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U.S. Fish and Wildlife Service
MS: PRB/3W
5275 Leesburg Pike
Falls Church, VA 22041-3803

Docket No. FWS-R3-ES-2024-0137

Re: Endangered and Threatened Wildlife and Plants; Proposed Rule to List the Monarch Butterfly Under the Endangered Species Act

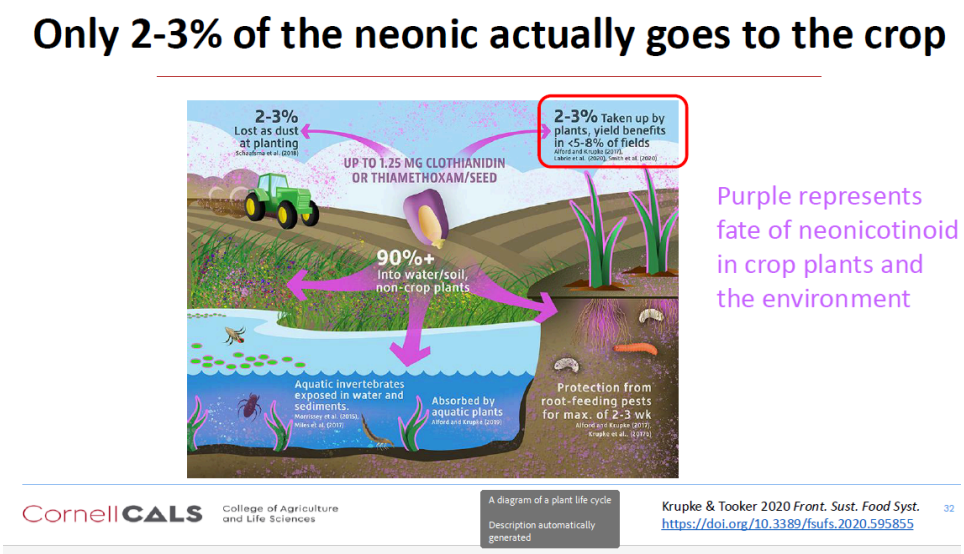
U.S. Fish and Wildlife Service,

The Pollinator Stewardship Council fully supports the petition to list the monarch butterfly (*Danaus plexippus*) as an endangered species under the Endangered Species Act (ESA) and emphasize the urgent need for regulatory reform to incorporate the growing body of research on chronic toxicity. While the Fish and Wildlife Service acknowledges that pesticides are a significant threat to monarch recovery, the proposed rule does not go far enough to address this critical issue. We urge the Service to ensure that the final rule includes strong, enforceable pesticide protections for monarchs rather than relying entirely on the EPA, whose risk assessment frameworks are fundamentally inadequate in key areas. The Service must take action where the EPA's regulatory process fails to protect monarchs from widespread pesticide exposure.

For years, we have urged the EPA to ban neonicotinoids from outdoor use in the U.S., recognizing the devastating impact these chemicals have on pollinators like monarch butterflies. Despite clear scientific evidence and bans in other countries, the EPA's refusal to act has directly contributed to the continued decline of monarchs. (Edwards et al, 2025) Without immediate intervention, this iconic species—and the critical pollination services it provides—will continue to vanish.

For example, the EPA's current framework does not fully assess how pesticides contaminate milkweed, the primary host plant for monarch larvae. Systemic insecticides such as neonicotinoids persist in plant tissues and soil, leading to chronic exposure of

monarch caterpillars. Research has demonstrated that even low-level, prolonged exposure to these pesticides can result in significant effects, including reduced growth, impaired navigation, and decreased survival rates.



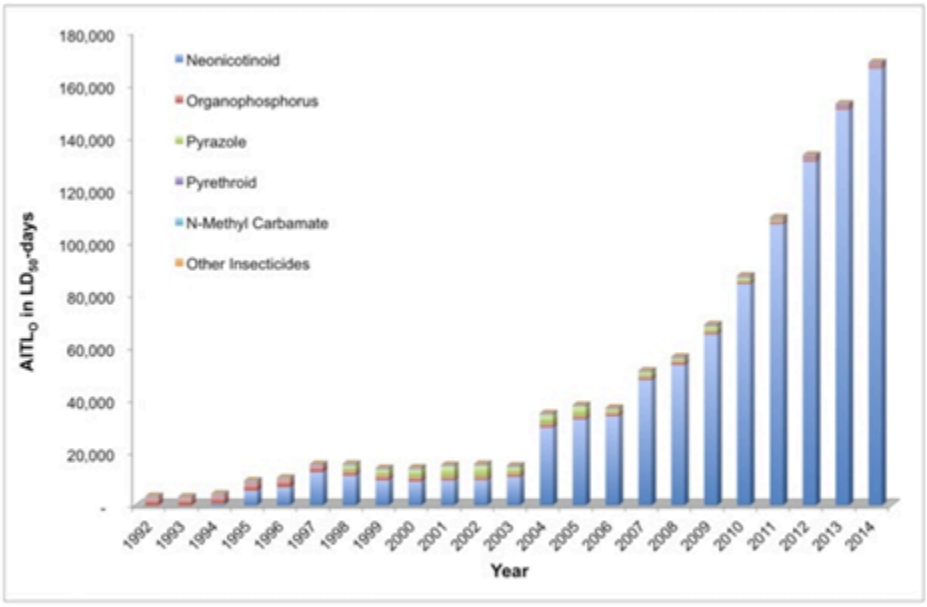
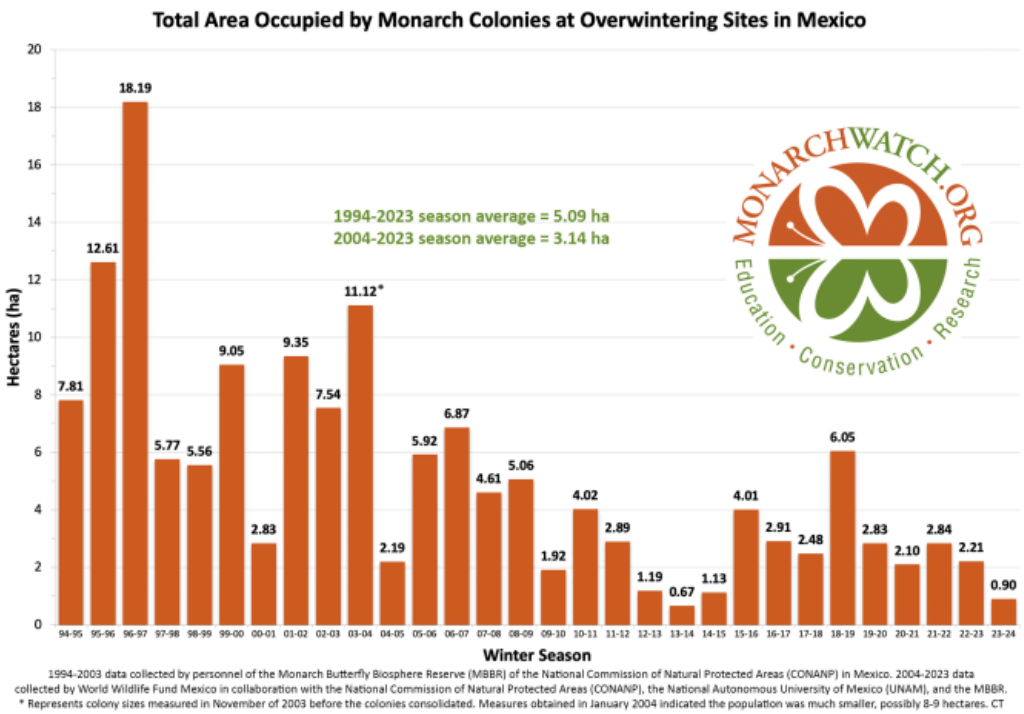


Figure 2: Oral acute insecticide toxicity loading (AITLo) by chemical class, 1992–2014.



Despite mounting evidence, the EPA's risk assessment process remains focused on acute toxicity thresholds, failing to incorporate the well-documented risks of chronic pesticide exposure. Unlike honeybees, for which LD50 data exist for many pesticides, monarchs have only been studied for clothianidin, leaving most chemicals untested. This knowledge gap severely limits the ability to evaluate risks accurately. Without comprehensive pesticide risk assessments—including chronic effects—the true impact of pesticides on monarch populations remains underestimated.

Current regulatory frameworks fail to account for chronic pesticide toxicity, which is particularly harmful to pollinators like monarchs and honey bees. While acute poisoning events are more rare, long-term chronic exposure to low pesticide concentrations leads to immune suppression, disorientation, and increased vulnerability to disease, ultimately reducing pollinator populations. A fundamental toxicological principle, the Druckrey-Küpfmüller equation, establishes that the lower the exposure concentration, the longer the latent period before a lethal effect occurs. This principle is particularly relevant for neonicotinoids, which accumulate in plant tissues, soil, and water, resulting in prolonged exposure to pollinators.

Lethal Effect of Imidacloprid on Honey Bees
Toxicity Is Reinforced By Exposure Time

Suchail S, Guez D, Belzunces LP, 2001. Environ. Toxicol. Chem. 20: 2482-2486
Tennekes HA, Sánchez-Bayo F, 2012. J. Environment. Analytic Toxicol. S4- 001

- **The *lower* the exposure concentration**, the *longer* the latent period up to a lethal effect, **the *lower* the lethal dose**
- **The dose : response relationship is a Druckrey-Küpfmüller equation**

  Ln T50 (hrs) = 5.11 – 0.22 Ln C (µg. L-1 or kg-1)

  or

  $C \times T50^{4.5} = \text{constant}$

Concentration C (µg/L)	Latent Period T50 (hours)	Lethal Dose (µg/L x hours)
57	48	2,736
37	72	2,664
10	173	1,730
1	162	162
0.1	240	24

Research by Dr. Henk Tennekes on imidacloprid confirms that as pesticide concentration decreases, the time to a lethal effect increases, but the total dose required drops dramatically—proving that even minimal exposure can be deadly over time. Monarchs, as critical pollinators, are particularly at risk due to their reliance on contaminated milkweed, yet current risk assessments largely ignore these long-term, cumulative effects. Without reforms to pesticide regulation that account for chronic toxicity, monarch populations will continue to decline.

Research has shown that monarch butterflies are widely exposed to pesticides, which can have both direct and indirect effects on their survival and migration success. A study by Olaya-Arenas et al. (2020) found that exposure to six commonly used pesticides—including clothianidin- resulted in significant chronic effects. Adult monarchs showed a 12.5% reduction in wing length due to exposure, which could impact their migratory success by reducing flight ability and increasing energy expenditure, ultimately diminishing their chances of reaching overwintering sites in Mexico. This aligns with findings from Halsch et al. (2020), who analyzed 227 milkweed leaf samples from various land-use types in California's Central Valley and detected 64 pesticides, including 25 insecticides, 27 fungicides, and 11 herbicides. The presence of multiple pesticides per sample indicates that monarchs are exposed to complex chemical mixtures with unknown synergistic effects, which may intensify toxicity beyond individual compound assessments. Additionally, a two-year study by Olaya-Arenas and Kaplan (2019) found that milkweed near agricultural fields contained 14 different pesticides, with clothianidin detected in up to 60% of sampled plants. Collectively, these studies highlight the widespread contamination of milkweed by pesticides and emphasize the urgent need for more comprehensive risk assessments that account for both lethal and sublethal effects, as well as the cumulative impact of multiple pesticide exposures.

Risk assessment is crucial for understanding the impact of pesticides on monarchs, yet significant gaps remain. Unlike honeybees, for which LD50 data exist for many pesticides, monarchs have only been studied for clothianidin, leaving most chemicals untested. This lack of toxicity data severely limits the ability to evaluate risks accurately. Additionally, current pesticide assessments focus on acute toxicity and largely ignore chronic effects, which can impair monarch development, reproduction, and migration over time. Without comprehensive risk assessments that include both lethal and chronic impacts, regulatory decisions may underestimate the true threat pesticides pose to monarch populations.

The scientific evidence overwhelmingly supports the necessity of ESA listing for monarch butterflies and the urgent need to reform pesticide regulations. Adding monarchs to the endangered species list is absolutely necessary as a starting point to mitigate their decline and work toward their survival. However, listing alone is not enough—monarch protections must actively address the critical gaps in pesticide risk assessments. These protections must rectify existing deficiencies and ensure that all potential exposure pathways, including chronic pesticide effects, are thoroughly evaluated and mitigated. Without such comprehensive measures, regulatory efforts will fall short of providing the meaningful protections monarchs urgently need.

The widespread distribution of monarchs across North America demands equally widespread protection. The Fish and Wildlife Service must take decisive action now by ensuring the final rule includes strong enforceable pesticide protection from neonicotinoids to ensure that monarchs are protected. Anything less is a failure to safeguard the future of one of our most vital pollinators.

Sincerely,

Pollinator Stewardship Council

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