October 30, 2020

Tulio Macedo, Chief
Pesticide Registration Branch
California Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95814

Re: Comments on the California Department of Pesticide Regulation's Proposed Pollinator Protection Mitigation Measures for Use of Nitroguanidine-Substituted Neonicotinoids in Agricultural Crops

Dear Pesticide Registration Branch Chief Macedo:

I write to submit the following comments on behalf of the Natural Resources Defense Council (NRDC), and its nearly 400,000 California members and online activists on the California Department of Pesticide Regulation's (DPR) Proposed Pollinator Protection Mitigation Measures for Use of Nitroguanidine-Substituted Neonicotinoids in Agricultural Crops (the "Proposed Mitigation").

NRDC recognizes and appreciates the considerable work by DPR staff that has gone into drafting the protections outlined in the Proposed Mitigation. While this work marks a significant and pathbreaking step on an issue of statewide—and national—importance, more must be done to protect California's pollinators, environment, and people. The comments below identify the areas in which DPR must strengthen its risk analysis and mitigation for neonicotinoid insecticides ("neonics")—most notably by accounting for the full range of harmful neonic exposure pathways, all outdoor neonic uses (including neonic-treated crop seeds and non-agricultural uses), and neonics' broad scope environmental risks and harms.

These additional measures would not only position DPR as a national regulatory leader at a time when national leadership is sorely lacking, but are also required by California law. We believe that sufficient scientific information exists to enable DPR to take additional protective measures immediately. However, to the extent DPR believes additional analysis and mitigation would take additional time, DPR should expeditiously move forward with the Proposed Mitigation as a temporary interim measure—making clear that additional mitigation will be provided at the conclusion of further analysis.

NRDC offers the following comments in support of this position:

I. Background

A. Neonicotinoids – Their Properties, Use, and Impacts

Neonicotinoids, commonly referred to as "neonics," are neurotoxic insecticides that permanently bind to and overstimulate nicotinic receptors in insect nerve cells, leading to collapse of the central nervous system.[1] Neonics kill insects by design, but even small, sublethal neonic exposures can ultimately cause individual or colony death by weakening critical functions—such as an insect's immune system, navigational ability, stamina, memory, and fertility.[2]

Neonics' toxicity to insect and invertebrate life is profound. Neonics have made U.S. agriculture up to forty-eight times more harmful to insects since their introduction,[3] where they are most commonly applied as coatings on crop seeds.[4] The neonic coating on just one such corn seed contains enough active ingredient to kill 250,000 bees or more.[5]

Neonics' chemical properties and popularity has led to the contamination of whole ecosystems. As "systemic" insecticides, neonics are designed to be absorbed by plants, making the plants themselves—their leaves, roots, fruit, pollen, nectar, etc.—toxic to insects. For this reason, while neonics may be sprayed, they are often applied as a soil application or "drench," or as coatings on crop seeds, both of which are designed to be taken up by the target plant's roots. With either use, the vast bulk—often over 95%—of the active ingredient stays in the soil, [6] where it persists—often for years—migrating easily in rain and irrigation water to contaminate new soil, plants, and water supplies. Due to these properties and their status as the most widely used insecticides in the world,[7] neonics now broadly contaminate soil, water, and plant life across large areas of the country.[8]

A large body of scientific research connects this vast environmental contamination to tangible ecological harm. While neonics are perhaps best known as a leading cause of massive losses of honey bees and

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[1] *See, e.g.,* National Pesticide Information Center, *Imidacloprid: Technical Fact Sheet* (visited Oct. 17, 2019), https://bit.ly/2lQqh8W.

[2] *See* Lennard Pisa et al., *An Update of the Worldwide Integrated Assessment (WIA) on Systemic Insecticides. Part 2: Impacts on Organisms and Ecosystems*, Envtl. Sci. Pollution Research Int'l (Nov. 9, 2017), https://bit.ly/2HqqHwB [hereinafter "Worldwide Assessment Part 2"]; Daniel Kenna et al., *Pesticide Exposure Affects Flight Dynamics and Reduces Flight Endurance in Bumblebees*, Ecology and Evolution (Apr. 29, 2019), https://bit.ly/2Y2VlQo [hereinafter "Kenna 2019"].

[3] Michael DiBartolomeis et al., *An Assessment of Acute Insecticide Toxicity Loading (AITL) of Chemical Pesticides Used on Agricultural Land in the United States*, PLoS One (Aug. 6, 2019), https://bit.ly/2Yr4Xc7 [hereinafter "DiBartolomeis 2019"].

[4] Margaret R. Douglas & John F. Tooker, *Large-Scale Deployment of Seed Treatments Has Driven Rapid Increase in Use of Neonicotinoid Insecticides and Preemptive Pest Management in U.S. Field Crops*, Environ. Sci. Technol. (Mar. 20, 2015), https://bit.ly/2VWiTqk [hereinafter "Douglas & Tooker 2015"].

[5] *See, e.g.*, European Food Safety Authority, *Conclusion on the Peer Review of the Pesticide Risk Assessment for Bees for the Active Substance Thiamethoxam,* 9 (Mar. 14, 2013), https://bit.ly/2lR7Xfo (listing the acute oral honeybee "LD50"—the dose of imidacloprid expected to kill half a population of exposed honeybees when ingested—as 0.005 µg per bee); EPA, *Amended Label to Increase Soybean Rates + Supplemental Label for Soybean Cruiser® Insecticide* (amended and approved Feb. 23, 2009), https://bit.ly/2kGCgW3 (allowing up to 1.25 mg of thiamethoxam per corn seed); EPA, *Registration for Imidacloprid (NTN 33893)*, 7 (Mar. 10, 1994) https://bit.ly/2K36Bbl (listing the honeybee LD50 as 0.0039 µg per bee); EPA, *Pesticide Label for Gaucho 600 Flowable*, 5 (Feb. 27, 2019), https://bit.ly/34FL8x2 (allowing up to 1.34 mg of imidacloprid per corn seed).

[6] *See, e.g.*, Adam Alford & Christian Krupke, *Translocation of the Neonicotinoid Seed Treatment Clothianidin in Maize*, PLoS ONE 12(3) (Mar. 10, 2017), https://bit.ly/2xZtEgS [hereinafter "Alford & Krupke 2017"] (finding uptake of neonic active ingredient from corn seed treatments was < 2%); Robin Sur & Andreas Stork, *Uptake, Translocation and Metabolism of Imidacloprid in Plants*, Bulletin of Insectology (2003), https://bit.ly/3kGNFz1 (finding uptake of imidacloprid from cotton, eggplant, potato, and rice seed treatments was <5%)

[7] *See* Douglas & Tooker 2015.

[8] *See, e.g.,* Michelle Hladik and Dana Kolpin, *First National-Scale Reconnaissance of Neonicotinoid Insecticides in Streams Across the USA*, Environmental Chemistry (Aug. 18, 2015), https://bit.ly/31Mse6o [herinafter "Hladik 2015"]; *cf.* Thomas Wood & Dave Goulson, *The Environmental Risks of Neonicotinoid Pesticides: A Review of the Evidence Post 2013*, Envtl. Sci. Pollution Research Int'l, (Jun. 7, 2017), https://bit.ly/2Hpn8T5 [hereinafter "Wood & Goulson 2017"].

other insect pollinators,[9] neonic contamination has also been linked to the devastation of fish populations and aquatic ecosystems,[10] declines in bird and butterfly populations,[11] and birth defects in white-tailed deer.[12]

In California, neonic residues appear in state waters at levels expected to cause ecosystem-wide damage.[13] In recent DPR testing, the neonic imidacloprid appeared in more than 90% of Southern and Central California agricultural surface water samples, with all detections exceeding the U.S. Environmental Protection Agency's (U.S. EPA) chronic "benchmark" for harm to aquatic ecosystems.[14] Other state and federal testing also reveal this benchmark commonly exceeded by ten-to-one-hundred-fold.[15] For example, in tributaries to the Salinas River in Monterey County, every sample over an eight-year period contained imidacloprid ten-fold above this ecological damage threshold.[16]

Concerningly, existing water testing data provides only a partial picture of neonic contamination. While four of the five main neonic active ingredients appear on California's "Groundwater Protection List" for pesticides designated as having the potential to pollute ground water, 3 Cal. Code Regs. (C.C.R.) § 6800 (listing clothianidin, dinotefuran imidacloprid, and thiamethoxam), DPR testing has largely focused only on imidacloprid. Despite fragmentary testing for the other neonic chemicals, the limited water testing data available for clothianidin and thiamethoxam suggests that these chemicals are "major contaminants of agricultural areas of California," likely even larger contributors than imidacloprid in many regions.[17]

Widespread neonic contamination in California raises human health concerns in addition to ecological concerns. Research now indicates that neonic exposures may lead to elevated risk of developmental or neurological damage—particularly in infants and young children—including malformations of the developing heart and brain.[18] These studies are particularly worrying given the pervasiveness of exposure—monitoring by the U.S. Centers for Disease Control and Prevention indicates that *roughly half*

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[9] *See* Chiara Giorio, *An Update of the Worldwide Integrated Assessment (WIA) on Systemic Insecticides. Part 1: New Molecules, Metabolism, Fate, and Transport*, Envtl. Sci. Pollution Research Int'l (Nov. 5, 2017), https://bit.ly/2qVqciQ [hereinafter "Worldwide Assessment Part 1"]; Worldwide Assessment Part 2; Wood & Goulson 2017; Daniel Cressey, *Largest-ever Study of Controversial Pesticides Finds Harm to Bees*, Nature (Jun. 29, 2017), https://go.nature.com/2sgJjDk; B.A. Woodcock et al., *Country-Specific Effects of Neonicotinoid Pesticides on Honey Bees and Wild Bees*, Science (Jun. 30, 2017), https://bit.ly/2lFOAG0 ("These field results confirm that neonicotinoids negatively affect pollinator health under realistic agricultural conditions.").

[10] *See* Masumi Yamamuro et al., *Neonicotinoids Disrupt Aquatic Food Webs and Decrease Fishery Yields*, Science (Nov. 1, 2019), https://bit.ly/34rKCSG; Francisco Sánchez-Bayo, *Contamination of the Aquatic Environment with Neonicotinoids and Its Implication for Ecosystems*, Frontiers in Environmental Science (Nov. 2, 2016), https://bit.ly/2LifRHf.

[11] *See* Caspar A. Hallmann et al., *Declines in Insectivorous Birds Are Associated with High Neonicotinoid Concentrations*, Nature (Jul. 9, 2014), https://go.nature.com/2KvIwah [hereinafter "Hallmann 2014"]; Matthew L. Forister et al., *Increasing Neonicotinoid Use and the Declining Butterfly Fauna of Lowland California*, The Royal Society Publishing: Biology Letters (Aug. 1, 2016), https://bit.ly/2o5P6i0 [hereinafter "Forister 2016"].

[12] Elise Hughes Berheim et al., *Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-tailed Deer*, Sci Rep. (Mar. 14, 2019), https://go.nature.com/2Q1I9Zf [hereinafter "Berheim 2019"].

[13] Mineau 2020 at 1, 16-26.

[14] *See* Xin Deng, *Surface Water Monitoring for Pesticides in Agricultural Areas in the Central Coast and Southern California, 2018*, DPR (May 28, 2019), https://bit.ly/2n8Epeg (finding imidacloprid in 94% of all samples); Robert Budd, *Urban monitoring in Southern California watersheds FY 2017-2018*, DPR (Mar. 1, 2019), https://bit.ly/2nY9TUq (finding imidacloprid in 92% of all samples); U.S. EPA, *Aquatic Life Benchmarks and Ecological Risk Assessments for Registered Pesticides* (visited Oct. 19, 2020), https://bit.ly/34clz8U [hereinafter "U.S. EPA Aquatic Life Benchmarks"]; Pierre Mineau, *Impacts of Neonics in New York Water* (2019), https://on.nrdc.org/2lXsO0O [hereinafter "Mineau 2019"] (finding neonics, on the basis of similar water testing results, were likely causing "ecosystem-wide damage" in New York).

[15] Mineau 2020 at 1, 21.

[16] *Id.* at 1, 23-24.

[17] *Id.* at 25.

[18] Comment Submitted by Gary D. Hammer, President, Endocrine Society to EPA Regarding Its Proposed Interim Decisions for Several Neonicotinoid Pesticides (May 6, 2020), https://bit.ly/3cM0CU7 [hereinafter "Endocrine Society Comment Letter 2020"]; Andria Cimino et al., *Effects of Neonicotinoid Pesticide Exposure on Human Health: A Systematic Review*, Envtl. Health Perspectives (Feb. 1, 2017), https://bit.ly/2NVA1LR [hereinafter "Cimino 2017"].

of the U.S. general population is exposed to neonics on a regular basis.[19] Contaminated food and water are likely the most common exposure sources. Where neonics contaminate drinking water sources, chlorination treatment typically does not remove them without additional filtration.[20] Fruits, vegetables, and processed foods—including baby food—frequently contain neonics too,[21] which, because they permeate treated foods, cannot be washed off.

B. National and International Assessment and Regulation of Neonics

In the past decade, the United States and other countries around the world have assessed neonics' risks and environmental impacts. While, in broad strokes, the scientific findings of the respective agencies are similar, the actions taken in response to the science are a portrait in contrasts.

The European Food Safety Authority (EFSA) was the first to release its findings. In 2013, it initially "identified a number of risks posed to bees" by popular uses of the three most-used neonic chemicals—clothianidin, imidacloprid, and thiamethoxam—including seed treatment uses and granules.[22] Recognizing these risks as well as the need for more information, the EU instituted a temporary ban of many outdoor uses of these neonic chemicals in 2013.[23] Following additional review, EFSA found in 2018 that "[m]ost uses of neonicotinoid pesticides represent a risk to wild bees and honeybees."[24] Subsequently, the European Commission expanded the 2013 neonic ban to most outdoor uses and made it permanent.

Similarly, in 2017-2018 Canada's Pest Management Regulatory Agency (PMRA), in its own reevaluation of nitroguanidine neonics, found that the chemicals posed varying risks to bees and other pollinators depending on the use, proposing cancellation of some neonic uses and significant restrictions on others.[25] Later in 2018, PMRA found that the nitroguanidine neonic chemicals posed unacceptable risks to Canada's aquatic ecosystems, proposing that all outdoor neonic uses (including neonic-treated crop seeds and non-agricultural uses) be cancelled.[26]

The U.S. EPA, under the Trump administration, has recognized many of the same risks that neonics pose to pollinators and the environment that its European and Canadian peer agencies have.[27] However, in

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[19] Maria Ospina et al., *Exposure to Neonicotinoid Insecticides in the U.S. General Population: Data from the 2015–2016 National Health and Nutrition Examination Survey*, Environmental Research (Sep. 2019), https://bit.ly/2YKLjmX; *see also* Go Ichikawa et al., *LC-ESI/MS/MS Analysis of Neonicotinoids in Urine of Very Low Birth Weight Infants at Birth*, PLoS One (Jul. 1, 2019), https://bit.ly/2nF2DNi (finding neonics in the urine of newborn babies, indicating that neonics pass from pregnant mother to developing fetus).
[20] *See* Kathryn L. Klarich et al., *Occurrence of Neonicotinoid Insecticides in Finished Drinking Water and Fate During Drinking Water Treatment*, Envtl. Sci. and Tech. Letters (Apr. 2017), https://bit.ly/2PMRunk [hereinafter "Klarich 2017"].
[21] *See, e.g.,* Olga Naidenko, *Neonic Pesticides: Banned in Europe, Common on U.S. Produce, Lethal to Bees*, Envt'l Working Group (Jul. 26, 2018), https://bit.ly/2EejbSx; Friends of the Earth, *Toxic Secret: Pesticides Uncovered in Store Brand Cereal, Beans, Produce*, http://bit.ly/2IlE26V (visited Oct. 17, 2019).
[22] EFSA, *EFSA Identifies Risks to Bees from Neonicotinoids* (Jan. 16, 2013), https://bit.ly/34AT5EN.
[23] European Commission, Commission Implementing Regulation (EU) No 485/2013, (May 24, 2013), https://bit.ly/2SEWA7M.
[24] *See* EFSA, *Neonicotinoids: Risks to Bees Confirmed* (Feb. 28, 2018), https://bit.ly/2I3C0f2.
[25] *See* PMRA, *Proposed Re-evaluation Decision PRVD2018-12, Imidacloprid and Its Associated End-use Products: Pollinator Re-evaluation* (May 31, 2018), https://bit.ly/2QlLHVI; PMRA, *Proposed Re-evaluation Decision PRVD2017-23, Clothianidin and Its Associated End-use Products: Pollinator Re-evaluation* (Dec. 19, 2017) https://bit.ly/2LbpY0b; PMRA, *Proposed Re-evaluation Decision PRVD2017-24, Thiamethoxam and Its Associated End-use Products: Pollinator Re-evaluation* (Dec. 19, 2018), https://bit.ly/2wNo5DK.
[26] *See* PMRA, *Proposed Special Review Decision PSRD2018-01, Special Review of Clothianidin Risk to Aquatic Invertebrates* (Aug. 15, 2018), https://bit.ly/2x2MHGk; PMRA, *Proposed Special Review Decision PSRD2018-02, Special Review of Thiamethoxam Risk to Aquatic Invertebrates* (Aug. 15, 2018), https://bit.ly/2wZbYQZ; PMRA, *Proposed Re-evaluation Decision PRVD2016-20, Imidacloprid* (Nov. 23, 2016), https://bit.ly/2Ky4iu4.
[27] *See, e.g.,* U.S. EPA, *Preliminary Terrestrial Risk Assessment to Support the Registration Review of Imidacloprid*, 8-9 (Nov. 28, 2017), https://bit.ly/2s7spLK; EPA, *Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam*, 14-23 (Jan.

contrast to its sister agencies, U.S. EPA issued proposed interim registration review decisions for all five major neonic chemicals approving their continued widespread (and largely unrestrained) use across the country.[28] Indeed, some of the proposed mitigation appears almost purposely designed to avoid addressing identified risks of concern.[29] In May of 2020, NRDC filed a petition and legal and technical comments outlining how U.S. EPA's analysis and proposed interim registration review decisions violate federal law by failing to protect against unreasonable adverse effects on the environment (including to pollinators) and risks to human health.[30]

C. DPR's Reevaluation of Neonics and Proposed Mitigation

DPR commenced reevaluation of pesticide products containing the four nitroguanidine-substituted neonic active ingredients—clothianidin, dinotefuran, imidacloprid, and thiamethoxam—on February 27, 2009.[31] DPR initiated the reevaluation after receiving data that imidacloprid applications to ornamental plants left imidacloprid residues in their leaves and blossoms at levels "well above" those lethal to bees, and which remained high for "more than 500 days after treatment."[32] Because the three other nitroguanidine neonics shared "soil mobility characteristics and half-lives that are very similar to imidacloprid," reevaluation was triggered for all four chemicals.[33]

In total, DPR initiated reevaluation for 282 neonic pesticide products—many of which were for approved for non-agricultural uses only, such as golf course turf products and Bayer's former "Bayer Advanced" line of home and garden consumer products.[34] From this list, DPR excluded neonic products unlikely to contaminate "source[s] of forage for honey bees and pollinators," such as indoor and veterinary uses.[35] While the 2009 Notice of Reevaluation announced DPR's intention to collect neonic residue data for "nectar and pollen of a representative number of crops,"[36] the document's text and associated list of reevaluated pesticides made clear that the reevaluation would also consider other uses—such as the ornamental plant uses that had initially triggered the reevaluation.

In 2014, the California legislature enacted California Food and Agriculture Code (FAC) § 12838 (the "2014 Pollinator Law"), which required DPR to "issue a determination with respect to its reevaluation of

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5, 2017), https://bit.ly/2jfMFon; U.S. EPA, *Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid*, 8-9 (Dec. 22, 2016), https://bit.ly/2r3Uuyy [hereinafter "U.S. EPA Imidacloprid Aquatic Risk Assessment 2016"].

[28] *See* U.S. EPA, *Proposed Interim Registration Review Decision for Neonicotinoids* (visited Oct. 19, 2020), https://bit.ly/3o03hzw.

[29] For example, EPA identified that consumer imidacloprid uses posed significant risks to aquatic ecosystems and showed some of the "strongest evidence of potential pollinator risk." U.S. EPA, *Imidacloprid: Proposed Interim Registration Review Decision*, 50 (Jan. 2020), https://bit.ly/34bVRRW [hereinafter "U.S. EPA Imidacloprid PID"]. However, to address the risks, the agency proposed only adding advisory label language identifying the products as "Intended for use by professional applicators." *Id.* Because most consumers are not professional applicators, the language would seem to advise consumers to simply not use purchased products. The label language appears odd in light of U.S. EPA authority to designate neonic products as "restricted use" and the seemingly nonsensical advisory may also cast doubt on the credibility of other label instructions.

[30] *See* Lucas Rhoads & Daniel Raichel, *Comments on the Proposed Interim Registration Review Decisions for the Neonicotinoid Insecticide Class*, NRDC (May 4, 2020), https://on.nrdc.org/35bI1y9; Jennifer Sass & Lucas Rhoads, *Petition to Revoke All Neonic Tolerances and Comments Regarding Dietary Exposure*, NRDC (May 4, 2020), https://on.nrdc.org/31p4MOd [hereinafter "NRDC FQPA Petition 2020"].

[31] DPR, *Notice of Decision to Initiate Reevaluation of Chemicals in the Nitroguanidine Insecticide Class of Neonicotinoids*, California Notice 2009-02 (Feb. 27, 2009), https://bit.ly/2DMA7la [hereinafter "2009 Notice of Reevaluation"].

[32] *Id.* at 1. The information was registrant-disclosed pursuant to California Food and Agriculture Code (FAC) § 12825.5.

[33] *Id.* at 2.

[34] *Id.*; List of Neonic Products Referenced in California Notice 2009-02 for the Initiation of Reevaluation of Chemicals in the Nitroguanidine Insecticide Class of Neonicotinoids, obtained Sept. 14, 2020, and attached as Attachment A to these comments [hereinafter "2009 Notice of Reevaluation Pesticide List"].

[35] *Id.* at 2-3. Specifically, DPR excluded the following products: (1) those formulated as a gel or impregnated in a strip; (2) termiticides; (3) flea control products combined with rodenticides; (4) pet spot applications; (5) ant and roach baits; (6) premise application for control of nuisance pests; and (7) manufacturing use only products.

[36] *Id.* at 3.

neonicotinoids," on or before July 1, 2018. FAC § 12838(a). The law further required that within two years of issuing the reevaluation determination, DPR must "adopt any control measures necessary to protect pollinator health" or else submit a report to the legislature explaining why such measures have not yet been adopted. FAC § 12838(a)(b).

In July 2018, DPR released a determination of neonics' risks to bees (the "2018 Risk Determination"), which identified agricultural neonic foliar and soil applications—broken out by crop and application method—that create "colony-level" risks to honey bees.[37] Risks were determined by observed neonic levels in pollen and nectar for treated agricultural crops only. The determination states that it satisified the reevaluation requirement of the 2014 Pollinator Law, but contains no risk analysis for other neonic exposure routes or outdoor uses (such as ornamental uses).[38]

On October 17, 2019, NRDC, along with the Center for Biological Diversity, Friends of the Earth, and the Xerces Society for Invertebrate Conservation, sent a letter to DPR identifying numerous concerns with the 2018 Risk Determination.[39] Among them were the determination's failures to assess risks from: outdoor, non-agricultural neonic uses; neonic-treated crops seeds; and other exposure routes, such as contaminated soil, water, and non-crop plants. The letter also identified concerns with using honey bee colony health as a proxy for the overall health of all California pollinators as well as concerns with neonics' broader ecological and potential human health impacts. On December 10, 2019, the letter signatories met with DPR to discuss these concerns.

In June of 2020, DPR released the Proposed Mitigation, and announced a public comment period, which the agency later extended to Oct. 11, 2020. At public webinars on August 11 and 12, DPR clarified that the scope of the Proposed Mitigation addresses only the risks of concern identified in the 2018 Risk Determination. On a September 8, 2020, conference call with NRDC, DPR stated that it believed the Proposed Mitigation fully satisfies the requirements of the 2014 Pollinator Law. DPR also stated that it would later release materials explaining the connection between the 2018 Risk Determination conclusions and the mitigation selected in the Proposed Mitigation.

II. Governing Law

The FAC charges DPR "[t]o provide for the proper, safe, and efficient use" of pesticides in order to, among other things, "protect the environment from environmentally harmful pesticides by prohibiting, regulating, or ensuring proper stewardship of those pesticides." *Id.* § 11501(a), (b). To this end, all pesticides sold, manufactured, or used in California must be first registered with DPR. *See* FAC §§ 12811, 12993, 12995. DPR may control the time, manner, and place of pesticide use through conditions imposed through the registration process, through its restricted material permitting program, or otherwise through regulation. *See* FAC §§ 12781, 12824, 14001-14015. DPR may also deny registration for or otherwise prohibit harmful or needless pesticides or pesticide uses. *See* FAC §§ 12781, 12824, 12825, 14102.

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[37] DPR, *California Neonicotinoid Risk Determination*, (Jul. 2018), https://bit.ly/2mwH6ph [hereinafter "2018 Risk Determination"].
[38] DPR, *California Neonicotinoid Risk Determination*, 8 (Jul. 2018), https://bit.ly/33HaU6d [hereinafter "Risk Determination"] (stating the reevaluation "meets the requirements of FAC §12838(a)").
[39] Letter from NRDC, Center for Biological Diversity, Friends of the Earth, and the Xerces Society for Invertebrate Conservation to DPR entitled "Concerns Regarding Reevaluation of Neonicotinoid Insecticides and Anticipated Rulemaking," (Oct. 17, 2019), attached as Attachment B to these comments.

The FAC imposes several duties on DPR in its regulation of pesticides. With respect to neonics and the Proposed Mitigation in particular, DPR must "adopt any control measures necessary to protect pollinator health." FAC § 12838. More generally, DPR must regulate and control the use of pesticides that create hazards to domestic animals (including honeybees), the environment, or farmworker and public health as "restricted materials." FAC §§ 14001, 14004.5. DPR must likewise regulate or prohibit the use of any "environmentally harmful materials," and in doing so "shall take whatever steps [DPR] deems necessary to protect the environment." *Id.* § 14102. Further, DPR must "endeavor to eliminate from use in the state any pesticide that endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented." FAC § 12824.

III. Comments

A. The Proposed Mitigation Represents an Important First Step on an Issue of Considerable Statewide, and National, Importance

As an initial matter, NRDC recognizes the considerable work reflected both in the 2018 Risk Determination and the Proposed Mitigation. To our knowledge, these efforts mark the only attempt by a U.S. state agency to analyze or mitigate for, in detailed fashion, the injuries and risks caused by agricultural neonic use—either to pollinators or any living thing. For this, we applaud DPR's efforts and attention to this issue.

However, while much work has been done, much more is left to do. Neonic exposure from the ingestion of the pollen and nectar of neonic-treated crops represents an important and harmful exposure pathway, requiring mitigation, but it is only one of many. Neonics' high insect-toxicity, persistence, and systemic properties coupled with their widespread use has contaminated whole ecosystems to likely devastating effect. Further, while agricultural foliar and soil uses may account for a significant portion of the neonics now polluting California's environment, a larger portion still may come from neonic-treated crop seeds and non-agricultural neonic uses.

The following comments outline the uses, exposure pathways, risks and harms, and other considerations DPR must account for in order to satisfy the protective mandate of the 2014 Pollinator Law as well as its general duties under the FAC. The Proposed Mitigation, while falling short of the Legislature's mandate, represents an important first step. DPR should therefore move forward with the current mitigation proposal—providing immediate protections while it addresses gaps in its analysis and mitigation plans. In doing so, DPR should make clear that the mitigation plan in the Proposed Mitigation is only a temporary interim measure.

Given the size and diversity of California agriculture and DPR's reputation as a leading state pesticide regulatory agency, the neonic mitigation DPR ultimately proposes may be of nationwide influence regarding one of the most widespread and ecologically harmful instance of pesticide contamination since DDT and "Silent Spring."[40] It is therefore of the utmost importance that DPR continue its work to

[40] The comparison between neonic contamination and the effects described in Rachel Carson's *Silent Spring* have increasingly been made in both the scientific community as well as the media. *See, e.g.,* S.D. Frank & J.F. Tooker, *Opinion: Neonicotinoids Pose Undocumented Threats to Food Webs*, PNAS (Sep. 15, 2020), https://bit.ly/3iZjpxC [hereinafter "Frank & Tooker 2020"]; Damian Carrington, *Fishery Collapse 'Confirms Silent Spring Pesticide Prophecy: Common Pesticides Found to Starve Fish 'Astoundingly Fast' by Killing Aquatic Insects*, The Guardian (Oct. 31, 2019), https://bit.ly/2T8eoIr; Jason Bittel, *Second Silent Spring? Bird Declines Linked to Popular Pesticides*, National Geographic (Jul. 9, 2014), https://on.natgeo.com/3dK9bjx.

ensure that its ultimate neonic mitigation fully meets the FAC's standards for the protection of pollinators, the environment, and all Californians.

B. The Proposed Mitigation Fails to Adopt Control Measures Necessary to Protect Pollinator Health

The 2014 Pollinator Law requires that DPR "adopt any control measures necessary to protect pollinator health." FAC § 12838(b)(1). As described below, given the numerous critical omissions in the Proposed Mitigation, it fails to fully satisfy this requirement.

1. The Limited Scope 2018 Reevaluation Determination Fails to Satisfy the 2014 Pollinator Law

The 2014 Pollinator Law requires that, by July 1, 2018, DPR have completed "its reevaluation of neonicotinoids." FAC § 12838(a). That reevaluation was initiated by data DPR received regarding the lethal and long-lasting neonic residues left by applications of imidacloprid to ornamental plants.[41] DPR's 2009 Notice of Reevaluation defined the scope of reevaluation, stating it "involve[d] 50 registrants and 282 pesticide products," many of which are non-agricultural products with no agricultural applications, such as golf course turf products and the "Bayer Advanced" line of home and garden products.[42] Accordingly, while the notice excludes indoor and veterinary neonic products unlikely to contaminate "source[s] of forage for honey bees and pollinators," it and the accompanying product list make clear that outdoor, non-agricultural neonic products—such as the ornamental uses that triggered reevaluation—were a key focus of the reevaluation.[43]

In a stark and unexplained departure from the scope of the reevaluation defined in the 2009 notice, the 2018 Reevaluation Determination assessed risks to honey bee colony health from agricultural neonic uses only. *See infra* Section III, B, 2. Yet there is more evidence now that confirming what DPR has long known—that non-agricultural and ornamental uses pose substantial risks to pollinator health.[44] Because the 2018 Reevaluation Determination fails to assess risks to pollinators from the non-agricultural and ornamental uses identified in the 2009 Notice of Reevaluation, it does not fully complete the reevaluation that DPR initiated in 2009, which the 2014 Pollinator Law references. Accordingly, the 2018 Reevaluation determination fails to meet the completion of reevaluation requirement of the 2014 Pollinator Law. *See* FAC § 12838(a).

Similarly, the 2018 Reevaluation Determination fails to adequately consider the risks from neonic-treated seeds. The product list for the 2009 Notice of Reevaluation lists numerous neonic seed treatment products,[45] yet DPR did not formally assess risks from neonic-treated seed use in the 2018 Reevaluation Determination, relying instead on U.S. EPA risk assessments. *See infra* Section III, B, 3. As discussed below, neonic-treated seeds pose considerable risks to pollinator health in California. The failure of the 2018 Reevaluation Determination to formally assess these risks therefore fails to satisfy the completion of reevaluation requirement of the 2014 Pollinator Law. *See* FAC § 12838(a).

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[41] 2009 Notice of Reevaluation at 1.
[42] *See Id.*; 2009 Notice of Reevaluation Product List.
[43] *Id.* at 2-3. 2009 Notice of Reevaluation Product List.
[44] Travis Grout et al., *Neonicotinoid Insecticides in New York State*, Cornell University 225-26 (Jun. 2020), https://bit.ly/3md4Mto [hereinafter "Grout 2020"].
[45] *See* 2009 Notice of Reevaluation Product List (listing Admire 2 Flowable Insecticide, Provado 1.6 Flowable Insecticide, Gaucho 480 Flowable, Gaucho 600 Flowable, and Pasada 1.6 F Flowable Insecticide among others).

2. *The Proposed Mitigation Wholly Fails to Address the Substantial Threats Non-Agricultural Neonic Uses Pose to Pollinator Health*

The Proposed Mitigation wholly excludes mitigation for all outdoor, non-agricultural neonic products, despite their extensive use across the state, and the high risks that they pose to pollinators. In 2017, for example, 78,130 pounds of the neonic chemical imidacloprid was applied in non-agricultural settings, representing 13.7% of the total Pesticide-Use-Reporting-database (PUR)-recorded imidacloprid use for that year.[46] This total, however, is likely a considerable underestimate given consumer neonic uses, such as consumer lawn and garden products, are not tracked in the PUR system. While indoor uses account for some of this use, DPR's own water testing shows neonic contamination in over 90% of Southern California urban surface water samples, indicating extensive outdoor, non-farm use.[47] DPR's Proposed Mitigation, by not addressing these uses, would allow them to continue at business-as-usual rates.

These uses pose considerable threats to pollinator populations—both in frequency and in magnitude.[48] Neonics are often applied to ornamental plants that are highly pollinator-attractive, such as flower gardens, whose pollen and nectar become contaminated with the neonic active ingredients due to their systemic properties. These risks may endure for long periods of time. For example, neonic residues can persist in ornamental trees for several years after treatment, and falling contaminated foilage from treated trees can contaminate water and other environmental media.[49] Exacerbating the problem is the fact that many neonic product labels allow use rates that greatly exceed those approved for agriculture, sometimes by orders of magnitude.[50] Moreover, consumers often fail to read product labels, applying the products in excess of even the higher labeled rates.

Even where neonics are not applied directly to pollinator-attractive plants, neonic residues can still find their way into pollen and nectar of those plants, as well as into soil and water, where pollinators are likely to be exposed. Half-lives of up to 1,000 days have been recorded for neonic residues in soil[51]—where the chemicals are often deposited through soil applications, treated seeds, chemigation, or otherwise. Neonics also travel easily in rain or from lawn watering, allowing them to spread through soil where they can contaminate the pollen and nectar of non-target plants, which may remain contaminated for years after the initial application—sometimes at higher levels than in the target plants.[52] In the agricultural context, studies suggest that this broader landscape contamination may be

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[46] *See* DPR, California Pesticide Information Portal (CalPIP), (accessed Sep. 9, 2020), *available at* https://calpip.cdpr.ca.gov/main.cfm.
[47] *See, e.g.*, Robert Budd, *Urban monitoring in Southern California watersheds FY 2017-2018*, DPR (Mar. 1, 2019), https://bit.ly/2nY9TUq [hereinafter "DPR Southern CA Urban Water Monitoring 2019"] (finding imidacloprid in 92% of all samples).
[48] Grout 2020 at 225-26.
[49] Worldwide Assessment Part 1; J. M. Bonmatin et al., *Environmental Fate and Exposure; Neonicotinoids and Fipronil*, Environmental Science and Pollution Research (Aug. 7, 2014), https://bit.ly/3iuSnOZ [hereinafter "Bonmatin 2014"].
[50] *See generally* Jennifer Hopwood et al., *How Neonicotinoids Can Kill Bees (2nd ed.)*, Xerces Society for Invertebrate Conservation, (2016), https://bit.ly/36fqOn7 [hereinafter "Hopwood 2016"].
[51] Bonmatin 2014.
[52] *See Id.*; Kate Basely & Dave Goulson, *Effects of Field-Relevant Concentrations of Clothianidin on Larval Development of the Butterfly Polyommatus icarus (Lepidoptera, Lycaenidae)*, Env. Sci. Technol. (Apr. 2018), https://bit.ly/2Zz9GY4 [hereinafter "Basely & Goulson 2018"] (finding plant food source of wild butterfly larva located next to wheat crop treated with the neonic clothianidin "not only contain[ed] the pesticide at concentrations comparable to and sometimes higher than those found in foliage of treated crops (range 0.2-48 ppb) but also remain[ed] detectable at these levels for up to 21 months after sowing"); Cristina Botías et al., *Contamination of Wild Plants Near Neonicotinoid Seed-Treated Crops, and Implications for Non-Target Insects*, Science of the Total Environment (Oct. 1, 2016), https://bit.ly/2EdJG9i ("Our results suggest that neonicotinoid seed-dressings lead to widespread contamination of the foliage of field margin plants"); Cristina Botías et al. *Neonicotinoid Residues in Wildflowers, a Potential Route of Chronic Exposure for Bees*, Env. Sci. Technol. (Oct. 6, 2015), https://bit.ly/3mhwTYm [hereinafter "Botías 2015"] ("we show that exposure is likely to be higher and more prolonged than currently recognized because of widespread contamination of wild plants growing near treated crops."); Schaafsma et al., *Neonicotinoid Insecticide Residues in Surface Water*

the primary driver of pollinator exposure to neonics and that higher soil concentrations of neonics in areas of neonic use are associated with lower native bee species richness.[53] Given neonics' chemical properties and use patterns in non-agricultural settings, the likelihood of neonic migration causing similar risks to bees and other pollinators is high.

DPR's own findings speak to the considerable risks to pollinators posed by persistent and migratory neonic residues from non-agricultural neonic uses. DPR initiated the neonic reevaluation on data showing that imidacloprid applications to ornamental plants left imidacloprid residues in their leaves and blossoms at levels "well above" those lethal to bees.[54] These residues "remained relatively low for the first six months after application, followed by a dramatic increase that remained stable in some cases for more than 500 days after treatment," indicating that "use of imidacloprid on an annual basis may be additive" as "significant residues from the previous use season" remain available to plants in subsequent years.[55] Further, DPR testing showing frequent neonic contamination in California urban surface waters indicates the tendency of these residues to cause extensive environmental contamination.[56]

Importantly, non-agricultural neonic use greatly enlarges the geographic expanse of where neonics threaten pollinators. Non-agricultural neonic uses dominate in areas well away from California's agricultural landscapes—such as the state's urban coastal areas—and many of those areas are the primary home for California's pollinating species, particularly endangered species. For example, the endangered callippe silverspot butterfly's only known habitat lies mainly within urban and suburban areas of the San Francisco Bay area, just as the endangered El Segundo blue butterfly's habitat lies within similarly urbanized areas of Southern California.[57] With little agriculture, non-agricultural neonic uses predominate in these areas. As many of the state's thousands of pollinating species also likewise live either partially or wholly outside of agricultural areas, any mitigation adequate to protect pollinator health must address non-agricultural uses. Because the Proposed Mitigation fails to do so, it also fails to satisfy the substantive pollinator protection standard of the 2014 Pollinator Law. *See* FAC § 12838(b)(1).

3. *The Proposed Mitigation Wholly Fails to Address the Substantial Threats Neonic-Treated Crop Seeds Pose to Pollinator Health*

The Proposed Mitigation excludes the use of neonic-treated crop seeds. Unlike all other agricultural neonic uses, the use of neonic-treated seeds remains wholly untracked and unregulated, due to a DPR

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and Soil Associated with Commercial Maize (Corn) Fields in Southwestern Ontario, PLoS One (Feb. 24, 2015), https://bit.ly/32wMJqt [hereinafter "Schaafsma 2015"]; Anson Main et al., *Widespread Use and Frequent Detection of Neonicotinoid Insecticides in Wetlands of Canada's Prairie Pothole Region*, PLoS One (Mar. 26, 2014), https://bit.ly/2CLoom3 [hereinafter "Main 2014"].

[53] *See, e.g.,* Anson Main et al., *Reduced Species Richness of Native Bees in Field Margins Associated with Neonicotinoid Concentrations in Non-Target Soils*, Agriculture, Ecosystems & Environment (Jan. 1, 2020), http://bit.ly/2OhMB6W [hereinafter "Main 2020"] (finding neonics in soils adjacent to both fields with historic neonic use and those without historic neonic use and that higher soil concentrations were correlated with lower native bee species richness); Scott McArt et al., High Pesticide Risk to Honey Bees Despite Low Focal Crop Pollen Collection During Pollination of a Mass Blooming Crop, Scientific Reports (Apr. 19, 2017), https://go.nature.com/2LO2ksS [hereinafter "McArt 2017"] (finding "majority of risk" from pesticide exposure for honey bees at apple orchards "risk came from pesticides that were not sprayed during bloom and non-focal crop sources"); Botías 2015 (finding "the large majority (97%) of neonicotinoids brought back in pollen to honey bee hives in arable landscapes was from wildflowers, not crops"), https://bit.ly/3mhwTYm.

[54] 2009 Notice of Reevaluation at 1.

[55] *Id.* at 1-2.

[56] DPR Southern CA Urban Water Monitoring 2019.

[57] *See* U.S. Fish & Wildlife Service, *Callippe Silverspot Butterfly (Speyeria Callippe Callippe)*, Environmental Conservation Online System (ECOS) (visited Oct. 20, 2020), https://bit.ly/2HpHuAI; U.S. Fish & Wildlife Service, *El Segundo Blue Butterfly (Euphilotes Battoides Allyni)*, ECOS (visited Oct. 20, 2020), https://bit.ly/3kaWu3L.

policy that effectively exempts them from the FAC's definition of "pesticide."[58] However, recent research finds that neonic-treated seeds may be the single largest use of neonics in California and are likely causing considerable harm to a broad swath of California pollinators.[59]

Specifically, that estimate finds California's total potential neonic-treated seed use (i.e., if neonic-treated seeds were used on all crops where such seeds are available) may cover as many as 4,000,000 acres, depositing 512,000 pounds of neonic active ingredients annually—well more than the 474,000 pounds of neonics applied by other means as reported in the PUR.[60] While the true total use remains unknown, it is likely considerable. Use of neonics on crop seeds is near ubiquitous in corn (which covers 460,000 acres in California) and cotton (258,000 acres), and widespread in wheat (420,000 acres).[61] Less information is available on neonic-treated seed use on other crops, but trends appear to suggest ever-increasing use.[62] Further, in California, retirement of older pesticide chemistries may also induce a shift to greater use of neonic-treated seeds.

Even under realistic low-end estimates, neonic-treated seed use in California is vast, but yet has largely been overlooked by DPR. Based on reasoning from U.S. EPA risk assessments, the 2018 Risk Determination finds neonic-treated seeds present "low risk to honey bee colonies" because little of their active ingredient ends up in the pollen and nectar of the target crop.[63] This, however, ignores the reality that the neonic active ingredients migrate *elsewhere* through the environment. Studies of neonic-treated corn, canola, and wheat have documented neonic residues in planted fields as well as surrounding soils, surface waters, and plant life—including the pollen and nectar of adjacent wildflowers, often at higher levels than that of the target crops.[64] During planting, clouds of abraded "seed dust" drifting across farm fields can prove fatal to bees and other pollinators and beneficial insects.[65] After planting, rain and irrigation water carry neonic-laden runoff water through ecosystems.[66] Substantial amounts of contaminated runoff have been documented leaving farm fields several months after planting and traveling considerable distances into wetlands and other water supplies.[67] Because neonics can persist in soil and plants for years, neonics often build-up in areas of repeated use and leave long-lasting legacy contamination.[68] Indeed, in areas where neonic-treated seeds are the predominant

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[58] NRDC et al., *Rulemaking Petition to Regulate Crop Seeds Treated with Neonicotinoids and Other Systemic Insecticides*, 11-12 (Sep. 23, 2020), https://on.nrdc.org/3nSOJlp [hereinafter "Neonic-Treated Seed Petition"].
[59] Pierre Mineau, *Neonicotinoids in California: Their Use and Threats to the State's Aquatic Ecosystems and Pollinators, with a Focus on Neonic-Treated Seeds*, (Sep. 2020), https://on.nrdc.org/35fAnTC [hereinafter "Mineau 2020"].
[60] *Id.* at 15.
[61] *See id.* at Appendix 4; U.S. Dep't of Agriculture (USDA), *2019 State Agricultural Overview: California* (accessed Jul. 9, 2020), https://bit.ly/2ZdE5v1.
[62] *See* Douglas & Tooker 2015; Mineau 2020 at 1, 4, Appendix 4.
[63] 2018 Risk Determination at 8.
[64] *See, e.g.,* Cristina Botías et al., *Contamination of Wild Plants Near Neonicotinoid Seed-Treated Crops, and Implications for Non-Target Insects*, Science of the Total Environment (Oct. 1, 2016), https://bit.ly/2EdJG9i ("Our results suggest that neonicotinoid seed-dressings lead to widespread contamination of the foliage of field margin plants"); Bonmatin 2014 (summarizing evidence of neonics' long persistence in soils and describing multiple neonic exposure routes); Schaafsma 2015; Main et al. 2014.
[65] Grout 2020 at 210-11 (discussing risks and harms to pollinators from neonic-treated seed dust).
[66] *See, e.g.,* Jesse Radolinski et al., *Plants Mediate Precipitation-Driven Transport of a Neonicotinoid Pesticide*, Chemosphere (May 2019), https://bit.ly/2OmbfT4 (documenting "that neonicotinoids can be transported from seed coatings both above and through the soil profile, which may enable migration into surrounding ecosystems."); Sara A. Whiting & Michael Lydy, *A Site-Specific Ecological Risk Assessment for Corn-Associated Insecticides*, Integrated Environmental Assessment and Management (Dec. 30, 2014), https://bit.ly/3elHw7i [hereinafter "Whiting & Lydy 2014"].
[67] Whiting & Lydy 2014; Sara Whiting et al., *A Multi-Year Field Study to Evaluate the Environmental Fate and Agronomic Effects of Insecticide Mixtures*, Science of the Total Environment (Nov. 1, 2014), https://bit.ly/2ZNXp2p; Jesse Miles et al., *Effects of Clothianidin on Aquatic Communities: Evaluating the Impacts of Lethal and Sublethal Exposure to Neonicotinoids*, PLoS One (Mar. 23, 2017) https://bit.ly/3jsaciH, *with 2018 correction* Miles et al., PLoS ONE, https://bit.ly/2ZOSVZb [hereinafter "Miles 2017"].
[68] Bonmatin 2014 ("the half-lives of neonicotinoids in soils can exceed 1,000 days"); Main 2020 (detecting neonics in soils adjacent to both fields with historic neonic use and those without historic neonic use; higher soil concentrations were correlated with lower native bee species

neonic use, neonic pollution is often described as "ubiquitous"—with the chemicals appearing in fields with no history of neonic use as well as local water supplies.[69]

Neonics' potent invertebrate toxicity translate this pervasive contamination into substantial harm. Neonic-treated seeds have driven the dramatic increase in neonic use generally in the last several decades,[70] which has made U.S. agriculture up to forty-eight times more toxic to insect life.[71] This increase has been linked with declines in insect populations—including California pollinators[72]—which ripple through ecosystems. Many studies also now link neonic-treated seed use directly with harms to pollinator populations and pollinator health.[73] Indeed, a recent Cornell University review of roughly a hundred exposure studies finds neonic-treated field crop seeds pose "substantial" risks to bees.[74]

In light of this large and growing body of scientific literature, as well as their large and growing use nationwide, DPR cannot rely on U.S. EPA's risk conclusions regarding neonic-treated seeds. Those conclusions suffer from many of the same omissions that cause the 2018 Risk Determination to significantly underestimate the impacts of neonic-treated seeds and other neonic uses on pollinator health.[75] DPR must perform its own analysis with respect to the environmental risks and harms cause by neonic-treated seed use. As DPR's September 28, 2020, memorandum notes, DPR already has neonic-treated seed residue studies in its possession, which it ignored for the purpose of the Proposed Mitigation[76]—ignoring exposure pathways that may cause harm to pollinators, the environment, or public health.

DPR may not justify inaction with its current policy that neonic-treated seeds fall outside its regulatory authority. As outlined in the petition filed by NRDC and several other advocacy groups on September 23, 2020, this policy constitutes and improper "underground rule" and violates the FAC.[77] The FAC demands that DPR regulate neonic-treated seeds as "pesticides" under that law and provide any control measures necessary to protect pollinator health from their use.[78]

On the whole, neonic-treated seeds represent a large and growing use of neonics that threatens the health of pollinators over hundreds of thousands (if not millions) of acres of California agricultural land and the surrounding environment. The complete exclusion of any mitigation proposal for neonic-treated seed use—or even for neonic-seed treatment products—renders the Proposed Mitigation as lacking necessary control measures to protect pollinator health. So too does DPR's failure to consider the

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richness); Schaafsma 2015 (measuring pre-plant neonic levels as high as 7.5 µg/L in ditches outside a seeded field and 16.5 µg/L in puddles outside Ontario corn fields, indicating contamination from the previous use of seed treatments in the preceding growing season).

[69] Main 2020; Klarich 2017; Tamanna Sultana et al., *Neonicotinoid Pesticides in Drinking Water in Agricultural Regions in Southern Ontario, Canada*, Chemosphere (Jul. 2018), http://bit.ly/2JZawXI.

[70] Douglas & Tooker 2015.

[71] *See* DiBartolomeis 2019; Margaret Douglas et al., *County-level Analysis Reveals a Rapidly Shifting Landscape of Insecticide Hazard to Honey Bees (Apis Mellifera) on US Farmland*, Scientific Reports (Jan. 21, 2020), https://go.nature.com/2SKhjHP [hereinafter "Douglas 2015"].

[72] *See* Forister 2016.

[73] *See, e,g.*, Main 2020; N. Tsvetkov et al., *Chronic Exposure to Neonicotinoids Reduces Honey Bee Health Near Corn Crops*, Science (Jun. 30, 2017), https://bit.ly/3hx9EH0; Ben Woodcock et al., *Impacts of Neonicotinoid Use on Long-Term Population Changes in Wild Bees in England*, Nature Communications (Aug. 16, 2016), https://go.nature.com/3hxAFKi; Maj Rundlöf, *Seed Coating with a Neonicotinoid Insecticide Negatively Affects Wild Bees*, Nature (Apr. 22, 2015), https://go.nature.com/2CYNo9Q.

[74] Grout 2020 at 237-38.

[75] *See generally* Mineau 2020 at 26-38.

[76] Karen Morrison, Assistant Director, DPR Pesticide Programs Division, *Memorandum: Identification of Crop Residue Studies for Development of Draft Proposed Pollinator Protection Regulations in Response to the Neonicotinoid Reevaluation*, 14 (Sep. 28, 2020), https://bit.ly/2Th73GL.

[77] *See generally* Neonic-Treated Seed Petition.

[78] DPR does not note this policy in the 2018 Risk Determination or any of the supporting materials for the Proposed Mitigation. However, to the extent this policy is an unspoken reason as to why DPR has avoided proposing mitigation for neonic-treated seed use, that reasoning violates the FAC.

scientific evidence regarding exposures from neonic-treated seeds when it determined which mitigation measures were necessary, including for soil and foliar uses, given the time-cumulative toxicity of neonics. *See infra* Section III, B, 4, ii. Accordingly, in this respect, the Proposed Mitigation fails to satisfy the protective mandate of the 2014 Pollinator Law. *See* FAC § 12838(b)(1).

4. The Proposed Mitigation Wholly Fails to Address Commonplace Neonic Exposure Sources That Threaten Pollinator Health and Their Cumulative Impacts

The 2018 Reevaluation Determination evaluates risks to honey bee colony health from the ingestion of pollen and nectar from neonic-treated agricultural crops only.[79] This narrow analysis ignores three important realities—namely, that: (1) wherever neonics are used they tend to broadly contaminate the surrounding environment; (2) this creates the strong likelihood that bees and other pollinators will be exposed to multiple significant sources of neonics outside of the pollen and nectar of the treated crop; and (3) harm to insect pollinator health from neonic exposures is additive over the life of the pollinator—in other words, greater neonic exposure equals greater harm, regardless of whether it occurs all at once or in small amounts spread over a long period of time.

Because the Proposed Mitigation addresses only those risks identified in the 2018 Reevaluation Determination, that determination's failure to consider several sources of neonic exposure with significant bearing on pollinator health renders the Proposed Mitigation insufficient to satisfy the substantive protective standard for pollinator heath of the 2014 Pollinator Law. *See* FAC § 12838(b)(1).

i. The Proposed Mitigation ignores several highly significant neonics exposure routes for pollinators

Recent research highlights that bees and other pollinators encounter neonics from a variety of sources, and that much (and perhaps the great majority) of this exposure comes from sources other than the pollen and nectar of neonic-treated crops. The 2018 Reevaluation Determination, and, by extension, the Proposed Mitigation, overlook the following key exposure sources.

a. Neonic-contaminated water

DPR ignores exposures that bees and other pollinating species are likely to have based on contact with and ingestion of neonic-contaminated water. Like all animals, pollinators must consume water, either by drinking it or obtaining it from their food. The 2018 Risk Determination appears to adopt the assumption of U.S. EPA that bees and other pollinators will satisfy all or nearly all of their water needs through the consumption of floral nectar. However, consumption of even a small amount of neonic-contaminated water may lead to significant neonic exposure, and the assumption that all pollinating species will consume only nectar and no water is highly unrealistic.

Initially, evidence demonstrates that pollinators drink water. The most-studied species have been honey bees, which even have members of the hive dedicated to water foraging.[80] The consumption of water versus nectar can be highly variable, depending on the landscape. For example, in areas with low-nectar-yielding plant life (e.g., a field of corn or tomatoes), bees will likely rely on surface waters or possibly guttation fluids—the excretion of excess water or nutrients through small openings on a plant's leaves

[79] *See* 2018 Reevaluation Determination at 6-8.
[80] Mineau 2020 at 35.

or stems—to satisfy their water needs. In its pollinator risk assessments, U.S. EPA acknowledged this uncertainty, estimating that honey bees would rely on water for between 7% to 100% of their daily water intake, with an estimated maximum water consumption level of 47 µL/day.[81] Water exposures may be an even greater concern for many of California's thousands of native pollinating species that receive less or none of their water needs from nectar.

There is every indication that the risk of pollinators' consumption of neonic-contaminated water in California is substantial. State and federal water testing show that neonics extensively contaminate California surface waters at levels expected to cause ecosystem-wide damage.[82] DPR testing has detected imidacloprid alone in more than 90% of Southern and Central California surface water samples and nearly 60% of Northern California urban surface water samples—all above EPA chronic benchmark levels for harm to aquatic invertebrates,[83] a relevant measure for pollinating insects.

Guttation fluid—liquids exuded by plants onto the surfaces of their leaves and stems—also presents concerns. For example, several researchers looking at corn planted with neonic-treated seeds found that neonic levels in guttation fluids were typically *two-to-three orders of magnitude higher* than found in nectar and pollen.[84] Accordingly, pollinators consuming or contacting these fluids are at considerable additional risk.

California's agricultural landscapes and arid climate zones may also contribute to risk. Agricultural monocultures often leave fewer nectar resources for native and managed bees, encouraging water foraging and consumption. In arid climates, the most accessible sources of water may be puddles in and around irrigated fields. Recent research shows—at least in areas sown with neonic-treated crop seeds—these puddles often contain neonic levels that would be damaging to pollinator health.[85] Further, honey bees have been observed as tending to prefer warmer and "unsanitary" water—i.e., that having higher levels of organic matter.[86] A puddle warmed by the spring sun in a newly fertilized, neonic-seeded corn field, for example, likely presents a highly attractive water source.

As Mineau (2020) observes, U.S. EPA has recognized that if bees and other pollinating insects "obtained [water] through puddles or guttation fluids, these routes of exposure would dwarf other routes of exposure such as direct sprays or dietary exposure through nectar or pollen."[87] Yet that agency inexplicably excluded these routes of exposure in its quantitative analysis of risk to pollinators. Because these routes are of considerable concern to California pollinators, DPR may not similarly exclude them from its risk calculations—they must be accounted for and mitigated appropriately.

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[81] *Id.* at 35.
[82] *Id.* at 1.
[83] *See* Xin Deng, *Surface Water Monitoring for Pesticides in Agricultural Areas in the Central Coast and Southern California, 2018*, DPR (May 28, 2019), https://bit.ly/2n8Epeg (finding imidacloprid in 94% of all samples); Robert Budd, *Urban monitoring in Southern California watersheds FY 2017-2018*, DPR (Mar. 1, 2019), https://bit.ly/2nY9TUq (finding imidacloprid in 92% of all samples); Michael Ensminger, *Ambient and Mitigation Monitoring in Urban Areas in Northern California FY 2017/2018*, DPR (Feb. 21, 2019), https://bit.ly/33EWXCK (finding imidacloprid in 58% of all samples). The detection threshold for imidacloprid in these DPR tests equals the U.S. EPA chronic benchmark for harm to aquatic invertebrates (0.01 ug/L), any detection indicates an exceedance of this threshold. *See* U.S. EPA Aquatic Life Benchmarks.
[84] Mineau 2020 at 36
[85] Mineau 2020 at 35.
[86] *Id.*
[87] Mineau 2020 at 36.

b. Neonic-contaminated soil

The 2018 Risk Determination fails to account for the threat of exposure of many of California's native pollinators to neonic-contaminated soil. It is estimated that about 70% of North American bee species are ground nesting.[88] These species make their home in soil—which, in agricultural, urban, and suburban landscapes, is frequently contaminated with neonics.[89] In farmed areas, recent research shows that the dramatic increase in neonic use over the past several decades has made U.S. agriculture up to four times more toxic to insect life on a contact-exposure basis.[90] The risk of exposure with contaminated soils in agricultural areas was recently highlighted in a study finding:

> neonicotinoid residues in soil pose a high risk to female hoary squash bees as they construct their nests in Cucurbita-crop growing systems or in field crop soils. These demonstrable risks for hoary squash bees seem likely to be applicable to other species of ground-nesting bees nesting in agricultural soils.[91]

While the 2018 Risk Determination accounts for risks from "soil applications"—where a neonic solution or granules are applied directly to soil—it does not account for the obvious contact risks that these applications entail. For example, a ground nesting bee in or near a crop field may very well be killed by a soil drench. The failure of the 2018 Risk Determination to consider these risks, and those of contact with contaminated soil generally, cannot be justified. DPR must analyze the risks from soil exposures and propose mitigation accordingly.

c. Neonic-contaminated non-target plants

A growing body of research shows that bees and other pollinators may face some of the greatest neonic exposure risks from the pollen and nectar of plant life in areas surrounding treated crops, not from the pollen and nectar of treated crops themselves. For example, a study of honey bees near canola, barley, and wheat fields found that "the large majority (97%) of neonicotinoids brought back in pollen to honey bee hives in arable landscapes was from wildflowers, not crops."[92] Similarly, although not limited to neonics, a recent Cornell University study of New York apple orchards found that "60% of pesticide risk was attributed to pesticides that were not sprayed during the apple bloom period," suggesting that "the majority of pesticide risk to honey bees providing pollination services came from residues in non-focal crop pollen, likely contaminated wildflowers or other sources."[93]

These results are perhaps unsurprising. Honey bees are generalist foragers, and often travel long distances to collect pollen and nectar.[94] Further, it is well documented that agricultural neonic uses result in long-lasting landscape contamination extending well beyond the borders of farm fields, which includes contamination of flowering plants that, in some cases, have been shown to contain *higher*

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[88] Hopwood 2016.
[89] *See, e.g.,* Main 2020; Schaafsma 2015; Worldwide Integrated Assessment Part 2. In California, widespread surface water contamination in urban and rural areas suggests similarly extensive soil contamination. *See supra* Section III, B, 4, I, a.
[90] DiBartolomeis 2019.
[91] D. Susan Willis Chan et al., *Assessment of Risk to Hoary Squash Bees (Peponapis Pruinosa) and Other Ground-Nesting Bees from Systemic Insecticides in Agricultural Soil*, Scientific Reports (Aug. 14, 2019), https://go.nature.com/2RSxvGW [hereinafter "Willis Chan 2019"].
[92] Botías 2015.
[93] McArt 2017.
[94] *See* M. Beekman & F. L. W. Ratnieks, *Long-range foraging by the honey-bee, Apis mellifera L.*, British Ecological Society (Dec. 25, 2001), https://bit.ly/35PLeWf.

pollen and nectar neonic levels than target treated crops.[95] Where honey bees are located in these neonic-suffused landscapes—which are now commonplace, especially in agricultural areas—they will very likely come into contact with harmful levels of neonics while off of farm fields. The failure of the 2018 Risk Determination and Proposed Mitigation to account for these exposure sources represents a fundamental flaw, rendering the Proposed Mitigation unable to provide control measures necessary to protect pollinator health as required by the 2014 Pollinator Law.

d. Neonic-laden dust from neonic-treated seeds

Neonic-laden dust from seeding is known to be an important source of neonic exposure and pollinator risk. Seeds rubbing against one another during the seeding process commonly produce neonic dust clouds. As dust clouds drift, they present hazards for bees both on and off farm fields. When these dust clouds settle, they often contaminate soil and water. From a "residue per unit dose" perspective, these dust clouds result in higher contamination levels than an equivalent spray application and account for a significant portion of the recorded bee mortality incidents.[96] While some practices may reduce or eliminate the creation of dust clouds at seeding, it appears that these are rarely implemented in the United States, and would not be fully effective even if they were.[97]

While the 2018 Risk Determination acknowledges "[t]here have been issues in other states and countries with contact exposure resulting from abraded seed coat dust at planting," it nonetheless concludes that "U.S. EPA has addressed this with best management practices."[98] However, there are currently *no* federal or state mandated mitigation measures regarding neonic-treated seed dust, and the cost of corrective action makes it unlikely that California farmers have adopted any mitigation practices to a meaningful degree.[99] While beekeepers may be aware of the risks at seeding and move their hives accordingly, the state's native pollinators enjoy no such protection. Neonic-treated seed dust almost certainly remains a considerable hazard to the health of California's pollinators in crop areas where neonic-treated seeds are extensively used (e.g., corn, cotton, wheat). DPR must consider the risks of this dust to pollinators and provide appropriate mitigation.

ii. By ignoring these exposure routes, the Proposed Mitigation will fail protect pollinator health because neonic toxicity is time-cumulative

Neonics work by irreversibly binding to insect neurons—overstimulating and, ultimately, destroying them. This damage is permanent and accumulates over time, whether from a few large exposures or many small ones. In other words, the "toxicity of neonicotinoids increases with exposure time as much as with the dose, and therefore it has been described as time-cumulative toxicity."[100]

Because neonics' harms to insect pollinators accumulate over the lifetime of that pollinator, it matters little where or when it comes in contact with neonic residues—what matters is whether the sum of all

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[95] *See* Main 2020; Basely & Goulson 2018; Arthur David et al., *Widespread Contamination of Wildflower and Bee-Collected Pollen with Complex Mixtures of Neonicotinoids and Fungicides Commonly Applied to Crops*, Environment International (Mar. 2016), https://bit.ly/3kyeHIc; Botías 2016; Botías 2015; Schaafsma 2015; Main 2014.
[96] Mineau 2020 at 33-34.
[97] Mineau 2020 at 33-34.
[98] 2018 Risk Determination at 8.
[99] *See* Mineau 2020 at 33-34.
[100] Francisco Sánchez-Bayo & Hank Tennekes, *Time-Cumulative Toxicity of Neonicotinoids: Experimental Evidence and Implications for Environmental Risk Assessments*, Int. J. Environ. Res. Public Health (Mar. 2020), https://bit.ly/3mGF7tq. [Hereinafter "Sánchez-Bayo & Tennekes 2020"].

exposures exceeds the threshold over which harm to pollinator health occurs. The Proposed Mitigation identifies neonic application restrictions based on whether exposure to treated crop pollen and nectar alone will exceed DPR's estimated harm threshold. But as discussed, these exposures may account for only a small part—indeed, perhaps a fraction—of the neonic exposures actual insect pollinators will encounter in the real world. Since the Proposed Mitigation wholly ignores these other exposures, it vastly underestimates the controls necessary to ensure that harm threshold is not exceeded. Accordingly, the Proposed Mitigation fails to satisfy the pollinator health protective standard of the 2014 Pollinator Law.

5. *The Proposed Mitigation May Be Based on Inadequate Assumptions About Exposure to Pollen and Nectar from Neonic-Treated Crops*

U.S. EPA uses a questionable method for estimating neonic concentrations in the pollen and nectar in target crops. To the extent DPR relies on the same or similar assumptions, it likely vastly underestimates those concentrations.

Mineau (2020) critiques U.S. EPA's method of extrapolating neonic residue data from a small number of crops to estimate the neonic pollen and nectar residues in crops for which it had no data. Specifically, U.S. EPA had pollen and nectar study data for only four crops—corn, soybean, cotton, and canola—with corn accounting for the bulk of the studies on pollen, and soybean and cotton for nectar. To estimate the pollen and nectar concentrations for all other crops, USEPA took the averages for pollen and nectar studies respectively, treating each study as a separate data point. However, this inevitably biased the averages toward crops like corn—which had fairly low neonic pollen residue levels—and away from canola, which had much higher residue levels. Mineau (2020) showed how if EPA instead assumed other crops were more "canola-like" than "corn-like," the estimated residue levels in pollen would be ten times higher, and twice as high for nectar.[101]

It is unclear to NRDC whether DPR employs the same gap-filling assumptions, although it appears that at least some of the data used by DPR is the same residue data used by USEPA in its pollinator risk analyses.[102] To the extent DPR similarly adopts U.S. EPA's methods for estimating pollen and nectar concentrations, it grossly underestimates those concentrations, and as a result, its Proposed Mitigation is arbitrary, unsupported by substantial evidence, and fails to satisfy the pollinator health protective standard of the 2014 Pollinator Law.

6. *The Proposed Mitigation's Focus on Honey Bee Health Leaves the Health of Other Pollinators Unprotected*

i. Honey bee colony health is an inappropriate proxy for the health of California's pollinators

Honey bee colony health is a poor proxy for the health of most California bees. California is home to over 1,500 native bee species—all of which are pollinators, but almost none of which form colonies or

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[101] Mineau 2020 at 31-32.

[102] *See* DPR, *Identification of Crop Residue Studies for Development of Draft Proposed Pollinator Protection Regulations in Response to the Neonicotinoid Reevaluation*, 7 (Sep. 28, 2020), https://bit.ly/2GDpeDA (referencing study EBNTY010 for the oilseed crop group for imidacloprid); U.S. EPA, *Data Evaluation Record for MRID 49511702 - Determination of the Residues of Imidacloprid and its Metabolites 5-Hydroxy Imidacloprid and Imidacloprid Olefin in Bee Relevant Matrices Collected from Treated Cotton During Two Successive Years and in White Clover Planted after Treated Cotton. Study ID EBNTY010* (Jan. 28, 2016), https://bit.ly/3d5xJTY.

make honey.[103] The vast majority of the state's bees are solitary and do not enjoy the protections inherent in honey bee hives, where overall colony health is often insulated from an individual's fatal exposures to pesticides.[104] Likewise, endpoints considered in the Risk Determination "such as decreased colony strength and decreased stores of honey in honeycombs"[105] do not apply to most native bees. Accordingly, DPR must analyze and incorporate endpoints regarding injury to the health of individual bees, providing mitigation where appropriate, in order to provide control measures necessary to protect native bee health.

In doing so, DPR must also account for the fact that many native bees may be more sensitive to neonics than honey bees. Sensitivity to pesticides often varies widely between species in the same taxonomic family. Within honey bees alone, U.S. EPA found acute oral LD50 values ranged a full two orders of magnitude (100X).[106] And in comparing honey bees to 19 other bee species, sensitivity to neonics ranged over six orders of magnitude.[107] Recognizing this variance, and attempting to account for it in their risk assessment, the EFSA proposed a 10X safety factor from the accepted honey bee LD50 in order to be sufficiently protective for other bee species.[108] While it would be impracticable to obtain toxicity data for all of California's 1,500+ species of native bees—and unadvisable with respect to California's rare and threatened bee species—DPR can and should similarly apply such a safety factor to its risk calculations. Likewise, this safety factor should be reflected in the mitigation that DPR selects to satisfy the 2014 Pollinator Law.

Native bees may also appear in different parts of the environment due to their nesting choices, foraging behavior, and other habits. As discussed above, native bees also live in urban and suburban areas where non-agricultural uses of neonics predominate and are mainly ground dwelling, making contact exposures in soil especially important to consider. *See supra* Section III, B, 4, i, b. They may also less often satisfy their water consumption needs with nectar alone, making exposure to neonic-contaminated surface waters or guttation fluid especially important. *See supra* Section III, B, 4, i, a. Lastly, native bees would presumably be more likely to prefer the pollen and nectar of native plants growing in and around crop fields than the pollen and nectar of crop plants themselves. Accordingly, DPR's omission of all of these exposure sources from the 2018 Risk Determination represents a series of glaring oversights with respect to native bee health.

Other native pollinators—including butterflies, birds, and bats—are even more fundamentally dissimilar to honey bee colonies, yet these species also suffer from neonic exposures. For example, recent research links increasing neonic use rates in lowland California with decreases in butterfly populations, even controlling for climactic and land use changes.[109] And other new research suggests neonics play a leading role in the dramatic declines of North American bird populations in the last several generations.[110] In order to enact control measures that protect all of California's pollinators, DPR must

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[103] UC Davis Arboretum and Public Garden, *Beyond the Honey Bee: Learn More about California Native Bees*, (Apr. 3, 2018), https://bit.ly/2Unsusy.
[104] Andi M. Kopit & Theresa L. Pitts-Singer, *Routes of Pesticide Exposure in Solitary, Cavity-Nesting Bees*, Environmental Entomology (Apr. 4, 2018), https://bit.ly/2nnXdWY.
[105] 2018 Risk Determination at 2.
[106] Mineau 2020 at 28.
[107] *Id.*; Maria Arena & Fabio Sgolastra, *A Meta-Analysis Comparing the Sensitivity of Bees to Pesticides*, Ecotoxicology (Jan. 17, 2014), https://bit.ly/37tKy9A.
[108] Mineau 2020 at 28.
[109] Forister 2016; *see also* Andre Gilburn et al., *Are Neonicotinoid Insecticides Driving Declines of Widespread Butterflies?*, PeerJ (Nov. 24, 2015), https://bit.ly/1lGvH0y.
[110] *See, e.g.,* Hallmann 2014; Margaret L. Eng et al., *A Neonicotinoid Insecticide Reduces Fueling and Delays Migration in Songbirds*, Science (Sep. 13, 2019), https://bit.ly/2kGS1MA [hereinafter "Eng 2019"]; Kenneth V. Rosenberg et al., *Decline of the North American Avifauna*, Science (Oct. 4, 2019), https://bit.ly/2mndueu.

analyze species that are better representative of most native California pollinator species, account for their susceptibilities to neonics, include all relevant exposure routes, and apply appropriate safety factors where data gaps exist. Failure to do so will fail to identify the risks needing mitigation to protect pollinator health as required by the 2014 Pollinator Law.

ii. Mitigation conditioned on whether managed pollinators have been employed for a particular crop is arbitrary and irrational

The Proposed Mitigation provides restrictions for crop uses that the 2018 Risk Determination concludes cause risk to pollinators. However, most of these restrictions are contingent upon the farmer employing "managed pollinators" on the crop.[111] Because DPR must mitigate risks to all pollinators, not merely those that are managed for crop production, this contingent mitigation is arbitrary, irrational, and fails to satisfy the 2014 Pollinator Law.

The 2014 Pollinator Law requires that DPR enact control measures to protect "pollinator health," which includes the health of honey bees as well as that of native bees, birds, bats and other pollinating species. *See* FAC § 12838(b)(1). Acknowledging this requirement demands protection of at least all bee species, as the 2018 Risk Determination states that "*Apis* bees [i.e., honey bees] serve as a surrogate for other non-*Apis* species of bees (e.g., bumble bees) that may be exposed under agricultural conditions."[112] Accordingly, by its own logic, where the determination identifies risk for honey bees, it identifies it for all bees.

The Proposed Mitigation addresses the risks of concern identified in the 2018 Risk Determination,[113] with mitigation tailored to soil and foliar applications for each of sixteen different crop groups, and often to particular crops within each group. While some proposed mitigation measures apply generally to most crops, the most stringent measures apply to those particular crop uses identified as posing the highest risk to pollinator health. However, most of these measures do not apply where managed bees—normally honey bees or bumble bees—are not being employed to pollinate the crop.

If the purpose of the Proposed Mitigation is to protect "pollinator health" as required by the 2014 Pollinator Law, this contingent mitigation is wholly irrational. Native bees and other pollinators live in and around agricultural fields where neonics are used, and they can become exposed to those neonics as they migrate through the environment, including when they consume the pollen and nectar of target crop plants. The absence of managed pollinators has no effect on these exposures. Indeed, one would expect *greater* risks for native pollinators where managed bees are not employed: either because there would presumably be greater quantities of crop pollen and nectar available to consume or because the decision not to employ managed pollinators suggests higher ambient populations of native pollinators that can perform the same services (or both).

Because DPR fails to explain why the risks of concern it identifies for all pollinators somehow disappear when managed bees are not present, the contingent mitigation it proposes is arbitrary, irrational, and fails to satisfy the 2014 Pollinator Law.

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[111] *See* Proposed Mitigation (berries and small fruit crops (YYYY.2(a)), cereal grain crops, (YYYY.4(a)), cucurbits, (YYYY.6(a)), fruiting vegetables, (YYYY.7(a)), legume vegetables, (YYYY.10), oilseed crops, (YYYY.11(a)), root and tuber vegetables, (YYYY.13(a)), tree nuts (YYYY.15(c)), tropical and subtropical fruit (YYYY.16(a)), coffee and peanuts, (YYYY.17(a)(1)).

[112] 2018 Risk Determination at 6.

[113] DPR confirmed this during its August 11 and 12, 2020, webinars for the Proposed Mitigation. Recordings of the webinars are available here: https://bit.ly/3jyqS85.

7. DPR Must Consider the Cumulative and Synergistic Effects of Exposure to Multiple Neonics or Multiple Pesticides or Other Stressors

The 2018 Risk Determination and Proposed Mitigation assess and mitigate for risks to honey bees from exposure to individual neonic chemicals alone. This ignores the reality that bees and other pollinators are often exposed to other neonic chemicals, other pesticides, and other stressors at the same time, and that the cumulative risks can be additive, if not multiplicative. DPR must consider these cumulative risks in its Proposed mitigation in order to satisfy the 2014 Pollinator Law.

Exposure to multiple neonics is highly likely. Honey bees' foraging range can extend for miles,[114] where they may come into contact with contaminated pollen and nectar from multiple different crops and wild plants contaminated with multiple neonic chemicals. Similarly, honey bees or other native pollinators can be exposed to multiple neonic chemicals when contacting soil or drinking contaminated guttation fluid or surface waters. In California, for example, imidacloprid has historically been the sole neonic tested for in most state water quality sampling, where it is frequently found in surface waters.[115] Where DPR has tested clothianidin and thiamethoxam at the same sites, it has also frequently detected those chemicals.[116] The results indicate these two other neonic chemicals are considerable contaminants across California's agricultural landscapes, meaning it's likely bees and other pollinators are exposed to multiple neonic chemicals at the same time. Even where bees are exposed to different neonics at different times, the risks may be equivalent—as the harms from neonic exposures are time-cumulative. *See supra* Section III, B, 4, ii.

Neonics' adverse impacts may also be significantly elevated when combined with other stressors. For example, recent research shows that low levels of clothianidin and thiamethoxam exposure may also decrease the ability of honey bees to combat parasitic varroa mite and increase incidence of deformed wing virus.[117] Other research shows that neonics' toxicity to bees and other insects may increase up to 8-fold when paired with fungicides commonly used alongside neonics.[118] Heightened risks from synergistic effects, like these, stem directly from neonic use and environmental contamination. DPR must, therefore, incorporate the environmental risks of neonics' synergistic effects with other chemicals and stressors into its risk analyses for bees and other wildlife.

8. DPR Must Consider the Lethal and Sublethal Endpoints that Threaten Pollinator Health

The 2014 Pollinator Law requires DPR to enact control measures necessary to protect "pollinator health." FAC § 12838(b)(1). This term encompasses not only the mere survival of an individual bee or honey bee colony shortly after exposure, but also the critical functions that enable pollinators to

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[114] James R. Hagler et al., *Foraging Range of Honey Bees, Apis mellifera, in Alfalfa Seed Production Fields*, Journal of Insect Science (Nov. 2, 2011), https://bit.ly/3kwX1Ns.
[115] Mineau 2020 at 20-21.
[116] *Id.* at 24-26.
[117] Nuria Morfin et al., *Effects of Sublethal Doses of Clothianidin and/or V. Destructor on Honey Bee (Apis Mellifera) Self-Grooming Behavior and Associated Gene Expression*, Scientific Reports (Mar. 26, 2019), https://go.nature.com/2Y3nfLU [hereinafter "Morfin 2019"]; Lars Straub et al., *Neonicotinoids and Ectoparasitic Mites Synergistically Impact Honeybees*, 9 Scientific Reports 8159 (Jun. 4, 2019), https://go.nature.com/2WTIjU8 ("Our data clearly show a significant negative synergistic effect of neonicotinoids and *V. destructor* mites on *A. mellifera* honeybee body mass and longevity").
[118] Helen Thompson et al., *Potential Impacts of Synergism in Honeybees (Apis Mellifera) of Exposure to Neonicotinoids and Sprayed Fungicides in Crops*, 45 (5) Apidologie 545-553 (2014), https://bit.ly/2Wax2k4; *see also* Fabio Sgolastra et al., *Synergistic Mortality Between a Neonicotinoid Insecticide and an Ergosterol-Biosynthesis-Inhibiting Fungicide in Three Bee Species*, 73(6) Pesticide Management Science 1236-43 (Jun. 2017), https://bit.ly/2WcdNH1.

perform pollination services as well as ultimately survive and reproduce in the wild over the long term. The 2018 Risk Determination and Proposed Mitigation, however, only assess and mitigate for "colony level" harms to honey bee hives—providing that:

> Hive health is determined by measuring parameters such as the population of adult bees (i.e., colony strength), the number of cells containing various brood stages (eggs, larvae, and pupae), and measuring hive resources in terms of honey and bee bread production.[119]

As discussed, honey bees are a poor proxy for the thousands of other pollinating species found in California—very few of which form colonies, and almost none of which produce honey or bee bread. Accordingly, DPR's chosen endpoints for pollinator health are likely largely meaningless when it comes to the health of most of California's pollinators.

To accurately understand and address harms to the true health of the state's pollinators, DPR must mitigate for neonics' lethal effects on individual insects—better representatives of the vast majority of pollinating insects, which are solitary. DPR must also consider neonics' sublethal effects on pollinating species that may ultimately affect their ability to survive and reproduce in the wild.[120] Many of these affects have been observed in bees—including impaired brain growth and learning,[121] immune response,[122] grooming,[123] and flight dynamics and endurance.[124] Where DPR relies on data for just one or a handful of species to determine a no or low adverse effects level or concentration, it should apply a safety factor (e.g., 10x or 100x) to account for potential higher sensitivity among other species (particularly endangered pollinators).

Failure to assess and mitigate for endpoints that account for the relevant dimensions of pollinator health across all of California's pollinators is arbitrary and also fails to satisfy the 2014 Pollinator Law and DPR's duties under the FAC.

9. DPR Must Continue Reporting to the Legislature Until All Control Measures Necessary to Protect Pollinator Health Are Adopted

The 2014 Pollinator Law provides that within two years of the release of the 2018 Risk Determination, DPR must "adopt any control measures necessary to protect pollinator health." FAC § 12838(b)(1). However, if DPR is unable to adopt such control measures, it must "submit a report to the appropriate committees of the Legislature" explaining why it cannot do so each year until adequate control measures are adopted. As discussed in these Comments, the Proposed Mitigation does not fully satisfy DPR's statutory obligation to adopt control measures necessary to protect pollinators. Accordingly, DPR must continue to report to the Legislature each year until the obligation is satisfied.

[119] 2018 Risk Determination at 8-9.

[120] *See* J.P. van der Sluijs et al., *Conclusions of the Worldwide Integrated Assessment on the Risks of Neonicotinoids and Fipronil to Biodiversity and Ecosystem Functioning*, Envtl. Sci. & Pollution Research Int'l (Oct. 10, 2014), https://bit.ly/2KXAlGl (explaining that because toxic "effects often occur at concentrations well below those associated with direct mortality," "short-term survival is not a relevant predictor neither of mortality measured over the long term nor of an impairment of ecosystem functions and services performed by the impacted organisms").

[121] Dylan B. Smith et al., *Insecticide Exposure During Brood or Early-adult Development Reduces Brain Growth and Impairs Adult Learning in Bumblebees*, 287 Proceedings of the Royal Society B (Mar. 4, 2020), http://bit.ly/2TVA0Jx.

[122] Gennaro Di Prisco et al. *Neonicotinoid Clothianidin Adversely Affects Insect Immunity and Promotes Replication of a Viral Pathogen in Honey Bees*, Proceedings of the Nat'l Academy of Sciences (Nov. 12, 2013), https://bit.ly/3bK7rVR.

[123] Morfin 2019.

[124] Kenna 2019.

C. DPR Must Evaluate the Impacts of Acetamiprid Use on Pollinator Health and Adopt Any Necessary Protective Control Measures

In addition to the four major nitroguanidine neonics, the neonic acetamiprid is not included either in DPR's 2018 Risk Determination or in the Proposed Mitigation. Like the other neonic chemicals, acetamiprid targets insect neurons (such as those in pollinating insect species) and is systemic, allowing it to migrate through ecosystems.

The U.S. EPA recent proposed interim registration review decision for acetamiprid highlights the importance of assessing and mitigating the pollinator risks from this chemical. Despite U.S. EPA's numerous methodological failings in its risk assessment—including failure to account for numerous critical exposure pathways, ignoring the time-cumulative toxicity of neonics and sublethal impacts that affect long term population survival, and inappropriately using honey bee colony health as a proxy for the health of all pollinators—U.S. EPA nonetheless identified risks of concern to birds and terrestrial invertebrates (both of which encompass pollinating species) from foliar acetamiprid applications.[125] Support for the harmful effects of acetamiprid is also found in the independent literature.[126]

In order to satisfy the 2014 Pollinator Law's mandate that DPR assess neonic risks to pollinators and enact necessary control measures to protect pollinator health, *see* FAC § 12838, DPR must assess the risks and harms of the neonic acetamiprid.

D. DPR Must List Neonicotinoids as Restricted Use Materials

The FAC requires that DPR must control environmentally injurious pesticides as "restricted materials." *See* FAC §§ 14001-14015. DPR must designate as a restricted material any pesticide that poses a hazard: (1) "to domestic animals, including honeybees;" (2) "to the environment from drift onto streams, lakes, and wildlife sanctuaries;" or (3) "related to persistent residues in the soil resulting ultimately in contamination of . . . waterways, estuaries or lakes, with consequent damage to fish, wild birds, and other wildlife." FAC §§ 14001, 14004.5 (c)-(e), 14005.

The outdoor use of neonics produces all of these hazards—including harms to honey bees from direct contact and otherwise, persistent residues in soil which run off to contaminate California water, and the decimation of invertebrate populations, whose losses ripple through ecosystems. *See supra* Section I, A; FAC § 14004.5 (c)-(e). For example, due to their exceptional potential to contaminate water, all neonic active ingredients commonly used as seed treatments appear on the state's Groundwater Protection List, as well as in an overwhelming proportion of state surface water sampling. *See* 3 C.C.R. § 6800; *supra* Section I, A. In California, neonics appear in water at levels expected to cause ecosystem-wide damage.[127]

As DPR must control the use of pesticides that meet any one criterion qualifying them as restricted materials, *see* FAC §§ (requiring to DPR "control and otherwise regulate the use of restricted materials" meeting criteria identified in Section 14004.5); 14004.5 (requiring creation of "a list of restricted materials based upon . . . *any* of the following criteria" (emphasis added)), and the use of neonics meet

[125] *See* U.S. EPA, *Acetamiprid: Proposed Interim Registration Review Decision*, 18 (Jan. 2020), https://bit.ly/36mIwrq [hereinafter "U.S. EPA Acetamiprid PID"].
[126] Jingliang Shi et al., *Effects of Sublethal Acetamiprid Doses on the Lifespan and Memory-Related Characteristics of Honey Bee (Apis Mellifera) Workers*, Apidologie (Jul. 4, 2019), https://bit.ly/2GvDP3x.
[127] Mineau 2020 at 1, 16-26.

several of these criteria, DPR must designate outdoor neonic uses as restricted materials, controlling their use as appropriate.

E. DPR Must Address the Other Environmentally Harmful Aspects of Neonic Use

In addition to mandating adoption of control measures to protect pollinator health, the FAC imposes several duties on DPR to prevent harmful pesticide use, which apply in the neonic context. Specifically, DPR must: (1) regulate and control the use of pesticides that create hazards to domestic animals (including honeybees), the environment, or farmworker and public health as "restricted materials," FAC §§ 14001, 14004.5; (2) regulate or prohibit the use of any "environmentally harmful materials," taking "whatever steps [DPR] deems necessary to protect the environment," FAC § 14102; and (3) "endeavor to eliminate from use in the state any pesticide that endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented." FAC § 12824.

These duties compel DPR to address the broad ranging harms associated with widespread neonic use—including those to pollinators and other terrestrial wildlife, aquatic ecosystems, and, possibly, human health. These risks and harms from a large and growing body of scientific literature are detailed below. We believe sufficient scientific information exists to merit immediate ecological and health-protective action by DPR. This action must include restrictions addressing non-agricultural uses of neonics as well as agricultural uses.

Alternately, the information below indicates how neonic use has and will continue to cause significant adverse impacts in California, requiring DPR investigation and reevaluation. *See* 3 C.C.R. § 6220; *Pesticide Action Network N. Am. v. Dep't of Pesticide Regulation*, 16 Cal. App. 5th 224, 233 (2017), *as modified on denial of reh'g* (Oct. 19, 2017) ("The Department must investigate 'all reported episodes and information [it receives] that indicate a pesticide may have caused, or is likely to cause, a significant adverse impact'" (quoting 3 C.C.R. § 6220)). To the extent DPR is not actively planning action to mitigate non-pollinator neonic impacts or investigating those impacts through reevaluation, it must.

1. Harms to Birds

Over the last several years, research has increasingly linked neonic use with declines in North American bird populations as well as those around the world.[128] For example, in a study released this past summer, University of Illinois researchers found that increased neonic use between 2008 and 2014 led to a significant reduction in bird populations and biodiversity across the U.S. Neonics were associated with declines in all four categories of birds studied—with the greatest negative effect on grassland bird populations (12% annually) and insectivorous bird populations (5% annually).[129]

Neonics harm birds both directly and indirectly, with direct impacts most often associated with the ingestion of neonic-treated seed. In its recent proposed interim registration review decisions for several neonic chemicals, U.S. EPA found that "[e]xposures from treated seeds result in the highest acute and chronic risks to terrestrial organisms," including birds.[130] Neonic-treated seeds are often left exposed or

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[128] *See* John W. Fitzpatrick & Peter P. Marra, *The Crisis for Birds Is a Crisis for Us All*, New York Times (Sep. 19, 2019), https://nyti.ms/3j2lSak (discussing the recent North American bird losses—30% over the last 50 years—and stating "[r]ecent evidence shows that pesticides, like neonicotinoids, may be directly or indirectly responsible for killing large numbers of birds").
[129] Yijia Li et al., *Neonicotinoids and Decline in Bird Biodiversity in the United States*, Nature Sustainability (Aug. 10, 2020), https://go.nature.com/2Yb6cub.
[130] U.S. EPA, *Clothianidin and Thiamethoxam Proposed Interim Registration Review Decision*, 32-33 (Jan. 22, 2020), https://bit.ly/2H992Ka [hereinafter "U.S. EPA Cloth. & Thiam. PID"].

buried shallow enough for birds to eat during planting, which they often do. A recent study performed in conjunction with the Minnesota Department of Natural Resources documented: exposed neonic-treated seed in 25% of forty-eight observed corn, soybean, and wheat fields; neonics in the blood and tissues of the vast majority of field-collected birds; and observations that ring-necked pheasants, Canada geese, American crows, various species of sparrows, and blackbirds (as well as white-tailed deer, rodents, rabbits, and raccoons) all eating exposed neonic-treated seeds.[131] An earlier European study found similar results, observing up to 30 different bird species eating neonic-treated cereal seeds in recently sown fields.[132]

Ingestion of neonic-treated seeds causes negative impacts of neonic ingestion on birds' migratory success and ultimate survival. Eating just one neonic-coated crop seed is enough to kill some small song birds.[133] And at nonlethal doses, neonics can damage birds' immune and reproductive systems, cause rapid weight loss, and impair navigation and migration ability—all reducing the likelihood of their surviving and reproducing in the wild.[134] For example, Eng et al. (2019) recently reported that ingestion of small amounts of imidacloprid results in weight loss, reduced fueling, and delayed migration in white-crowned sparrows.[135] Ultimately, delayed migration could result in failure to match migration patterns to food sources and favorable weather patterns and result in death or reduced reproductive success.

Profound effects on bird populations have also been linked to neonic water contamination and its impact on the populations of insects and other invertebrates that birds eat. In the Netherlands, researchers linked declining populations of insect-eating birds to extremely low neonic levels in water (starting at only 20 parts per *trillion*).[136] Similar or higher neonic concentrations are frequently found in California waters, indicating a "very high probability" of "ecosystem-wide damage" resulting when the loss of aquatic invertebrates, in turn, starves consumer species like birds, fish, and mammals.[137] Indeed, a recent comprehensive assessment of neonics' ecological impacts of neonics notes that "indirect effects [of neonic use] may be as important as direct toxic effects on vertebrates and possibly more important."[138]

2. Harms to Aquatic Ecosystems

DPR water testing data indicates neonics are harming California's aquatic ecosystems. In recent testing, the neonic imidacloprid appeared in more than 90% of Southern and Central California agricultural surface water samples, with all detections exceeding U.S. EPA's chronic "benchmark" for harm to aquatic ecosystems.[139] Other state and federal testing also reveal this benchmark commonly exceeded

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[131] Charlotte Roy et al., *Neonicotinoids on the Landscape: Evaluating Avian Exposure to Treated Seeds in Agricultural Landscapes*, Minnesota Department of Natural Resources & Wildlife Restoration (2017), https://bit.ly/337ENZK.

[132] Ana Lopez-Antia et al., *Risk Assessment of Pesticide Seed Treatment for Farmland Birds Using Refined Field Data*, 53 J. of Applied Ecology 1373-1381 (Oct. 2016), https://bit.ly/2m0Z5Ef.

[133] Pierre Mineau & Cynthia Palmer, *The Impact of the Nation's Most Widely Used Insecticides on Birds*, American Bird Conservancy 3 (Mar. 2013), https://bit.ly/1jmQ7u0.

[134] Ana Lopez-Antia et al., *Imidacloprid-Treated Seed Ingestion Has Lethal Effect on Adult Partridges and Reduces Both Breeding Investment and Offspring Immunity*, Environmental Research (Jan. 2015), https://bit.ly/2kwUdWS; Eng 2019; Margaret L. Eng et al., *Imidacloprid and Chlorpyrifos Insecticides Impair Migratory Ability in a Seed-Eating Songbird*, Scientific Reports, (Nov. 2017), https://go.nature.com/2QEWHA6.

[135] Eng 2019.

[136] Hallmann 2014.

[137] Mineau 2020 at 1, 16-26; *see also* David Gibbons et al., *A Review of the Direct and Indirect Effects of Neonicotinoids and Fipronil on Vertebrate Wildlife*, 22 Envtl. Sci. Pollution Research Int'l 103-18 (Jun. 18, 2014), https://bit.ly/2YeJORn (reviewing literature on indirect effects of prey reduction).

[138] Worldwide Assessment Part 2.

[139] *See* Xin Deng, *Surface Water Monitoring for Pesticides in Agricultural Areas in the Central Coast and Southern California, 2018*, DPR (May 28, 2019), https://bit.ly/2n8Epeg (finding imidacloprid in 94% of all samples); Robert Budd, *Urban monitoring in Southern California watersheds FY*

by ten-to-one-hundred-fold.[140] For example, in tributaries to the Salinas River in Monterey County, every sample over an eight-year period contained imidacloprid ten-fold above this ecological damage threshold.[141] For this reason, it is very highly likely that neonics are causing ecosystem-wide harms in California waters.[142]

Neonics' destructive potential for aquatic ecosystems—resulting from their high invertebrate toxicity and their proclivity to contaminate surface waters—is well known.[143] Indeed, in its recent neonic risk assessments, U.S. EPA notes that "risks of concern were identified for all four [nitroguanidine] neonicotinoid insecticides . . . to freshwater invertebrates on both an acute and chronic basis,"[144] and, in several places, makes general statements about neonics' indirect impacts of prey reduction on fish and aquatic-phase amphibians.[145] These destructive impacts were perhaps most vividly shown in Yamamuro et al. (2020), where researchers attributed the sudden, dramatic collapse of an otherwise sustainable fishery in Japan to the introduction of neonics in nearby agriculture. Researchers observed that neonic introduction correlated with rapid and substantial loss of zooplankton—the primary food source for smelt and eel—along with two-to-ten-fold reductions in those species.[146] Neonic levels in California waters regularly match or exceed those later measured at the fishery,[147] indicating that neonic use may have already had similar destructive impacts on California's invertebrate-eating fish populations.[148]

3. Harms to Terrestrial Invertebrates

Neonics' widespread presence in DPR water quality sampling indicates their likely widespread presence in California soil and plant life.[149] Where neonics ubiquitously contaminate the environment, terrestrial invertebrates can become exposed through a variety of means—including contact with contaminated soil, puddles, spray droplets, or chemigation water and the ingestion of plant tissues, other invertebrates, or invertebrate byproducts contaminated with neonics. Given neonics' high and broad-spectrum toxicity to insect life, all of these exposure routes are of considerable concern. Recent research found that neonics have increased the "acute insecticide toxic loading" of U.S. agriculture—a measure that accounts for the acute toxicity as well as persistence (and therefore availability) of insecticides used—by four-fold on a contact exposure basis and forty-eight fold on an oral exposure basis.[150]

2017-2018, DPR (Mar. 1, 2019), https://bit.ly/2nY9TUq (finding imidacloprid in 92% of all samples); U.S. EPA Aquatic Life Benchmarks; Mineau 2019 (finding neonics, on the basis of similar water testing results, were likely causing "ecosystem-wide damage" in New York).

[140] Mineau 2020 at 1, 21.

[141] *Id.* at 1, 23-24.

[142] *Id.* at 1, 16-26

[143] Francisco Sánchez-Bayo, *Contamination of the Aquatic Environment with Neonicotinoids and Its Implication for Ecosystems*, Frontiers in Environmental Science (Nov. 2, 2016), https://bit.ly/2LifRHf; Miles 2017.

[144] U.S. EPA Cloth. & Thiam. PID.

[145] U.S. EPA Imidacloprid Aquatic Risk Assessment 2016 at 14, 99, 119; U.S. EPA, *Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support the Registration Review of Clothianidin*, 15 (Nov. 27, 2017), https://bit.ly/3kfn4IV; U.S. EPA, *Preliminary Environmental Fate and Ecological Risk Assessment in Support of the Registration Review of Acetamiprid*, 5, 15, 72, 73, (Dec. 22, 2017), https://bit.ly/3m1kIht; U.S. EPA, *Preliminary Risk Assessment to Support the Registration Review of Dinotefuran*, 13, 65 (Nov. 28, 2017), https://bit.ly/34eRe9V.

[146] Masumi Yamamuro et al., *Neonicotinoids Disrupt Aquatic Food Webs and Decrease Fishery Yields*, Science (Nov. 1, 2019), https://bit.ly/34rKCSG.

[147] Mineau 2020 at 21-24.

[148] CBC Radio, "Canada Bans Neonic Pesticides Implicated in Bee Declines," August 17, 2018, https://bit.ly/2nPgU6S.

[149] *Cf.* Wood & Goulson 2017; Bonmatin 2014.

[150] DiBartolomeis 2019; *see also* Douglas 2015.

While species-specific research often focuses on pollinating species—such as that showing neonic soil contamination presenting risks to ground-nesting bees[151] and that linking increased neonic use rates in lowland California with decreases in butterfly populations[152]—studies have demonstrated neonics' harmful impacts on hymenopteran (aside from bees, e.g., wasps) and coleopteran (e.g., beetles) as well as earthworms.[153] For example, one recent study found that neonics kill beneficial insects feeding on the honeydew (the most abundant carbohydrate source for insects in agroecosystems) produced by phloem-feeding hemipteran insects such as aphids, mealybugs, whiteflies, or psyllids.[154] Similarly, earlier research showed how neonic-contamination of slug species (which tend to be more neonic-tolerant) from neonic-treated crop seeds reduced populations of predatory beetle species (which are much less tolerant).[155] In these ways, neonics can move through terrestrial food webs, adding to other contact and oral exposures,[156] all progressively debilitating invertebrates over time given neonics' permanent and time-cumulative harmfulness.[157] Accordingly, many researchers have found that—in addition to their harms to pollinating species—neonics pose significant risks to terrestrial food webs and ecosystems,[158] with some linking widespread neonic contamination with larger worldwide insect losses sometimes dubbed an "insect apocalypse."[159]

4. Harms to Mammals and Other Wildlife

Neonic-treated seeds can also harm mammals—either through direct ingestion or contamination of food and water sources or indirect prey reduction effects. For example, open literature studies show that neonics may have adverse direct and indirect effects on bats,[160] and neonic exposures have also been linked with birth defects in white-tailed deer—including decreased body and organ weight, decreased jawbone length, and higher death rates for fawns.[161] Concerns about neonic impacts on white-tailed deer were initially sparked by anecdotal observations by hunters of deer exhibiting these defects in the wild,[162] prompting the Minnesota Department of Natural Resources to conduct its own hunter-assisted field study of the issue.[163]

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[151] *See, e.g.*, Willis Chan 2019; Nicholas Anderson et al., *Chronic Contact with Realistic Soil Concentrations of Imidacloprid Affects the Mass, Immature Development Speed, and Adult Longevity of Solitary Bees*, Sci. Reports (Mar. 6, 2019), https://go.nature.com/2V9WA04; L.W. Pisa et al., *Effects of Neonicotinoids and Fipronil on Non-target Invertebrates*, Envtl. Sci. & Pollution Research (Sep. 17, 2014), https://bit.ly/2y1UqII [hereinafter "Pisa 2014"] ("ground-nesting species may face additional exposure risks (i.e. pesticide-contaminated soil) that are not encountered by honeybees, but which remain to be evaluated").
[152] *See* Forister 2016.
[153] Pisa 2014.
[154] Miguel Calvo-Agudo, *Neonicotinoids in Excretion Product of Phloem-Feeding Insects Kill Beneficial Insects*, PNAS (Aug. 20, 2019), https://bit.ly/37cGgU1.
[155] Margaret R. Douglas et al., *Neonicotinoid Insecticide Travels Through a Soil Food Chain, Disrupting Biological Control of Non-Target Pests and Decreasing Soya Bean Yield*, Journal of Applied Ecology (Dec. 4, 2014), https://bit.ly/344Fir7.
[156] Frank & Tooker 2020.
[157] Sánchez-Bayo & Tennekes 2020.
[158] *See, e.g.*, *id.*; Frank & Tooker 2020; Pisa 2014 (finding neonics are "likely have large-scale and wide ranging negative biological and ecological impacts on a wide range of non-target invertebrates in terrestrial, aquatic, marine and benthic habitats.").
[159] *See* Brooke Jarvis, *The Insect Apocalypse Is Here*, The New York Times Magazine (Nov. 27, 2018), https://nyti.ms/3iZOUaM.
[160] *See* Chung-Hsin Wu et al., *Effects of Imidacloprid, A Neonicotinoid Insecticide, on the Echolocation System of Insectivorous Bats*, 163 Pesticide Biochemistry and Physiology 94-101 (Feb. 2020), https://bit.ly/3aAybqx; Pierre Mineau & Carolyn Callaghan, *Neonicotinoid Insecticides and Bats: An Assessment of the Direct and Indirect Risks*, Canadian Wildlife Federation (Dec. 2018), https://bit.ly/2KCJwvH.
[161] E. H. Berheim et al., *Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-Tailed Deer*, Scientific Reports (Mar. 14, 2019), https://go.nature.com/2Q1I9Zf. Surprisingly, in the study, deer in the control group—i.e., those purposely not exposed to neonics—still contained detectable levels of neonics in their organs, demonstrating the ubiquity of neonic contamination real world.
[162] Jim Daley, *As Pesticide Turns Up in More Places, Safety Concerns Mount*, Scientific American (Apr. 30, 2019), https://bit.ly/2FDXdLS.
[163] Tony Kennedy, *DNR Study Seeks Farm Chemical Levels in Wild Deer*, Minnesota Star Tribune (Oct. 29, 2019), http://strib.mn/3jecFfz.

5. Potential Harms to Human Health

Neonic contamination in California may have repercussions for the health of Californians. Laboratory studies demonstrate that neonic exposures are linked to developmental, reproductive, or neurological damage, including thyroid disruption and low sperm quality.[164] Limited epidemiologic evidence also link neonic exposure with elevated risks of malformations of the developing heart and brain as well as a cluster of neurological symptoms including memory loss and finger tremors.[165] These studies are particularly worrying given the pervasiveness of exposure—monitoring by the U.S. Centers for Disease Control and Prevention indicates that *roughly half* of the U.S. general population is exposed to neonics on a regular basis.[166] Contaminated food and water are likely the most common exposure sources. Where neonics contaminate drinking water sources, chlorination treatment does not remove them without additional filtration.[167] Fruits, vegetables, and processed foods—including baby food—frequently contain neonics too,[168] which, because they permeate treated foods, cannot be washed off.

U.S. Environmental Protection Agency (EPA) acknowledged neonic-related health risks in its recent proposed interim registration review decisions for neonic pesticides, proposing to cancel imidacloprid lawn spray uses due to human health concerns.[169] Nonetheless, EPA's proposed decisions would otherwise continue to permit widespread outdoor uses which contribute to pollution in waterways, contamination of drinking water, and pesticide residues on fresh fruits and vegetables. In their comments on the proposal, the Endocrine Society—an international professional society of over 18,000 medical clinicians and science researchers with expertise in the diseases, disorders, and vulnerabilities of the human hormone system—stated that "the data linking early-life neonicotinoid exposure to thyroid disruption is very concerning and EPA should conduct their review of these chemicals, incorporating the latest peer-reviewed science, as a cumulative assessment group." As thyroid functioning is critical to brain development, and "[neonic] chemicals may have effects at extremely low doses," the comments warn "there may in fact be no 'safe' level for these chemicals."[170]

In May 2020, NRDC petitioned U.S. EPA to revoke all neonic food tolerances under the Federal Food, Drug, and Cosmetic Act—as amended by the Food Quality Protection Act (FQPA)—due to the agency's failure to consider neonics' potential harm on human health in violation of the Act.[171] In particular, the petition alleges that U.S. EPA failed to: (1) use the most sensitive endpoint and appropriate uncertainty factors when calculating the reference dose; (2) retain the FQPA 10X child safety factor; (3) assess the cumulative impacts of exposure to the neonic class; (4) assess aggregate effects of exposure to neonics and all degradates; and (5) conduct an acute dietary risk assessment that accounts for risks to high-exposure individuals. As outlined in the petition, these failures leave pregnant women, children, and

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[164] NRDC FQPA Petition 2020; CalEPA. Office of Environmental Health Hazard Assessment, *Prioritization: Chemicals Identified for Consultation with the Developmental and Reproductive Toxicant Identification Committee* (Oct. 2020), https://bit.ly/2TC1Itv.

[165] Endocrine Society Comment Letter 2020; Cimino 2017.

[166] Maria Ospina et al., *Exposure to Neonicotinoid Insecticides in the U.S. General Population: Data from the 2015–2016 National Health and Nutrition Examination Survey*, Environmental Research (Sep. 2019), https://bit.ly/2YKLjmX; *see also* Go Ichikawa et al., *LC-ESI/MS/MS Analysis of Neonicotinoids in Urine of Very Low Birth Weight Infants at Birth*, PLoS One (Jul. 1, 2019), https://bit.ly/2nF2DNi (finding neonics in the urine of newborn babies, indicating that neonics pass from pregnant mother to developing fetus).

[167] *See* Kathryn L. Klarich et al., *Occurrence of Neonicotinoid Insecticides in Finished Drinking Water and Fate During Drinking Water Treatment*, Envtl. Sci. and Tech. Letters (Apr. 2017), https://bit.ly/2PMRunk.

[168] *See, e.g.,* Olga Naidenko, *Neonic Pesticides: Banned in Europe, Common on U.S. Produce, Lethal to Bees*, Envt'l Working Group (Jul. 26, 2018), https://bit.ly/2EejbSx; Friends of the Earth, *Toxic Secret: Pesticides Uncovered in Store Brand Cereal, Beans, Produce*, http://bit.ly/2IlE26V (visited Oct. 17, 2019).

[169] U.S. EPA Imidacloprid PID at 41.

[170] Endocrine Society Comment Letter 2020.

[171] NRDC FQPA Petition 2020.

other sensitive populations at risk from continued widespread neonic use and exposure—both in California and across the country.[172]

F. The Proposed Mitigation Must Comply with the California Environmental Quality Act

DPR's Proposed Mitigation must comply with the California Environmental Quality Act (CEQA). While DPR's regulatory program regarding the regulation of pesticides constitutes a certified program meeting the procedural requirements of CEQA, 14 C.C.R. § 15251(i)(4), this does not excuse the Proposed Mitigation from meeting CEQA's substantive requirements. *See Pesticide Action Network N. Am. v. Dep't of Pesticide Regulation*, 16 Cal. App. 5th 224, 243, *as modified on denial of reh'g* (Oct. 19, 2017) (finding DPR registration of neonic pesticide product violated substantive requirements of CEQA, even though pesticide registration is a certified program).

Where DPR must regulate pesticide use in order to satisfy a statutory duty to take environmentally protective action, failure to satisfy CEQA's substantive requirements constitutes a violation of CEQA. *Cf. Lake Norconian Club Found. v. Dep't of Corr. & Rehab.*, 39 Cal. App. 5th 1044, 1053 (2019), *review denied* (Dec. 11, 2019) (noting that the National Environmental Policy Act applies to inaction where federal statute requires protective action, and analyzing whether state law imposed such a duty in the instant case). Here, as discussed, DPR must regulate neonic use to satisfy the 2014 Pollinator Law as well as other FAC-imposed duties. However, the agency fails to consider impacts to pollinators and California's environment from significant categories of neonic use (e.g., neonic-treated crop seeds and non-agricultural, outdoor uses), highly relevant neonic exposure routes (e.g., water, soil, and non-target-plant pollen and nectar), cumulative neonic exposures to multiple sources and multiple neonics, and more protective alternatives to the present mitigation plan—such as a mitigation plan that applies a 10x or 100x safety factor to protect native bees and other pollinators given uncertainty regarding the sensitivity of those species compared to honey bees.

IV. Conclusion

For the foregoing reasons, NRDC urges DPR to address the deficiencies these comments identify in the 2018 Risk Determination and Proposed Mitigation, providing all appropriate mitigation—including, where necessary, cancellation of problematic neonic uses—to protect pollinators, the environment, and Californians in accordance with the FAC. Failure to do so would constitute arbitrary and capricious action and a violation the 2014 Pollinator Law, other relevant portions of the FAC, and CEQA. To the extent that addressing the issues raised in these comments would take additional time, DPR should expeditiously move forward with the mitigation plan in the Proposed Mitigation to provide immediate protections for pollinators, making clear that these temporary interim measures will be supplemented with additional protections upon further analysis. DPR should also continue reporting to the legislature in accordance with the 2014 Pollinator Law until it has fully discharged its responsibilities under that law.

Again, NRDC appreciates all of the work evident in the 2018 Risk Determination and Proposed Mitigation, and urges DPR to continue its work on neonics as required by the FAC. In doing so, we believe that DPR can become a practical and forward-looking leader on this issue of both statewide and national importance.

[172] *Id.*

Respectfully,

Daniel Raichel
Staff Attorney
Natural Resources Defense Council
draichel@nrdc.org