Multivariate Analysis of Drought Conditions in the United States: 1895-2016

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Atlanta, GA
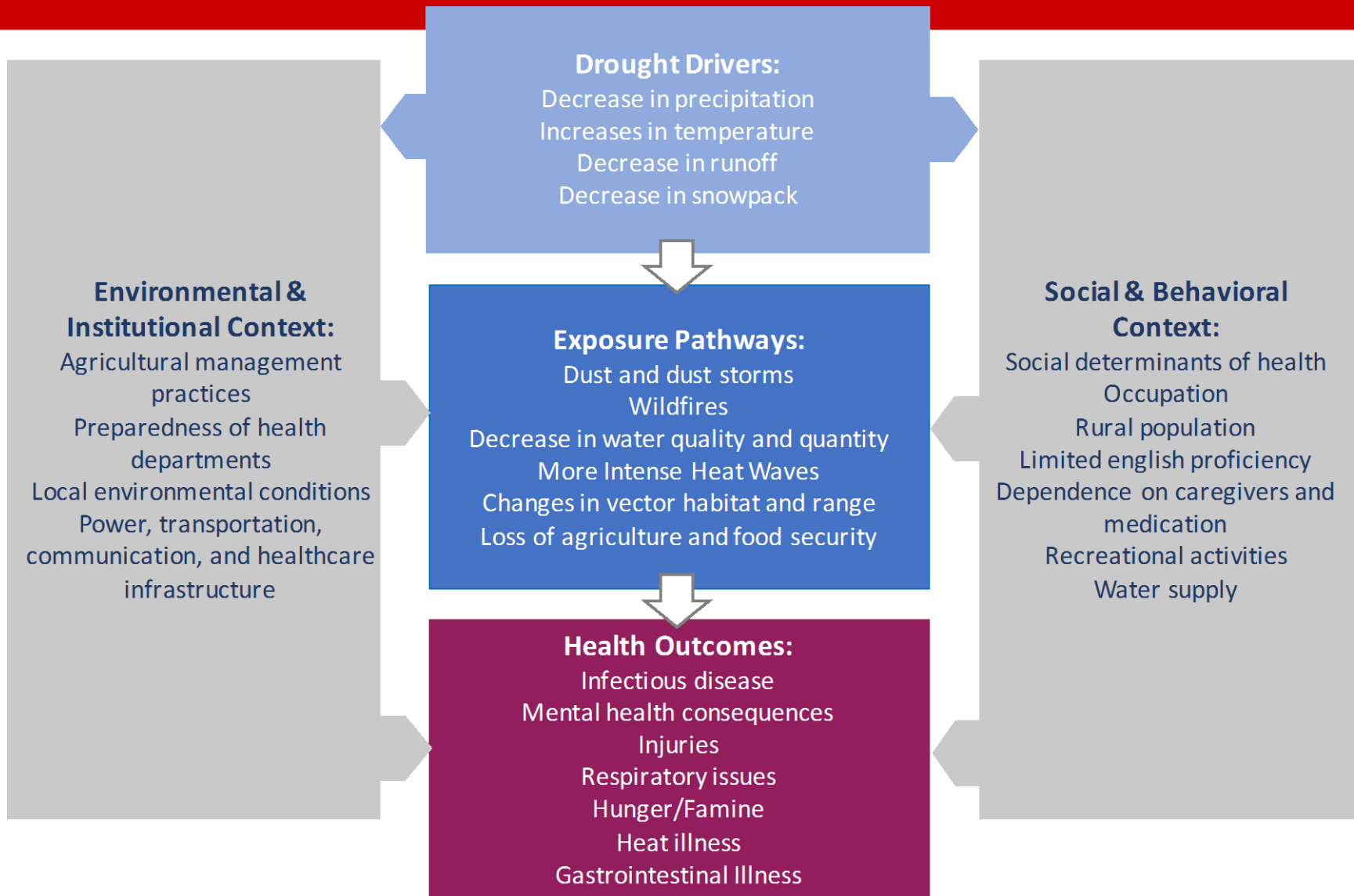
Drought Impacts

- Environmental Impacts
  - Agricultural production
  - Air quality
  - Wildfires
- Health Impacts
  - Quantity and quality of water
  - Food and nutrition
  - Illness and disease

Pathway Between Drought and Health

Drought Drivers:
Decrease in precipitation
Increases in temperature
Decrease in runoff
Decrease in snowpack

Environmental & Institutional Context:
Agricultural management practices
Preparedness of health departments
Local environmental conditions
Power, transportation, communication, and healthcare infrastructure

Exposure Pathways:
Dust and dust storms
Wildfires
Decrease in water quality and quantity
More Intense Heat Waves
Changes in vector habitat and range
Loss of agriculture and food security

Social & Behavioral Context:
Social determinants of health
Occupation
Rural population
Limited english proficiency
Dependence on caregivers and medication
Recreational activities
Water supply

Health Outcomes:
Infectious disease
Mental health consequences
Injuries
Respiratory issues
Hunger/Famine
Heat illness
Gastrointestinal Illness

Drought Data at NCEI

- Palmer Drought Severity Index *(PDSI)*
  - Palmer 1965
- Standard Precipitation Index *(SPI)*
  - McKee et al. 1995
- Standard Precipitation Evapotranspiration Index *(SPEI)*
  - Vincente-Serrano et al. 2010
- United States Drought Monitor *(USDM)*
  - Svoboda et al. 2002

U.S. Climatological Divisions

	Spatial Scale	Temporal Scale	Period of Record
PDSI	Climate Division	Monthly	1895-Present
SPI	5 km Grid	Monthly	1895-Present
SPEI	5 km Grid	Monthly	1895-Present
USDM	Sub-County	Weekly	2000-Present
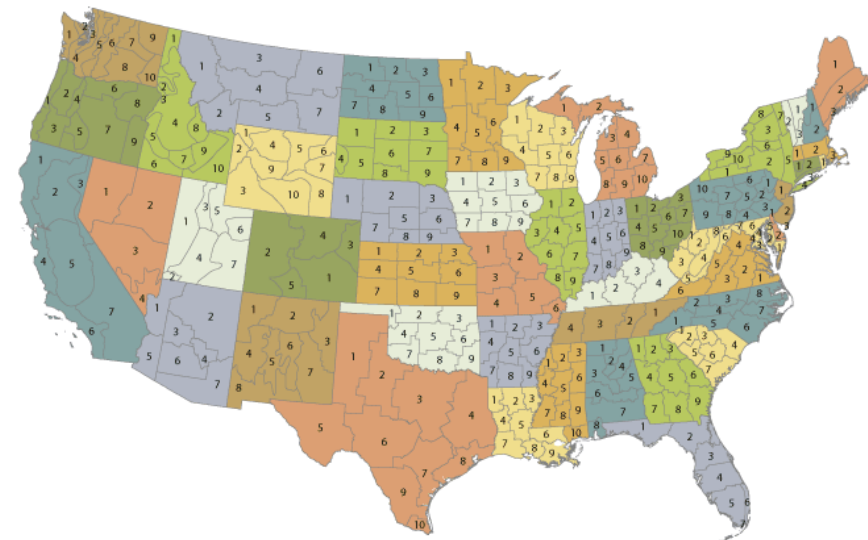
Methodology

Goal #1: Develop a consistent approach to evaluate drought data at the *county level* for CONUS

	Spatial Scale	Temporal Scale	POR	Methodology	Result Scale
PDSI	Climate Division	Monthly	1895-Present	Areal Average	County
SPI	5 km Grid	Monthly	1895-Present	Grid point Average	County
SPEI	5 km Grid	Monthly	1895-Present	Grid point Average	County
USDM	Sub-County	Weekly	2000-Present	None	County

Methodology

Goal #1: Develop a consistent approach to organize drought data at the *county level* for CONUS

CONUS pdsi 2016 12

ncics.org
ncsu.edu
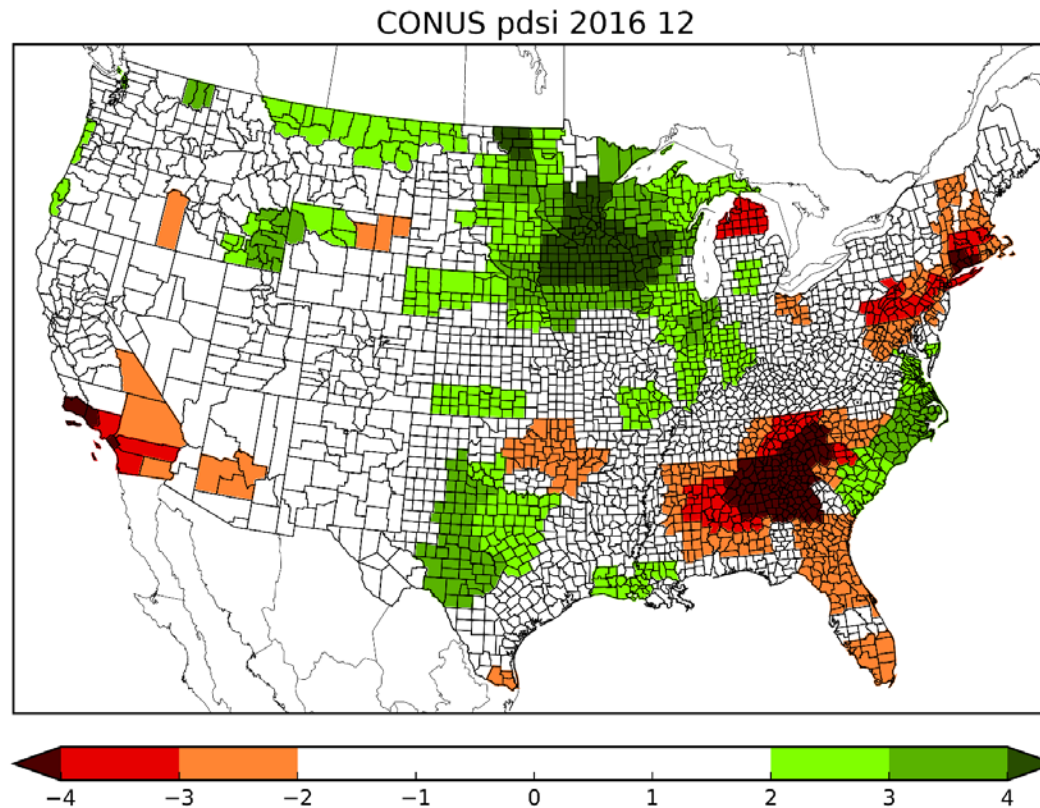
Methodology

Goal #2: Provide statistical measures to help understand drought severity and its potential impacts.

- Percentiles
  - Number of months a county experiences extreme drought
  - 10th and 01st Percentiles
- Trends
  - Overview of drought severity over time
  - 1895-2016
  - 1950-2016
  - 1980-2016
  - 2000-2016
- Exposure
  - Help assess vulnerability
  - Luh et al. 2015

$$County\ exposure\ (E)\ score\ =\ a\ +\ \frac{(X - X_{min}) \times (b\ -\ a)}{(X_{max} - X_{min})}$$

RESULTS

Monthly Value of PDSI for July 2016

PDSI Value
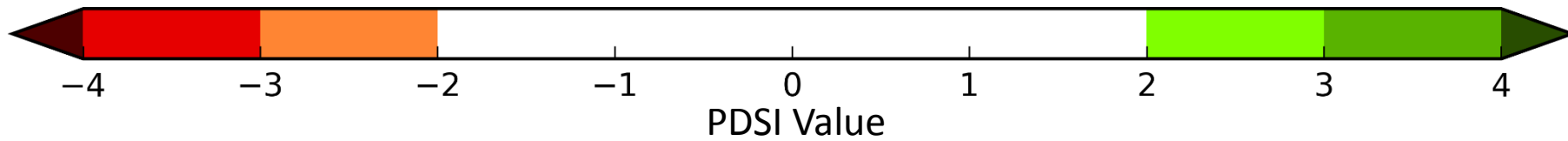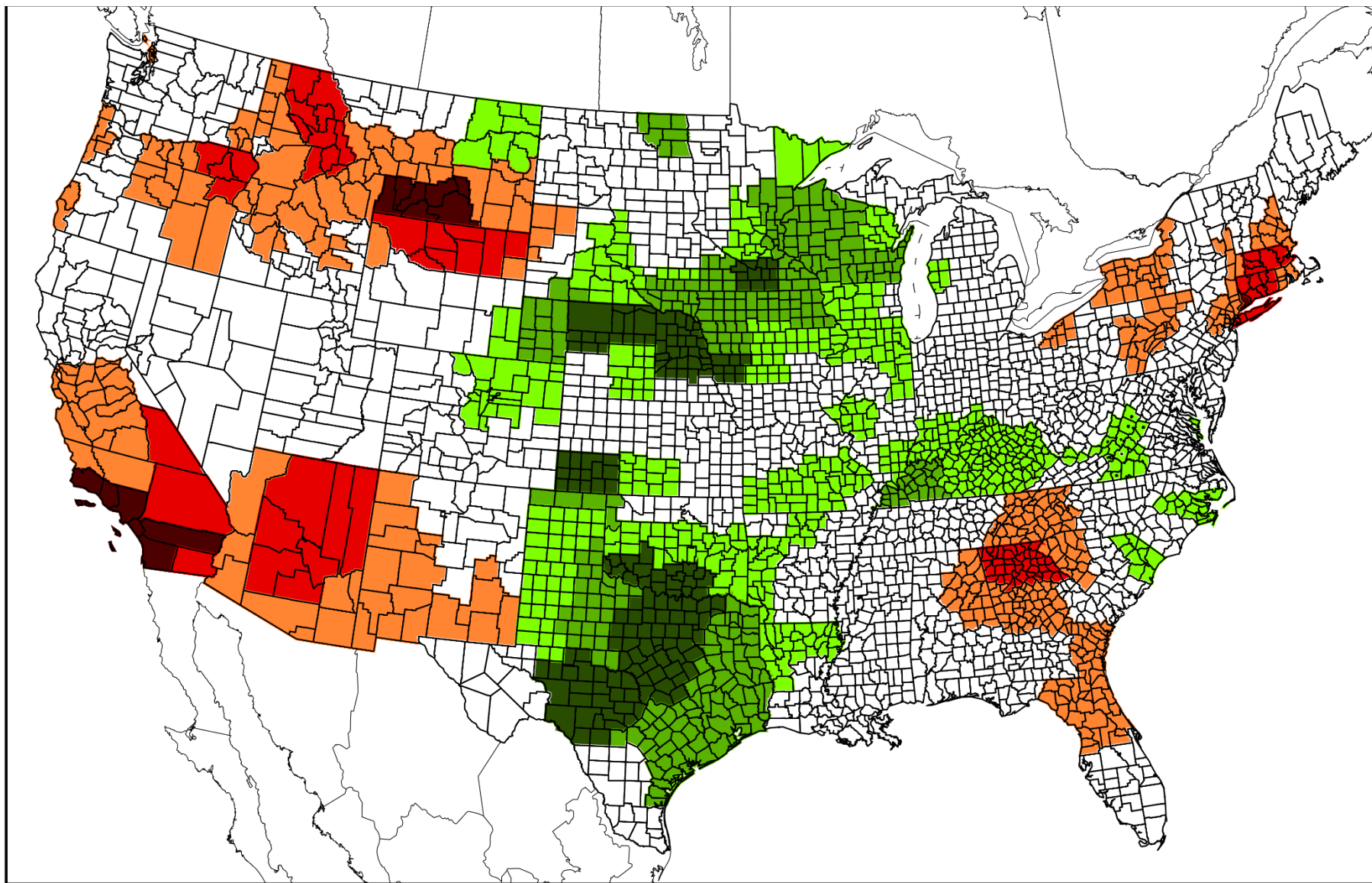
Monthly Value of SPI for July 2016

SPI Value
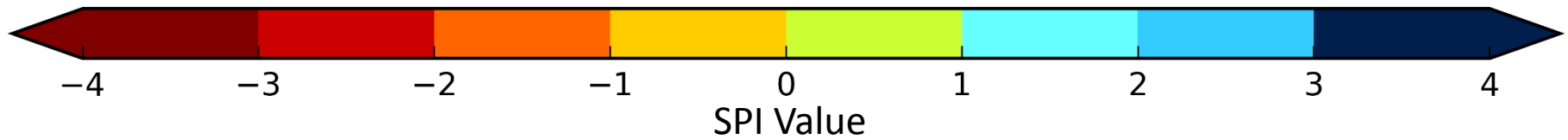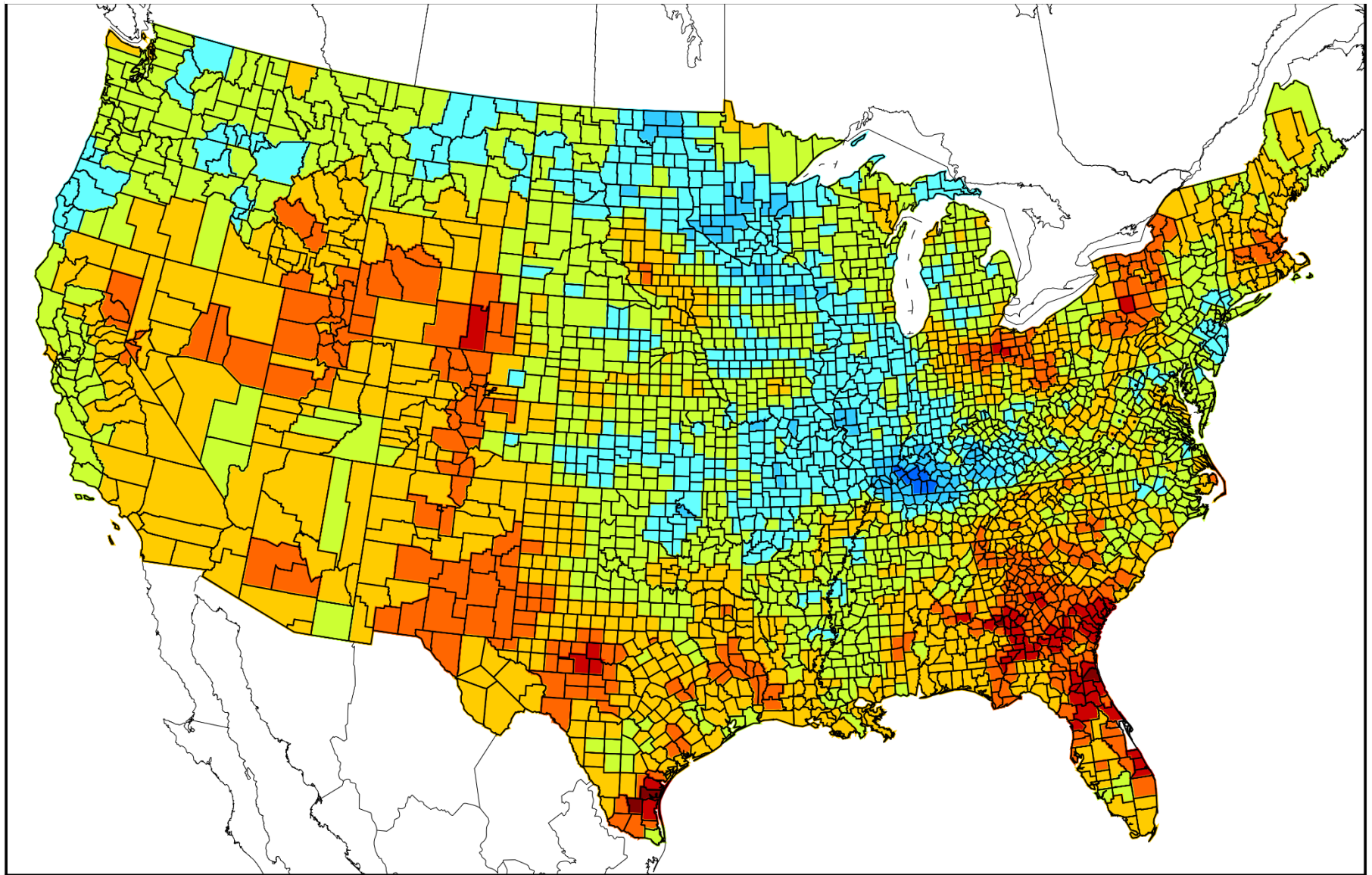
Monthly Value of SPEI for July 2016
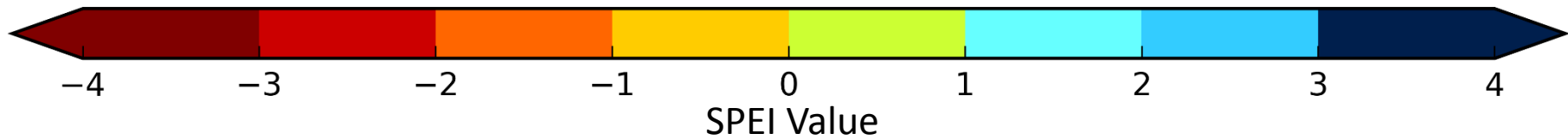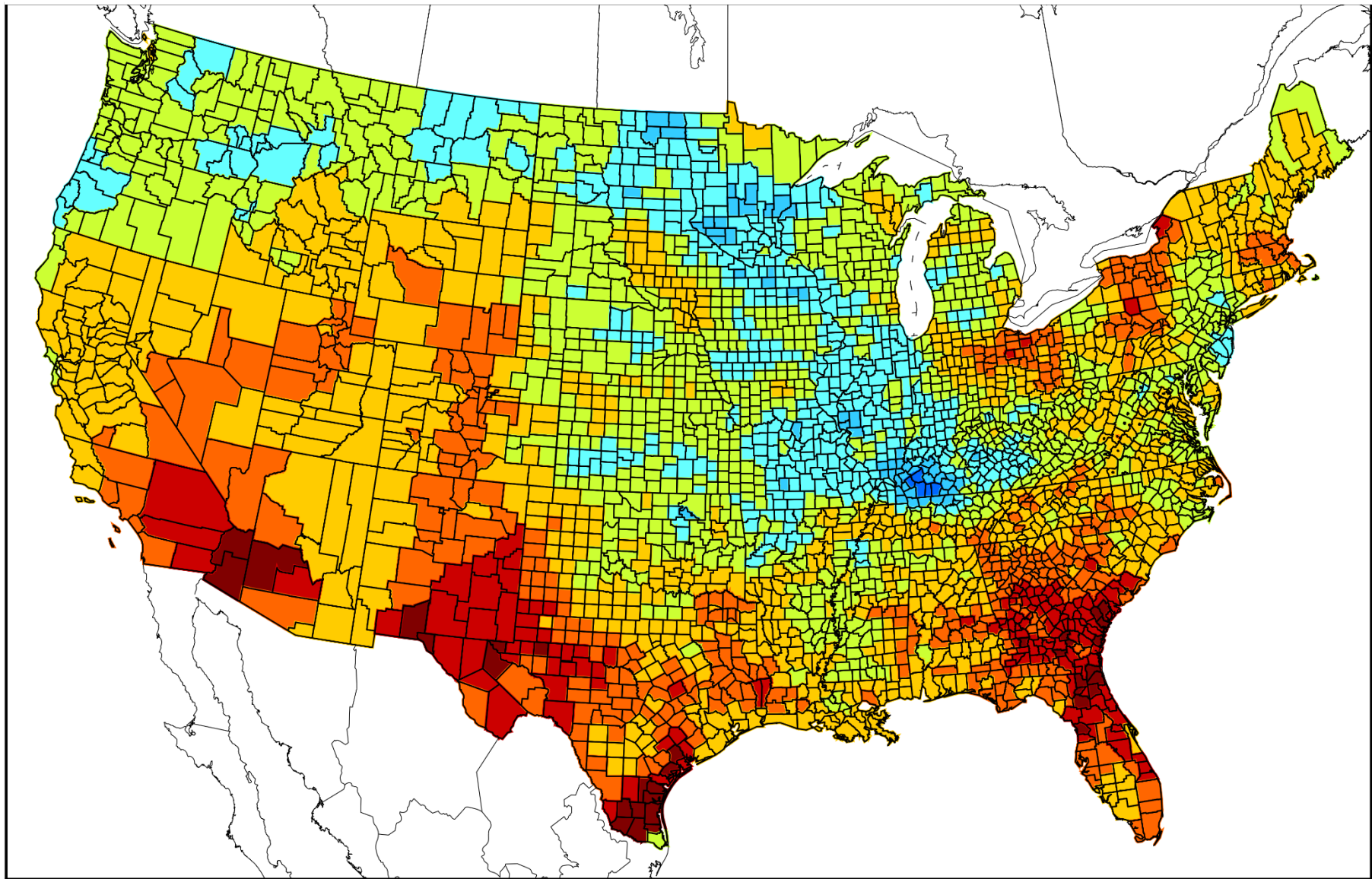
Weekly Value of SPEI for July 19th 2016
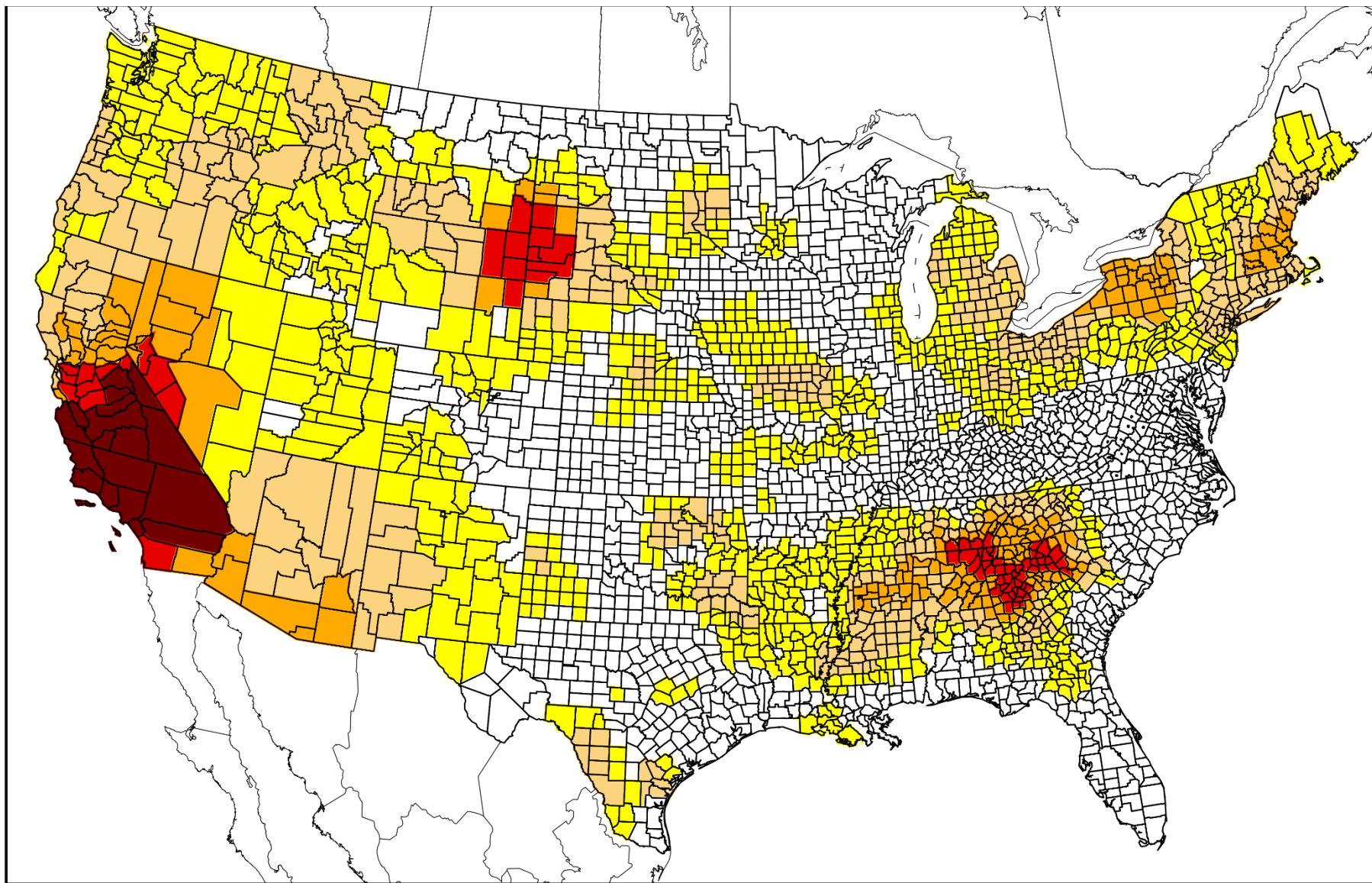
USDM Category

0   1   2   3   4

Months Since 1895 Where spi Lower than 10th Percentile
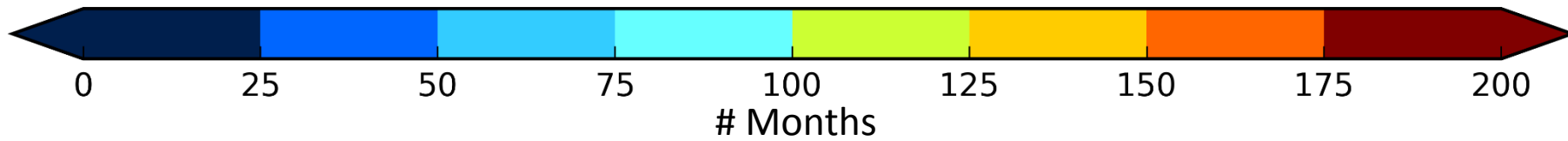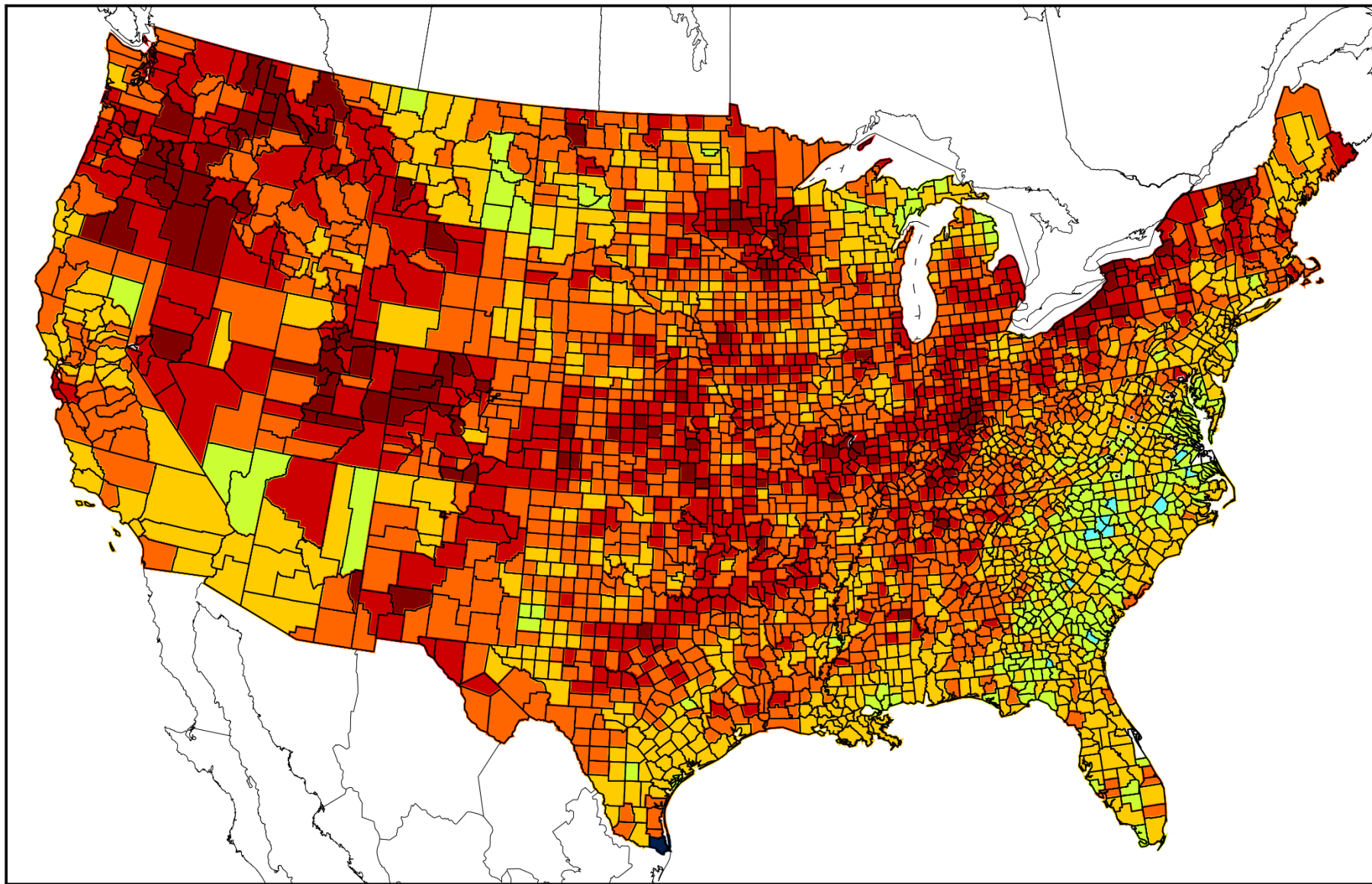
Months

Months Since 1895 Where spi Lower than 01st Percentile
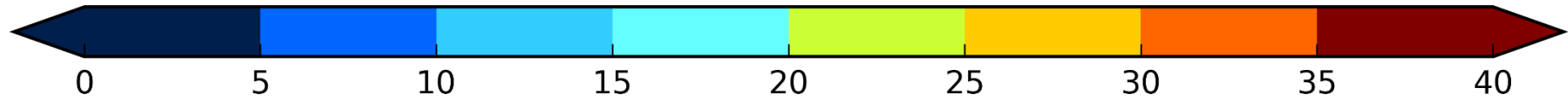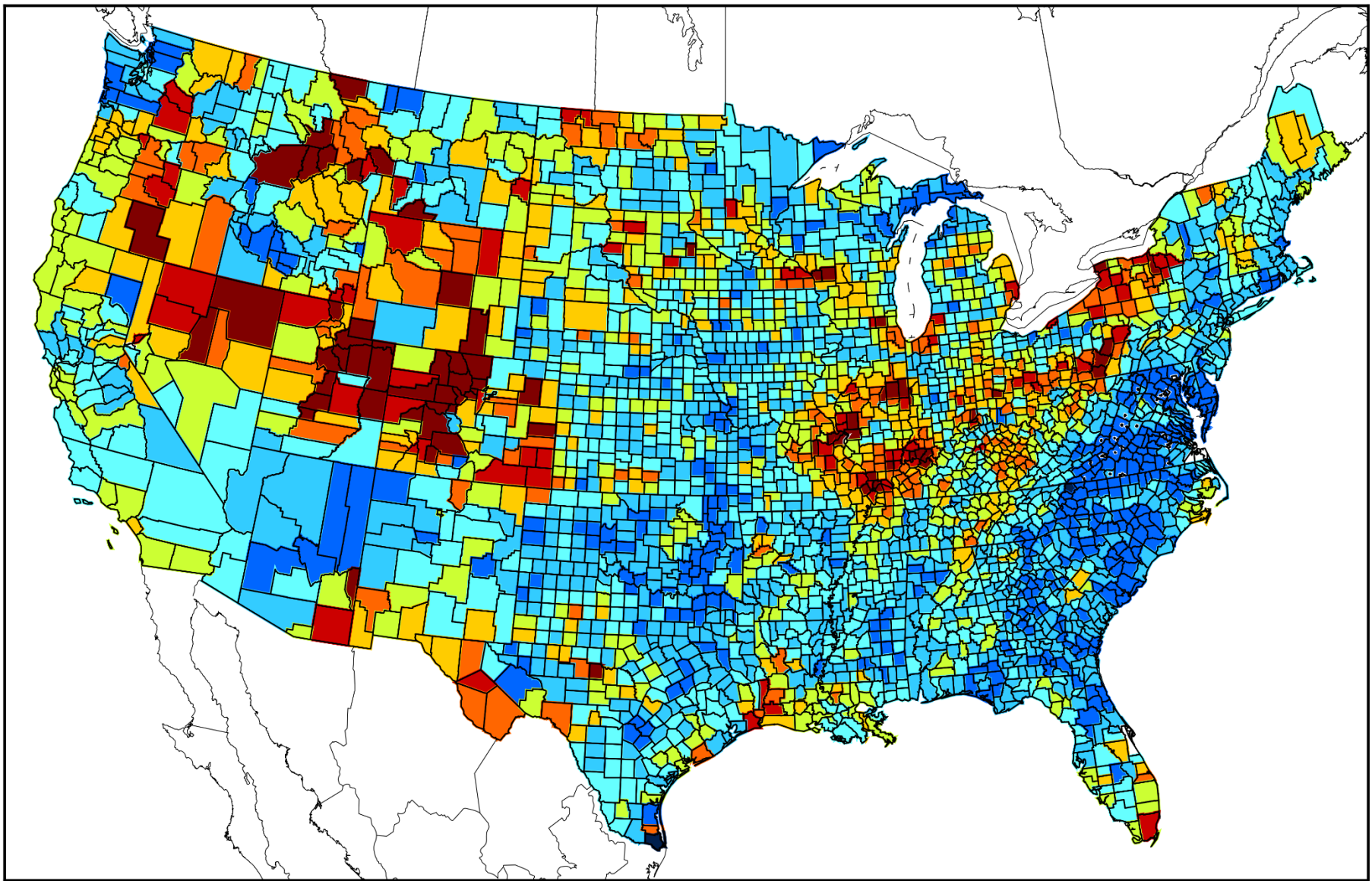
Months

spei Mann-Kendal Trend: 1895-2015
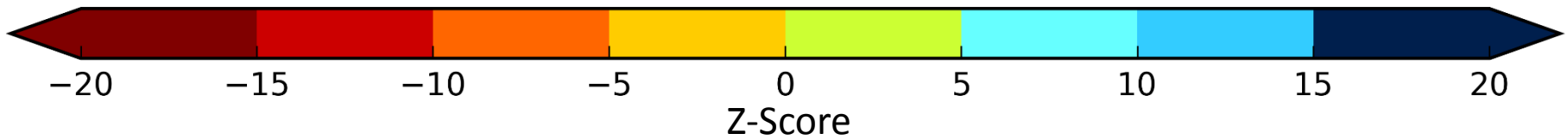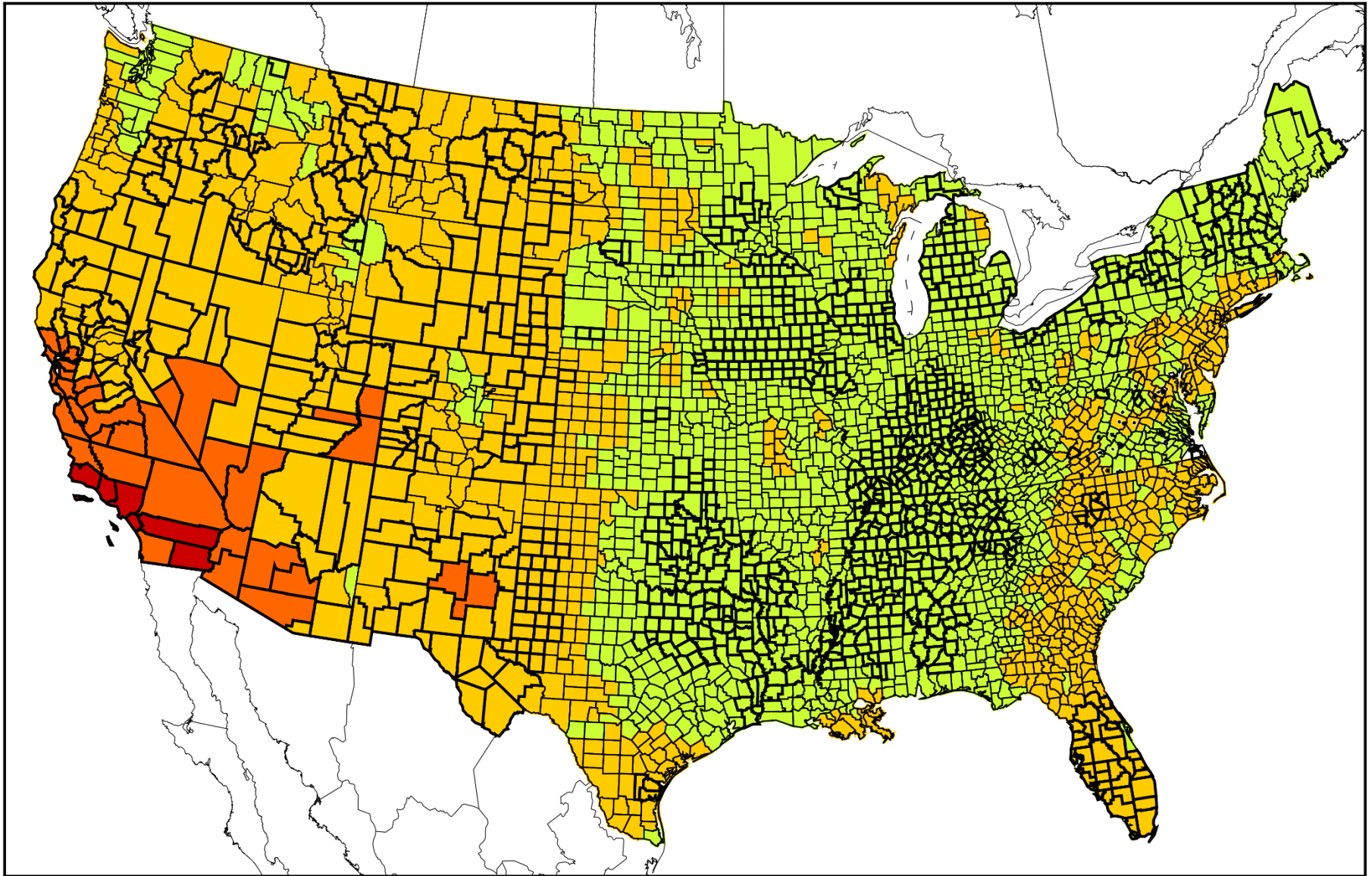
spei Mann-Kendal Trend: 1980-2015
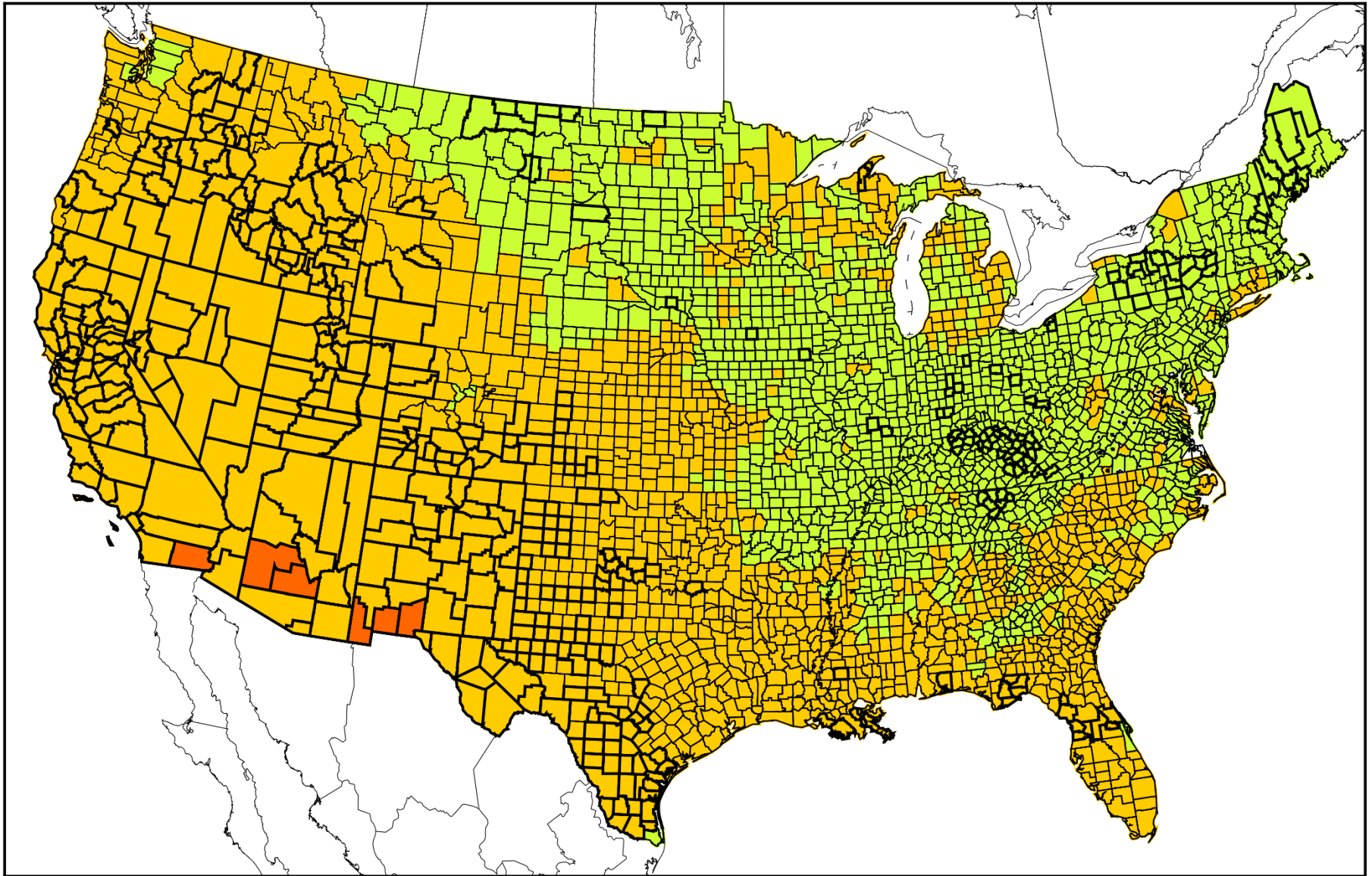
pdsi Exposure Index
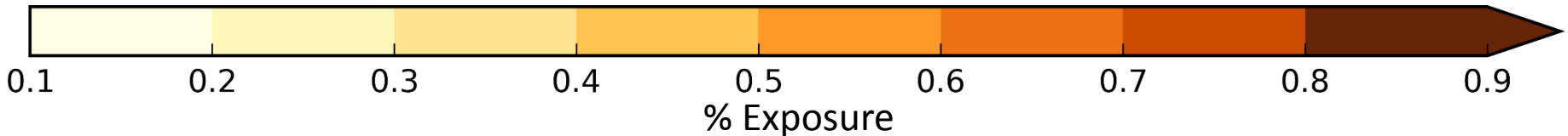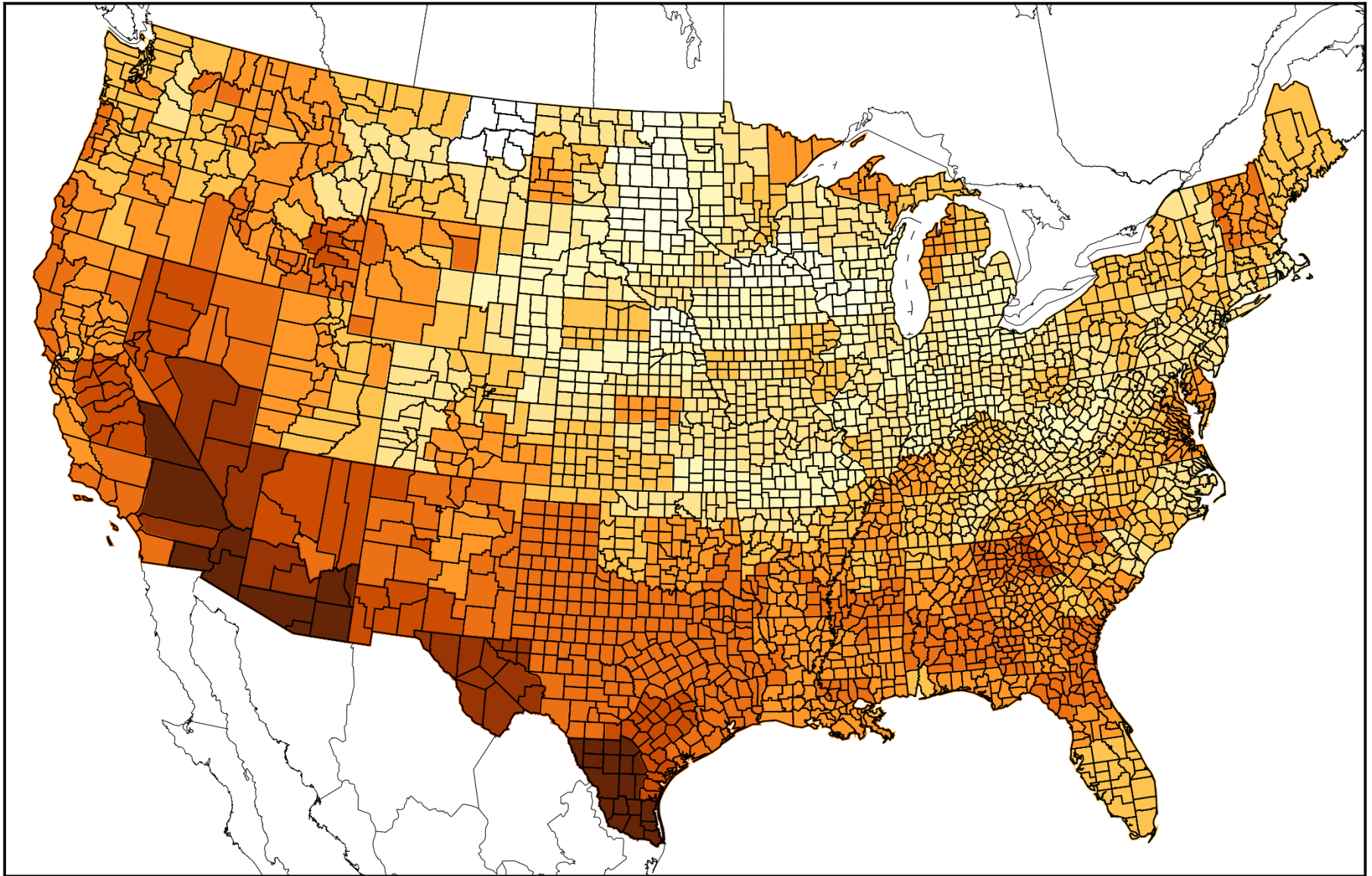
Drought Data on CDC's Website

- Data released on CDC Health portal on March 14th, 2017: https://ephtracking.cdc.gov/

THANK YOU!

https://ephtracking.cdc.gov/

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