

SAGUARO CENSUS  
**TRAINING GUIDE**



# About the Census

The summer of 2020 was historically one of the hottest and driest summers for the Valley. That summer, there were many reports from residents whose saguaro (*Carnegiea gigantea*) lost an arm or fell over and many were lost completely. There are assumptions about why, but the exact cause is unclear. To look for answers, the Saguaro Census counts and documents saguaros in metro Phoenix. This is the first step to generate a database to monitor the saguaro population in the Valley, learn more about their health and research the effects climate change might have on them.

The Saguaro Census is part of a larger project led by Dr. Hernandez. The project seeks to understand the biology, distribution and genetics of the urban saguaro population by comparing them with their relatives growing in the wild. The project will also be used to develop tools to understand and preserve endangered cactus species in the Southwest with substantial community involvement.

**"This is a great opportunity to study plant responses to heat and stress. Saguaro plants in the city are a climate change experiment, which would be impossible to generate artificially. With information from the census, we will select some plants to perform further studies, analyze how they are adapting at the genetic level, and monitor their physiological responses over time, particularly in the hot summers."**

**- Dr. Hernandez.**

The Saguaro Census will begin on May 1, 2022 and continue indefinitely, with concentrated effort during the month of May. This training manual will guide you in making observations of urban saguaro cactus and contribute information on their age, size, and general health.



*The Saguaro Census is in collaboration with Desert Botanical Garden, Metro Phoenix EcoFlora, and the Save Our Saguars Gold Award project led by Ella Werre.*

# GETTING STARTED



## Step One

Download the free iNaturalist app to your mobile device.

## Step Two

Create an account using your email and an iNaturalist username and password.

## Step Three

Join the Saguaro Census project. In the app, search for *Volunteer Urban Saguaro Census\** and tap "Join."

\*There is a public project and a volunteer project. You are welcome to contribute to both, but please make sure you have joined the volunteer project. Public project is named *Metro Phoenix Saguaro Census*.

## Step Four

Make observations. This is a traditional iNaturalist project and you *will need to add every observations to the project every time, and fill out the observation fields*. Be sure to include the entire saguaro and closeup photos if you can, especially for damage.

### FOR iNATURALIST HELP:

Visit the iNaturalist website (<https://www.inaturalist.org>) to find helpful information and video tutorials, found under the "More" tab at the top of the page.

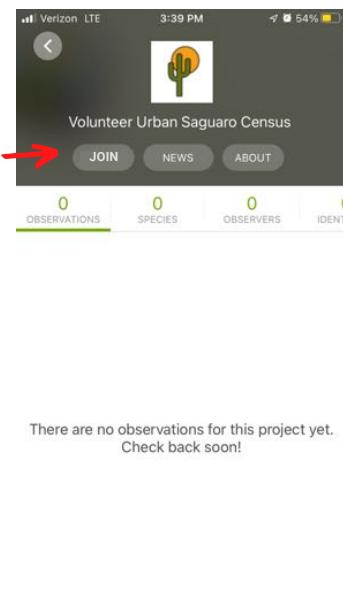
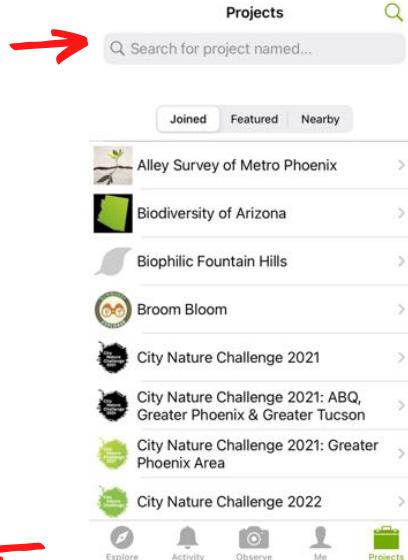
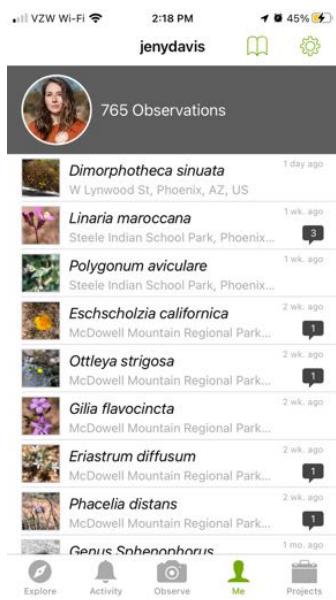
You can also visit the Metro Phoenix EcoFlora website (<https://dbg.org/ecoflora>) for helpful information and videos.

**THANK YOU FOR PARTICIPATING IN  
THE SAGUARO CENSUS!**

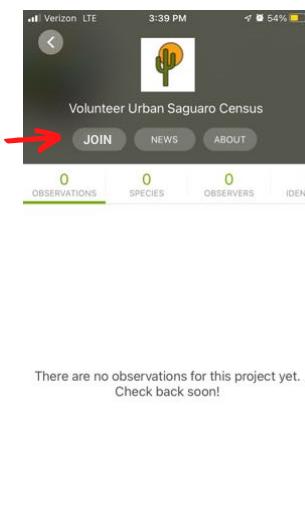
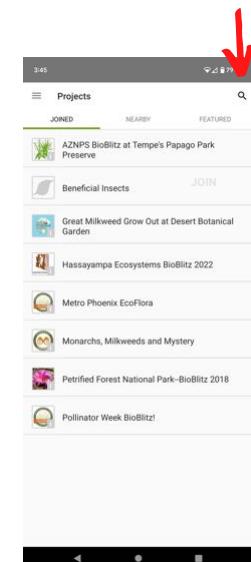
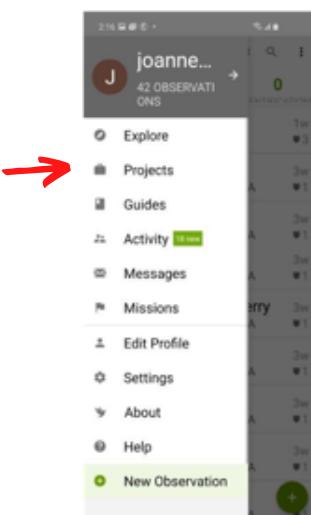
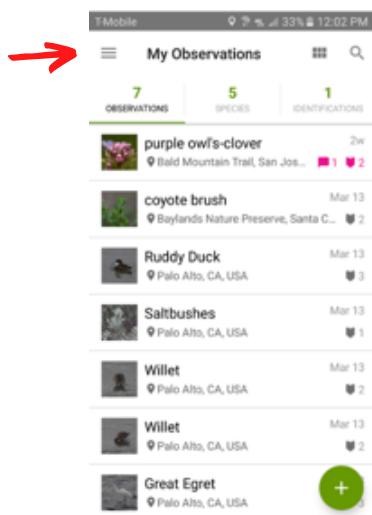
# iNATURALIST: JOIN



## iPhone



## Android



# iNATURALIST: OBSERVE



## How to Make an Observation with your iPhone

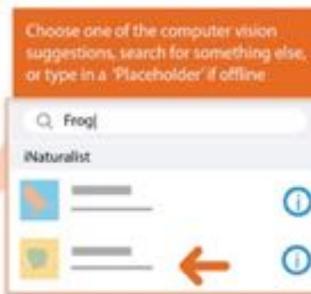
1 Tap observe.



2 Add one or more photos as evidence.



3 Choose what you saw.



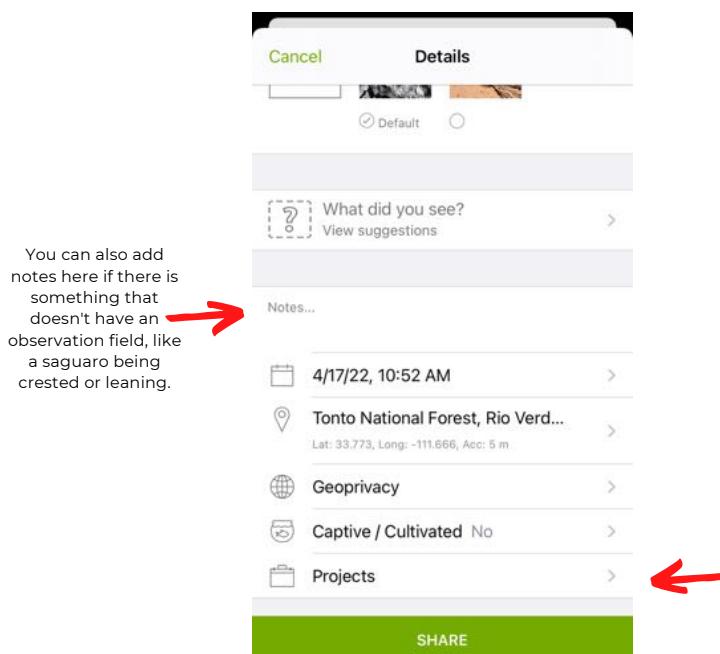
4 When you saw it should be added automatically.



5 Where you saw it should be added automatically. If it doesn't, check Privacy in the Settings app.

6 Save your observation.

Graphic by iNaturalist



# iNATURALIST: OBSERVE

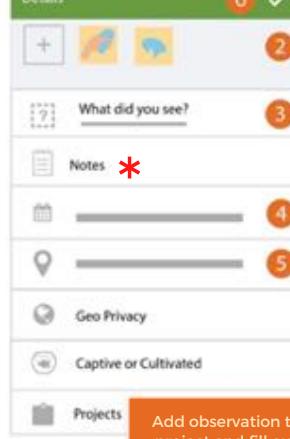


## How to Make an Observation with your Android

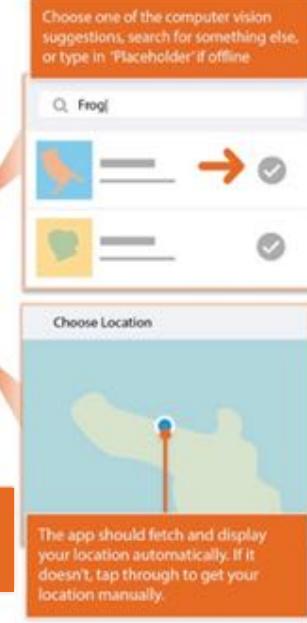
1 Tap the **observe** button from the My Observations tab.



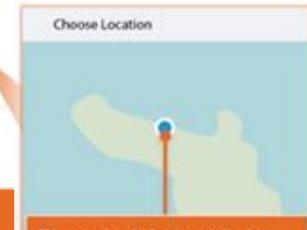
2 Add one or more photos as **evidence**.



3 Choose what you saw.



4 When you saw it should be added automatically.



\* You can also add notes here if there is something that doesn't have an observation field, like a saguaro being crested or leaning.

5 Where you saw it should be added automatically. If this doesn't happen, check app permissions in the Settings app.

Add observation to project and fill out observation fields (see below)

6 Save your observation.

Graphic by iNaturalist

Left Screenshot: Select from Joined Projects

- AZNPS BioBlitz at Tempe's Papago Park Preserve
- Beneficial Insects
- Volunteer Urban Saguaro Census** (highlighted with a red arrow)
- Collection and Umbrella Projects
- Great Milkweed Grow Out at Desert Botanical Garden
- Hassayampa Ecosystems BioBlitz 2022
- Metro Phoenix EcoFlora
- Monarchs, Milkweeds and Mystery
- Petrified Forest National Park-BioBlitz 2018
- Pollinator Week BioBlitz!

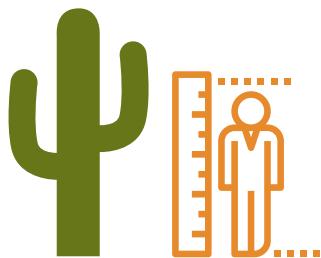
Right Screenshot: Observation Form for Volunteer Urban Saguaro Census

- Saguaro Size: Small (Less than 1m (3 ft.))
- Number of Arms: Field Value
- Saguaro Phenology: Budding
- Saguaro Habitat: Residential
- Saguaro Holes: Round holes that show evidence of an inner chamber
- Saguaro Lean: Yes
- Saguaro Rot: No
- Saguaro Frost Damage: Yes
- Saguaro Sun Scorch: Yes
- Saguaro Herbivory: Yes

# SAGUARO BASICS



Take a photo of the entire saguaro. We are looking for saguaros in urban areas, NOT parks or natural areas. Is it in a residential, commercial, public, roadside or school habitat?



**How tall are you? This can be used to estimate saguaro height.**



How many arms does the saguaro have?  
How many holes do you see?

# SAGUARO PHENOLOGY



## BLOOMING



## FRUITING



**\*Note the dried flower on top of the fruit, this can be a helpful way to tell buds from fruit.**

# SAGUARO DAMAGE



## ROT

Dark spots, can look and feel soft and discolored.  
(Please DO NOT cut into saguaro to investigate)



## FREEZE DAMAGE

Bleaching or discoloration, can look similar to sun damage.



## SUN DAMAGE

Clear brown to yellowish scars. Often more noticeable on one side.

# SAGUARO DAMAGE



## HERBIVORY

Eaten by animals, generally at the base of stem, holes and chunks of stem have been removed



## MISSING ARMS

Arms may have fallen off (left) or been cut off (right). Arms that have fallen off can leave large areas of damage.



## HUMAN DAMAGE

Carving, bullet holes, graffiti

Image credits: [National Park Service](#) (left) and [Doug Kreutz: Arizona Daily Star](#) (right).

# SAGUARO CONDITION



## HYDRATION

Does the saguaro look thick and full of water (left), thin (center), or mixed some parts with both (right)?



## OVERALL CONDITION

In your opinion, what overall condition is the saguaro in?  
Examples: Good (left), fair (center), or poor (right).

# SAGUARO LOOK-ALIKE



## SAGUARO LOOK-ALIKE

The cardon cactus (*Pachycereus pringlei*) looks similar to saguaro (*Carnegiea gigantea*). Here are a few ways you can generally tell them apart:

Cardons tend to be more blueish in color, have more "wiggly" pleats with a V-shaped stripe pattern in between (below, center), generally they have more arms that are closer to the ground, flowers grow down the sides and the fruit is fuzzy and more round. Mature stems also look nearly spineless.

(Cardon on the left and below, saguaro on the right)



# CONTACT/RESOURCES



## DR. TANIA HERNANDEZ

Dr. Tania Hernandez is a Desert Botanical Garden (DBG) Research Scientist specializing in succulent plants, particularly agave and cactus. Born and raised in central Mexico, Dr. Hernandez has been surrounded and astonished by cacti diversity all her life. Under her recent appointment at the DBG, Dr. Hernandez is working on developing genomics tools applied to better understand and preserve agave and cactus biodiversity.

EMAIL:  
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## JENY DAVIS

Jeny Davis is the EcoFlora Coordinator at Desert Botanical Garden. Her studies in sustainable ecosystems provided the tools to share her enthusiasm for urban nature and plant life. Through the Metro Phoenix EcoFlora project, Jeny works with community scientists to collect data to better understand urban plant biodiversity. She uses science communication to engage the public and bridge the gap between wilderness and nearby nature.

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JDAVIS@DBG.ORG

### For more information about the Saguaro Census:

<https://dbg.org/saguaro-census/>

<https://www.inaturalist.org/projects/volunteer-urban-saguaro-census>

*WE NEED YOUR SAGUARO! If you have a saguaro growing on your property and are willing to allow DBG to study it, please message Tania at the email address listed above.*

# ACKNOWLEDGEMENTS

**We would like to thank Kevin Hultine, Kristen Kindl, Joni Ward, Steve Blackwell, Kayla Killoren, Grace Fullmer, Dana Terrazas, Marisol Pelaez, Ashley Quay, Abdel Jimenez and Lindsey Miles at Desert Botanical Garden for their input and expertise. We would also like to thank Gwen Iacona, Ryan Esch and Ben Wilder for useful discussion and helpful comments.**

**We obtained guidelines from the 'Condition Assessment Worksheet' to assess the general health of saguaros in DBG during the 2022 inventory, as well as the protocols of the Saguaro Census in Tucson (<https://irma.nps.gov/DataStore/DownloadFile/671388>).**

**We also used information from:**

**Arizona Daily Star**  
([https://tucson.com/news/local/recent-hard-freeze-likely-will-be-death-knell-for-many-weaker-saguaros/article\\_ef8c2538-c8dd-518f-9c2a-1fc37a8f4873.html](https://tucson.com/news/local/recent-hard-freeze-likely-will-be-death-knell-for-many-weaker-saguaros/article_ef8c2538-c8dd-518f-9c2a-1fc37a8f4873.html))

**Gardening Know How**  
(<https://www.gardeningknowhow.com/ornamental/cacti-succulents/saguaro/bacterial-necrosis-of-saguaro.htm>"  
[culents/saguaro/bacterial-necrosis-of-saguaro.htm](https://www.gardeningknowhow.com/ornamental/cacti-succulents/saguaro/bacterial-necrosis-of-saguaro.htm))



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