Influence of water availability on native wildflower phenology and pollinator attractiveness

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Native Plant Gardening is Popular

- Gardening with native plants is increasing in popularity
- Despite the popularity of native plant gardening, little is known about native plant performance in garden settings.
- Are floral bloom and survival impacted by gardening practices?
Native Plants and Pollinators

- Targeted plantings are often suggested as ways to improve pollinator habitat in gardens.

- If floral bloom and plant survival are impacted by gardening practices, what impact does this have on pollinators?

*Clarkia amoena*

*Solidago canadensis*
2017 vs. 2018 Rainfall

• May-Aug 2017: 2.87”

• May-Aug 2018: 0.87”

• Irrigated to establish perennials in 2018
Study Questions

• Does water availability change native plant bloom phenology?
  • Timing?
  • Length?

• Do phenological differences affect plants’ attractiveness to pollinators?
  • Different bloom and flight times could create mismatches
  • Increased or decreased bloom length could change resource availability
Field Study: Measuring Bloom Phenology

• Record duration of peak bloom for each species (27, total)

• Peak bloom = 75% or more of plot was in bloom.
  • For plants or plots that bloomed in succession (e.g. Oregano), 50% or more in bloom was the conservative threshold
  • Goal was to get three consecutive weeks of bee data

• Phenology data will allow gardeners to plant flowers with overlapping bloom
Peak Bloom Phenology

- 2018 peak bloom began 17.7 days earlier than 2017
- 2018 peak ended 28 days earlier
- 2018 bloom was 10 days shorter, overall

Aquilegia formosa
Eschscholzia californica
Salvia elegans*
Sidalcea virgata
Anaphalis margaritacea
Eriophyllum lanatum
Gilia capitata
Achillea millefolium
Clarkia amoena
Origanum vulgare*
Solidago canadensis
Nepeta cataria*
Madia elegans
Aster subspicatus

*= exotic garden species
Field Study: Pollinator Abundance & Diversity

- Perform timed pollinator counts
  - Timed for 5 minutes
  - Counted insects that landed on open flowers

- Vacuum sample insect communities
  - Census all insects present on flowers
  - Four overhead vacuum passes of each plot

- Week before, during, and after peak bloom

Sampling bees on California poppy
2017 vs. 2018 Pollinator Visitation Results

• Overall visitation differed between years, and was higher in 2018

• Shorter bloom periods did not result in reduced bee visitation

• Most attractive flower species differed between years

• Honeybees disproportionally visited exotic species
2017 Mean Bee Abundance by Plant Species

Mean Bee Abundance / 5 mins

* = exotic garden species

- Gilia capitata
- Madia elegans
- Solidago canadensis
- Nepeta cataria
- Eschscholzia californica
- Origanum vulgare
- Clarkia amoena
- Phacelia heterophylla
- Anaphalis margaritacea
- Sidalcea virgata
- Helianthus annuus
- Collinsia grandiflora
- Salvia elegans
- Achillea millefolium
- Lupinus bicolor
- Eriophyllum lanatum
- Aquilegia formosa

- Other Native Bee
- Bumblebee
- Green Bee
- Honeybee
What Does This Mean?

• Water availability may influence wildflower phenology in the garden
  • Less water $\rightarrow$ advanced bloom and shorter bloom

• How does this impact pollinators?
  ✓ Providing longer bloom period (more resources)
  ✓ More overlap in floral bloom
  ✗ Potential mismatch between plant bloom and bee flight periods

• Consider how water availability may influence phenology when designing a planting palette for pollinators