Restoration to Benefit Pollinators

Plant Selection & Herbicide Impacts

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What is the Xerces Society?

Major Programs
• Pollinator conservation and agricultural biodiversity

Conservation planning, restoration, education, research, & advocacy to protect invertebrates and habitat

• Pesticide reduction
• Endangered species protection
• Aquatic conservation

Photos: Xerces Society / Sarah Foltz Jordan; Dana Ross; Justin Ross / NRCS
Native Plants & Pollinators

The Importance of Using Native Plants in Restoration

• Native Plants and Pollinators have coevolved over millennia

Recommendations for Restoration

• Use native plants as much as possible
• Consider bloom periods
• Use a diversity of plants
• Provide forage, shelter, & nesting materials
• Make sure the plants are site appropriate
Native Plants & Pollinators

Benefits of Native Plants for Pollinator Conservation

• Plants Provide:
  • Forage
  • Shelter
  • Nesting Sites

• Pollinators Provide:
  • Pollination
  • Increased Genetic Diversity
  • Increased Seed Yields
  • Pest Control

Photo: Deedee Soto/Xerces Society
Monarchs & Milkweeds

Host Plant Specialists

- In their larval stage monarch caterpillars are dependent on milkweed species as their primary source of food.
- Milkweeds contain toxic cardenolides/cardiac glycosides which monarchs are immune to.
- Milkweeds are necessary for monarchs to complete their life cycles.
- Like monarchs there are many other insect that are specialist particularly other lepidopterans.

Photo: Stephanie McKnight/Xerces Society
Non-native & Invasive Plants

Impacts on Pollinators

- Non-native plants can provide forage, shelter, & nesting habitat
- Non-native invasive plant species can also inversely reduce available forage and habitat for pollinators
- Displace native vegetation & reduce diversity
- Create monocultures
- Have significant impacts on insect and pollinators that are host specific
- Harbor pests and pathogens
Non-native & Invasive Plants

Impacts on Pollinators

Tropical Milkweed

- Introduced from Mexico
- Unlike native milkweeds it does not die back in the winter
- Harbors protozoan pest *Ophryocystis elektroscirrha* (OE)
- OE can cause malformations, weakness, & reduced vitality in monarchs

Photo: Deedee Soto/Xerces Society
Pesticides & Pollinators

Toxicity research is fairly limited for many native pollinators
• Especially for fungicides and herbicides
• Unknown effects of mixtures

Pesticide use, especially insecticides, can contribute to pollinator declines
• Sublethal impacts can reduce populations over time
Indirect Herbicide Impacts

Herbicides are generally associated with indirect impacts on pollinators

- Removal of habitat resources
- Reductions in plant vigor can reduce forage quality
- Example: Declines in milkweed impacting monarchs in the Midwest

Direct Herbicide Impacts

Some herbicides show direct toxicity to pollinators

- Rarely kill pollinators outright, but can have lasting sublethal effects
- Most studies are done at higher levels of exposure, but results are concerning for lower doses as well

Several herbicides in EPA review, will require additional pollinator studies
Direct Herbicide Impacts: Examples

**Bees:**
- Changes in gut microbiome
- Impaired navigational and learning abilities
- Effects on immune systems

**Butterflies:**
- Reduced caterpillar and pupal mass
- Reduced larval survivorship

Reducing Herbicide Impacts

- Manage within an IVM plan based on prevention
- Prepare planting sites carefully to avoid needing herbicides in habitat
- Train staff in plant identification
- Time management appropriately
- Choose selective herbicides
- Use targeted applications
Xerces Resources

CREATING AND MAINTAINING HEALTHY POLLINATOR HABITAT

Guidance to Protect Habitat from Pesticide Contamination

This guidance document was designed to help growers, land managers, and others safeguard pollinator habitat from harmful pesticide contamination. It includes information on selecting habitat sites, as well as ways to maintain clean habitats by planting and carefully managing pesticide use.

There is a growing body of evidence demonstrating that pollinators are at risk as pollinator habitats in levels that could harm native bees and bumblebees, as well as honey bees placed in the area (Gilbert et al. 2013; Pimentel & Lande 2013; Damoulaki et al. 2016; Long & Kropf 2016). Pesticides have been found at locations contaminated levels in habitat immediately adjacent to agricultural fields (Pimentel & Lande 2013; Dauwalter et al. 2014), as well as in areas further from agricultural sites, although not all pesticide contamination or these more distant sites is from agricultural uses (Gilbert et al. 2013; Dauwalter et al. 2014; Gilbert et al. 2016; Long & Kropf 2016; Magan & Lande 2016).

With growing interest in restoring pollinator habitat, it is very important to manage the habitat and surrounding areas to reduce pesticide contamination. This can be achieved by instituting a combination of measures such as incorporating non-chemical options into pest management plans, eliminating pesticides and other pesticides, and implementing risk mitigation efforts that limit movement of pesticide residues that cannot be managed. Habitat should not be installed.

Priority Pesticide Concerns for Pollinators

While a wide range of pesticides could pose risk to pollinators, priority pesticide concerns include:

- Herbicides: In general, herbicides are more acutely toxic to most pollinators than other pesticides. Herbicides are a priority concern for many pollinators, particularly in the organic farming communities. Pollinator habitat projects supported by USDA Natural Resources Conservation Service (NRCS) cost-share programs, for example, have received substantial interest and participation from organic farmers. However, since herbicides are often the go-to method for preparing a site for pollinator habitat, farmers interested in organic methods have been left with limited options and guidance.

- Insecticides: To address this, the Xerces Society conducted field trials throughout the Midwest, and western United States to inform best practices for wildlife habitat establishment using organic site preparation methods. We tested seven organic site preparation approaches: mowing, natural crop residue, composting, plant growth, composting, native plants, and organic herbicides, and seed annuals.

Managing for Monarchs in the West

Best Management Practices for Conserving the Monarch Butterfly and its Habitat

Comprehensive Overview

Organic Site Preparation Methods

Pollinator Habitat

The results of these national field trials were published as the Xerces Society guidelines. Organic Site Preparation for Monarch Establishment: a comprehensive reflection on what we learned about the effectiveness of each weed control technique, evaluated with the current science on organic weed control and the success and failures of numerous other restoration projects across the country. This fact sheet provides a brief overview of the site preparation methods used in Organic Site Preparation for Monarch Establishment, and it is intended to help you quickly assess the feasibility of each method for a given site. For more detailed information on the site preparation methods, including site and region-specific recommendations, regional timelines, chiseling, and other resources, download the guidelines at: xerces.org/guidelines/organic-site-preparation.

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