

myRAINge Log: Tool for monitoring precipitation on rangelands

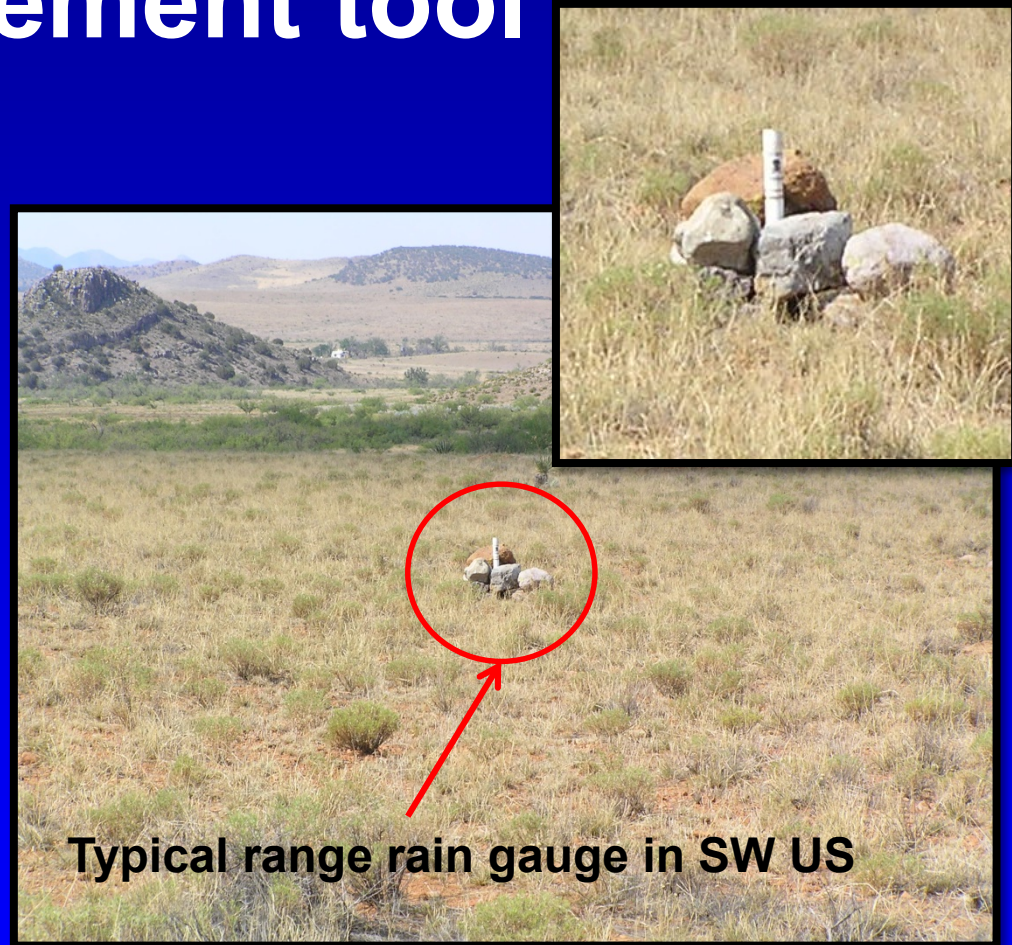
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Dept. of Environmental Science
The University of Arizona**



Precipitation monitoring is key management tool

“What type of information would help drought planning and management? *Rain gauges*. Some ranchers have them but don't read them. Some have only a home. Would like to see a couple per pasture”

- USFS Rangeland Mgmt Specialist



Typical range rain gauge in SW US

A rain gauge in every pasture and allotment

- Simple, capped PVC gauges that measure cumulative precipitation over time can be effective rain gauges at remote locations.
- UofA Cooperative Extension has been working with ranchers and land managers to develop best practices in constructing, placing and reading gauges and managing/utilizing observations
- <https://myraingelog.arizona.edu> was designed to support these efforts



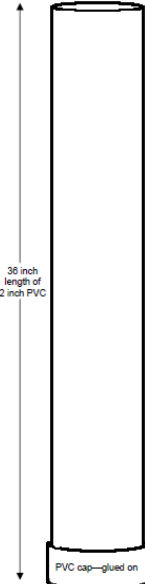
PVC depth gauge at range monitoring site near Clifton, AZ

Simple rain gauges for range monitoring

Yavapai County

**ARIZONA COOPERATIVE
EXTENSION**
COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Simple Design for a Remote Rain Gauge
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36 inch length of 2 inch PVC

PVC cap—glued on

Precipitation data is often useful in making land management decisions. However, sites of interest are often in remote areas that are visited infrequently. Below are instructions for building an inexpensive precipitation gauge and how to take seasonal measurements on remote sites. The precipitation gauge is made from a 36-inch length of 2 inch PVC pipe that has a PVC cap glued onto one end. The pipe is then hose clamped open-end-up to a fence post or T-post.

Make sure to locate the gauge away from trees, buildings, power lines, and other features that may reduce the accuracy of data collected. After securing the gauge to the post, place a small volume (2 to 3 inches) of a 50:50 mix of antifreeze and automatic transmission fluid. The ATF keeps the captured water from evaporating and the red color of the ATF makes it easy to read on a tape measure. The antifreeze keeps the water from freezing.

Measurements should be recorded following winter (usually collected in June) and summer precipitation (usually collected in early October). More frequent readings (i.e. monthly or quarterly) may be collected when justified. At each site, depth readings are taken, giving the amount of precipitation since the last reading. The gauge should be cleaned and replenished at least once per year. It is also a good idea to put a piece of hardware cloth inside the opening to prevent birds, rodents, and other small animals from entering the pipe.

On grazing allotments managed by state or federal agencies, it is a good idea to locate several precipitation gauges distributed across the management unit. Many ranchers that have permanent monitoring sites place these gauges at each site. Some users of these gauges have camouflaged them to decrease the likelihood of vandalism.

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Can we design a better rain gauge for remote, range monitoring?: 'Cow proof', easy to read and maintain, inexpensive, rugged and long-lasting...

Rain Gauge Construction Guide (UA Extension Bulletin)



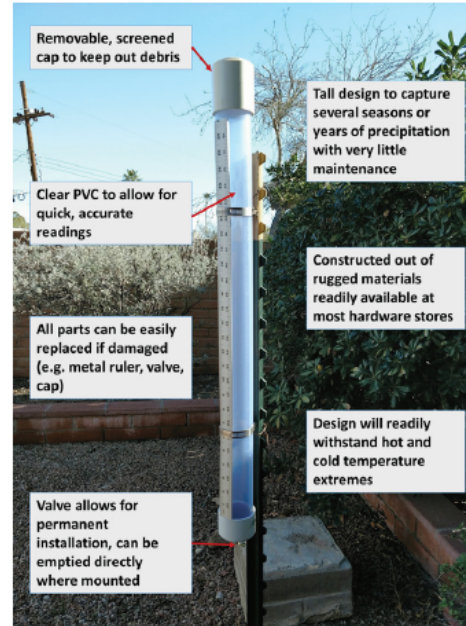
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Cooperative Extension

az1747

September 2017

Do-it-yourself construction guide: Rugged accumulation precipitation gauge for remote monitoring

Michael A. Crimmins, Mitchel McClaran, Julie Brugger, Ashley Hall and Douglas Tolleson



Introduction

Precipitation is the key variable in assessing drought status and tracking changes in drought conditions. Precipitation

unattended site? A simple and inexpensive accumulation gauge can help in this situation. These gauges are typically

https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1747-2017_0.pdf

Precip Monitoring Best Practices Guide (UA Extension Bulletin)



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Cooperative Extension

az1751

November 2017

Rain Gauges for Range Management: Precipitation Monitoring Best Practices Guide

Michael A. Crimmins, Mitchel McClaran, Julie Brugger, Ashley Hall, Douglas Tolleson and Andrew Brischke

Introduction

Precipitation in the form of rain and snow is critical to many aspects of working lands from controlling the growth of vegetation used in grazing by livestock and wildlife to recharging local water resources found in springs, tanks and riparian areas. Land management decisions often require some knowledge of how much precipitation fell within a management unit to assess how past actions have performed and what to do next. For example, do forage conditions reflect a lack of precipitation or grazing management? Did the next pasture or allotment in my rotation get any rainfall over the past season?

Given that precipitation monitoring is important, where and how do we usually get this information? Typically, we consult websites and maps that track precipitation observations from airports and backyard observers. These 'official' sites, managed by volunteer and federal agency programs, do a good job of maintaining a steady stream of high quality data, but often are located near cities away from rural and backcountry areas where the bulk of land management activities occur. Estimates provided by interpolating between these official gauges can provide just that, estimates. Knowing how much and when precipitation fell in your pasture, allotment or land management unit is a key variable for sound decision making and requires collecting precipitation data directly at that site.

Overall, this "best practices" guide will cover some of the basic approaches to collecting and using precipitation observations at remote sites in support of rangeland management including:

- Tying observations to a drought plan
- Where to place gauges and how often to record observations
- Managing and using precipitation observations

This guide will also highlight some new tools that help put



Figure 1. Clear PVC rain gauge (photo courtesy of J. Lyman)

Rain gauges

Precipitation monitoring is one of the most straightforward aspects of weather and climate monitoring and does not require overly sophisticated or expensive equipment. Simple rain gauges consisting of a collection container suffice under most situations. Gauges made out of PVC tubes capped at one end and mounted to fence posts in key areas have been utilized by ranchers and land managers for many years. These gauges typically have a small amount of oil in the gauge to

piece of information to support a management decision.

for direct reading of the precipitation amounts in the gauge

<https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1751-2017.pdf>



Climate Science Applications Project



CLIMAS
Climate Assessment for the Southwest



Where?: Key allotments or pastures
When?: Tie observations to decision timing
What?: Precipitation climatology provides context

Aug 23rd – (2) ‘Near peak’ forage production at mid-point of season: Checking precipitation levels and forage conditions at this point will help support needed course corrections to rotation schedule and help anticipate how the rest of the season will turn out –

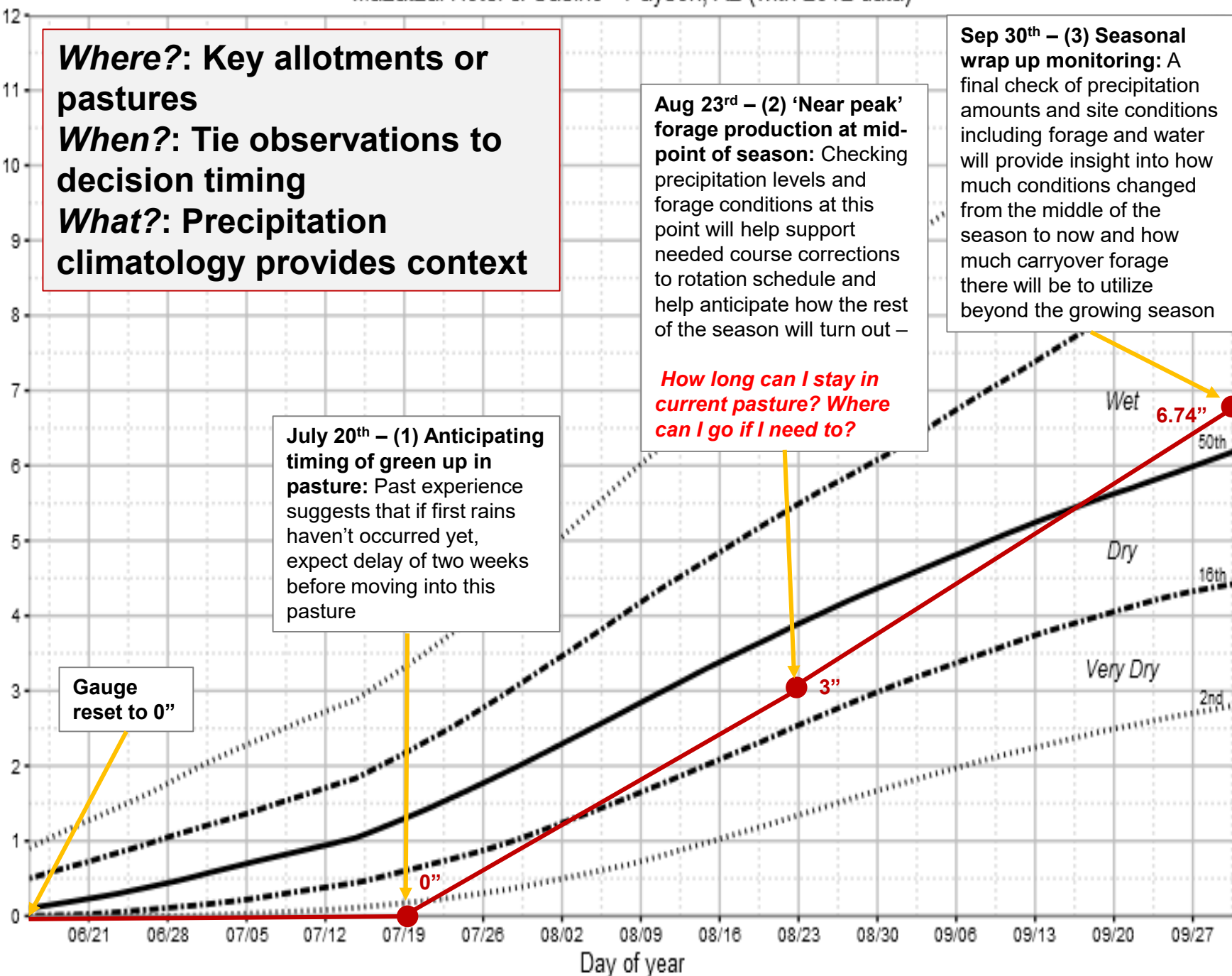
Sep 30th – (3) Seasonal wrap up monitoring: A final check of precipitation amounts and site conditions including forage and water will provide insight into how much conditions changed from the middle of the season to now and how much carryover forage there will be to utilize beyond the growing season

July 20th – (1) Anticipating timing of green up in pasture: Past experience suggests that if first rains haven't occurred yet, expect delay of two weeks before moving into this pasture

How long can I stay in current pasture? Where can I go if I need to?

Gauge reset to 0"

cumulative precip (in)



Precipitation Logbook Generator

Precipitation Logbook Generator About Tool Choose a location Generate Logbook

Set location and download data

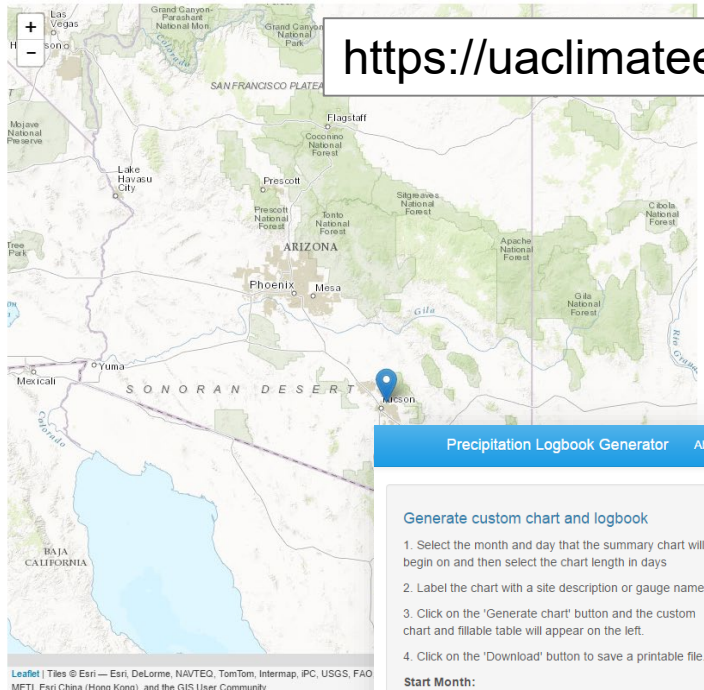
1. Click map to select location (use +/- buttons to zoom, use cursor to pan -- only works for locations within continental U.S.)
2. Click 'Download data' button (this may take a couple of seconds, look to upper right corner for progress message)
3. Proceed to Generate Logbook page

Download data

Selected location

Latitude: 32.268554462148

Longitude: -110.906810760498



<https://uaclimateextension.shinyapps.io/precipChart/>

Precipitation Logbook Generator About Tool Choose a location Generate Logbook

Generate custom chart and logbook

1. Select the month and day that the summary chart will begin on and then select the chart length in days
2. Label the chart with a site description or gauge name.
3. Click on the 'Generate chart' button and the custom chart and fillable table will appear on the left.
4. Click on the 'Download' button to save a printable file.

Start Month:

6

Start Day:

15

Chart length
(days):

120

Site name:

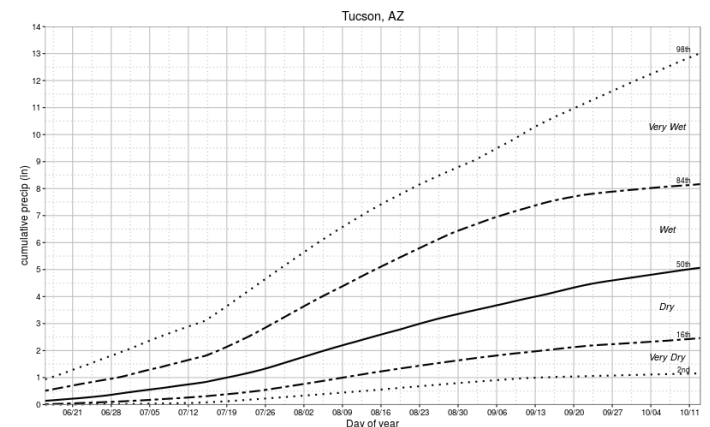
Tucson, AZ

Generate Chart

Download printable chart/table (html file that can be opened and printed with browser)

Download

Cumulative Precipitation Chart



Selected location

Lat: 32.268554462148
Lon: -110.906810760498
Elevation (ft): 2391.7

Center of data grid cell

Lat: 32.25
Lon: -110.916667
Elevation (ft): 2428

Distance between selected location and center of grid cell (ft): 7407

CSAP



my
RAINge
Log

myraingelog.arizona.edu

Local precipitation records support better management

An easy-to-use tool to help you track your actual rainfall so you can better manage your land.

GET STARTED

LEARN MORE

CLEAR BENEFITS



Local Observations

Site-specific is more accurate than an estimate from other locations



Better Management

Make better decisions based on site-specific precipitation records



Precipitation Report

Generate custom report of your observations



Full Control

Share only what you want with whom you want



Save Time

No messy spreadsheets, view all your records on any device in an instant



Free and Easy

Simple to use and no cost

Set precipitation date range

11/26/2020

-

02/24/2021

APPLY



MY GAUGES

ADD GAUGE



Tipping Bucket

N/A 10/14/2017
TOTAL LAST LOG

2-2

1 HELPER

N/A 08/27/2018
TOTAL LAST LOG

Test gauge 3

GET STARTED!



2-3

0.81 02/24/2021
TOTAL LAST LOG

1-1


0.43 02/24/2021
TOTAL LAST LOG

2-1s

N/A 05/06/2018
TOTAL LAST LOG

Set precipitation date range

05/01/2020 - 02/24/2021 ✓ ?



SETTINGS ⚙

2-3

2" PVC gauge, funnel

SUMMARY BY DATE RANGE:
CUMULATIVE: 2.30" OBSERVATION COUNT: 4

LOG

ADD OBSERVATION +

FEB 24

OBSERVATION 13.60"


DIFFERENCE 1.30"

Dry winter continues
Feb 24, 2021 9:02 am

RAINFALL CHART

View, print and share a summary for your rain gauge for a given time period.

VIEW REPORT



PREFERENCES

Public Map

- ✓ Display **only** gauge location and observations.
- ✓ Additionally display gauge images, descriptions and comments

SAVE


Units

Default for **this** gauge.

Inches ▼

Helpers

Invite folks to help you manage each of your gauges as an Editor or Contributor.

ADD HELPER 

OCT 2 OBSERVATION 12.30" DIFFERENCE 0.30" ▼

AUG 6 OBSERVATION 12.00" DIFFERENCE 0.70" ▼


MAY 1 OBSERVATION 11.30" DIFFERENCE 11.30" ▼

JUN 2 RESET TO 0.00" ▼

JUN 2 OBSERVATION 18.30" DIFFERENCE 3.90" ▼

MAY 11 OBSERVATION 14.40" DIFFERENCE 1.30" ▼

OCT 23 OBSERVATION 13.10" DIFFERENCE 3.10" ▼



Set precipitation date range

06/01/2020

- 03/01/2021



2-3

RAINFALL CHART

2-3

06/01/2020 - 03/01/2021

- Observation
- Estimated
- Historical Avg.
- Extremely Dry
- Very Dry
- Dry
- Wet
- Very Wet

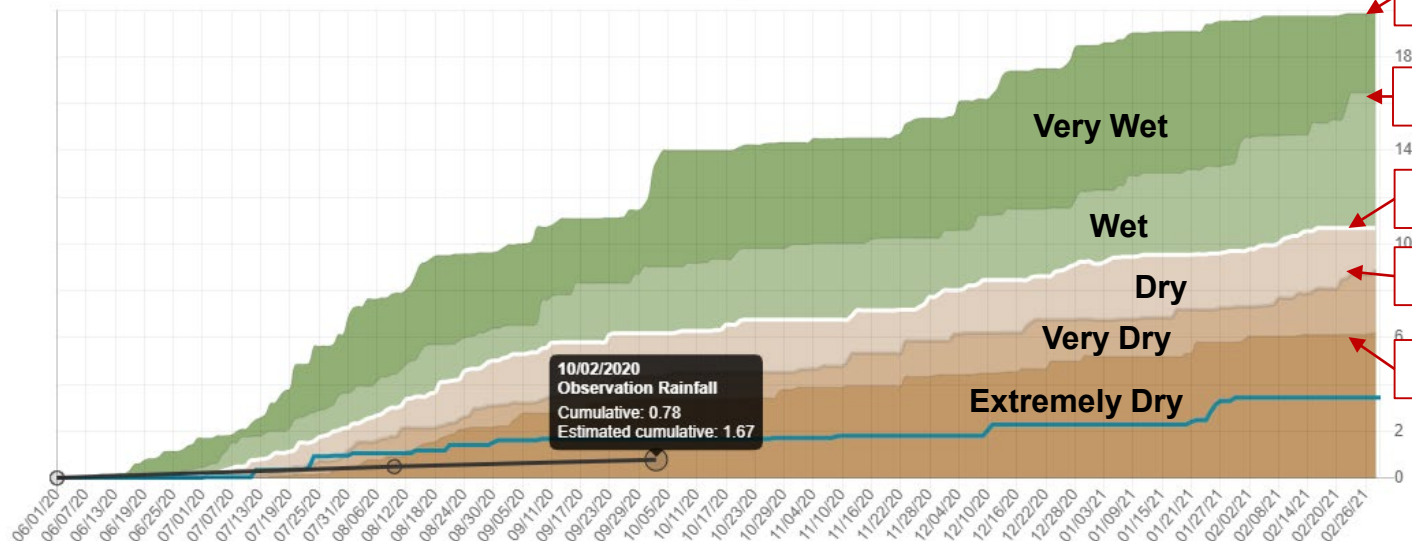
Compared to:

Another Year

Select prior year(s) for comparison

Year values relative to date range. Your selections will change when date range changes.

- Observation
- Estimated



EXPLAIN THIS CHART

CSAP

Set precipitation date range

06/01/2020

03/01/2021



2-3

RAINFALL CHART

2-3

06/01/2020 - 03/01/2021

- ☒ Observation
 - ☒ Estimated
 - ☒ Historical Avg.
- Extremely Dry Very Dry Dry Wet Very Wet

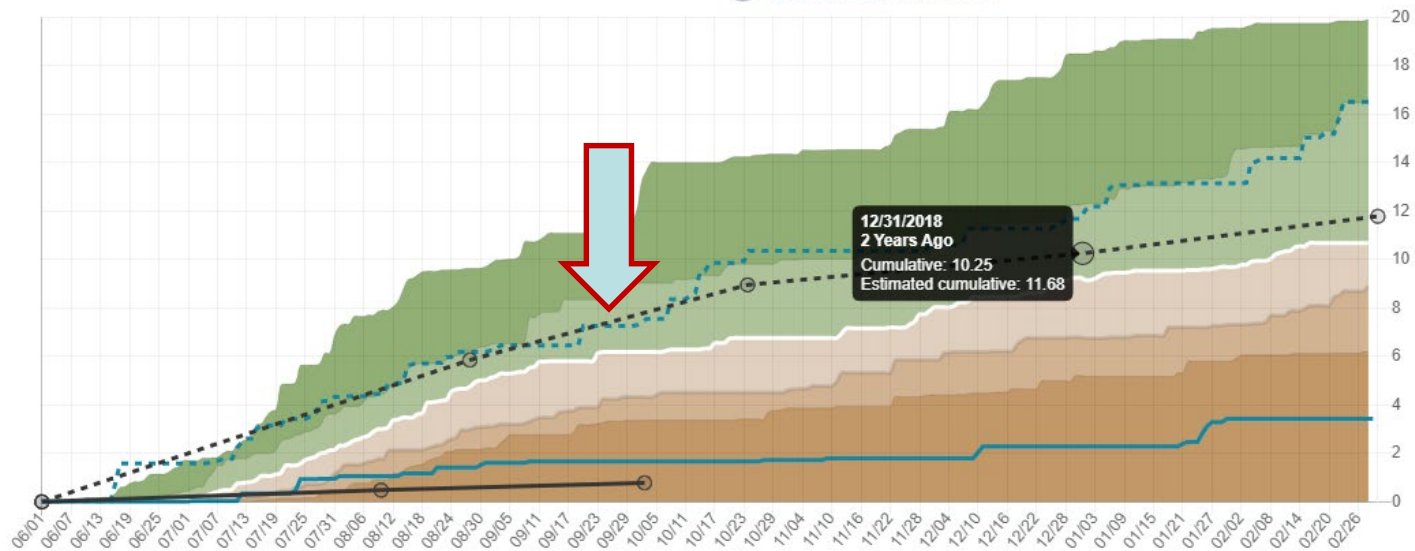
Compared to:

Another Year

2 years ago (06/01/2018 - 03/01/2019)

Year values relative to date range. Your selections will change when date range changes.

- ☒ Observation
- ☒ Estimated



EXPLAIN THIS CHART

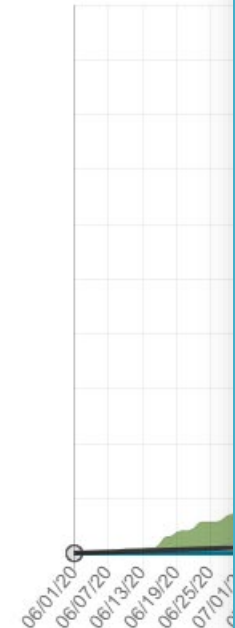
CSAP

RAINFALL CHART

2-3

06/01/2020 - 03/01/2021

- Observation
- Estimated
- Historical Avg.
- Very Wet



TABLES OF LOG DATA

MAP

TABLES OF LOG DATA (IN) AND GAUGE SUMMARIES

2-3

2" PVC gauge, funnel

CUMULATIVE: 0.78"

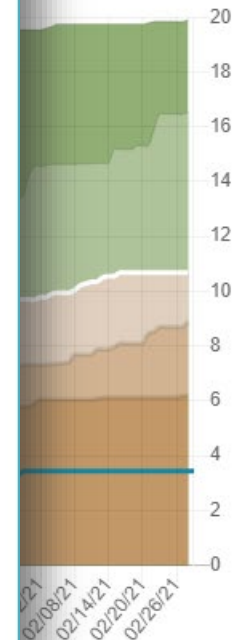
OBSERVATION COUNT: 2

Date ▲	Observation	Estimated	Notes	Image
08/09/2020	0.48 (Very Dry)	1.06 (Very Dry)	Bummer summer 🙄	
10/02/2020	0.78 (Very Dry)	1.67 (Very Dry)	Driest monsoon on record	

MAP

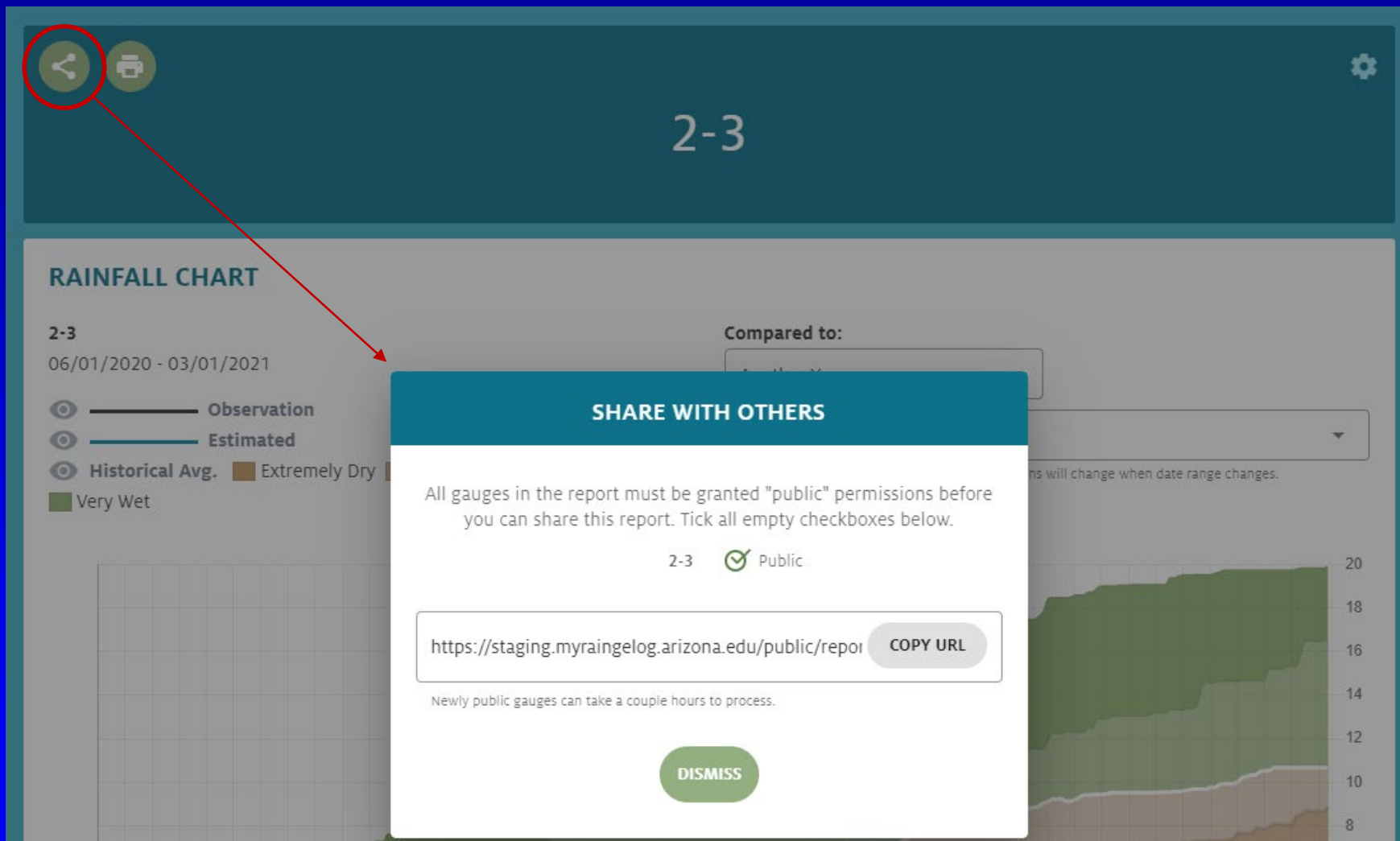


ange changes.



EXPLAIN THIS CHART







Huerfano Butte

RAINFALL CHART

Huerfano Butte

04/09/2020 - 04/09/2021 (defaulted to last 365 days)

- Observation
- Estimated
- Historical Avg. Extremely Dry Very Dry Dry Median Wet Very Wet

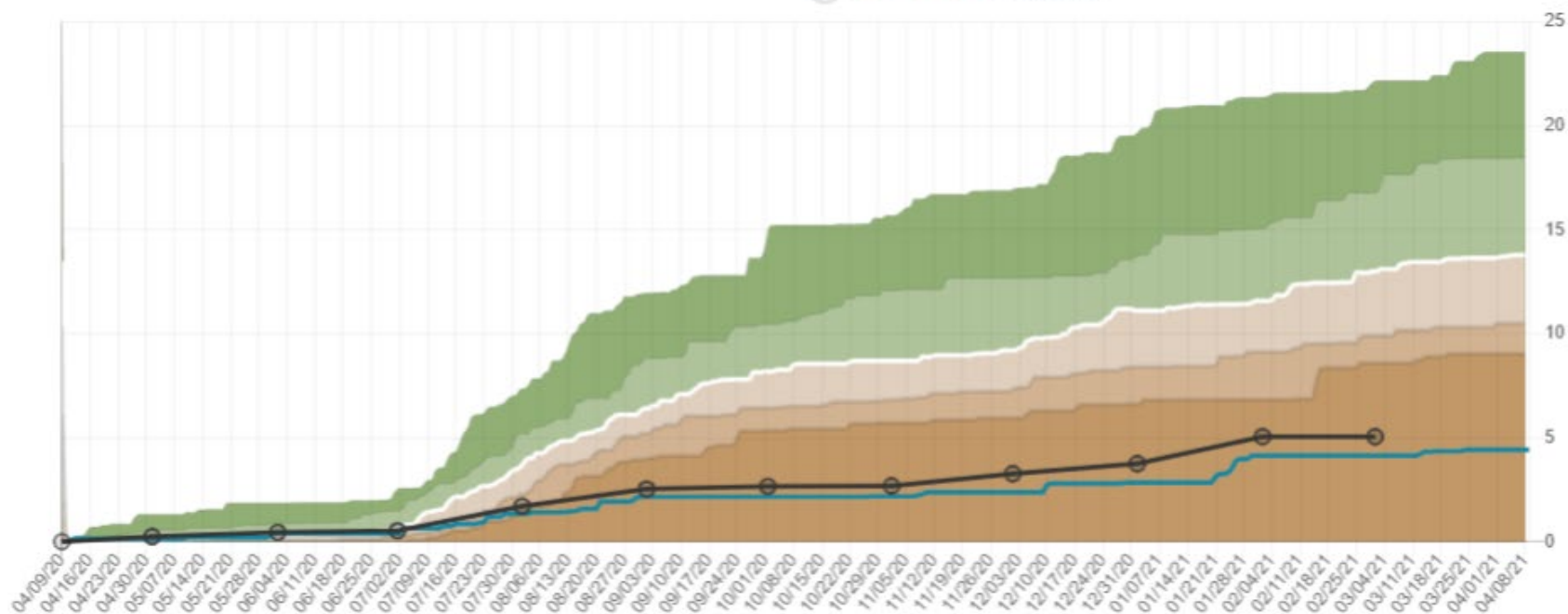
Compared to:

Another Year

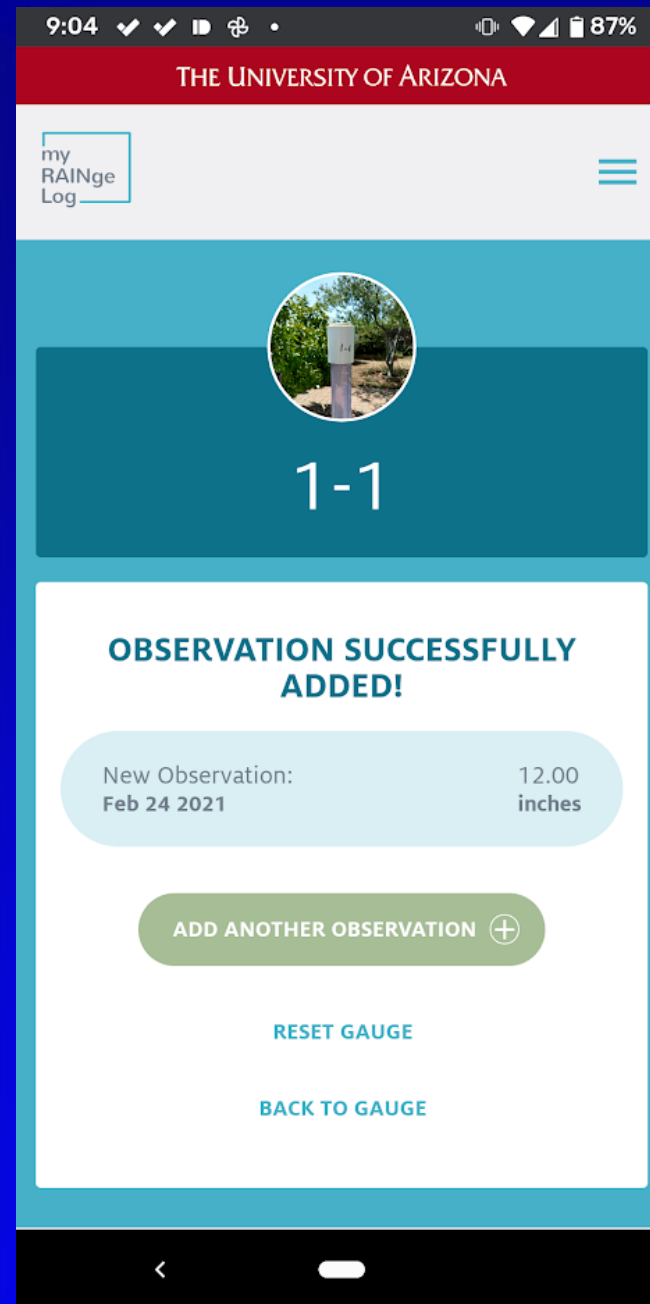
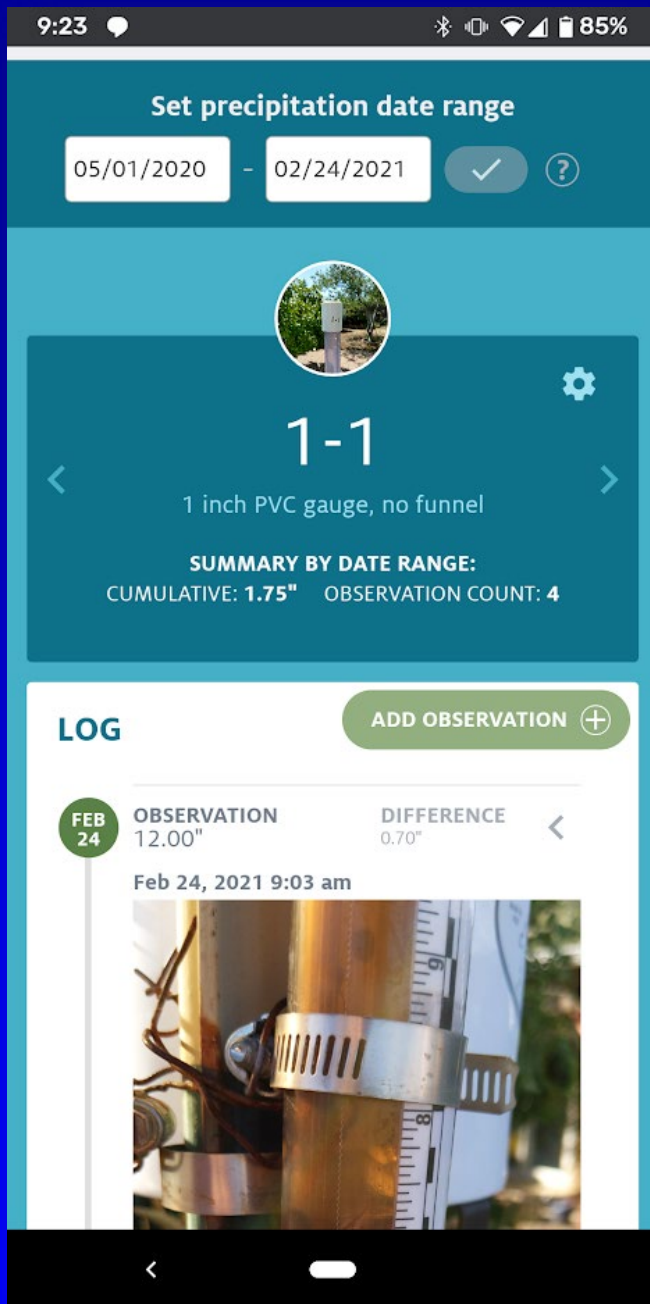
Select prior year(s) for comparison

Year values relative to date range. Your selections will change when date range changes.

- Observation
- Estimated



EXPLAIN THIS CHART





Help site - <https://info.myraingelog.arizona.edu/>
(also check out myRAINge Log YouTube channel)

Contact for more info:
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