

Building a Better Monarch Butterfly Garden

Summary of Research completed by Adam Baker & Dan Potter, University of Kentucky

MONARCHS' TALE OF THE TAPE

Scientific Name:

Danaus plexippus

Wingspan: 7-10cm

Lifespan: ~ 2 months-8 months dependent on the generation.



DID YOU KNOW?

There are two main populations of Monarchs in North America, divided by the Rocky Mountains.

Some Monarchs will migrate up to 3,200 Kilometers to their over-wintering grounds in Central America!

Monarchs have coevolved with the plant Genus *Asclepias* to be immune to the toxic cardenolides found in the milkweed's leaves. This toxin bioaccumulates inside the Monarch to protect them from predators.

Main Findings

1. Structured gardens with milkweeds located on the perimeter and set off by mulch recruited more monarchs; along with gardens containing unimpeded north-south access.
2. Accessible milkweeds recruit more monarch eggs.
3. Milkweeds and their cultivars are excellent bee attractants.

Background

Danaus plexippus is an integral species in the sense they help promote positive conservation efforts such as inspiring civilian scientists, gardeners, plant merchants and nature lovers alike. Their aesthetic and life history have made them a made them a "posterchild" for conservation and the education of such. An additional bonus of conserving *Danaus plexippus* is the benefit superior pollinators such as bees receive indirectly. In this sense monarch butterflies can be considered an umbrella species.

Problem and Goals

While the benefits of Monarch butterflies are apparent, they are unfortunately in decline. This is largely due to the logging of their wintering grounds and the conversion of their feeding grounds to agricultural land. To counteract this population decline it has been proposed the creation of monarch friendly habitat in suburban and urban systems be implemented. This research aims to answer the questions pertinent to the issue; namely the best way to promote the inclusion of monarchs to urban systems through the design and placement of urban gardens. Since monarch butterflies require association with milkweed plants to survive, questions about how best to orient milkweed in a garden, and the most effective species to grow have been explored. These questions will be explored in the context of promoting bees.

To answer the question what garden factors promote or deter use by monarchs, characteristics of 22 waystations (managed gardens planted with milkweed and nectar-producing plants) were explored. These characteristics include:

- Percent Hardscape (asphalt, concrete, etc.)
- Number of Structures
- Proximity to Structures
- Accessibility
- Milkweed Density
- Nectar Plant Density
- Size of Garden
- Plant Spacing

To answer the question does garden design matter, experimental plots were created with three general designs.

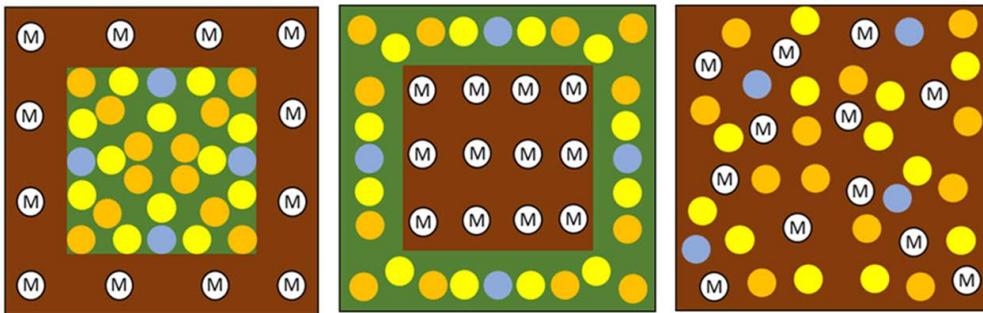


Figure above: The three garden designs implemented in this study. The white circles represent milkweed and the brown mulch.

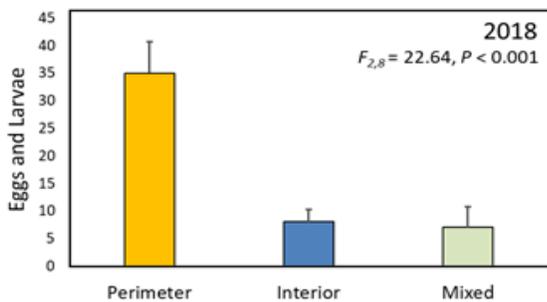
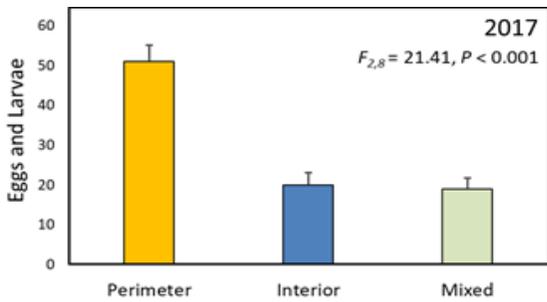
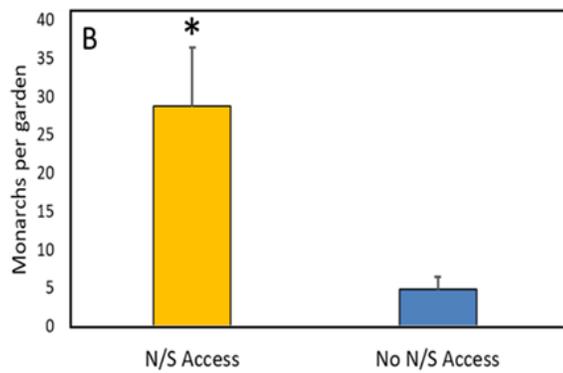
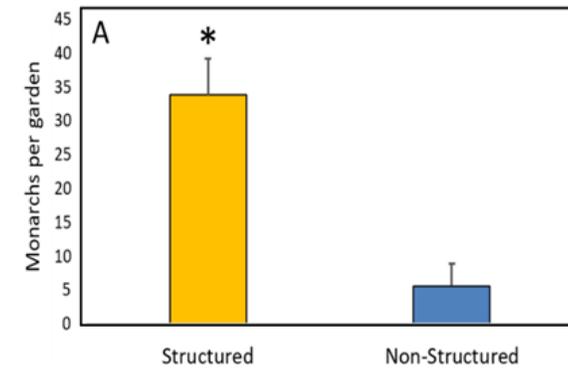
To answer the question which milkweed species are preferable for monarch promotion and health eight species of milkweeds were used.

- Replicate gardens were implemented and the number of eggs laid counted
- Nutritional quality was compared by measuring larval growth and survival. Both field conditions and laboratory conditions were utilized.

Bee visitations were also recorded on milkweeds to see which species were the most attractive.

Results

Structured gardens with mulched milkweeds planted along the perimeter, and allowing for North/South access promoted more monarch visitations and eggs.



Best Milkweeds for Small Gardens



Common Milkweed



Butterfly Weed



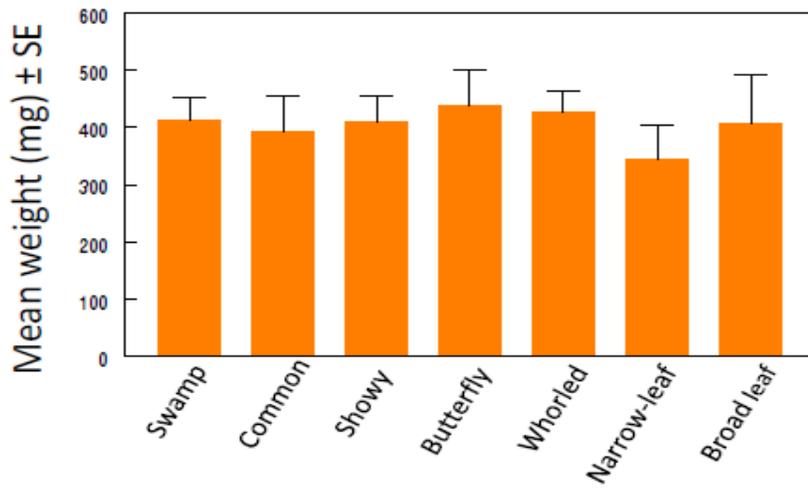
Whorled Milkweed



Green Milkweed

The eight milkweed species used in this study were suitable for larval growth.

- The three tallest species were most attractive to egg-laying monarchs
 - *A. incarnata* (Swamp)
 - *A. syriaca* (Common)
 - *A. speciosa* (Showy)
- Cultivars recruited and supported as many monarchs as straight species



Above: Graph showing milkweed species used in this study promoted similar monarch larval growth.

Three Species Most Attractive to Egg-laying Monarchs



Swamp Milkweed



Common Milkweed



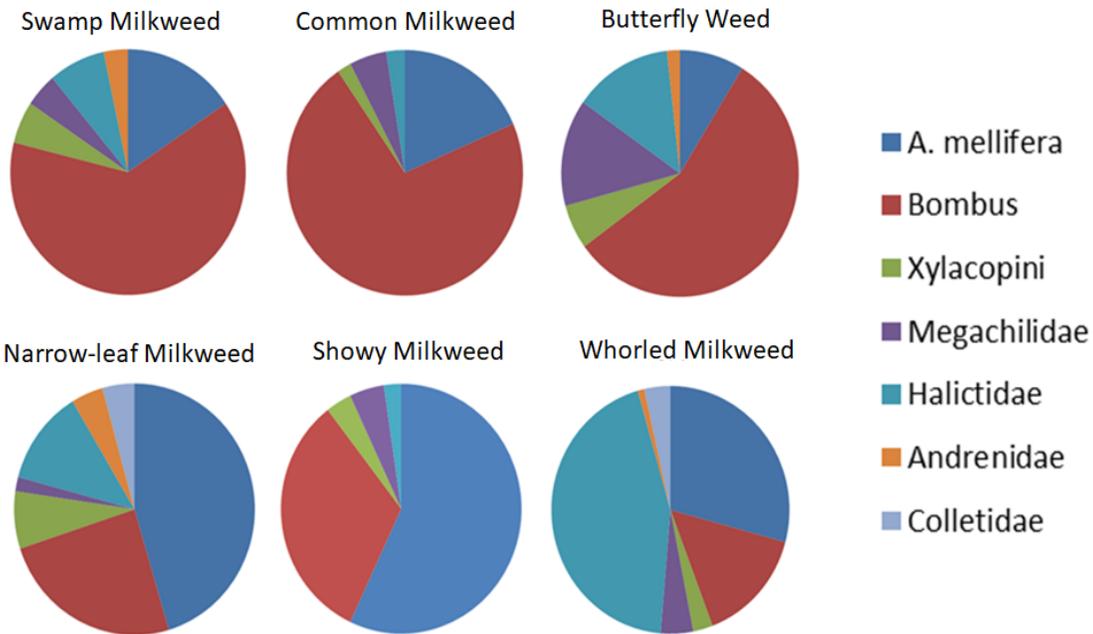
Showy Milkweed

What About the Bees?

Milkweeds are excellent bee attractors.

- Common, Showy, and Swamp Milkweeds were the best for Honeybees and Bumble Bees.
- Butterfly Weed and Whorled Milkweeds promoted the highest diversity of bees.
- Cultivars of the Swamp Milkweed were the most successful attractors to bees.

Bees Use Milkweed!



BEWARE!

The European Paper Wasp (*Polistes dominula*) is a social wasp who preys extensively on Monarch caterpillars. They can be extremely problematic to urban gardens; where garages, sheds, and decks make excellent structures for the wasps to construct their nests. They are extremely efficient predators and have been observed to take over a dozen caterpillars a day!



Left :Monarch feeding on a Tropical Milkweed. Right: European Paper Wasp

While they can add beauty to any garden, the non-native Tropical Milkweed (*Asclepias curassavica*) can have a negative effect on Monarch populations. In temperate climates they often do not die back; which can entice Monarchs to not migrate southward. This inevitably can cause the butterflies to die in the winter cold. Additionally, the Tropical Milkweed can be a vector organism for the pathogen *Ophryocystis elektroscirrha*, which is lethal to Monarchs.

Some Take-Aways

- Plant the milkweed around the perimeter and set it off by mulch. Don't "hide" it amongst other plants.
- Plant gardens where there is **north/south access** to incoming butterflies.
- Common & Showy are the best to plant in large areas; while the others are used best in small, urban gardens.
- Cultivars can be just as good as straight species for bee and butterfly promotion.
- Don't let your garden be an "Ecological Trap". Avoid or manage European Paper Wasps and DO NOT plant Tropical Milkweed.

Supplementary Material

Quick Reference Guide for Growers

NAME (MILKWEED)	EGGS & LARVAE	CATERPILLAR HEALTH	BEE ATTRACTIVENESS	BEE DIVERSITY	MILKWEED REPRODUCTION
COMMON <i>A. Syriaca</i>	Great for attracting egg-laying Monarchs	Supports growth and development	Highly attractive	Honey, Bumble, and Carpenter Bees	Seeds & Rhizomes, good for large area
SWAMP <i>A. incarnata</i>	Great for attracting egg-laying Monarchs	Supports growth and development	Moderately attractive	Honey, Bumble, and Carpenter Bees	Seeds, good for small gardens
BUTTERFLY <i>A. tuberosa</i>	Not so great for attracting egg-laying Monarchs	Supports growth and development	Highly attractive	High diversity. Many types of bees	Seeds, good for small gardens
GREEN <i>A. viridis</i>	Not so great for attracting egg-laying Monarchs	Supports growth and development	Moderately attractive	Bumble Bees	Seeds, good for small gardens
WHORLED <i>A. verticillate</i>	Not so great for attracting egg-laying Monarchs	Supports growth and development	Moderately attractive	High diversity. Many types of bees	Seeds & Rhizomes, but not prolific grower, small areas
SHOWY <i>A. speciosa</i>	Great for attracting egg-laying Monarchs	Supports growth and development	Not very attractive	Bumble & Carpenter bees	Seeds & Rhizomes, good for large area

How to identify a European Paper Wasp from a Yellowjacket



The Paper Wasp's abdomen will **gradually** constrict towards the petiole (waist), while a Yellow Jacket's will **abruptly** constrict. A Paper Wasp's antennae are a dark orange on the top half while a Yellow Jacket's is black throughout. **Warning! Bee Careful!** Yellow jackets are more aggressive and live in larger colonies.

Source Materials

Baker M & Potter DA (2018). Colonization and usage of eight milkweed (*Asclepias*) species by monarch butterflies and bees in urban garden settings. *Journal of Insect Conservation*. <https://doi.org/10.1007/s10841-018-0069-5>.

Research Supported By:



This document was supported in part by USDA-NIFA Specialty Crop Research Initiative Award # 2016-51181-25399 and USDA-NIFA IR-4 Project Award # 2019-34383-29973.