



DoD Natural Resources Program

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Conservation and Management of Western Monarchs on DoD Lands

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Conservation and Management of Western Monarchs on DoD Lands

Cheryl Schultz¹, **Stephanie McKnight**², Cameron C. Thomas¹, Emma Pelton², Sarina Jepsen², David James¹, and Elizabeth Crone³

¹Washington State University, ²Xerces Society for Invertebrate Conservation, ³Tufts University

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The Xerces Society

The Xerces Society is a science based nonprofit organization that engages in education, outreach, applied research, policy, and restoration to protect invertebrates and their habitats

Conservation programs:

Pollinators

Endangered Species

Aquatic Conservation

Pesticides



Photo: ©The Florida Museum

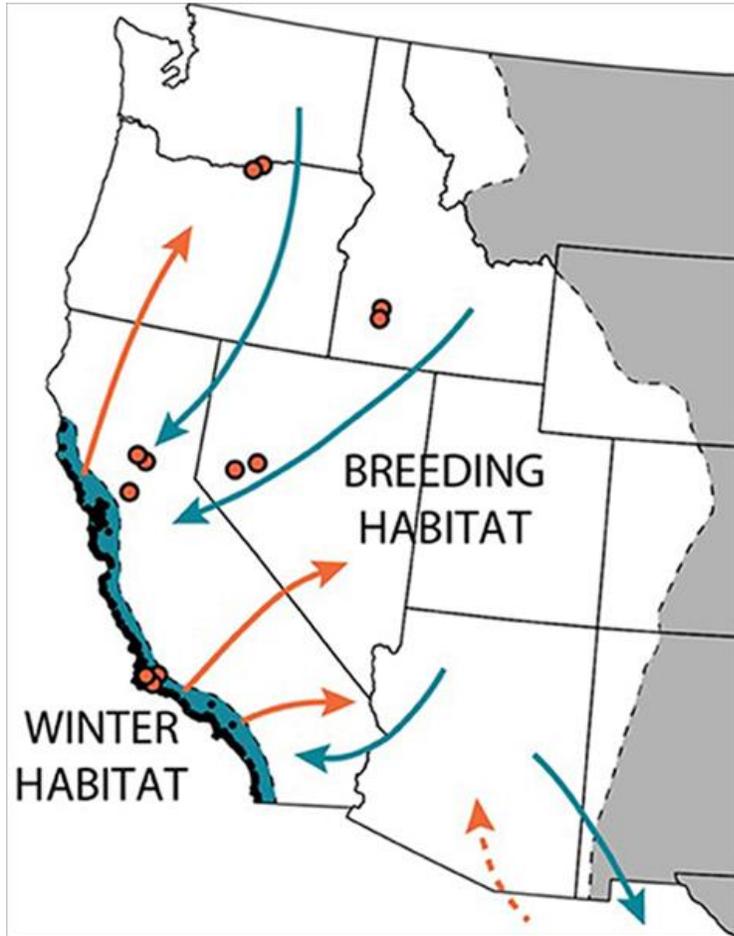


Photo: Stephanie McKnight, Xerces Society

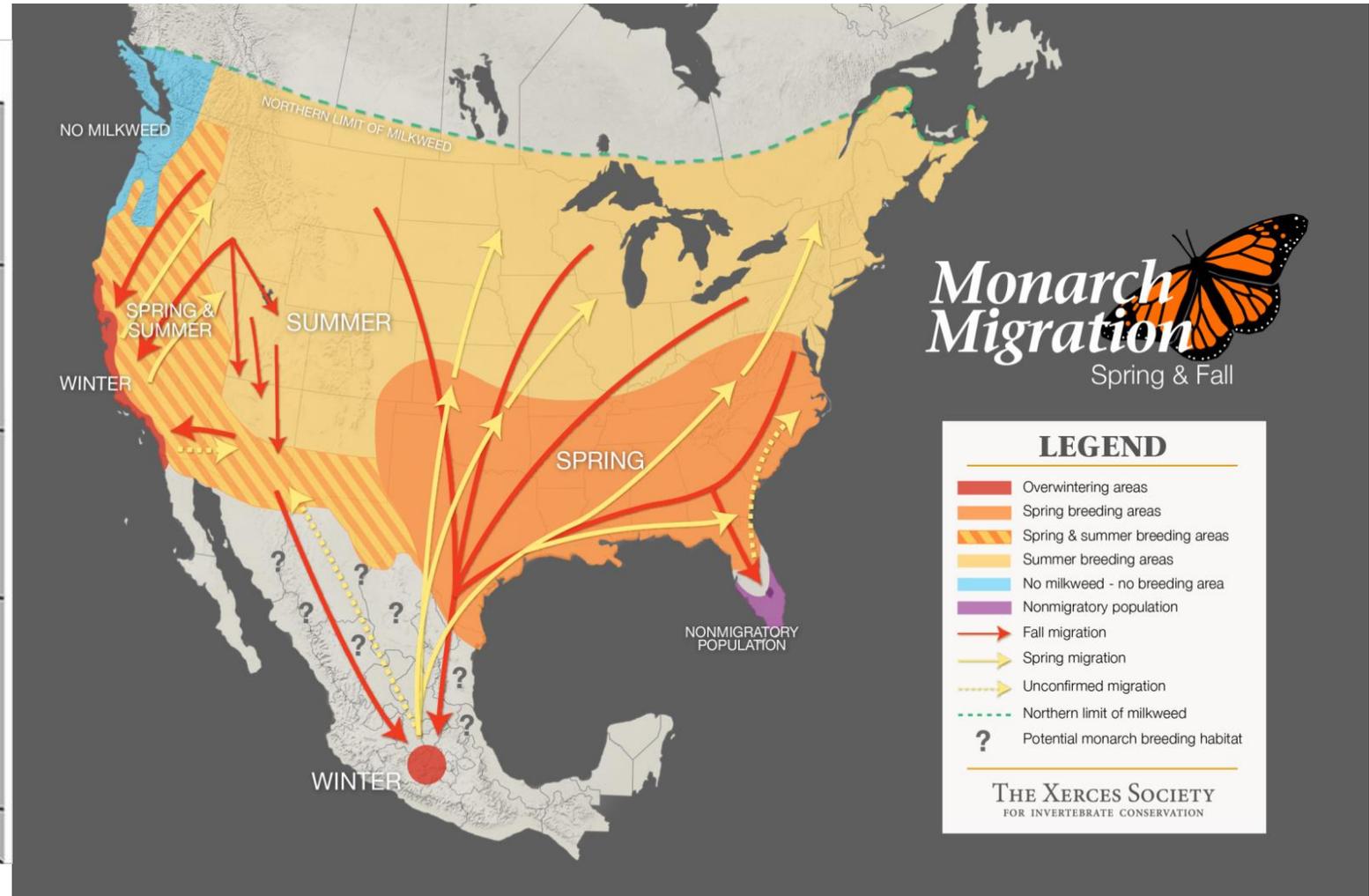
Presentation Overview

- I. Brief Overview of Western Monarch Life History
- II. Western Monarch Population Status and Call to Action
- III. Research Overview: Conservation and Management of Western Monarchs on DoD Lands: Implications of Breeding Phenology
- IV. Research implications for managing DoD Lands for Monarchs

What's a "western" monarch?

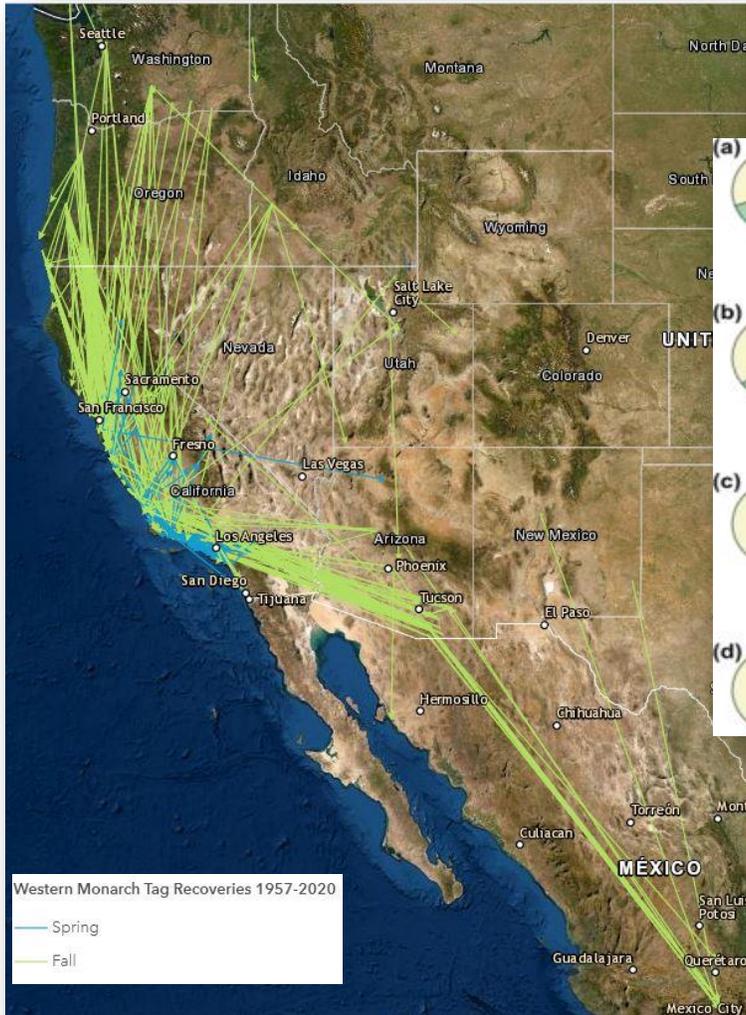


Graphic from Pelton et al. 2019

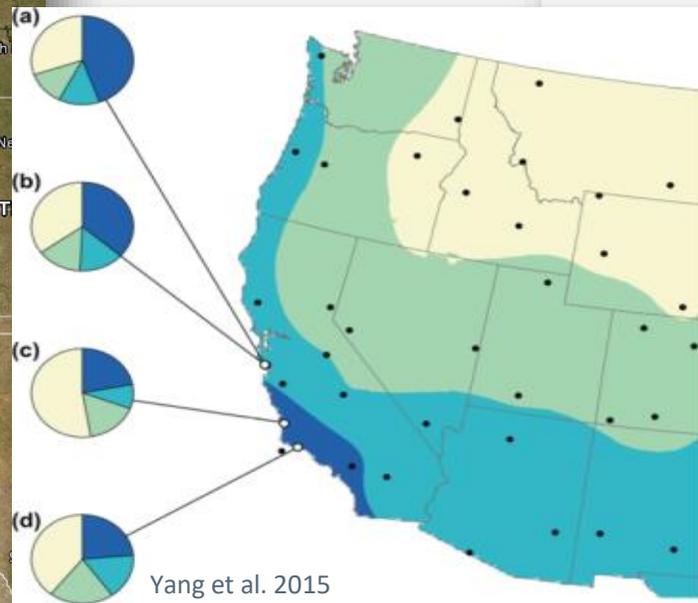


What's a "western" monarch?

Tagging

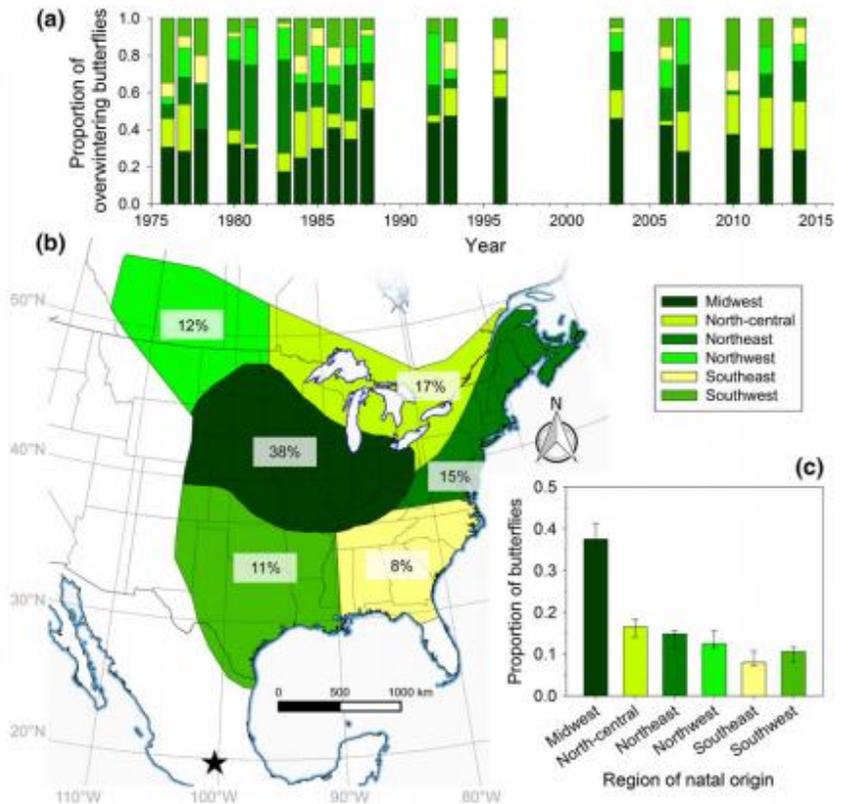


Isotopic signatures



+ Genetics + Adaptations

4 T. FLOCKHART *et al.*



Monarch Life Cycle



Western Milkweed Species

- There are approximately 72 milkweed species native to the U.S. and Canada (excluding ssp.)
- ~44 of these species are found in the western U.S.
- Showy milkweed (*A. speciosa*) is the most broadly distributed species in the West.
- Monarchs have been documented using ~20 of these species as larval hosts.
- Several non-native milkweed species occur in California, including tropical milkweed (*A. curassavica*)



Milkweeds in the Landscape

Milkweeds occur in a wide variety of habitats, including open grasslands, deserts, river canyons, roadsides, and wetlands.



Photos: Stephanie McKnight/Xerces Society

Western Monarch Migration and Breeding Timing



Map by Elizabeth Crone and Cheryl Schultz

Seasonal monarch movements in the West

- Monarchs typically overwinter from mid-Oct to mid-February
- Monarchs reach interior West in early summer
- Phenology in the West has been poorly understood.
 - Spring Dispersal - overwintering generation oviposits on milkweed in California to start first breeding generation: February-April
 - Summer Breeding and Range Expansion: May-September
 - Fall Migration: September-October
 - Overwintering: November-February

Western Monarch Overwintering Biology

Adult monarchs overwinter in clusters in protected microhabitats provided by groves of trees from ~October-February

Trees include native pines, cypress, and non-native eucalyptus trees, however research has found that monarchs prefer native trees.

- Monarchs are known to cluster at **over 400 locations** along the California coast from Mendocino to Baja, Mexico as well as small, inland sites in Inyo county, the Las Vegas area, and parts of Arizona
- Only ~30 sites routinely host more than 1,000 monarchs

Overwintering sites provide suitable microclimate conditions such as

- protection from wind and freezing temperatures
- Variable light conditions (dappled sunlight)
- available nectar sources; water
- adequate humidity



Photo: Candace Fallon, the Xerces Society, Map by the Xerces Society

Western Monarchs: Population Status and Call to Action





Photo: Xerces Society / Candace Fallon

Western Monarchs in Crisis

Western monarchs have declined by over 99% since the 1980s.

There were an estimated **4.5 million** monarchs overwintering in California in the 1980s.

This season's Thanksgiving count totaled ~29,000 monarchs, less than 1% of the population's size in the 1980s and nearly identical to last year's total of an all-time low.

The projected threshold for quasi-extinction of western monarchs is 30,000 individuals (Schultz et al. 2017).

Western Monarchs in Crisis

There were an estimated **4.5 million** monarchs overwintering in California in the 1980s.

In 2019, a mere **29,418** monarchs were counted.

That's like the population of Los Angeles...



shrinking to the size
of Monterey, which
looks like this...

but is actually only this
big compared to L.A.

Photos: Los Angeles, Sarah Castillo; Monterey, Harold Litwiler; both from Flickr Creative Commons 2.0

Western Monarchs in Crisis

1980s

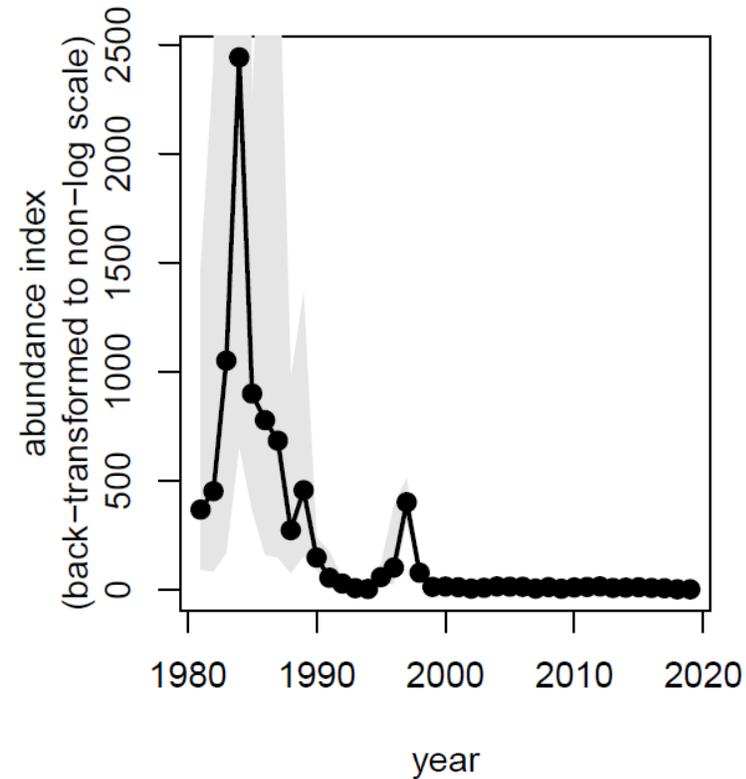


2018

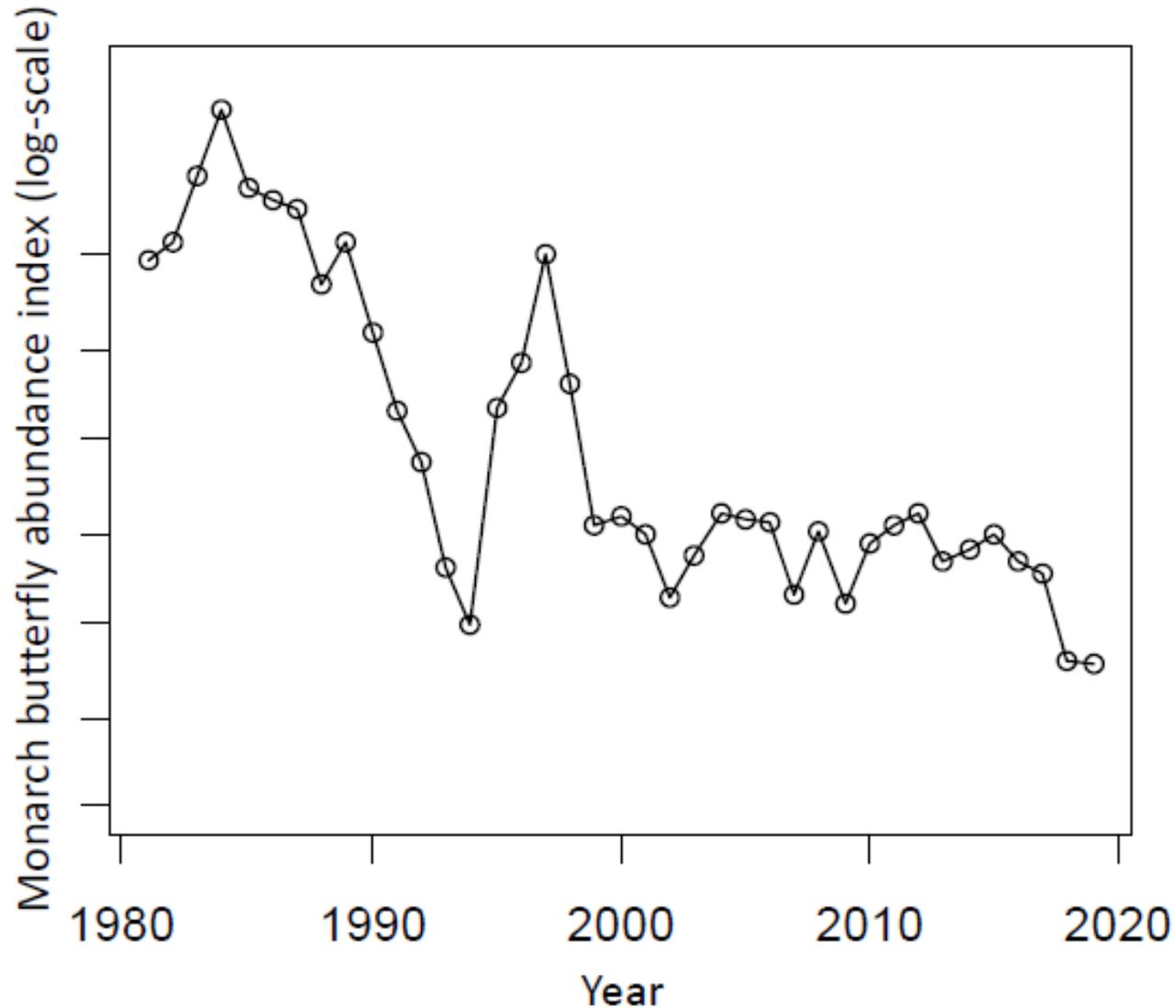


As of winter 2019-2020, only 0.6% of the historic population remains.

For every ~160 monarchs there were in the 1980s, there is now only one



Monarchs Overwintering in California



Western Monarch Thanksgiving Count

- **>99%** decline compared to the 1980s
(Pelton et al. 2019)
- **>99% probability of quasi-extinction (20,000+)** in next 50 years
(Voorhies et al. 2019)



Xerces Western Monarch Thanksgiving Count

- Data has been used in 10 peer reviewed publications.
 - Available at: www.westernmonarchcount.org/publications
- Data is used to inform conservation and management of Western Monarch overwintering sites.
 - More information available at: www.westernmonarchcount.org/overwintering-site-management-and-protection/

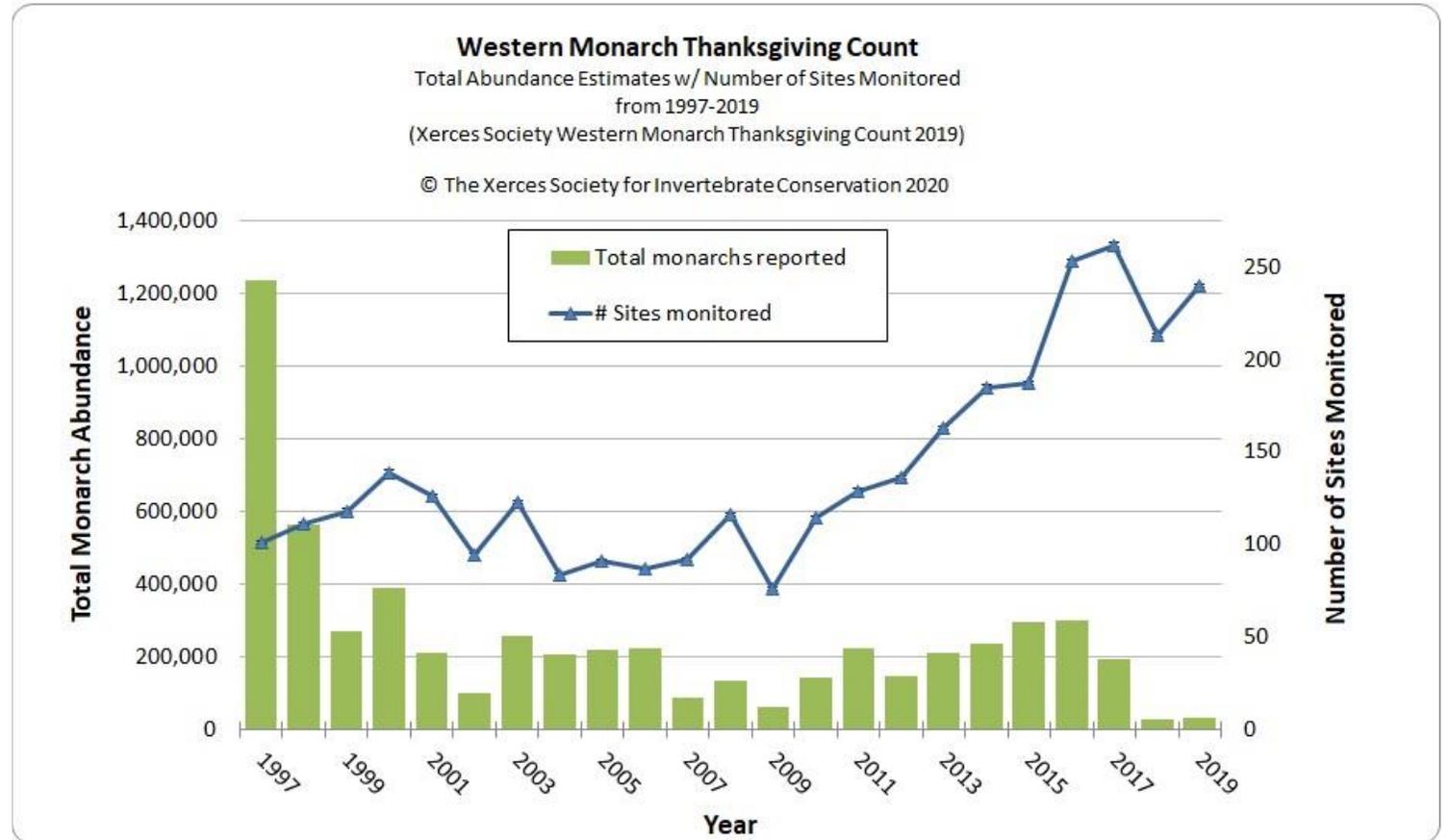




Photo: Monarchs larva on woollypod milkweed (*A. eriocarpa*) Southern California -Stephanie McKnight/Xerces

How do we assess the status of the Western Monarch Population?

- Overwintering Counts:
 - Western Monarch Thanksgiving Count and New Year's Count
- Breeding Season:
 - Research:
 - Art Shapiro's long-term butterfly monitoring transects in California (35+ years)
 - Louie Yang at UC-Davis in CA (Yang & Censer 2019, Yang et al. 2020)
 - Dept. of Defense western monarch phenology study by Tufts, WSU, & Xerces (2017, 2018, 2019)
 - Habitat suitability models (Dilts et al. 2018)
 - Site-specific surveys (e.g., by David James at WSU in WA, Southwest Monarch Study in Arizona)
 - Community science projects:
 - Journey North, Western Monarch Milkweed Mapper, Integrated Monarch Monitoring Program (MJV), Monarch Larva Monitoring Project



Photo: Monarch larva on narrowleaf milkweed (*A. fascicularis*) Fallon Naval Air Station, Nevada -Stephanie McKnight/Xerces Society

Why Are Monarchs in Trouble?

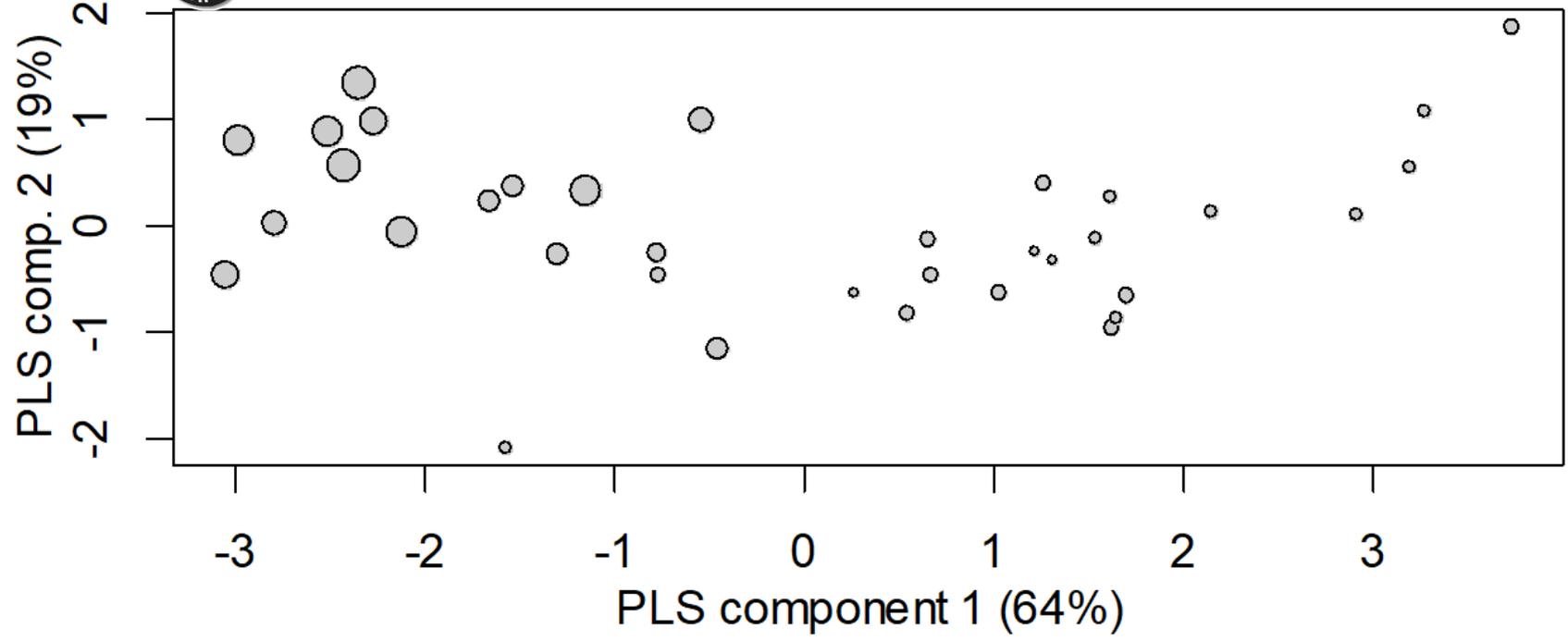
- Loss and degradation of breeding & migrating habitat
 - **Early season milkweed may be limiting**
- **Loss and degradation of overwintering habitat in California**
- **Pesticides (insecticides, herbicides, etc.)**
- Climate change
- Disease, parasites, and predation

(Crone et al. 2019, Cezner and Yang 2019, Pelton et al. 2019, Espeset et al. 2016, etc.)

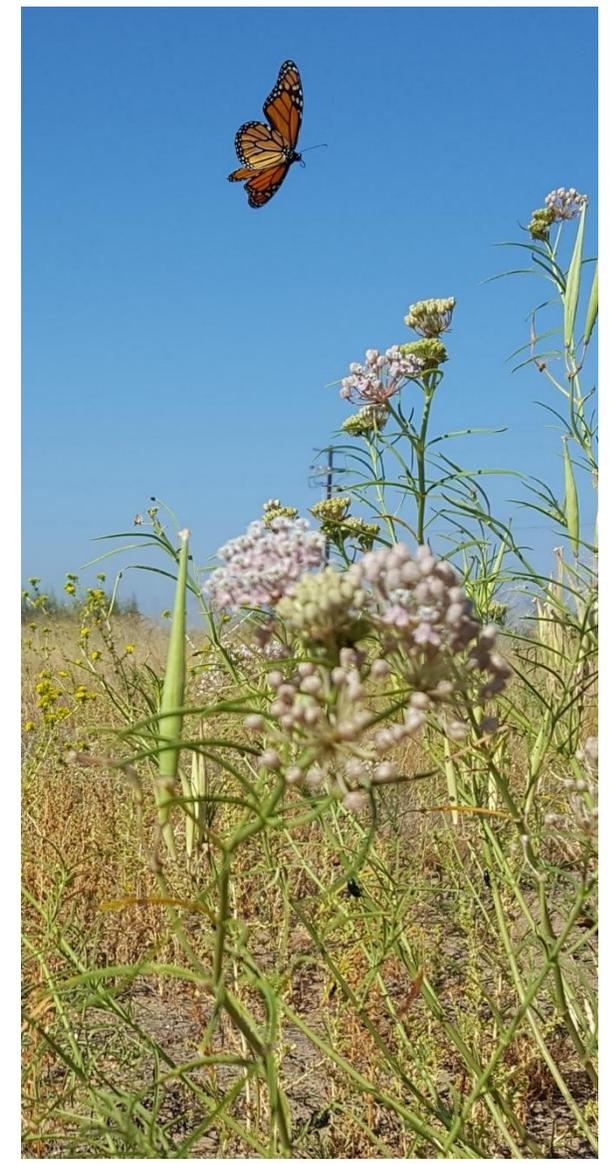
Causes of monarch population declines (2018)



↑ Coastal temperature
↓ Coastal precipitation



- Coastal land development
- Glyphosate
- Neonicotinoids
- Breeding season drought
- Breeding season temperature



Western Monarch Call to Action

This Western Monarch Call to Action, led by the Xerces Society for Invertebrate Conservation & with the input of the western monarch science community, aims to provide a set of rapid-response conservation actions that can help the western monarch population bounce back from its extremely low 2018 and 2019 overwintering size.



www.savewesternmonarchs.org

Photo: Xerces Society / Stephanie McKnight



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Western Monarch Call to Action

Savewesternmonarchs.org

- 1.) Protect and manage California overwintering sites.
- 2.) Restore breeding and migratory habitat in California.
- 3.) Protect monarchs and their habitat from pesticides.
- 4.) Protect, manage, and restore summer breeding and fall migration monarch habitat outside of California.
- 5.) Answer key research questions about how to best aid western monarch recovery.

Conservation and Management of Western Monarchs on DoD Lands: Implications of Breeding Phenology

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Objective of the Project:

The primary purpose is to determine seasonal timing of monarch butterflies in locations across the West, and to use this information to increase the efficiency and effectiveness of managing habitat for monarchs on DoD lands.

Summary of Approach:

The project involves systematic surveys and demographic models to determine seasonal timing of monarch breeding across the West.

Benefit:

Demographic data will enable DoD managers to balance habitat protection with training activities and other land uses. This work will contribute to key aspects of DoD land management plans, such as Integrated Natural Resources Management Plans (INRMPs) at each installation, by focusing efforts on the temporal windows with greatest importance to breeding monarchs throughout their range.



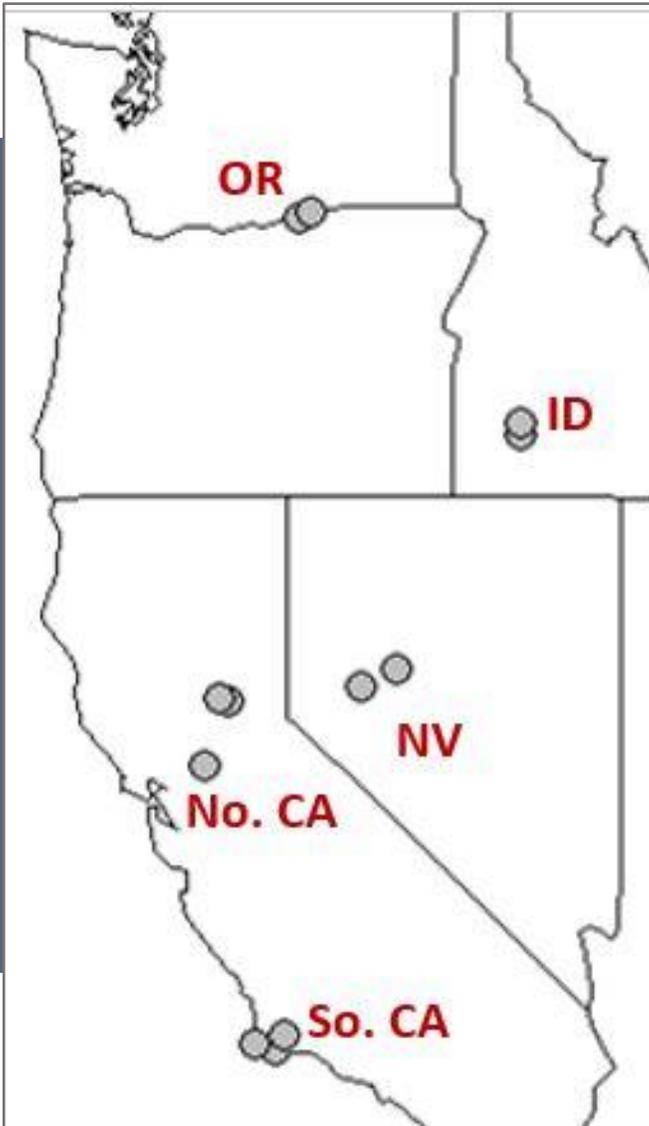
Research Approach and Field Sites



Monthly systematic surveys with statistical models to determine seasonal timing of monarch breeding across the West.

- Study sites in 5 Western states: Vandenberg AFB and Beale AFB in California, NWSTF Boardman in Oregon, JBLM Yakima Training Center in Washington, NAS Fallon in Nevada, and Mountain Home AFB in Idaho. In addition, we worked with US Army Corps of Engineers, Stone Lakes National Wildlife Refuge, and California State Parks in northern California, and Sedgwick Reserve - University of California Santa Barbara Natural Reserve System in Southern California. Thank you to all of the agency and university partners for participating in this research, and allowing access to field sites!

Research Approach and Field Sites



Breeding season monitoring

Site selection

- 5 regions
- 2-3 sites / region
- Transects/monitoring in “best” (not random) locations

Surveys

- Every 4 weeks
- Count milkweed stems, by species
- Count monarch eggs & larvae by stage class
- Surveys in 2017 & 2018 & 2019
- In 2019, Beale Air Force Base in California was added as a research site



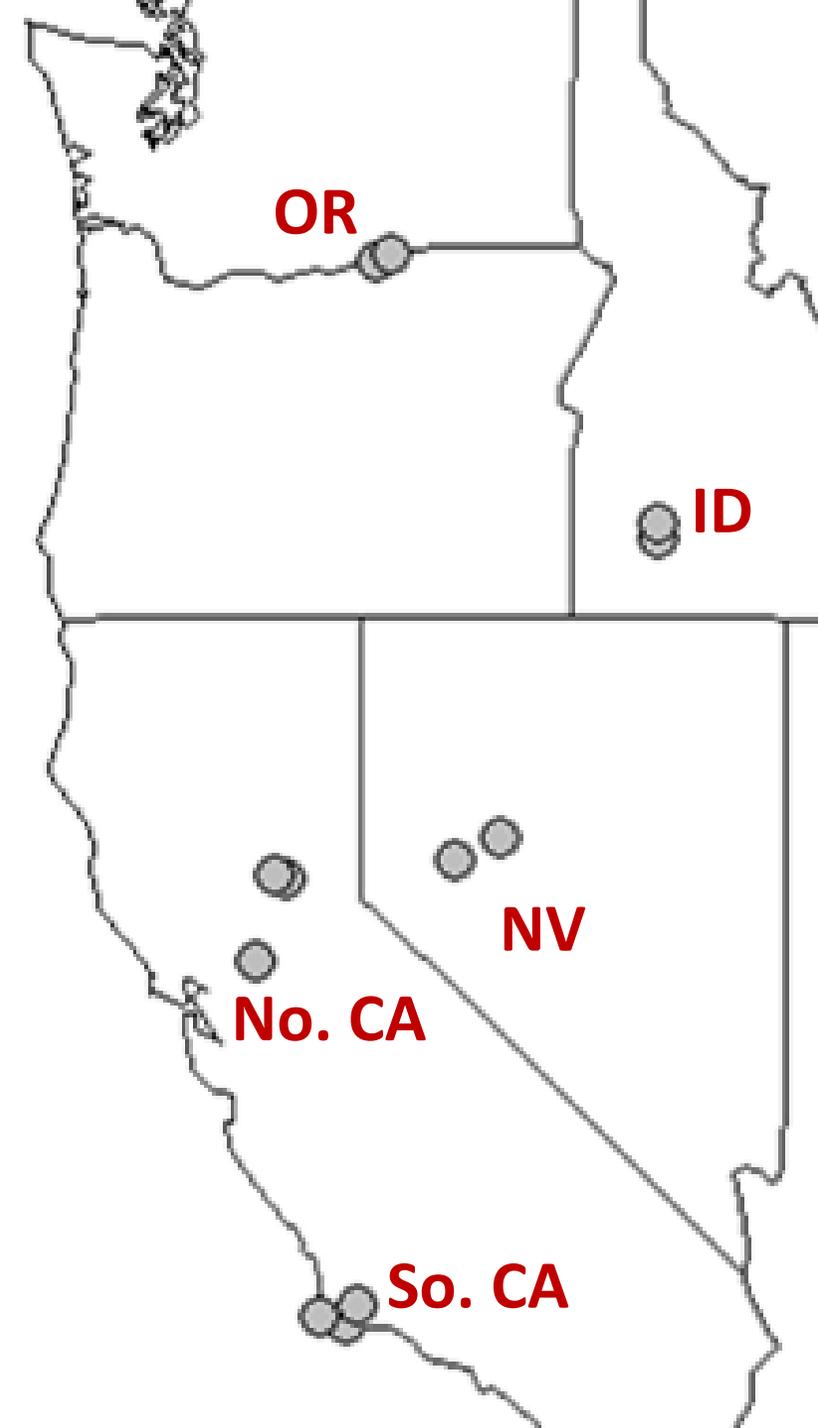


Breeding season monitoring

- 5 regions
- 2-3 sites / region
- Transects in “best” (not random) locations

Surveys

- Every ~4 weeks
- Count milkweed stems, by species
- Count monarch eggs & larvae by stage class
- Surveys in 2017, 2018 & 2019 (*no surveys in 2020*)





All sites, 2017-2019:
Monarch immatures in
relation to shade

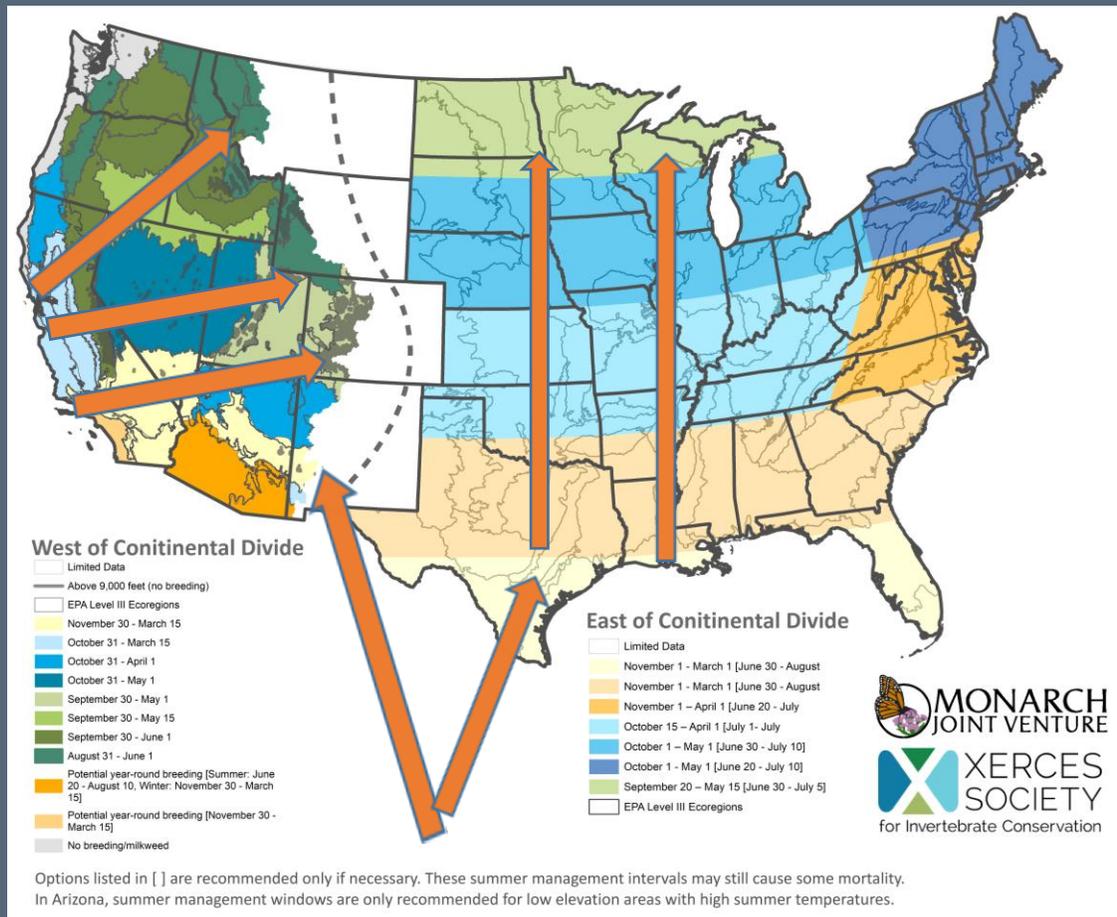
- Record cover over
transects:
 - 0 = no shade
 - 3 = full shade
- Monthly counts of eggs
& larvae

Focal site (Beale AFB), 2019:
Effects of shade on
temperature

- iButtons, late June
through October



Expanding vs. shifting population

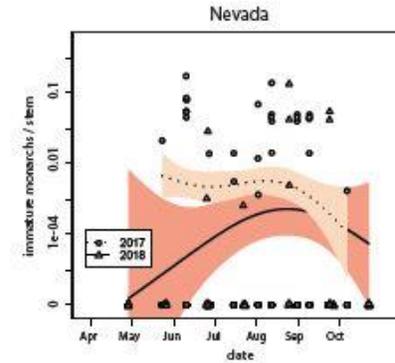
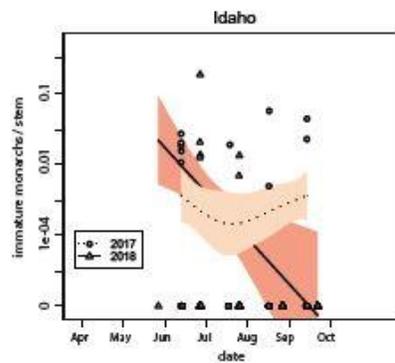
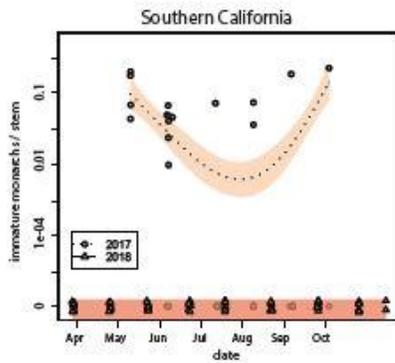
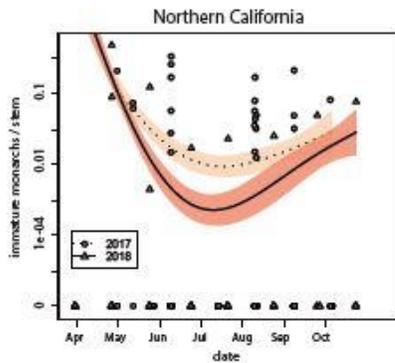
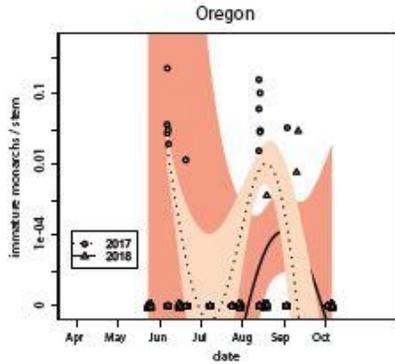
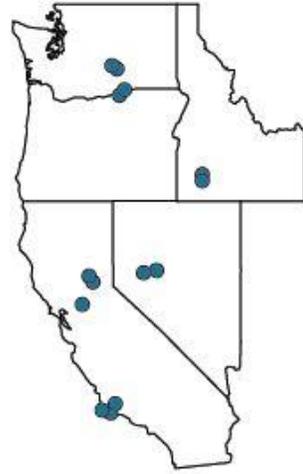


Western monarchs differ from eastern monarchs in at least two ways:

1. Western monarchs breed throughout the summer in central parts of their breeding range (California and Nevada), in contrast to eastern monarchs which migrate north through successive summer generations. Our monitoring data are consistent with an expanding population that spreads across the range rather than one that shifts throughout the breeding season.
2. Densities of immature monarchs (eggs and larvae per milkweed stem) in the west are much lower than reported numbers for the east (<0.1 eggs/stem in the West vs. 0.2 – 0.4 eggs/stem in the East); this implies that stem densities of milkweed per se are not the critical limiting factor in the same way that they are for eastern monarch (Nail et al. 2015, Thogmartin et al. 2017).

FIGURE 5: IMMATURE MONARCHS/MILKWEED STEM WITHIN EACH REGION.

Circles = 2017; triangles = 2018, No immature monarchs observed in Washington in 2017 or 2018 so no figure provided.

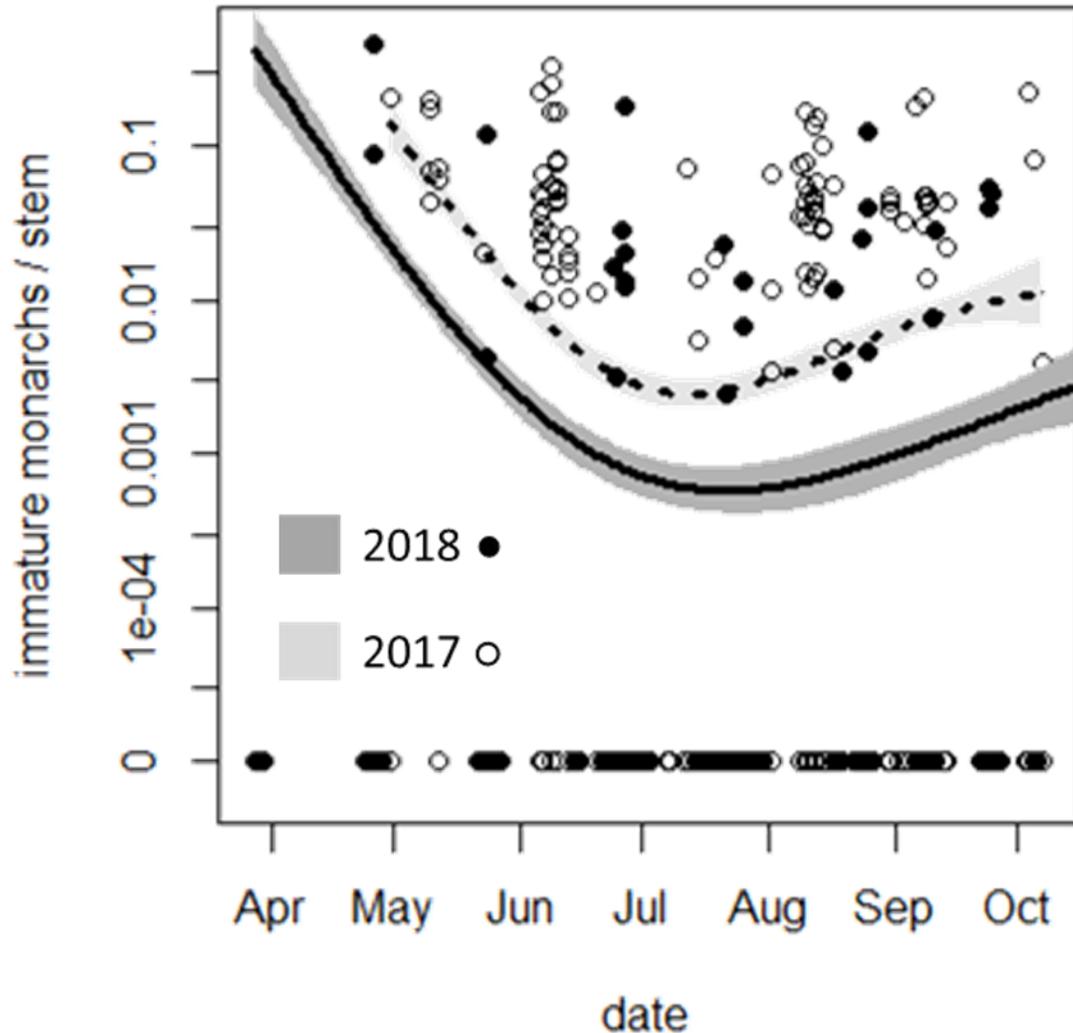


What we learned in years 1 & 2

- 2017-2018 monarch breeding was continuous throughout the summer in California and Nevada, and in Oregon there were distinct generations.
- Monarchs did not breed in Washington in 2018 or 2019 and was limited in 2017
- 10 fold decline in immature monarchs/stem between 2017 & 2018, similar numbers in 2019 as 2018!

Figure courtesy of Elizabeth Crone and Cheryl Schultz

2018 population drop happened before breeding...



2017 vs. 2018: $t = -2.53$, $P = 0.030$

We did not set up this research program to understand factors responsible for a population crash, but because we were monitoring the year prior to the crash and in the year of the crash—we can draw valuable and timely insight into western monarch biology and what might (or might not) have caused the crash.

Higher immature densities in Spring than Summer

→ milkweed limitation in spring...?

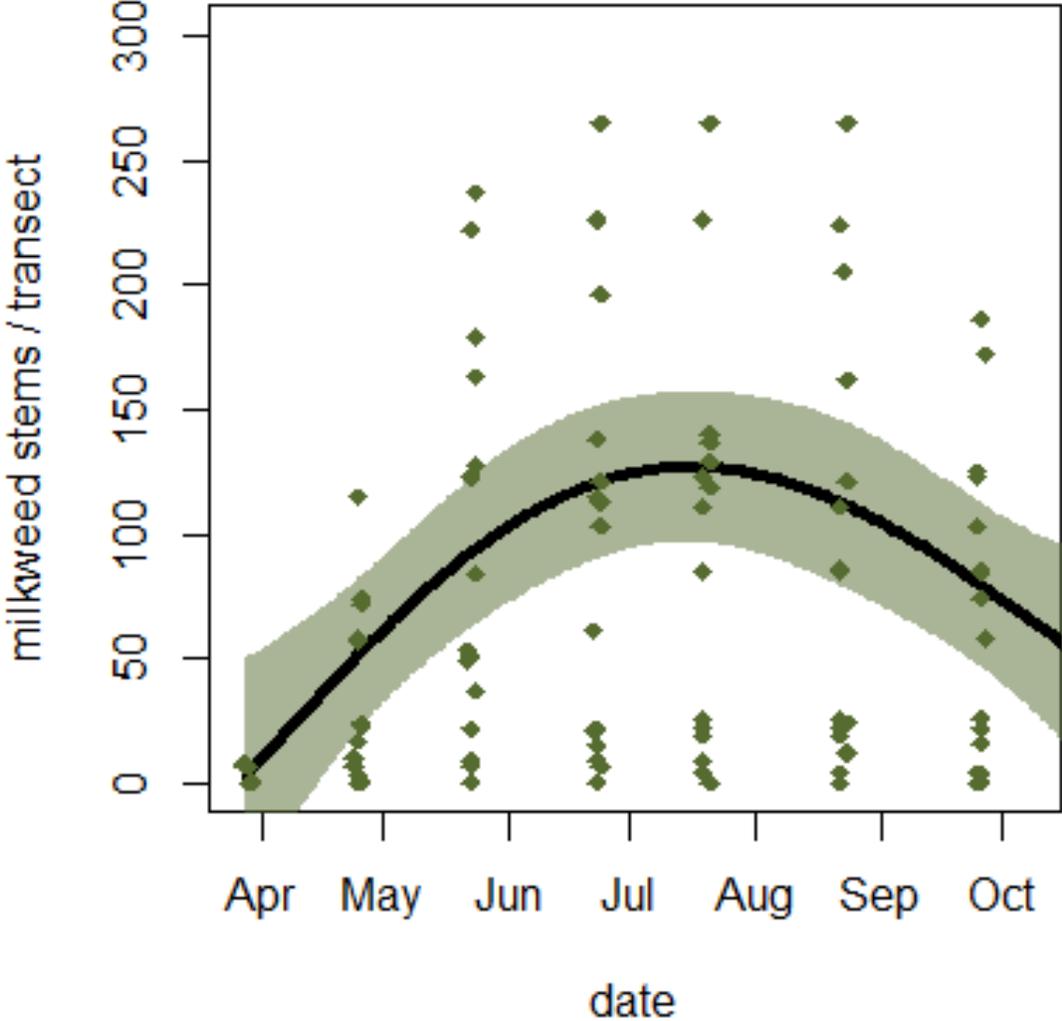
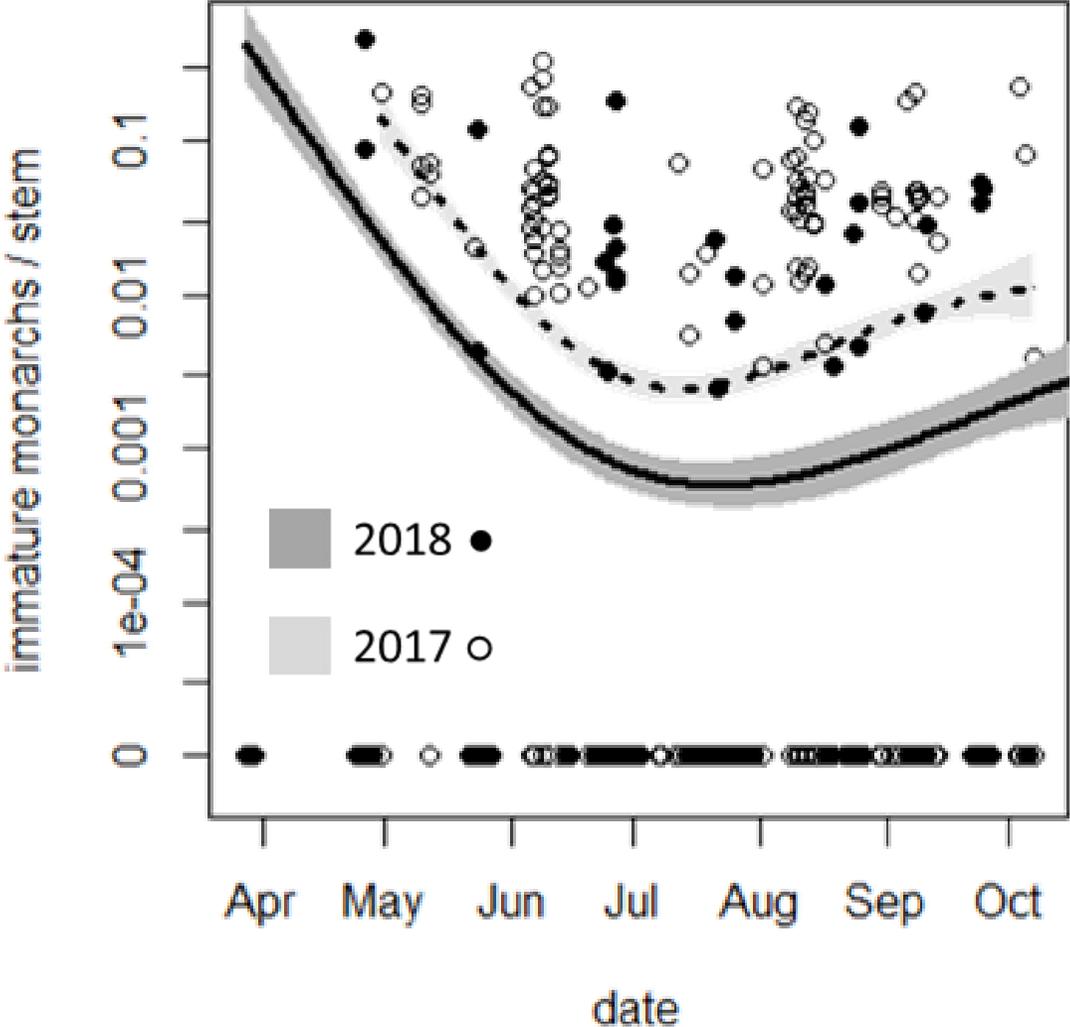
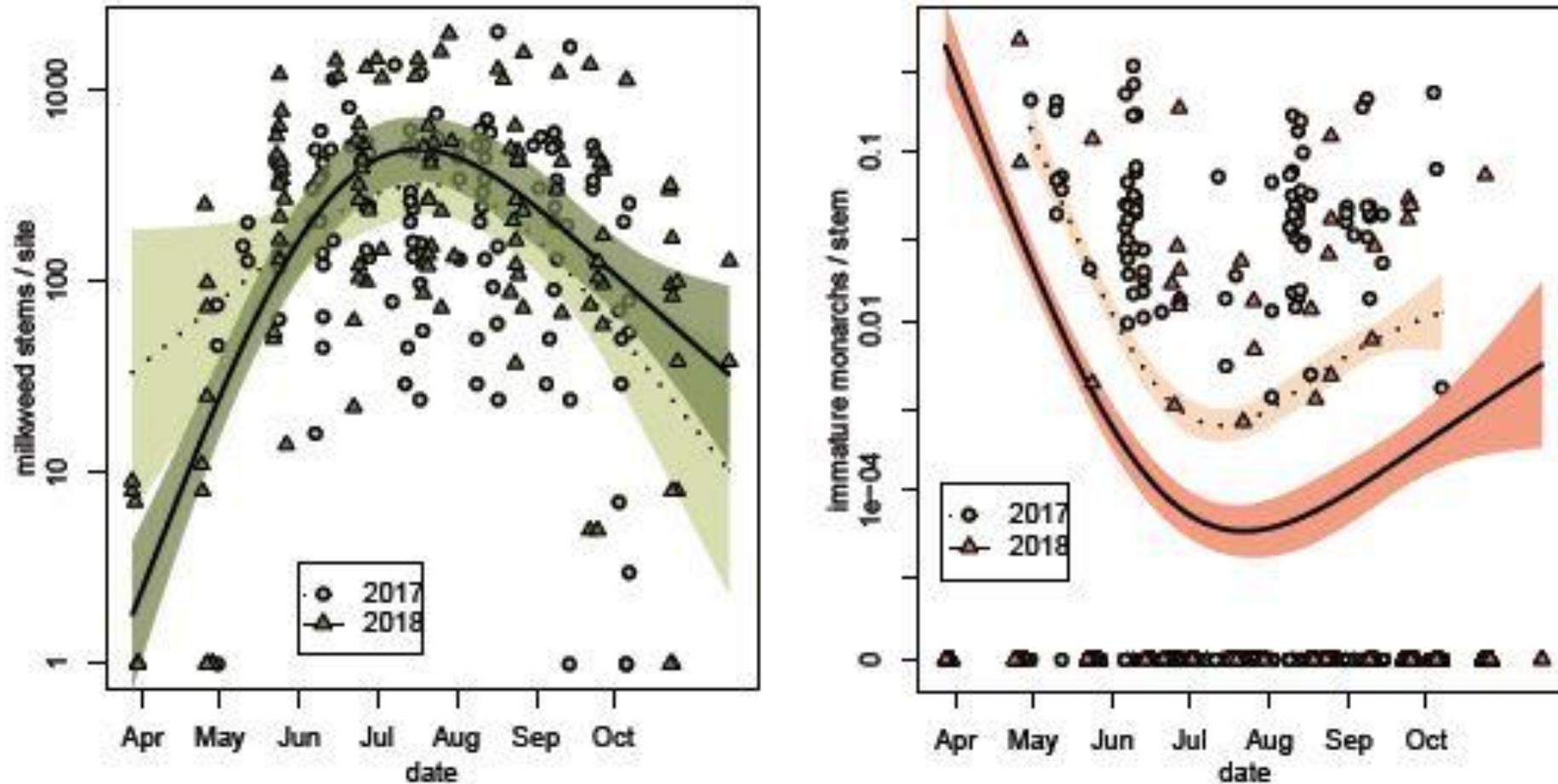


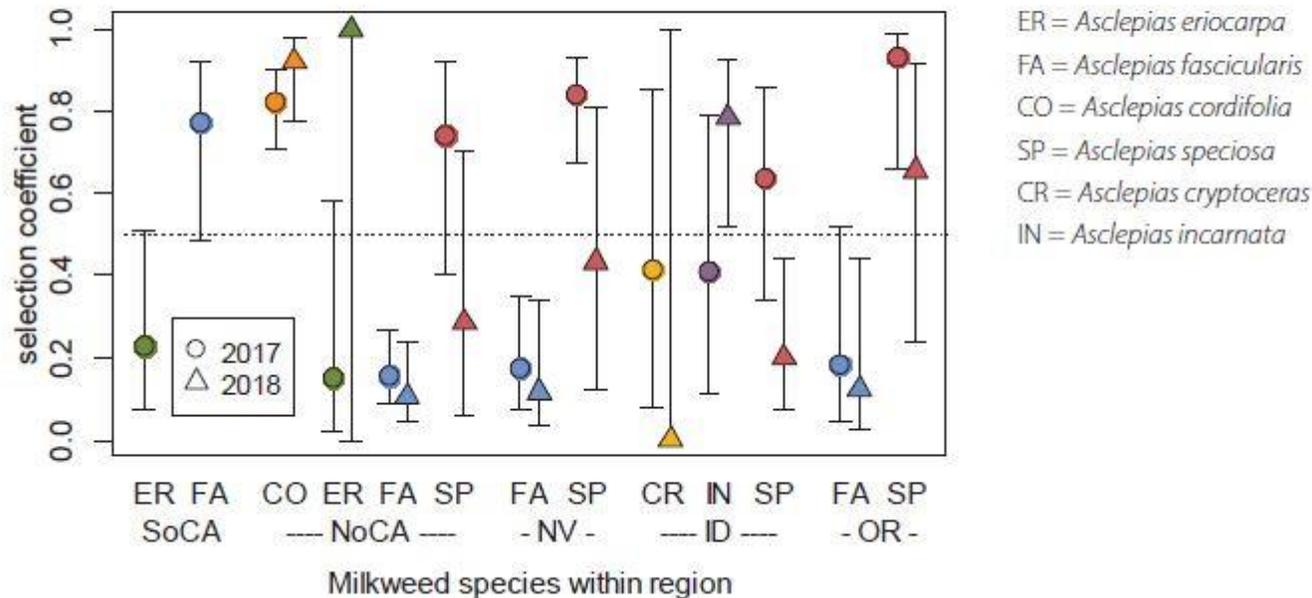
FIGURE 12: MILKWEED AND MONARCH PHENOLOGY. FIGURES SHOW SEASONAL CHANGES IN MILKWEED STEM DENSITY (LEFT PANEL) AND IMMATURE MONARCH DENSITY (RIGHT PANEL) IN BOTH 2017 AND 2018, ACROSS ALL STUDY SITES.



Milkweeds may be limiting in spring, not limiting during the rest of the breeding season. Overall, we found an increase in milkweed from 2017 to 2018, while monarchs declined.

Milkweed Preference by Region

FIGURE 9: SELECTION COEFFICIENT FOR MILKWEED SPECIES WITHIN EACH REGION AND YEAR COMBINATION.



Our analyses indicate that monarchs select some milkweed species more than others, but that these effects are strongest in some regions and vary by year.

Monarchs showed preferential use of *A. fascicularis* in Southern California, *A. cordifolia* in Northern California and *A. speciosa* in Oregon.

In some regions monarchs show preference in one year but no preference in another (e.g., *A. speciosa* in No CA and Nevada and *A. incarnata* in Idaho).

Figure courtesy of Elizabeth Crone and Cheryl Schultz

Additional Findings: Habitat Associations

Preliminary data from 2017 & 18 suggested that some habitat associations such as shade may be important for monarch breeding particularly in areas

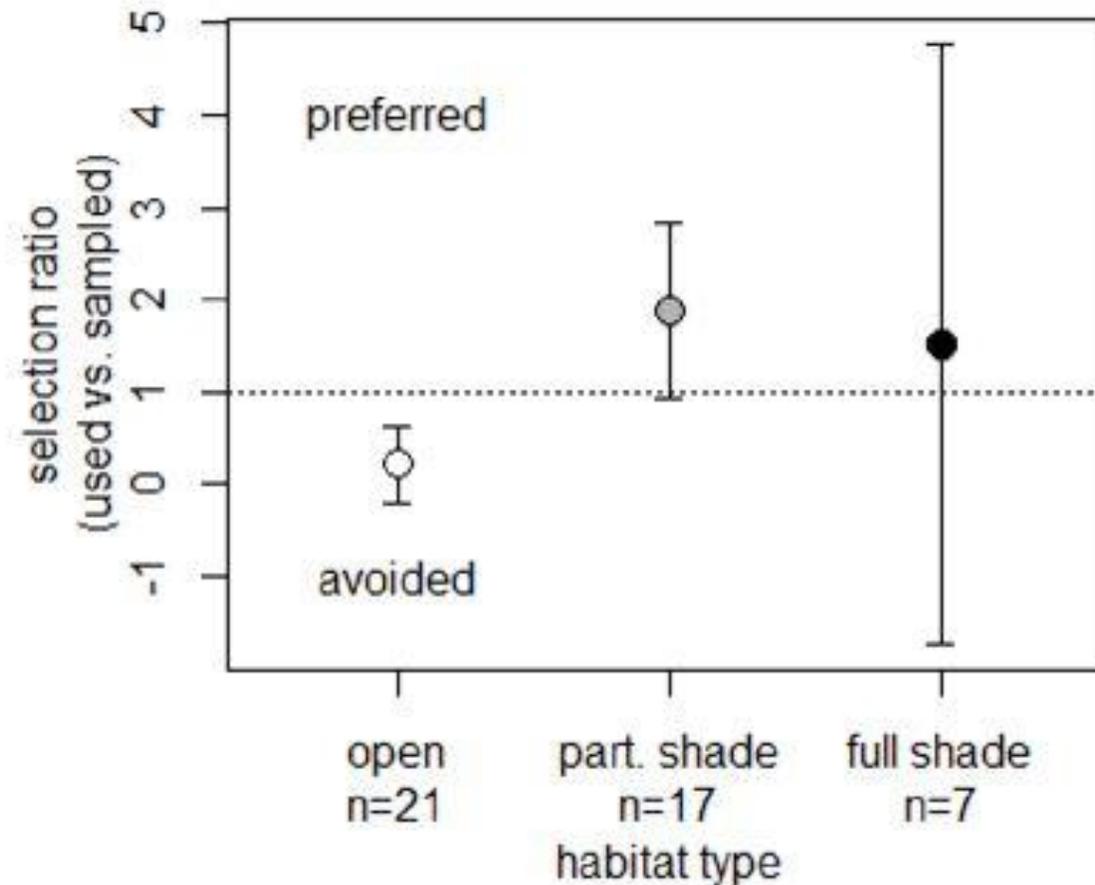
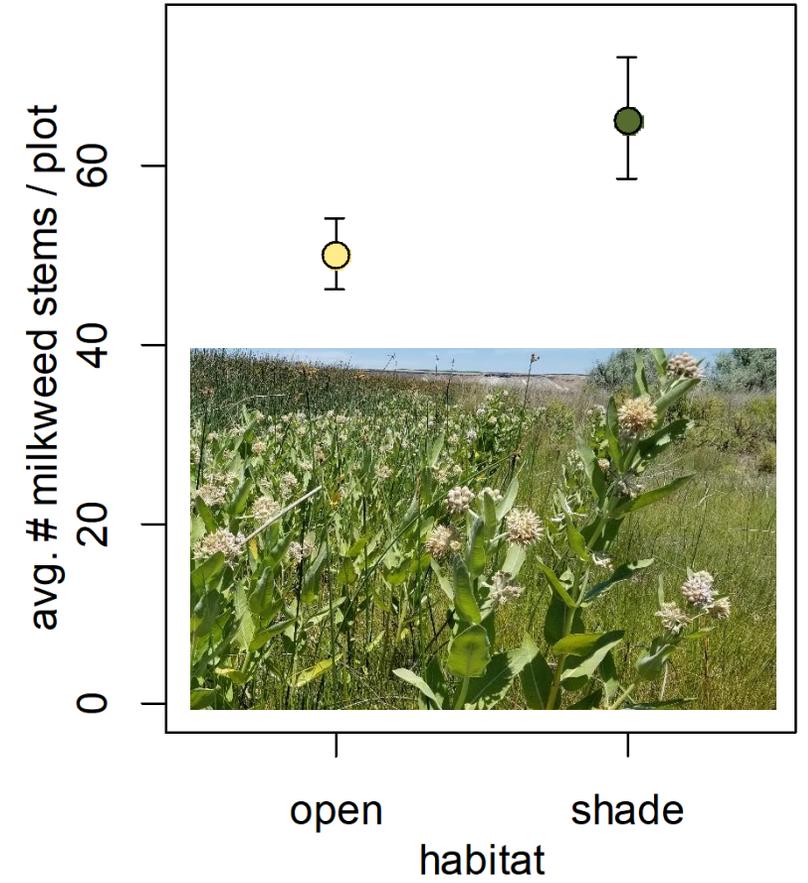
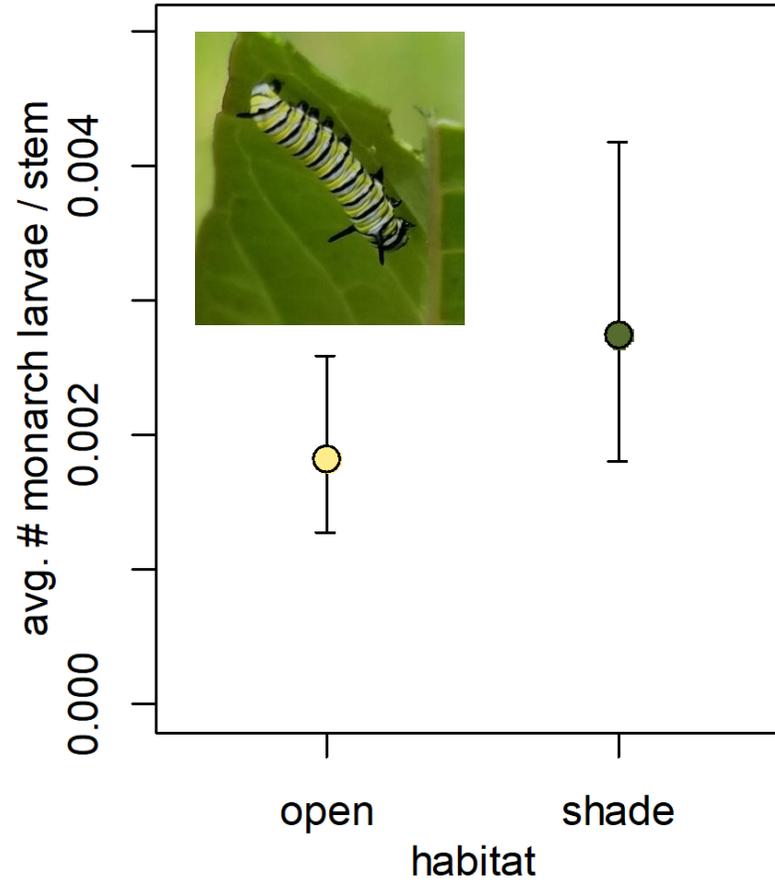
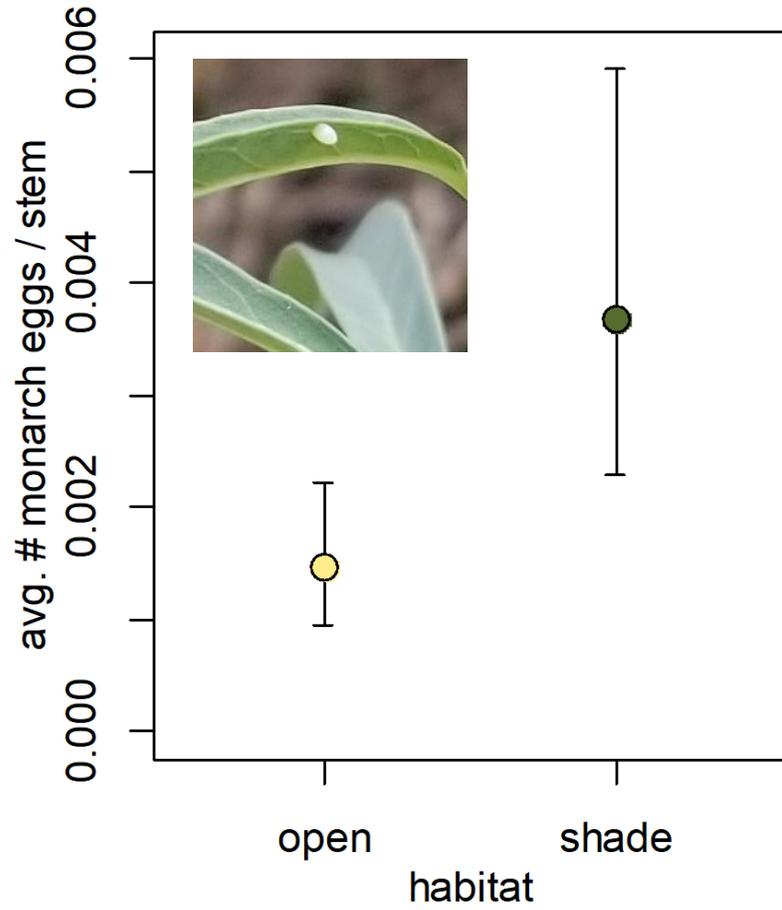
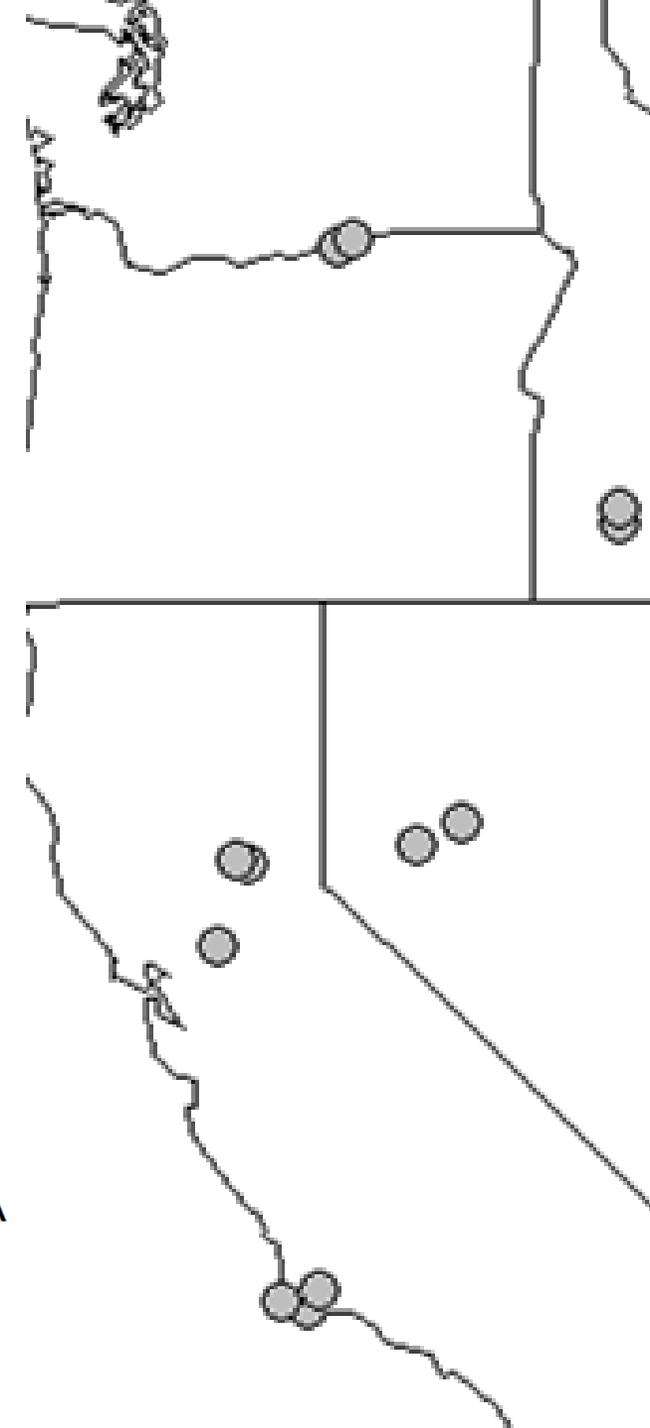
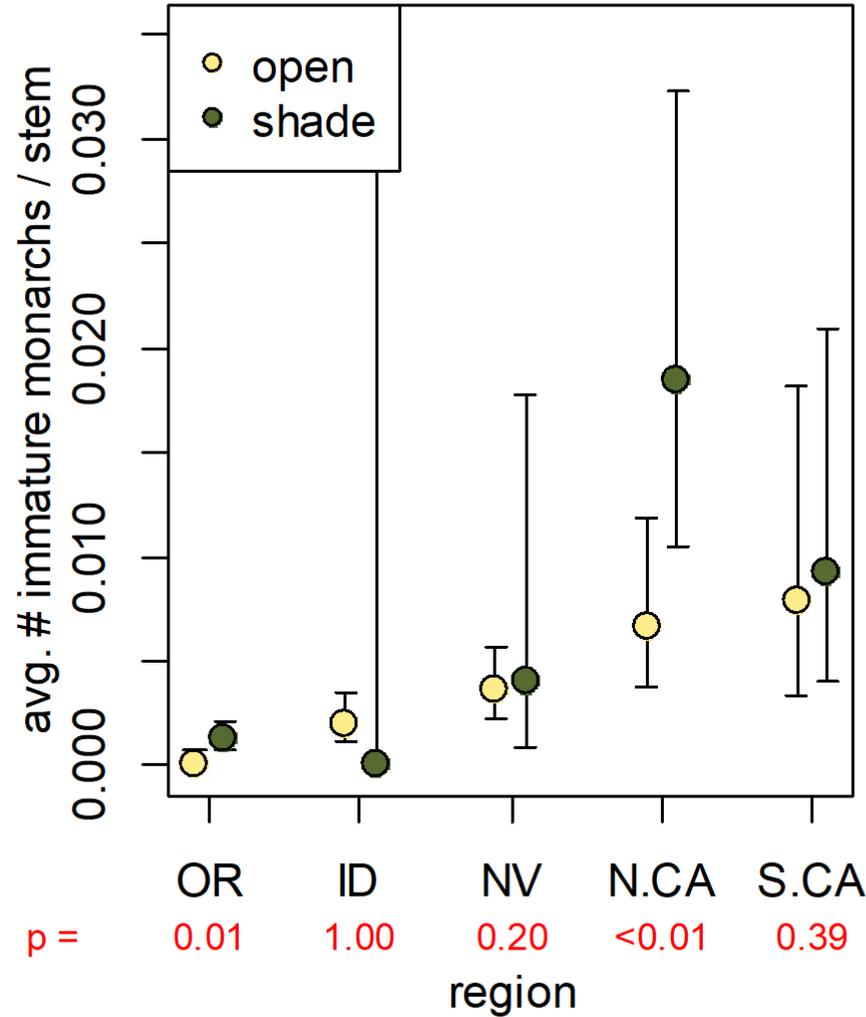
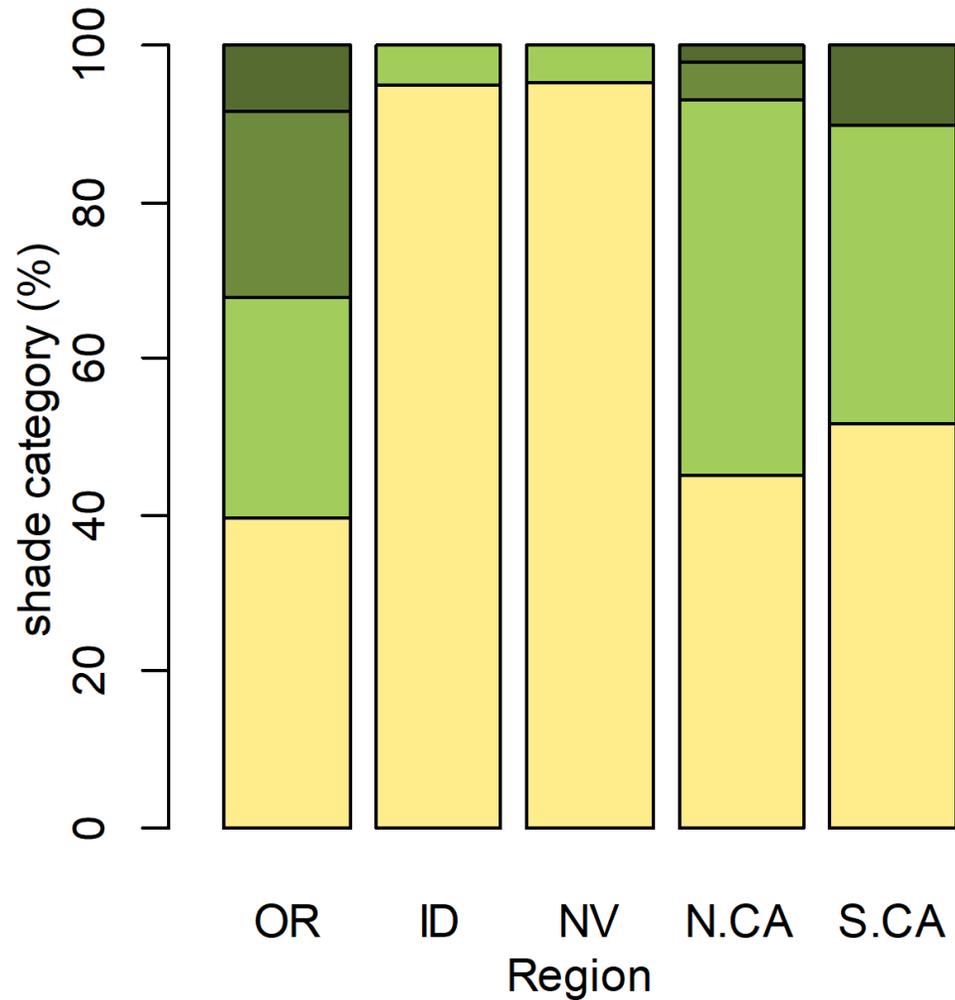


Figure courtesy of Elizabeth Crone and Cheryl Schultz

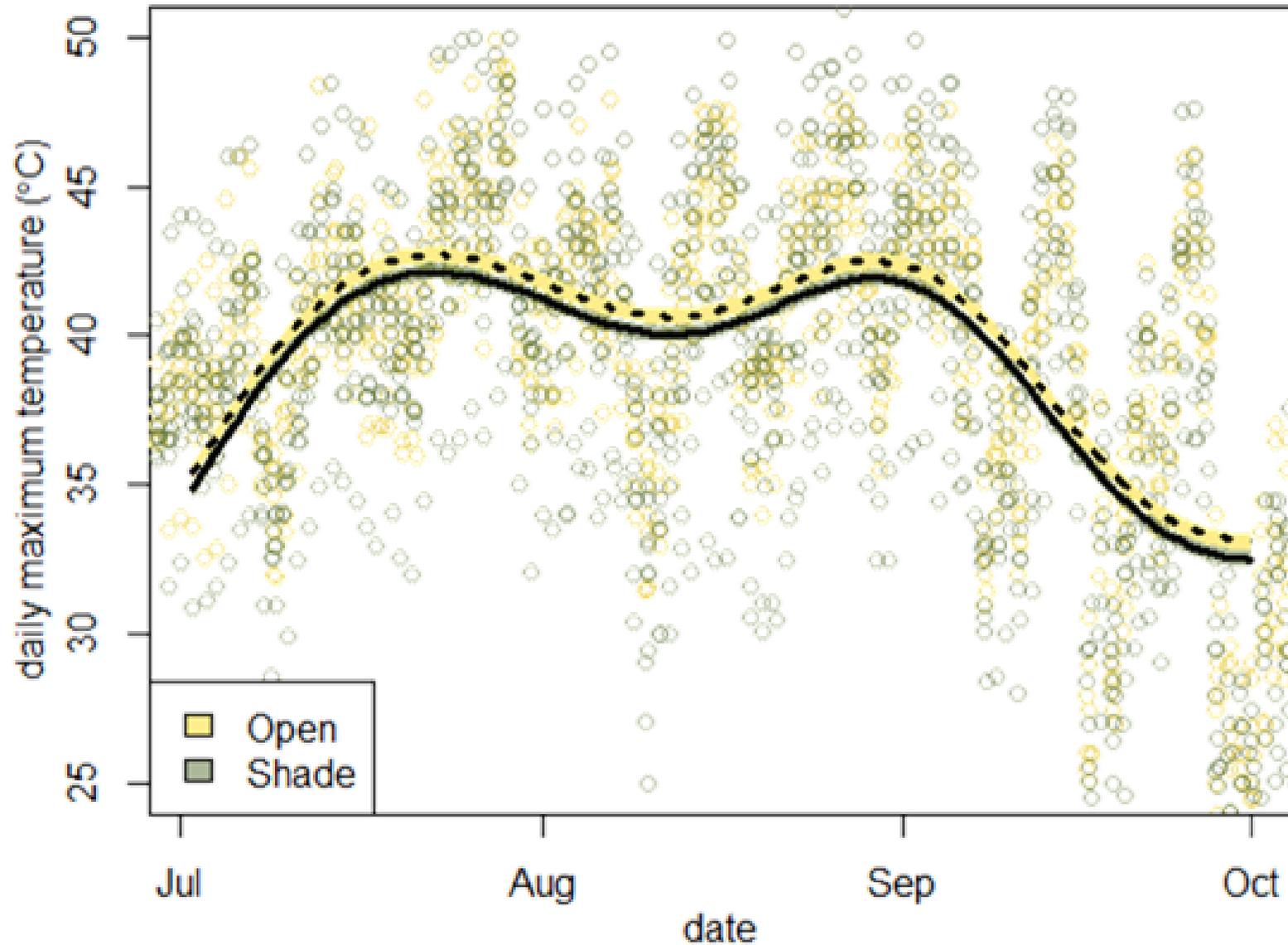
More immature monarchs in the shade:
(but they use both open and shaded sites)



Importance of shade differs by region:



Temperature difference: 0.59°C cooler in shade





Conclusions of shade/sun research:

1. Monarch butterflies lay eggs in both shade and sun (when both are available)
2. In hot places, monarchs may prefer shade for egg laying
3. Broadly, effects of changing temperature (so far) can be mitigated with habitat heterogeneity

Unlikely to be a major player in observed declines to date

Research Implications for Management

1.) Western Monarch Management Windows: Timing Management in Monarch Breeding Habitat

2.) Habitat Heterogeneity: monarchs have a preference for shaded milkweed in places that have both sun and shade in the hottest times of the summer. Diversity of milkweed availability (temporally, # of species) - monarchs show preference for some milkweed species = aim for at least two species.

3.) Early spring is a crucial time for the Western Monarch population = early spring milkweed + nectar plants

4.) Climate: warm springs are generally good for monarchs; high rain in spring may not be good for monarchs; monarchs are able to moderate microclimate by being in shade in heat of summer.

Timing Management in Monarch Breeding Habitat

Manage habitat in a way that minimizes harm to monarchs during the breeding season.

Fact sheet developed for DoD land managers – this map is included in the fact sheet.

Date Range to manage within (monarchs not breeding during this time)

- November 30 - March 15
- October 31 - March 15
- October 31 - April 1
- October 31 - May 1
- September 30 - May 1
- September 30 - May 15
- September 30 - June 1
- August 31 - June 1

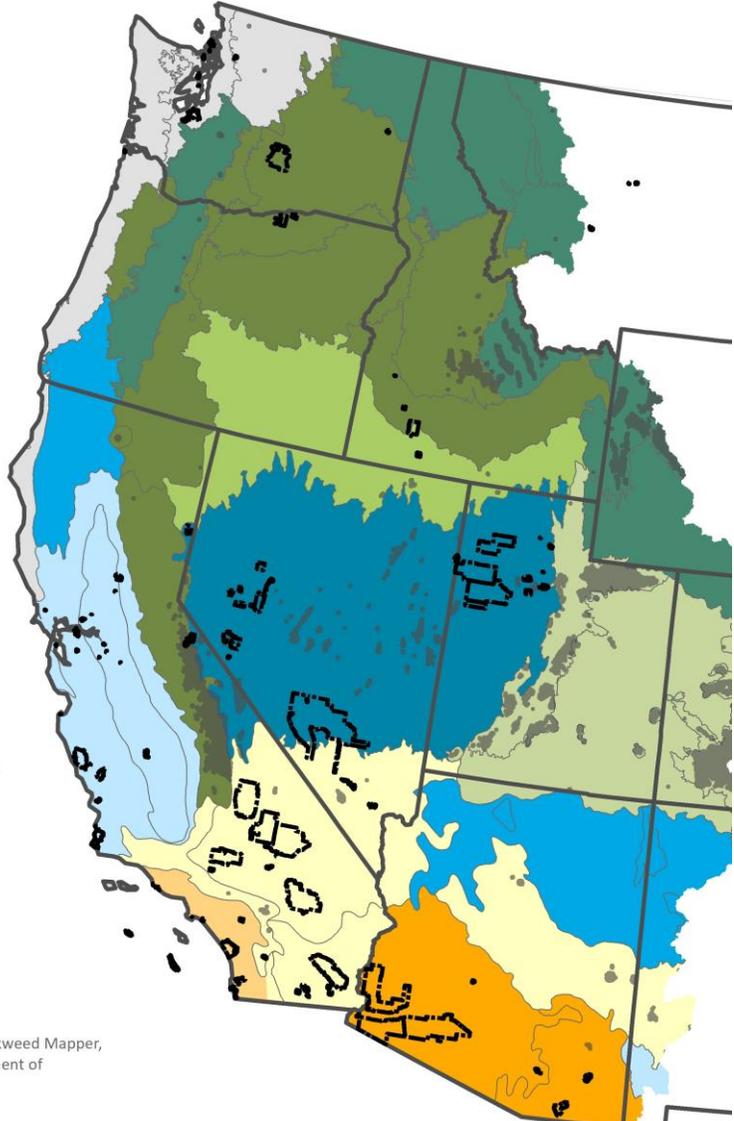
- Potential year-round breeding: November 30 - March 15 [Summer: June 20 - August 10]
- Potential year-round breeding: November 30 - March 15
- No breeding/milkweed
- Above 9,000 feet (no breeding)

- EPA Level III Ecoregions
- Limited Data
- Department of Defense Lands

Options listed in [] are recommended only if necessary. These summer management intervals may still cause some mortality. In Arizona, summer management windows are only recommended for low elevation areas with high summer temperatures..



Data sources: EPA Level III Ecoregions, Western Milkweed Mapper, Journey North, Southwest Monarch Study, Department of Defense Legacy Fund Research, Dingle et al. 2005.



Habitat heterogeneity

Protect existing milkweed and plant milkweed in both sun and shade.

Increase native milkweed & nectar plant availability.

Protect existing habitat!!!

Plant native milkweed and nectar species, especially early spring species (February–April) .

Plant and manage for more than one milkweed species.



A monarch larva on showy milkweed (*A. speciosa*). Providing sufficient milkweed (the monarch's larval host plant) and other nectar plants is a key component to aiding western monarchs' recovery. (Photo: Xerces Society / Stephanie McKnight)

Milkweed Emergence and Flowering in California

Species	Common Name	When do monarchs generally use these plants as a host?	Flowering Phenology = x (green box indicates possible plant emergence timing, grey indicates occasional winter growth on the SoCal coast)											
			J	F	M	A	M	J	J	A	S	O	N	D
<i>Asclepias californica</i>	California milkweed	Early spring - summer			x	x	x	x	x					
<i>Asclepias cordifolia</i>	heartleaf milkweed	Early spring - summer			x	x	x	x	x					
<i>Asclepias eriocarpa</i>	woollypod milkweed	Early spring - summer					x	x	x	x	x	x		
<i>Asclepias erosa</i>	desert milkweed	Early spring - summer				x	x	x	x	x	x	x		
<i>Asclepias vestita</i>	wooly milkweed	Early spring - summer				x	x	x	x					
<i>Asclepias fascicularis</i>	narrowleaf milkweed	Late spring - Fall					x	x	x	x	x	x		
<i>Asclepias speciosa</i>	showy milkweed	Late spring - Fall					x	x	x	x	x			

Regional Monarch Nectar Plant Guides



- Nectar guides include information on species which are
- Native & attractive to monarchs (documented visitation)
 - Commercially available
 - Hardy and appropriate for large-scale restoration
 - In bloom during the time period when monarchs are in a particular region



Bloom	Common Name	Scientific Name	Flower Color	Max. Height	Water Needs	Notes
<p>PLEASE NOTE: In general, milkweed should not be planted within 5 miles of the coast north of Santa Barbara, nor within 1 mile of the coast from Santa Barbara south. These areas are generally outside of milkweed's historical range and planting milkweed too close to overwintering sites may interfere with monarch migration and overwintering behavior.</p> <p>This list was produced by the Xerces Society for Invertebrate Conservation.</p>						
<p>FORBS</p> <p>All species perennials, unless otherwise noted. Monarchs can be found year-round in California.</p>						
Spring to Summer	1 Nettleleaf giant hyssop	<i>Agastache urticifolia</i>	Purple/red	2	L	Establishes better from transplant than seed. Tolerates clay soil and wet or dry conditions.
	2 Yarrow	<i>Achillea millefolium</i>	White	3	L	Tolerates clay soil and wet or dry conditions. Attractive to many insects.
	3 Coastal sand verbena	<i>Abronia latifolia</i>	Yellow	1	L	Tolerates salt spray and prefers sandy soils. Can bloom year-round.
Spring to Fall	4 Gumplant	<i>Grindelia camporum</i>	Yellow	4	L-H	Tolerates clay soil and wet or dry conditions.
	5 Milkweed	<i>Asclepias</i> spp.	Pink/white/purple	2-4	L/M	Monarch caterpillar host plant. 1 Likely entire genus is attractive to monarchs.
	6 Oregon gumweed	<i>Grindelia stricta</i>	Yellow	5	H	Wetland / riparian.
	7 Western vervain	<i>Verbena lasiostachya</i>	Purple	3	L	Good butterfly plant. Tolerates seasonal flooding, sand and clay. Can be used for erosion control.

Images: www.xerces.org



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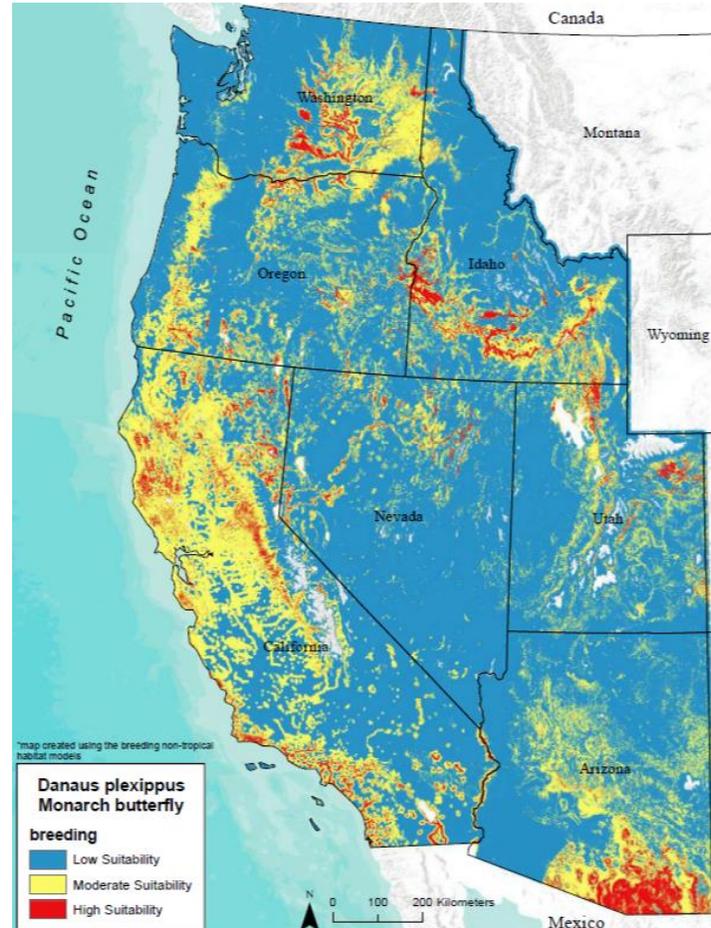
Best Management Practices

Protect, manage, and restore summer breeding and fall migration monarch habitat

Identify existing habitat and protect it from destruction.

Especially in the most important areas where it has been lost.

Learn more in *Managing for Monarchs in the West*



Dilts et al. 2019

Managing for Monarchs in the West

Best Management Practices for Conserving the Monarch Butterfly and its Habitat

Monarch Conservation on Department of Defense Lands in the West: Best Management Practices – Available at DoD Natural Resources Website

XERCES SOCIETY
for Invertebrate Conservation

xerces.org

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Manage habitat in a way to minimize harm. Example: Mowing

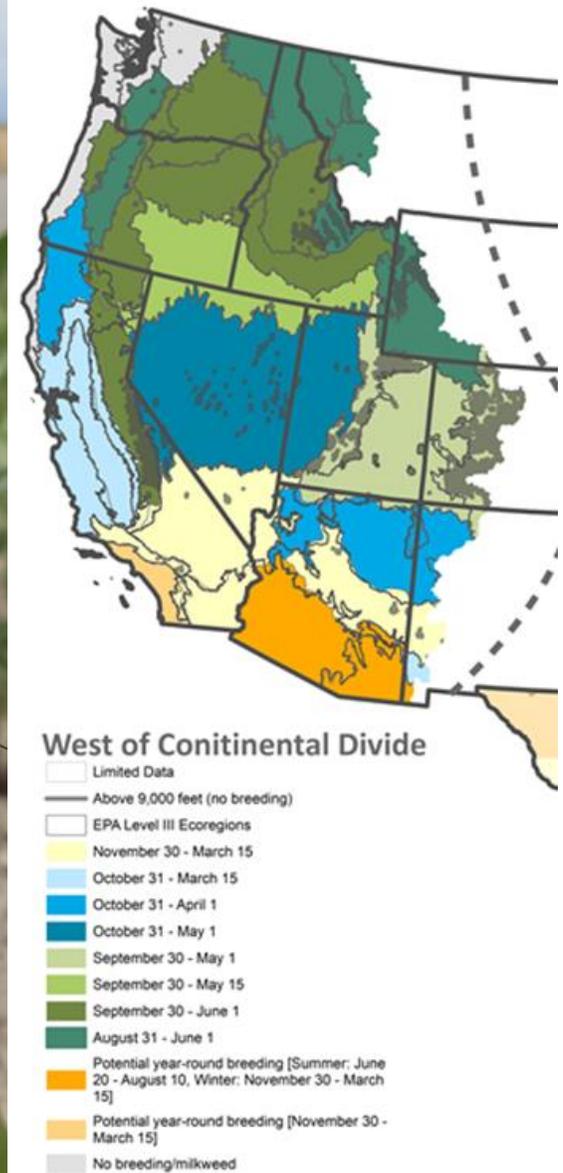
There are millions of acres of roadside habitat that are mowed in the West.

Mowing can kill pollinators – including monarch larvae - and remove nectar resources.

Excessive mowing reduces wildflower abundance and diversity over time.



Photo: Stephanie McKnight/Xerces Society



Adopt Monarch Friendly Roadside Management

Milkweed in the West is common on roadsides. Resources for managing roadside habitat for monarchs:

- Monarch Butterflies, Weeds, and Herbicides
- Milkweed Guides for Roadsides
- Roadside BMPs
- Climate-Smart Right-of-Way Habitat



Monarch butterflies are in decline in their historic and native range. Monarch caterpillars require milkweed species and monarchs can be found on roadside habitats. Roadsides provide more than just milkweed; they are also other pollinators. Native plants which monarchs to that host nectar from a variety of flowering plants, including self-seeds support monarchs as they raise their overwintering, grass-like breeding monarchs. Milkweed flowers provide nectar of nectar to build fat reserves to support their long-distance flight. Weeds and invasive weeds can degrade habitat for monarchs and are not recognized by many transportation agencies as an increasing woody vegetation. However, some roadside habitats for monarchs by connecting the management guide highlights best management practices to reduce the impact.

Best Management Practices

Roadside managers and other vegetation managers can reduce 1. using herbicides within an integrated approach that uses non-compatible vegetation, 2. limiting a herbicide treatment application, which can do 3. using herbicides as efficiently as possible to reduce the an reducing off-site movement of herbicides, and 4. limiting direct exposure of monarchs to herbicides when Specific management practices to reduce risk to monarchs include:

Application Training

- Train staff and contractors to identify critical areas and species to reduce unintended damage to managed plants (native Canada thistle, Crown vetch) from the soil and to monitor plants for emerging herbicide in the soil
- Train applications to herbicide applications in dry season
- Consider specifications that would hold contractors to

Assessment

- Inventory roadside vegetation regularly to identify areas

Milkweed flowering plants can be found on roadside habitats in California. They are a vital source of nectar for monarch butterflies and other pollinators. As required best plants for monarchs, they are also important to play an essential role in the butterfly life cycle. This guide provides management practices to reduce the impact on monarchs. The guide can help you monitor the monarch population growth and sustainability in your region.

The most common milkweeds in California are categorized as follows:

<p>Black-foot milkweed (CA, central)</p> <p>PLANT: Spreading upright herbaceous perennial. LEAVES: Opposite to the stem. FLOWERS: Small, tubular, pink to red. SEEDS: Small, round, black. USDA Hardiness Zones: 5-9. Notes: This species is native to California and is a common roadside plant.</p>	<p>Winged milkweed (CA, throughout)</p> <p>PLANT: Upright, branched stem, densely branched. LEAVES: Opposite to the stem. FLOWERS: Small, tubular, pink to red. SEEDS: Small, round, black. USDA Hardiness Zones: 5-9. Notes: This species is native to California and is a common roadside plant.</p>
<p>Common milkweed (CA, throughout)</p> <p>PLANT: Upright, branched stem, densely branched. LEAVES: Opposite to the stem. FLOWERS: Small, tubular, pink to red. SEEDS: Small, round, black. USDA Hardiness Zones: 5-9. Notes: This species is native to California and is a common roadside plant.</p>	<p>Mariposa milkweed (CA, throughout)</p> <p>PLANT: Upright, branched stem, densely branched. LEAVES: Opposite to the stem. FLOWERS: Small, tubular, pink to red. SEEDS: Small, round, black. USDA Hardiness Zones: 5-9. Notes: This species is native to California and is a common roadside plant.</p>

Roadside Best Management Practices that Benefit Pollinators

Handbook for Supporting Pollinators through Roadside Maintenance and Landscape Design

U.S. Department of Transportation
Federal Highway Administration

Pollinators and Roadsides: Best Management Practices for Managers and Decision Makers



January 2016

U.S. Department of Transportation
Federal Highway Administration

Pollinators and Roadsides: Best Management Practices for Managers and Decision Makers | December 2015
Federal Highway Administration



Key Management Implications

Managing Western Monarch Breeding Habitat

Incorporate Best Management Practices for Monarchs into INRMPS, including management timing for monarchs

Increase the availability of nectar and native milkweed. Plant a diversity of milkweed species, plant in sun and shade. Plant a diversity of monarch nectar plants.

Identify and protect existing milkweed from disturbance (mowing, fire, road maintenance, pesticide application, etc.) during the active monarch breeding season. Protect habitat in shade and sun.



Research Products available at:

[https://www.denix.osd.mil/legacy/
nr-legacy-project-deliverables](https://www.denix.osd.mil/legacy/nr-legacy-project-deliverables)

- Best Management Practices: Monarch Conservation on Department of Defense Lands in the West (Updated version will be published later this year)
- Fact Sheet: Western Monarch Management Windows: Timing Management in Monarch Breeding Habitat
- Annual Project Reports (2017 & 2018 season final report complete, 2019 final report in progress)
- Expected in the future: Publications from results of this research, Date: TBD

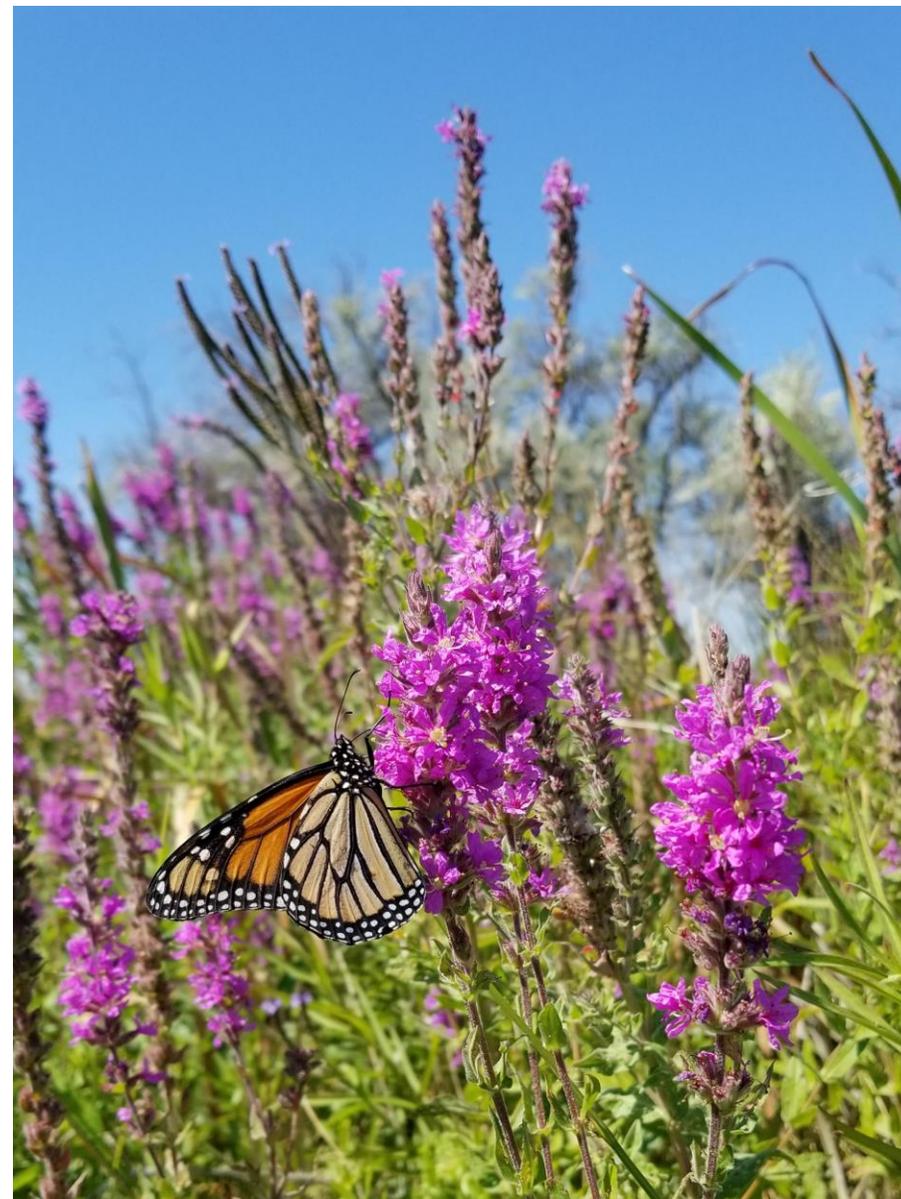
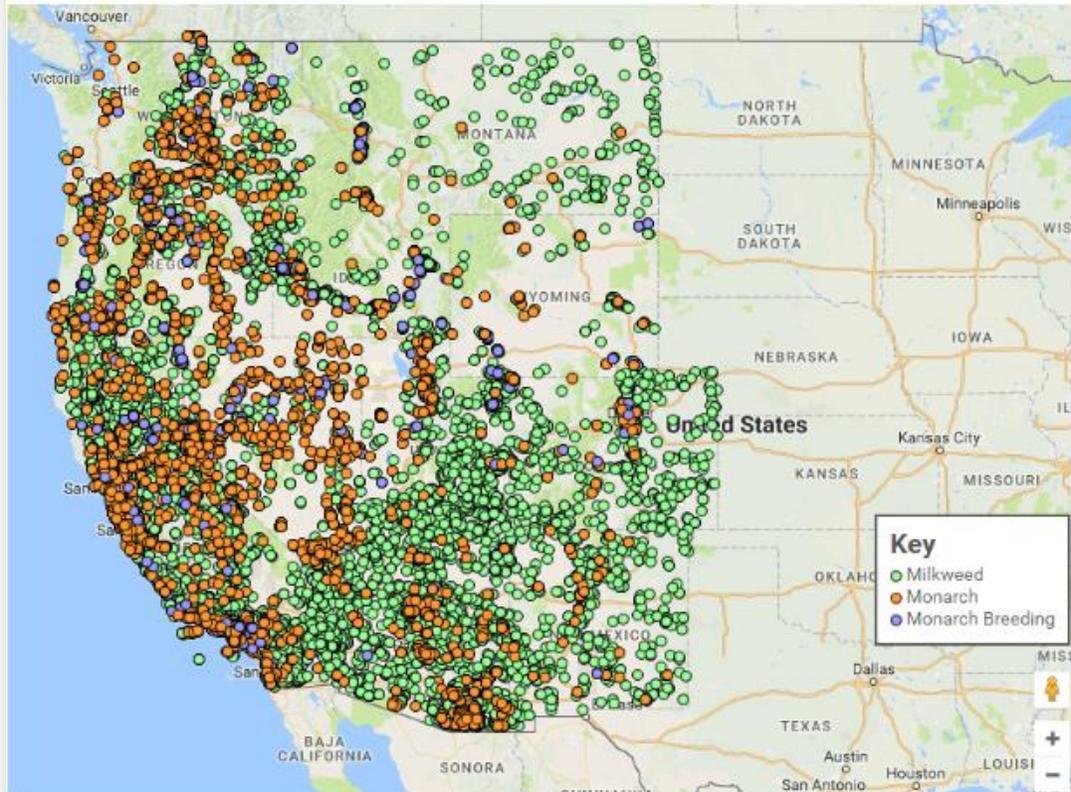


Photo: Stephanie McKnight/Xerces Society

Western Monarch Milkweed Mapper

Check out sightings submitted in your area! [Explore now](#)



How to Submit a Sighting

1



Take a photo of a monarch and/or milkweed

2



Login and upload your photo(s)

3



Identify your sighting

4



Submit your sighting!!

Get started!



WESTERN MONARCH
MILKWEED MAPPER

Submissions

Milkweed Sightings: **38552**

Monarch Sightings: **16977**

Monarch Breeding

Sightings: **2959**

Total Sightings: **55529**

Learn more & participate at
www.monarchmilkweedmapper.org



Additional Community Science Projects

Community Science Monitoring Programs for Monarchs

Integrated Monarch Monitoring Program

This monitoring program is a tri-national initiative led by the Monarch Conservation Science Partnership to monitor monarch populations and habitat throughout their breeding range.

Journey North

Report observations of migrating monarchs to real-time migration maps.

Monarch Larva Monitoring Project

How many generations do western monarchs have annually? What is the survival rate of eggs/larvae?

Project Monarch Health

How common is OE in the West? Other parasites?



Monarch Larva Monitoring Project



PROJECT MONARCH HEALTH

Identifying Western Monarch Migration Pathways

Western Tagging Programs

California

Monarch Alert at Cal-Poly

The screenshot shows the homepage of the Monarch Alert website. At the top, it says "POLY Monarch Alert". Below that is a navigation menu with links for Home, About, Sponsors, Affiliates, Monarchs, Data, News, Report, Links, and Contact. The main content area features a large image of monarch butterflies and caterpillars. A prominent heading reads "Help the Western Monarch" with a sub-heading "Did you know? *Danaus plexippus*, the monarch butterfly, overwinters in California and Mexico. During winter, California's monarch population can top 100,000. The exact numbers fluctuate from year to year." Below this, there is a section titled "Project Monarch Alert is a citizen-based research project backed by graduate student researchers and faculty from Cal Poly in San Luis Obispo. We focus on the" and another section titled "Have a Butterfly Garden? We Need Your Help! Please complete our online survey about butterfly gardens and winter sites."

Northwest

Pacific Northwest Monarch Butterflies

The screenshot shows the Facebook page for "Monarch Butterflies in the Pacific Northwest". The page header includes the name and a search bar. Below the header, there is a cover photo of monarch butterflies. The main content area shows a post with a photo of a young girl holding a monarch butterfly. The page has 2,854 likes and a "Like" button. There are also links for "Share" and "Message".

Southwest

Southwest Monarch Study

The screenshot shows the homepage of the Southwest Monarch Study website. At the top, it says "Southwest Monarch Study". Below that is a navigation menu with links for Home, About, Photos, Likes, and More. The main content area features a large image of monarch butterflies. A prominent heading reads "Southwest Monarch Study" with a sub-heading "A scientific paper, *Status of *Danaus plexippus* in Arizona*, that reports the findings of the first of the Southwest Monarch Study has been published in the *Journal of the Lepidopterists' Society*. You can also download a pdf summary of the Arizona paper [Top Ten Findings of Status of *Danaus plexippus* in Arizona.pdf](#). A report entitled *Monarch Butterfly (*Danaus plexippus*) in New Mexico and a Proposed Framework for Conservation* is now available [here](#). Visit [/SouthwestMonarchStudy](#) for up to the minute monarch news! The Southwest Monarch Study is researching the migration and breeding patterns of monarch butterflies in Arizona and the Southwestern United States. It was once believed that monarch butterflies East of the Rocky Mountains flew to the mountains near Mexico City for the winter and monarchs West of the Rockies flew to the coast of California. Through Fall tagging in the Southwest (Arizona, Nevada, New Mexico, California deserts, Utah and Western Colorado), we have learned that this is not always the case. There is much more to learn about the wild monarch migration throughout the Southwestern states. If you love monarch butterflies, consider joining our study. Our Mission: 1. To identify and describe the migration and breeding patterns of Monarch Butterflies (*Danaus plexippus*) in the Southwestern United States. 2. To monitor and encourage Monarch Butterfly conservation. 3. To provide a meaningful research project for citizen scientists of all ages.



Thank you for supporting this research!



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