

# Grass-Cast:

A grassland productivity forecast for  
the Great Plains & Southwest

**Dannele Peck**

**Grass-Cast Team:** Bill Parton, Melannie Hartman, Bill Smith, Brian Fuchs,  
Justin Derner, Rafael Guerrero, Emile Elias, Julie Elliott...

NC CASC Webinar Series  
May 13, 2021

DEVELOPED BY:



FUNDED BY:





# Climate Hubs

U.S. DEPARTMENT OF AGRICULTURE



**Vision:** Maintain and strengthen agricultural production & natural resources under increasing climate variability and change.



Photo credit: NOAA



Photo credit: UNL Extension

**Mission:** Co-develop science-based, region-specific info & tech for working-land managers to enable climate-informed decisions, in collaboration with internal (USDA) and external research, extension & education partners.





# How does our Hub work?





# All Spring, We Wait & Watch...



# All Spring, We Wait & Watch...



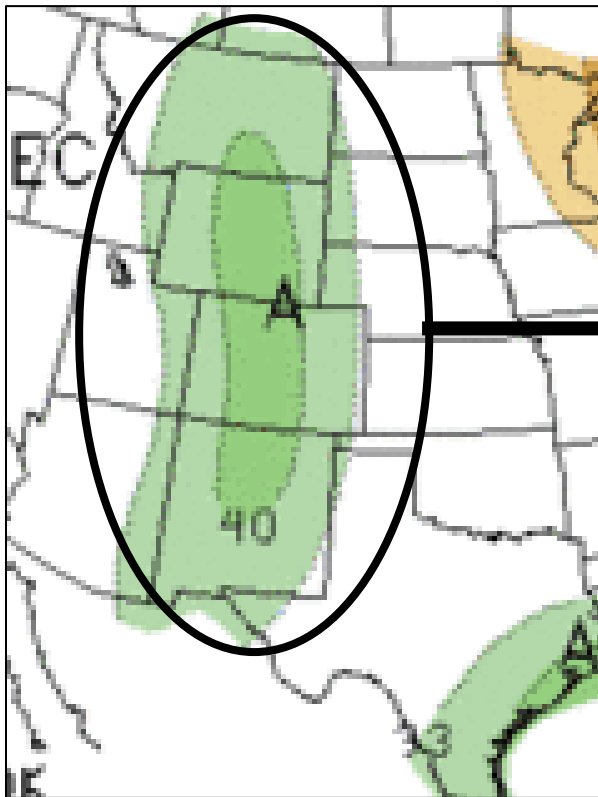


# All Spring, We Wait & Watch...



# Making Weather Info Usable for You

## Seasonal Outlook

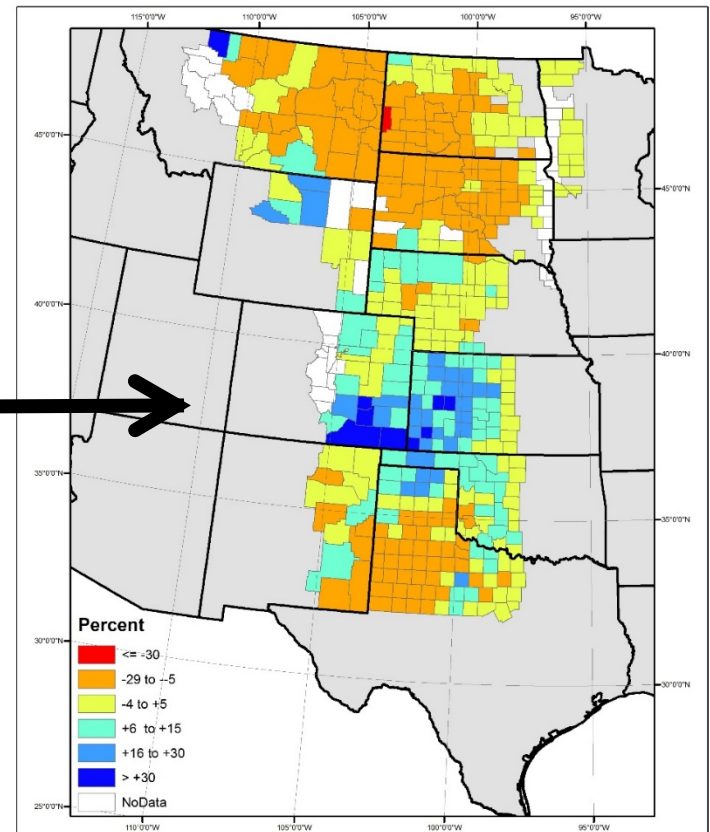


THREE-MONTH OU  
PRECIPITATION  
0.5 MONTH LEAD  
VALID MJJ 2017  
MADE 20 APR 20

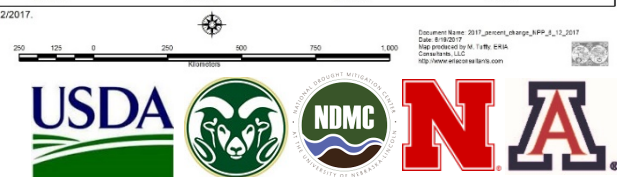
What does  
it *MEAN*  
for  
*grassland  
managers?*

## “Grass-Cast”

Percent Change in 2017 Predicted NPP compared to 1986 - 2016 mean NPP (%)



Data are from 6/12/2017.

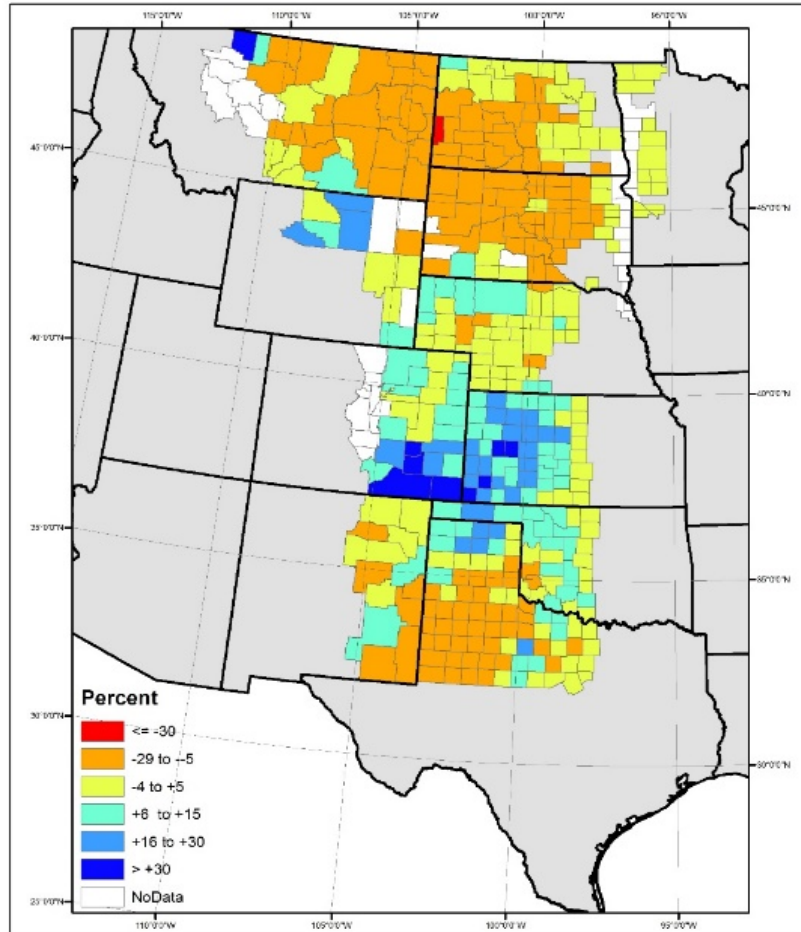




# Grassland Productivity Forecast

## “Grass-Cast”

Percent Change in 2017 Predicted NPP compared to 1986 - 2016 mean NPP (%)



“Based on **observed weather** + **future weather scenarios**... we expect **grassland productivity** in *your* area... to be X% **higher** or **lower** than your area’s 38-year average.”



NORTHERN PLAINS  
CLIMATE HUB  
EXTENSION & OUTREACH

<https://grasscast.unl.edu>

# Overview of “Grass-Cast” Procedure

## 1. Observed weather + Forecasted weather



DayCent model  
predicts



## 2. ET for the growing season



Evapotranspiration

Correlates to:



## 3. Greenness for the season



Heathy Vegetation  
Reflectance

50% NIR

8% Red



NDVI = 0.72

Stressed Vegetation  
Reflectance

40% NIR

30% Red



NDVI = 0.14

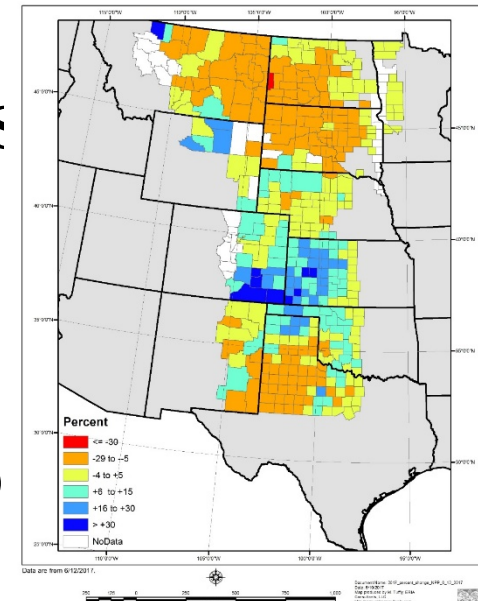
$$\text{NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$

Correlates to:



## 4. Lbs/Acre of Veg for season

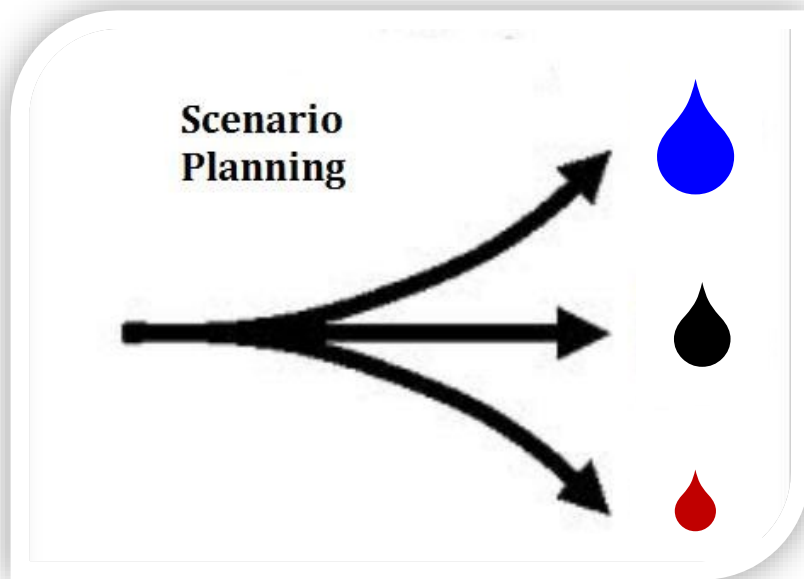
Percent Change in 2017 Predicted NPP compared to 1986 - 2016 mean NPP (%)





Forecasts ***aren't*** always correct, so...  
3 possible weather **scenarios** instead:

**What if** rainfall in May-Aug is:

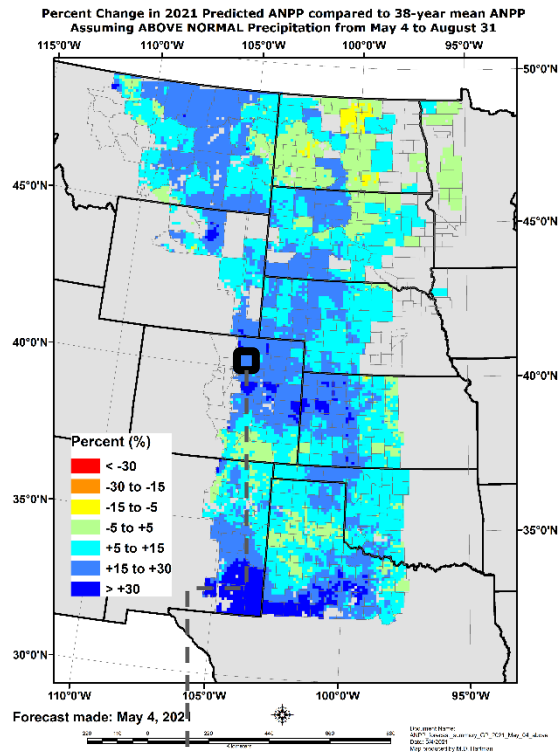


1. above-normal?
2. near-normal?
3. below-normal?

# May 5, 2021: “What if precip thru Aug is...”

(then updated every 2 weeks)

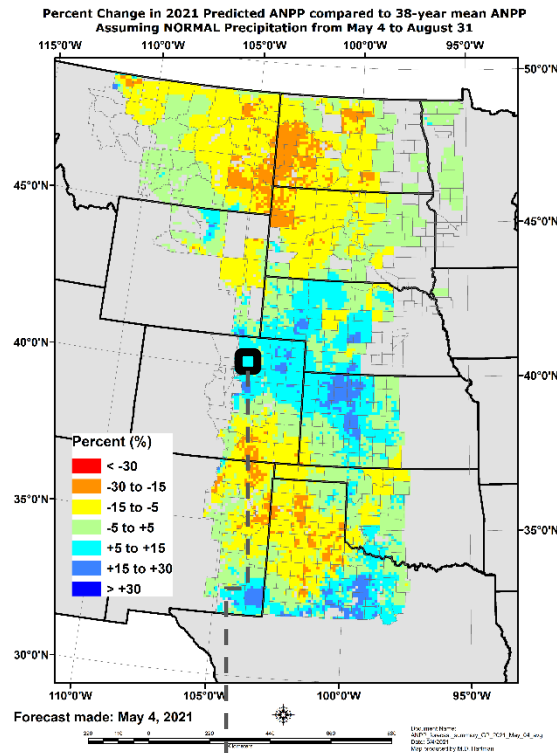
## Above-Normal



### Medium Blue:

If precip is **above**-normal, we expect **15% to 30% more** pounds per acre than the area's 38-year average.

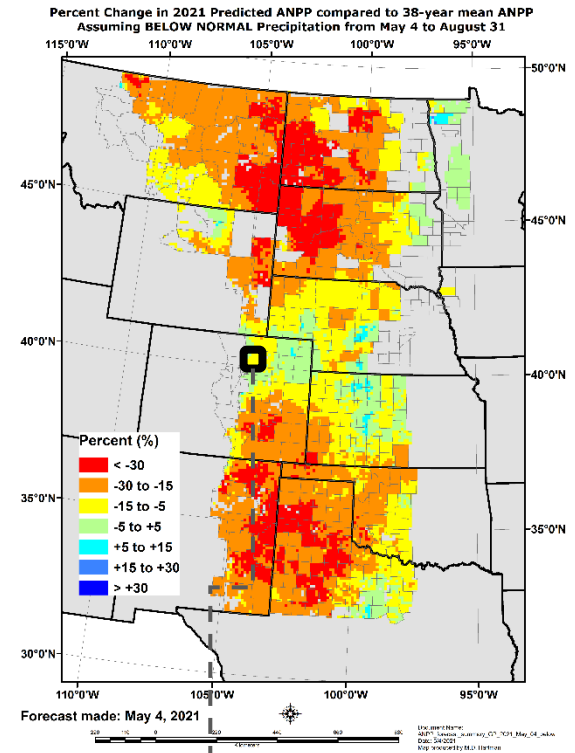
## Near-Norm



### Turquoise:

If precip is **near**-normal, we expect **5% to 15% more** pounds per acre.

## Below-Norm



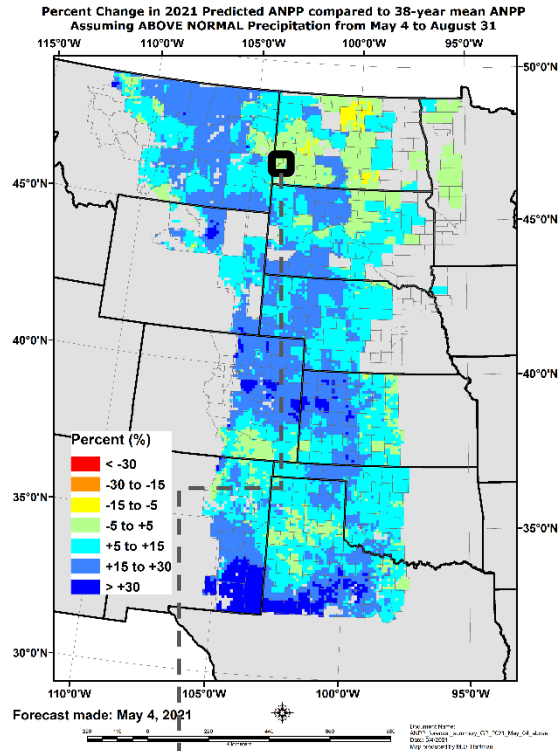
### Yellow:

If precip is **below**-normal, we expect **5% to 15% less** pounds per acre.



# May 5, 2021: “What if precip thru Aug is...” (then updated every 2 weeks)

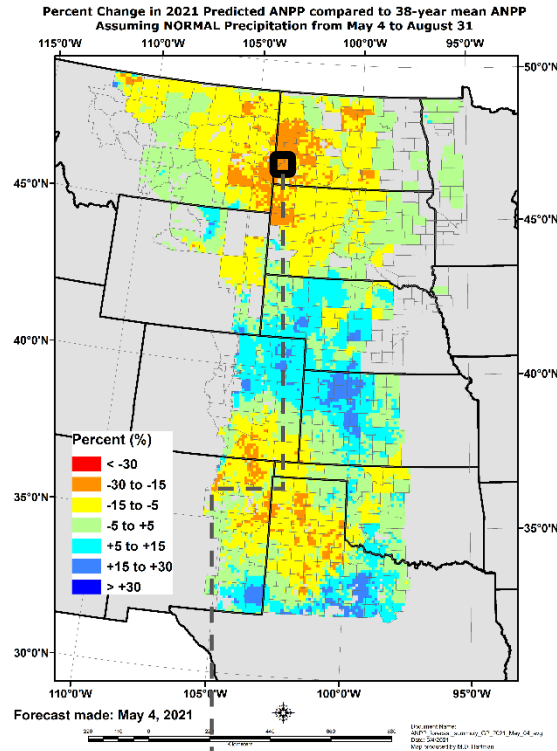
## Above-Normal



**Green:**

If precip is **above-normal**, we expect **5% less to 5% more** pounds per acre than the area's 38-year average.

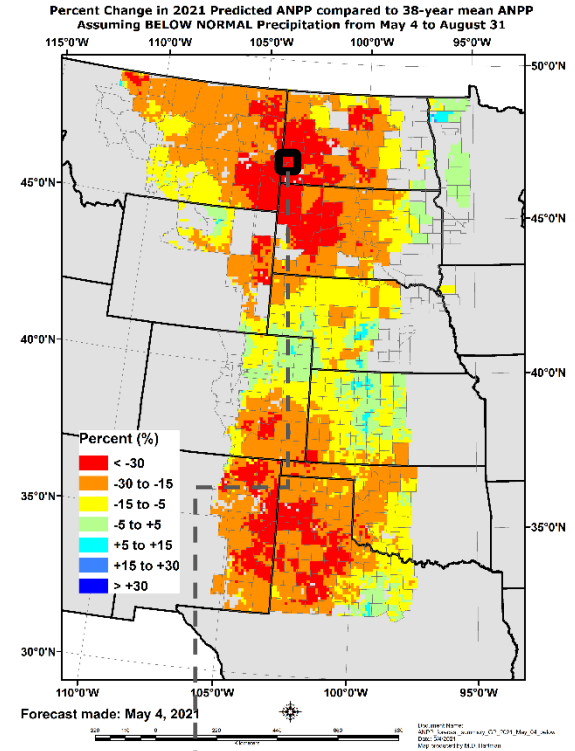
## Near-Norm



**Orange:**

If precip is **near-normal**, we expect **15% to 30% less** pounds per acre.

## Below-Norm



**Red:**

If precip is **below-normal**, we expect **30% less** pounds per acre **or worse**.

# More precise % estimates?

# Grassland Productivity Forecast

[Outlook](#)[Maps Archive](#)[Historical Data](#)[FAQ](#)[Quick Links](#)[Contact Us](#)

## Outlook

<https://grasscast.unl.edu>

Zoomable to 6-mile x 6-mile areas

Static Image

Zoomable

Select an area:

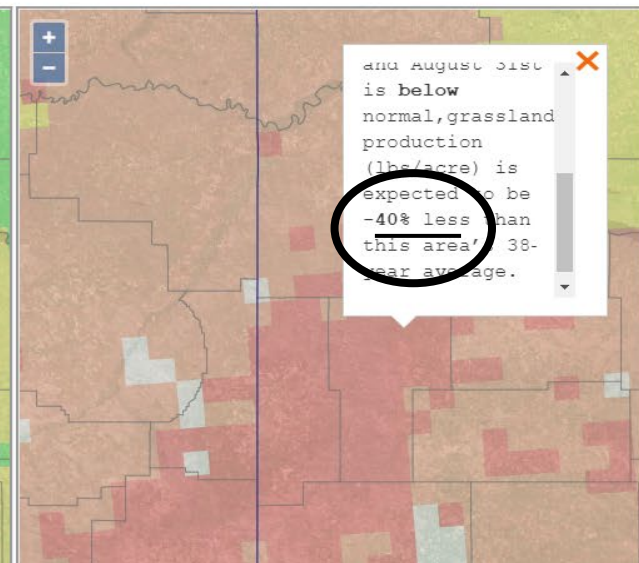
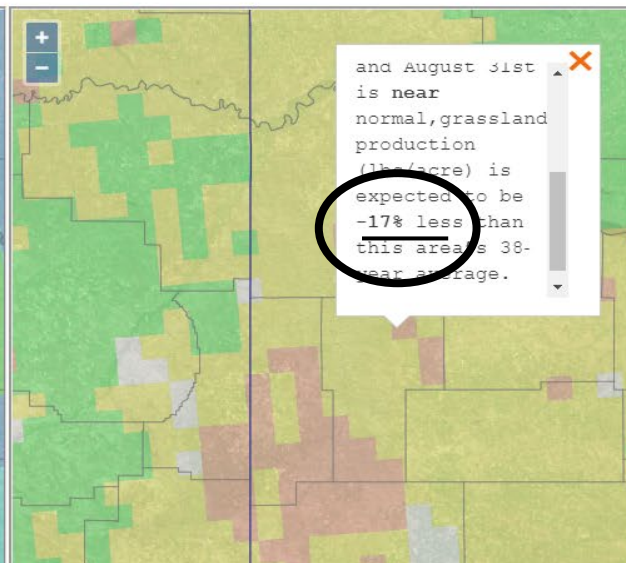
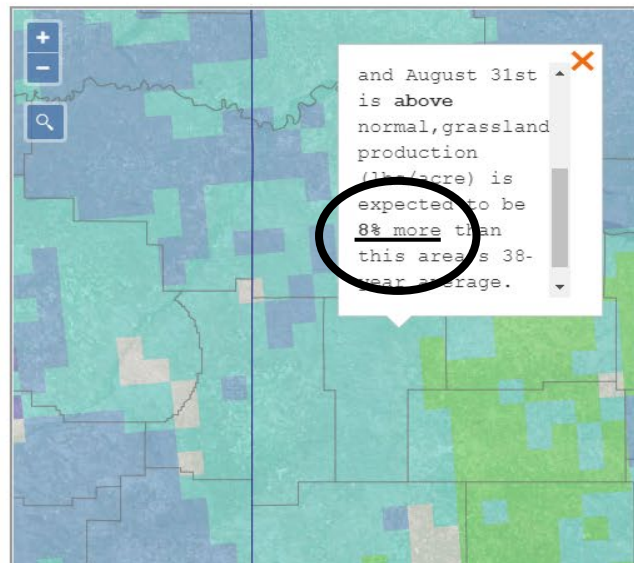
☒ Great Plains ☐ Southwest

### % Change in Grassland Production for Your Area this Summer Compared to Its 38-yr Average

% Change in 2021 Predicted ANPP compared to 1983-2020 mean ANPP Assuming ABOVE Normal Precipitation through August (%)

% Change in 2021 Predicted ANPP compared to 1983-2020 mean ANPP Assuming NEAR Normal Precipitation through August (%)

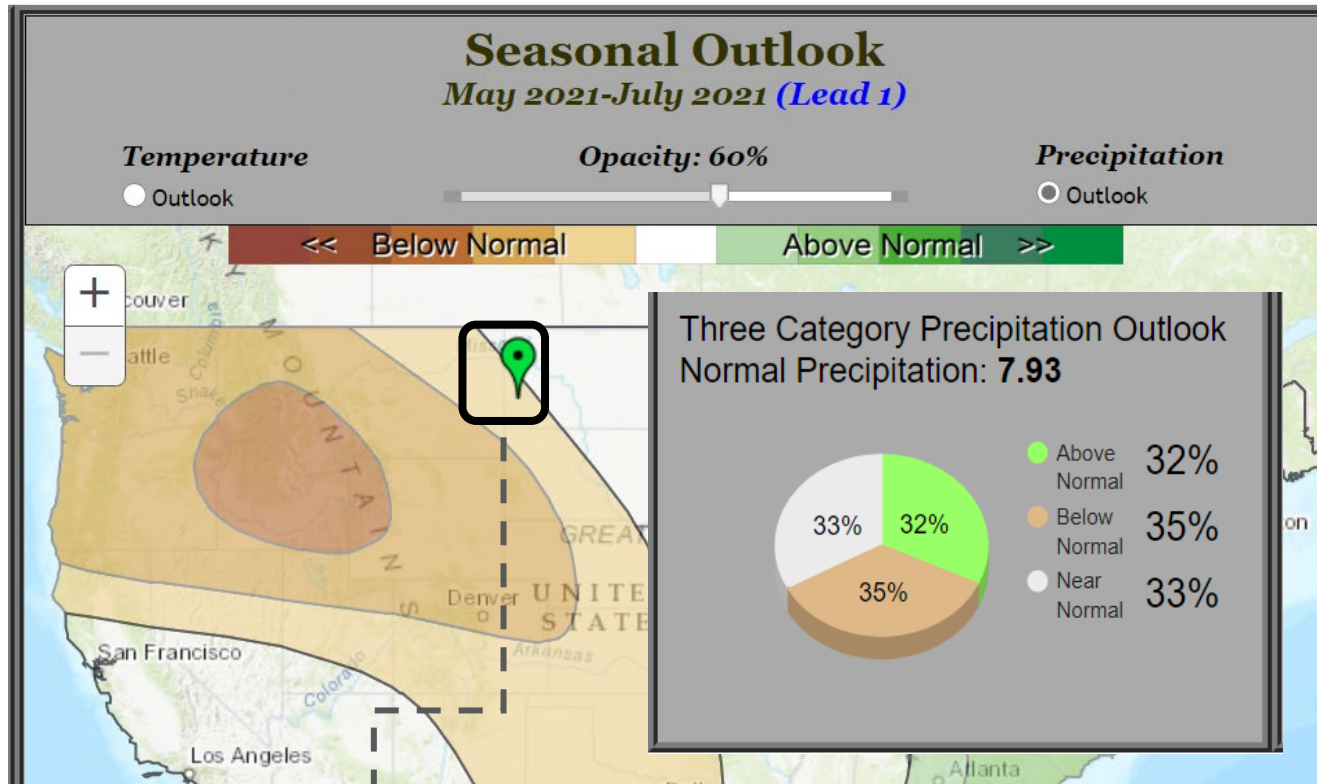
% Change in 2021 Predicted ANPP compared to 1983-2020 mean ANPP Assuming BELOW Normal Precipitation through August (%)



Which map or scenario is more likely?

# Which Scenario is Most Likely?

NOAA Climate Prediction Center (CPC) 90-Day Precipitation Outlook



**B = "Below Normal"**

NOAA's outlook is leaning slightly (~**35% chance**) towards **below**-normal precipitation through July 31.

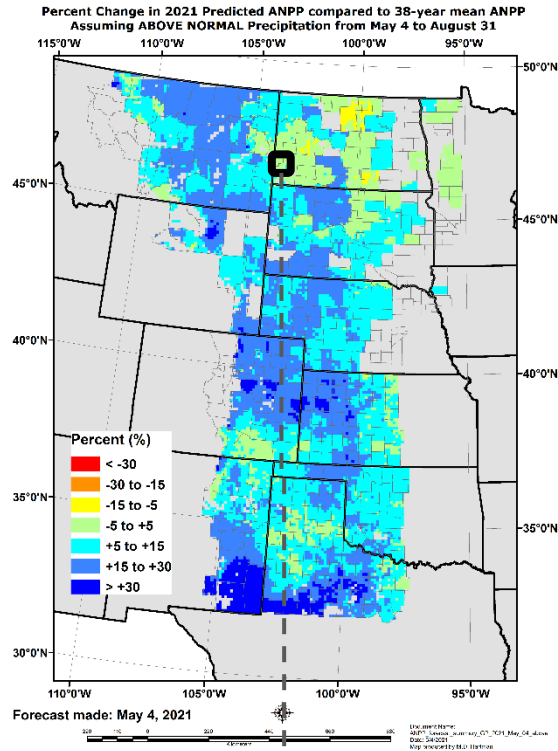
Still a **33%** chance of **near** & **32%** chance of **above**.



# May 5, 2021: “What if precip thru Aug is...”

(then updated every 2 weeks)

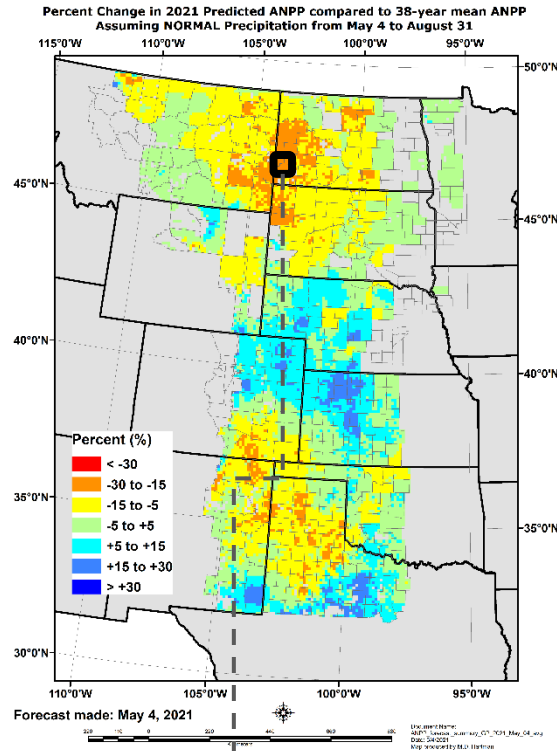
## Above-Normal



**Green:**

If precip is **above-normal**, we expect **5% less to 5% more** pounds per acre than the area's 38-year average.

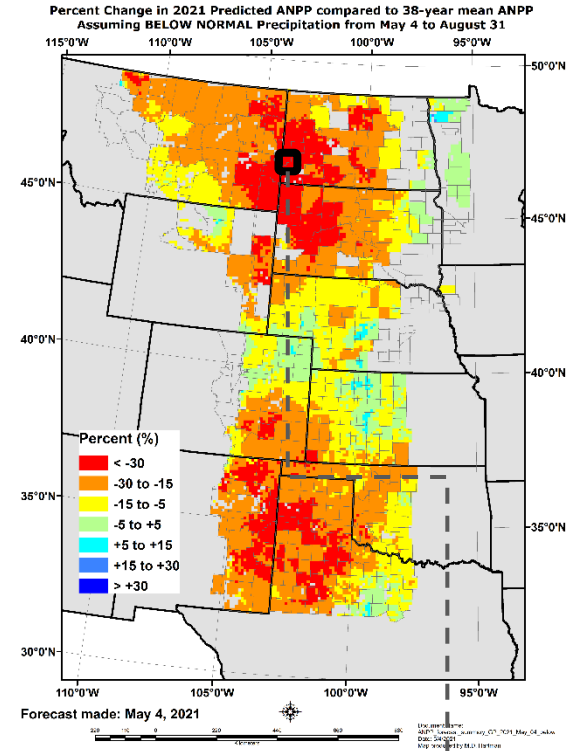
## Near-Norm



**Orange:**

If precip is **near-normal**, we expect **15% to 30% less** pounds per acre.

## Below-Norm



**Red:**

If precip is **below-normal**, we expect **30% less** pounds per acre **or worse**.

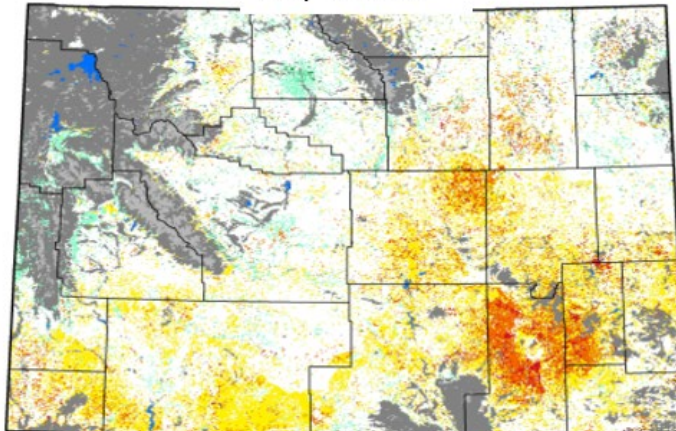
# Be sure to consider **OTHER** sources of information!

## VegDRI

### Vegetation Drought Response Index Rangelands: Wyoming

May 3, 2020

#### Vegetation Condition

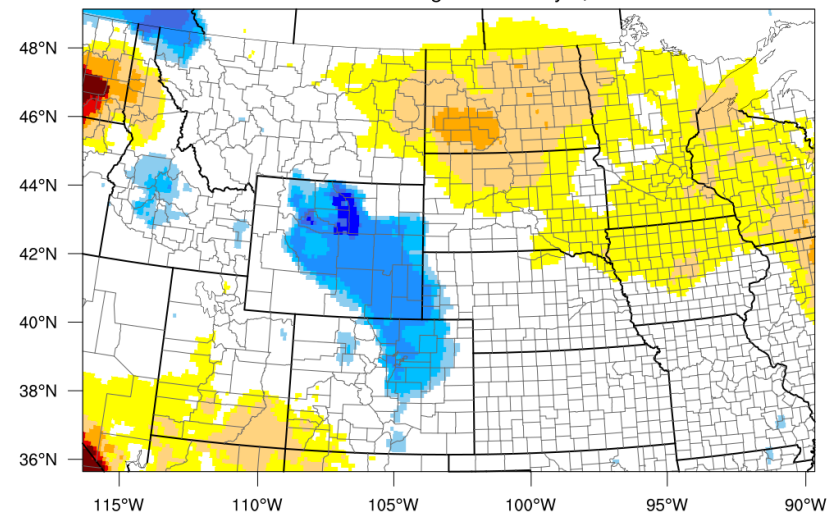


- Real-time conditions
- *Not* a forecast
- Greenness
- Quality



## EDDI

### 8-week EDDI categories for May 7, 2021



#### Drought categories



#### Wetness categories



100% 98% 95% 90% 80% 70% 30% 20% 10% 5% 2% 0%  
(EDDI-percentile category breaks: 100% = driest; 0% = wettest)

Generated by NOAA/ESRL/Physical Sciences Laboratory

<https://vegdrv.unl.edu/>

<https://psl.noaa.gov/eddi/>

Be sure to consider **YOUR** local context!





# Don't Misuse Grass-Cast

It's not a substitute  
for seeing rangeland  
conditions in  
person.

Don't use it as a sole  
source of info for:

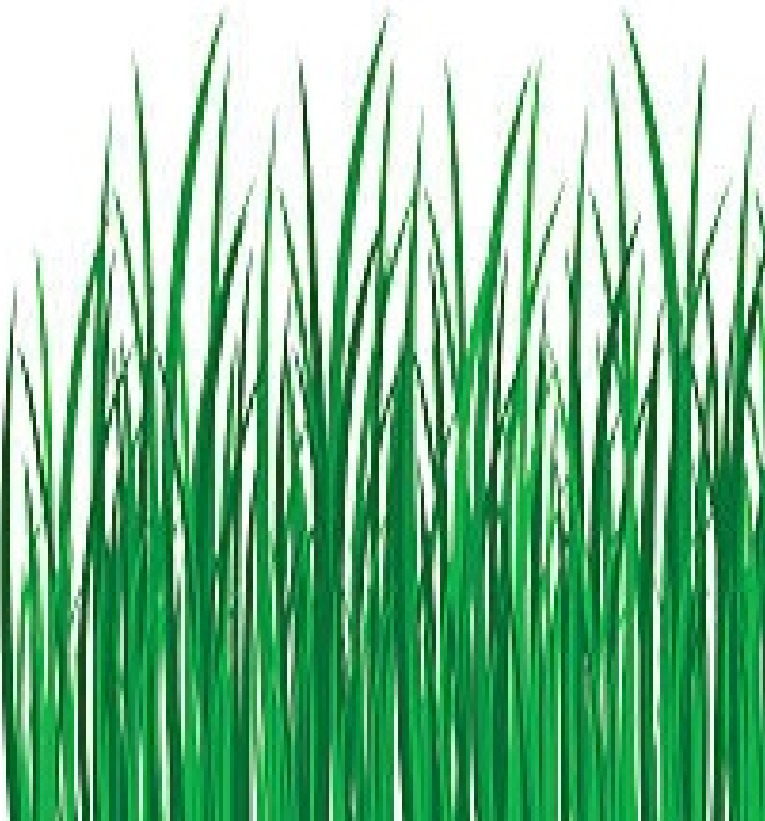
- Management Decisions
- Setting Stocking Rates
- Determining Turnout & Removal Dates
- Range Monitoring
- Grazing Losses
  - grazing loss (as a %) may be larger than total production % loss





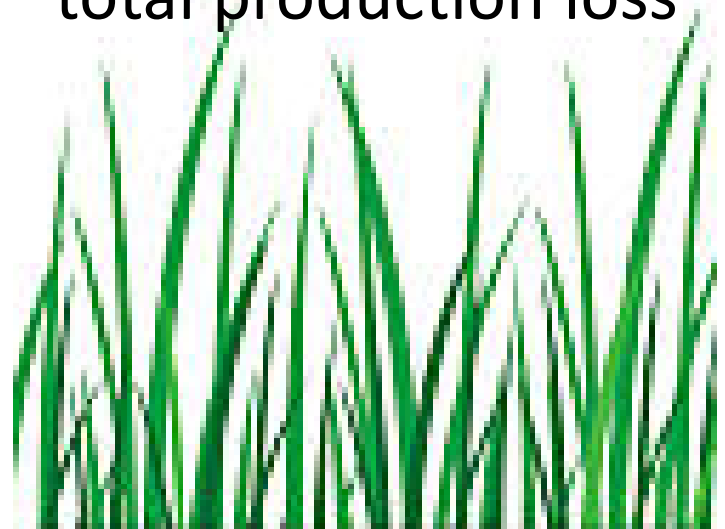
## Average Year

- **1000** pounds per acre
- Leave  $\frac{1}{2}$  → leave 500 lbs
- Take  $\frac{1}{2}$ , but half of it gets trampled, so you really get to take  $\frac{1}{4}$  = **250 lbs**



## Drought Year (30% less)

- **700** pounds per acre
- If leave 500 lbs...
- 200 lbs left to take, but half gets trampled, so you really get **100 lbs**
- 100 lbs vs. 250 lbs =
- A **60%** grazing loss
- Which is >> than a 30% total production loss




# To Learn More...

Grassland Production Forecast

Outlook Maps Archive Historical Data **FAQ** Quick Links Contact Us

## Outlook

- Grass-Cast Maps
- Maps Discussed
- About Our Maps
- Introductory Video**
- How to Read the Maps**
- Grass-Cast Handout
- Science Webinar Recording
- Acknowledgements
- Historical Productivity**
- Print PDF



The video player shows a landscape with the text 'GRASS-CAST' in large green letters. The title 'Grass-Cast: The Grassland Productivity Forecast' is at the top, and 'Watch later' and 'Share' buttons are in the top right corner. A play button is centered on the video frame.

<https://grasscast.unl.edu>

or type '**Grass-Cast**' into your favorite web browser





Filter By:

License

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OPEN DATA

Other Access

**DOI:**  
**10.15482/**  
**USDA.ADC/**  
**1521120**

## Grass-Cast Database - Data on aboveground net primary productivity (ANPP), climate data, NDVI, and cattle weight gain for Western U.S. rangelands



### NDVI

Annual NDVI growing season values for Grass-Cast sites. See readme for more...

MD5:

Explore Data

50.36 KB



### NDVI\_raw

Raw bimonthly NDVI values for Grass-Cast sites.

MD5:

Explore Data

1.16 MB



### Grass-Cast\_sitelist

This provides a list of sites-studies that are currently incorporated into...

MD5:

Explore Data

40.49 KB



### ANPP

Dataset for annual aboveground net primary productivity (ANPP). Excel sheet...

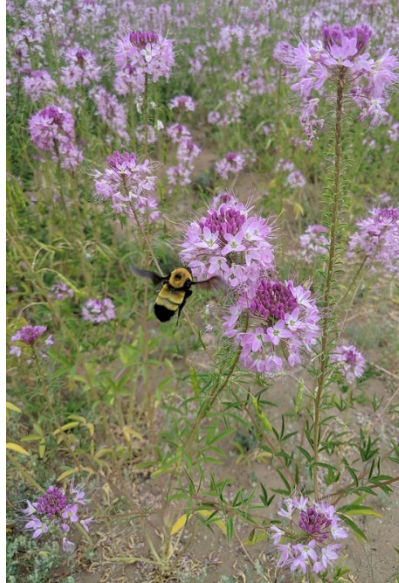
MD5:

Explore Data

302.8 KB

**<https://go.usa.gov/xHH82>**

# How can Grass-Cast help inform **YOUR** decisions?







Northern Plains Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

# Thanks for your time!

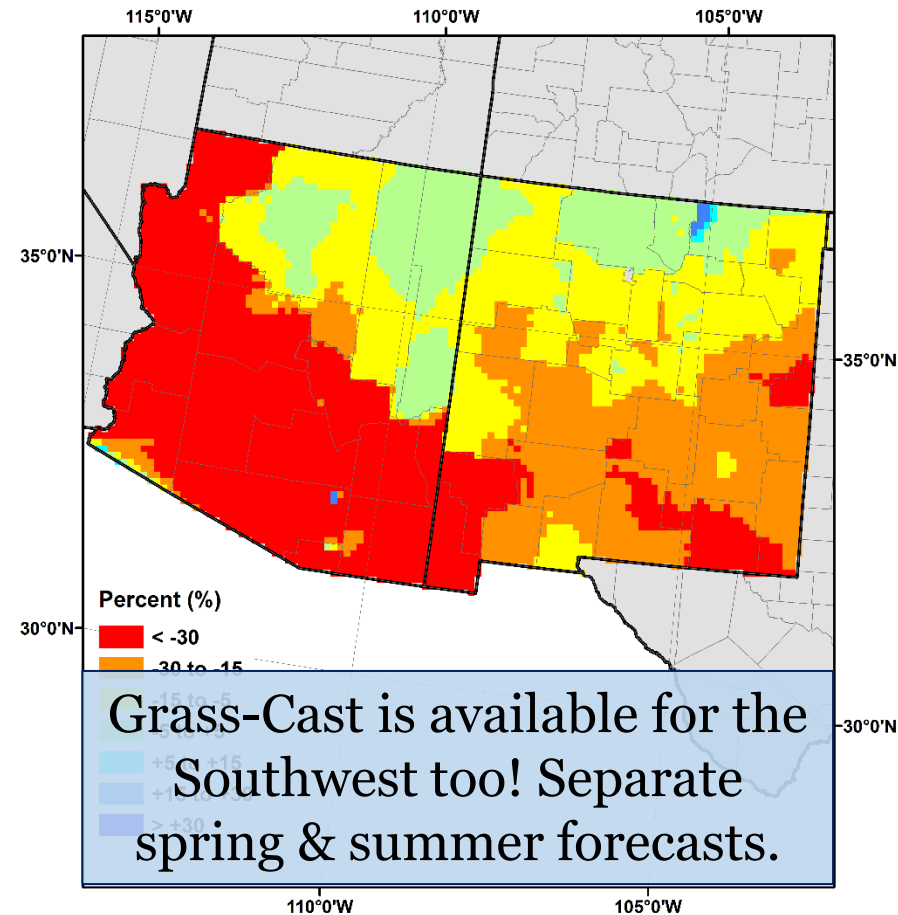
Developed by:



Funded by:



*Grass-Cast team contact:*  
[dannele.peck@usda.gov](mailto:dannele.peck@usda.gov)



<https://grasscast.unl.edu>