

Conserving Monarchs: We Need to Talk about Pesticides

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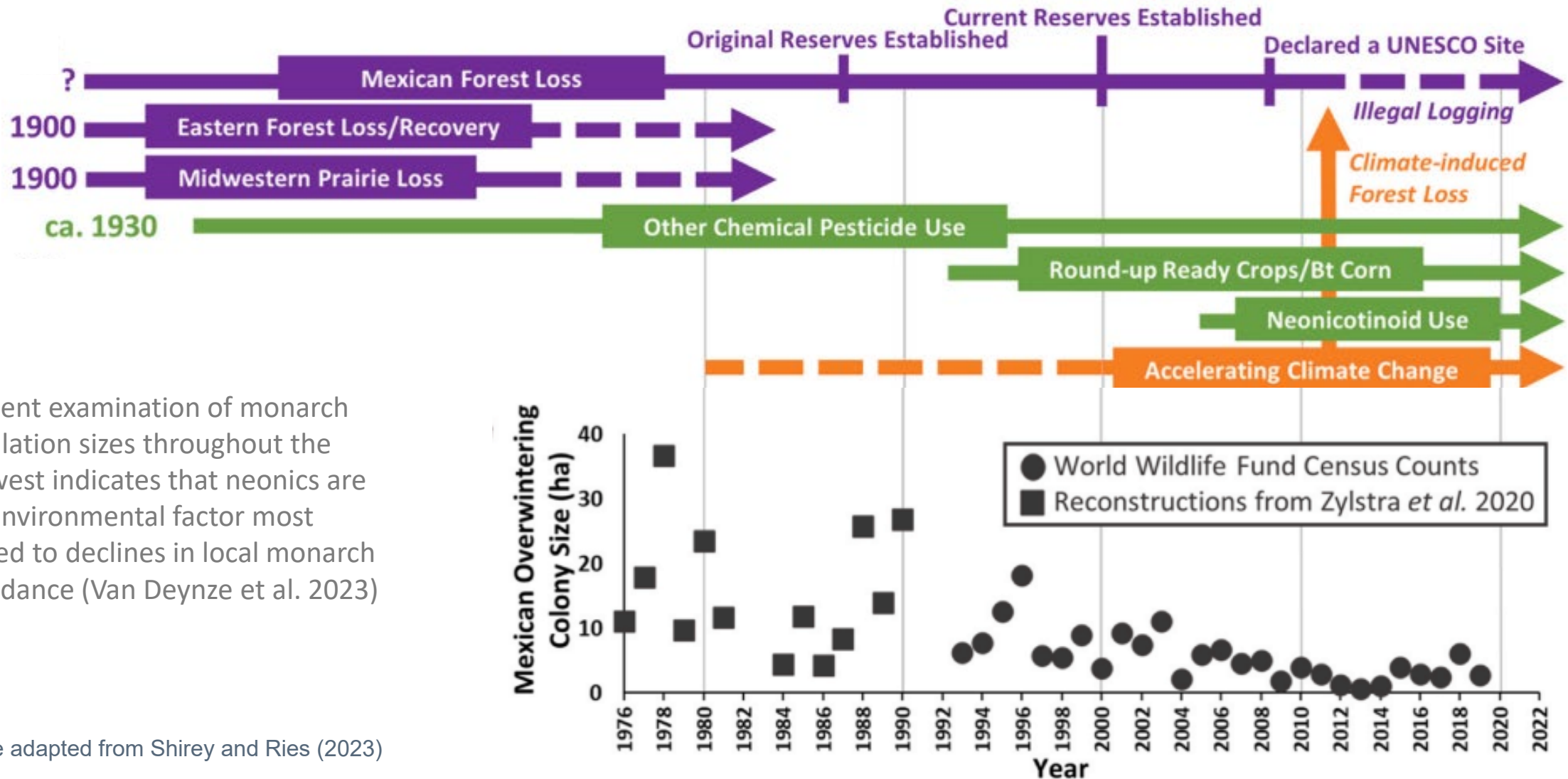
The Xerces Society for Invertebrate
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Drivers of eastern monarch decline over time



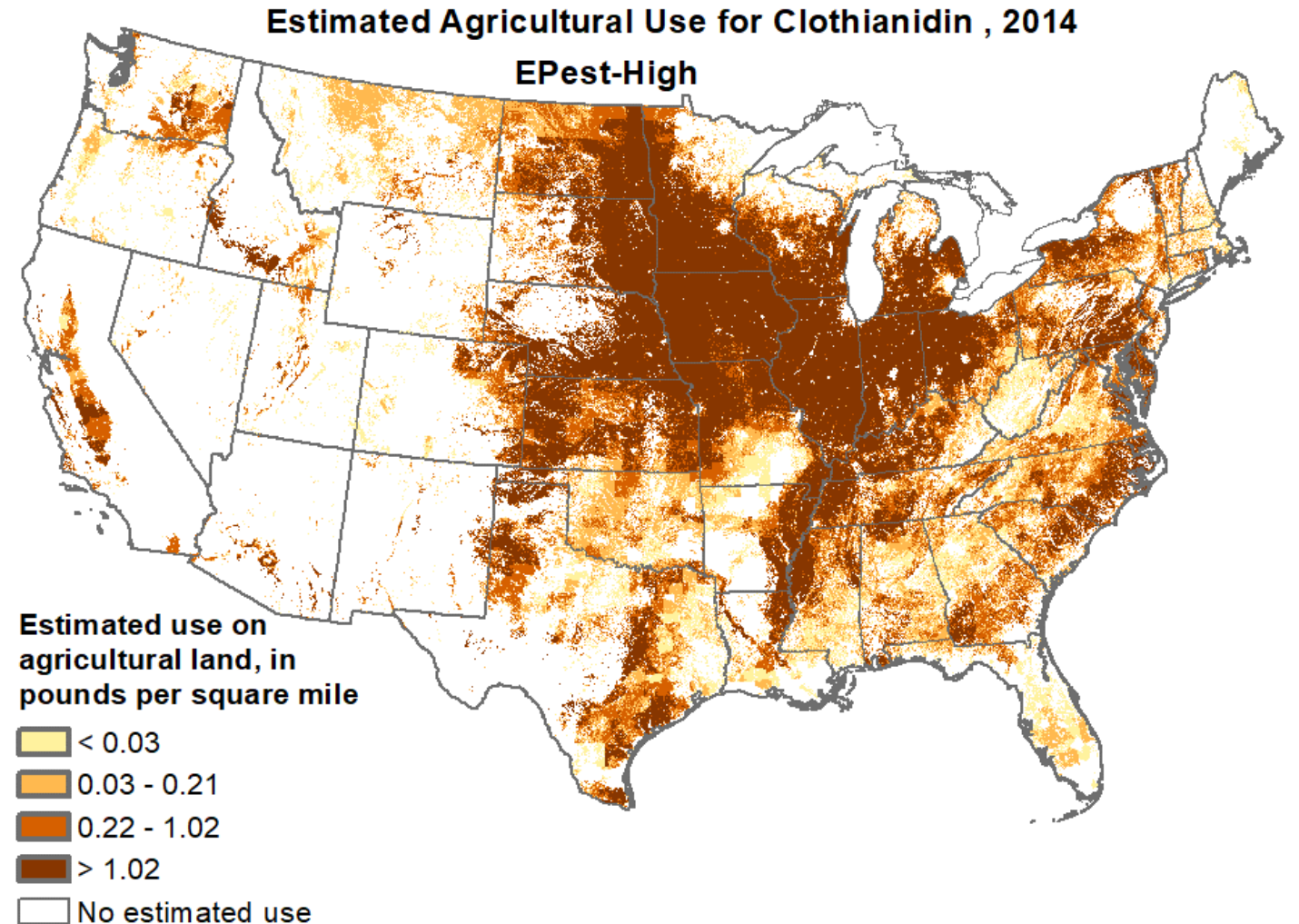
A recent examination of monarch population sizes throughout the Midwest indicates that neonics are the environmental factor most related to declines in local monarch abundance (Van Deynze et al. 2023)

Figure adapted from Shirey and Ries (2023)

Pesticide Use Is Widespread

Pesticides: A Range-wide Threat

- Applied to hundreds of millions of acres of crops, backyards, parks, even natural areas
- Residues contaminate milkweed leaves and nectar
- Increasing toxic load for insects



Pesticide Risks to Monarchs

Monarchs are vulnerable to a variety of pesticides



Photo: Stephen Asmus / USDA-ARS . NCTC Creative Imagery-USFWS/Flickr CC; Krishnan et al. (2021)/CC 4.0 (cropped)



Eggs and larvae tend to be more sensitive than adults

High toxicity seen in monarch studies: chlorantraniliprole (50-500x more toxic than neonics), pyrethroids



Pesticide Toxicity to Monarchs: What we know

Pesticide exposure can have subtle side effects

- Ex: Reduced body size, larval growth, wing length, oviposition, longevity
- Larvae exposed to fungicides had smaller wings as adults (Olaya-Arenas et al 2020)
- More eggs laid but lower larval survival on milkweed next to neonic-treated corn (Knight et al. 2021)

James 2019, Bargar et al 2020, Knight et al 2021, Olaya-Arenas et al. 2020, Wilcox et al 2021

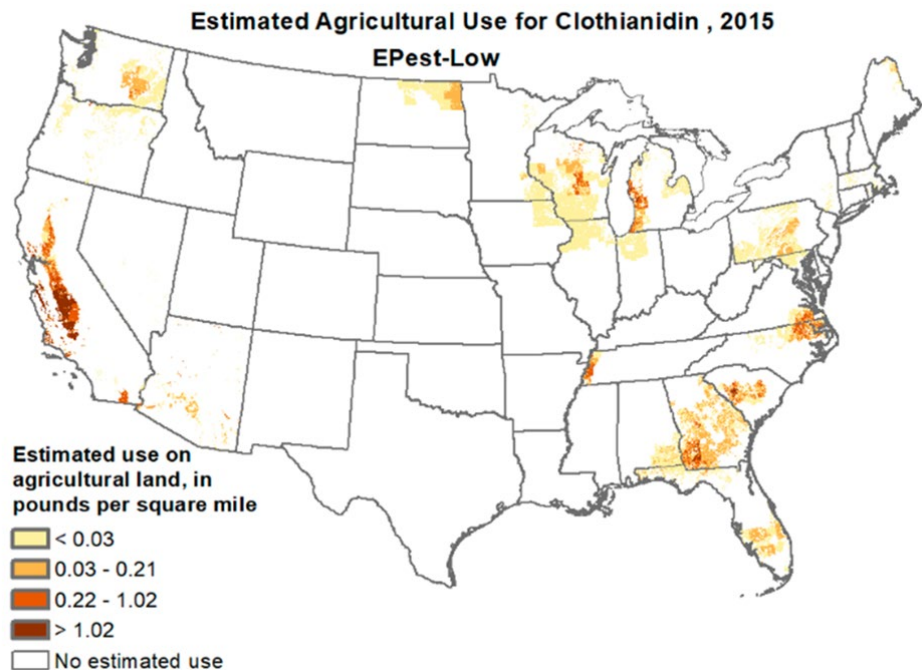
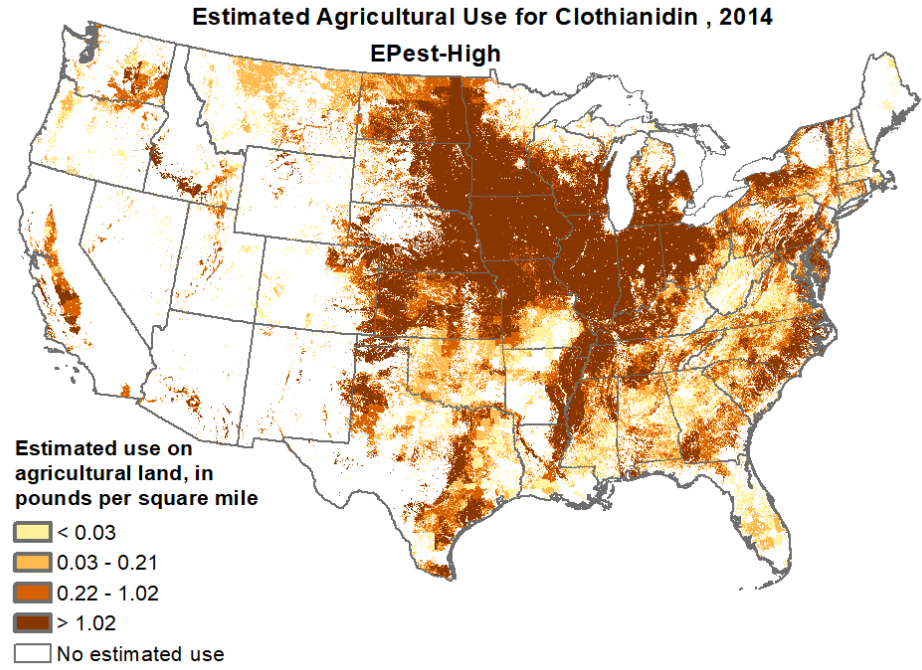


Photos: Kelly Gill/Xerces, Stephanie McKnight/Xerces

Data Gaps: Pesticide Use

Millions of pounds of pesticide use not tracked or reported

- Residential use not tracked: 60 million pounds, 25% of total insecticide use
- Seed treatments not tracked: >10% of ag insecticide use in the US
- Public data on ag pesticide use cut back



Figures: USGS NAWQA



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Pesticide risk is often underestimated

- Limited toxicity data for LepS
- Screening for individual chemicals, not mixtures
- Real world impacts are more complex than our models



Photo: Jennifer Prince (CC 4.0)

Conservation Approach

Pesticide contamination is pervasive and risks are often underestimated



When planning habitat, we cannot ignore pesticide risk. Hard conversations are necessary; not every space is suitable for habitat.



With limited resources, let's prioritize high quality habitat



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