Urbanization and spatio-temporal patterns of flowering phenology of plants in the Phoenix metropolitan area

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ABSTRACT

- Research of the effects of urbanization on flowering phenology, i.e. the timing and duration of flowering, has shown that many spring flowering plants are blooming earlier in urbanized areas than in the surrounding rural areas. The urban heat island phenomenon has been hypothesized to be a primary cause for change in flowering phenology. These studies have been conducted in temperate, Mediterranean, and boreal regions of North America, Europe, and Asia where the temperature-photoperiod interaction is widely accepted as the primary trigger of floral development under these bioclimatic conditions.
- While moisture and temperature are considered the primary triggers for most arid plants, flowering phenology in arid urban areas has yet to be studied. We propose to study the spatial and temporal pattern of flowering phenology of two common plant species in the Phoenix metropolitan region. This will be done by field observations of selected plants at various sites across the city.
- We hypothesize that the pattern of flowering phenology of these plants will vary due to land-use heterogeneity, high night-time temperatures, and higher water availability. A common indigenous species and a common non-indigenous species will be selected to represent allergen producers, food sources in the form of pollen for local bees and other insects, and an insect-pollinated non-indigenous plant. Therefore, the flowering phenology of these plants can be related to important ecological and human health issues.

RESEARCH OBJECTIVES

- Describe intra-annual spatio-temporal patterns of flowering phenology of two common species within the CAP region
- Link observed patterns with causative processes
- Understand potential consequences of patterns and processes

Parkinsonia/Cercidium spp.

- Native to the Americas
- Used for landscaping and two spp. are native
- Deciduous shrub/tree
- Flowers during early spring
- Yellow flowers

Nerium oleander

- Native to Asia and Mediterranean region
- Widely used for landscaping
- Evergreen shrub
- Flowers during summer and fall
- White to cream to pink flowers

METHODS

- Pick one indigenous plant (*Parkinsonia/ Cercidium*) and one non-indigenous plant (*Nerium oleander*)
- Chose sites from the 2000 CAP-LTER 200 point survey that has at least one individual of either chosen plant (will probably have to pick some outside of the survey)
  - urban, residential (mixed and xeric), and desert sites for *Parkinsonia*
  - urban, residential (mesic, mixed, and xeric), and (1) desert sites for *Nerium*
  - 4-5 replicates for each
- Observe plants for first date of flowering, duration of flowering, and intensity of flowering
  - once a month until in bloom (flowers on three separate branches)
  - when in bloom, twice weekly for *Parkinsonia* since it has short blooming period
  - when in bloom, once a week for *Nerium* since it has a long blooming period
- Analyze intra-seasonal temporal and spatial flowering pattern of both species
- Link any observed patterns to causes using various statistical analyses
- If possible, investigate any relationship with phenological pattern and pollinators and/or seed production by collecting seed samples and trapping pollinators