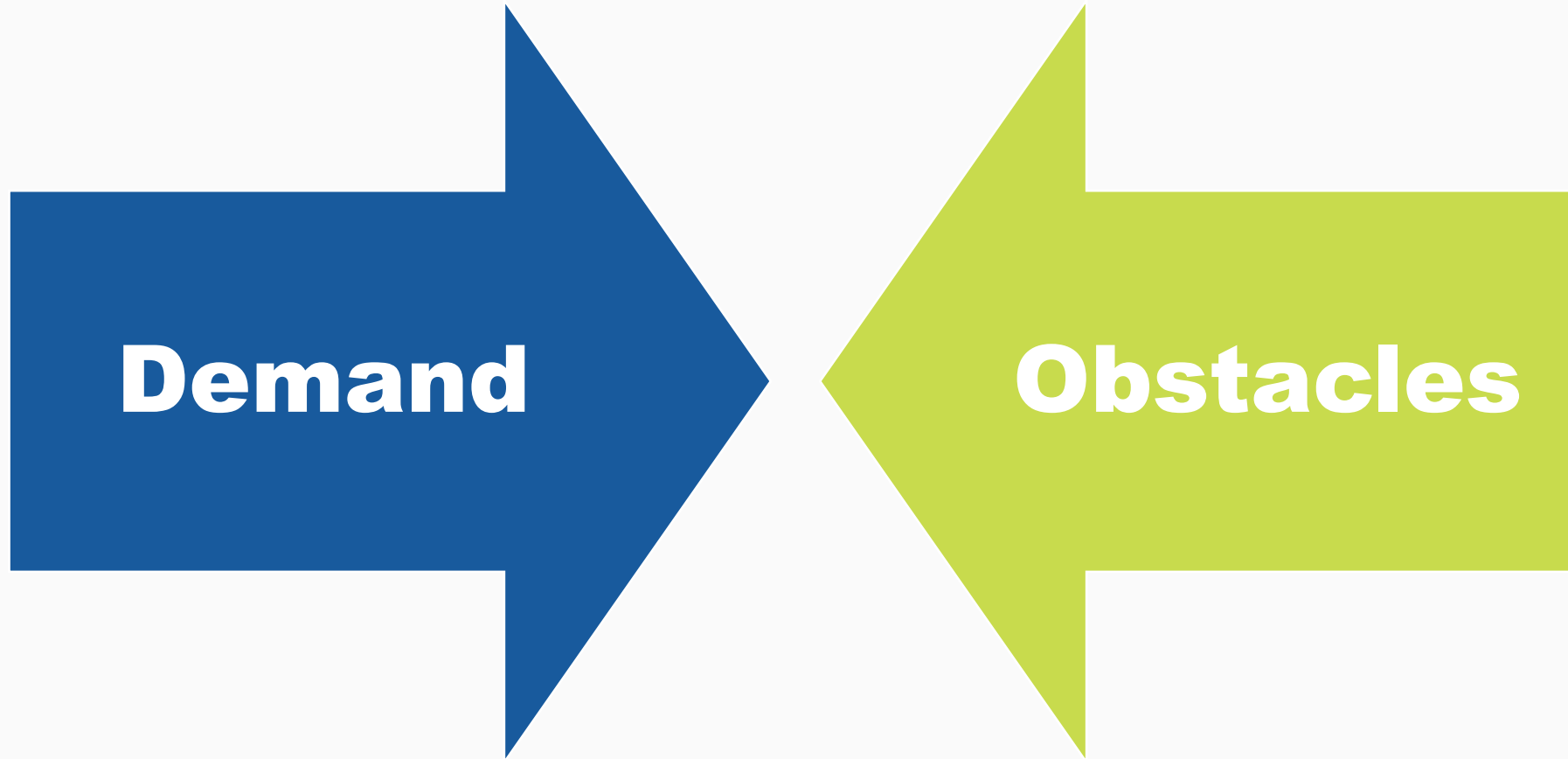




▼

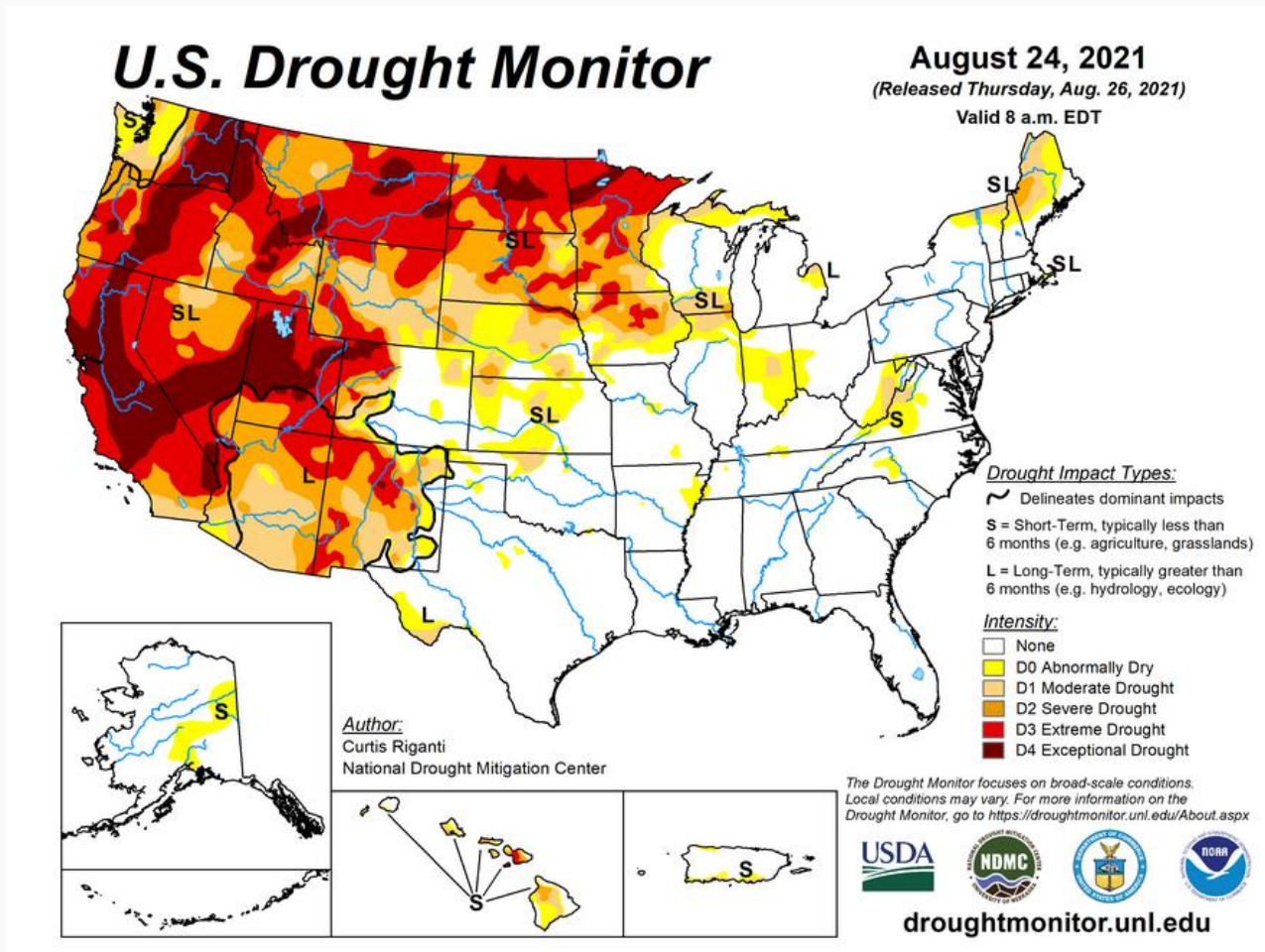
# Soil Health and Drought

# Ready for the Challenge?



**Soil health is key!**

# August 24<sup>th</sup>, 2021 Drought Map



~ - Delineates dominant impacts  
 S - Short-term, typically less than 6 months (agriculture, grasslands)  
 L - Long-term, typically more than 6 months (hydrology, ecology)  
 SL - Short- and long-term impacts

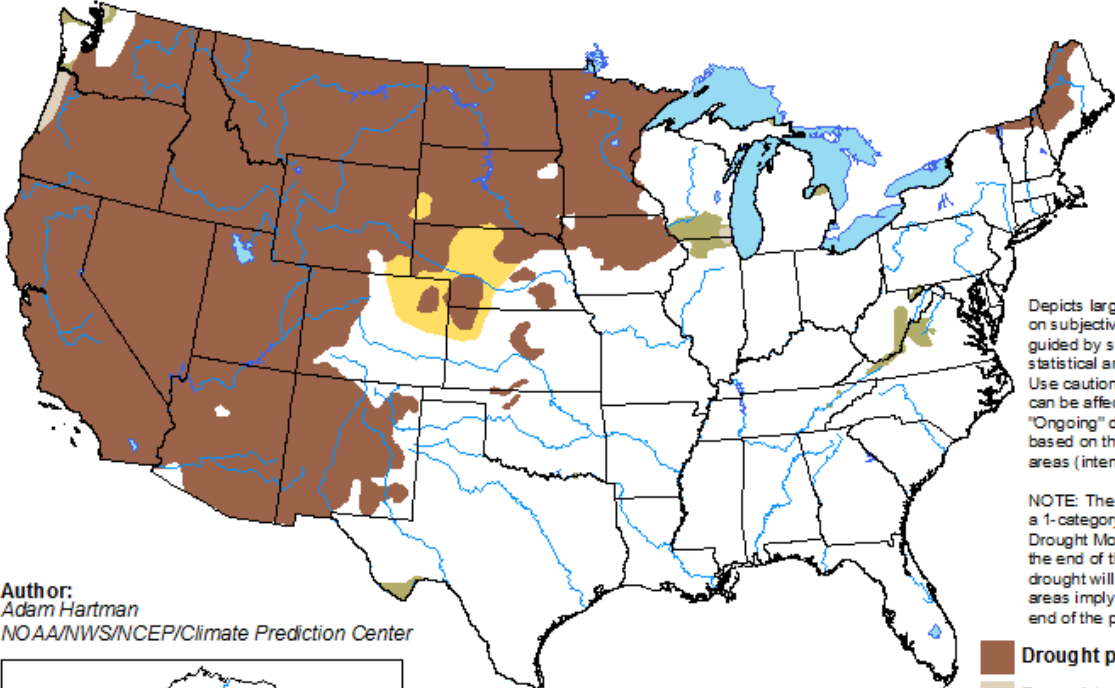
**Intensity and Impacts**

None	D3 (Extreme Drought)
D0 (Abnormally Dry)	D4 (Exceptional Drought)
D1 (Moderate Drought)	No Data
D2 (Severe Drought)	

# August – November 2021 Drought Outlook

## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for August 19 - November 30, 2021  
Released August 19



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

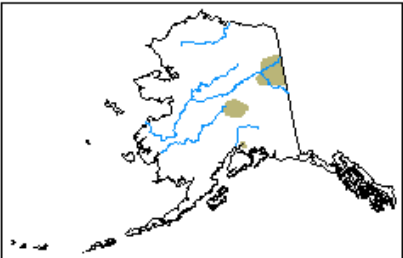
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely



<http://go.usa.gov/3eZ73>

Author:  
Adam Hartman  
NOAA/NWS/NCEP/Climate Prediction Center



<b>Drought persists</b> Drought present on December 17, 2020 is expected to continue through March 2021.	<b>36.6%</b> of U.S.
<b>Drought remains but improves</b> Drought present on December 17, 2020 is expected to continue, but improve through March 2021.	<b>1.2%</b> of U.S.
<b>Drought removal likely</b> Drought present on December 17, 2020 is expected to be removed from the map by the end of March 2021.	<b>3.2%</b> of U.S.
<b>Drought development likely</b> Abnormally dry conditions on December 17, 2020 are expected to intensify by the end of March 2021.	<b>7.8%</b> of U.S.

**Drought is caused by persistent warm/dry conditions or soils that cannot store water.**

# What Healthy Soils Do

**Store Water  
& Resist  
Drought**

**Resist  
Erosion**

**Sequester  
Carbon**

**Improve  
Profitability**

**Reduce  
Externalities**

**Improve  
Nutrient Use**

**Key Issue:** Agricultural Practices Negatively Impact Soil Health



# How To Improve Your Soil Biology

# How To Improve Soil Biology

## [Article Link](#)

Component	Practice
Feed the soil biology	Provides the soil microbiome a balanced food source
Cover Cropping	Keeps living roots in the soil and protects soil from erosion
Reduce tillage	Helps keep soil structure and microbial communities intact
Mulches and compost	Provides a bulk carbon and nutrient source to the soil
Irrigation Management	Helps keep microbes alive and reduces erosion

# August 2021 - Crops Need Microbes for Drought Stress Mitigation

REVIEW

## Harnessing rhizosphere microbiomes for drought-resilient crop production

Franciska T. de Vries<sup>1,2\*</sup>, Rob I. Griffiths<sup>3</sup>, Christopher G. Knight<sup>1</sup>, Oceane Nicolitch<sup>1</sup>, Alex Williams<sup>1</sup>

**EPS & Soil  
Structure**

**Antioxidants**

**Osmoprotection**

<https://science.sciencemag.org/content/368/6488/270/tab-pdf>



# A Living Soil Promotes Healthy Soil!

Limited  
Microbial  
Growth



Typical Ag Soil



Excellent  
Abundance  
and  
Diversity



Secreted  
"glues"



Soil agar + Phycoterra®

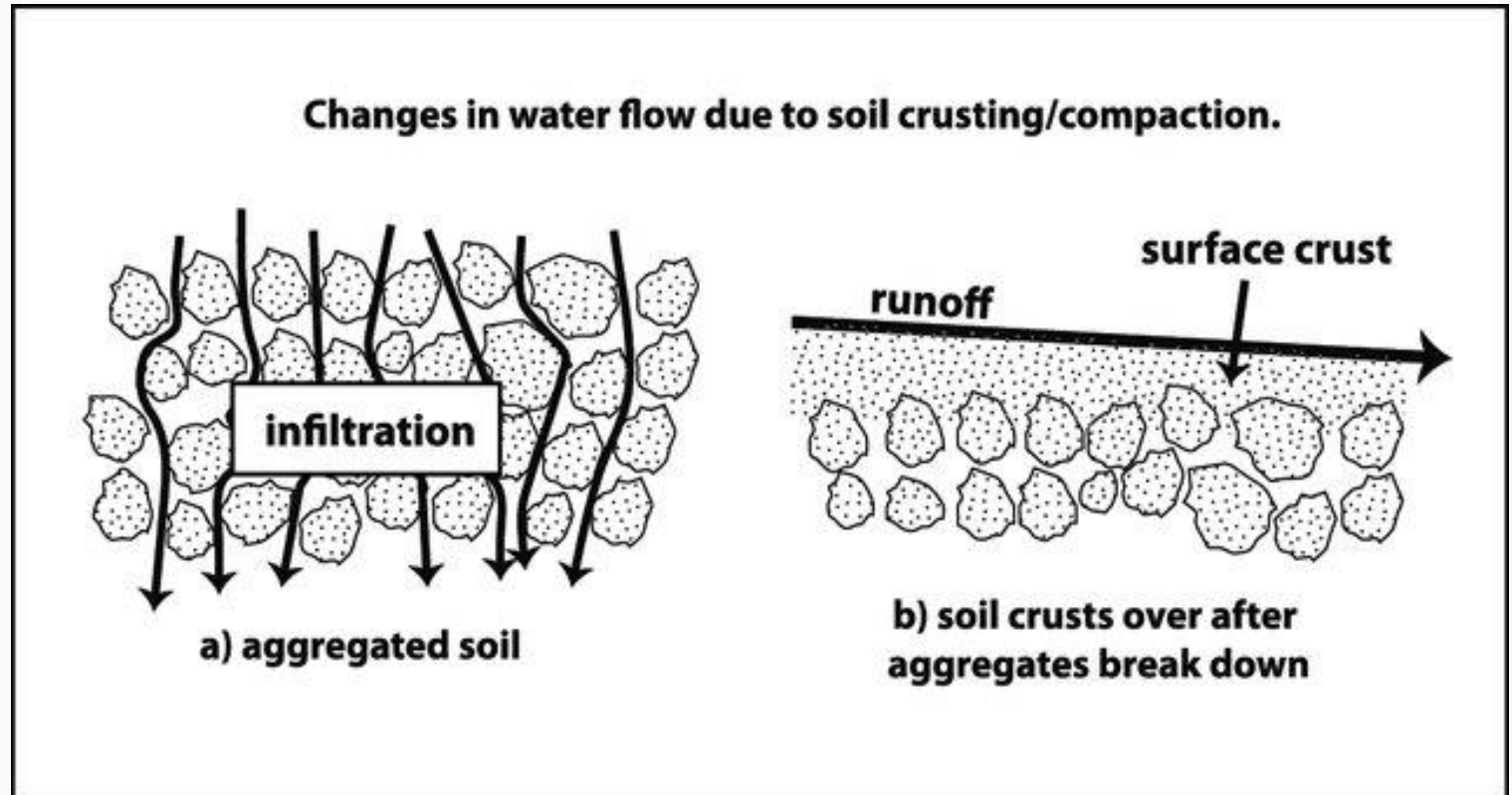




# The Case for Optimizing Soil Biology for Drought Management



# Rule 1 - Infiltration



# Rule 2 - Storage



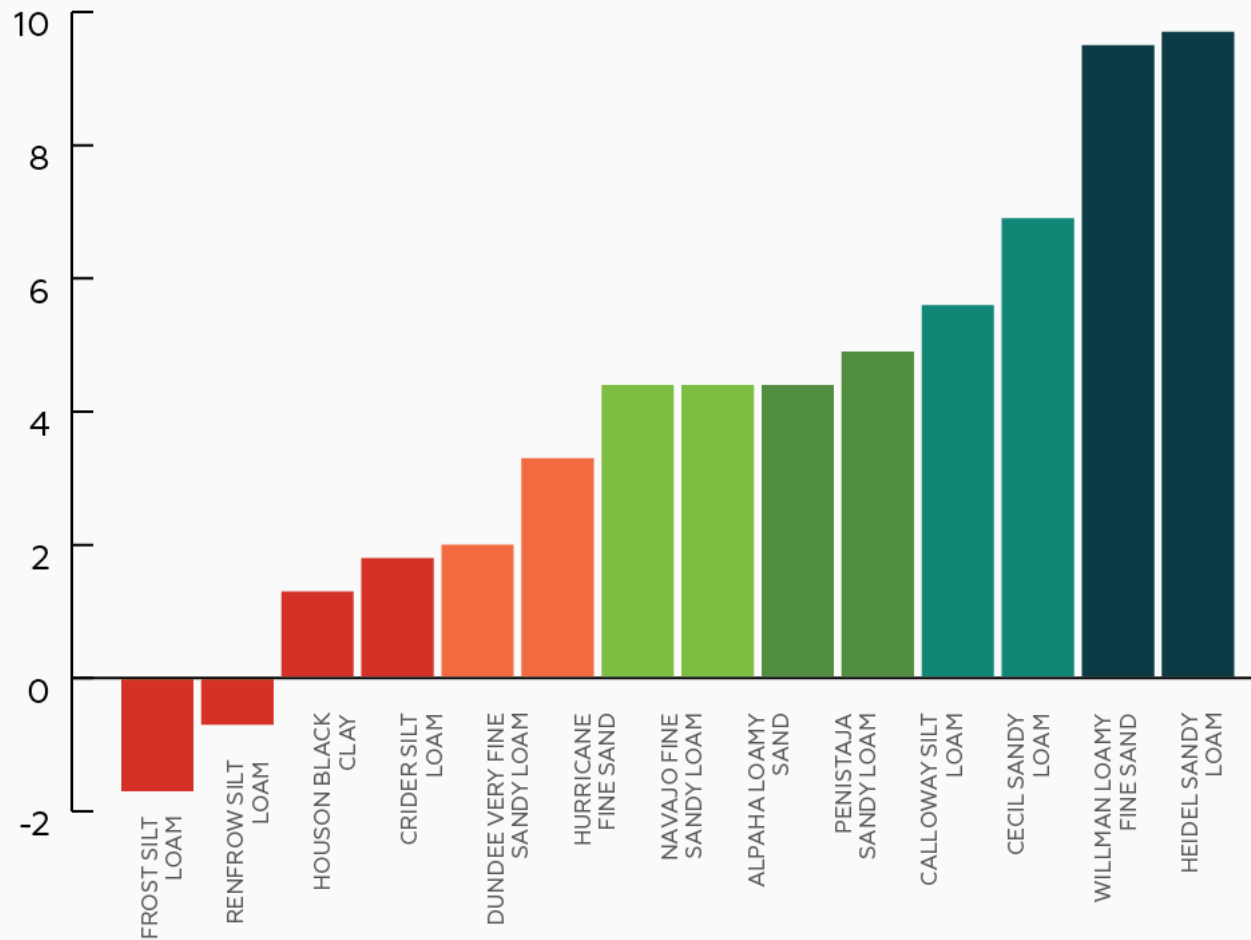
Soil pores between soil particles filled with water



Films of water around soil particles

# Water Holding Capacity Improvement with PhycoTerra®

1% v/v for 40 days after three biweekly applications in greenhouse



Rebot et al., 2018 Soil structure as an indicator of soil functions: A review

# Abundance and Diversity = Osmoprotection and Antioxidant

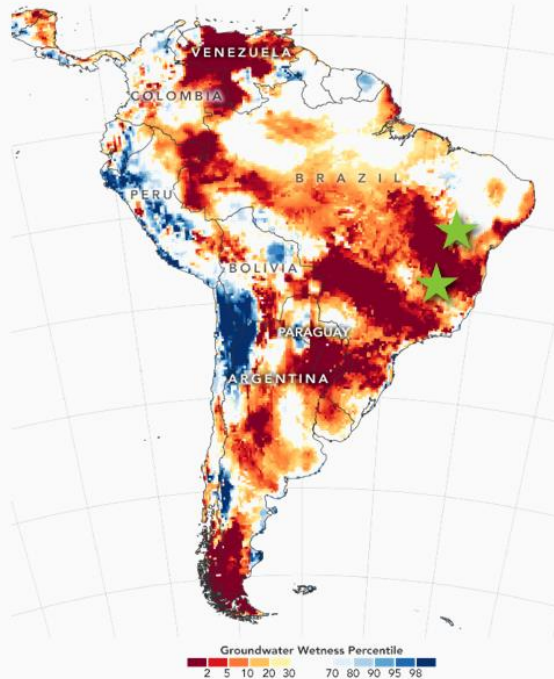




# Spotlight on Drought

# Brazil Soybean Trial Summary – PhycoTerra® - 2020/2021

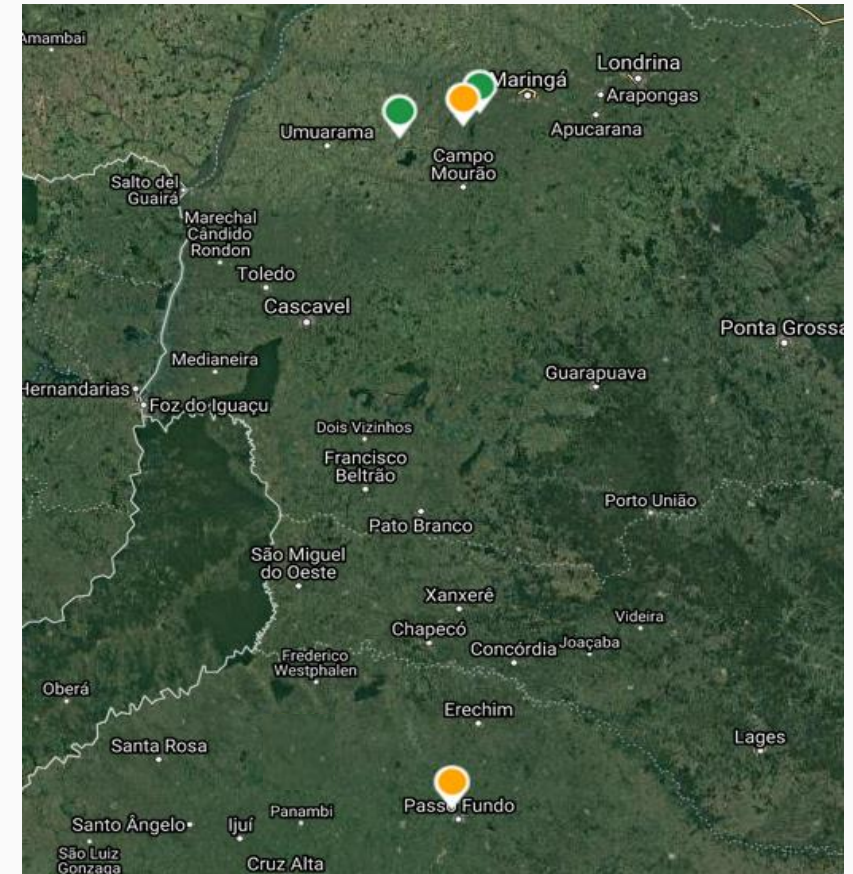
1.25 qt/acre in furrow at planting; multiple soil types



**Drought Severity at Planting  
– November 3, 2020**

**Win Rate: 100%**  
**Average ROI When Won: 5:1**

When Won:	
vs. Grower Standard	Difference
Yield (bu/acre)	+4.6

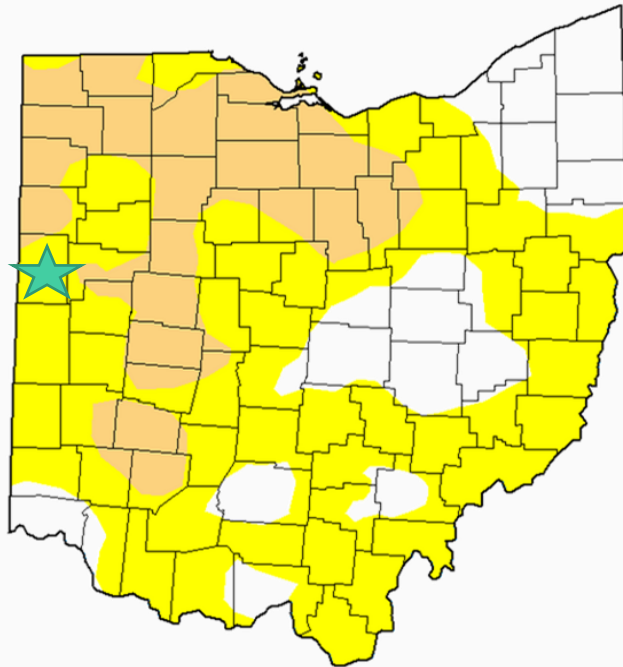




# Ohio – July 2020 – Silage Corn

Grower Trial near Celina, OH – silt loam & silty clay loam soil  
PhycoTerra® was applied in furrow at planting in 6x replicated strips

## U.S. Drought Monitor Ohio



July 21, 2020

(Released Thursday, Jul. 23, 2020)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	21.10	78.90	23.12	0.00	0.00	0.00
Last Week 07-14-2020	41.01	58.99	3.26	0.00	0.00	0.00
3 Months Ago 04-21-2020	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 12-31-2019	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 10-01-2019	19.41	80.59	12.37	0.00	0.00	0.00
One Year Ago 07-23-2019	100.00	0.00	0.00	0.00	0.00	0.00

### Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

### Author:

Richard Heim  
NCEI/NOAA



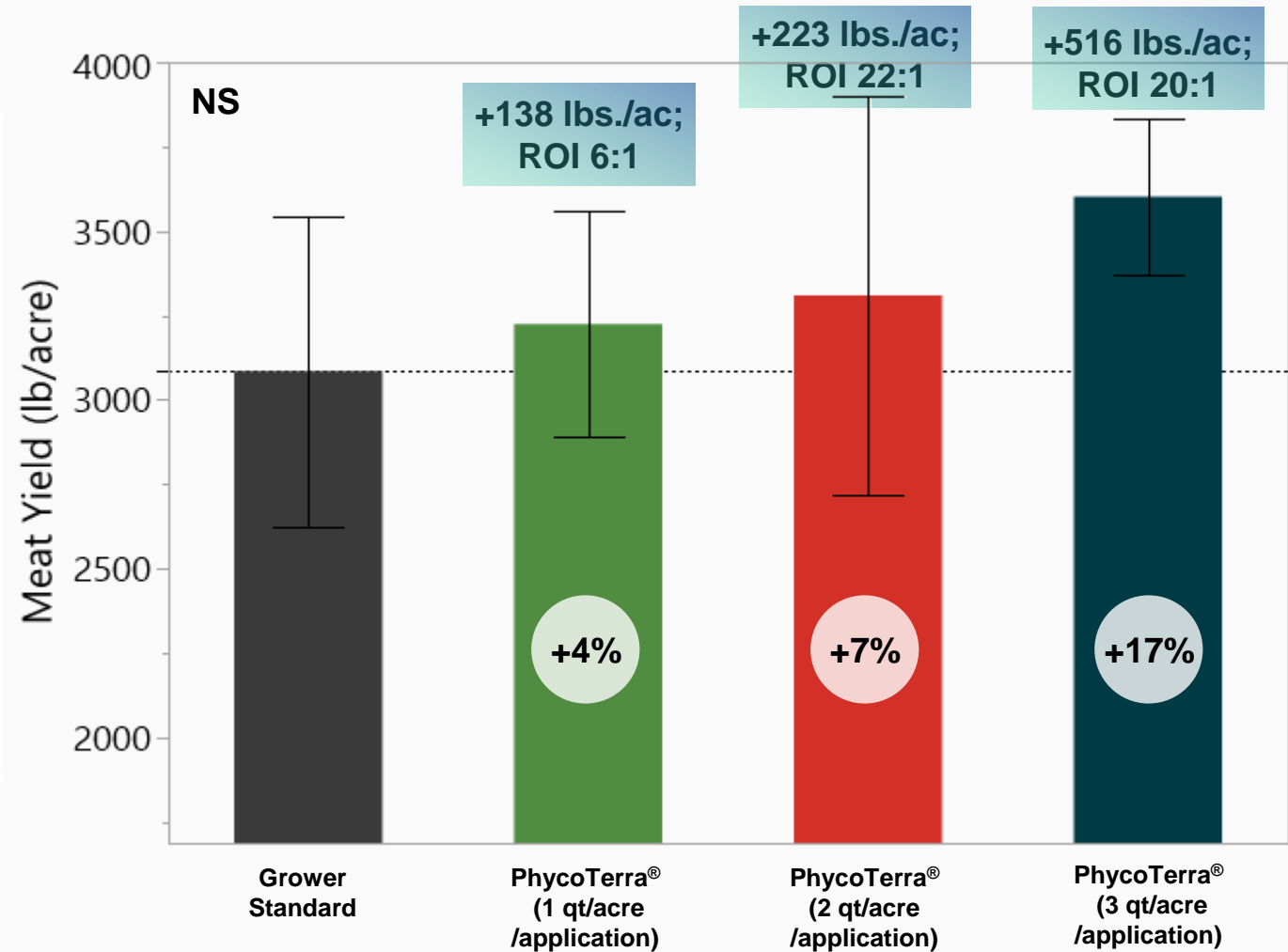
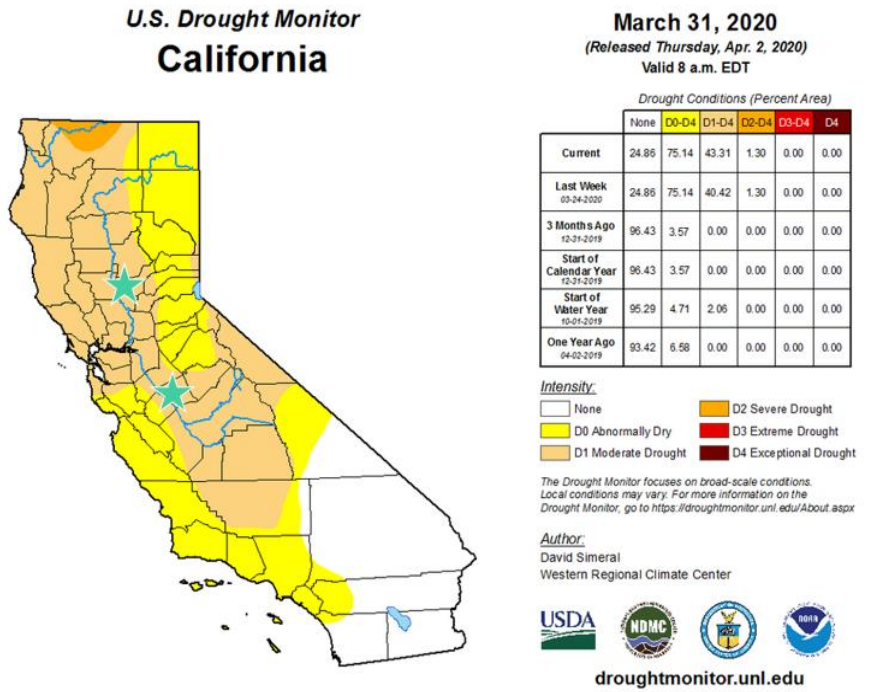
[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

## Silage Corn (tons/acre)

- Grower Standard 18.8
- Phycoterra @ 2 qts/ac 21.8
- +3 tons/acre \* \$30/ton  
= \$90/acre or +~\$70/acre net
- 5:1 ROI

# 12<sup>th</sup> Leaf Almonds – Sutter, CA - 2020

Sandy Loam, 1.5% OM; var. Nonpareil; 12<sup>th</sup> Leaf; 3rd Party CRO; treatments applied by drip fertigation 4x





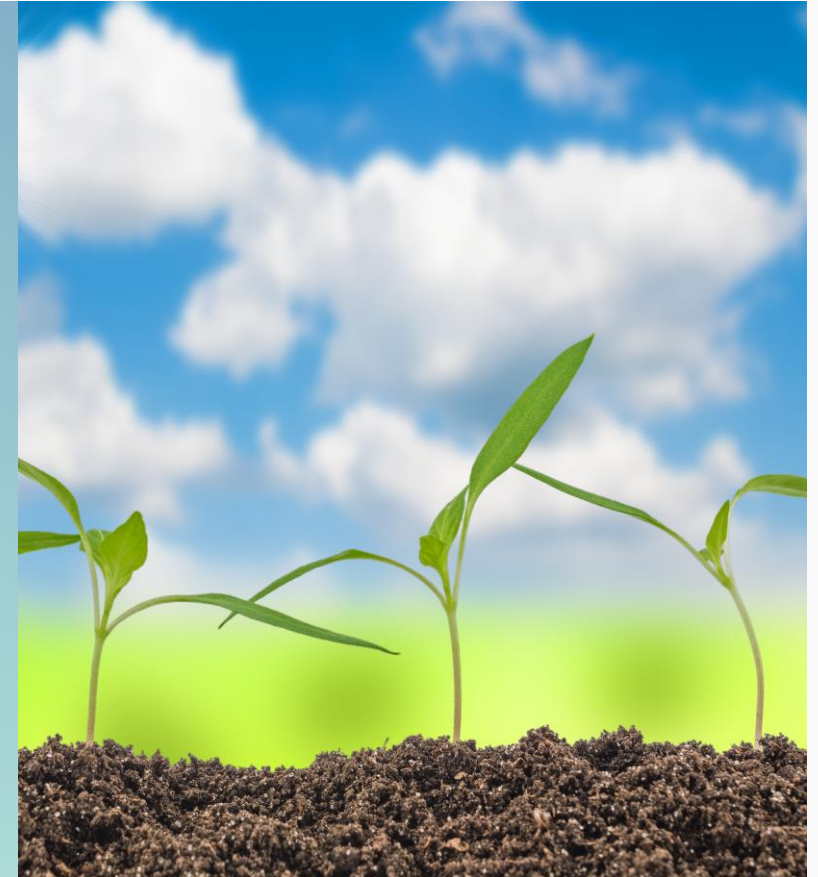
# Closing



# Next Steps

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- Crop production systems have tremendous potential for soil health
- Small management changes can boost the soil biology and help with drought stress
- Soil tests can guide management decisions



# More Resources



## **Contact Local Lab**

*Ask about soil health tests and interpretation*

## **NRCS Soil Health and Quality Pages**

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>

## **Soil Health Institute**

<https://soilhealthinstitute.org/resources/>

## **PhycoTerra® Blog**

<https://phycoterra.com/blog/>



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[www.PhycoTerra.com](http://www.PhycoTerra.com)

