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What's All the Buzz About? Analyzing the Decision to List the Rusty Patched Bumblebee on the Endangered Species List

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WHAT'S ALL THE BUZZ ABOUT? ANALYZING THE DECISION TO LIST THE RUSTY PATCHED BUMBLEBEE ON THE ENDANGERED SPECIES LIST

I. The Government and the Bees

There are over four thousand recognized species of bees native to the United States.[1] American species account for approximately one-sixth of the world's twenty-five thousand recognized species of bees.[2] The species are broken into nine "families," each with specific characteristics.[3] Several of those species of bees are now endangered according to the United States Fish and Wildlife Service (FWS).[4] In October of 2016, the FWS placed seven species of bees native to Hawaii on the endangered species list.[5] The addition stemmed in part from a rapid decline in population due to loss of habitat and invasive predators.[6] In January of 2017, the FWS released a statement to the public regarding the inclusion of the Rusty Patched Bumblebee (bumblebee) to the endangered species

1. *See* Beatriz Moisset & Stephen Buchmann, *Bee Basics: An Introduction to Our Native Bees*, U.S. Dep't of Agric. Forest Serv. & Pollinator P'ship 1 (Mar. 2011), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf (documenting number of native bee species in United States).

2. *See Types of Bees*, Buzzaboutbees.net, http://www.buzzaboutbees.net/types-of-bees.html (last visited Feb. 15, 2017) (noting total number of recognized bee species on Earth).

3. *See id.* (noting further distinction of bee species into families). Other families include solitary bees, mining bees, and bees of smaller stature spread throughout the world. *Id.*

4. *See* ECOS, *Environmental Conservation Online System*, U.S. Fish and Wildlife Serv., http://ecos.fws.gov/ecp0/pub/SpeciesReport.do?groups=I&listingType=L&mapstatus=1 (last visited Jan. 20, 2017) (noting status change of certain bee species to endangered).

5. *See* Merrit Kennedy, *Bees Added to U.S. Endangered Species List for 1st Time*, NPR (Oct. 3, 2016, 1:58 PM), http://www.npr.org/sections/thetwo-way/2016/10/03/496402620/bee-species-added-to-u-s-endangered-species-list-for-1st-time (noting inclusion of seven Hawaiian bee species to endangered species list). Seven species of "yellow-faced" bees were included in the Federal Register under the scientific names "Hylaeus anthracinus, H. assimulans, H. facilis, H. hilaris, H. kuakea, H. longiceps, and H. mana." *Id.* (citing 81 Fed. Reg. 190, 67786 (codified at 50 C.F.R. 17)).

6. *See id.* (including reasons for inclusion of seven Hawaiian bee species to endangered species list). Other reasons for decline include "nonnative animals, the introduction of nonnative plant species, wildfires, nonnative predators and natural events such as hurricanes, tsunamis and drought." *Id.*

list.[7] The FWS posted the final rule in the Federal Register triggering the thirty-day delay period marking the effective date of the status change.[8] The FWS marked the effective date of the bumblebee's status as February 10, 2017, but the new White House administration placed a temporary freeze on all regulations proposed by the previous administration at the end of President Obama's term.[9] As a result, the effective date of the final rule and official endangered species listing was pushed back to March 21, 2017.[10] FWS officials believe the delay in listing will not pose a significant threat to the species.[11] Now listed, the bumblebee will receive federal protections aimed at preserving the species.[12]

7. *See Rusty Patched Bumble Bee*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/midwest/endangered/insects/rpbb/index.html (last updated June 6, 2017) (confirming rusty patched bumblebee is now endangered); *see also* Endangered and Threatened Wildlife and Plants; Endangered Species Status for Rusty Patched Bumble Bee, 80 Fed. Reg. 7, 3186 (proposed Jan. 11, 2017) (to be codified at 50 C.F.R. pt. 17) (listing rusty patched bumblebee on endangered species list).

8. *See* Endangered and Threatened Wildlife and Plants; Endangered Species Status for Rusty Patched Bumble Bee, 80 Fed. Reg. 7, 3186 (proposed Jan. 11, 2017) (to be codified at 50 C.F.R. pt. 17) (listing rusty patched bumblebee on endangered species list); *see also Listing a Species as Threatened or Endangered: Section 4 of the Endangered Species Act*, THE U.S. FISH AND WILDLIFE SERV. 2 (Aug. 2016), https://www.fws.gov/endangered/esa-library/pdf/listing.pdf (noting general rule of thirty day wait period after publication in Federal Register).

9. *See* Juliet Eilperin, *Trump Administration Puts Off Listing Bumblebee as Endangered*, THE WASHINGTON POST (Feb. 9, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/02/09/trump-administration-puts-off-listing-bumble-bee-as-endangered/?utm_term=.71efbc7c1e4e (noting change of White House administration).

10. *See id.* (identifying new effective date of change to endangered status). The listing became official on March 21, 2017 without change or additional specification; *see also Rusty Patched Bumble Bee*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/midwest/endangered/insects/rpbb/index.html (last updated June 6, 2017).

11. *See id.* (paraphrasing FWS Assistant Director for Ecological Services Gary Frazer and discussing result of President Trump's executive order signed on January 11, 2017 placing temporary sixty-day freeze on all proposed regulations from President Obama's administration).

12. *See Rusty Patched Bumble Bee*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/midwest/endangered/insects/rpbb/index.html (last updated June 6, 2017); *see also* Endangered and Threatened Wildlife and Plants; Endangered Species Status for Rusty Patched Bumble Bee, 80 Fed. Reg. 7, 3186 (proposed January 11, 2017) (to be codified at 50 C.F.R. pt. 17) (listing rusty patched bumblebee on endangered species list); *see also* 16 U.S.C. § 1532(19) (providing authority to Environmental Protection Agency under Endangered Species Act to criminalize conduct meant to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" the rusty patched bumblebee).

Since the late 1990's, the rusty patched bumblebee population has plummeted ninety-one percent.[13] What once was a very common occurrence, seeing bumblebees traveling between plants and flowers in gardens, has now become increasingly rare.[14] The occurrence has become so rare because bumblebees now only inhabit nine American states.[15] In some instances, the bumblebee's geographical range has decreased by an astonishing eighty-six percent of its previously inhabited area.[16] In an attempt to prevent the extinction of the bumblebee, the FWS has changed the status of the species to endangered.[17] The goal is to develop "a recovery plan to guide efforts to bring this species back to a healthy and secure condition."[18]

The main distinction between the Hawaiian bee listings and the most recent bumblebee listing is the designation of pesticide use as a contributing factor to the steep decline in the bumblebee population.[19] Definitive research does not point directly to pesticide use as the sole cause of the decline; rather, it shows pesticide use as a major contributing factor to the drop in bee populations.[20] Currently, more than 400 thousand tons of pesticides are used annually in the United States to control pest devastation.[21] Neonicotinoid pesticides accounted for "one quarter of the global insecticide

13. *See Rusty Patched Bumble Bee*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/midwest/endangered/insects/rpbb/archives.html (last updated June 6, 2017) (recognizing steep decrease in rusty patched bumblebee population).

14. *See id.* (noting scarcity of seeing rusty patched bumblebees where occurrence was once common).

15. *See id.* (identifying scarcity of rusty patched bumblebees spread throughout nine American states, including Illinois, Indiana, Iowa, Maine, Massachusetts, Minnesota, Ohio, Virginia, and Wisconsin).

16. *See* Sydney A. Cameron et al., *Patterns of Widespread Decline in North American Bumble Bees*, PROCEEDINGS OF THE NAT'L ACAD. OF SCIS. OF THE U.S., 662 (Gene E. Robinson, vol. 108 no. 2. 2011), http://www.pnas.org/content/108/2/662.full.pdf (providing most extreme loss of geographical habitat for North American bumblebees).

17. *See Rusty Patched Bumble Bee*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/midwest/endangered/insects/rpbb/archives.html (last updated June 6, 2017) (paraphrasing FWS Midwest Regional Director, Thomas Melius, regarding endangered status of rusty patched bumblebees).

18. *See* Eilperin, *supra* note 9 (quoting FWS Assistant Director for Ecological Services, Gary Frazer, regarding FWS' goal).

19. For a discussion of the listed causes which led to the endangerment of the Hawaiian yellow-faced bees and the rusty patched bumblebee, see *supra* notes 4-7 and accompanying text.

20. For a discussion of the factors attributable to colony collapse disorder, see *infra* notes 79-87 and accompanying text.

21. *See* David M. Whitacre & Kristin R. Eads, DEFENDING PESTICIDES IN LITIG. § 20:12, Westlaw (database updated Aug. 2016) (supplying statistics on utility of bees and amount of pesticides used to treat crops for pests).

market" in 2008 and "the rate is increasing."[22] The initial purpose of this type of pesticide was to efficiently eliminate pests from devastating farmers' fields and to increase crop production.[23] The use of neonicotinoid pesticides (neonicotinoids), which are derivatives of nicotine, have drawn worldwide attention due to the recent link between high toxicity levels and the steep decline in bee populations.[24] Neonicotinoids are "'systemic' insecticides, which means that they are sprayed onto plants, which then absorb the chemicals and distribute them throughout the plant, into the tissues, pollen, and nectar."[25] As a result, neonicotinoid pesticides kill bumblebees and other pollinators either from direct contact with the pesticide or "when they ingest the plant, which has absorbed the pesticide," and "interfer[es] with the insect's central nervous system."[26] Alarmingly, due to its systemic nature, the "half-life" of neonicotinoid pesticides "range[s] from 200 to over 1,000 days."[27] This means the pesticide can be present in the soil for years after its initial application and if left untreated, will infect every plant growing in the exposed soil.[28]

II. FROM A BEE'S EYE VIEW

Is the honey bee following in the proverbial wing steps of the bumblebee, and if so, when will the FWS provide similar federal protections?[29] Bumblebees and honey bees are classified in the same species of bee known as Apidaes.[30] Bees in the Apidae family

22. *See* Lorenzo Furlan & David Kreutzweiser, *Alternatives to Neonicotinoid Insecticides for Pest Control: Case Studies in Agriculture and Forestry*, 22 ENVTL. SCI. AND POLLUTION RES. 135 (2015), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284368/pdf/11356_2014_Article_3628.pdf (noting popularity of neonicotinoid pesticides as result of efficacy).

23. *See id.* (discussing introduction of neonicotinoid pesticides).

24. *See id.* at 407 (discussing national and world-wide response to toxicity levels of neonicotinoid pesticides found in bees).

25. *See* Pollinator Stewardship Council v. U.S. Envtl. Prot. Agency, 806 F.3d 520, 523 (9th Cir. 2015) (discussing systemic nature of neonicotinoid compounds throughout application and plant life cycle).

26. *See id.* (discussing multiple ways for bees to be killed and/or adversely effected by neonicotinoid pesticides).

27. *See* Kelsey Ott, *Buzzkill: How the EPA's Inaction is Killing America's Bees*, 39 WM. & MARY ENVTL. L. & POL'Y REV. 401, 409 (2015). A chemical's half-life is defined as "the time required for one-half of a given sample of the element to 'decay.'" In re TMI Litigation, 193 F.3d 613, 632 (3d Cir. 1999).

28. *See id.* (explaining how chemical will remain in soil without additional spraying of chemical).

29. For a discussion of whether honey bees will experience the same declines as bumblebees, see *supra* notes 13-16 and accompanying text.

30. *See Types of Bees*, BUZZABOUTBEES.NET, http://www.buzzaboutbees.net/types-of-bees.html (last visited Feb. 15, 2017) (noting family classification of bumblebees and honey bees).

are typically categorized as "social bees" that live in colonies and are very efficient pollinators.[31] Similar to bumblebees, honey bees are experiencing declines in population.[32] Bumblebees and honey bees both forage and collect pollen from native plants and are thus affected by pesticides.[33] Beekeepers have reported a loss of thirty to ninety percent of their colonies in the last two decades.[34] Notably, there is no way to measure the loss of wild, solitary bees which are "generally more efficient" in pollination than commercially colonized honey bees.[35] The factors affecting bumblebees and honey bees discussed herein are known to affect several other types of pollinators such as birds and butterflies.[36] Several species appear to be "on the verge of extinction" and researchers are swarming to understand the reasons.[37] Researchers, however, have identified "cascade[ing] effects . . . resulting from pollinator-endangerment and presume these effects will be devastating and *irreparable* if they persist."[38]

A. Species Distinction and Life Cycle

1. The Bumblebee

A bumblebee's life cycle begins in the early spring when the queen emerges from her underground burrow after hibernating

31. *See id.* (describing characteristics of bees within Apidae family).

32. *See Colony Collapse Disorder*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/pollinator-protection/colony-collapse-disorder (last updated Jan. 16, 2017) (identifying reports from commercial beekeepers regarding percentage of hives lost to colony collapse disorder).

33. *See* Moisset, *supra* note 1, at 4-16, 30 (noting similarities between bumblebees and honey bees).

34. *See Colony Collapse Disorder, supra* note 32 (identifying reports from commercial beekeepers regarding percentage of honey bee hives lost due to colony collapse disorder).

35. *See* Whitacre, *supra* note 21 (noting efficiency of wild honey bees over commercialized honey bees).

36. For a discussion of how factors associated with bee decline effect several different species of pollinators in addition to bees, see *supra* note 1 and accompanying text. Other pollinator species include ants, bats, bees, beetles, birds, butterflies, flies, moths, and wasps. *Id.* at 38.

37. *See id.* at 30 (referencing decline of several species of bumblebee and admitting failure in past attempts to understand circumstances).

38. *See* Caitlin Kelly-Garrick, Note, *Using the Endangered Species Act to Preempt Constitutional Challenges to GMO Regulation*, 43 HASTINGS CONST. L.Q. 93, 101 (2015) (citing to *Pollinators in Decline—Causes*, U.S. FISH AND WILDLIFE SERV. (last visited Feb. 2, 2017)) (emphasis added) (noting scientific concern of cascading events resulting in extinction of hundreds of vertebrate pollinator species). An example of a cascading event is when "one species extinction caus[es] secondary extinctions in other dependent species." *Id.*

during the winter.[39] Once the queen finds a suitable nesting location, she lays the first round of eggs, which she incubates until larvae emerge.[40] While in the hive, the larvae feed on pollen and nectar collected by the queen before spinning a cocoon where they will develop into adult bees.[41] These bees are all infertile female worker bees who take over the maintenance of the hive.[42] The second batch of bees to develop includes males and new fertile queens, which ultimately mate and allows the colony to reproduce and grow.[43] The males typically leave the hive solely to mate with a new queen.[44] After mating, the queen will feed heavily on pollen and nectar to survive the winter hibernation and begin the hive's life cycle again in the spring as a fertile queen.[45]

2. *The Honey Bee*

Honey bees are not native to the United States.[46] English settlers transported honey bee hives to the United States to help facilitate the pollination of various plants.[47] Like bumblebees, honey bees are separated into three distinct classes and include queens, workers, and drones.[48] The queen is a fertile female and the mother to all the bees in the colony.[49] Workers are infertile female bees "that perform[ ] the labor tasks of the colony including feed preparation, guarding the hive, feeding the queens, drones, and brood, and heating and cooling the hive."[50] The drones' sole pur-

39. *See The Bumblebee Lifecycle*, BUMBLEBEE CONSERVATION TRUST, https://bumblebeeconservation.org/about-bees/lifecycle/ (last visited Jan. 20, 2017) (discussing emergence of queen bee from hibernation underground).

40. *See id.* (identifying queen bee's process for establishing hive and laying first round of eggs).

41. *See id.* (discussing first weeks of brood's development).

42. *See id.* (identifying role of first round of bees as infertile female workers to maintain hive for queen allowing her to populate hive).

43. *See id.* (noting second round of bees can be males and fertile queens who mate to increase the size and productivity of hive).

44. *See The Bumblebee Lifecycle*, BUMBLEBEE CONSERVATION TRUST, https://bumblebeeconservation.org/about-bees/lifecycle/ (last visited Jan. 20, 2017) (discussing life cycles of different types of bumblebees).

45. *See id.* (discussing different roles of male versus female bumblebees).

46. *See* Moisset, *supra* note 1, at 1 (noting honey bees originated from European Settlers).

47. *See id.* (noting reason for introducing honey bees to American agriculture).

48. *See Honey Bee Facts*, AMERICAN BEEKEEPING FED'N, http://www.abfnet.org/?page=71 (last visited Jan. 20, 2017) (discussing makeup and life cycle of honey bee hives).

49. *See id.* (noting importance of queen honey bee during early stages of hive formation).

50. *See id.* (discussing role of infertile female worker bees in hive).

pose is to mate with a queen.[51] On average, a drone will live for six to eight weeks before dying.[52] Healthy queens have the potential to live for over four years and lay over three thousand eggs per day, while worker bees can live for over five months.[53]

The network, hive structure, and pollination techniques of bumblebees and honey bees are similar.[54] Both species collect nectar and pollen from flowering plants and trees and return to the hive with their bounty to feed the colony.[55] Both species are susceptible to neonicotinoid pesticides and both are vulnerable to "colony collapse disorder," experiencing the same adverse reactions.[56] For the purpose of this Comment, the term bee(s) will encompass both species unless otherwise specifically noted.[57]

B. Utility of Pollinators

Bees are part of a group of pollinators responsible for pollinating a majority of the crops produced in the United States, collectively contributing to the production of approximately twenty-nine billion dollars of crops annually to the United States.[58] As a result, the United States is dependent upon a healthy beekeeping industry to sustain the current agricultural economy.[59] Pollinators contribute to the growth of "over 180 thousand plant species and twelve hundred crops" worldwide.[60] Honey bee pollination accounts for

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51. *See id.* (discussing role of drones in hive).

52. *See id.* (expanding on information of drone's responsibilities in bee hives).

53. *See Learning About Honey Bees*, THE S.C. MID-STATE BEEKEEPERS ASS'N, http://www.scmidstatebeekeepers.org/honeybeelifecycle.htm (last visited Jan. 20, 2017) (discussing upper limits of life expectancies for healthy queen bees and female worker bees).

54. For a discussion of the similarities between the bumblebee and honey bee species, see *supra* notes 30-36 and accompanying text.

55. *See* Moisset, *supra* note 1, at 7 (noting hive's method of maintaining sustainable life).

56. For a discussion of the effects neonicotinoid pesticides have on bees and other pollinators, see *infra* notes 64-69, 79-80 and accompanying text.

57. For a discussion of the similarities between bee species and "family" designations, see *supra* notes 30-36 and accompanying text.

58. *See Pollinators*, U.S. FISH AND WILDLIFE SERV., https://www.fws.gov/pollinators/ (last updated Aug. 8, 2016) (noting economic contribution of bees through pollination).

59. *Declining Wild Bee Population Worrisome for Agriculture*, NAT'L SUSTAINABLE AGRIC. COAL., http://sustainableagriculture.net/blog/pnas-wild-bee-study/ (last visited July 26, 2017) (emphasizing correlation between healthy bees and healthy agricultural economy).

60. *See Pollinators Need You. You Need Pollinators*, POLLINATOR P'SHIP, http://www.pollinator.org/pollinators.htm (last visited Feb. 4, 2017) (noting number of plants and crops dependent upon pollination).

"about a quarter of the food sources consumed by Americans" annually.[61] To gain perspective of the potential extinction, without bees, pollination of the world's coffee crop would experience a severe reduction in the quantity of available crops.[62] Coffee would become exceedingly rare and expensive, as would the majority of all foods pollinated by bees and other insects.[63]

C. Pesticide Use

Neonicotinoids are a class of neuro-active insecticides identified by the EPA as being highly toxic to bees through (1) direct contact, (2) oral consumption of crops containing the pesticide, and (3) the residual amounts remaining in the nectar and pollen of flowering plants.[64] "All neonicotinoids kill insects by interfering with their central nervous system, causing tremors, paralysis, and death."[65] While these types of pesticides do not always kill bees immediately, they have a debilitating effect on their behavior and reproductive capacities.[66] Even low levels of neonicotinoids found in pollen or nectar is sufficient to adversely affect neuro-activity in the bee's brain.[67] The largest effect on bees is seen in their honing abilities, as exposure to neonicotinoids damages a bee's ability to navigate back to the hive.[68] As a result, scientists typically do not find dead bees in hives experiencing colony collapse.[69]

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61. *See* Tom Polansek, *Minnesota Sets Broadest U.S. Limits on Chemicals Blamed for Bee Declines*, 37 NO. 4 WESTLAW J. ENVTL. 6, *1 (Sept. 14, 2016) (illustrating importance of pollination to food production in United States agriculture).

62. *See* Vernon G. Thomas & Peter G. Kevan, *Insect Pollination: Commodity Values, Trade and Policy Considerations Using Coffee as an Example*, 7(2) J. POLLINATION ECOLOGY, 5 (2012) (discussing importance of insect pollination for coffee crop).

63. *See id.* at 5 (noting repercussions of serious decline in bees and other pollinators).

64. *See* Pollinator Stewardship Council v. U.S. Envtl. Prot. Agency, 806 F.3d 520, 523 (9th Cir. 2015) (defining neonicotinoids and emphasizing systemic nature of chemical).

65. *Id.* (explaining biological effect of neonicotinoids on insects).

66. *See* Jennifer Hopwood et al., *How Neonicotinoids Can Kill Bees*, XERCES SOC'Y FOR INVERTEBRATE CONSERVATION, vii (2d ed. 2016), http://www.xerces.org/wp-content/uploads/2016/10/HowNeonicsCanKillBees_XercesSociety_Nov2016.pdf (identifying adverse effects of neonicotinoids on bee development, neurological functions, and behavior).

67. *See* Grant Hill, *Researchers Confirm That Neonicotinoid Insecticides Impairs Bee's Brains*, PHYS.ORG (Feb. 5, 2015), https://phys.org/news/2015-02-neonicotinoid-insecticides-impair-bee-brains.html (noting low levels of neonicotinoids in pollen and nectar can result in adverse effects to bees).

68. For a discussion of the debilitating effect on bees' navigational capabilities, see Hopwood, *supra* note 66, at *22 and accompanying text.

69. *See id.* at 19, 22 (positing lack of dead bees is due to navigational inability to return to hive); For a discussion of colony collapse disorder, see Trabolsi, *infra* note 78 and accompanying text.

In the United States, neonicotinoid pesticides are sprayed on approximately "95 percent of corn and canola crops; the majority of cotton, sorghum, and sugar beets; and about half of all soybeans."[70] These pesticides are sprayed on large numbers of fruits, vegetables, and various grains.[71] Neonicotinoids can alternatively be sprayed on undeveloped seeds prior to planting, which will achieve the same effect as spraying directly on the crops due to the chemicals' systemic nature.[72] Entomologists employed by pesticide manufacturers contend neonicotinoids, if applied according to the warning labels, become diluted throughout the life cycle of the plant and thus do not reach toxic levels.[73] Conversely, researchers from the Connecticut Agricultural Experiment Station have found lethal levels of the pesticide in the pollen and nectar of vegetable plants even when the pesticide is applied as directed.[74] As a systemic compound, neonicotinoids persist in plants and soils for years even after proper application.[75] Studies have shown improper application techniques, such as soil drenching, can result in toxic levels of the pesticide for up to six years after application.[76] The widespread effects of these pesticides led the EPA to mandate additional testing and, in January 2016, led the FWS to ban the use of neonicotinoids in National Wildlife Refuge lands.[77]

D. Colony Collapse Disorder

The phrase "Colony Collapse Disorder" emerged in 2006 and describes the phenomenon of a mass disappearance of adult worker bees leaving the queen to maintain the hive and feed the

70. *See* Elizabeth Grossman, *Declining Bee Populations Pose a Threat to Global Agriculture*, YALE ENV'T 360 (Apr. 30, 2013), http://e360.yale.edu/feature/declining_bee_populations_pose_a_threat_to_global_agriculture/2645 (noting extent of spraying neonicotinoid pesticides on domestic crops).

71. *See* id. (noting extent of spraying neonicotinoid pesticides reaches fruits, vegetables, and grains).

72. *See* Ott, *supra* note 27, at 408 (noting additional application method of spraying seeds before planting); For a discussion of the systemic nature of neonicotinoid pesticides, see *supra* note 25, at 523 and accompanying text.

73. *See* Grossman, *supra* note 70 (citing to inaccurate information provided by entomologists employed by pesticide manufacturing companies).

74. *See id.* (quoting research performed counteracting evidence offered by pesticide manufacturing companies).

75. *See* Hopwood, *supra* note 66, at *vi (discussing half-lives of neonicotinoid pesticides in soil subject to proper application of chemical).

76. *See id.* (discussing half-lives of neonicotinoid pesticides in soil subject to improper application of chemical).

77. *See id.* at v (noting ban on neonicotinoid pesticide use on federally protected refuge land).

new larvae.[78] Colony collapse is generally characterized by multiple factors occurring simultaneously and include sudden loss of the colony's adult bees, the presence of a healthy "capped brood" (also known as developing larvae) with low numbers of parasitic mites, the presence of food stores including both honey and bee pollen, the minimal evidence of wax moth or small hive beetle damage, and the presence of the queen bee.[79] Researchers also note the lack of dead bees in or around the hive as evidence of colony collapse.[80]

Although the scientific community has yet to single out any one specific cause for colony collapse, it lists parasites, pesticide use, infection, malnutrition, genetic factors, immunodeficiencies, and a loss of habitat as contributing factors.[81] One type of parasite, the varroa mite, creates wing deformities in developing bees and can easily spread throughout the colony.[82] The United States Department of Agriculture (USDA) credited the cause of millions of bee deaths to this parasite, but concluded it is not sufficient on its own to explain colony collapse disorder.[83] Nosema disease is also linked to bee deaths but rarely results in an outbreak and thus cannot explain a drastic drop in population.[84] Some researchers argue shipping bees around the country for the pollination of specific crops increases bees' stress levels, which leads to malnutrition and eventually death.[85] Other researchers include the use of pesticides as a cause in reducing a bee's ability to fend off disease.[86] Ultimately, all these factors play a role in the decline of bee popula-

78. *See* Alex Trabolsi, *Pollinator Stewardship Council v. EPA and the Duty to Research FIFRA Applications*, 43 ECOLOGY L.Q. 503, 503-04 (2016) (providing definition and history of colony collapse disorder).

79. *See Colony Collapse Disorder Action Plan*, U.S DEP'T OF AGRIC., Colony Collapse Steering Committee, 7 (June 20, 2007), https://www.ars.usda.gov/is/br/ccd/ccd_actionplan.pdf (listing elements of diagnosing colony collapse disorder).

80. *See id.* (emphasizing lack of dead bees in colonies suffering from collapse disorder).

81. *See* Ott, *supra* note 27, at 404-08 (2015) (identifying existence of several factors contributing to colony collapse disorder).

82. *See id.* (discussing impact of varroa mites in bee hives). "Varroa mites create wing deformities and carry contagious viruses that affect honey bee gene expression." *Id.*

83. *See id.* at 405 (noting varroa mite could not independently explain colony collapse disorder).

84. *See id.* at 406 (discussing impact of disease commonly found in bee hives).

85. *See id.* (discussing forced travel as additional cause of bee death).

86. *See* Ott, *supra* note 27, at 408 (discussing neonicotinoid pesticide use as additional cause of bee death due to its ability to weaken immune systems).

tions, with neonicotinoid pesticides continuing to be the primary driver of the declining bee population.[87]

Several countries around the world have recognized the adverse effects of neonicotinoid pesticides on pollinators.[88] In response to this acknowledgement, the European Commission (EC) imposed a ban on the use of neonicotinoid pesticides for two years to study the resulting effect on bee populations.[89] The EC stated "neonicotinoids are one of the leading suspected causes of colony collapse disorder" because of their "'high acute risk' to honey bees and other pollinators."[90] Although no individual study conclusively singled out neonicotinoid use as the singular cause behind colony collapse disorder, the evidence is mounting, and the EC found continuing the ban and performing further investigation of the issue is warranted.[91]

As a result of the ban, farmers in the United Kingdom have reported the need to use other pesticides at much higher application rates to mimic the results of neonicotinoids.[92] These farmers report annual losses exceeding thirty-three million dollars due to alternative pesticide use, lost crops, and replanting.[93] Because of these devastating costs, the government granted emergency authorizations for farmers to use neonicotinoid pesticides, but only in certain parts of England.[94] Although the ban ended in 2015, the government continued to restrict the use of neonicotinoids.[95] The lack of reportable findings, however, has led opponents of the ban to question whether the outcome of the ban was dispositive or in-

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87. *See id.* at 404-08 (emphasizing multiple factors contribute to colony collapse disorder).

88. *See* Grossman, *supra* note 70 (noting European Committee's view on neonicotinoid pesticide use in Europe).

89. *See id.* (noting European Committee's two-year ban on neonicotinoid pesticide use in Europe).

90. *Id.* (identifying neonicotinoids as leading cause of colony collapse disorder).

91. *See id.* (acknowledging parasites and pathogens as other potential causes for bee population decline).

92. *See* Andrew Amelinckx, *Ban of Neonicotinoids in UK Cost Farmers Millions* (Sept. 11, 2015), http://modernfarmer.com/2015/09/neonicotinoids-ban-uk/ (reporting attempts by farmers to replicate results equivalent to those recognized with neonicotinoid pesticides).

93. *See id.* (citing to Newcastle University study which reports cost of ban on farmers is twenty-two million pounds (equating to thirty-three million dollars in United States currency)).

94. *See id.* (reporting emergency grant allowing farmers to use neonicotinoid pesticides).

95. *See* Claire Marshall, *Ban Lifted on Controversial 'Neonic' Pesticide*, BBC NEWS (July 23, 2015), http://www.bbc.com/news/science-environment-33641646 (noting date of conclusion and resulting legislation).

conclusive due to the European Union's failure to collect the necessary data.[96] European Union scientists estimated results to be available by January 2017, a date which has come and gone without an answer.[97]

Canada also experienced a sharp decline in native bee populations in the early 1970's, when the blueberry crop was almost "entirely wiped out" despite healthy plants.[98] In New Brunswick, Canada, the government developed a plan to eradicate the spruce worm, a pest inhabiting the forests in the area.[99] The pesticides used to control the pest, while not in the neonicotinoid class, resulted in a near extinction of native bees.[100] After multiple rounds of litigation, the New Brunswick Supreme Court ruled the government must institute restrictions on pesticide use.[101] After several years, the ban on pesticide use restored the population of native bees and the blueberry crop began flourishing again.[102]

E. Current United States Legislation

1. *The Federal Insecticide, Fungicide, and Rodenticide Act*

The EPA enforces the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which uses a "cost-benefit analysis to ensure there is no unreasonable risk created for people or the environment from a pesticide."[103] The United States code defines an unreasonable adverse effect as "any unreasonable risk to man or the environment, taking into account the economic, social, and envi-

96. *See id.* (noting absence of reportable data).

97. *See id.* (reporting proposed date of release regarding results of ban).

98. *See* Peter G. Kevan, *Blueberry Crops in Nova Scotia and New Brunswick–Pesticides and Crop Reductions*, 61 (1977), https://www.researchgate.net/profile/Peter_Kevan/publication/264597769_Blueberry_crops_in_Nova_Scotia_and_New_Brunswick_pesticides_and_crop_reductions/links/54130ff00cf2fa878ad3d1e5.pdf?origin=publication_detail (noting similar declines in bee populations resulting from pesticide use).

99. *See id.* (identifying plan to eradicate pest).

100. *See id.* (discussing result of pesticide use).

101. *See* Bridges Brothers Ltd. v. Forest Prot. Ltd., 1976 N.B.R. (2d) LEXIS 538 (Queen's Bench Div. June 14, 1976) (referencing holding of case requiring additional restrictions on pesticide use).

102. *See id.* (noting results of pesticide ban regarding bee populations and crop harvestability).

103. *See* Pollinator Stewardship Council v. U.S. Envtl. Prot. Agency, 806 F.3d 520, 522-23 (9th Cir. 2015) (quoting Washington Toxics Coal. v. U.S. Envtl. Prot. Agency, 413 F.3d 1024, 1032 (9th Cir. 2015)) (identifying United States Environmental Protection Agency as enforcer of Federal Insecticide, Fungicide, Rodenticide Act in addition to EPA's methodologies). FIFRA states "[t]he EPA may deny an application for registration 'when necessary to prevent unreasonable adverse effects on the environment.'" *Id.* at 523 (citing 7 U.S.C. § 136a(a) (2007)).

ronmental costs and benefits of using the pesticide."[104] To register a new pesticide, FIFRA requires companies to file an application "describing how the pesticide will be used, the claims made of its benefits, the ingredients, and a description of all tests and studies done and the results thereof, concerning the product's health, safety, and environmental effects."[105] If the EPA determines the applicant provided sufficient documentation and supporting data, it may register or grant a license for the chemical.[106]

The EPA may register the pesticide unconditionally or conditionally, which requires further testing to assess the adverse environmental effects before granting an unconditional registration.[107] The EPA Administrator will approve the registration if:

> (A) the pesticide's composition is such as to warrant the proposed claims for it; (B) its labeling and other materials required to be submitted comply with the requirement of this subchapter; (C) it will perform its intended function without unreasonable adverse effects on the environment; and (D) when used in accordance with widespread and commonly recognized practices it will not generally cause unreasonable adverse effects on the environment.[108]

In 2015, the EPA issued a moratorium on the manufacture and use of neonicotinoid pesticides, which has resulted in manufacturers seeking out new chemical formulas.[109] The EPA has since looked to state legislatures to regulate the use of pesticides.[110] In August of 2016, the governor of Minnesota set a very broad restric-

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104. *See id.* at 523 (quoting 7 U.S.C. § 136(bb)).

105. *See id.* (citing 7 U.S.C. § 136a(c) (2007)) (listing requirements for new registration applications).

106. *See id.* (discussing options after submitted applications meet requirements listed in 7 U.S.C. § 136a(c) (2007)).

107. *See id.* (citing 7 U.S.C. § 136a(c)(5) (2007); § 136a(c)(7)(A) (2007); § 136a(c)(7)(C) (2007)). The Administrator makes the determination on a case by case basis and will notify the applicant of the reasons for denial providing an opportunity to correct the deficiencies within thirty days. *See* 7 U.S.C. § 136a(c)(3)(A).

108. *See Pollinator Stewardship*, 806 F.3d at 523 (citing 7 U.S.C. § 136a(c)(5) (2007)) (noting factors Administrator will consider when deciding whether to approve new pesticide registrations).

109. *See* Daniel Bloom, *USDA Survey Shows Massive Declines in Domestic Honey Bee Colonies*, CQ ROLL CALL WASHINGTON ENERGY BRIEFING, 2016 WL 2847707, Westlaw (May 16, 2016) (discussing results of 2015 moratorium on neonicotinoid use).

110. *See EPA Actions to Protect Pollinators*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/pollinator-protection/epa-actions-protect-pollinators (last updated May 23, 2017) (showing reliance on States to enact regulations regarding use of neonicotinoid pesticides).

tion on neonicotinoid pesticide use, requiring "farmers to verify that they face an imminent threat of significant crop loss" before using the pesticide.[111]

2. *The Endangered Species Act*

The Endangered Species Act (ESA), makes it unlawful for any person or entity to "take" any species of plant, fish, or wildlife currently listed under the ESA.[112] The ESA defines "take" to mean any conduct intended to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or an attempt to engage in any such conduct" against an endangered species.[113] Any person who violates the ESA faces civil penalties.[114] If a person knowingly violates any provision of the ESA, criminal sanctions will apply.[115] The Act provides certain exceptions to "taking" an endangered species so long as the person, entity, or agency applies to the Secretary of Commerce or the Secretary of Interior for an incidental take permit.[116] The permit is intended for those who incidentally "take" an endangered species as a result of an otherwise lawful activity.[117] For example, in 2015, the Court of Appeals for the District of Columbia stated a "clean energy" company may apply to the FWS for an incidental take permit due to the likelihood their wind turbine operation, which is a lawful activity, would cause the death of a protected species of bat.[118]

To receive an incidental take permit, the application must include a conservation plan which outlines:

> (i) the impact which will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to im-

111. *See* Polansek, *supra* note 61, at *1 (quoting Minnesota governor Mark Dayton in requiring farmers to show imminent threat to crop production in order to obtain permit to use neonicotinoids).

112. *See* 16 U.S.C. § 1538(a)(1) (1988) (listing unlawful actions towards endangered species).

113. *See* 16 U.S.C. § 1532(19) (1988) (defining term "take" under statute).

114. *See* 16 U.S.C. § 1540(a)(1) (2002) (establishing civil penalties for violating ESA).

115. *See* 16 U.S.C. § 1540(b)(1) (establishing criminal penalties for violating ESA). "Any person who knowingly violates any provision of this chapter . . . shall upon conviction, be fined not more than $50,000 or imprisoned for not more than one year, or both." *Id.*

116. *See* 16 U.S.C. § 1539(a)(1)(B) (1988) (discussing concept of "taking" under ESA).

117. *See id.* (discussing purpose of incidental take permits).

118. *See generally* Union Neighbors United v. Jewel, 831 F.3d 564 (D.C. Cir. 2015) (describing method for obtaining incidental take permit from FWS).

> plement such steps; (iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and (iv) such other measures as the Secretary may require as being necessary or appropriate for the purposes of the plan.[119]

The EPA will release the conservation plan for public comment and after review, the Secretary will grant the incidental take permit if:

> (1) the taking will be incidental; (2) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; (3) the applicant will ensure that adequate funding for the plan will be provided; (4) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (5) the measures, if any, required under subparagraph (A)(iv) will be met.[120]

"The Secretary will also consider whether he has received such other assurances as he may require that the plan will be implemented."[121]

In addition to the considerations outlined above, the Secretary can include conditional requirements in the permit, which are binding upon the applicant.[122] These requirements can include any necessary conditions to further facilitate the FWS's purpose in protecting an endangered species.[123] The Congressional intent of establishing the ESA is to "preserve [the] species and grant endangered species the highest protection[s]" of the EPA.[124]

119. *See* 16 U.S.C. § 1539(a)(2)(A)(i)-(iv) (1988) (listing requirements for incidental take permit).

120. *See* 16 U.S.C. § 1539(a)(2)(B)(i)-(v) (1988) (listing steps Secretary will take to approve and grant permit for incidental takings).

121. *See id.* (providing additional step used in issuing incidental take permit).

122. 16 U.S.C. § 1539(a)(2)(B) (1988) (listing inclusions Secretary may add to conservation plan before approving incidental taking permit).

123. *See id.* (explaining purpose and policy of allowing Secretary to amend incidental take permits). The Secretary may force an applicant to implement reporting requirements to ensure specific conditions are held in compliance. *Id.*

124. *See* Kelly-Garrick, *supra* note 38, at 109 (noting Congressional intent in formulating ESA).

III. THE EPA IS LOSING ITS STING

A. Interpreting FIFRA and the EPA's Role

The Court of Appeals for the Ninth Circuit considered whether the EPA acted properly under FIFRA in registering sulfoxaflor, a pesticide found in the neonicotinoid class.[125] "Under FIFRA, a reviewing court must sustain a pesticide registration if the registration is supported by substantial evidence when considered on the record as a whole."[126] Sulfoxaflor is an insecticide that acts on the same receptors in insects as other classes of neonicotinoids pesticides.[127] Sulfoxaflor differs from other neonicotinoids because of a "unique mechanism" which affects "insects that are resistant to other neonicotinoids."[128] The court noted the EPA properly employed the Pollinator Risk Assessment Framework (PRAF) in its initial investigation of sulfoxaflor.[129]

The PRAF is a multi-tiered investigation into whether a new pesticide poses a potential risk to pollinators, and if so, what the risk is and what the magnitude of the adverse effect will be.[130] In the first tier, the EPA analyzed the data collected in laboratories regarding how much pesticide would be used and the point at which the dose becomes toxic to bees.[131] The EPA considered toxicity levels in both contact and oral consumption.[132] In this case, the EPA ultimately determined sulfoxaflor is "extremely toxic" to bees and therefore, mandated additional testing prior to registering the new pesticide.[133] In concluding its tier one analysis, the

125. *See* Pollinator Stewardship Council v. U.S. Envtl. Prot. Agency, 806 F.3d 520 (9th Cir. 2015) (referring to scope of case, court's inquiry, and court's holding).

126. *See id.* at 528 (quoting 7 U.S.C. § 136n(b)) (discussing scope of judicial review for agency action).

127. *See id.* at 523 (describing chemical composition and resulting impact of sulfoxaflor on insects).

128. *See id.* (noting difference between sulfoxaflor and other neonicotinoids, and introducing concept of new composition being more potent and potentially effecting more insects).

129. *See id.* at 524 (introducing Pollinator Risk Assessment Framework as means to investigate newly introduced pesticides for approval by EPA). The EPA, Canada's Pest Management Regulatory Agency, and California's Department of Pesticide Registration developed the PRAF. *Id.*

130. *See Pollinator Stewardship*, 806 F.3d at 524 (explaining PRFA's multi-tiered investigation approach).

131. *See id.* (discussing first tier of investigation into sulfoxaflor). Dow Agrosciences, LLC, the respondent-intervenor in the original EPA action, provided the data for review by the EPA. *Id.*

132. *See id.* at 524 (noting EPA considers two types of exposure, contact and oral consumption, when conducting tier 1 analysis).

133. *See Id.* (noting EPA finding of tier 1 investigation for sulfoxaflor).

EPA noted several deficiencies in the studies conducted by Dow Agrosciences (applicant) and believed the results actually understated the risk to bees.[134]

Tier two required the applicant to perform "semi-field test" studies, which consider the pesticides' effect on the bee colony as a whole.[135] Semi-field test studies require manufacturers to place bees inside of an enclosed tunnel and force them to feed on pesticide treated crops to gain a better understanding of how the chemical will travel through the colony.[136] The court noted several deficiencies in this type of analysis, emphasizing the failure to identify sub-lethal effects of the insecticide, which take longer to manifest.[137]

The applicant conducted six semi-field test studies over several years, but the EPA noticed the actual application rate of sulfoxaflor was significantly lower than the proposed application rate for environmental use.[138] Due to the semi-field test study's insufficiency, the EPA required the applicant to perform additional semi-field test studies within the requirements set forth in the Organization for Economic Coordination and Development (OECD).[139] As a result, the EPA issued a conditional registration restricting the single application rate of sulfoxaflor application to 0.09 pounds of active ingredient per acre and further limiting the application to specific

134. *See id.* at 525 (noting EPA conclusion of tier 1 analysis). The EPA compared the median lethal doses of sulfoxaflor with the concentration of pesticide that will be applied in the environment resulting in the "expected environmental concentration." *Id.* The EPA will then divide the expected environmental concentration by the "acute median lethal dose" to arrive at the "risk quotient." *Id.* Any risk quotient exceeding 0.4 triggers a need for further study. *Id.* The risk quotient for oral exposure was 83 and the risk quotient for contact exposure was 2.8. *Id.*

135. *See Pollinator Stewardship*, 806 F.3d at 525 (introducing tier two analysis).

136. *See id.* (explaining how tier two analysis works and expectation of study).

137. *See id.* at 526 (noting maximum duration of semi-field test studies is ten days because of resulting stress on bees in enclosed environments may alter results in analyzing bee death).

138. *See id.* (noting application rate during field test studies was lower than original application which specified maximum application rate of .133 pounds of active ingredient per acre). Only one study used the maximum application rate, but applied the pesticide to cotton, which is a "sub-optimal" source of pollen for bees. *Id.* at 526.

139. *See id.* at 526 (noting court's mandate for additional testing with emphasis on OECD 75 guidance). OECD is an international organization which has developed protocols for honey bee semi-field test studies which have been favorably viewed as providing reliable data to satisfy FIFRA requirements. *Id.* at 526; *see also* 40 C.F.R. 158.70 (explaining when EPA evaluates experimental design, it will consider whether generally accepted methods were used, sufficient numbers of measurements were made to achieve statistical reliability, and sufficient controls were built into all phases of experiment).

crops.[140] The court specifically took notice of the EPA's grant of a conditional use permit for the pesticide despite concerns regarding the welfare of bees.[141] The court cited the EPA's questionable finding that "sulfoxaflor applications will not result in a *catastrophic loss* to brood during the time period required for the conditional studies to be performed and assessed."[142]

The EPA's concerns quickly disappeared when it granted unconditional registration for sulfoxaflor less than seven months after originally granting a conditional registration.[143] In an unprecedented move, the EPA granted the registration without first analyzing the results from the tests it mandated the applicant to conduct.[144] It is unknown if the applicant conducted the additional testing.[145] The EPA is mandated to deny registration of a new pesticide if it would result in unreasonable adverse environmental effects; yet the agency concluded sulfoxaflor "would not cause 'unreasonable adverse effects' on bees, and that 'the benefits of [sulfoxaflor] compared to the registered alternatives, as well as [sulfoxaflor's] ability to control problematic target pests' outweighed the costs and therefore justified the registration" if the pesticide is applied according to labeled instructions.[146] The court noted this inconsistency and questioned the EPA's grant of the unconditional registration "despite its earlier refusal . . . and despite the lack of any meaningful study of the effects of mitigation measures."[147]

The court correctly vacated the unconditional registration and remanded the action back to the EPA emphasizing the agency cannot "avoid its own regulations when actual measurements trigger

140. *See Pollinator Stewardship*, 806 F.3d at 526-27 (discussing EPA's conditional registration requirements reducing maximum application rates, limiting application to specific crops, and suggested use of warning labels explaining risks to bees).

141. *See id.* at 527 (emphasizing court's concern in EPA's holding when compared to its concern of risks faced by bees during time for additional testing).

142. *See id.* (emphasizing court's concern in EPA's quote regarding catastrophic loss when compared to its concern of risks faced by bees during time for additional testing) (emphasis included).

143. *See id.* (noting EPA change of heart to grant unconditional registration for sulfoxaflor).

144. *See id.* (noting EPA did not analyze results from mandated OECD 75 semi-field test studies prior to granting unconditional registration).

145. *See Pollinator Stewardship*, 806 F.3d at 527 (noting record does not contain evidence proving existence of additional semi-field test studies).

146. *See id.* at 528 (alterations in original) (quoting EPA language in unconditional registration statement).

147. *See id.* (questioning EPA's decision to unconditionally register sulfoxaflor without conducting mandated testing).

risk concerns."[148] The EPA is mandated by its own regulations to "review[ ] all data pertaining to the pesticide and [ ] conclude[ ] . . . no additional studies are necessary to approve the pesticide under FIFRA's unreasonable adverse effects standard."[149] Unlike the Administrative Procedure Act, a court may uphold agency action under FIFRA if the agency provides sufficient evidence to uphold the basis presented in the agency's findings.[150] The EPA used two different studies to arrive at an acceptable reason for granting a registration.[151] The court found deficiencies in the EPA's basis for granting the registration and correctly vacated the registration.[152]

B. Adding the Endangered Species Act to the Mix

In 2015, the United States District Court for the Northern District of California considered the role of the ESA in agency action.[153] Section 1536 of the ESA holds "that all federal agencies 'shall, in consultation with and with the assistance of the [FWS or the National Marine Fisheries Service ('NMFS'][sic], insure that any . . . agency action . . . is not likely to jeopardize the continued existence of any endangered species or threatened species.'"[154] Agencies have a duty to consult with the FWS even when the proposed action *may* affect an endangered or threatened species.[155] The ESA does not allow the FWS to rely on data provided by manufacturers; rather, it "requires the FWS to make decisions based on the 'best available science and commercial data.'"[156] Requiring the

148. *See id.* at 531 (noting court's holding in case).

149. *See* Kristen Hilferty, *Pollinator Stewardship Council v. U.S. Environmental Protection Agency: The Ninth Circuit Reaffirms the Prioritization of Protecting the Environment Over Agency Action*, 29 TUL. ENVTL. L.J. 87, 91 (2015) (citing 40 C.F.R. § 152.112(b)-(c), (e) (2014)) (evaluating EPA mandate requiring EPA to evaluate new pesticide registrations).

150. *See id.* at 89 (citing Motor Vehicles Manufacturers Association of United States, Inc. v. State Farm Mutual Auto Insurance Co., 463 U.S. 29, 50 (1983)).

151. *Pollinator Stewardship*, 806 F.3d at 531-32 (emphasizing limitations and inaccuracies in combining results for separate studies to arrive at favorable conclusion).

152. *See* Hilferty, *supra* note 149, at 89 (applying court's understanding of APA in Pollinator Stewardship Council v. U.S. Envtl. Prot. Agency, 806 F.3d 520 (9th Cir. 2015)).

153. *See* Ellis v. Housenger, No. C-13-1266 MMC, 2015 WL 3660079, *2 (N.D. Cal. June 6, 2015) (noting alleged issue of EPA violating ESA).

154. *See id.* at *5-6 (citing 16 U.S.C. § 1536) (providing requirement of interagency cooperation).

155. *See id.* (citing Karuk Tribe v. U.S. Forest Serv., 681 F.3d 1006, 1020 (9th Cir. 2012)) (explaining duty to consult).

156. *See* Kelly-Garrick, *supra* note 38, at 109 (citing Northern Spotted Owl v. Lujan, 758 F.Supp 621, 628 (W.D. Wash. 1991)) (discussing role of FWS during consultations with EPA concerning agency action).

EPA to apply the *Ellis* analysis to future considerations in registering neonicotinoid pesticides will require a consultation with the FWS prior to any approval.[157]

Consequently, combining the holdings of *Pollinator Stewardship* and *Ellis* results in an additional requirement for the EPA to consult with the FWS when considering approval of pesticides for commercial use in the United States.[158] Requiring farmers to comply with this obligation could arguably lead to a temporary destruction of crops, increased use of other pesticides, and added costs of crop production.[159]

C. Someone Has to Lose, Right?

Zero-sum game theory, in its most basic form, posits that where one party wins, the opposite or opposing party must lose.[160] If the government chooses to protect bees from certain actions which result in the decline of their numbers, farmers will have to: (1) use ineffective pesticides in unprecedented amounts; (2) spend more money to apply the pesticides in conjunction with other anti-pest actions; and (3) replant crops to avoid soil contamination; all of which result in the need to increase the cost of produce.[161] As a result, two situations become likely: (1) either the price of food soars to the point of unaffordability; or (2) the United States experiences a famine.[162] If the government chooses to protect the farmers and allow the continued use of neonicotinoid pesticides, the sharp decline in bee populations will continue toward extinction.[163] If bees become extinct, necessary pollination of crops cannot occur

157. For a discussion of applying the *Ellis* standard to future pesticide registrations, see *supra* note 153 and accompanying text.

158. For a discussion of the requirement for the EPA to consult with FWS when granting registrations for new neonicotinoid chemical compounds under FIFRA because of known dangers to endangered species, see *supra* notes 153-155 and accompanying text.

159. For a discussion of the results of banning neonicotinoid pesticides in the United Kingdom, see *supra* notes 92-94 and accompanying text.

160. *See* Ramah Navajo School Board, Inc. v. Babbitt, 87 F.3d 1338, 1345-46 (D.C. Cir. 1996) (explaining concept of zero-sum game theory).

161. For a discussion of farmers' necessary response if the government chooses to protect bees through banning neonicotinoid pesticides, see *supra* notes 92-94 and accompanying text.

162. For a discussion of the likely results of banning neonicotinoid pesticides, see *supra* notes 92-94, 98 and accompanying text.

163. For a discussion of the realistic result of continued use of neonicotinoid pesticide based on past research into the adverse effects experienced in bee colonies, see *supra* notes 64-69 and accompanying text.

and the same result will follow, either soaring prices or famine.[164] Zero-sum thinking will not address the issues faced in banning or allowing the continued use of neonicotinoid pesticides.[165]

Researchers have begun to look elsewhere for an alternative answer to this dichotomous approach.[166] Proponents of integrated pest management (IPM) believe the use of an informed management system based upon all available information is the most viable alternative.[167] The IPM approach is based on decades of scientific research and includes "an assessment of economically important pest populations in order to determine if an insecticide treatment is required."[168] The use of a neonicotinoid pesticide may only be used if there is a documented "actual need."[169]

The approach is codified under European Union Directive 2009/128/CE, which provides five steps to reduce the use of neonicotinoid pesticides.[170] The first step of an IPM procedure is documenting and monitoring the existence of pests.[171] If the level of pest activity exceeds a predetermined economic threshold for crop protection, treatments may be warranted.[172] The first stage of treatment utilizes "agronomic solutions," such as crop rotation, tillage, choice of sowing dates, and altering rotation sequences.[173] If agronomic solutions are unavailable or inefficient, farmers should consider biological or physical treatments before using chemical pesticides.[174] If no alternative treatment solutions are available, or prove ineffective, farmers may only use chemical treatments that pose the lowest risk to environmental and human health.[175] Positive results regarding IPM procedures have been reported in Italy

164. For a discussion of the realistic result of mass non-pollination of the majority of crops produced in United States, see *supra* notes 60-63, 70-71 and accompanying text.

165. For a discussion of the conclusion that zero-sum game theory can no longer be used in addressing critical environmental concerns, see *supra* notes 160-163 and accompanying text.

166. *See* Furlan, *supra* note 22 (noting change of direction in researching alternatives to neonicotinoid pesticide use).

167. *See id.* (introducing concept of Integrated Pest Management approach).

168. *See id.* (noting basis of IPM approach is rooted in scientific research).

169. *See id.* (noting "actual need" requirement inherent in IPM approach).

170. *See id.* (introducing EU directive implementing IPM approach).

171. For a discussion of the first requirement of the IPM approach, see *supra* note 167 and accompanying text.

172. *See id.* at 136 (noting required result of first requirement to move forward with treatment options).

173. *See id.* (discussing requirement of agronomic solutions prior to chemical treatment).

174. *See id.* (providing last resort before using chemical treatments)

175. *See id.* (noting limitation on using chemical treatments).

and Canada regarding IPM procedures.[176] Although the full implementation of an IPM approach may prove costly and time consuming, it will ultimately produce economic competition and sustainable agricultural systems.[177]

IV. "THE PLIGHT OF THE BUMBLEBEE"[178]

Bumblebees are under the federal government's protection and any action taken, without permit, resulting in the death of a bumblebee is now a strict liability offense.[179] Research has undisputedly found neonicotinoids, including sulfoxaflor, to be "extremely toxic" to bees.[180] How can individuals and corporations continue using neonicotinoid pesticides, while having actual knowledge of their adverse effects on multiple species of bees?[181] The only logical answer is, they cannot; not without violating federal law.[182] It is debatable whether the Secretary of Commerce or the Secretary of the Interior will grant any incidental take permits for neonicotinoid pesticide use when the research identifies the potential risk to pollinators as excessive, and while the research for mitigation measures is non-existent.[183] One theory rests on the assumption that a ninety-one percent drop in bumblebee population is too severe to warrant an incidental take permit.[184]

176. For a discussion of the IPM approach used in Italy and Canada, see *supra* note 168, at 143 and accompanying text. "Azadirachtin is a natural compound extracted from the seeds of the neem tree and has been shown to have antifeedant, antifertility, and growth-regulating insecticidal properties against a range of insect pests." *Id.* at 142.

177. *See id.* (weighing initial cost with overall benefit of implementing IPM approach over "prophylactic use" of neonicotinoid pesticides).

178. *See* Anthony King, *Plight of the Bumblebee*, http://www.sciencemag.org/news/2012/09/plight-bumblebee (last visited Feb. 4, 2017).

179. For a discussion of the inclusion of the bumblebee onto the endangered species list and the substantive provisions of ESA, see *supra* notes 7-10, 122-116 and accompanying text.

180. For a discussion of toxicity levels and application rates of sulfoxaflor, see *supra* notes 24, 130-140 and accompanying text.

181. For a discussion of warning label requirement for neonicotinoid pesticides to include risks associated with bee death, see *supra* notes 73, 108, 146 and accompanying text.

182. For a discussion of strict liability ESA violations, see *supra* notes 112-115 and accompanying text.

183. For a discussion of the specific facts, which will preclude EPA administrators and government officials from granting incidental take permits due to significantly damaging evidence relating to decline of bee populations coupled with significant economic utility of bees, see *supra* notes 64-69, 79-80 and accompanying text.

184. For a discussion of the theoretical assumption of bumblebee decline based on the high percentage of loss, see *supra* note 13 and accompanying text.

FIFRA states the EPA Administrator may only approve a pesticide's registration if the product will not have "unreasonable adverse effects" on the environment.[185] The ESA states the Secretary of the Interior may grant an incidental take permit only when the "taking" will not "reduce the likelihood of the survival and recovery of the species."[186] The goal of listing the bumblebee as endangered is to develop and implement a recovery plan to reverse its precipitous decline, not contribute.[187] Studies conducted in Italy and Canada reveal the adoption of IPM approaches can reduce the overall amount of neonicotinoid pesticide use and limit use to very specific circumstances.[188] The answer does not have to be black and white.[189]

Every new addition to the endangered species list sparks a new investigation into the potential risks the species faces at the hands of the people of the United States.[190] The ESA requires every agency to engage in a consultation with the FWS or NMFS prior to taking action that may threaten an endangered or threatened species.[191] Granting any type of registration for a neonicotinoid pesticide is considered an agency action and the EPA will be required to consult with the FWS because this class of pesticide threatens bumblebees.[192] Evidence previously addressed illustrates the undeniable fact that neonicotinoid pesticides cause adverse effects resulting in the death of pollinators, namely, bees.[193] Approving registration for neonicotinoid threatens the survival of pollinators, including

185. For a discussion of pesticide registration requirements, see *supra* note 105 and accompanying text.

186. For a discussion of when the Secretary of Commerce or the Secretary of the Interior may grant incidental take permits, see *supra* notes 118-122 and accompanying text.

187. For a discussion of the stated goal of FWS Assistant Director for Ecological Services in listing the rusty patched bumblebee on the endangered species list, see *supra* note 18 and accompanying text.

188. For a discussion of the IPM procedures and results, see *supra* notes 167-177 and accompanying text.

189. For a discussion of zero-sum game theory as it applies to environmental issues, see *supra* notes 160-165 and accompanying text.

190. For a discussion of the possibilities surrounding future listings due to the current requirements, see *supra* notes 154-158 and accompanying text.

191. *See id.* (discussing ESA requirement of consultation prior to agency action which may threaten endangered or threatened species).

192. For a discussion of the guidelines establishing compliance with the ESA's mandatory consultation clause, see *supra* notes 154-158 and accompanying text.

193. For a discussion of the extreme toxicity levels associated with neonicotinoid pesticides and the resulting effects on individual bees, hives, and entire colonies, see *supra* notes 64-70, 88-90, 129-132 and accompanying text.

the endangered bumblebee.[194] To approve a new neonicotinoid pesticide registration, the EPA would have to insure the approval is not likely to jeopardize the existence of bumblebees, a task it cannot truthfully complete.[195] Evidence of the adverse effects of neonicotinoids demonstrates that these pesticides go beyond the required "may threaten" language of the ESA; if the FWS is seriously concerned about the future of the species, it will force the EPA to deny any additional registrations for neonicotinoid pesticides.[196]

The EPA must abide by the ESA and consult with the FWS prior to granting a registration for a chemical known to threaten the bumblebee.[197] Perhaps the inclusion of the bumblebee on the endangered species list will result in a ban on the use of neonicotinoid pesticides.[198] Either result would contribute to the re-population of essential pollinators throughout the country, which is favorable to pollinator activists and those who appreciate the economic utility of pollinators.[199]

If we decide bees win, farmers must lose, right?[200] American farmers will be forced to find alternatives to rid their fields of devastating pests that have the potential to destroy entire harvests.[201] Farmers will have no alternative but to abandon fields where neonicotinoid pesticides are used, prove pests pose a serious threat to their crop, engage in alternate agronomic solutions, or if any of those alternatives do not work, use more ineffective pesticides,

194. *See* Kelly-Garrick, *supra* note 38, at 109 (drawing conclusions between neonicotinoid pesticide approval and GMO deregulation).

195. For a discussion of the inability to ensure bumblebee safety based upon current EPA regulations, see *supra* note 152 and accompanying text.

196. For a discussion of the language used in ESA requiring agencies to consult with FWS when action may threaten an endangered species, see *supra* notes 154-156, 190-192 and accompanying text.

197. For a discussion of the EPA's likelihood of cooperating with FWS officials regarding approval of dangerous pesticides now that bumblebees are considered endangered, see *supra* notes 7-8, 65-71, 90-91, 132 and accompanying text.

198. For a discussion of whether changing the status of the rusty patched bumblebee to endangered will result in its re-population, see *supra* notes 7-8 and accompanying text.

199. *See Mission*, XERCES SOC'Y FOR INVERTEBRATE CONSERVATION, http://www.xerces.org/mission/ (last visited Feb. 4, 2017) (noting mission of society as "endeavor[ing] to make meaningful long-term conservation a reality" through "using applied research, engaging in advocacy, providing educational resources, and addressing policy implications").

200. For a discussion of zero-sum game theory, see *supra* notes 160-165 and accompanying text.

201. For a discussion of the conclusion drawn to United States agricultural production through techniques farmers in United Kingdom employed during the neonicotinoid pesticide ban, see *supra* notes 92-94 and accompanying text.

which will ultimately result in the loss of crops.[202] In the United Kingdom, a country seventy-five times smaller than the United States, farmers experienced an annual economic loss of approximately thirty-three million dollars after neonicotinoid pesticides were banned.[203] Alternatives to neonicotinoid use are in their infant stages in Europe and data will take time to compile and organize.[204] Does Minnesota's new regulation find a middle ground of protecting bees or does it provide a loophole if farmers can prove an "imminent threat of significant crop loss"?[205] These questions remain unanswered and will continue to remain unanswered until the current White House administration choses a side: bees or farmers.[206] At a minimum, the federal government will provide protections for bees.[207] In addition, the EPA must now consult with the FWS prior to approving any permit for new pesticides; a requirement expected to result in the increase of bee populations throughout the United States.[208]

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202. For a discussion of the potential complexities faced by United States farmers compared to European farmers' attempts to utilize the IPM approach after the neonicotinoid ban in Europe, see *supra* notes 92-94, 170-176 and accompanying text.

203. For a discussion of the economic loss experienced in England due to the ban on neonicotinoid pesticide use, see *supra* note 93 and accompanying text.

204. For a discussion of the IPM approach, see *supra* notes 167-177 and accompanying text.

205. For a discussion of the Minnesota regulation banning use of neonicotinoid pesticides unless farmers can prove an "imminent threat of significant crop loss," which places a burden on farmers, see *supra* note 111 and accompanying text.

206. For a discussion of the importance of how future decisions made by President Donald Trump, as well as new EPA and FWS administrations, will undeniably shape American agricultural history, see *supra* notes 9-11, 29, 37-38, 157-158, 184-188, 191-195 and accompanying text.

207. For a discussion of the protections outlined in the ESA, which now apply to the rusty patched bumblebee, see *supra* notes 7-8 and accompanying text.

208. For a discussion of the consultation requirement with FWS when an agency takes action that could lead to adverse effects on endangered species, see *supra* notes 190-191 and accompanying text.

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