Species Richness During the 2024 Effort to Start Repeat Photography in August on the Santa Rita Experimental Range

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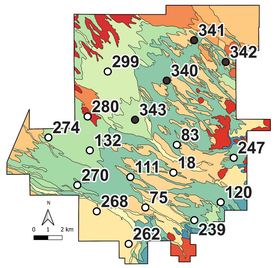
ANNUAL REPEAT PHOTOGRAPHY IN AUGUST

Where

- 18 Photo Stations (PS) out of 119, 14 existing + 4 established in 2024, for a total of 23 Photo Directions
- PS distributed on the SRER, from 920 to 1,430 m elevation range ascending to SE
- Open views on Desert Grasslands, a mixture of short trees, shrubs, cacti and other succulents, perennial grasses, and other herbaceous species
- Mosaic of 18 Ecological Sites (*Breckenfeld & Robinett 2003*)



SRER Eco Sites and August Photo Stations
New 4 PS established in 2024 in black

When

- August 2024
- Photos taken in 2024 will be repeated every year in August and every 6 years in the spring

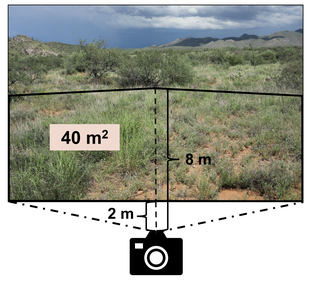
Why

So far, only 15 PS have had photos taken in consecutive years (from 1953 to 1956) to document annual changes

- SRER Repeat Photography allows a long-term and landscape-scale representation of vegetation dynamics at the century, decadal, and annual time scales, BUT intervals between photographs vary:
  - The average interval between photos is ~ 15-20 years, with photos taken in different months to meet specific research needs
  - Since 2000, photos are taken every 6 years (about 20 PS/year), in March (114 PS) or in October (5 PS)
  - Two PS have photos taken 98 years apart
  - 28 PS have photos taken twice a year to document seasonal changes (1936, 1948, from 1951 to 1956, 1984, and 1987)
  - Only 15 PS from 1953 to 1956 have photos taken annually
- Annual Repeat Photography in August and associated floristic records will allow:
  - Documenting and better understanding vegetation and species richness annual changes after each monsoon season and contributing to updating the Flora of the SRER
  - Informing the annual livestock grazing plan
  - Making annual photos and species list databases available on the SRER website

What

- Complete list of all annual and perennial plant species within a 40 m² area in front of the camera
- Floristic plots start 2 m from the camera and end 8 m from camera; right and left boundaries follow the right and left edges of the camera view



Plant Species
Ambrosia artemisiifolia
Aristida spp.
Ayenia filiformis
Calliandra eriophylla
Chamaesyce florida
Eragrostis lehmanniana
Eriogonum abertianum
Evolvulus arizonicus
Heteropogon contortus
Machaeranthera tagetina
Mollugo verticillata
Portulaca umbraticola
Talinum aurantiacum
Tidestromia lanuginosa

PS 342.1, August 2024. Looking E on sandy loam soil, at 1,100 m.
Boundaries of the floristic plot and distance from the camera

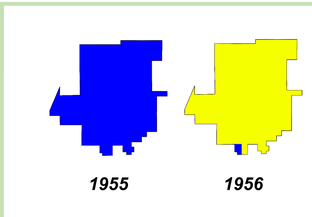
THE ROLE OF ANNUAL REPEAT PHOTOGRAPHY

1955 ***1956***

Consecutive years show grass increase and decrease following dry and wet summers

PS 120.1. Looking E at 1,296 m and 213 mm average summer (July-September) precipitation:
In September 1955, abundant grass following wet summer (334 mm).
In October 1956, grass abundance declined following dry summer (87 mm).

SRER summer SPEI in 1955 and 1956. Maps of SPEI ≤ -1.0 drought patches (yellow cells) among the 100 1.5 x 1.5 km cells on the SRER for summers (June-September) 1955 and 1956 using the SPEI index (*McClaran & Wei 2014*)



1955 ***1956***

2024 AUGUST SPECIES RICHNESS AND FLORA UPDATES

PS Species Richness

73 plant species (64% perennial)

- ~ 13 plant species per Photo Direction (0.3 / m²)
- Most represented families: Asteraceae (19%), Poaceae (16%), and Euphorbiaceae (11%)
- Most common species (# of recordings out of 23 PS Directions):

Plant Species	#/23
Eragrostis lehmanniana	21
Digitaria californica	15
Machaeranthera tagetina	
Panicum hirticaule	14
Ambrosia artemisiifolia	10
Aristida spp.	
Calliandra eriophylla	
Chenopodium fremontii	
Evolvulus arizonicus	
Boerhavia coccinea	9
Chamaesyce florida	
Portulaca umbraticola	8
Sida abutifolia	
Isocoma tenuisecta	7
Opuntia engelmannii	
Prosopis velutina	
Solanum elaeagnifolium	
Tidestromia lanuginosa	
Xanthisma gracile	
Mollugo verticillata	6
Talinum aurantiacum	
Other species (N = 53)	≤ 5

SRER Flora Updates

Three new species for the SRER Flora

- *Euphorbia polycarpa* (PS 340.1) and *Euphorbia serpillifolia* (PS 341.1) vouched by UofA Herbarium; *Encelia frutescens* will be vouched in 2025
- References: SRER Flora (Medina, 2003) and SEINet Portal (September 2024)

Euphorbia serpillifolia

Euphorbia polycarpa

March versus 2024 August Photos (Examples)

March 2019

August 2024

PS 270.1. Looking SE, on sandy loam soil, at 1,011 m. *Abutilon* spp., *Ambrosia artemisiifolia, Aristida* spp., *Ayenia filiformis, Boerhavia coccinea, Calliandra eriophylla, Chamaesyce florida, Chenopodium fremontii, Digitaria californica, Eragrostis lehmanniana, Eriogonum abertianum, Eriogonum wrightii, Gutierrezia sarothrae, Heteropogon contortus, Isocoma tenuisecta, Janusia gracilis, Machaeranthera tagetina, Panicum hirticaule, Portulaca suffrutescens, Prosopis velutina, Salsola tragus, Setaria macrostachya, Sida abutifolia, Solanum elaeagnifolium,* and *Talinum aurantiacum.*

March 2021

August 2024

PS 280.2. Looking W, on clay loam soil, at 961 m. *Allionia incarnata, Aristida* spp., *Baccharis brachyphylla, Boerhavia coccinea, Boerhavia spicata, Digitaria californica, Eragrostis lehmanniana, Heliomeris longifolia* var. *annua, Isocoma tenuisecta, Kallstroemia californica, Machaeranthera tagetina, Mollugo verticillata, Opuntia engelmannii, Panicum hirticaule, Portulaca umbraticola, Tidestromia lanuginosa,* and *Xanthisma gracile.*

March 2022

August 2024

PS 120.1. Looking E, on deep, sandy loam soil, at 1,296 m. *Ambrosia artemisiifolia, Aristida* spp., *Boerhavia coccinea, Carlowrightia arizonica, Chenopodium fremontii, Cirsium neomexicanum, Digitaria californica, Ditaxis neomexicana, Eragrostis lehmanniana, Evolvulus arizonicus, Gomphrena sonorae, Guilleminea densa, Mimosa dysocarpa, Opuntia spinosior, Panicum hirticaule, Sida abutifolia,* and *Talinum aurantiacum.*

March 2023

August 2024

PS 83.1. Looking W-NW, on deep, sandy loam soil, at 1,131 m. *Allionia incarnata, Ambrosia artemisiifolia, Calliandra eriophylla, Digitaria californica, Ditaxis neomexicana, Eragrostis curvula* var. *conferta, Eragrostis lehmanniana, Heliomeris longifolia* var. *annua, Isocoma tenuisecta, Machaeranthera tagetina, Opuntia engelmannii, Prosopis velutina, Sida abutifolia,* and *Talinum aurantiacum.*

What's Next?

The 18 PS will be retaken every year in August and every six years in March

- August photos and plant species compositions will be uploaded to the SRER website:
  - "August PS Plant Species" database to document species richness changes
  - "Plant Species on Transects and August PS" database to reference every species to the source study
  - "SRER Flora Updates" after UofA Herbarium vouches for new specimens
- Plant species composition and species richness changes will be related to summer precipitation patterns over time

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2025..

REFERENCES: Breckenfeld D.J. & Robinett D. (2003): https://santarita.arizona.edu/proceedings/. McClaran M.P. & Wei H. (2014): Agricultural and Forest Meteorology 197, 40-51. SPI Explorer Tool V2.0: https://uaclimateextension.shinyapps.io/SPItool/. Medina A.L. (2003): https://santarita.arizona.edu/proceedings/. SEINet Portal Network (09/26/2024): http//:swbiodiversity.org/seinet/index.php.