

Monarch Butterfly Conservation Gardens

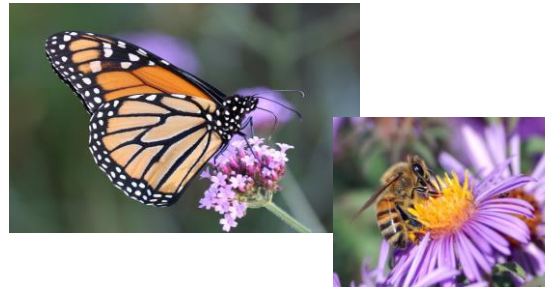
Adam M. Baker, PhD
Technical Advisor
Davey Tree



1

What Good is a Monarch?

Is it a really great pollinator? **No!**



2

What good is a Monarch?



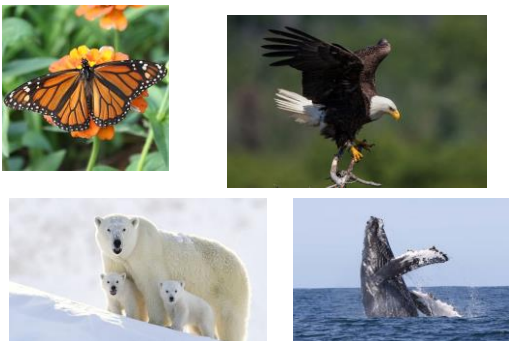
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What Good is a Monarch?



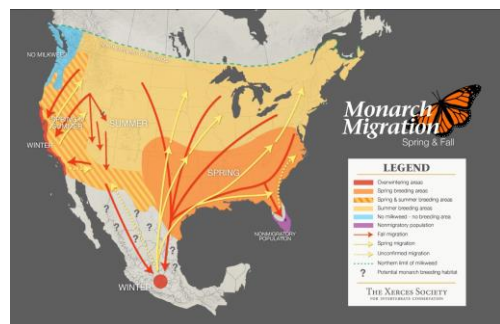
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Why do we care?



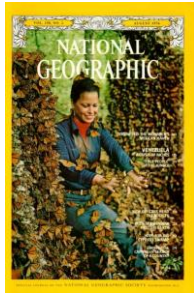
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Monarchs can fly upwards of 2000 miles!!

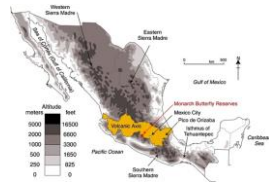


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Monarchs Use Special Overwintering Grounds



Revealed to the world in August, 1976 issue of National Geographic magazine.



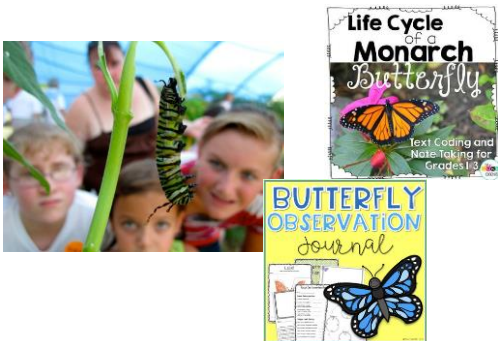
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Monarchs overwintering on fir trees in highlands of central Mexico



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Monarchs inform scientific literacy



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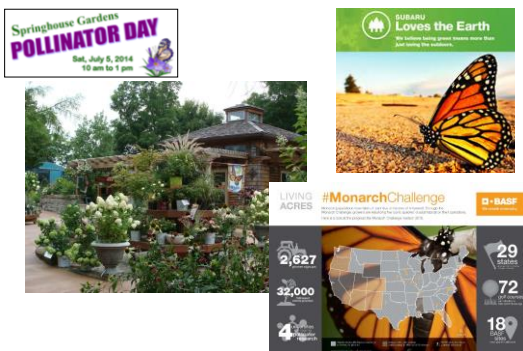
Example of interpretive signage (at North Carolina Arboretum)



Lego Monarch!

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Monarchs are good for business



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Monarchs inspire interest in nature



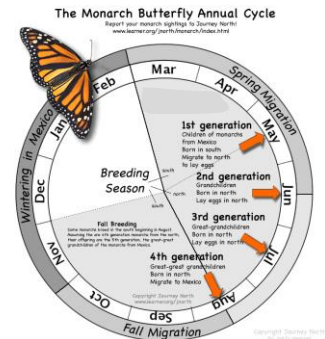
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Monarchs as a conservation icon inspire gardeners, nature lovers and citizen scientists



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Life Cycle



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Monarchs are Host Plant Specialists



Asclepiadoideae

Common Milkweed
Asclepias syriacaSwamp Milkweed
Asclepias incarnataButterfly Milkweed
Asclepias tuberosa

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Milkweed contains a ramifying network of **latex canals** pressurized with a lethal brew of toxic **cardenolides** in a quick-setting glue



16

Monarchs cut veins to neuter milkweed defenses!



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Monarchs Sequester Plant Chemicals



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Mimicry and Monarchs



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Monarchs are Declining

How do we know?



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Populations are Counted at Overwintering Sites



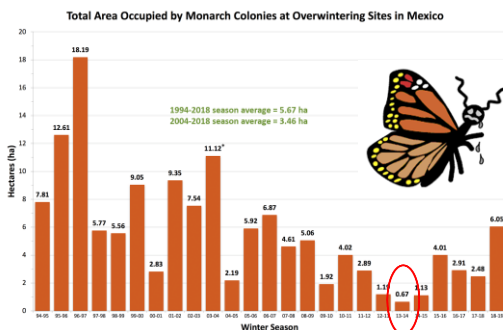
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Orange = overwintering monarchs in trees



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Monarch populations have declined over the past 25 years



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Why are monarchs declining?



Logging of overwintering grounds



Loss of billions of stems of milkweed to agriculture and urbanization

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Monarchs need two things during their migration:

- Milkweed for the caterpillars
- Nectar for the butterflies



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Planting milkweed is key to the **North American Monarch Conservation Plan**



An estimated 1.8 billion additional stems is needed!

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All Hands on Deck!

Contributions from all land use sectors are needed to restore enough milkweed



27

All hands on deck to plant milkweeds!



Farm reserve lands



Roadsides



Industrial/Rights of way



Urban/suburban gardens

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MONARCH WAYSTATIONS
CREATE, CONSERVE, & PROTECT MONARCH HABITATS
www.MonarchWatch.org

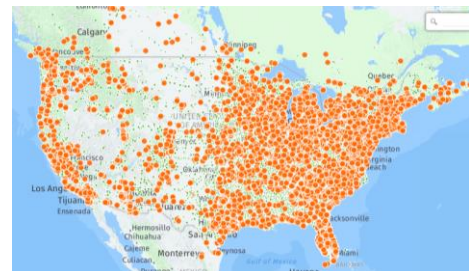


> 22,000 Gardens



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Million Pollinator Garden Challenge



>1,000,000 Gardens Registered!

30

Monarch Waystation Certification Guidelines are pretty vague:



1. Full sun



2. Two or more milkweed species



3. Nectar sources



4. Plants close together

31

1. Do monarchs use small gardens?
2. What garden characteristics promote use?
3. Can we improve small gardens?



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ORIGINAL RESEARCH ARTICLE

Front. Ecol. Evol., 05 December 2019 | <https://doi.org/10.3389/fevo.2019.00474>



Configuration and Location of Small Urban Gardens Affect Colonization by Monarch Butterflies

Adam M. Baker and Daniel A. Potter*

Department of Entomology, University of Kentucky, Lexington, KY, United States

11,840

TOTAL VIEWS



94%

Views rank

This article has more views than 94% of all **Frontiers** articles.

*Baker and Potter 2019

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Methods: Preexisting gardens

Identify Monarch Waystations (n = 22)

Monitor twice monthly May-September

Inventory gardens

- botanical
- size
- location
- design
- landscape features



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Some gardens were structured



35

Some gardens were non-structured



36

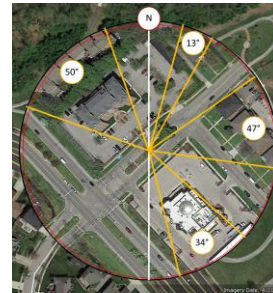
Some gardens were surrounded by hardscape



Others were in more open areas



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Landscape characteristics

- % Hardscape
- Number of Structures
- Proximity to Structures
- Accessibility

Garden characteristics

- Milkweed Density
- Nectar Plant Density
- Size of Garden
- Plant Spacing

38

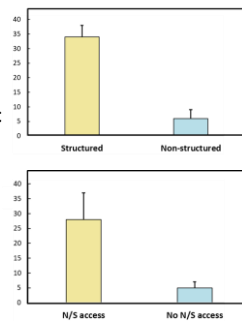
Results: Preexisting gardens

1. Yes, monarchs use small gardens!

2. Structured gardens, with host plants set off by mulch, had more monarchs

3. Gardens with unimpeded north/south access recruited more monarchs

4. Isolated plants more attractive

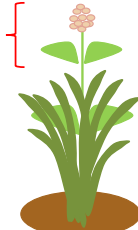


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Easy to find, accessible plant!



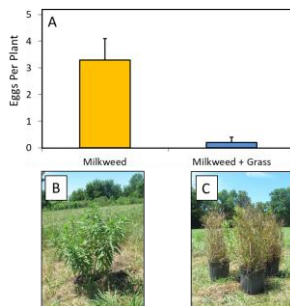
Harder to find and lay eggs on this one!



Vs.

40

Accessible milkweeds get more monarch eggs!



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3. Can we improve small gardens?



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What do we already know about how butterflies find appropriate host plants upon which to lay their eggs?



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Butterflies Use Visual Cues



*Williams and Gilbert 1981

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Swallowtails use visual cues, too, forming search image for narrow- or broad-leaved plants



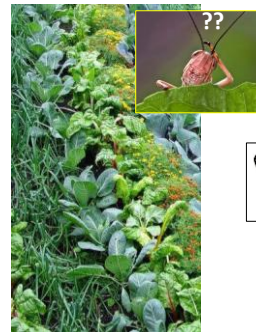
Pipevine swallowtail



Aristolochia plant

45

Polyculture agriculture aims to make it harder for herbivores to find and colonize the crop

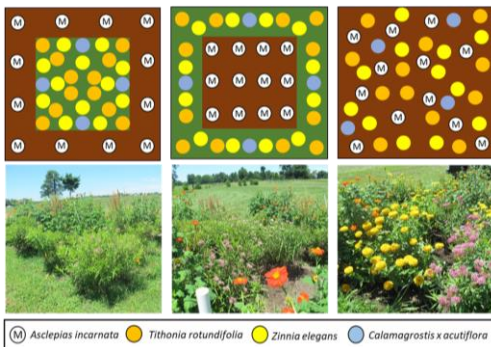


For monarch gardens, we want it to be easier!



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Methods: Experimental gardens



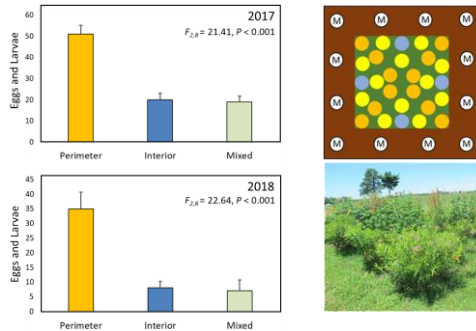
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Methods: Experimental gardens

1. Monitored gardens twice monthly for 2 seasons
 - a. monarch eggs and larvae
 - b. foliar predators
2. Deployed pitfall traps for ground-dwelling predators

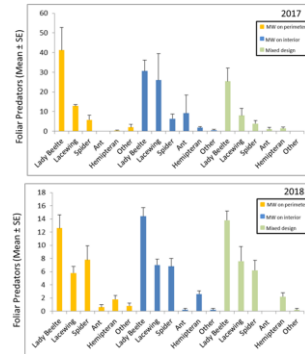
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Gardens with perimeter milkweeds supported 2.5 to 4 times more monarchs!!



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Predators Observed on Foliage



50

3. Which Milkweeds Should We Use?



51



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These three relatively tall species were most attractive to egg-laying monarchs



53

We also compared suitability of different milkweeds as food for monarch caterpillars



54

All 8 species are suitable for monarchs and supported similar larval growth



55

Milkweed – it's not just for monarchs!

The ideal conservation garden supports other pollinators, too!



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Best milkweeds for large bees
(honey bees and bumble bees)



Common



Showy



Swamp

58

Best milkweeds for wide variety of bees



Butterfly weed
(*Asclepias tuberosa*)



Whorled milkweed
(*Asclepias verticillata*)

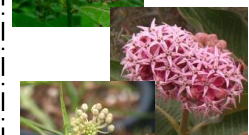
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Stays put where
planted



60

Spreads aggressively
by rhizomes



Best for small gardens



Swamp



Butterfly



Whorled



Green

61

Best for filling in large open areas



Common



Showy

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Are Cultivars Just as Good?

Swamp milkweed
wild-type

'Soulmate'



'Ice Ballet'



'Cinderella'

Butterfly milkweed
wild-type

'Hello Yellow'



'Gay Butterflies'



'Blonde Bombshell'

63

The Perfect System!



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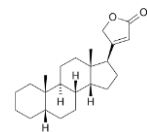
Questions: 1. Does cultivation influence milkweed defenses?
2. Colonization by monarchs?
3. Growth and development?
4. Other pollinators?



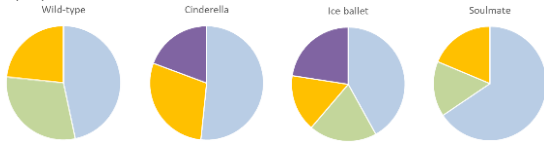
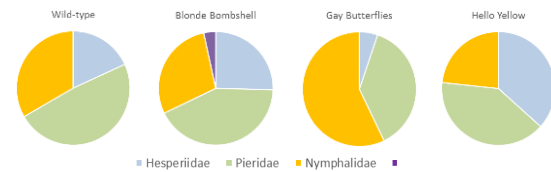
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Does cultivation influence milkweed defenses?

	Latex (mg)	Trichomes	Cardenolides	% Mortality
<i>A. incarnata</i>				
Wild-type	1.4 ± 0.2	97 ± 13	4.6 ± 1.8	10
Cinderella	3.4 ± 0.8*	93 ± 14	4.9 ± 2.8	0
Ice Ballet	1.1 ± 0.2	131 ± 13*	18.5 ± 6.3*	10
Soulmate	1.1 ± 0.2	92 ± 14	12.2 ± 3.4	10
<i>A. tuberosa</i>				
Wild-type	0.7 ± 0.2	212 ± 17	392 ± 93	10
Blonde Bombshell	NA	NA	489 ± 148	NA
Gay Butterflies	2.1 ± 0.4*	202 ± 27	684 ± 535	20
Hello Yellow	2.3 ± 0.3*	153 ± 21	498 ± 296	0



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Lepidoptera data: *A. incarnata*Butterfly data: *A. tuberosa*

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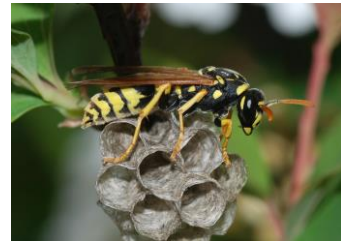
Don't let your Monarch garden become an "Ecological Trap"



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European Paper Wasp (EPW)

Game Changer for Urban Monarch Conservation



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European paper wasp

Orange antenna



Abdomen narrows at front

Yellow Jacket Wasp



77

European paper wasp is an urban wasp.

It prefers to nest in, under, or around homes, garages, and sheds, etc.



78

EPW preys on caterpillars!

They swoop down and bite their victims, chew them into pieces, and feed to their larvae



79

In 2019 we spent 100s of hours observing wasp predation in urban gardens



80

European Paper Wasp Preys on Monarchs!

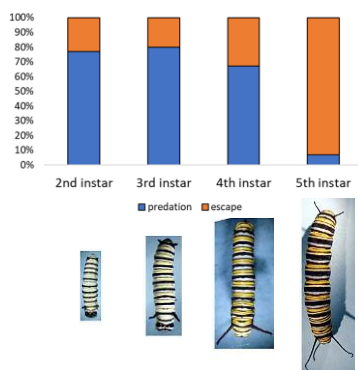
We've seen them take dozens from a garden in one day!



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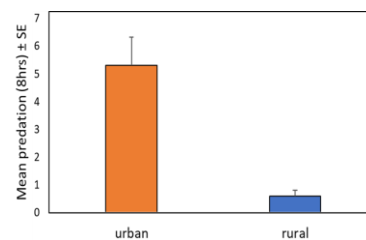


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83

European paper wasps pose a much greater threat to monarchs in urban gardens than in rural settings!



84

A Few Take Home Points.....



85

Plant the milkweed around perimeter or set it off by mulch. Don't "hide" it amongst other plants



86

Plant gardens where there is **north-south access** to incoming butterflies



87

Best for small gardens



Swamp



Butterfly



Whorled



Green

Best for filling in
large open areas



Common

88

Key finding: Cultivars were as attractive as straight species to bees

Indeed, the swamp milkweed cultivars were even **MORE** attractive than straight species!



'Soulmate'



'Cinderella'



'Ice Ballet'

89

Don't let your garden be an "Ecological Trap"



Don't plant tropical
milkweed in gardens

Avoid or manage
paper wasps



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Research Supported by:



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