MONARCH JOINT VENTURE

Partnering across the U.S. to conserve the monarch migration

www.monarchjointventure.org

The Monarch Joint Venture is a partnership of federal and state agencies, non-governmental organizations, and academic programs that are working together to protect the monarch migration across the lower 48 United States.

MISSION

Recognizing that North American monarch (*Danaus plexippus*) conservation is a responsibility of Mexico, Canada and the U.S., as identified in the North American Monarch Conservation Plan, this Joint Venture will coordinate efforts throughout the U.S. to conserve and protect monarch populations and their migratory phenomena by developing and implementing science-based habitat conservation and restoration measures in collaboration with multiple stakeholders.

Our mission will be achieved by coordinating and facilitating partnerships and communications in the U.S. and North America to deliver a combination of habitat conservation, education, and research and monitoring.

VISION

The vision of this Joint Venture is abundant monarch populations to sustain the monarch migratory phenomena into perpetuity, and more broadly to promote monarchs as a flagship species whose conservation will sustain habitats for pollinators and other plants and animals.

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Risks of Neonicotinoid Use to Pollinators

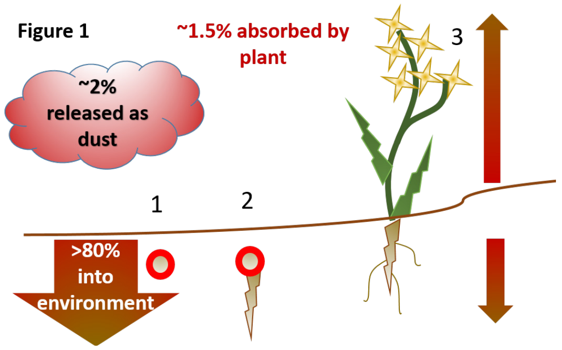
Globally, pollinator populations are decreasing; their declines endanger food production and threaten natural ecosystems (Ollerton, Winfree, & Tarrant, 2011). Many factors contribute to these declines, including habitat loss, climate change, predators and disease, poor nutrition, invasive species and chemical exposure. A relatively new class of pesticides, **neonicotinoids**, is of growing concern as a threat to pollinators.

How Neonicotinoids Work

Neonicotinoids (neonics) are commonly-used insecticides (Goulson, 2013; Simon-Delso et al., 2015) and are used in agricultural, nursery, and private settings. They can be applied to plants many ways, such as seed treatments or spraying plants or soil.

In agriculture, seed treatments account for an estimated 60% of neonic use (Goulson, 2013). Neonics are highly water soluble, allowing the growing plants to absorb and transport the chemical to all plant tissues, from roots to shoots (Bonmatin et al., 2015) (Figure 1). While seed coatings are the most common application method, other methods often use a heavier amount of neonics.

Figure 1



Neonics disrupt the central nervous system of insects and other invertebrates; sufficient doses cause paralysis and death. Since small quantities of neonics are highly lethal (Goulson, 2013), their systemic movement to all tissues of treated plants offers protection against insect pests, especially during early stages of plant development. Because of differences between vertebrate and invertebrate nervous systems, neonics are much less toxic to vertebrates (Simon-Delso et al., 2015). Their low toxicity to vertebrates and systemic plant protection make neonics appealing for pest control, but they can bring unintended harm to pollinators.

Routes of Neonicotinoid Exposure

Pollinators can be exposed to neonicotinoids in multiple ways. Pollinators may consume contaminated plant products like leaves, pollen and nectar and be killed if they consume a high enough dose of the chemical. For example, when monarch caterpillars eat neonicotinoid treated milkweed plants they are often killed. Toxic dust kicked up while planting neonic-treated seeds can also kill honeybees foraging nearby (Bonmatin et al., 2015; Goulson, 2013). Since neonics are water soluble, they can also move through environments with water (Figure 3). Surveys have documented widespread neonic residues in waterways (Bayo et al 2016, Goulson 2013, Hladik et al 2014, Morrissey et al 2015).

In the field, corn plants absorb at most 1.5% of the neonic treatment applied to seeds (Alford and Krupke, 2017). 2% of the seed coating is released as toxic dust and the rest is released into the environment in other ways (Figure 1). Neonics can also enter the surrounding area when applied by soil drenching or plant sprays. Once in the soil, neonics may persist for hundreds to thousands of days (Bonmatin et al., 2015; Goulson, 2013). Residues may leach out of treated fields into adjacent habitats and be absorbed by neighboring plants (Figure 2) (Botías et al., 2016). Contamination of nearby wild plants raises the likelihood of pollinators in the habitat experiencing unintended harm.

Finally, as neonics enter soil and waterways, they undergo different chemical breakdown processes, resulting in toxic byproducts. Due to limited research, we lack complete understanding of repercussions from application and persistence of these chemicals and their byproducts in the environment.

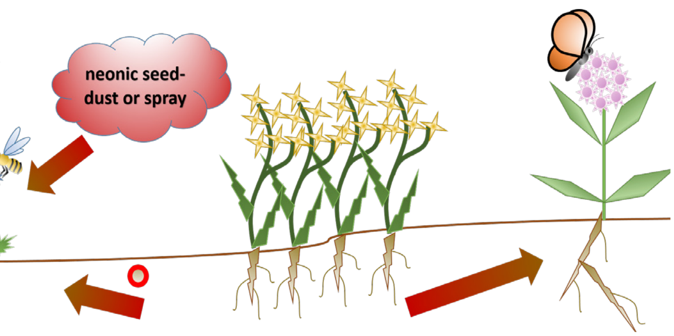
Sublethal Risks of Exposure

If exposed to neonics in sufficient quantities, pollinators and other beneficial invertebrates are killed. However, sublethal effects, such as reduced survival and reproductive success, can occur when the dose does not result in immediate death. The severity of sublethal effects depend on exposure amount, method, and pollinator species. Relatively few studies have investigated sublethal effects of neonic exposure in monarchs, but further studies are in progress. There are also sublethal effects on vertebrates such as birds and fish (Gibbons et al., 2015).

Neonicotinoids and Agricultural Approaches

Integrated Pest Management (IPM) is an established farming approach that minimizes pesticide applications. In IPM, farmers only apply pesticides when pest populations reach levels where resulting crop damage would be more costly to profits than applying a pesticide, and use other methods first to prevent using chemicals. Reducing and preventing pesticide applications lowers the chances of selecting for pests that are resistant to chemical treatments, preserving the effectiveness of available pesticides. Fewer chemical applications also reduces the chemical burden placed on the environment, lowering exposure risks to non-target insects and to the farmers applying chemicals.

Figure 2



Counter to the wisdom of IPM where chemicals are applied only when necessary, neonic seed treatments are applied before planting the crops, when treatment would not always be necessary. In addition, some studies have found pest populations with evolved resistance to neonics (Goulson, 2013; Simon-Delso et al., 2015).

Farmers can contact local service providers, such as the NRCS, Xerces Society, Pheasants Forever, Pollinator Partnership, Soil and Water Conservation Districts, and others, to get guidance on IPM, reducing neonic use, and other pollinator friendly practices.

Pollinator Friendly Practices in Your Garden

The use of neonicotinoid and other pesticides is common in nurseries, and plants are often not labeled as treated when sold. This creates problems for consumers purchasing plants to support pollinators. Nectar and host plants treated with neonics and other pesticides can be toxic to pollinators and other insects long after they are purchased, and can be harmful to the insects they intend to attract. Here are some things you can do to prevent accidental neonic exposure in your pollinator habitat.

1) Ask before you buy: Talk to the store manager to find out if their plants have ever been treated. Inform the store manager that you want to purchase neonic-free plants.

2) Shop local: Consumer demand is an important part of making neonic-free plants more commercially available. Support local native plant growers who do not use neonics by buying their plants and encouraging others to as well.

3) Avoid pesticide use: Do not use insecticides in or around your pollinator habitat. If you need to use chemicals elsewhere on your property, follow label instructions carefully and avoid neonics.

4) Educate others: Talk with your neighbors about the risks of neonics to pollinators, and ask them not to use neonics on their property. Bring these concerns to town or homeowner association meetings. For more information about educating others and advocating for pollinators visit monarchjointventure.org/get-involved.

Scaling Up Solutions

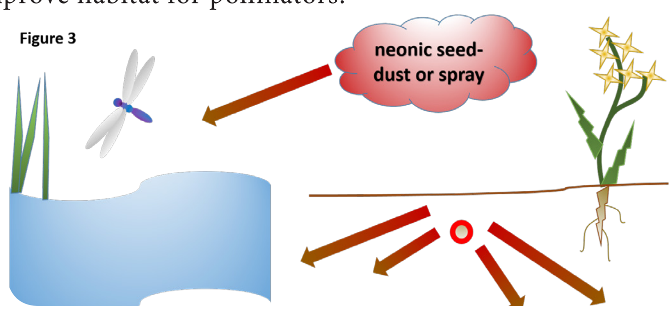
To ensure a future with robust pollinator populations, we recommend the following three large-scale actions:

1) Research: Fund research identifying and mitigating causes of pollinator declines, including investigations of the risks of neonics and other chemicals. Economic analyses of neonic benefits must balance the environmental costs to health of pollinator populations and other beneficial organisms.

2) Habitat: Protect existing pollinator habitats from inadvertent pesticide contamination, and create additional habitat to support healthy pollinator populations.

3) Extension and Outreach: Support initiatives to educate scientists, government regulatory agencies, beekeepers, conservationists, nursery growers, farmers, agribusiness, and the general public about best management practices to improve habitat for pollinators.

Figure 3



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Figures: Holly Holt. Photo: Wendy Caldwell.

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