrates the plant and manifests itself throughout the plant's tissue: stems, leaves, roots, everything. Bugs nibble on the plant, bugs die. It can't be washed off by rain."[170] Often, seeds are soaked in imidacloprid prior to planting, and as a result the mature plant is loaded with the insecticide.[171] French beekeepers believed their bees were dying from sublethal doses of imidacloprid as a result of the use of Gaucho, which had been applied to sunflowers[172] in France for the first time that very summer.

The French beekeepers requested that imidacloprid's creator, German-based Bayer CropScience, conduct studies on honeybees and the effects of sublethal doses of the insecticide.[173] Bayer conducted tests for several years and determined that the nectar sipped by bees did not contain lethal doses of the imidacloprid, therefore its product was safe.[174] Bayer's tests did not consider, however, whether sublethal doses could result in disorientation among bees, prevent-

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164. L. Maxim & J.P. van der Sluijs, *Expert Explanations of Honeybee Losses in Areas of Extensive Agriculture in France: Gaucho® Compared with Other Supposed Causal Factors*, 5 ENVTL. RES. LETTERS 014006, 3 (Jan. 21, 2010), *available at* http://iopscience.iop.org/1748-9326/5/1/014006/pdf/erl10_1_014006.pdf.

165. SCHACKER, *supra* note 44, at 52.

166. Maxim & van der Sluijs, *supra* note 164, at 3 (citations omitted).

167. Christian Maus et al., *Safety of Imidacloprid Seed Dressings to Honey Bees: A Comprehensive Overview and Compilation of the Current State of Knowledge*, 56 BULL. INSECTOLOGY 51, 55 (2003); *see also* JACOBSEN, *supra* note 26, at 90.

168. SCHACKER, *supra* note 44, at 53.

169. *Id.*

170. JACOBSEN, *supra* note 26, at 86.

171. *Id.*

172. *See* Email Interview by Predrag Cvetkovic with Henri Clément, President, Nat'l Union of French Beekeeping (UNAF) (Oliver Mihajlovic trans., Mar. 2008), http://pcela.rs/interview_henryEn.htm. Honeybees are very fond of the sunflower; in fact, in 1995, half of the honey produced in France was sunflower honey. *Id.*

173. SCHACKER, *supra* note 44, at 54.

174. Maus et al., *supra* note 167, at 55; SCHACKER, *supra* note 44, at 55.

ing them from finding their way home.[175] They also did not consider the cumulative effect of bees' exposure to imidacloprid through nectar, flowers, pollen, and leaves.[176] While Bayer insisted its insecticide was safe, French beekeepers continued to suffer extreme losses.[177] Within five years of the onset of mad bee disease, French production of sunflower honey had declined by more than fifty percent.[178] Within seven years, mad bee disease had wiped out one-third of France's honeybees.[179]

In 1997, French beekeepers appealed to their government to conduct further tests.[180] A year of intense imidacloprid research followed, with the French Agriculture Ministry concluding that even minute amounts of the insecticide would "disrupt [the bees'] ability and desire to feed and forage."[181] The French government initially planned to continue more trials to resolve discrepancies between its findings and Bayer's claims of safety.[182] In response, incensed members of France's National Association of French Beekeeping (UNAF)[183] and supporters took to the streets of Paris in a massive protest and urged the government to suspend use of the insecticide on sunflowers.[184]

Based upon the Ministry's research findings and public outcry, the French Minister of Agriculture cited the "principle of precaution,"[185] and in 1999, issued a "two-year nationwide ban on the use of Gaucho as a sunflower seed treatment and commissioned a round of studies."[186] In 2001, the ban was extend-

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175. *See* SCHACKER, *supra* note 44, at 54–55; Maus et al., *supra* note 167.

176. SCHACKER, *supra* note 44, at 55; *see also* Maus et al., *supra* note 167.

177. SCHACKER, *supra* note 44, at 55.

178. *Id.* ("Production of 110,000 metric tons of sunflower honey in 1996 fell to just 50,000 tons in 1999, more than a 50% decline in honey production.").

179. JACOBSEN, *supra* note 26, at 90 ("What began as 1.5 million bee colonies had dropped below 1 million by 2001.").

180. SCHACKER, *supra* note 44, at 55–56.

181. *Id.* at 56; *see also* C. DOUCET-PERSONENI ET AL., COMITÉ SCIENTIFIQUE ET TECHNIQUE DE L'ETUDE MULTIFACTORIELLE DES TROUBLES DES ABEILLES [SCIENTIFIC AND TECHNICAL COMMITTEE FOR THE STUDY OF MULTIFACTORIAL DISORDERS IN BEES], IMIDACLOPRIDE UTILISÉ EN ENROBAGE DE SEMENCES (GAUCHO®) ET TROUBLES DES ABEILLES RAPPORT FINAL [USE OF IMIDACLOPRID COATED SEEDS (GAUCHO®) AND DISORDERS IN BEES FINAL REPORT] (2003).

182. SCHACKER, *supra* note 44, at 58–59.

183. The National Association of French Beekeeping, UNAF, has 22,000 members who collectively own more than 500,000 hives. Email Interview by Predrag Cvetkovic with Henri Clément, *supra* note 172. The union works "to protect the bees and beekeeping activities." *Id.* The union works with the Ministry of Agriculture to resolve beekeeping issues, including the use of insecticides. *Id.* The union, through legal action and research, successfully led the fight to ban the use of Gaucho in France. *Id.*

184. SCHACKER, *supra* note 44, at 59.

185. *Id.*

186. JACOBSEN, *supra* note 26, at 91.

ed for an additional two years.[187] Gaucho was permanently banned for use on sunflowers in France in 2003.[188] Subsequent French studies revealed that Gaucho-treated maize could lead to the death of caretaker bees and Gaucho was permanently banned for use on maize in 2004.[189]

Unfortunately, honeybee populations in France did not immediately recover after Gaucho was banned for use on sunflowers.[190] Perhaps this is because, as later tests revealed, the chemical remains in the soil for several years, where new plants absorb it through their roots.[191] Or perhaps it is because honeybees were exposed to Gaucho through maize plants treated with the insecticide for five years after Gaucho was banned for use on sunflowers.[192] Since the initial ban on Gaucho, there has been some good news: In a 2008 interview, Henri Clément, the President of France's National Association of Beekeepers, stated that colony loss had returned to its natural annual level.[193] As French beekeepers closely monitor the health of their bees, researchers in France continue to publish and describe the effects of honeybee exposure to sublethal doses of neonicotinoid systemic pesticides.[194]

C. *The Emergence of Colony Collapse Disorder*

Colony Collapse Disorder is a syndrome that causes honeybees "to suddenly and mysteriously disappear from their hives—thousands of individual worker bees literally fly[] off to die."[195] As discussed above, commercial beekeepers are accustomed to incurring hive losses; some level of bee illnesses and bee deaths are to be expected. The unexplainable disappearance of the bees that began in 2006, however, has drastically reduced honeybee populations and become one of the biggest scientific mysteries of the day.[196]

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187. *Id.*
188. *Id.*
189. *Id.* at 92.
190. *Id.* at 91–92.
191. *Id.* at 92.
192. *Id.*
193. Email Interview by Predrag Cvetkovic with Henri Clément, *supra* note 172 (citing colony loss as 4–10% per year, more recently).
194. *See, e.g.*, Mickaël Henry et al., *A Common Pesticide Decreases Foraging Success and Survival in Honey Bees*, 336 SCIENCE 348 (2012); *see also* Penelope R. Whitehorn et al., *Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Bee Production*, 336 SCIENCE 351 (2012) (British study).
195. Spivak et al., *supra* note 55, at 34.
196. *Id.* at 35.

Dave Hackenberg, a prominent commercial beekeeper for over fifty years, is credited with the discovery of CCD.[197] Hackenberg's bees were pollinating in Florida when he discovered that hives that had been full a month earlier were totally empty.[198] In early November 2006, Hackenberg contacted state apiarists in Florida and Pennsylvania to report that a devastating number of his hives had collapsed.[199] By February, Hackenberg had lost 1900 of his 2900 hives.[200] As of June 2007, he had lost over 2100 hives, and estimated that CCD had cost him $460,000.[201]

Dave Hackenberg was the first beekeeper to report collapsed colonies, but his story was not unique. As the winter wore on, apiarists across the country were receiving reports of disappearing bees.[202] Beekeepers throughout the United States and around the world were experiencing colony collapse in alarming numbers.[203] Some operators lost up to ninety percent of their hives that year.[204]

By spring 2007, collapses had been found in twenty-seven states[205] and the total number of hives in the United States had declined by approximately thirty-one percent.[206] Colony collapses were also reported in Canada, Europe, South America, Central America, and Asia.[207] Since the emergence of CCD, U.S. beekeepers have continued to experience annual hive losses averaging over thirty percent, nearly double the annual rate of loss before CCD.[208] As of this writing, thirty-five states have reported hive collapses from CCD.[209]

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197. Stefan Lovgren, *Mystery Bee Disappearances Sweeping U.S.*, NAT'L GEOGRAPHIC NEWS (Feb. 23, 2007), http://news.nationalgeographic.com/news/2007/02/070223-bees.html.

198. Peter Huck, *The Strange Case of the Vanishing Bees*, GUARDIAN, June 26, 2007, http://www.guardian.co.uk/environment/2007/jun/27/society.conservation1.

199. JACOBSEN, *supra* note 26, at 57, 63.

200. Lovgren, *supra* note 197.

201. Huck, *supra* note 198.

202. JACOBSEN, *supra* note 26, at 64.

203. Lovgren, *supra* note 198; *see also* KLUSER ET AL., *supra* note 94 (surveying instances of CCD around the globe).

204. Lovgren, *supra* note 198.

205. Barrionuevo, *Scientists Race for Reasons*, *supra* note 93.

206. 2012 CCD REPORT, *supra* note 9, at 2 n.2.

207. Tracy Schelmetic, *A World Without Bees: Declining Colonies Could Threaten the World's Food Crops*, THOMASNET.COM (Feb. 28, 2012), http://news.thomasnet.com/green_clean/2012/02/28/a-world-without-bees-declining-colonies-could-threaten-the-worlds-food-crops.

208. *Compare* 2012 CCD REPORT, *supra* note 9, at 2 n.2 (showing losses averaging 32% between 2007 and 2011), *with* Kaplan, *supra* note 99, at 4 (estimating average annual losses between 15–20% prior to onset of CCD).

209. JOHNSON, *supra* note 157, at 4 (citing *Map of U.S. States Reporting Colony Collapse Disorder*, BEE ALERT INC., http://beealert.blackfoot.net/~beealert/USshaded.pdf (last visited Jan. 14, 2013)).

D. *Possible Causes of Colony Collapse Disorder*

As the number of beekeepers reporting collapses grew, a common set of characteristics emerged, including

> sudden disappearance of adult bees but no bodies in or near the hive; evidence of recent brood rearing, meaning the queen and young larvae are left behind; and an eerie absence of pests which typically pillage honey and bee bread (a mixture of honey and pollen that is the bees' main food) from dying or abandoned hives.[210]

Significant hive losses from parasites, pathogens, and acute pesticide poisoning had been seen before,[211] but the losses were not so widespread and substantial.[212] In addition, hive losses from these causes result in an accumulation of dead bees outside the hive.[213] It is the unique disappearance of the bees from their hives that makes CCD so mysterious.[214]

Dennis vanEnglesdorp, the Pennsylvania state apiarist Hackenberg contacted in November 2006, was one of the first experts researching CCD.[215] His

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210. Melissa Beattie-Moss, *Colonies in Collapse: What's Causing Massive Honeybee Die-Offs? Part 1*, PENN STATE LIVE, Nov. 11, 2008, http://live.psu.edu/story/35937.

211. *See* Huck, *supra* note 198.

212. *See* Barrionuevo, *Keepers in Peril*, *supra* note 87 ("The bee losses are ranging from 30 to 60 percent on the West Coast, with some beekeepers on the East Coast and in Texas reporting losses of more than 70 percent; beekeepers consider a loss of up to 20 percent in the offseason to be normal.").

213. *See Pesticide Issues in the Works: Honeybee Colony Collapse Disorder*, ENVTL. PROT. AGENCY, http://www.epa.gov/pesticides/about/intheworks/honeybee.htm (last updated Sept. 26, 2012).

> A common element of acute pesticide poisoning of bees is, literally, a pile of dead bees outside the hive entrance. With CCD, there are very few if any dead bees near the hive. Piles of dead bees are an indication that the incident is not colony collapse disorder. Indeed, heavily diseased colonies can also exhibit large numbers of dead bees near the hive.

Id.

214. JOHNSON, *supra* note 157, at 8.

> The bees are not returning to the hive but are leaving behind their brood (young bees), their queen, and maybe a small cluster of adults. What is uncharacteristic about this situation is that the honey bee is a very social insect and colony-oriented, with a complex and organized nesting colony. Failing to return to the hive is considered highly unusual. An absence of a large number of dead bees makes an analysis of the causes of CCD difficult.

Id.

215. Randal R. Rucker et al., Colony Collapse: The Economic Consequences of Bee Disease 12 (April 14, 2011) (unpublished manuscript), http://economics.clemson.edu/files/ccd-paper-full-package-apr14-2011.pdf.

name, like Hackenberg's, has become attached to the study and discussion of CCD. When vanEnglesdorp first examined dead bees collected from Hackenberg's beehives, he discovered that the bees had numerous infections and viruses; the bees had suffered from collapsed immune systems.[216] The cause of the collapsed immune systems was unknown.[217]

As the reports of massive hive losses continued, speculation as to the cause of CCD was rampant. Early theories included "genetically modified crops, cellular phone towers and high-voltage transmission lines."[218] Comparisons to France's mad bee disease were made.[219] Other possible causes suggested shortly after CCD's discovery included climate change, inadequate nutrition, drought, and stress put on bees from trucking and other commercial beekeeping practices.[220] Many of these early theories were removed from the list of suspects, including the cell-phone tower theory, feeding practices, and miticides.[221]

In 2007, the Agricultural Research Service held a Colony Collapse Disorder Research Workshop, convening over eighty prominent bee scientists, extension agents, and industry representatives to identify areas where more information was needed and to prioritize additional research projects related to CCD.[222] A CCD Steering Committee was formed and a CCD Research Action plan was developed.[223] In the 2008 farm bill legislation, Congress authorized the appropriation of significant funds for research, inspections, and surveillance of honeybees,[224] and directed the Secretary of Agriculture to submit an annual report

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216. *Id.*

217. *See id.* at 13.

218. Barrionuevo, *Scientists Race for Reasons*, *supra* note 93.

219. *See, e.g.*, Alison Benjamin, *Toxic Pollen and the Mad Bee Disease Disaster*, GUARDIAN, Mar. 29, 2012, http://www.guardian.co.uk/environment/2012/mar/29/toxic-pollen-mad-bee-disease; Huck, *supra* note 198.

220. Huck, *supra* note 198.

221. JOHNSON, *supra* note 156, at 8; *Honey Bees Colony and Collapse Disorder (CCD)*, AGRIC. RESEARCH SERV., USDA, http://www.ars.usda.gov/news/docs.htm?docid=%2015572 (last updated Oct. 1, 2012).

222. *Honey Bees Colony and Collapse Disorder (CCD)*, *supra* note 221; Howard Garrett, *Honeybee–Colony Collapse Disorder*, DIRT DOCTOR, http://www.dirtdoctor.com/Honeybee-Colony-Collapse-Disorder_vq2259.htm (last visited Jan. 14, 2013).

223. CCD STEERING COMM., AGRIC. RESEARCH SERV., USDA, COLONY COLLAPSE DISORDER ACTION PLAN (2007), *available at* http://www.ars.usda.gov/is/br/ccd/ccd_actionplan.pdf; *see also* Kim Kaplan, *USDA Announces Colony Collapse Disorder Research Action Plan*, AGRIC. RESEARCH SERV., USDA (July 13, 2007), http://www.ars.usda.gov/is/pr/2007/070713.htm.

224. Food, Conservation, and Energy Act of 2008, 7 U.S.C. § 5925(h)(1)–(3) (Supp. V 2011). For each of fiscal years 2008 through 2012, $10,000,000 was authorized to be appropriated for research and extension grants to study bee colony production and health, to conduct research on factors that may be causing CCD and other threats to the health of honeybees and other pollinators, and to improve and promote the health of honeybees and native pollinators. *Id.* § 5925(h)(1). For

describing progress made by the USDA in "(A) investigating the cause or causes of honey bee colony collapse; and (B) finding appropriate strategies to reduce colony loss."[225]

While preliminary scientific research focused on pathogens, parasites, environmental stresses, and bee management practices, scientists later suspected that perhaps a combination of these stressors was weakening bee colonies, thus making them more susceptible to pathogens that caused the final collapse.[226] Others wondered whether conditions present in migrating hives were making the bees more susceptible to disease while at the same time increasing the bees' exposure to pathogens and parasites.[227] Early genetic tests at Columbia University, like vanEngelsdorp's findings,[228] suggested that the bees' immune systems were weakened.[229]

Research conducted through 2008 led experts to conclude that CCD could not be attributed to any single factor.[230] Researchers began to focus their efforts on determining whether CCD was the result of a combination or synergy of factors, such as an interaction between stress factors and pathogens.[231] Researchers used questionnaires and conducted surveys to identify common hive management practices and environmental factors shared by beekeepers affected by CCD; however, the Agricultural Research Service maintains that "no common environmental agents or chemicals stand out as causative."[232] Collaborative CCD

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each of fiscal years 2008 through 2012, $7,250,000 was authorized to be appropriated to increase the USDA's capacity and infrastructure to address and conduct research on CCD and other issues related to pollinator health. *Id.* § 5925(h)(2). For each of fiscal years 2008 through 2012, $2,750,000 was authorized to be appropriated to "conduct a nationwide honey bee pest and pathogen surveillance program." *Id.* § 5925(h)(3). Unfortunately, "[s]ince the Farm Bill became law this funding has never been fully appropriated." Spivak et al., *supra* note 55, at 36.

225. 7 U.S.C. § 5925(h)(4).

226. *Review Colony Collapse Disorder in Honey Bee Colonies Across the United States: Hearing Before the Subcomm. on Horticulture and Organic Agric. of the H. Comm. on Agric.*, 110th Cong. 6–7 (2007) [hereinafter *Hearing on Colony Collapse Disorder*] (statement of Diana Cox-Foster, Ph.D., Professor, Penn. State Univ.); JOHNSON, *supra* note 157, at 8–9.

227. *Hearing on Colony Collapse Disorder*, *supra* note 226, at 4 (statement of Caird E. Rexroad, Ph.D., Agric. Research Serv., USDA); JOHNSON, *supra* note 157, at 9.

228. Dennis vanEngelsdorp et al., *Colony Collapse Disorder: A Descriptive Study*, 4 PLOS ONE (Aug. 3, 2009), http://www.plosone.org/article/info:doi/10.1371/journal.pone.0006481.

229. Barrionuevo, *Scientists Race for Reasons*, *supra* note 93; *see also* Diana L. Cox-Foster et al., *A Metagenomic Survey of Microbes in Honey Bee Colony Collapse Disorder*, 318 SCIENCE 283 (2007).

230. CCD STEERING COMM., USDA, COLONY COLLAPSE DISORDER PROGRESS REPORT 6 (2009), *available at* http://www.ars.usda.gov/is/br/ccd/ccdprogressreport.pdf.

231. *Id.*

232. Claire Bramble, *Colony Collapse Disorder: Theories*, WHAT'S THE BUZZ IN PHILA.?, (May 11, 2012, 6:41 PM), http://philadelphiaapiary.blogspot.com/2010/05/colony-collapse-

research efforts among federal agencies, state departments of agriculture, universities, and other groups continue in the United States today.[233]

E. *Pesticides and Colony Collapse Disorder*

Widely used, systemic[234] neonicotinoid pesticides, including imidacloprid and clothianidin,[235] have been of great interest to researchers since CCD first emerged.[236] Years before the onset of CCD, there was evidence that neonicotinoids had an adverse effect on bee populations.[237] Honeybee research in France had already concluded to the government's and beekeepers' satisfaction that imidacloprid disrupts bees' ability to feed and forage.[238] In 2003, the EPA itself

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disorder-theories.html; *see also Honey Bees Colony and Collapse Disorder (CCD)*, *supra* note 221 (stating that while a number of surveys and studies have identified potential correlations, there has been no consistent pattern identified).

233. JOHNSON, *supra* note 157, at 4. As of 2010,

> [m]uch of the current research on CCD is being conducted by scientists at USDA's Agriculture Research Service . . ., Pennsylvania State University, the University of Montana, and the Pennsylvania and Florida Departments of Agriculture, among others. Many of these researchers also participate in the CCD Working Group, which includes Bee Alert Inc., the Florida and Pennsylvania Departments of Agriculture, Pennsylvania State University, and USDA. Up-to-date information is regularly posted to the website of the Mid-Atlantic Apiculture Research and Extension Consortium . . ., which represents beekeeping associations in New Jersey, Maryland, Delaware, Pennsylvania, and West Virginia.

Id.

234. Systemic pesticides are "chemicals [that] can be absorbed and transported throughout the plant, offering protection against insects that feed on plants. Plants absorb these chemicals through their roots or leaves, and the vascular tissues transport the chemical into stems, leaves, flowers, and even fruit." HOPWOOD ET AL., *supra* note 139, at 3.

235. *Id.* "Six neonicotinoid insecticides are used on crops: imidacloprid, clothianidin, thiamethoxam, dinotefuran, acetamiprid, and thiacloprid." *Id.*

236. *See* Barrionuevo, *Scientists Race for Reasons*, *supra* note 94. In spring 2007, a Pennsylvania State University professor and insect toxicologist sent samples to a federal laboratory to screen for chemicals. *Id.* "Of greatest interest are the 'systemic' chemicals that are able to pass through a plant's circulatory system and move to the new leaves or the flowers, where they would come in contact with bees." *Id.* "One such group of compounds is called neonicotinoids, commonly used pesticides that are used to treat corn and other seeds against pests. One of the neonicotinoids, imidacloprid, is commonly used in Europe and the United States . . . ." *Id.*

237. *See Honey Bees Colony and Collapse Disorder (CCD)*, *supra* note 221. Although there were early studies done that showed adverse effects on bees due to neonicotinoids, they are likely not the sole cause of CCD. *Id.*

238. *See* JACOBSEN, *supra* note 26, at 89–90; SCHACKER, *supra* note 44, at 52–59; Email Interview by Predrag Cvetkovic with Henri Clément, *supra* note 173; *see also* Maxim & van der Sluijs, *supra* note 166, at 9 (discussing the debate between French beekeepers and Bayer scientists regarding the role of imidacloprid in colony collapses).

acknowledged that clothianidin "has the potential for toxic chronic exposure to honey bees, as well as other non-target pollinators, through the translocation of clothianidin residues in nectar and pollen."[239]

Neonicotinoid pesticides are particularly harmful to honeybees.[240] Neonicotinoids can be applied in numerous ways,[241] and there are various routes through which honeybees can be exposed to the chemical, both directly and indirectly.[242] Due to their systemic nature, neonicotinoids remain toxic throughout the plant's life and remain in the soil, where the chemical can be taken up by future plant life.[243] Upon exposure, "[n]eonicotinoids paralyze insects by blocking a specific chemical pathway that transmits nerve impulses in the insect's central nervous system."[244] Some researchers suspect that this pathway blockage is interfering with honeybees' abilities to communicate and navigate, which would explain why foragers fail to return to the hive.[245]

Clothianidin has been widely available on the U.S. market for nearly a decade.[246] Despite its known risks to pollinator health,[247] in 2003 the EPA grant-

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239. OFFICE OF PREVENTION, PESTICIDES, AND TOXIC SUBSTANCES, ENVTL. PROT. AGENCY, PESTICIDE FACT SHEET: CLOTHIANIDIN 15 (May 30, 2003), *available at* www.epa.gov/opp00001/chem_search/reg_actions/registration/fs_PC-044309_30-May-03.pdf.

240. *See* HOPWOOD ET AL., *supra* note 139, at 3, 6 ("[T]he presence of systemic insecticides in plants poses a particular risk to bees, because they feed on nectar as adults and collect nectar and pollen to feed their offspring.").

241. *Id.* at 3 ("Neonicotinoids can be applied as seed coatings, soil drenches or granules, foliar sprays, by direct injection into tree trunks, or by chemigation (addition of the insecticide to irrigation water).").

242. *Id.* at 6–7. Bees can be exposed to neonicotinoids through contaminated pollen and nectar, direct spray, residue contact, particles released during the planting of treated seeds, contaminated nesting areas, contaminated nesting material, contaminated water, guttation fluid (water droplets found on plants in the morning), and extrafloral nectaries (nectar producing glands located on leaves and stems). *Id.*

243. *Id.* at 3 (citing C. MUAS ET AL., RESIDUES OF IMIDACLOPRID WG 5 IN BLOSSOM SAMPLES OF SHRUBS OF DIFFERENT SIZES OF THE SPECIES *RHODODENDRON* SP. AFTER DRENCHING APPLICATION IN THE FIELD (2005); J.M. Bonmatin et al., *Behaviour of Imidacloprid in Fields. Toxicity for Honey Bees*, *in* ENVIRONMENTAL CHEMISTRY, GREEN CHEMISTRY AND POLLUTANTS IN ECOSYSTEMS 483, 491–92 (E. Lichtfouse et al., eds., (2005)).

244. *Id.* (citing Motohiro Tomizawa & John E. Casida, *Selective Toxicity of Neonicotinoids Attributable to Specificity of Insect and Mammalian Nicotinic Receptors*, 48 ANN. REV. ENTOMOLOGY 339 (2003)).

245. *Id.* at 13.

246. *See Clothianidin–Registration Status and Related Information*, ENVTL. PROT. AGENCY, http://www.epa.gov/pesticides/about/intheworks/clothianidin-registration-status.html (last updated July 27, 2012); Letter from Steven P. Bradbury, Director, Office for Pesticide Programs, Envtl. Prot. Agency, to Peter T. Jenkins, Ctr. for Food Safety and Int'l Ctr. for Tech. Assessment 2 (July 17, 2012), *available at* http://www.epa.gov/opp00001/about/intheworks/epa-respns-to-clothianidin-petition-17july12.pdf ("In 2003, the EPA granted Bayer CropScience (Bayer) the original registration of clothianidin for use as a corn . . . and canola seed treatment . . . .").

ed conditional registration[248] of clothianidin and required its manufacturer, Bayer CropScience, to conduct a chronic honeybee study to evaluate the sublethal effects of the chemical over time.[249] Despite the risks, clothianidin was "marketed and sold to farmers nationwide for use on corn, canola, soy, sugar beets, sunflowers, and wheat."[250] Bayer's long-awaited study finally became available in 2007.[251] While Bayer's research methods were widely criticized,[252] the EPA accepted the study as "scientifically sound."[253]

In 2010 Bayer applied to register clothianidin for use on additional crops.[254] The application relied on the research data submitted back in 2007.[255] Upon review of Bayer's 2007 field study on honeybees, the EPA identified deficiencies, acknowledged that potential toxic effects on pollinators were still unknown, and declared that another field study was required.[256] Nevertheless, the

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247. Memorandum from Miachel Rexroad, Senior Aquatic Biologist, Envtl. Prot. Agency, to Meredith F. Law, Chief, Insecticide Branch & Terri Stowe, NAFTA Joint Review Coordinator, Envtl. Prot. Agency 1–2 (Apr. 10, 2003), *available at* http://www.epa.gov/pesticides/chem_search/cleared_reviews/csr_PC-044309_10-Apr-03_a.pdf; James Gerken, *Clothianidin Pesticide Harms Honeybees and Must Be Banned, Beekeepers Claim*, HUFFINGTON POST (Mar. 21, 2012), http://www.huffingtonpost.com/2012/03/22/clothianidin-pesticide-honeybees-banned_n_1371274.html; *Clothianidin–Registration Status and Related Information*, *supra* note 246.

248. The EPA has the authority to conditionally register a pesticide "for a period reasonably sufficient for the generation and submission of required data (which are lacking because a period reasonably sufficient for generation of the data has not elapsed since the Administrator first imposed the data requirement) . . . ." 7 U.S.C. § 136a(c)(7)(C) (2006).

249. Memorandum from Miachel Rexroad to Meridith F. Law & Terri Stowe, *supra* note 247, at 2; *see also* Deniza Gertsberg, *Are Systemic Pesticides to Blame for Honeybee Colony Collapse?*, GMO J. (Oct. 25, 2011), http://gmo-journal.com/index.php/2011/10/25/are-systemic-pesticides-to-blame-for-honeybee-colony-collapse/.

250. Gertsberg, *supra* note 249.

251. Memorandum from Allen Vaughan, Biologist, Envtl. Prot. Agency, to Kable Davis, Risk Manager Reviewer, & John Hebert, Risk Manager, Envtl. Prot. Agency (Nov. 16, 2007), *available at* http://www.beyondpesticides.org/pollinators/Clothianidin%20EPAmemo2007_2.pdf (reviewing and approving the Clothianidin study); *see also* Gertsberg, *supra* note 249.

252. *See* Gertsberg, *supra* note 249 (discussing criticisms of Bayer's study).

253. Memorandum from Allen Vaughan to Kable Davis & John Hebert, *supra* note 251, at 1.

254. Memorandum from Joseph DeCant, Ecologist & Michael Barrett, Chemist, Envtl. Prot. Agency, to Kable Davis et al., Envtl. Prot. Agency 1 (Nov. 2, 2010), *available at* http://www.epa.gov/opp00001/chem_search/cleared_reviews/csr_PC-044309_2-Nov-10_b.pdf; *see also* Gertsberg, *supra* note 250.

255. *See* Memorandum from Joseph DeCant et al. to Kable Davis et al., *supra* note 254, at 2; Gertsberg, *supra* note 250.

256. Memorandum from Joseph DeCant et al. to Kable Davis et al., *supra* note 254, at 2 ("However, after another review of this field study in light of additional information, deficiencies were identified that render the study supplemental. It does not satisfy the guideline 850.3040, and

agency has not revoked clothianidin's registration.[257] Despite new research suggesting even low levels of neonicotinoids can significantly affect bee colonies,[258] nicotinoids continue to be widely used in U.S. agriculture[259] and sold for home garden use on the U.S. market.[260]

Pesticide synergy is also an area of interest in CCD research. The bee research team at Penn State University[261] is taking a broad approach to its study of the impacts chemicals have on bees.[262] The team is concerned that there are so many herbicides, pesticides, fungicides, and miticides on the market today without sufficient research on how combinations of these chemicals affects bees.[263] The team believes inert ingredients and tank mixes, which are not tested, may be more harmful than the active ingredients.[264] The team also believes the effects of pesticide exposure beyond the application period may be significant.[265] To resolve these issues, they are "focusing on synergistic and sublethal effects of multiple pesticides on the chemical senses and chemically mediated behaviors of honeybees in relation to honeybee health and CCD."[266]

It has been more than five years since Dave Hackenberg discovered the first victims of CCD. Despite years of intensive research, the specific cause or causes of CCD continues to elude scientists and beekeepers. While common symptoms have emerged and research has revealed some answers, we still have

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another field study is needed to evaluate the effects of clothianidin on bees through contaminated pollen and nectar.").

257. Gertsberg, *supra* note 249.

258. *See* Henry et al., *supra* note 194; Whitehorn et al., *supra* note 194.

259. *Our Commitment to Bee Health*, BAYER CROP SCI., 1, http://www.bayercropscience.us/our-commitment/Documents/OurCommitment_BeeHealth_SolutionsAgriculture.PDF (last visited Jan. 14, 2013); *see also* Elizabeth Kolbert, *Silent Hives*, NEW YORKER (Apr. 20, 2012), http://www.newyorker.com/online/blogs/comment/2012/04/new-studies-colony-collapse-disorder.html. ("[A]t least a hundred and forty million acres were planted with neonicotinoid-treated seeds in 2010 . . . an area larger than California and Florida combined.").

260. *See generally* HOPWOOD ET AL., *supra* note 139, at 5 (providing examples of neonicotinoid products marketed in the United States for non-commercial use).

261. The research team includes Dr. James Frazier, Professor of Entomology; Dr. Chris Mullen, Professor of Entomology; Maryann Frazier, bee expert and Sr. Extension Agent; and Daniel Schmehl, graduate student. Telephone Interview with Dr. James Frazier, Professor of Entomology, Penn. State Univ. (Apr. 19, 2012).

262. *Id.*

263. *Id.*

264. *Id.*

265. *Id.*

266. *James Frazier, Ph.D*, PENN. STATE UNIV., ENTOMOLOGY, http://ento.psu.edu/directory/jff2 (last visited Jan. 14, 2013).

"more questions than we have answers for."[267] With so much evidence suggesting pesticide use is causing bee die-offs, perhaps the biggest question is whether the federal government is effectively regulating the use of pesticides.

F. *The Role of Federal Pesticide Regulation*

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[268] prohibits the sale or distribution of any pesticide[269] in the United States without proper registration.[270] The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for registering each pesticide product and for specifying allowed uses.[271] Under FIFRA, the EPA is directed to restrict the use of pesticides as "necessary to prevent unreasonable adverse effects on the environment," taking into account the costs and benefits of various pesticide uses.[272]

In order to obtain registration for a pesticide product or to register a new use of a pesticide, a manufacturer must conduct tests and submit scientific data on toxicity and behavior in the environment.[273] The EPA dictates the tests and data required "depending on the potential toxicity of active and inert ingredients and degree of exposure."[274] Once the data has been submitted, the EPA assesses "the hazards to human health and the environment that may be posed by the pesticide."[275]

The EPA next performs a balancing test to determine whether the pesticide presents a risk of "unreasonable adverse effects on the environment."[276] Under FIFRA, the EPA must take "into account the economic, social, and envi-

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267. *Mike Hood: Honey Bees*, CLEMSON UNIV., http://www.clemson.edu/public/psatv/ag/ss_honeybees.html (last visited Jan. 14, 2013).

268. Federal Fungicide, Insecticide, and Rodenticide Act, 7 U.S.C. § 136–136y (2006 & Supp. V 2011).

269. See 7 U.S.C. § 136(u) (2006) for the FIFRA definition of "pesticide."

270. *Id.* § 136a(a).

271. LINDA-JO SCHIEROW, CONG. RESEARCH SERV., RL 31921, PESTICIDE LAW: A SUMMARY OF THE STATUTES 1 (2012), *available at* http://www.nationalaglawcenter.org/assets/crs/RL31921.pdf; *see* 7 U.S.C. § 136(b).

272. 7 U.S.C. § 136a(a).

273. *Pesticides: Regulating Pesticides*, ENVTL. PROT. AGENCY, http://www.epa.gov/pesticides/regulating/ (last updated Sept. 25, 2012).

274. SCHIEROW, *supra* note 261, at 4; *see* 7 U.S.C. § 136a(c) (providing statutory authority for creation of procedures for registration and data requirements).

275. *Registering Pesticides*, ENVTL. PROT. AGENCY, http://www.epa.gov/opp00001/regulating/registering/ (last updated May 9, 2012).

276. 7 U.S.C. § 136(bb); *see also* Aaron Gershonowitz, *Environmental Regulation: Fitting the Pieces Together*, 32 ENVIRONS ENVTL. L. & POL'Y J. 99, 114 (2008) ("EPA decides whether the risks may outweigh the burden of precautions, comparing the cost of the injuries against cost to the seller of not selling the product.").

ronmental costs and benefits of the use of any pesticide."[277] If the EPA concludes the benefits outweigh the risks, the product will be registered for either general use[278] or restricted use.[279] The EPA "specifies the approved uses and conditions of use" for each pesticide it registers.[280] Pesticide manufacturers and distributors must comply with labeling requirements, including instructions for use, storage, and disposal.[281]

As ongoing research continues to suggest pesticides are contributing to massive pollinator loss, the EPA is coming under attack. The severe risks to pollinator health imposed by the widespread use of pesticides in commercial agriculture, turf management, and home gardens make clear the need for more stringent regulation of these chemicals.

Critics of the EPA argue the agency has too much discretion and believe the testing and data requirements are grossly insufficient.[282] The EPA does in fact have broad discretion in its regulation of pesticides. Under FIFRA, the EPA is required to determine whether the chemical poses an "unreasonable risk," "a term that [is] subjectively interpreted."[283] This subjective term essentially grants the EPA full authority to determine what level of risk is reasonable.[284] In addition, the EPA determines the weight of the social and economic benefits, thereby

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277. 7 U.S.C. § 136(bb)(1).

278. A pesticide, or particular use of the pesticide, is classified for general use if

> when applied in accordance with its directions for use, warnings and cautions and for the uses for which it is registered, or for one or more of such uses, or in accordance with a widespread and commonly recognized practice, [it] will not generally cause unreasonable adverse effects on the environment . . . .

Id. § 136a(d)(1)(B).

279. A pesticide, or a particular use of the pesticide, is classified for restricted use if

> when applied in accordance with its directions for use, warnings and cautions and for the uses for which it is registered, or for one or more of such uses, or in accordance with a widespread and commonly recognized practice, may generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment, including injury to the applicator . . . .

Id. § 136a(d)(1)(C).

280. SCHIEROW, *supra* note 261, at 4.

281. 7 U.S.C. § 136a(c)(9) (setting forth pesticide labeling requirements); *see also* SCHIEROW, *supra* note 261, at 4.

282. *See, e.g.*, SCHACKER, *supra* note 44, at 147–51.

283. *Id.*

284. *See id.*

allowing the EPA to register a pesticide with a high risk of adverse effects provided the agency, in its discretion, determines the benefits outweigh risks.[285]

Critics also claim that EPA risk-benefit analyses relies too heavily on data supplied by the manufacturer.[286] When the EPA performs a risk-benefit analysis, the analysis is based on data submitted by the pesticide-manufacturing applicant, as required by the EPA.[287] The applicant has no incentive to perform tests beyond those mandated by the EPA, but rather, is incentivized to perform the most limited set of tests that will satisfy the EPA requirements.[288] It has been said that FIFRA actually rewards ignorance because the law is "structured so that potential harm causers find that it is in their own interest not to know about a problem or not to explore the full extent of a potential harm."[289] To make matters worse, the risk-benefit analysis is usually performed by EPA administrators; EPA scientists generally are not involved in the approval process.[290] Further, the EPA rarely conducts its own tests on pesticides.[291] This policy creates a situation in which the entity responsible for proving a pesticide is safe is the very same entity that stands to benefit if the pesticide is granted registration.[292]

Another major problem with EPA pesticide registration procedures, according to Dr. James Frazier, is that testing requirements and risk assessments do not address the synergistic effects of combinations of chemicals, including herbicides, pesticides, fungicides, and miticides that are generally applied in concert.[293] Much like drug interactions can be dangerous to humans, chemical interactions among pesticides can be extremely harmful to wildlife. For example, when certain fungicides are applied in combination with certain insecticides, the insecticides can become up to 1000 times more toxic.[294] In addition, no testing or data

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285. *See id.*

286. *E.g.*, *Does Government Registration Mean Pesticides Are Safe?*, 19 J. PESTICIDE REFORM 3, 3 (1999) (suggesting that the registration process relies on "a built-in conflict of interest").

287. SCHACKER, *supra* note 44, at 149; *see also* 7 U.S.C. § 136a(c)(1)(F) (2006) (requiring pesticide manufacturers to submit test results and literature relating to the safety and effects of their products).

288. *See* Daniel C. Esty, *Environmental Protection in the Information Age*, 79 N.Y.U. L. REV. 115, 201 (2004).

289. *Id.* at 204.

290. Gertsberg, *supra* note 249.

291. JACOBSEN, *supra* note 26, at 97.

292. *See id.*

293. Telephone Interview with Dr. James Frazier, *supra* note 261; *see also* JACOBSEN, *supra* note 26, at 98–99.

294. Telephone Interview with Dr. James Frazier, *supra* note 261.

is required for inert ingredients, which may be more harmful than active ingredients.[295]

Frazier is also concerned that EPA-required data provided by applicants significantly underestimates the effects of pesticides because they are only looking at exposure during application.[296] Systemic pesticides last for years in the ground and in woody plants, however, and repeated use results in the bioaccumulation of pesticides in soil and trees.[297] In addition, honeybees are exposed to systemic pesticides not only during application, but also when they gather nectar and pollen from the plant.[298] To date, the EPA has failed to address these risks.[299]

For over five years honeybees have been in the spotlight. Much of the attention honeybees receive centers around their mysterious disappearances and the search to find a cause. Increasingly, however, honeybees are attracting a different kind of attention.

IV. KEEPING BEES IN THE CITY?

"[T]o the bee a flower is a fountain of life,
And to the flower a bee is a messenger of love . . . ." – Kahlil Gibran[300]

In recent years, cities across the United States have legalized urban beekeeping.[301] While the federal government does regulate honeybee imports and honey standards,[302] the regulation of beekeeping is a primarily a state and local matter. At the state level, apiary registration and inspection may be required,[303]

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295. *Id.*
296. *Id.*
297. *Id.*
298. HOPWOOD ET AL., *supra* note 139, at 6.
299. *Id.*
300. KAHLIL GIBRAN, THE PROPHET 73 (Alfred A. Knopf 1976) (1923).
301. *E.g.*, CHI., ILL., MUN. CODE OF CHI. § 17-17-0270.7 (2012); CLEVELAND, OHIO, CODE OF ORDINANCES §§ 205.01–.04 (2012); MADISON, WIS., CODE OF ORDINANCES § 9.53 (2012); N.Y.C., N.Y., HEALTH CODE §161.01(b)(12) (2012); DENVER, COLO., DENVER ZONING CODE § 11.8.5.1(A) fig. (2010); MILWAUKEE, WIS., CODE OF ORDINANCES § 78-6 (2010); AUSTIN, TEX., AUSTIN CITY CODE §§ 3-6-1 to -25 (2008); BALT., MD., BALT. CITY REV. HEALTH CODE § 10-312(b)(4) (2008); *see also* Patricia E. Salkin, *Honey, It's All the Buzz: Regulating Neighborhood Beehives*, 39 B.C. ENVTL. AFF. L. REV. 55, 55–56 (2012) (describing recent local legislation enacted to respond to the increased interest in urban beekeeping).
302. 7 U.S.C. §§ 281–286 (2006); 7 C.F.R. §§ 322.1–.35 (2012).
303. *See, e.g.*, MD. CODE ANN., AGRIC. §§ 5-502 to -503 (LexisNexis 2007) (requiring the Maryland Secretary of Agriculture to conduct apiary inspections and investigations, and setting forth mandatory annual registration requirements for beekeepers); *see also Apiary Inspection,* MD. DEP'T OF AGRIC., http://www.mda.state.md.us/plants-pests/plant_protection_weed_mgmt/apiary

right-to-farm laws may apply,[304] and honey is often heavily regulated.[305] In addition, some states have laws that prohibit local restrictions on beekeeping; these state laws preempt any local regulations.[306] At the municipal level, beekeeping is generally addressed, if addressed at all, in land use regulations contained in the zoning code.[307] Regulations pertaining to bees may also be found in other portions of a city's municipal code, including health code and animal code regulations.[308]

A. *Municipal Regulation of Urban Beekeeping*

Municipalities have been regulating land use through comprehensive zoning ordinances for nearly a century.[309] In order to be valid, land use regulations must promote the community's health, safety, general welfare, and morals.[310] Zoning codes typically divide a city into types of districts and contain provisions for the uses of land allowed in each district.[311] The purpose of zoning is

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_inspection/index.php (last visited Jan. 14, 2013) (stating that apiary inspectors annually visit approximately two-thirds of Maryland's apiaries, examining the colonies for diseases and pests).

304. *See e.g.*, CAL. CIV. CODE § 3482.5 (West 2012); WASH. REV. CODE ANN. § 7.48.305 (West 2007).

305. *See e.g.*, MINN. STAT. ANN. § 31.74 (West 2009); OHIO REV. CODE ANN. § 3715.38 (West 2012); WASH. REV. CODE ANN. §§ 69.28.050–.070 (West 2007); *see also* Salkin, *supra* note 301, at 62–63 (providing more examples).

306. *E.g.*, GA. CODE ANN. § 2-14-41.1 (2003); 55 ILL. COMP. STAT. ANN. § 5/5-12011 (West 2011); N.Y. AGRIC. & MKTS. § 305-a (McKinney 2004).

307. Salkin, *supra* note 301, at 66.

308. *E.g.*, N.Y.C., N.Y., HEALTH CODE §161.01(b)(12) (2012); CLEVELAND, OHIO, CODE OF ORDINANCES § 205.04 (2012).

309. *See* Village of Euclid, Ohio v. Ambler Realty Co., 272 U.S. 365, 379–80, 387, 395 (1926) (holding that a restriction on land use was a valid exercise of the police power). New York enacted the first comprehensive zoning ordinance in 1916. N.Y.C. Dep't of City Planning, *About Zoning*, NYC.GOV, http://www.nyc.gov/html/dcp/html/zone/zonehis.shtml (last visited Jan. 14, 2013).

310. *See Euclid*, 272 U.S. at 395 (citations omitted). The court explained,

> If these reasons, thus summarized, do not demonstrate the wisdom or sound policy in all respects of those restrictions which we have indicated as pertinent to the inquiry, at least, the reasons are sufficiently cogent to preclude us from saying, as it must be said before the ordinance can be declared unconstitutional, that such provisions are clearly arbitrary and unreasonable, having no substantial relation to the public health, safety, morals, or general welfare.

Id.

311. *See, e.g.*, *id.* at 380 ("The entire area of the village [was] divided by the ordinance into six classes of use districts . . . .").

to prevent incompatible uses within a district.[312] While agricultural use was once held to be incompatible with residential use,[313] today the uses are increasingly viewed as compatible if not complementary. Given this compatibility, cities across the United States have recently amended their municipal codes to permit and regulate agricultural uses, including beekeeping, within city limits.[314]

Urban agricultural uses, including beekeeping, are generally addressed in a city's zoning code. These uses may be permitted by right or may be allowed as a conditional use. A use permitted by right is a use that is allowed without special approval by the zoning authority (though the issuance of a permit may still be required).[315] A conditional use, also commonly referred to as a special exception, is a use that is allowed in the zoning district, but requires the approval of the zoning authority.[316] Both uses permitted by right and conditional uses may be allowed as a primary use or as an accessory use (to a primary use).[317] Urban agricultural uses are often permitted as an accessory use in urban areas. For example, the City of Chicago permits the keeping of up to five honeybee colonies "as an accessory use to the primary activity on the site."[318]

In addition to restrictions and rules imposed by the zoning code, a city's municipal code may address beekeeping in its animal regulations title. For example, the Austin City Code dedicates a portion of their animal regulation chapter to beekeeping.[319] The Code addresses colony density, hive maintenance, flyway barriers, aggressive colonies, wild and abandoned bees, hive identification and ownership, inspections, and enforcement.[320]

A city's health code or health regulations may also contain provisions pertaining to the keeping of bees. The City of Baltimore's Health Code and De-

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312. *See id.* at 386–87.

313. *See* Clark v. Wambold, 160 N.W. 1039, 1040 (Wis. 1917) (holding that the odors from the farm are "one of those minor discomforts of life, which must be borne").

314. *See generally* Peters, *Current and Emerging Issues*, *supra* note 115, at 328–43 (discussing various municipal codes that have been enacted to permit urban agricultural enterprises, many of which permit urban beekeeping).

315. Brad Neumann, *Permitted Uses, aka "Use by Right"*, IOWA STATE UNIV. EXTENSION AND OUTREACH, http://www.extension.org/pages/26509/permitted-uses-aka-use-by-right (last updated May 5, 2010).

316. Gary D. Taylor, *Special Exceptions*, IOWA STATE UNIV. EXTENSION AND OUTREACH, http://www.extension.org/pages/26488/special-exceptions (last updated Mar. 11, 2010).

317. *See, e.g.*, DANA POINT, CAL., MUN. CODE 9.13.020(a)(2) (2012) (defining accessory uses as those "allowed by right if accessory to a permitted or conditional use"). Accessory uses are uses that are customarily conducted in association with a primary use, but which are incidental and subordinate to the primary use. JULIAN CONRAD JUERGENSMEYER & THOMAS E. ROBERTS, LAND USE PLANNING & DEVELOPMENT REGULATION LAW 75–77 (2d ed. 2007).

318. CHI., ILL., MUN. CODE OF CHI. § 17-17-0270.7 (2012).

319. AUSTIN, TEX., AUSTIN CITY CODE §§ 3-6-1 to -25 (2008).

320. *Id.* §§ 3-6-3 to -22.

partment of Health regulations prohibit the keeping of bees without first registering with the Maryland Department of Agriculture.[321] The Health Code also authorizes Baltimore's Commissioner of Health to set fees for beekeeping permits, to adopt rules and regulations governing the care and control of bees, and to perform inspections.[322]

While the details of beekeeping ordinances vary across cities, they share many common provisions.[323] Hive limits are generally imposed and are often based on lot size.[324] Siting and setback requirements are frequently contained in beekeeping ordinances.[325] Flyway barriers consisting of shrubs, walls, and fences are often required;[326] these barriers are intended to alter the honeybees' flight path to minimize contact with humans.[327] Some beekeeping regulations require the replacement of the queen if the hive demonstrates aggressive characteristics.[328] Permits and/or registration are often required by beekeeping regulations.[329]

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321. BALT., MD., BALT. CITY REV. HEALTH CODE § 10-312(b)(4) (2008); BALT., MD., CITY HEALTH DEP'T, BEES: ACCEPTABLE STANDARDS FOR KEEPING § 1 (2007).

322. BALT., MD., BALT. CITY REV. HEALTH CODE §§ 10-104 to -106 (2008).

323. *See* Salkin, *supra* note 301, at 66–71 (discussing provisions commonly found in local beekeeping ordinances).

324. *See id.* at 67. In the City of Baltimore, residents are allowed to keep one hive (containing no more than one swarm) per 2500 square feet of lot area. BALT., MD., CITY HEALTH DEP'T, BEES: ACCEPTABLE STANDARDS FOR KEEPING § 2 (2007).

325. *See* Salkin, *supra* note 301, at 68–69. In the City of Denver, "[h]ives must be in rear 1/3 of zone lot with a 5 foot setback from side and rear zone lot lines." DENVER, COLO., DENVER ZONING CODE § 11.8.5.1(A) fig. (2010).

326. *See, e.g.*, AUSTIN, TEX., AUSTIN CITY CODE § 3-6-4(A), (C). In the City of Austin, Texas, any person keeping a "colony within 25 feet of the property line of a tract" must establish and maintain a flyway barrier at least six feet high (consisting of a "solid wall, fence, dense vegetation, or a combination") that runs parallel to the property line and extends "at least 10 feet beyond the hives on each end of the colony." *Id.*

327. *See* MARY C. WOOD ET AL., REFORM OF LOCAL LAND USE LAWS TO ALLOW MICROLIVESTOCK ON URBAN HOMESTEADS 41 (2010), *available at* http://llm.uoregon.edu/assets/facultydocs/mwood/microlivestock.pdf.

328. *E.g.*, AUSTIN, TEX., AUSTIN CITY CODE § 3-6-5 ("A person shall immediately replace the queen in a colony that exhibits aggressive characteristics . . . ."); MILWAUKEE, WIS., CODE OF ORDINANCES § 78-6(3)(i) (2011) ("In any instance in which a hive exhibits unusually aggressive characteristics it shall be the duty of the beekeeper to destroy or re-queen the hive.").

329. *See, e.g.*, CLEVELAND, OH., CODE OF ORDINANCES § 205.04 (2012) (requiring residents to obtain a license prior to keeping bees); MADISON, WIS., CODE OF ORDINANCES § 9.53 (2012) (requiring license); N.Y.C., N.Y., HEALTH CODE §161.01(b)(12) (2012) (requiring notice be given to Department of Health); SEATTLE, WASH., MUN. CODE § 23.42.052(E) (2012) (requiring registration with the State Department of Agriculture); MILWAUKEE, WIS., CODE OF ORDINANCES § 78-6(1) (2011) (requiring permit); BALT., MD., BALT. CITY REV. HEALTH CODE § 10-312(b)(4) (2008) (requiring registration with state Department of Agriculture).

B. *Case Studies of Beekeeping Ordinances in U.S. Cities*[330]

In 2010, the city of Milwaukee passed an ordinance that permits residents within city limits to keep up to two honeybee hives on a private lot.[331] An annual permit is required, and only beekeepers are allowed to keep honeybees.[332] Obtaining a beekeeping permit requires the submission of an application, payment of a fee,[333] an inspection, and neighborhood approval.[334] Milwaukee's ordinance includes detailed rules, including but not limited to, setback requirements, proper maintenance of the hives, water supply requirements, and flyway barrier requirements.[335] The ordinance also contains a provision regarding aggressive characteristics in a hive.[336] The keeping of hives that "cause any unhealthy conditions or interfere with the normal use and enjoyment of human or animal life of others, [and] any public property or property of others" is prohibited.[337]

The City of Cleveland revised its municipal code in early 2009 to allow the keeping of small livestock, including bees, on urban lots throughout the City.[338] Cleveland's Zoning and Health Codes contain detailed sections titled "Restrictions on the Keeping of Farm Animals and Bees,"[339] designed to "permit the keeping of farm animals and bees in a manner that prevents nuisances to occupants of nearby properties and prevents conditions that are unsanitary or unsafe."[340]

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330. For a broader discussion on the evolution of local laws permitting small urban agricultural enterprises (for example, bees, chickens, other small mammals, and even livestock under specific conditions), see Peters, *Current and Emerging Issues*, *supra* note 115, at 232–48.

331. MILWAUKEE, WIS., CODE OF ORDINANCES § 78-6-3(a).

332. *Id.* § 78-6-1. According to the City's Code of Ordinances, a beekeeper is "a person who owns or has charge of one or more colonies of bees and has demonstrated to the commissioner that he or she has obtained formal education or sufficient practical experience to act as a beekeeper." *Id.* § 78-1-5.

333. *Id.* § 78-6-1. The annual fee for keeping bees is eighty dollars. *Id.* § 60-7-7.

334. *Id.* § 78-6-1 to -2. Prior to the issuance of a permit, the commissioner of health shall notify "all property owners within a circular area having a radius of 200 feet, centered on the premises for which a permit has been requested." *Id.* § 78-6-2(a). Any such property owners objecting to the granting of the permit have fourteen business days to file a written objection and request a hearing. *Id.* § 78-6-2(b).

335. *Id.* § 78-6-3.

336. *Id.* § 78-6-3(i). "In any instance in which a hive exhibits unusually aggressive characteristics it shall be the duty of the beekeeper to destroy or re-queen the hive. Queens shall be selected from stock bred for gentleness and non-swarming characteristics." *Id.*

337. *Id.* § 78-6-3(j).

338. *Chickens and Bees Ordinance: Cleveland Revamps Zoning Codes to Promote Urban Agriculture*, CLEVELAND-CUYAHOGA CNTY. FOOD POLICY COAL., 2 (Oct. 2011), http://cccfoodpolicy.org/sites/default/files/resources/chickens_and_bees_policy_summary_0.pdf.

339. CLEVELAND, OHIO, CODE OF ORDINANCES §§ 205.04, 347.02 (2012).

340. *Id.* § 347.02(a).

Cleveland's Health Code requires anyone proposing to keep bees to submit a detailed application for a two-year license;[341] payment of a fee is also required.[342] Prior to the issuance of an initial license, the applicant's site plan must be approved by the Department of Building and Housing;[343] in residential districts, twenty-one days' notice and an opportunity to comment must be provided "to the owner of each property directly adjoining the property that is the subject of the license application."[344] Evidence of a nuisance or an unsafe or unsanitary condition relative to the subject property is grounds for the denial of a license.[345] While beekeeping regulations are contained in the City's Zoning Code, the Department of Health has the authority to ensure compliance with the regulations and issue penalties.[346]

Cleveland's Zoning Code specifies the number of beehives allowed.[347] In residential districts, the zoning code allows up to one beehive for each 2400 square feet of lot area;[348] in non-residential districts, one beehive for each 1000 square feet of lot area is allowed.[349] Beehives are permitted on lots that are vacant or have no occupied residence, subject to certain conditions.[350] Beehives are

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341. *Id.* § 205.04(a). The applicant must provide:

> (1) The name, phone, phone number and address of the applicant; (2) The location of the subject property; (3) The size of the property; (4) The number of animals or bee hives to be kept on the property; (5) A description of any proposed cages, coops, beehives, fences or enclosures; (6) A scaled drawing showing the precise location of cages, coops, enclosures, beehives, stables and fences in relation to property lines and to houses on adjacent properties; (7) A description of the manner by which feces and other waste materials will be removed from the property or will be treated so as not to result in unsanitary conditions or in the attraction of insects or rodents; (8) In the case of a lot that is vacant or has no occupied residence, documentation demonstrating that the use will be managed in a manner that prevents the creation of nuisances or unsanitary or unsafe conditions; (9) A signed statement from the property owner, if the applicant is not the property owner, granting the applicant permission to engage in the keeping of farm animals or bees as described in the registration; and (10) The addresses of all properties directly adjoining the subject property.

Id. § 205.04(a)(1)–(10).

342. *Id.* § 205.04.

343. *Id.* § 205.04(b)(3).

344. *Id.* § 205.04(b)(2).

345. *Id.* § 205.04(b)(1).

346. *Id.* § 205.04(e)–(f).

347. *Id.* § 347.02(d)(1)(A).

348. *Id.*

349. *Id.* § 347.02(d)(2).

350. *Id.* § 347.02(e). The applicant for such activity must submit written documentation to the Director of Public Health, "demonstrating that the use will be managed in a manner that prevents the creation of nuisances or unsanitary or unsafe conditions." *Id.*

listed as permitted accessory uses and structures in Cleveland's Urban Garden Districts.[351] In addition to regulating the number of hives allowed, Cleveland's Zoning Code also governs location and setbacks,[352] flyway barrier requirements,[353] water supply requirements,[354] and types of bees permitted.[355]

C. *Passing a Beekeeping Ordinance*

Legalizing beekeeping can be a lengthy and challenging endeavor.[356] Opponents may feel uncertain about inviting populations of bees into dense urban areas.[357] Common concerns include additional bee sting incidents, risk to people with acute allergies, and the increased presence of bees in general.[358] A solid understanding of policy barriers, including preemptive federal and state laws, broad stakeholder involvement, community education, a well-crafted ordinance, and patience are essential elements to the enactment of a beekeeping ordinance.

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351. *Id.* § 336.04(d).

352. *Id.* § 347.02(d)(1)(B). The zoning ordinance provides

> [n]o beehive shall be kept closer than five (5) feet to any lot line and ten (10) feet to a dwelling or the permitted placement of a dwelling on another parcel, and no beehive shall be kept in a required front yard or side street yard. The front of any beehive shall face away from the property line of the Residential property closest to the beehive.

Id.

353. *Id.* § 347.02(d)(1)(C). The zoning ordinance provides

> [a] solid fence or dense hedge, known as a "flyway barrier," at least six (6) feet in height shall be placed along the side of the beehive that contains the entrance to the hive, and shall be located within five (5) feet of the hive and shall extend at least two (2) feet on either side of the hive. No such flyway barrier shall be required if all beehives are located at least twenty-five (25) feet from all property lines and for beehives that are located on porches or balconies at least ten (10) feet above grade, except if such porch or balcony is located less than five (5) feet from a property line.

Id.

354. *Id.* § 347.02(d)(1)(D) ("A supply of fresh water shall be maintained in a location readily accessible to all bee colonies on the site throughout the day to prevent bees from congregating at neighboring swimming pools or other sources of water on nearby properties.").

355. *Id.* § 347.02(d)(1)(E) ("No Africanized bees may be kept on a property under the regulations of this section.").

356. *See supra* text accompanying note 16.

357. Telephone Interview with Morgan Taggart, Urban Agric. & Natural Res. Program Specialist, Ohio State Univ. Extension (Apr. 17, 2012).

358. *Id.*

The large number of beekeeping ordinances recently enacted provides an excellent resource for local governments and/or resident groups interested in legalizing beekeeping in their communities. When the Land Use Working Group of the Cleveland-Cuyahoga County Food Policy Coalition set out to legalize beekeeping (and the keeping of small animals) in Cleveland, they started by identifying policy barriers and then studied ordinances to learn how other cities had overcome these barriers.[359] The group looked at studies from a variety of cities, and eventually narrowed their focus to cities that were similar in character to their own city.[360] As part of their evaluation, the group focused on the impacts the keeping of small animals and bees would have on the local food system.[361]

Once the group had a solid understanding of the issues, they approached the planning department to discuss the possibility of an ordinance.[362] After this initial meeting, the group worked with the planning department, city council, housing authority, local beekeepers, and urban agriculture experts to develop guidelines for beekeeping that would address common concerns without overburdening residents who wanted to keep bees.[363]

As the group moved forward in drafting the ordinance, they engaged the greater community in the process. Two public meetings were held to inform residents about the development of the ordinance and provide them with an opportunity to voice concerns.[364] To address these concerns, the group worked with bee experts to educate residents and city leaders about honeybee behaviors and the difference between honeybees and other stinging insects.[365] The ordinance was also revised several times to reflect concerns.[366]

After fourteen months of hard work, the ordinance was introduced to the Cleveland City Council, and after a successful vote, beekeeping was legalized.[367] A member of the group attributes this achievement to ongoing stakeholder involvement, education, and compromise.[368] Urban beekeeping in the city appears

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359. *Chickens and Bees Ordinance: Cleveland Revamps Zoning Codes to Promote Urban Agriculture*, *supra* note 338, at 1.

360. Telephone Interview with Morgan Taggart, *supra* note 357.

361. *Chickens and Bees Ordinance: Cleveland Revamps Zoning Codes to Promote Urban Agriculture*, *supra* note 338, at 1.

362. Telephone Interview with Morgan Taggart, *supra* note 357.

363. *Id.*; *Chickens and Bees Ordinance: Cleveland Revamps Zoning Codes to Promote Urban Agriculture*, *supra* note 336, at 2.

364. Telephone Interview with Morgan Taggart, *supra* note 357.

365. *Id.*

366. *Id.*

367. *Id.*

368. *Id.*

to be a success; Cleveland has allowed urban beekeeping since February 2009 and to date has not received any official complaints about honeybees.[369]

The legalization of beekeeping in cities allows urbanites to keep bees without violating land use laws; however, urban beehives must still be maintained in a safe and reasonable manner. If a beekeeper fails to act reasonably, legal troubles may result.

V. URBAN BEEKEEPING AND LIABILITY

Several early bee cases considered whether honeybees fall into the class of fierce and dangerous animals. Owners of animals in this category are considered to have express notice of the animal's propensity to cause injury and, therefore, are strictly liable for any injury the animal may cause.[370] In 1850, a New York court declined to find that bees are of so fierce a disposition that their propensity to do mischief renders their keepers "liable *at all events* for any accidental injury they may do."[371] Rather, the court concluded that honeybees had become domesticated and had a low propensity for mischief.[372] In 1903, the Iowa Supreme Court concluded that bees were "so useful and common as to be all but domesticated."[373] The court went on to state that the owner should not be liable for injury caused by his bees absent lack of care in their management.[374] Later courts have declined to find that bees have a vicious nature.[375]

It is now widely accepted that the honeybee is a domesticated animal and not an inherently dangerous animal; therefore, beekeepers are not strictly liable for harms caused by their bees. A beekeeper may still be liable for damages or injuries caused by his or her bees, however, if the plaintiff can prove the beekeeper acted negligently.[376] A beekeeper will only be liable under the theory of

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369. *Id.*
370. *E.g.*, Earl v. Van Alstine, 8 Barb. 630, 633–34 (N.Y. Gen. Term 1850).
371. *Id.* at 636 (emphasis in the original).
372. *Id.* at 635–36.
373. Parsons v. Manser, 93 N.W. 86, 88 (Iowa 1903).
374. *Id.* (citing *Earl*, 8 Barb. 630).
375. *See* Allman v. Rexer, 21 Pa. D. & C. 431, 433 (1934).
376. *Id.*; *see also Negligence*, CORNELL UNIV. LAW SCH. LEGAL INFO. INST. (August 19, 2010), http://www.law.cornell.edu/wex/negligence.

> Five elements are required to establish a prima facie case of negligence: the existence of a legal duty to exercise reasonable care; a failure to exercise reasonable care; cause in fact of physical harm by the negligent conduct; physical harm in the form of actual damages; and proximate cause, a showing that the harm is within the scope of liability.

Id.

negligence if he or she fails to exercise reasonable care and, due to that failure, a plaintiff suffers actual and foreseeable harm.[377] While the case law is sparse, several courts have considered the issue. Courts have stated that owners of bees have a "reasonable duty [to locate the bees in a place where] they will not come in contact with persons traveling roads and similar places."[378] Courts have also discussed whether the beekeeper had notice of the vicious nature of his or her particular bees.[379] Absent knowledge of the bees' propensity to cause harm and subsequent carelessness in siting the beehives, courts will likely not find a beekeeper negligent.

Urban beekeepers can reduce their risk of liability by situating their beehives in a location where interaction with neighbors and passersby will be minimal. A beekeeper should ensure that neighbors are aware of the bees' presence and habits. Erecting a flyway barrier, managing hive populations, and providing sufficient water will also reduce the risk of harm and provide evidence that the beekeeper has acted reasonably while keeping bees in densely populated urban areas.[380]

Urban beekeepers should be aware that even where beekeeping is a permitted use, the activity must not unreasonably interfere with another's use of property, so as to create a public or private nuisance.[381] Bees may become a nuisance if they swarm,[382] become aggressive, or frequently invade a neighboring property.[383] While a plaintiff has a higher burden of proof when claiming a permitted use creates a nuisance, compliance with zoning does not provide safe harbor from a nuisance claim.[384] In determining whether the use constitutes a nuisance, the court will weigh the gravity of the harm to the plaintiff against the

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377. Ammons v. Kellogg, 102 So. 562, 563 (Miss. 1925); *see also Parsons*, 93 N.W. at 88 (citing *Earl*, 8 Barb. 630).

378. *Ammons*, 102 So. at 563; *see also Parsons*, 93 N.W. at 88.

379. *See, e.g.*, Ferreira v. D'Asaro, 152 So. 2d 736,737 (Fla. Dist. Ct. App. 1963) (discussing the requirement that beekeepers take notice of the propensity of their bees).

380. *Keeping Bees in Populated Areas (Urban)*, UNIV. OF ARK. COOP. EXTENSION SERV., http://www.aragriculture.org/insects/bees/urban_beekeeping.htm (last updated Jan. 8, 2013).

381. A public nuisance is a use that interferes with the public health, safety, comfort, or convenience; an unreasonable interference with a right common to the general public. *See* JUERGENSMEYER & ROBERTS, *supra* note 316, at 622. A private nuisance is the non-trespassory invasion of another's interest in the private use and enjoyment of land. *Id.* at 623.

382. *See Beekeeping and Honey Production*, UNIV. OF KY. COOP. EXTENSION SERV., 2 (May 2009), http://www.uky.edu/Ag/NewCrops/introsheets/honey.pdf ("Swarming, which greatly reduces hive strength, is most often associated with overcrowding in the hive. It can be avoided with proper management practices.").

383. Salkin, *supra* note 301, at 63–65 (discussing nuisance and bee case law).

384. Prah v. Maretti, 321 N.W.2d 182, 192 (Wis. 1982) (citing Bie v. Ingersoll, 135 N.W.2d 250 (Wis. 1965)) (stating that a "landowner's compliance with zoning laws does not automatically bar a nuisance claim").

utility of the defendant's use.[385] It is generally recognized that beekeeping is not a nuisance per se, and instead, whether an individual's keeping of bees constitutes a nuisance depends on the facts and circumstances of the case.[386]

Some opponents of urban beekeeping ordinances have expressed concern about the increased presence of bees in the city.[387] It remains to be seen whether the surge in urban beekeeping will spur nuisance litigation. In the meantime, beekeeping in violation of zoning codes has caused conflict between beekeepers and local government officials.[388] Where permitted, the activity seems to be well accepted. If media coverage is representative of community opinions, the responses to urban hives in compliance with local regulations are overwhelmingly positive.[389]

VI. CONCLUSION

"Last night, as I was sleeping,
I dreamt—marvelous error!—that I had a beehive here inside my heart.
And the golden bees were making white combs and sweet honey from my old failures."– Antonio Machado[390]

Honeybees are incredibly important to our food supply. Roughly one-third of the food we consume is directly or indirectly dependent upon pollination by honeybees.[391] Whether food is grown in a rural or urban environment, honeybees are essential for the production of berries, stone fruits, citrus, melons, squash, broccoli, carrots, onions, and many other fruits and vegetables.[392]

While we have been growing increasingly dependent upon honeybees for food production over the years, bee populations are rapidly declining. Pests, pathogens, environmental stresses, and pesticide use have contributed to honey-

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385. *Id.* (citing RESTATEMENT (SECOND) OF TORTS § 826 cmt. a (1977)).

386. City of Arkadelphia v. Clark, 11 S.W. 957, 958 (Ark. 1889) (per curiam).

387. *See, e.g.*, Larry Carson, *Growing Interest in Home Beekeeping Sets Off Howard Zoning Dispute*, BALT. SUN, Jan. 19, 2011, http://articles.baltimoresun.com/2011-01-19/news/bs-md-ho-honeybees-20110118_1_jeri-hemerlein-beekeeping-sam-peperone (describing citizen concerns about urban beekeeping, including concerns about the dangers of allowing children to play outside when bees are kept nearby).

388. *See, e.g.*, Laurel Walker, *Port Washington Beekeeper Stung by Threat of Fines*, MILWAUKEE J. SENTINEL, Oct. 21, 2011, http://www.jsonline.com/news/waukesha/port-washington-beekeeper-stung-by-threat-of-fines-132360158.html.

389. *See, e.g.*, Tomkins, *supra* note 130.

390. ANTONIO MACHADO, *Last Night as I Was Sleeping*, *in* TIMES ALONE: SELECTED POEMS OF ANTONIO MACHADO 28 (Robert Bly trans., 1983).

391. *Colony Collapse Disorder*, *supra* note 7.

392. *Vanishing Bees*, *supra* note 65.

bee losses for decades, but researchers have yet to determine what is causing the recent and unusual losses of honeybee populations to CCD. If these losses continue at current rates or escalate, our food supply will be at risk; experts say our current honeybee populations are barely meeting commercial pollination demand.[393] To protect these creatures that are so important to our food supply, it is essential that measures be taken to increase their populations. As commercially-kept honeybees are particularly affected by CCD,[394] and there is evidence that suggests honeybees actually thrive in urban environments,[395] policies that promote urban beekeeping may help save the honeybee.

Beyond the benefits of protecting honeybee populations, policies that allow and promote urban beekeeping are essential to productive urban agricultural systems. In recent years, urban food production has increased as a result of food security concerns, a growing awareness of the importance of local food systems, and the establishment of sustainability plans throughout the United States. For reasons including extreme weather patterns,[396] a growing world population, increased fuel costs, and the loss of agricultural land due to urban sprawl, urban food production will become an increasingly essential component of our national food system.[397] In order for urban food systems to be productive, sufficient populations of honeybee pollinators must be present in cities; as the number of urban gardens and farms grows, the number of urban beehives must grow proportionately.[398]

Urban beekeeping ordinances can encourage beekeeping in cities. Ordinances that permit and regulate urban beekeeping provide guidelines and requirements that inform urban beekeepers of their responsibilities and limitations while also serving to protect neighboring residents. Without explicit permission and clear regulations, some urban residents may choose not to keep honeybees; others may choose to keep honeybees even though it may not be a permitted use.[399] As the need for and interest in urban beekeeping grows, cities must enact

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393. *See* Aizen & Harder, *supra*, note 64, at 916–17.

394. *See* Spivak et al., *supra* note 55, at 35 (counting the pollination demands of monoculture cropping and cross-country transportation characteristic of many large, commercially kept colonies among the stress factors making a colony more susceptible to CCD).

395. Telephone Interview with Will Allen (Apr. 20, 2012), *supra* note 124; *Bees Reared in Cities 'Healthier'*, *supra* note 134; Gray, *supra* note 135.

396. *See* Ray Grabanski, *Drought Deepens in Corn Belt*, AGRICULTURE.COM (June 28, 2012), http://www.agriculture.com/markets/analysis/corn/drought-deepens-in-cn-belt_9-ar24972 (discussing the record high temperatures and drought conditions experienced across the United States in the summer of 2012, and consequences for crop yields).

397. Telephone Interview with Will Allen (July 25, 2012), *supra* note 120.

398. *Id.*

399. Depending on the applicable land use regulations, where beekeeping is not specifically permitted, the keeping of bees may be prohibited or may not be addressed. Where the appli-

ordinances that permit the activity to ensure that law-abiding citizens know they are permitted to keep bees. In cases where residents are keeping bees in violation of land use regulations, or without express permission, the enactment of a beekeeping ordinance will serve to legitimize this useful activity and impose standards that ensure the keeping of bees is done safely and according to best practices.

The issue of urban beekeeping is important to the legal community because land use planners, policymakers, and citizen groups may seek assistance from attorneys in the drafting of urban beekeeping ordinances. In order to draft comprehensive and effective ordinances pertaining to the keeping of bees in cities, attorneys and other drafters must understand common concerns of opponents, the habits of honeybees, as well as the precautions beekeepers must take to prevent harm to others, including flyway barriers, setbacks, hive density, and sufficient water supply. Ordinances may also contain provisions that require beekeepers to ensure honeybees have access to sufficient pesticide-free food sources. The prevention of private and public nuisances should be an explicit provision of any beekeeping ordinance. Such an explicit provision gives notice to all beekeepers that they have a duty to conduct their beekeeping activities so as not to unreasonably interfere with another's use and enjoyment of his or her property.

Urban beekeeping is also of interest to the legal community because attorneys may be retained to represent a party in a negligence or nuisance case involving urban beekeeping or to advise large urban beekeeping operations on liability issues. As urban beekeeping becomes more prevalent, attorneys may face these issues more frequently. An attorney defending a client against a nuisance claim must understand the utility of honeybees, both as pollinators and as producers of honey and other useful bee products, in order to convince the court that the utility of the defendant's keeping of bees outweighs the gravity of any harm caused by the activity.

For numerous reasons, the present state of our agricultural system and food supply has become a matter of concern in recent years. Many believe urban agriculture can transform our food system into one that provides healthier, nutritious food to city residents while reducing the environmental side effects associated with industrial agriculture.[400] As urban agriculture continues to spread and

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cable regulations do not address beekeeping, the question of whether it is a permitted activity will depend on the particular jurisdiction's interpretation of commonly accepted uses.

400. *See* Anne C. Bellows et al., *Health Benefits of Urban Agriculture*, COMMUNITY FOOD SECURITY COALITION (2004), http://www.foodsecurity.org/UAHealthArticle.pdf; Sarah DeWeerdt, *Is Local Food Better?*, 22 WORLD WATCH MAG., May–June, 2009, http://www.worldwatch.org/node/6064. These impacts include increasing use of chemicals, such as pesticides, herbicides, and fertilizers; energy and materials for processing, packaging, and storing products for transport; and the use of fuel for hauling food an average of 1500 miles from farm to plate.

blossom, it is essential that honeybees are part of the urban food system. For this reason, it is important that attorneys and city leaders are well-informed about the honeybee, its benefits, and its plight as they go about their advocacy and decision making.

Thus far, cities with legalized beekeeping have had positive results. Whether urban beekeeping will continue to be successful remains to be seen. Well-crafted urban beekeeping ordinances can promote urban beekeeping while imposing sufficient requirements to minimize risks associated with the activity. If current trends are any indication, honeybees will continue to find sanctuary on rooftops, backyards, and urban farms. And life in the city will be a little bit sweeter.

DeWeerdt, *supra*; *see also* John Cloud, *Eating Better Than Organic*, TIME, Mar. 2, 2007, http://www.time.com/time/magazine/article/0,9171,1595245,00.html (comparing the merits of purchasing organic produce against produce that is locally-grown).