Californians For Pesticide Reform

February 15, 2022

California Natural Resources Agency
715 P Street
Sacramento, CA 95814
Submitted via email Californianature@resources.ca.gov

RE: Draft Pathways to 30x30 California

Dear CNRA Staff:

On behalf of the statewide coalition Californians for Pesticide Reform (CPR), we thank you for the opportunity to comment on the draft Pathways to 30x30 California ("draft 30x30" or "draft 30x30 Pathways"). **CPR is a statewide coalition of 200+ organizations** working together to protect public health, improve environmental quality and support a sustainable and just agricultural system by building a diverse movement across California to change statewide and local pesticide policies and practices.

We support the draft 30x30 Pathways' three key objectives to: 1) Protect California's biodiversity, 2) Expand equitable access to nature and its benefits, and 3) Conserve places that help California achieve carbon neutrality and/or build climate resilience.

But synthetic pesticide use undermines all three goals and needs to be addressed in the plan.

We call for the final Pathways to 30x30 California to include:

- **specific targets for:**
  - **pesticide reduction,**
  - **adoption of organic farming,**
  - **adoption of ecological pest management, and**

- **strategies for how to achieve these targets.**

We also call for the California Department of Pesticide Regulation to have a seat at the table as a member of the California Biodiversity Collaborative, responsible for implementation of 30x30.

Agricultural pesticides are now globally-recognized as one of the most significant drivers of biodiversity loss and insect population decline worldwide. While the plan does reference 'avoidance of toxic chemicals' on working lands, there is no clear "pathway" in the plan for achieving such avoidance. Synthetic pesticide use, with all its harms to biodiversity and clean air and water, is likely to increase if the 30x30 Pathways and complementary state strategies do not explicitly

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include synthetic pesticide reduction as part of their targets. Rising temperatures are expected to lead to increases in certain pest pressures[1], including: weeds whose growth will increase as a result of increased CO_2; insects whose populations will grow, uninhibited by warmer winters; and the spread of vectors and invasive species.[2] Without state investment and prioritization of more sustainable farming and pest management practices, heavier use of synthetic pesticides is likely in urban, natural and agricultural areas.

Throughout the draft 30x30 Pathways there are references to the agencies and departments that will be collaborating in the plan, but missing from this list is the Department of Pesticide Regulation (DPR). DPR needs to be included in the design and implementation of 30x30 to ensure increased adoption of alternatives to pesticides and reduction of harmful synthetic pesticide use.

Finally, we support CNRA's intent to support programs that enhance the sustainability of our food systems, including improvements to soil health and protections for pollinators (page 22), that promote climate smart land management actions (page 22), that avoid the use of toxic chemicals (page 31), and that institutionalize advance mitigation and expand and accelerate environmental restoration (page 35). Many of these goals can be achieved by ag lands that are managed through agroecological or regenerative organic farming systems, which have been proven to be most effective at improving drought resilience and weathering the extremes of climate change.

I. Intensive Agricultural and Urban Pesticide Use Undermines Goal of 30x30 Pathways to Protect California's Biodiversity

Agricultural Pesticides Are a Primary Driver of Biodiversity Loss

Of the approximately 100 million acres in California, nearly 25% are agricultural lands, according to the US 2017 Census of Agriculture State Profile[3]. Accounting for nearly ¼ of all California land, the toxic management of many of these areas cannot be ignored if we want to protect California's overall biodiversity, especially since:

- Farming areas are 48 times more toxic to honeybees and other organisms than 25 years ago, due to pesticides.[4]
- Approximately 200 million pounds of pesticide active ingredients are applied to California fields each and every year.[5]
- The California agricultural sector applies pesticides at a rate 4.5 times higher than the national average.[6]
- California applies at least 138 pesticide active ingredients that have been banned in at least one country, many of which are banned by dozens of countries.[7]

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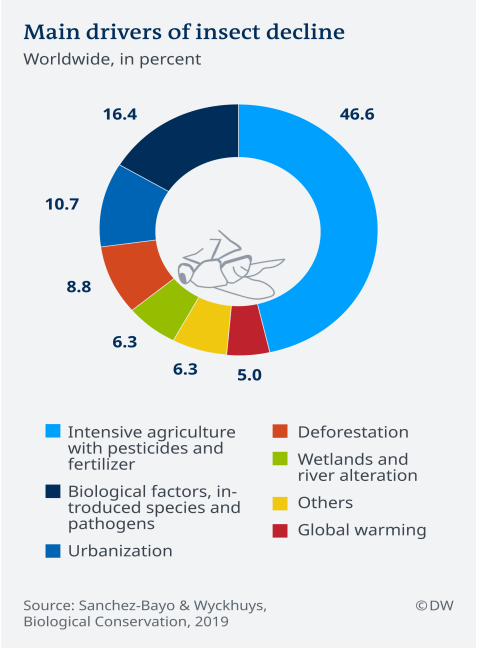
[1] Milder winters are expected to reduce insect mortality, and expand pest ranges, too, as northern regions warm.
[2] Pests and Disease, USDA. https://www.climatehubs.usda.gov/taxonomy/term/400
[3] https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/California/cp99006.pdf
[4] DiBartolomeis M, et al. (2019) *An assessment of acute insecticide toxicity loading (AITL) of chemical pesticides used on agricultural land in the United States*. PLoS ONE 14(8): e0220029. https://doi.org/10.1371/journal.pone.0220029.
[5] The ~200 million pounds does not include the bulk of most pesticide products, which are made up of inert ingredients that may also pose risks to ecological health but are considered confidential business information. California Department of Pesticide Regulation, 2018 Pesticide Use Report. https://www.cdpr.ca.gov/docs/pur/pur18rep/18sum.htm
[6] Rafter, F., et al. (2019). *Farmworkers at Risk: The Growing Dangers of Pesticides and Heat*. Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/resources/farmworkers-at-risk.
[7] Comparison of data from CDPR's 2018 Pesticide Use Reporting database (https://www.cdpr.ca.gov/docs/pur/pur18rep/18_pur.htm) with PAN International Consolidated List of Banned

- Many of the pesticides applied linger for years in soil, travel easily through water, and concentrate in the food chain, harming biodiversity in the short- and long-term.

The pesticide-intensive agricultural model has been internationally-recognized as a major cause of biodiversity loss. The UN Special Rapporteur on the Right to Food noted in a 2017 report, "Pesticides can persist in the environment for decades and pose a global threat to the entire ecological system upon which food production depends. Excessive use and misuse of pesticides result in contamination of surrounding soil and water sources, causing loss of biodiversity, destroying beneficial insect populations that act as natural enemies of pests and reducing the nutritional value of food."[8]

Pesticides Are A Key Factor in Worldwide Decline of Insects, Pollinators and Other Fauna

Insects play a crucial role within terrestrial food webs.[9] As pollinators, many insects are critical for our food supply, and insects form the basis of our entire ecosystem, consumed by predators like other insects, spiders, amphibians, reptiles, birds and mammals.[10] Insects also provide critical ecosystem functions and services, such as nutrient cycling, soil formation, decomposition, water purification, biological pest control, pollination and food web interactions – all critical to healthy ecological systems, food supply, and human health.[11]



Documenting that intensive agriculture with pesticides and fertilizers is responsible for nearly 50% of insect decline worldwide. https://www.dw.com/en/munich-study-confirms-severe-decline-in-insect-populations-in-germany/a-51052955

Pesticides are one of the greatest causes of what has been called the insect apocalypse. A 2019 worldwide study identified "pollution, mainly that by synthetic pesticides and fertilisers" as the second most important driver for the worldwide decline in insect populations, second only to habitat loss and conversion to intensive agriculture and urbanization.[12] The comprehensive review of 73 historical reports of insect decline around the world found pathogens, introduced species, and climate change to be lesser drivers.

Pesticides, 5th edition, March 2021 (https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/)

[8] Report of the Special Rapporteur on the right to food, January 24, 2017, A/HRC/34/48, https://undocs.org/A/HRC/34/48

[9] Noriega, J. A. et al. *Research trends in ecosystem services provided by insects*. Basic Appl. Ecol. 26, 8-23

[10] Noriega, J. A. et al. *Research trends in ecosystem services provided by insects*. Basic Appl. Ecol. 26, 8-23

[11] Noriega, J. A. et al. *Research trends in ecosystem services provided by insects*. Basic Appl. Ecol. 26, 8-23

[12] Sánchez-Bayo, F., et al. (2019). *Worldwide decline of the entomofauna: a review of its drivers*. Biol. Conserv. 232, 8–27. doi: 10.1016/j.biocon.2019.01.020.

Setting aside lands for conservation and establishing biological corridors is critical but insufficient to protect insects and other fauna, when our state is overly reliant on agricultural chemicals that pay no heed to such boundaries. A number of studies, both in California[13] and elsewhere have now documented the dramatic impact that agricultural pesticides have had on insect populations in the field, and in even in protected nature preserves.

- A 2016 California study found an association between neonicotinoid pesticides and significant butterfly declines in Northern California, beginning in the late 1990s.[1] Previous analyses had implicated changing patterns of land use and warming autumn and summer temperatures for the declines, but neither land conversion nor shifting temperatures showed evidence of increased rate of change concomitant with the butterfly declines, whereas neonicotinoid use in the region began to increase dramatically at the same time the butterfly populations started to significantly decline. These results suggest that neonicotinoids can influence non-target insect populations occurring in proximity to application locations.

- A similar, even more robust study in Germany in 2017 sparked worldwide concern about an insect apocalypse when scientists studying 21 German nature preserves documented devastating insect declines of nearly 80% over the last 30 years in those preserves. The researchers found that the dramatic declines were due to the use of pesticides[14], not in the preserves, but in agricultural landscapes up to 1.25 miles away.[15] Insects found in the nature preserves were consistently contaminated with over a dozen pesticides[16], calling into question the ability for nature preserves to function as refuges for critical, threatened and endangered species. With California using greater amounts and even more types of pesticides than Germany there's no reason to expect the impact to our natural wealth would be any less significant. To prevent the agricultural pesticide-induced decline of non-target insects, the German researchers proposed investing in the development of 1.25-mile buffer zones around the country's nature preserves where no synthetic pesticides would be allowed.[17]

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[13] Forister, M.L., et al. 2016, *Increasing neonicotinoid use and the declining butterfly fauna of lowland California*. Biol. Lett. 12: 20160475. http://dx.doi.org/10.1098/rsbl.2016.0475

[14] Hallmann C.A., et al. *More than 75 percent decline over 27 years in total flying insect biomass in protected areas*, (2017). PLOS ONE 12(10): e0185809. https://doi.org/10.1371/journal.pone.0185809 :

[15] Brühl, C.A., et al. *Direct pesticide exposure of insects in nature conservation areas in Germany*, Scientific Reports (2021) 11:24144, https://doi.org/10.1038/s41598-021-03366-w

[16] Collected insects were contaminated with 16.7 pesticides on average, with ranges from 7 to 27 different substances on a single insect. Overall 47 of the 92 pesticides researchers tested for were discovered on tested insects. The researchers found that the number of pesticide detections on insects corresponded most closely to the amount of agricultural production within 1.25 miles of a given site. Brühl, C.A., et al. *Direct pesticide exposure of insects in nature conservation areas in Germany*, Scientific Reports (2021) 11:24144, https://doi.org/10.1038/s41598-021-03366-w

[17] The German researchers proposed ensuring "that future transformation in land management could be specifically targeted around nature conservation areas to form the required buffer zones of organic agriculture where no synthetic pesticides are applied." Brühl, C.A., et al. *Direct pesticide exposure of insects in nature conservation areas in Germany*, Scientific Reports (2021) 11:24144, https://doi.org/10.1038/s41598-021-03366-w

Pesticides Pose Significant Threats to Rare and Endangered Species

1,066 pesticide active ingredients are registered for use in California, sold under 13,754 different products.[18] Just a few of these pesticide active ingredients have been studied for their impact on rare and endangered species, with devastating conclusions:

- In November 2021, the U.S. Environmental Protection Agency (U.S. EPA) released its final biological evaluation, finding that glyphosate – the active ingredient in Roundup and the world's most-used herbicide – is likely to injure or kill 93% of the plants and animals protected under the Endangered Species Act, or 1,676 endangered species.[19] The evaluation also found that glyphosate adversely modifies critical habitat for 759 endangered species, or 96% of all species for which critical habitat has been designated. Nearly 12 million pounds of glyphosate were applied in California in 2018 alone.[20]

- As the most widely used insecticides in the U.S.,[21] neonicotinoids (neonics) now broadly contaminate soil, water, and non-target plants in large areas of the country's urban, suburban, and rural landscapes.[22] Since the introduction of neonic pesticides, annual losses of honeybee colonies have jumped dramatically. An outpouring of scientific research has linked neonic use not only to these continued and unprecedented pollinator losses,[23] but also to the devastation of aquatic ecosystems,[24] declines in bird and butterfly populations,[25] and birth defects in white-tailed deer.[26] Unlike other pesticides that remain on the surface of treated foliage, systemic pesticides, such as neonics, are taken up by the plant and transported to all the tissues, including leaves, flowers, roots, stems, as well as pollen and nectar. Neonics remain toxic even at very low doses, and they have a high persistence in soil and water, remaining in situ for months on average. This results in sustained and chronic exposure of non-target organisms, such as invertebrates. They can also migrate considerable

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[18] These numbers do not reflect the inert ingredients used, which are considered confidential and make up the bulk of most pesticide products. https://www.cdpr.ca.gov/docs/label/actai.htm

[19] https://www.epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-glyphosate#executive-summary, https://sustainablepulse.com/2021/11/18/us-epa-reveals-massive-damage-to-endangered-species-from-glyphosate-and-atrazine/

[20] California Department of Pesticide Regulation Pesticide Use Report, 2018.

[21] Douglas, M.R., et al. *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.

[22] Hladik, M., et al. *First National-Scale Reconnaissance of Neonicotinoid Insecticides in Streams Across the USA*, Environmental Chemistry (Aug. 18, 2015), https://bit.ly/31Mse6o; Thomas Wood, T., et al., *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.

[23] Giorio, C. *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 (Jul. 15, 2017), https://bit.ly/2qVqciQ; Worldwide Assessment Part 2; Wood & Goulson 2017; Cressey, D., *Largest-ever Study of Controversial Pesticides Finds Harm to Bees*, Nature (Jun. 29, 2017), https://go.nature.com/2sgJjDk; Woodcock, B.A., et al., *Country-Specific Effects of Neonicotinoid Pesticides on Honey Bees and Wild Bees*, Science (Jun. 30, 2017), https://bit.ly/2lFOAG0

[24] Sanchez-Bayo, F. *Contamination of the Aquatic Environment with Neonicotinoids and Its Implication for Ecosystems*, Frontiers in Environmental Science (Nov. 2, 2016), https://bit.ly/2LifRHf.

[25] Hallmann, C.A., et al. *Declines in Insectivorous Birds Are Associated with High Neonicotinoid Concentrations*, Nature (Jul. 17, 2014), https://go.nature.com/2KvIwah; Forister, M.L., 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.

[26] Berheim, E.H., 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.

distances as run-off from agricultural fields, which can then get taken up by other plants that provide nectar resources for non-target insects. Many seeds are treated with neonics, which also results in contamination of soil and water and has been shown to be ineffective in a number of key crops.[27]

- In 2017 the U.S. EPA released its first-ever analysis on the effects of three common organophosphate pesticides – chlorpyrifos, diazinon and malathion - on endangered and threatened species and designated critical habitat nationwide. According to the analysis, malathion and chlorpyrifos harm an astounding 97% of the 1,782 animals and plants protected under the Endangered Species Act. Diazinon harms 79%.[28] More than 350,000 pounds of malathion, were used in 2018 in California, with more than 600,000 pounds of chlorpyrifos and approximately 27,000 pounds of diazinon applied that same year.[29]

Pesticides Pollute Coastal Waters and Harm Aquatic Species

Pesticides also pose a significant threat to water quality[30] and aquatic species in California. Protecting coastal waters requires protecting them from land pollutants that drain into coastal areas from streams, rivers and run-off.

In California a new generation of pesticides (including pyrethroids, neonicotinoids, fipronil and others) promoted as safe alternatives to pesticides known to endanger the environment and public health are turning up in California streams at toxic levels according to a new study by researchers with the U.S. Geological Survey.[31] The scientists sampled scores of small streams along California's Central Coast, from Sonoma County to Santa Barbara and found pesticides in all but two of the 85 streams sampled. When they found a pesticide, they found it nearly every time they sampled a stream, which they did once a week for six weeks. Highest concentration of frequently detected insecticides occurred in areas with both urban and agricultural use, followed by solely agricultural or urban sites, with the lowest concentrations in undeveloped sites. The USGS study found that the vast majority of hundreds of samples contained two or more pesticides. About a third contained at least 10 compounds.

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[27] "In 2014, EPA found that neonic soybean seed treatments "likely provide $0 in benefits to growers," yet up to half of all conventional soybean seed is still neonic-treated. Other recent research shows neonics to be similarly ineffective on corn, yet *up to 100%* of conventional corn seed gets a neonic treatment. These uses account for the vast bulk of neonics entering the environment and—since they don't work—they don't need replacing." https://www.nrdc.org/experts/daniel-raichel/ten-things-you-always-wanted-know-about-neonics

[28] Dunsmith, G., *3 common agrochemicals imperil endangered species*, E&E News, January 19, 2017. https://www.biologicaldiversity.org/news/media-archive/a2017/Pesticides_eande_1.19.17.pdf

[29] California Department of Pesticide Regulation Pesticide Use Report, 2018. Chlorpyrifos use has dropped dramatically since its near complete ban, (except for granular applications), went into effect in 2020.

[30] California's 2020 Water Resilience Portfolio states that "California's major water pollution problems are from diffuse, difficult-to-control sources, such as urban and farm runoff, fertilizers, pesticides, and soil erosion." As briefly summarized in the "California Water Today" section and further detailed in Appendix 3, numerous water bodies and groundwater basins throughout California are impaired due to various pollutants, including synthetic pesticides, that are consistently detected above water quality objectives protective of people and ecosystems. Agricultural pollutants affect both groundwater and surface water, with serious consequences for both human health and ecosystem health. Disadvantaged communities in the Central Valley and other agricultural centers are disproportionately burdened by these impacts. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/Final_California-Water-Resilience-Portfolio-2020_ADA3_v2_ay11-opt.pdf, page 14.

[31] Sandstrom M. W., et al., *New-generation pesticides are prevalent in California's Central Coast streams*, Science of the Total Environment. Feb 1, 2022. Vol. 806, Part 4, 150683. https://doi.org/10.1016/j.scitotenv.2021.150683

And these pesticides are reaching coastal waters:

- A 2013 USGS/UC Davis study found pesticides frequently in water, sediment, and the tissue of resident aquatic organisms in an agriculturally-dominated estuary along the central California coast.[32] The estuary and lagoon, near Guadalupe, provide nursery and foraging habitat for numerous marine and estuarine fish and other aquatic animals including the endangered tidewater goby fish. Three fungicides, an herbicide, and two organophosphate insecticides were observed frequently in the study area. Pesticides found in the water increased during the summer months as pesticide applications increased in the adjacent agricultural watershed; pesticides in bed sediment decreased with increasing distance from potential sources. Fish and sand crabs collected from the mouth of the estuary accumulated a number of pesticides in their tissues. This is the first study to document the occurrence of many current-use pesticides, including fungicides, in aquatic tissue.

- A 2014 study investigated pesticide impacts in the Santa Maria River estuary, which provides critical habitat to numerous aquatic, terrestrial, and avian species on the central California coast.[33] Results suggest the Santa Maria River estuary is impacted by current-use pesticides, with the majority of water samples found to be highly toxic to invertebrates. Toxicity was associated with the organophosphate pesticide chlorpyrifos, pyrethroid pesticides, or mixtures of both classes of pesticides. This study suggests that the same pyrethroid and organophosphate pesticides that have been shown to cause water and sediment toxicity in urban and agriculture water bodies throughout California, have the potential to affect estuarine habitats.

II. Intensive Agricultural Pesticide Use Undermines 30x30 Goal of Expanding Equitable Access to Nature and Its Benefits

The California agricultural sector applies pesticides at a rate 4.5 times higher than the national average,[34] with extensive scientific literature confirming that pesticide exposure causes debilitating and fatal diseases from Parkinson's disease to asthma to cancer.[35]

Providing equitable access to nature for all the diverse communities in the state of California doesn't mean only ensuring development and physical access to parks and other natural areas. In order to be able to enjoy the multitude of benefits these natural areas provide, people need to benefit from an overall environment that is conducive to good health and to being outdoors. That is not the case for many underserved communities of color in the state of California who suffer from disproportionate pollution burdens from pesticides, which contribute to poor air quality that lessens people's ability to take advantage of natural areas.

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[32] Smalling, K.L, et al. *Environmental fate of fungicides and other current-use pesticides in a central California estuary*, Marine Pollution Bulletin, Volume 73, Issue 1, 15 August 2013, Pages 144-153, https://doi.org/10.1016/j.marpolbul.2013.05.028

[33] Anderson, B., et al. *Impacts of pesticides in a Central California estuary*, Environ Monit Assess. 2014 Mar; 186(3):1801-14. DOI: 10.1007/s10661-013-3494-7

[34] Rafter, F., et al. (2019). *Farmworkers at Risk: The Growing Dangers of Pesticides and Heat*. Cambridge, MA: Union of Concerned Scientists. https://www.ucsusa.org/resources/farmworkers-at-risk.

[35] Sanborn, M., et al. (2007). *Non-cancer health effects of pesticides: systematic review and implications for family doctors*. Canadian family physician, 53(10), 1712-1720.

The San Joaquin Valley suffers from among the worst air pollution in the entire nation.[36] It is also the heart of California agriculture. That is not a coincidence. An agricultural system dominated by industrial interests that rely on inordinate amounts of pesticides to grow monocrops for export has led to unacceptably high levels of air pollution. According to DPR, the top counties in terms of overall volume of pesticides applied are the San Joaquin Valley counties of Fresno, Kern and Tulare, all three of which are majority Latinx.[37] The heavy use of synthetic pesticides in the agricultural region contribute to among the highest rates of asthma, childhood cancer, and other ailments found in the state.[38] **Ensuring equitable access to nature and its benefits requires that CNRA adopt targets that will lead to reduction of the use of synthetic pesticides that so drastically contributes to poor air and water quality in agricultural areas, affecting people's health and their ability to use natural areas.**

And the problem is not restricted to the San Joaquin Valley. Across the state pesticide use is highly concentrated in areas with higher numbers of residents of color. For instance, research by the California Environmental Protection Agency found that "60% of zip codes with the highest proportion of residents of color host >95% of agricultural pesticide use in the state."[39] Pesticides and toxic chemical releases were the top two pollutants whose distribution was most correlated with race and ethnicity. Similarly, a 2013 report from the Center for Biological Diversity found that more than half of all glyphosate applications in California occurred in the 8 lowest-income counties in California, with a combined population that is 53% Latinx, compared with 38% for California as a whole.[40]

III. Intensive Agricultural Pesticide Use Undermines 30x30 Goal of Conserving Places That Help California Achieve Carbon Neutrality and/or Build Climate Resilience

Pesticides also pose grave risks for soil health and biodiversity and frustrate California's effort to fight climate change, in part, through natural carbon sequestration on working lands. Soils are among the planet's most complex and biodiverse ecosystems, containing nearly a quarter of all species.

In the most comprehensive study ever undertaken analyzing the effects of pesticides on soil health, researchers found that widely-used pesticides pose a grave threat to organisms that are critical to

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[36] "The World Health Organisation had just identified this baked corner of California as having the country's worst air pollution." Carroll, R. *Life in San Joaquin valley, the place with the worst air pollution in America*, May 13, 2016. https://www.theguardian.com/us-news/2016/may/13/california-san-joaquin-valley-porterville-pollution-poverty. Part of the contribution to the poor air quality comes from more than 30 million pounds of pesticides that are or contribute to Volatile Organic Compounds, which in turn, result in unhealthy levels of ozone.

[37] US Census Bureau. https://www.census.gov/quickfacts/fact/table/tularecountycalifornia,kerncountycalifornia,fresnocountycalifornia/PST045219.

[38] Pesticide Action Network. *Kids on the Frontline in California*. May 2016. https://www.panna.org/sites/default/files/KoF-CA-factsheet-FINAL.pdf.

[39] Cushing, L., et al. (2015). *Racial/ethnic disparities in cumulative environmental health impacts in California: evidence from a statewide environmental justice screening tool* (CalEnviroScreen 1.1). American Journal of Public Health, 105(11), 2341-2348.

[40] Donnaly, N. (2015). *Lost in the Mist*. The Center for Biological Diversity. https://www.biologicaldiversity.org/campaigns/pesticides_reduction/pdfs/LostInTheMist.pdf.

healthy soil, biodiversity, and soil carbon sequestration.[41] They found that in 71% of cases studied, pesticides across all classes kill or harm soil invertebrates, including earthworms, ants, beetles and ground nesting bees. The review shows "extensive evidence that pesticides pose a serious threat to soil invertebrates and the essential ecosystem services" that they provide, such as cycling nutrients that plants need to grow, decomposing dead plants and animals so they can nourish new life, and regulating pests and diseases. And effects on soils can last for decades.[42]

Ample research documents the effects of pesticides on soil health and ultimately its ability to store carbon. Organochlorine pesticides inhibit nitrogen-fixing rhizobia bacteria, increase dependence on synthetic fertilizers and reduce overall plant yield. [43] Fungicides are associated with decreases in populations of nitrogen-fixing bacteria, increased populations of denitrifiers[44], and decreases in the number and type of soil fungi and formation of macroaggregates, which are essential to good soil structure.[45] The systemic herbicide glyphosate reduces populations of soil microbial communities and disrupts nutrient cycling processes, reducing bioavailability of essential micronutrient and macronutrients, increasing reliance on mineral fertilizers, and reducing essential nutrient content in associated food crops.[46] Applications of the common soil fumigant metam sodium has shown persistent damage (lasting at least 4 months) in various microbial-mediated functions including nutrient cycling.[47] Neonicotinoid insecticides, which can persist in soils for years, can cause significant adverse effects on key soil organisms, including earthworms, soil microbes and decreased fungal abundance, and can lead to significant changes in levels of nitrate-N, ammonium, nitrite-N, and nitrate reductase enzyme activity, among other impacts.[48] Pesticide applications result in a population shift from beneficial soil bacteria and fungi-feeding nematodes, essential for organic matter decomposition, nitrogen cycling, and biological control, to greater proportion of plant-parasitic nematodes.[49] Several pesticides decrease reproductive success, juvenile survival, and overall development in earthworms, which are vital for good soil structure and fertility.[50]

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[41] The researchers analyzed 394 studies encompassing 275 unique species or types of soil organisms and 284 different pesticides or pesticide mixtures. Gunstone, Tari, et al., *Pesticides and Soil Invertebrates: A Hazard Assessment*, Frontiers in Environmental Science, Volume 9, 2021, ISSN 2296-665X, DOI=10.3389/fenvs.2021.643847, https://www.frontiersin.org/article/10.3389/fenvs.2021.643847

[42] Riedo J, et al. *Widespread Occurrence of Pesticides in Organically Managed Agricultural Soils - the Ghost of a Conventional Agricultural Past?* Environ. Sci. Technol. 2021, 55, 2919−2928. https://dx.doi.org/10.1021/acs.est.0c06405

[43] Fox E., et al. 2007. *Pesticides reduce symbiotic efficiency of nitrogen-fixing rhizobia and host plants*. PNAS vol. 104 no. 24 10283

[44] Martınez-Toledo, M.V., et al. 1998. *Effects of the fungicide Captan on some functional groups of soil microflora*. Applied Soil Ecology 7: 245–255; doi: https://doi.org/10.1016/S0929-1393(97)00026-7.

[45] Kalia, A., et al. *Effect of pesticide application on soil microorganisms*. Archive of Agronomy and Soil Science, Volume 57, Issue 6. https://www.tandfonline.com/doi/full/10.1080/03650341003787582.

[46] Mertens, M., et al. 2018. *Glyphosate, a chelating agent—relevant for ecological risk assessment?* Environ Sci Pollut Res Int. 25(6): 5298–5317. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5823954/

[47] Macalady, J.L., et al. 1998. *Effects of Metam Sodium Fumigation on Soil Microbial Activity and Community Structure*. J. Environ. Qual. 27:54-63.

[48] Madeleine C, Kreutzweiser D, Mitchell EAD, Morrissey CA, Noome DA, Van der Sluijs JP. 2015. *Risks of large-scale use of systemic insecticides to ecosystem functioning and services*. Environ Sci Pollut Res 22:119–134.

[49] Yardirn E.N., et al. 1998. *The effects of chemical pest, disease and weed management practices on the trophic structure of nematode populations in tomato agroecosystems*. Applied Soil Ecology 7: 137–147; doi: https://doi.org/10.1016/S0929-1393(97)00036-X.

[50] a. Casabé, N., et al. 2007. *Ecotoxicological assessment of the effects of glyphosate and chlorpyrifos in an Argentine soya field*. Journal of Soils and Sediments 7:232–239; doi: https://doi.org/10.1065/jss2007.04.224.
b. Yasmin, S., et al. 2010. *Effects of Pesticides on the Growth and Reproduction of Earthworm: A Review*. Applied and Environmental Soil Science 2010:1–9; doi: https://doi.org/10.1155/2010/678360.

IV. Solution: Incentivize Pesticide Reduction and Support Ecological Pest Management and Organically-Farmed Lands, Which Have Significantly Higher Biodiversity and are More Resilient

Numerous comparative studies showing the impact of conventional and organic farming systems verify the positive effect organic farming has on flora and fauna on field and also farm level.[51] A comprehensive analysis of 66 scientific studies shows that organically farmed areas have on average 30% more species and 50% more individuals than non-organic areas.[52] The positive effect of organic farming is most significant in cleared landscapes, but is also seen in structurally rich regions.[53,54] In particular, birds, predatory insects, spiders, soil dwelling organisms and field flora benefit from organic management.

The higher diversity of flora and fauna also encourages beneficial organisms that naturally reduce pests.[55] A more diverse flora and fauna in organic soil result in a revitalized, more active soil life.[56] Research from Norway shows a stronger reduction in soil pests in organic soils than in conventional soils due to richer fungal fauna.[57]

Various farm practices and landscaping measures are implemented in organic farming that have a proven positive influence on biodiversity. The following measures typically carried out on organic farms that most notably promote biodiversity are:

- Prohibition of use of nearly all 900+ synthetic pesticides (only about 2 dozen are allowed under organic farming)
- Prohibition of use of synthetic fertilizer
- More diversified crop rotation
- Conservation tillage
- Higher percentage of semi-natural, arable and ecological areas

None of this should come as a surprise. The USDA National Organic Program (NOP) requires organic farmers to "maintain or improve the natural resources of the operation," and "conserve biodiversity," and the NOP has issued a series of guidance in support of biodiversity over the years.[58]

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[51] Fuller, R.J., et al. 2005. *Benefits of organic farming to biodiversity vary among taxa*. Biology Letters 1: 431-434.
[52] Bengtsson, J., et al. 2005. *The effects of organic agriculture on biodiversity and abundance: a metaanalysis*. Journal of Applied Ecology 42: 261-269.
[53] Gabriel, D., et al. 2006. *Beta diversity at different spatial scales: plant communities in organic and conventional agriculture*. Ecological Applications 16: 2011-2021.
[54] Gabriel, D., et al. (2010). *Scale matters: the impact of organic farming on biodiversity at different spatial scales*. Ecology Letters 13(7): 858-869.
[55] Zehnder, G., et al. 2007. *Arthropod pest management in organic crops*. Annual Review of Entomology, 52: 57-80.
[56] Mäder, P., et al. 2002. *Soil fertility and biodiversity in organic farming*. Science 296: 1694-1697.
[57] Klingen, I., et al. *Effects of farming system, field margins and bait insect on the occurrence of insect pathogenic fungi in soils*. Agriculture, Ecosystems and Environment 91: 191-198.
[58] In 2016 the NOP provided Guidance on Biodiversity (NOP 5020) encouraging the protection and maintenance of a high level of biodiversity on farms because it brings benefits not only to the entire ecosystem in that geographic area, but also to the farmer. The OFPA Preamble to the Final Rule establishing the NOP states: "[t]he use of 'conserve' [in the definition of organic production] establishes that the producer must initiate practices to support biodiversity and avoid, to the extent practicable, any activities that would diminish it. Compliance with the requirement to conserve biodiversity requires that a producer incorporate practices in his or her organic system plan that are beneficial to biodiversity on his or her operation." (65 FR 80547, December

In addition, organic farming offers a systems solution for climate mitigation, reaping greater climate benefits than conventional ag or adoption of individual climate-smart farming practices. [59] We recommend that CNRA develop targets for supporting farmers' transition to organic farming systems, especially organic farming systems that include other regenerative and agroecological elements. Not only have a multitude of scientific studies now demonstrated the greater effectiveness of organic farming to sequester carbon, especially stable carbon, when compared to conventional farming, but organic farming brings a multitude of other benefits, including in air and water quality, biodiversity, community health, and jobs.[60] Organic agriculture is structured for continuous improvement and is the only form of management that is certified and nationally regulated by precise standards to verify its claims.

V. Target Recommendations

We recommend CNRA include targets mirroring those adopted by the European Union in the EU's Farm to Fork strategy:

- 50% reduction in synthetic pesticide use by 2030
- 75% reduction in use of the most hazardous pesticides by 2030 (in light of California's continued use of many pesticides that have already been banned in the EU)
- 25% of all agricultural lands be organic by 2030

VI. Include DPR in the California Biodiversity Collaborative

The California Biodiversity Council, one of two existing organizations that form the foundation of the Collaborative includes 42 members including 20 state agencies, 12 federal agencies, and 10 local governments. As the primary state entity focused on pest management and pesticides, and

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20, 2001). 7 CFR 205.2 describing the National Organic Program offers this definition: "Organic production: production system that is managed to respond to site-specific conditions by integrating cultural, biological and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity."

[59] A sampling of studies:

1. A UC Davis Long-Term Research on Agricultural Systems (LTRAS) study found that after 10 years, organic systems resulted in 14 times the rate of carbon sequestration as the conventional system. Kong, A.Y., et al. (2005). *The relationship between carbon input, aggregation, and soil organic carbon stabilization in sustainable cropping systems*. Soil Sci Soc Am J., 69, 1078-1085. After 20 years, organically managed soils sequestered significantly more soil organic carbon than conventionally managed soils. Wolf, K., et al. (2017). *Long-term agricultural experiments inform the development of climate-smart agricultural practices*. California Agriculture, 71, 120-124.
2. Organic agricultural systems, which avoid the use of synthetic fertilizers and pesticides, have been found to significantly reduce greenhouse emissions -- with one study showing organic management to increase soil organic carbon by 36 percent after 12 years in California cropping systems. Horwath, W. R., et al. (2002). *Soil carbon sequestration management effects on nitrogen cycling and availability*. In ''Agricultural Practices and Policies for Carbon Sequestration in Soil'' (J. M. Kimble, R. Lal, and R. F. Follett, Eds.), 155–164.
3. The Rodale Farming Systems Trial, which is the longest running organic comparison study in the United States, documented that after 22 years, soil organic carbon increased by 15-28% in organically-managed soils compared to 9% in the conventionally managed soils. Pimentel, D., et al. (2005). *Environmental, energetic and economic comparisons of organic and conventional farming systems*. Bioscience*, 55*(7), 573-583.
4. An extensive 2017 study comparing soils from 659 certified organic farms and 728 conventional farms found that organic farms across 48 states sequester significantly more carbon than conventional farms. Ghabbour, E. A., et al. (2017). *Chapter one - national comparison of the total and sequestered organic matter contents of conventional and organic farm soil*. Advances in Agronomy, 146*,* 1-35.

[60] California Certified Organic Farmers. *Roadmap to An Organic California: Benefits Report*. 2019. https://indd.adobe.com/view/08d24118-8d54-474d-8c2e-1f49328d429b

integrated pest management alternatives to pesticides, DPR needs to be part of part of the Council and Collaborative.

VII. Track Pesticide Use and Work Across Agencies to Reduce State's Use of Pesticides

For California to achieve its biodiversity, equity and climate targets under the 30x30 Pathways, state agencies and departments need to 1) track pesticide applications and impacts and 2) work in alignment with one another on reducing pesticide use, supporting organic and agroecological farming systems and promoting ecological pest management.

Tracking
CA Nature should incorporate the following mapping and tracking tools to overlap conservation efforts with pesticide use and socially-disadvantaged communities who bear disproportionate pollution burdens:

- CalEnviroScreen: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40)
- Tracking California Pesticide Map: https://trackingcalifornia.org/pesticides/pesticides-landing
- UC Davis' pesticide database: http://ziram.lawr.ucdavis.edu/PURwebGIS.html (built upon DPR's pesticide use reporting system)

Aligning State Actions
State agencies should drastically reduce their own pesticide applications on state and county lands, and should replace chemicals with manual, cultural and other methods for removing invasive or other unwanted pests and species. Among agencies that should adopt a new approach to align with the 30x30 Pathways are:

- CalTrans, which applies high levels of herbicides to roadsides and other transportation areas
- California Department of Food and Agriculture, which:
    - to date has not included pesticide reduction as a practice eligible for funding under its Healthy Soils Program
    - recently lost a lawsuit for attempting to adopt, in violation of CEQA, a statewide "pest management" program that would have allowed CDFA to apply more than 75 pesticides known to cause cancer and birth defects and to be highly toxic to bees, butterflies, fish and birds on private residential property, schools, public property and agricultural and wild lands, with insufficient public notice and inadequate evaluation of potential local impacts[61]
    - has never incorporated into the very successful and important SALC (Sustainable Agricultural Lands Conservation) Program the final component of SALC, which was ensuring that preserved ag lands would be farmed sustainably
- DPR, which, among other issues:
    - is insufficiently regulating neonicotinoid pesticides and neonic-treated seeds
    - has not yet developed a scientifically-grounded, public process for assessing manufacturer requests to do experimental field releases of genetically-engineered insects - a completely new class of biopesticides, even though one company has

[61] https://biologicaldiversity.org/w/news/press-releases/court-of-appeal-rejects-californias-blanket-approval-of-pesticide-spraying-2021-10-18/

already petitioned the U.S. EPA to carry out, in California, what would be the largest release of GE mosquitos anywhere in the world[62]

For all of the above reasons we urge the California Natural Resources Agency to work on aligning sister agencies with the 30x30 goals; include DPR in the California Biodiversity Council and California Biodiversity Collaborative; and include pesticide reduction targets as well as targets for adoption of ecological pest management and organic farming into the final 30x30 Pathways.

Thank you again for the opportunity to comment, and we would welcome a discussion with you or your staff on these topics to address any further questions or comments.

Sincerely,

Sarah C. Aird and Jane Sellen
Co-Directors, Californians for Pesticide Reform

[62] Application 93167-EUP-2 from Oxitec (Docket No. EPA-HQ-OPP-2019-0274). The UK firm Oxitec has petitioned the U.S. EPA for expansion of its GE-mosquito field experiments from Florida to California, proposing to release several billion GE mosquitoes on 85,000 acres in 12 undisclosed counties in California. There has been no independent evaluation of the impacts of their GE mosquitos on human health or the environment. DPR has no regulations specific for GE insects, and no procedures for adequately assessing this type of request.