

Rainbow Saguaro Project 2019

**Data Gathering at
Tohono Chul and
Other Interesting
Information**

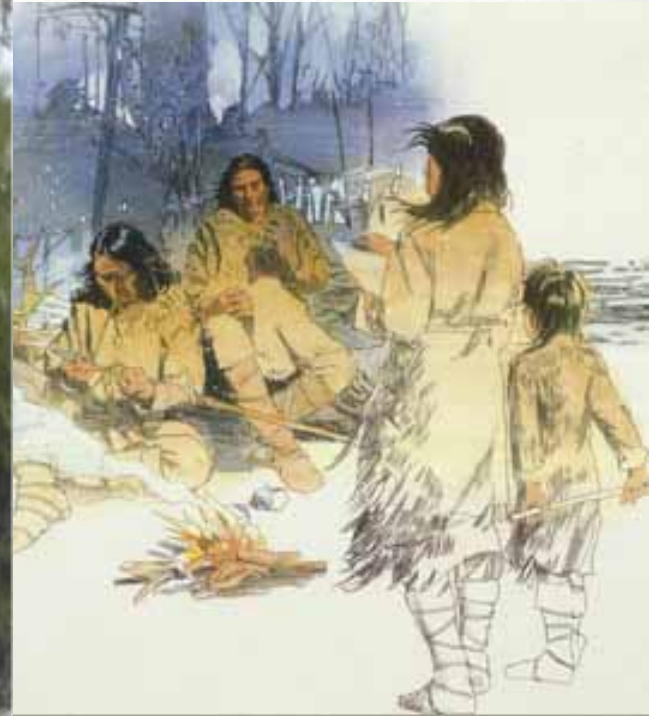
Why we're here

- Provide stories, facts, and myths to share with our visitors
- Profile Saguaro Huggers
- Share initial study results
- Invite you to join our awesome team

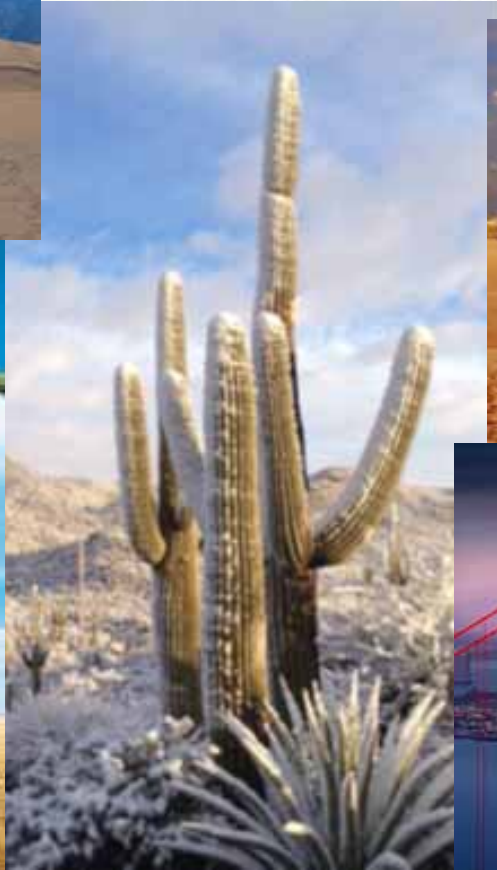


Who got to Tucson first?

- People?
- Saguaros?
- Javelinas?

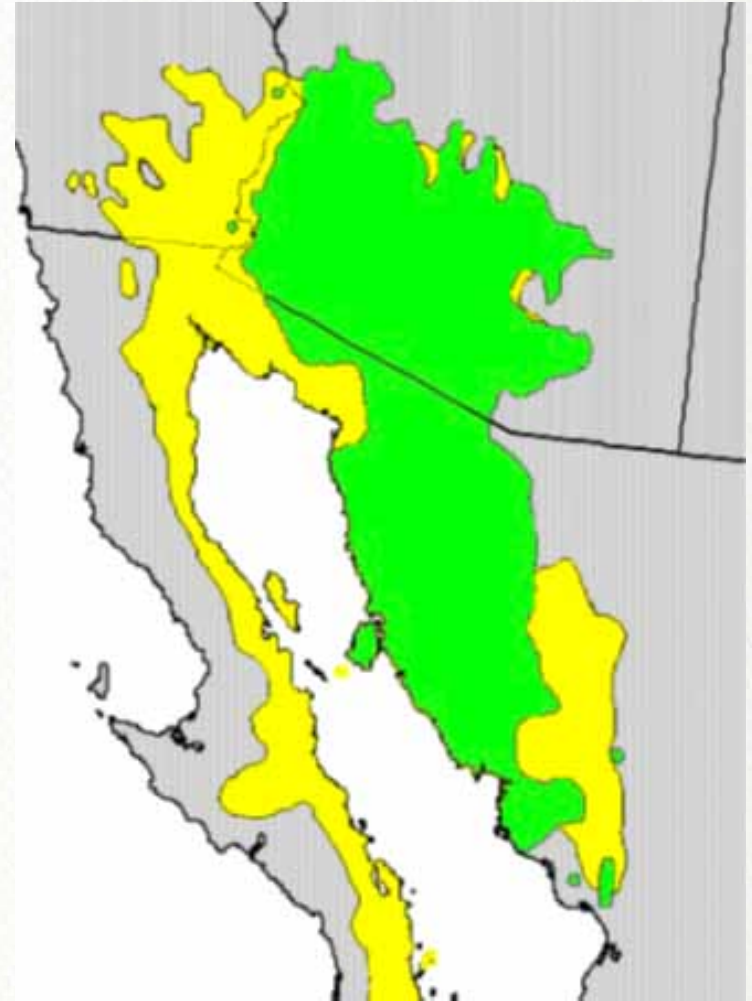


Where do Saguaro grow?



Map of Saguaro Range

- Saguaros grow in **SOME** areas of the Sonoran desert
- Growth limiting factors:
 - Microclimate
 - Temperature
 - Water
 - Altitude/thermal belt
 - Competition



Questions we've been asked

- How many saguaros in Tohono Chul
- Cacti vs cactuseesses



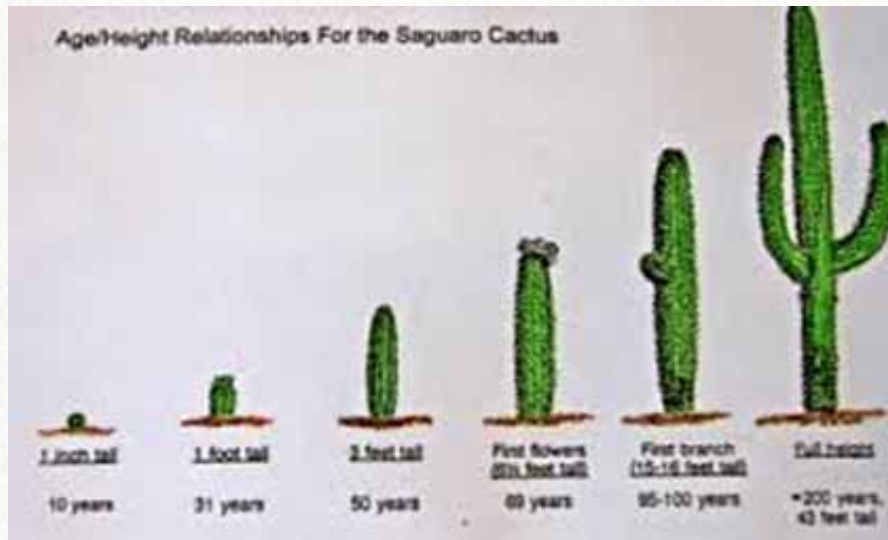
New Sub Species

- *Carnegiea gigantea verizonii*



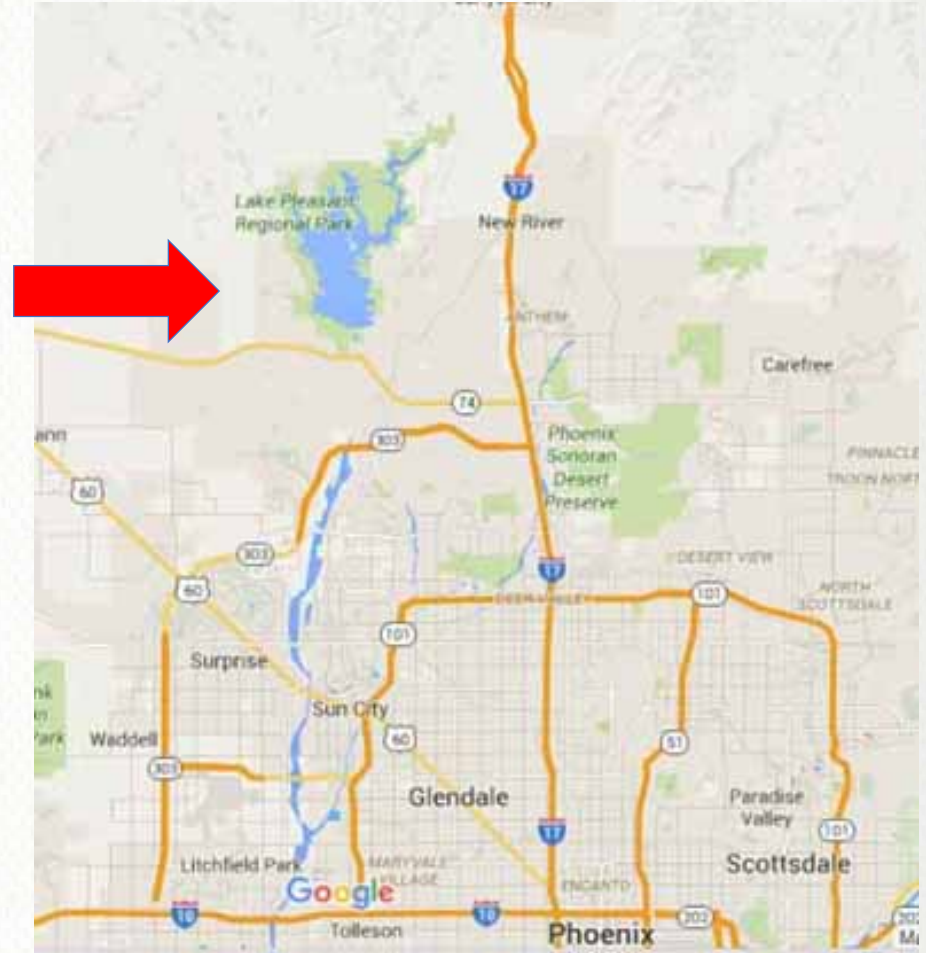
How fast do Saguaros grow?

- .1 inch per year
- .5 inch per year
- 5.8 inches per year
- Depends ...



Myth? Saguaro gets revenge!

- 1982
- David Grundman and Friend
- Darwin Award



One of the Greats – Old Granddaddy

Saguaro National Park

- 200-300 years old
- 45-52 arms
- 45-52 feet-tall
- 10 -15 tons
- Died 1992-1996 due to the succulent equivalent of extreme old age
- Bacterial Necrosis after Freezing



Saguaro Huggers - Why?

- Share information with Tohono Chul visitors
- Better understand growth rates at Tohono Chul
- Contribute to citizen science projects and Phenology studies



Saguaro Huggers – Brief History

- Started in 1999 with 3 intrepid volunteers
- Ann Nylan kept the project alive
- 2012 - evaluate viability
- Late 2012 - restarted Saguaro Study
- May 2016 –began Phenology study
- Sept 2018 – began data analysis group



Saguaro Huggers – Overcoming Challenges

- Hard to find saguaros in study – “under the palo verde”

Solution: GPS, Photos

- Missing tags

Solution: Replaced

- Changing reference point for measuring

Solution: 16” rebar posts installed

- Saguaros getting taller

Solution: ladders and extendable pole

- Too much to do

Solution: Form parallax and painting teams



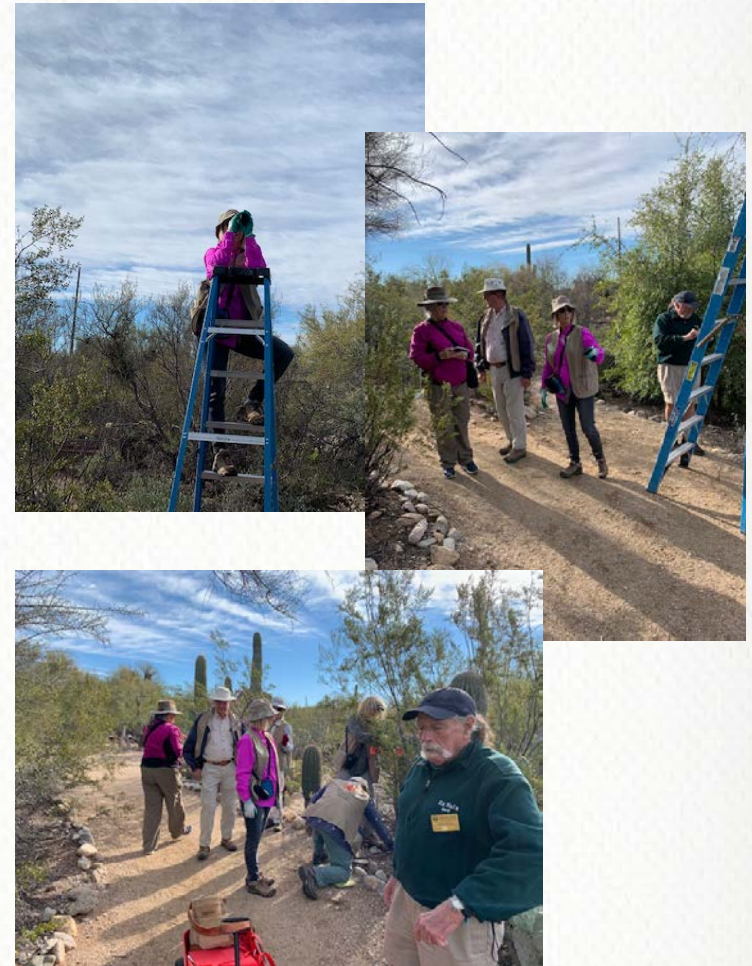
Saguaro Huggers – Current Team Members

Don Johnson
Julie Hallbach
Hank Verbais
Karen Endorf
Julia Nelson
Olivia Carey
Glen Ostrander
Zoe Holmes
Don Eagle
Rick Anderson
Mack Consigny
Cindy Maize



Saguaro Huggers – Field Work

- Winter:
 - Measure and record height of ~300 individual saguaros
 - Paint spines on crown (doesn't hurt saguaro)
 - Count number of new areoles
 - Touch-up old paint
- Spring/Summer:
 - Gather Phenology data



Saguaro Huggers - Analysis

- Data input to local Database
- Maps built from GPS Data
- Data Analysis:
 - Phenology
 - Growth



Map of Saguaros in Study

Tohono Chul



Saguaro Database

- Used to store and extract information



CactusID	Date	Side	Height	Color	Areoles	Last Color	Note
G001	09/30/1999						First painted
G001	06/29/2000		12				
G001	09/28/2000	N	28	Sienna	1		
G001	05/24/2001	N	23	Purple	1	Sienna	
G001	09/06/2001	N	30	Purple	1.5	Purple	
G001	08/22/2002						Not open yet
G001	12/05/2002						Deceased, Defunct, RIP, Dried up
G002	09/30/1999						First painted
G002	05/04/2000						Very Dry
G002	06/29/2000		9				
G002	09/28/2000	N	13	Sienna	1		
G002	05/24/2001	N	16	Purple	1	Sienna	
G002	09/06/2001						Deceased, Defunct, RIP, Dried up
G003	09/30/1999						First painted
G003	06/29/2000						No growth
G003	10/15/2000	E	180	Sienna	1~2		
G003	05/24/2001	E	193	Purple	1	Sienna	
G003	09/06/2001	E	201	Purple	2	Purple	
G003	08/08/2002	E	212	Pink	1	Purple	
G003	09/04/2003	E	260	Apple Green	3.5	Pink	
G003	08/12/2004	E	293	Aqua Dandelion	3	Apple Green	
G003	09/08/2005	E	356	Yellow	3~3.5	Aqua	

More FAQs about Saguaros?

- How many flowers per season? **6-100 per stem**
- How many seeds in a fruit? **2,000 – 2,500**
- How many seeds reach maturity? **<1% survive 1st year**
- How old does it need to be to grow arm? **50-75 years**
- Can an arm grow on an arm? **Yes**
- Can an arm grow near a crown? **Never, Maybe**



SAGUARO PHENOLOGY STUDY



What is Phenology?

- Study of seasonal plant and animal life cycle events
- National Phenology Network (NPN)
- Purpose is to identify and predict threats to humans and environment
- Tohono Chul group formed in 2016



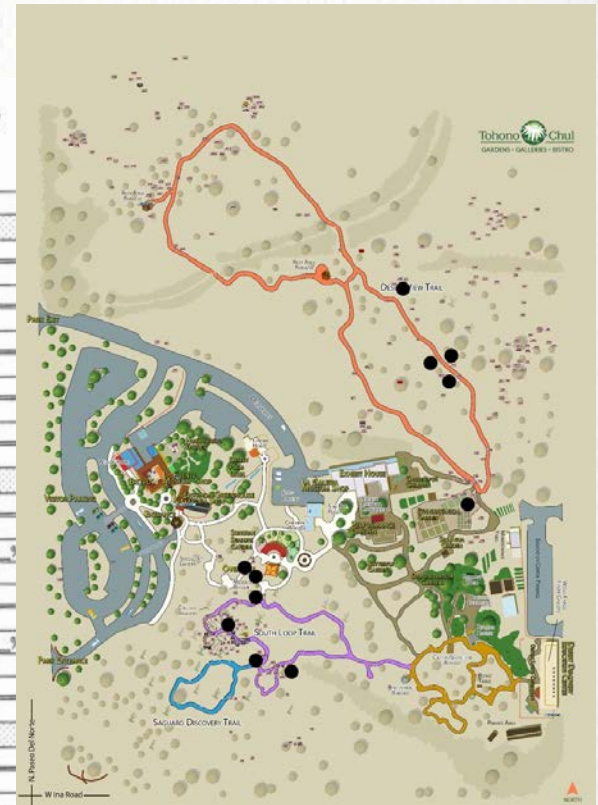
Data Collection

- Data worksheet based on Nature's Notebook
- 10 saguaros in Phenology Study
- Data collected on all saguaros in height study:
 - Physique
 - Environment
- Data input into local Database

Saguaro Observation History

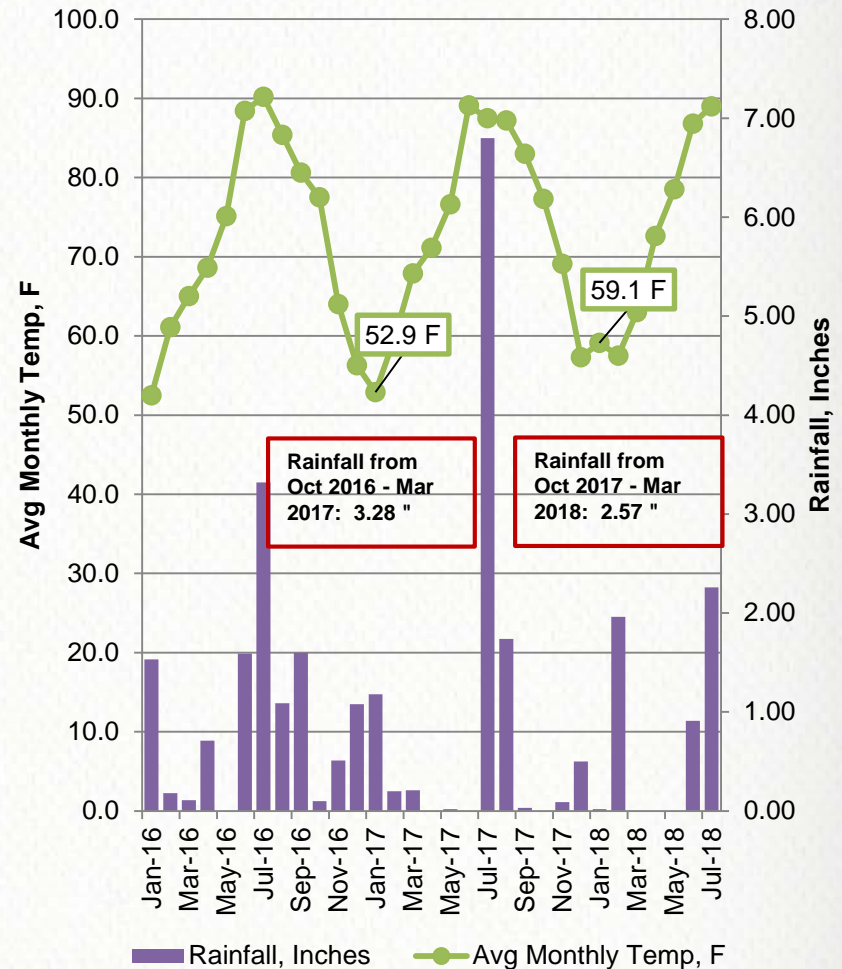
Specimen #: _____

Did you observe ...	Date & Time:		
PHYSIQUE			
main arms	Y	N	?
secondary arms	Y	N	?
budding arms	Y	N	?
broken off arms	Y	N	?
bird nest holes	Y	N	?
PHENOLOGY			
Flowers or buds	Y	N	?
open flowers	Y	N	?
fruits	Y	N	?
ripe fruits	Y	N	?
recent fruit/seed drop	Y	N	?
ENVIRONMENT			
slope/grade	Y	N	?
water close - type	Y	N	?
- distance			
nurse tree - type	Y	N	?
	Y	N	?
	Y	N	?
neighborhood - id	Y	N	?
- count			
- radius			
comments:			
check data			
when entered on-line			

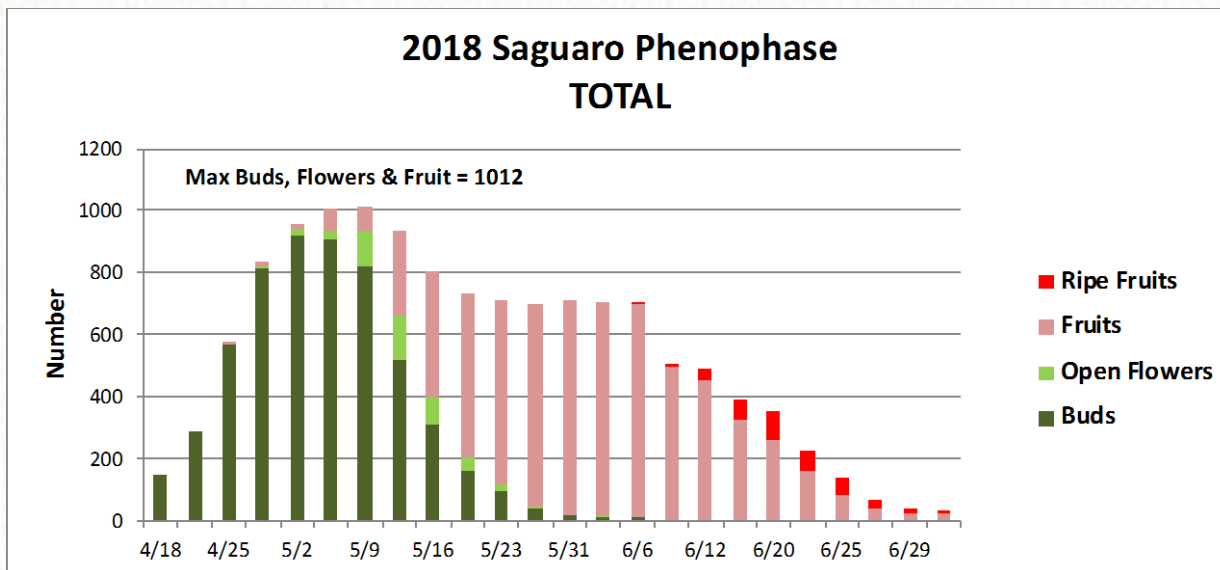
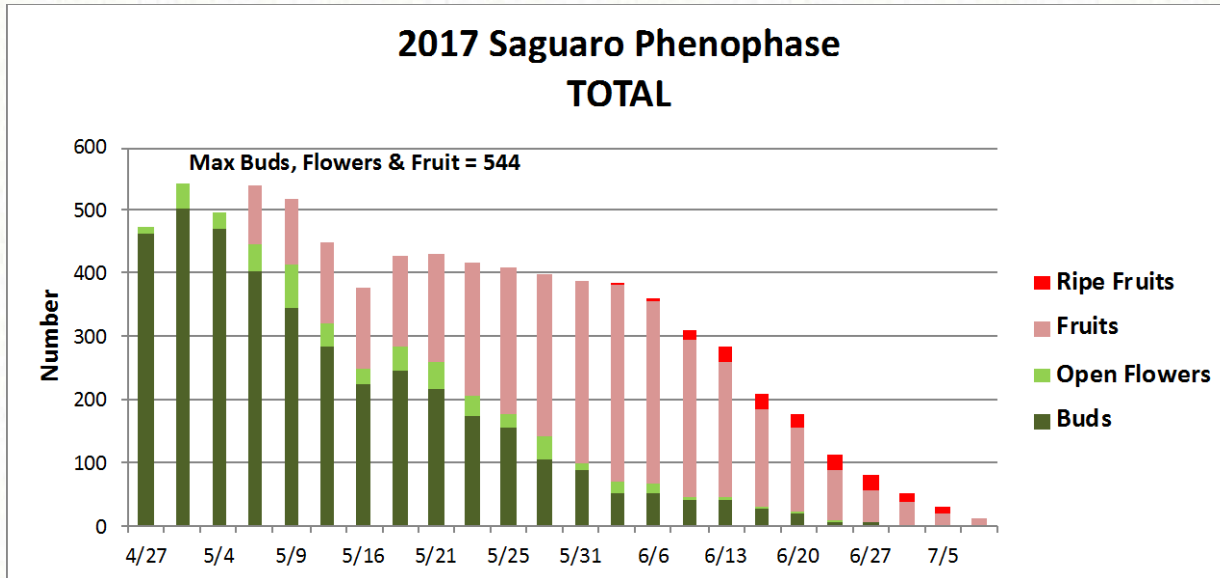


Environmental Triggers:

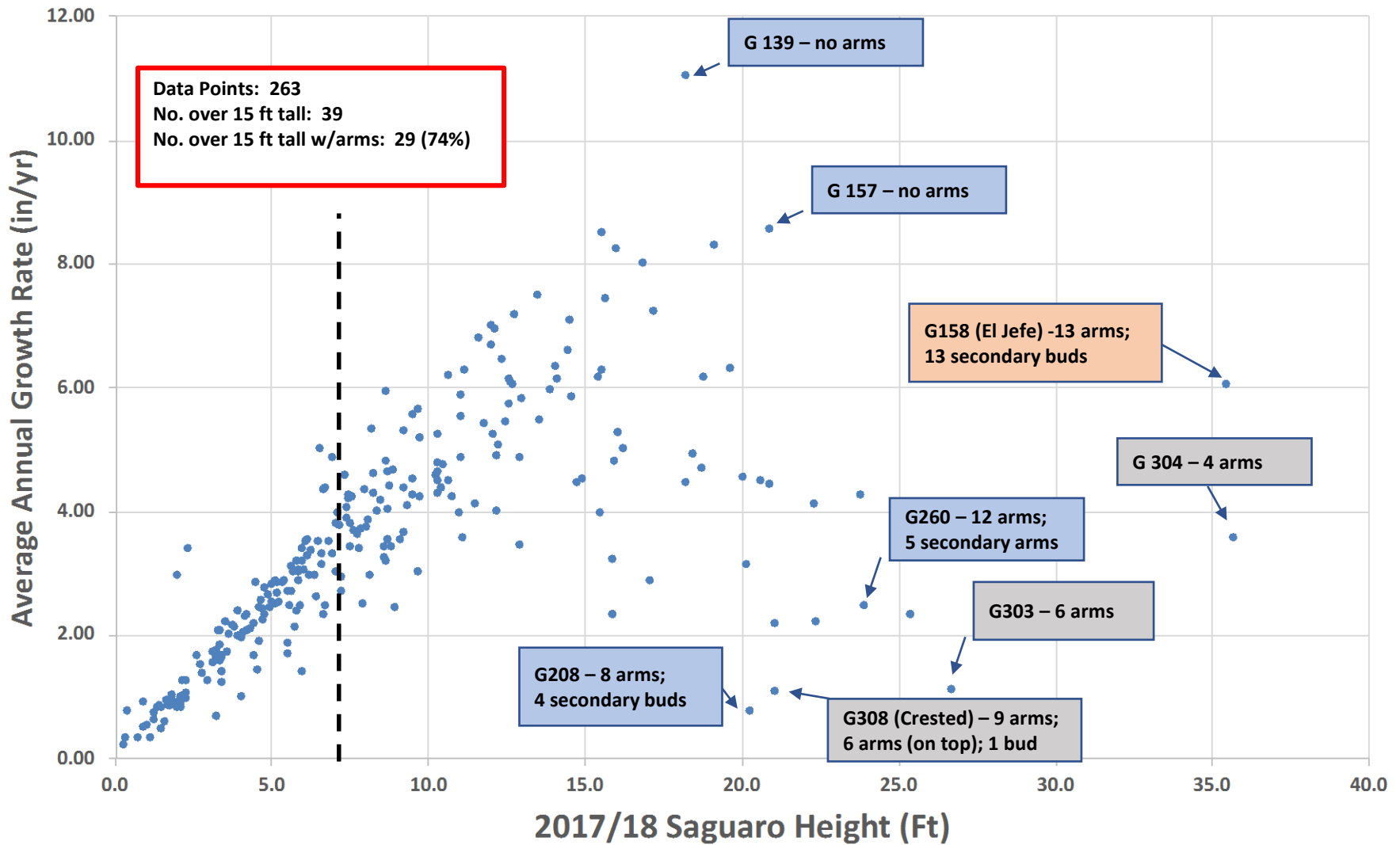
- Initial trigger to flowering process is a fall/winter rain
- Rate of bud development depends on winter and spring temperatures
- Peak bloom: mid-May to Mid-June
- Abundant autumn rains and warm temperatures trigger early blooms



Saguaro Phenophase 2017 vs 2018



Saguaro Height vs Average Annual Growth Rate



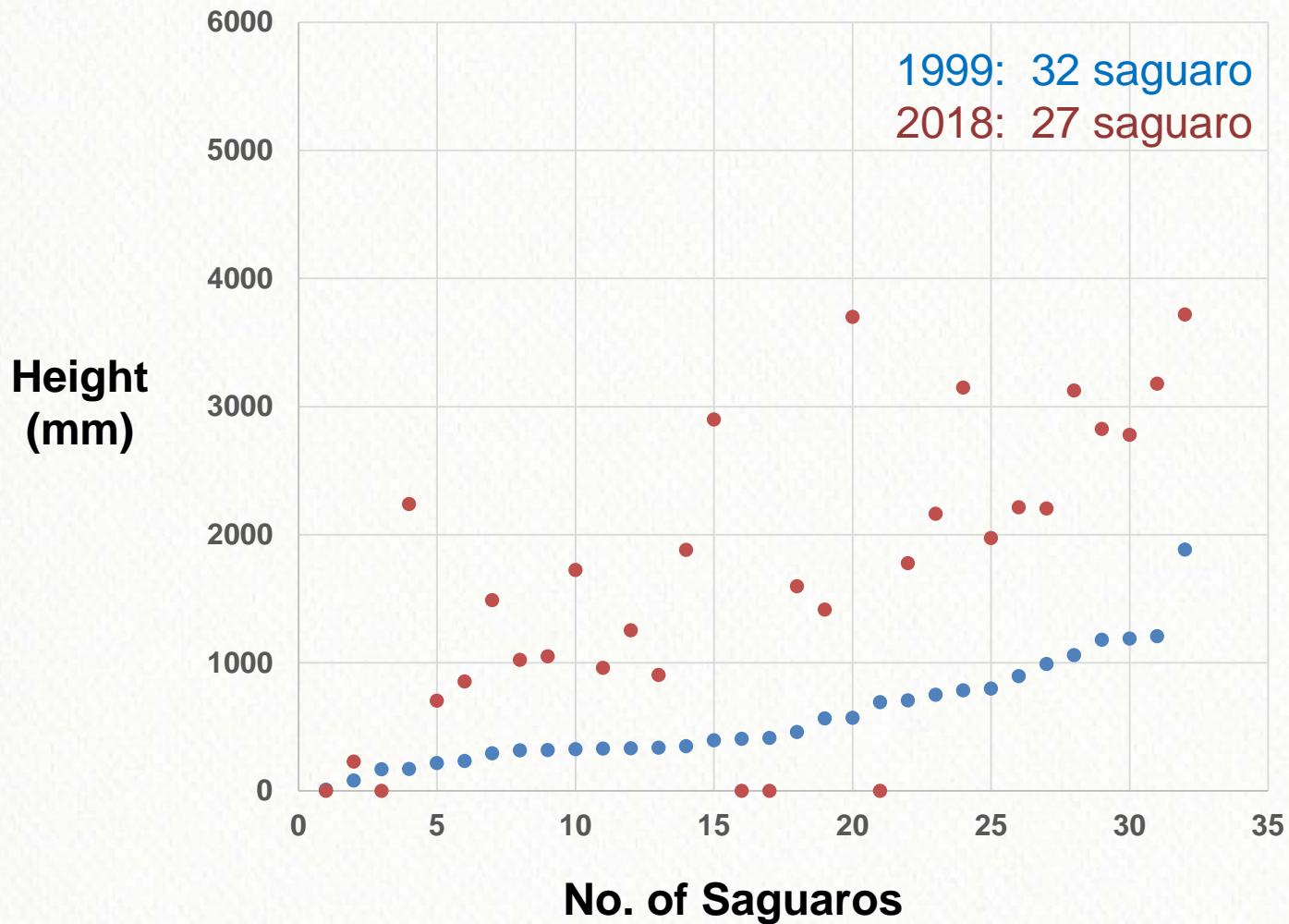
SAGUARO GROWTH STUDY



Saguaro Growth Study Overview

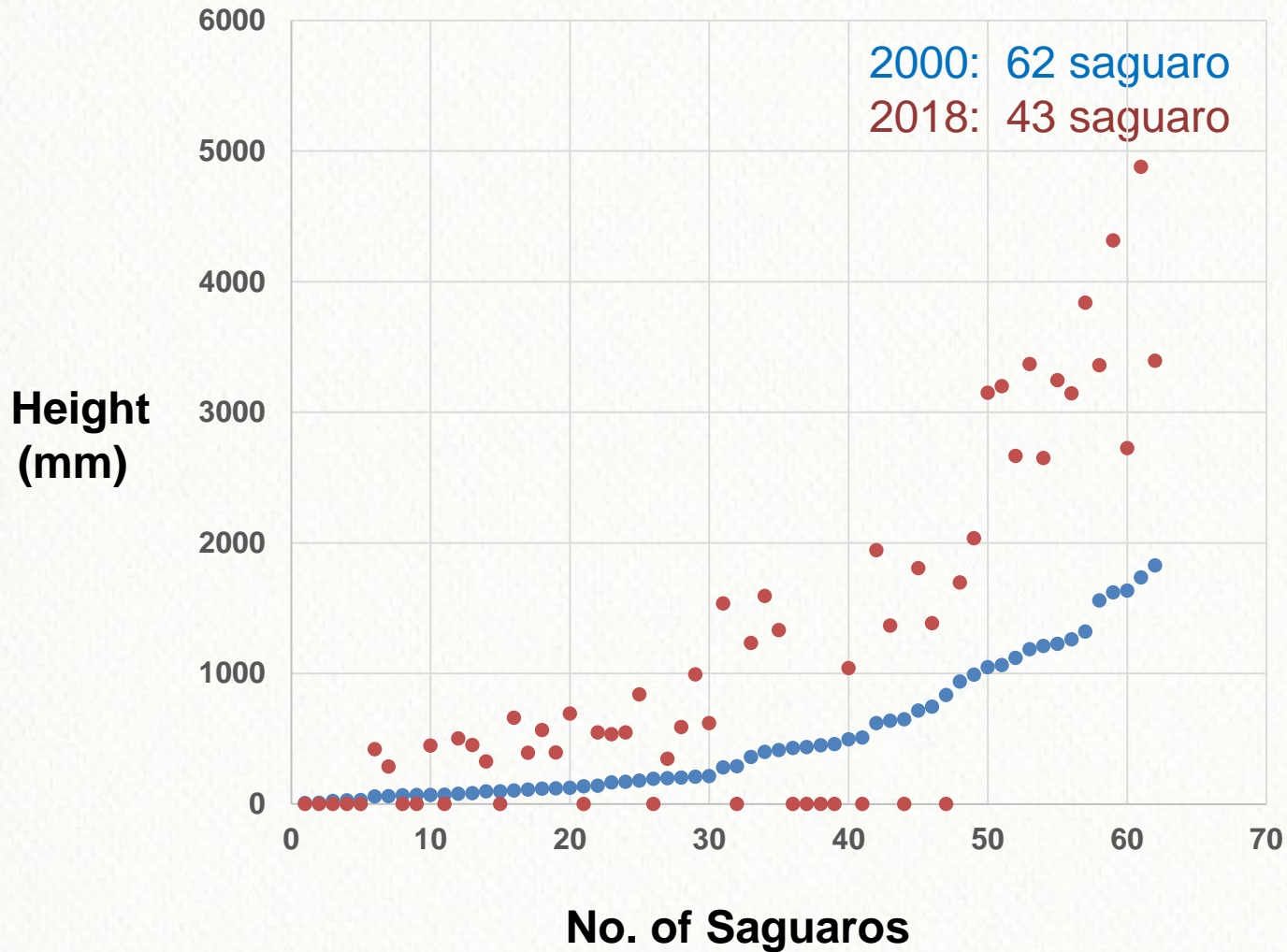
- 314 saguaros in database; height measured annually
- 1999 – 2018:
 - 32 saguaros added to database in 1999
 - 27 saguaros measured in 2018
- 2000 – 2018:
 - 62 saguaro added to database in 1999
 - 43 saguaro measured in 2018
- 2001 – 2018:
 - 157 saguaro entered into database in 1999
 - 116 saguaro measured in 2018
- Overall:
 - 251 saguaro entered (1999 – 2001)
 - 186 saguaro still active in 2018

Saguaro Growth Analysis 1999 to 2018



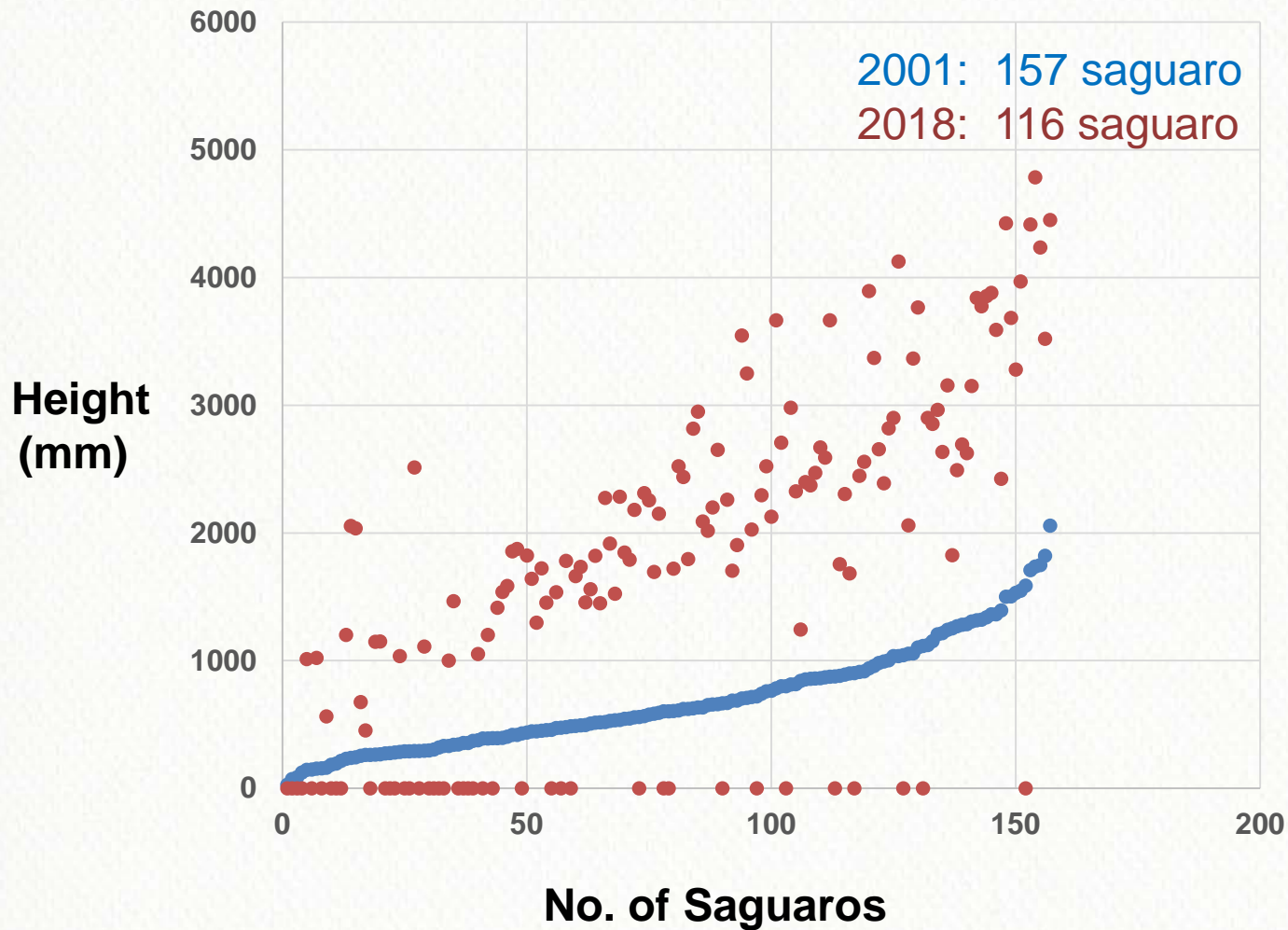
Saguaro Growth Analysis

2000 vs 2018

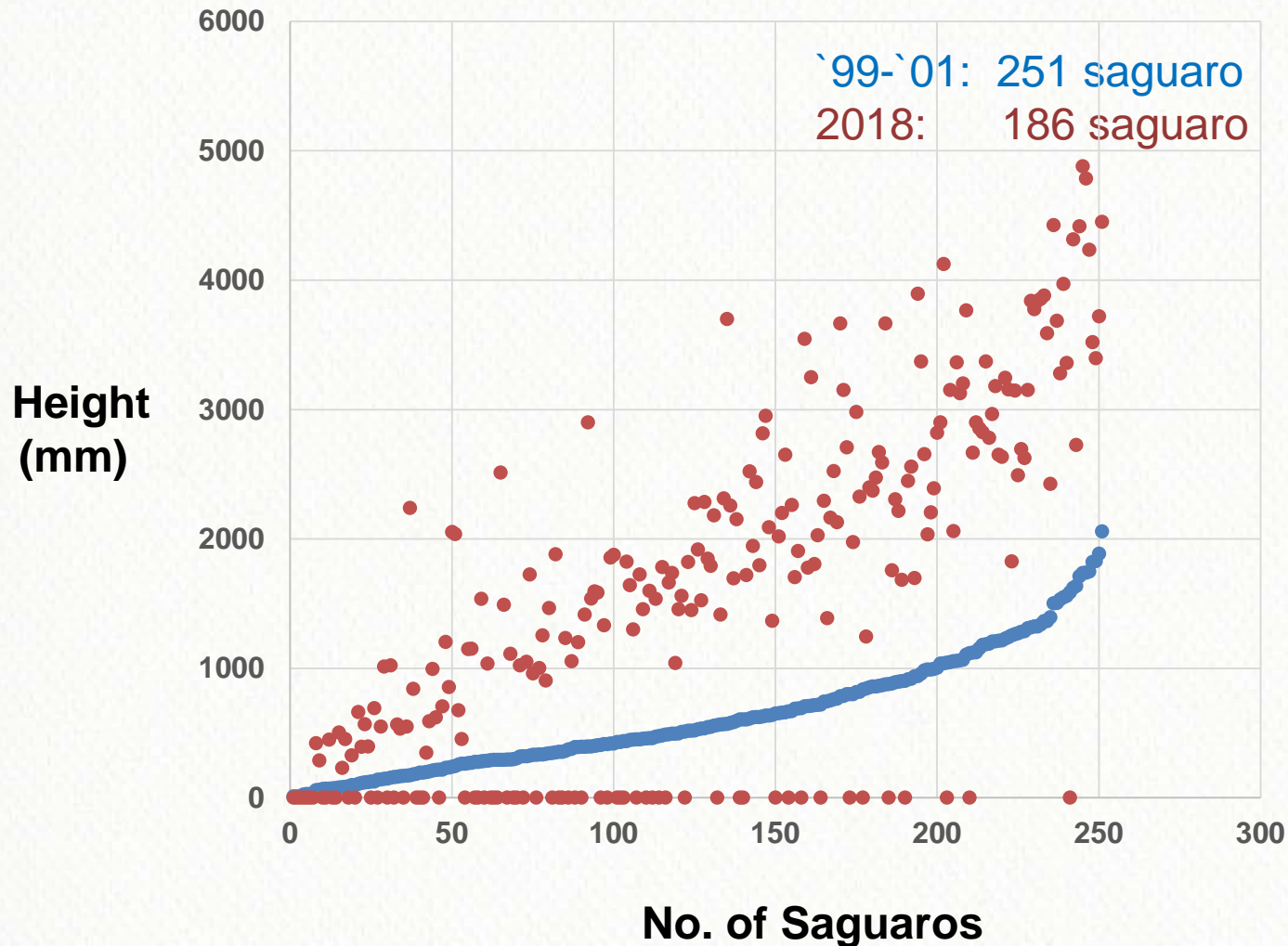


Saguaro Growth Analysis

2001 vs 2018



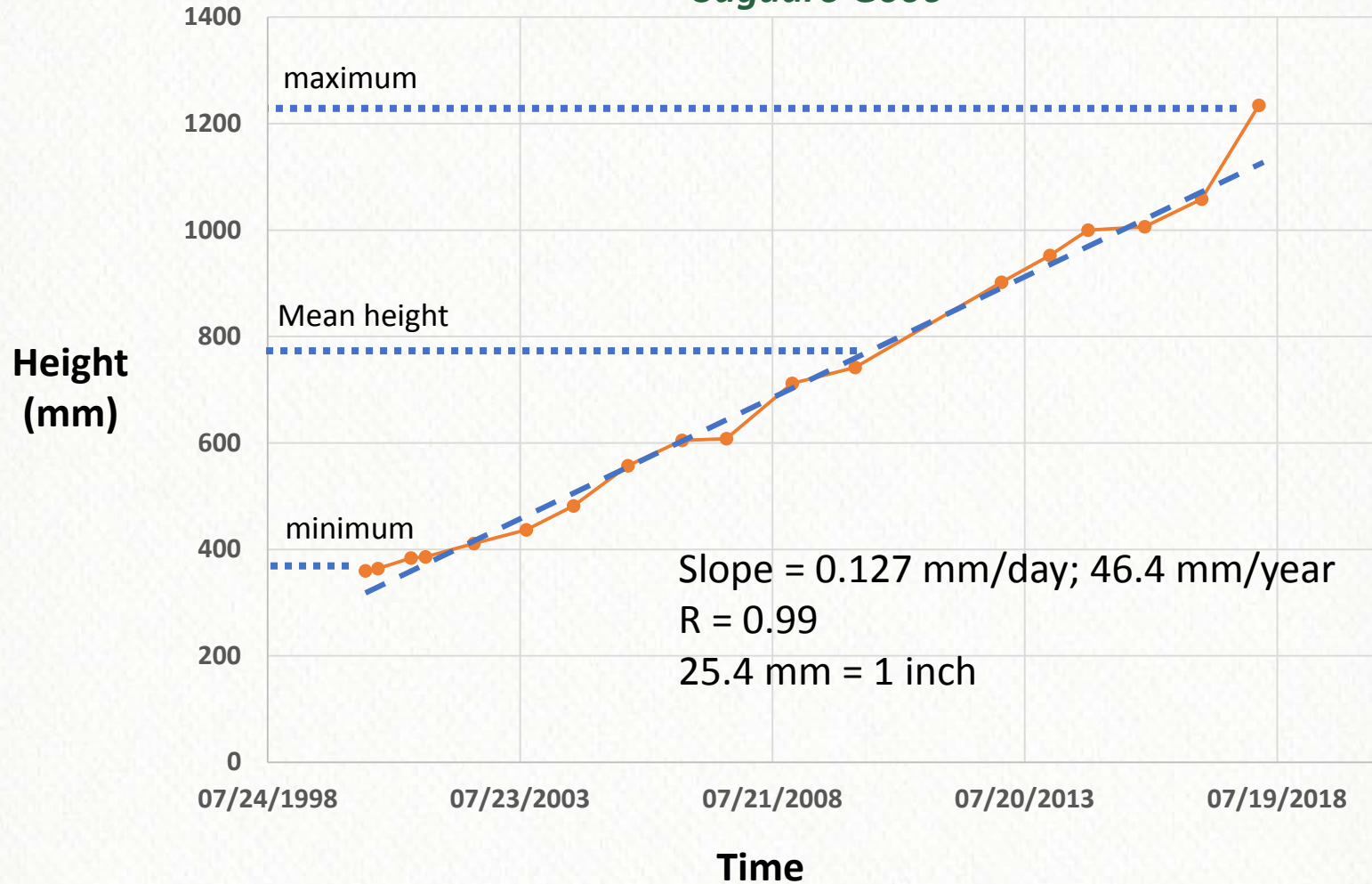
Saguaro Growth Analysis (1999-2001) vs 2018



Saguaro Growth Analysis

Linear estimation of growth

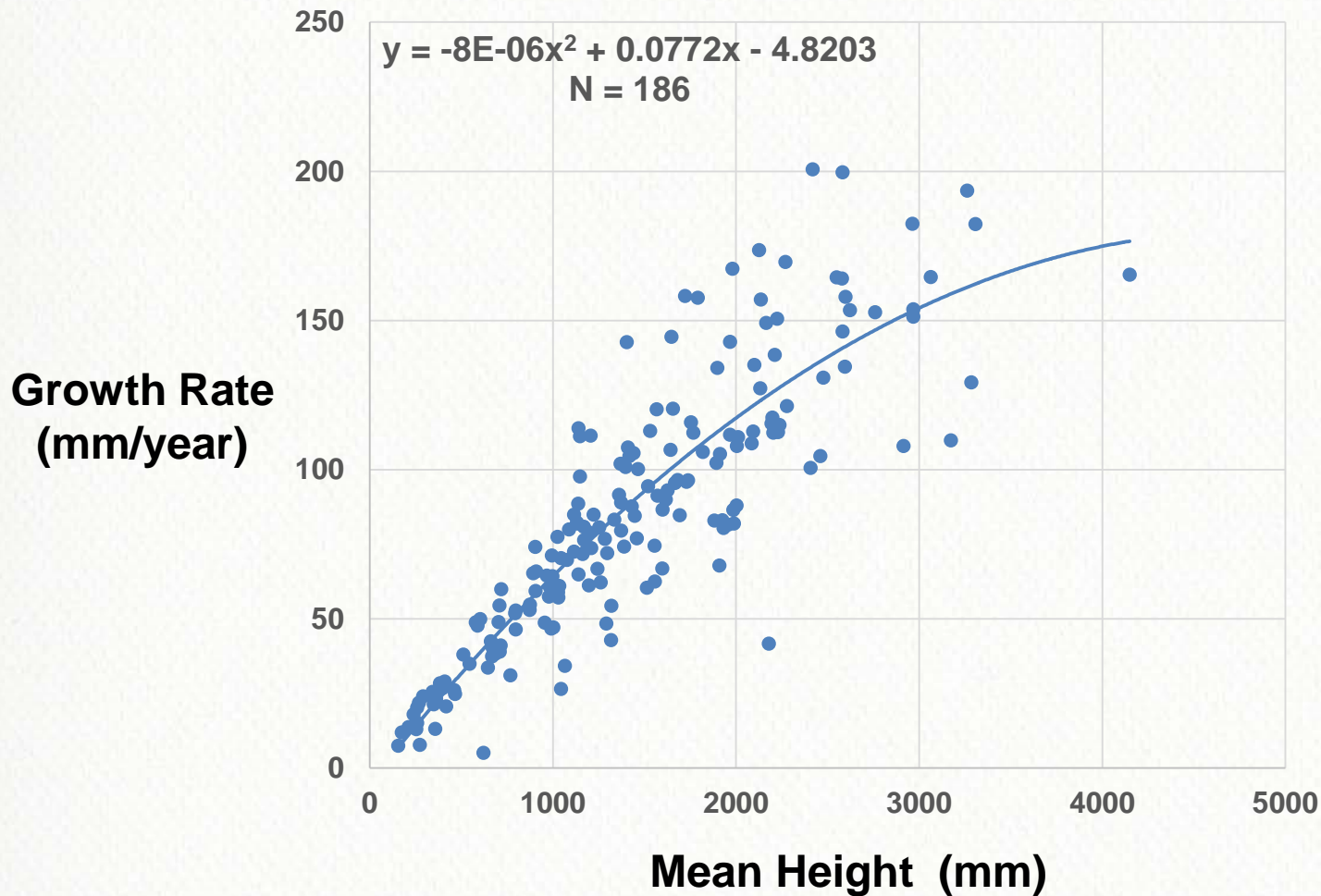
Saguaro G006



Saguaro Growth Analysis

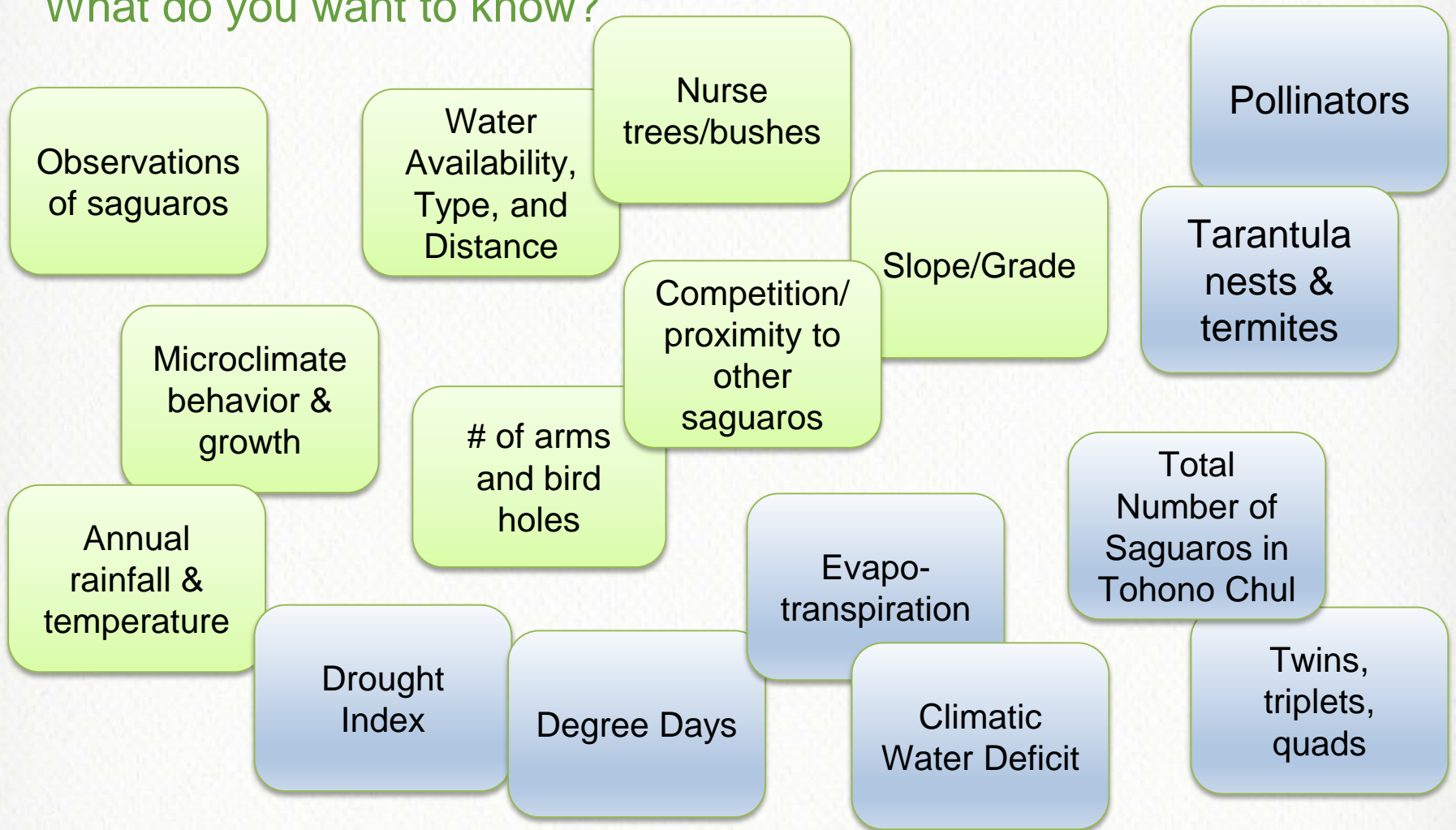
Effect of Height on Growth Study

(1999-2001) to 2018



What more can be looked at?

What do you want to know?



Reasons for Participating....

Some comments from Cactus Huggers

- I love saguaros
- My participation will be help to our understanding and the survival of these wonderful plants.
- You needed typing. I can do that.
- I am interested in organizing valuable data.
- I feel I'm doing something useful.
- I'm learning new things every week.
- I love watching the saguaro growth year to year.
- The Saguaro Huggers are a great group.



Questions?

- What did the saguaro say when he ran into a bar?

OUCH!!!!





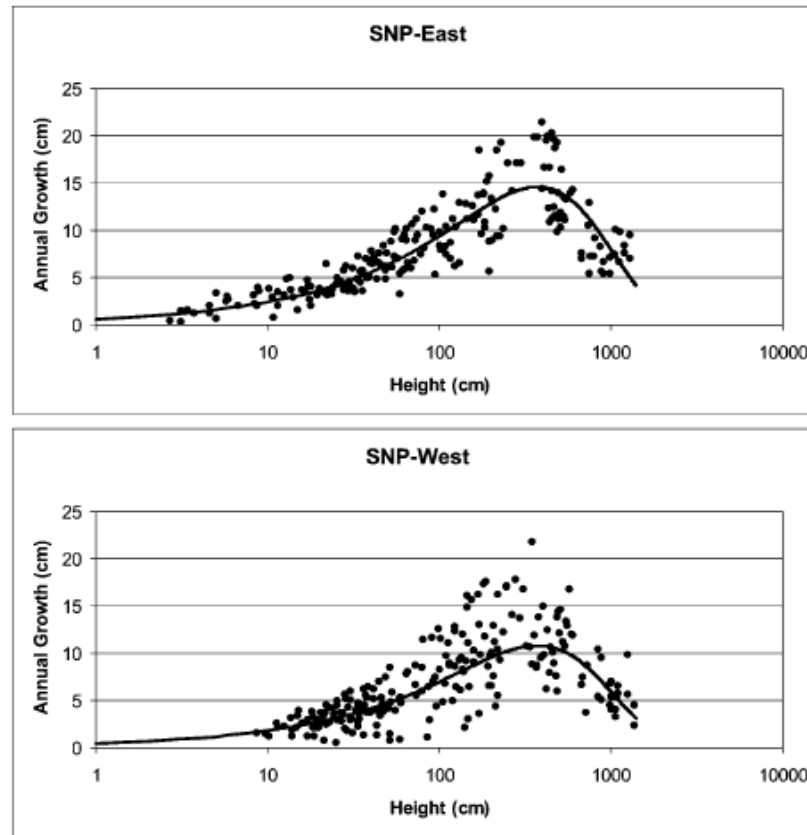
Join fellow Docent Scientists

“When one tugs at a single thing
in nature, he finds it attached to
the rest of the world.”
- John Muir

Backup

Saguaro Growth Analysis

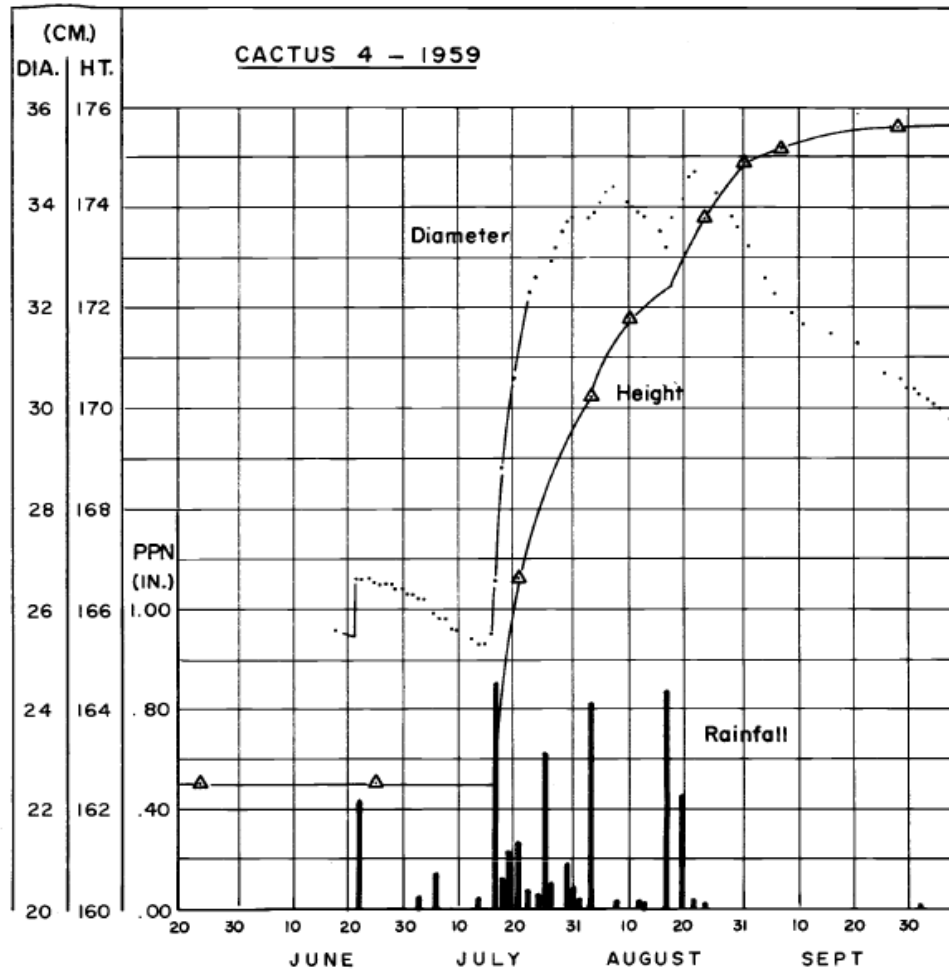
Annual Growth vs Height: Saguaro Parks East vs West



Drezner TD. Saguaro age-height relationships and growth: the development of a general growth curve. *Am J Botany* 2003; 90(6): 911-914.

Saguaro Growth Analysis

Effect of Rainfall on Saguaro Diameter and Height



Saguaro Growth Analysis

Effect of Irrigation and Grade on Growth Rate

