Time to Restore: Oklahoma

SUPPORTING POLLINATOR RESTORATION

When restoring land to support pollinators, managers aim to select a mix of species that support pollinators throughout their periods of activity. This guide provides information on the timing of flowering and fruiting of nectar plants in Oklahoma and information on which species are most suitable for future climate conditions.

SHIFTS IN PHENOLOGY OF NECTAR PLANTS

Multiple factors can influence the timing of flowering, including warmth, freeze events, winter chill, rainfall, and daylength. Generally, researchers have documented earlier flowering in many flowering plants (United Nations Environment Programme, Frontiers 2022).

RESTORATION IN ACTION IN OKLAHOMA

Several organizations and community groups are involved in pollinator restoration in Oklahoma. Tribal Alliance for Pollinators (TAP) provides training, technical assistance, and native plants to tribal partners who are restoring monarch and pollinator habitat on their lands. TAP is currently assisting fourteen tribes in Oklahoma with native plant restoration. TAP's online library of native plant restoration resources are available to the public at www.TribalAllianceForPollinators.com.

Okies for Monarchs, an initiative of Oklahoma Monarch & Pollinator Collaborative, provides education and resources for pollinator habitat to residents statewide including what to plant, where to buy, and custom seed mixes, as well as best management practices for rangelands and rights-of-ways. Each of these resources and much more can be found at okiesformonarchs.org.

While little phenology research has been carried out in the region, authors of studies in other locations have reported a large shift in the timing of events, such as common milkweed, *Asclepias syriaca*, in the Midwest and Northeast shifting 7 days earlier with each °F warming (Howard 2018). Other research found a different pattern between spring and fall-flowering species in the Southeastern Coastal Plain, with spring species flowering 3-4 days earlier per °F of warming. In the same study, fall flowering shifted slightly earlier with warmer spring temperatures and later with warmer summer temperatures at a rate of 2 days per °F (Pearson 2019). Under experimental warming, flowering of prairie plants occurred 2-10 days earlier (Wittington et al 2015).

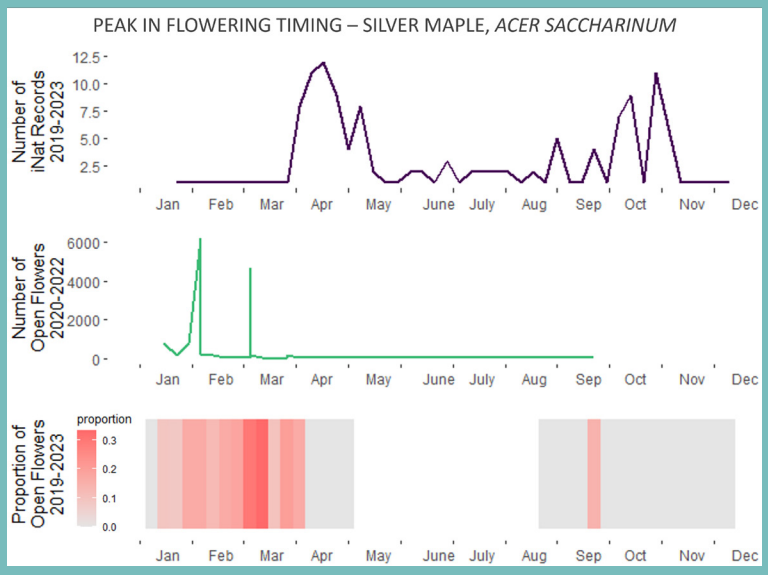
FUTURE CLIMATE IN OKLAHOMA

The following are projections for the South Central region for mid-century (2036-2065; Dixon et al 2020); ranges represent the low (Representative Concentration Pathway 2.6) and high (RCP 8.5) emissions scenarios.

- Average high temps increase 2.6-5.2°F
- Average low temps increase 2.2-4.6°F, particularly in Western OK
- Increase of 10.5-24.3 very hot days over 100°F, particularly in Western OK
- Increase of 2.1-4 heatwaves a year
- Decrease of 13-26.1 days below freezing
- Decrease in 0.1-4.3% in total annual rainfall
- Increase in the amount of 1 day (0.1 in) and 5 day (0.4-1.7 in) rainfall, particularly in Eastern OK
- Increase in dry spell length by 0.1-1.2 days in Western OK

More climate projections from the SC CASC can be found at: southcentralclimate.org/resources/climate-projections.

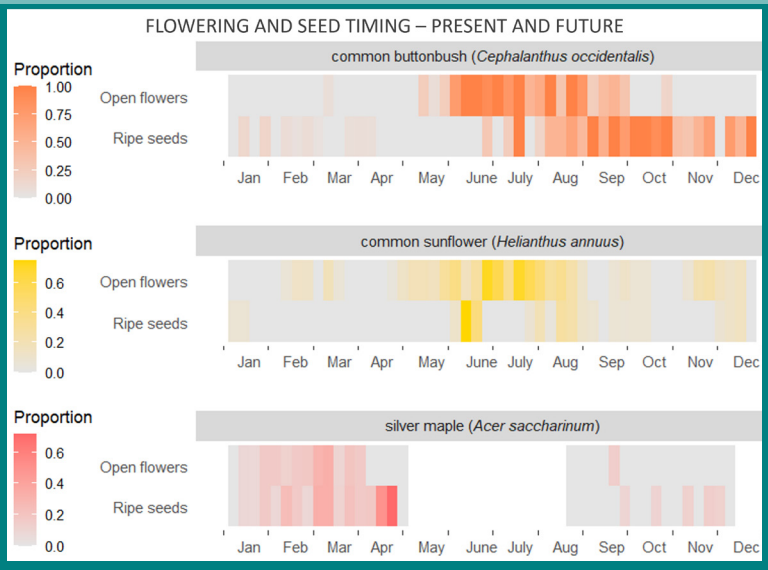
OCTOBER 2023



We compiled data collected via iNatualist and *Nature's Notebook* on flowering and seed timing in Time to Restore priority species. The graph at left shows the timing of open flowers as well as the peak in activity for silver maple, *Acer saccharinum*, in Oklahoma.

Top: Presence records contributed to iNaturalist, which show the magnitude of observations collected on this species across 2019-2023. Middle: Number of open flowers observed in *Nature's Notebook* 2020-2022. Bottom: Proportion of open flowers in *Nature's Notebook* 2019-2023.

We also created linear models to determine climate cues to flowering and seed timing, presented below. Visit the StoryMap linked from the Time to Restore webpage (usanpn.org/TimeToRestore) to learn more about our methods.



This calendar displays data collected in OK, TX, and LA.

Based on our national-scale analysis of climate cues combined with climate projections from the SC CASC, we project the following changes to life cycle stages by mid-Century (2036-2065):

Common buttonbush, *Cephalanthus occidentalis*
Open flowers onset - 5-10 days earlier
Flowering peak onset - 3-5 days earlier

Common sunflower, *Helianthus annuus*
Open flowers onset - 9-19 days earlier
Flowering peak onset - 10-20 days earlier, may depend on latitude

Silver maple, *Acer saccharinum*
Open flowers onset - 2-16 days earlier, may depend on latitude
Flowering peak onset - 7-13 days earlier
Ripe fruit onset - 7-13 days earlier
Fruit peak onset - 3-5 days earlier

Projections for species not included in community calendar above

Species	Life Cycle Stage	Projected shift
wild bergamot, *Monarda fistulosa*	Open Flowers Onset	0.1-1 days later
	Flowering Peak Duration	0.02-4 days shorter
	Ripe Fruit Onset	3-5 days earlier
	Fruit Peak Onset	1-10 days later
	Fruit Peak Duration	0.1-1 days longer
eastern purple coneflower, *Echinacea purpurea*	Open Flowers Onset	7-14 days earlier
	Flowering Peak Onset	6-11 days earlier
	Ripe Fruit Onset	2-20 days earlier
	Fruit Peak Onset	7-13 days earlier
	Fruit Peak Duration	9-17 days longer
swamp milkweed, *Asclepias incarnata*	Open Flowers Onset	7-14 days earlier
	Flowering Peak Duration	4-8 days longer
	Ripe Fruit Onset	0.5-1 days later
	Fruit Peak Onset	4-8 days earlier
cardinal flower, *Lobelia cardinalis*	Open Flowers Onset	10-19 days later
	Flowering Peak Onset	0.1-1 days earlier
	Flowering Peak Duration	10-18 days longer

References:

Dixon K.W., A.M. Wootten, M.J. Nath, J. Lanzante, D.J. Adams-Smith, C.E. Whitlock, C.F. Gaitán, R.A. McPherson, 2020: South Central Climate Projections Evaluation Project (C-PrEP), South Central Climate Adaptation Science Center, Norman, Oklahoma, USA. doi.org/10.21429/12gk-dh47

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