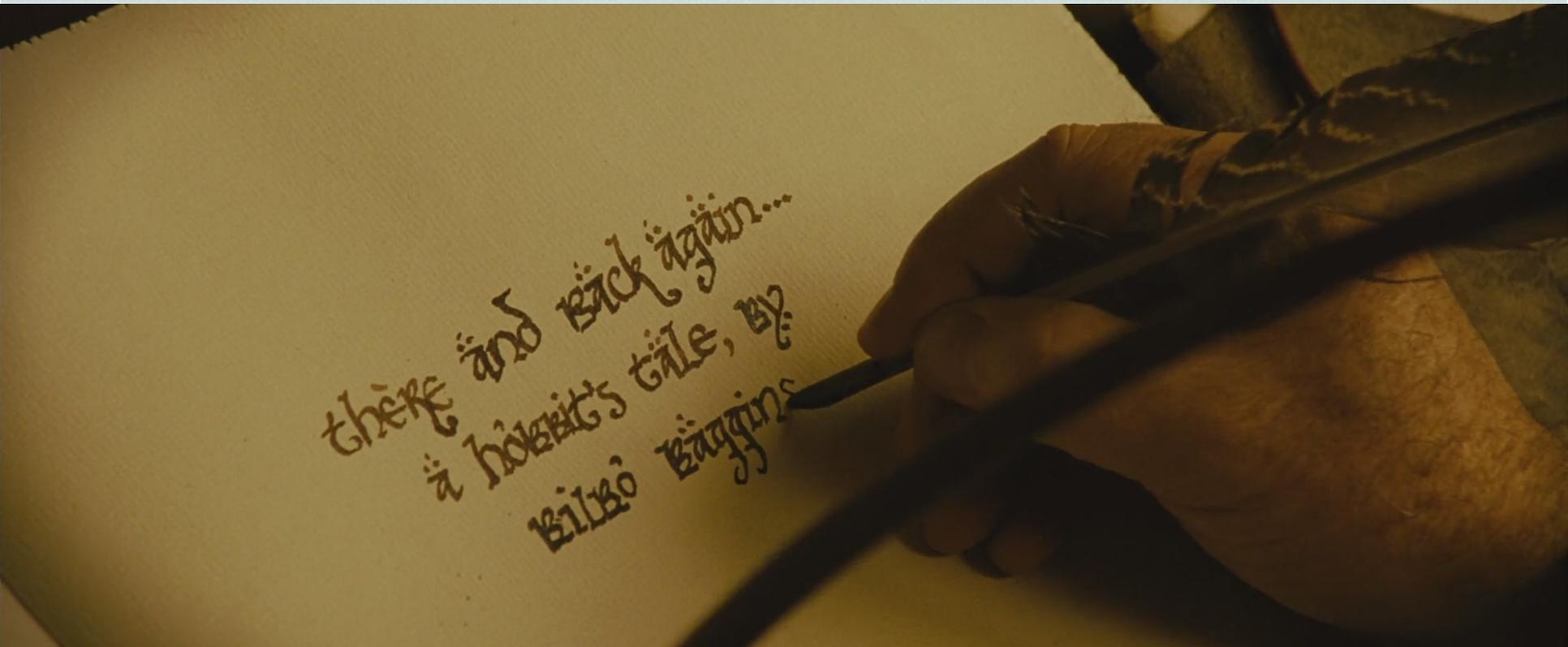


Dipole Events

Historical Shifts from Dry to Wet

Mark Shafer
University of Oklahoma
Norman, OK

The Journey into Drought



What is a Dipole?

A pair of equal and opposite electric charges or magnetic poles of opposite sign separated especially by a small distance

An abrupt year-to-year transition from drought to flood (pluvial)

Able to erase multi-year droughts in a matter of months

Based on the work of Jordan and Katy Christian & Jeff Basara, University of Oklahoma.

Christian, J., K. Christian, and J. Basara (2015). Drought and Pluvial Dipole Events within the Great Plains of the United States. *Journal of Applied Meteorology and Climatology*, **54**, 1886-1898.

Defining Dipole Events

Years were categorized as:

- Drought: 90% of normal or less
- Pluvial: 110% of normal or greater
- Normal: 90-110%

Year-to-Year changes from drought to pluvial were identified

Also looked at large inter-annual changes, regardless of phase

- From very dry to less dry
- From near-normal to very wet

Study Area

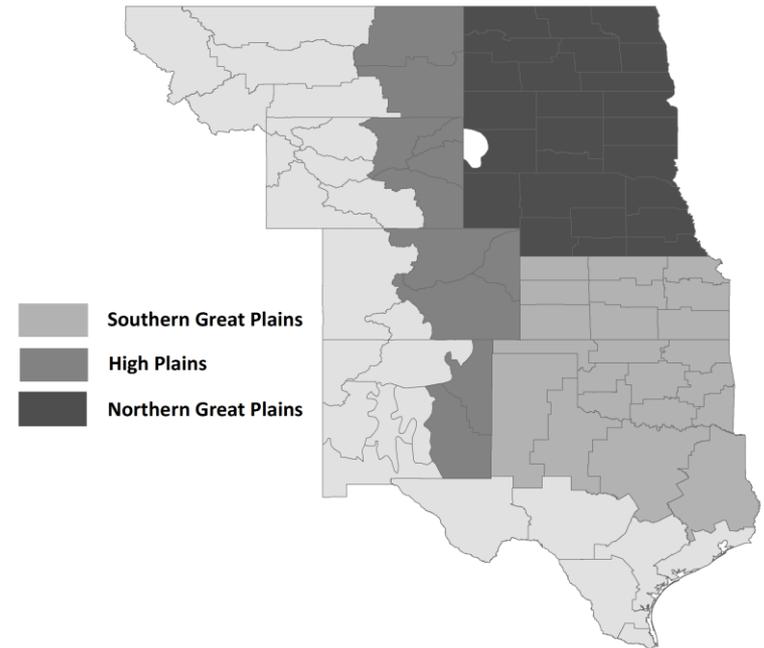
3 regions with different climate characteristics

- Southern Great Plains (SGP)
- Northern Great Plains (NGP)
- High Plains (HP)

Probability of a significant drought year followed by a pluvial year:

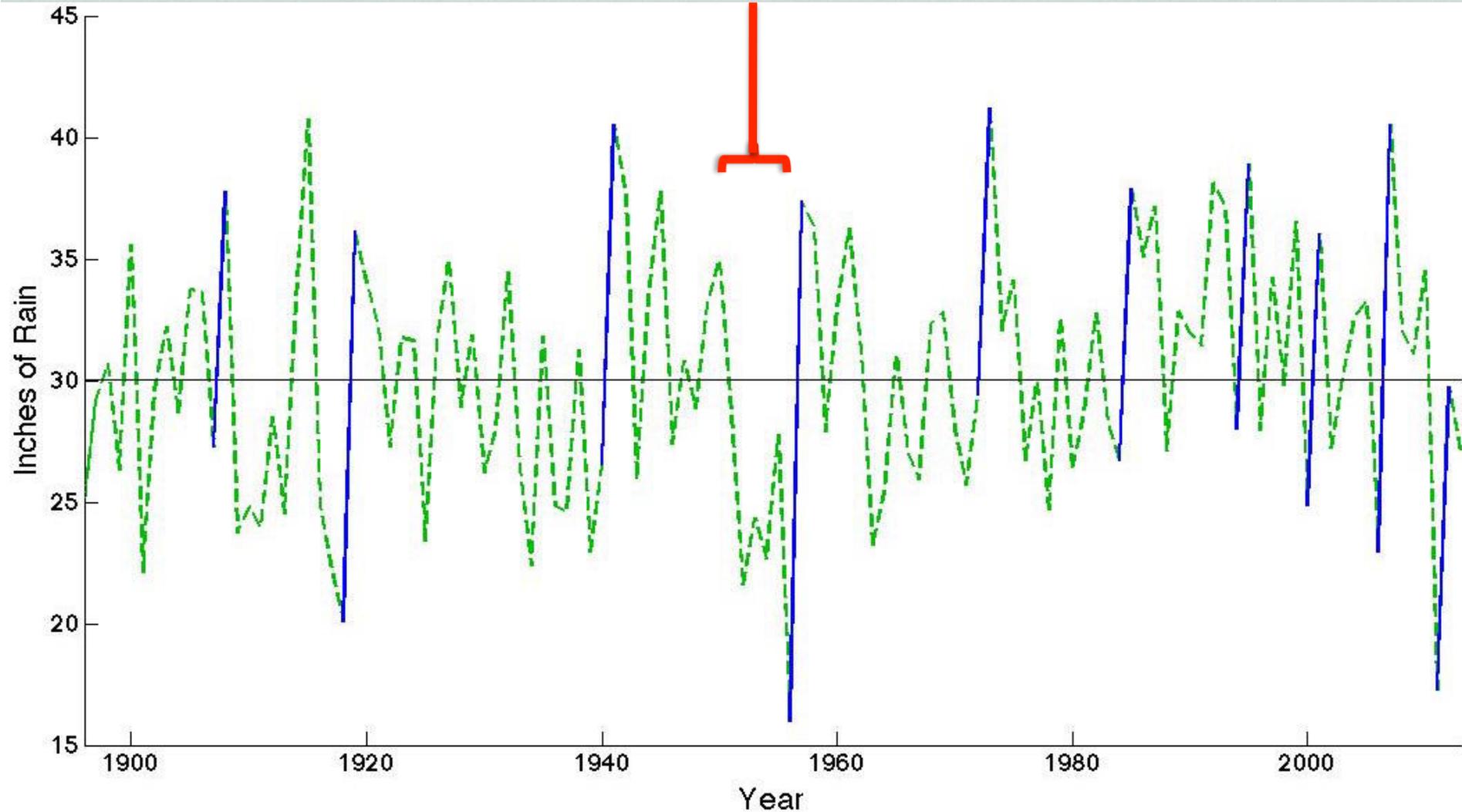
- SGP: 25%
- NGP: 25%
- HP: 16%

Climate Divisions within the Southern Great Plains, High Plains, and Northern Great Plains

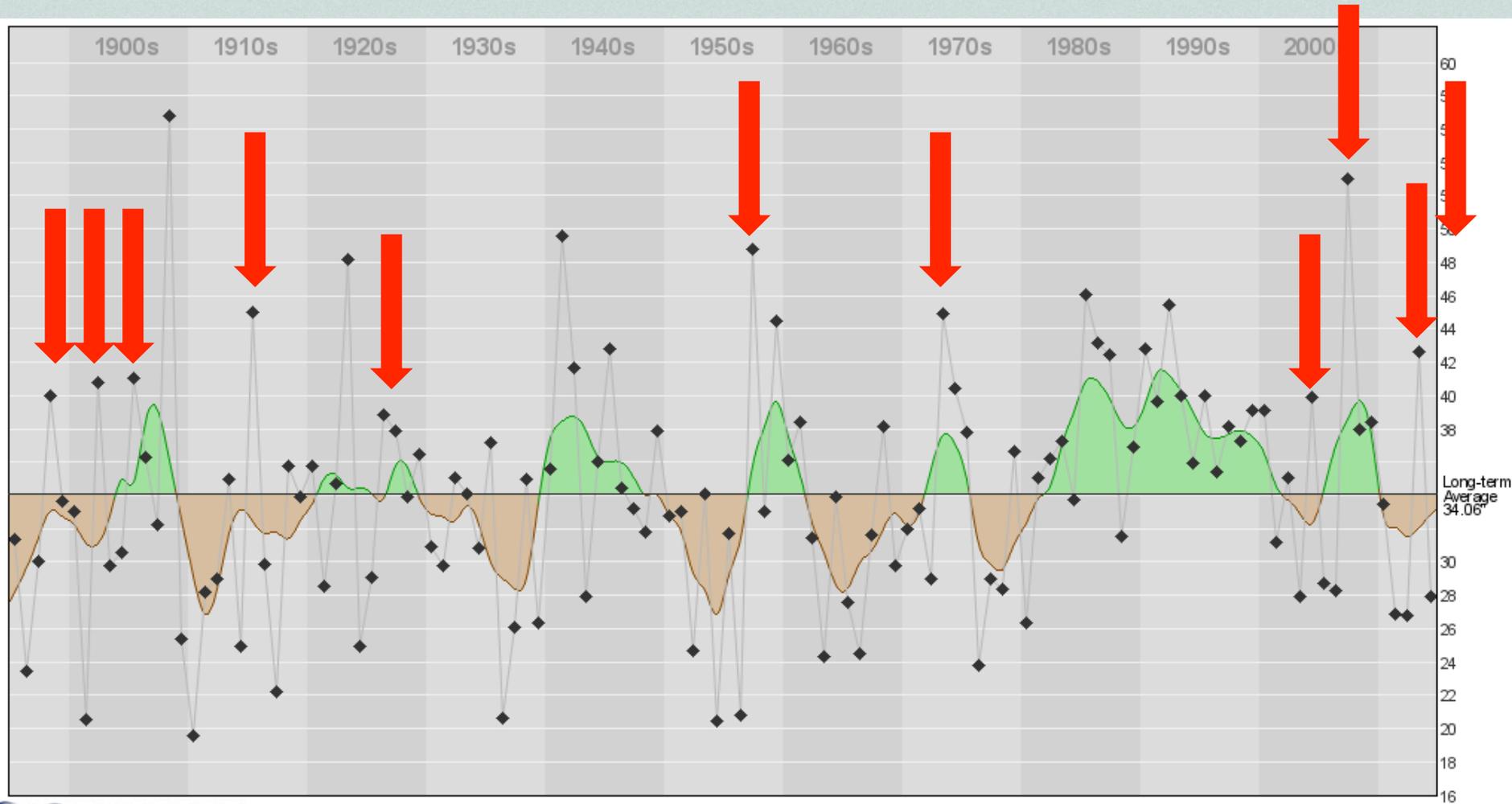


Notable Occurrences in SGP

Drought of Record



Historical Dipoles in Central Oklahoma



OKLAHOMA CLIMATOLOGICAL SURVEY Annual Precipitation History with 5-year Tendencies OK-CD5 (5-Central): 1895-2014

Wetter periods Drier periods
◆ Annual precipitation value

When Does It Happen?

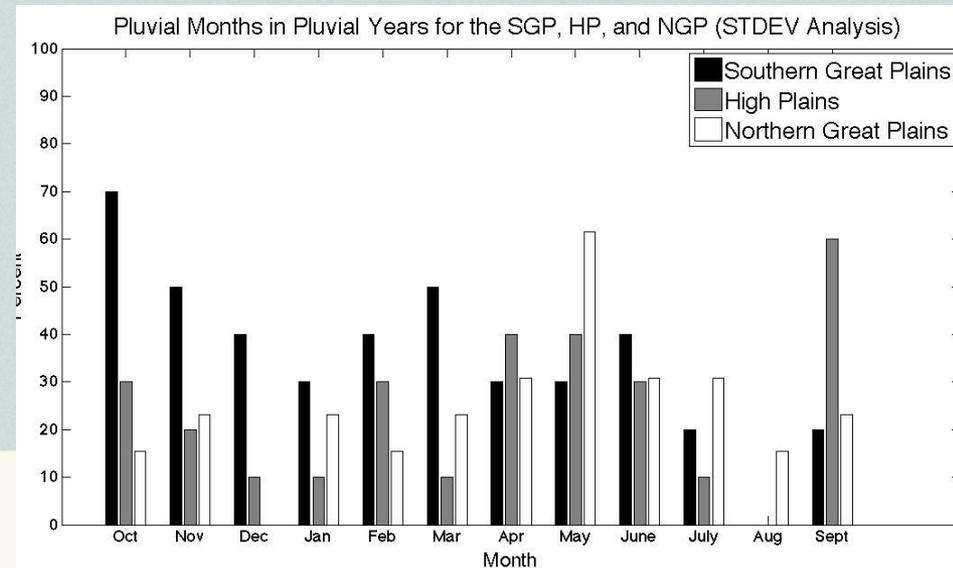
Wettest months of pluvial year varies

-Months with 40% or more above normal precipitation

SGP transition most likely fall / late winter

NGP transition most common in spring, especially May

HP transition most common in September with a secondary peak in spring

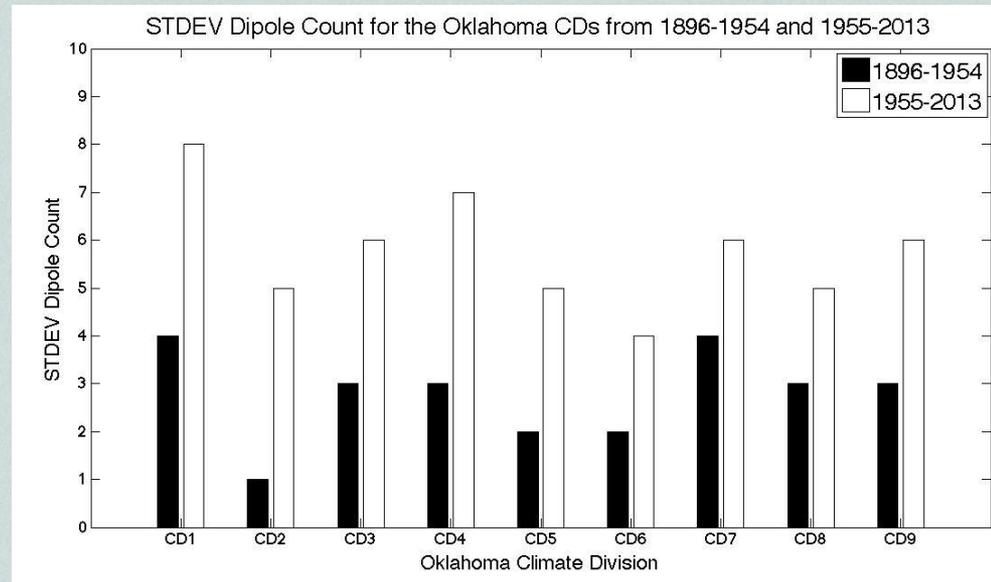


Becoming more frequent?

In SGP, more common in second half of climate record than first half

Only 3 events 1896-1945
- Average spacing 17 years

7 events 1955-2013
- Average spacing 9 years
- 3 in last 10 years (if 2015 added)



No such trends in NGP or HP

Takeaway Messages

Droughts in the Plains often end abruptly

Every area has seen these abrupt transitions

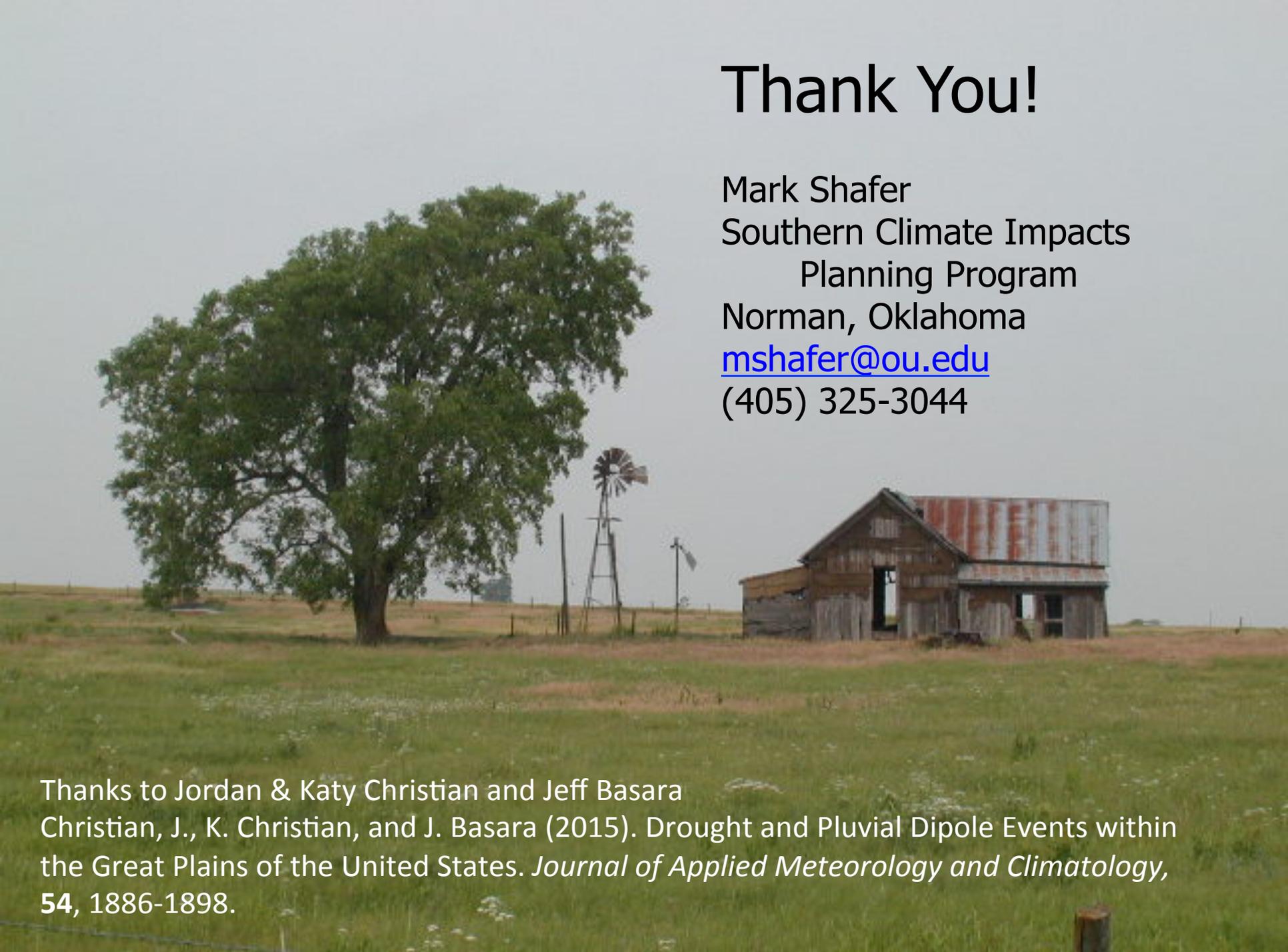
Most likely to occur in Fall or Winter (Southern Plains) or Spring (Northern Plains) but can occur at any time

In the Southern Plains, the flip between dry and wet years appears to be increasingly common

These are just observations from the climate record - the hard part is explaining the causes

Thank You!

Mark Shafer
Southern Climate Impacts
Planning Program
Norman, Oklahoma
mshafer@ou.edu
(405) 325-3044



Thanks to Jordan & Katy Christian and Jeff Basara
Christian, J., K. Christian, and J. Basara (2015). Drought and Pluvial Dipole Events within
the Great Plains of the United States. *Journal of Applied Meteorology and Climatology*,
54, 1886-1898.