

# Managing Headwaters in the High Country



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# Outline

- The forest-water supply connection
- Impacts of drought
- How could forest management help?



# Forests and water

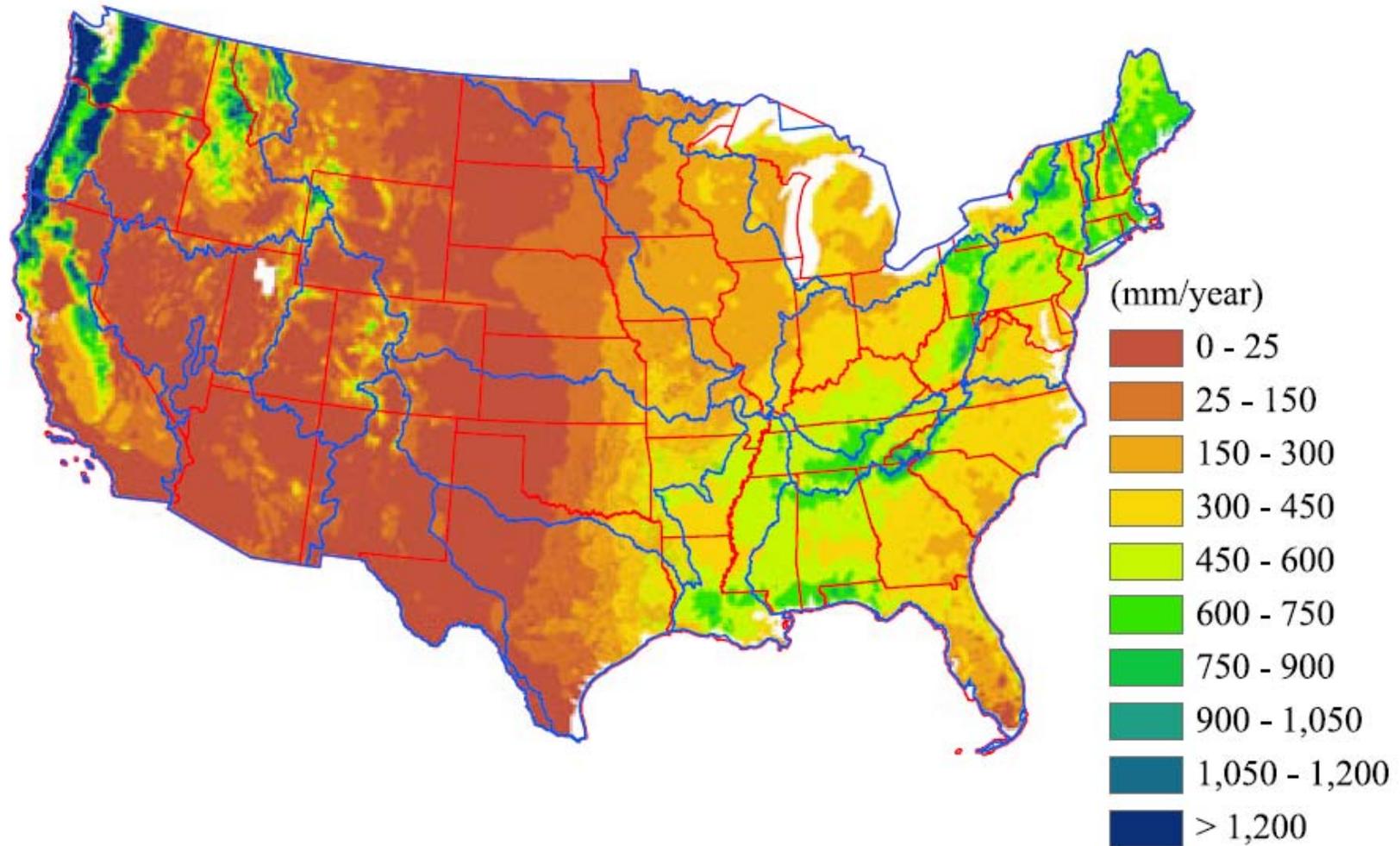
- The cleanest and most regulated supplies of water come from forested landscapes
- Forests can be managed in ways that do not negatively impact water quality



Chattahoochee River, GA



# Distribution of water supply in the US

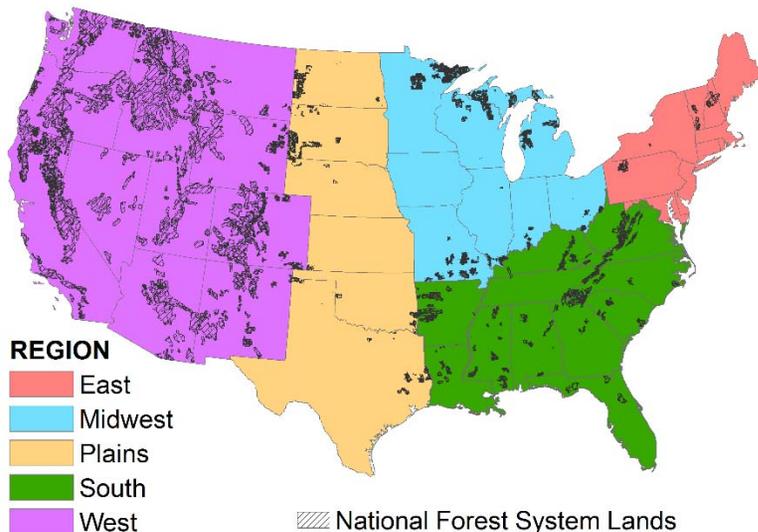
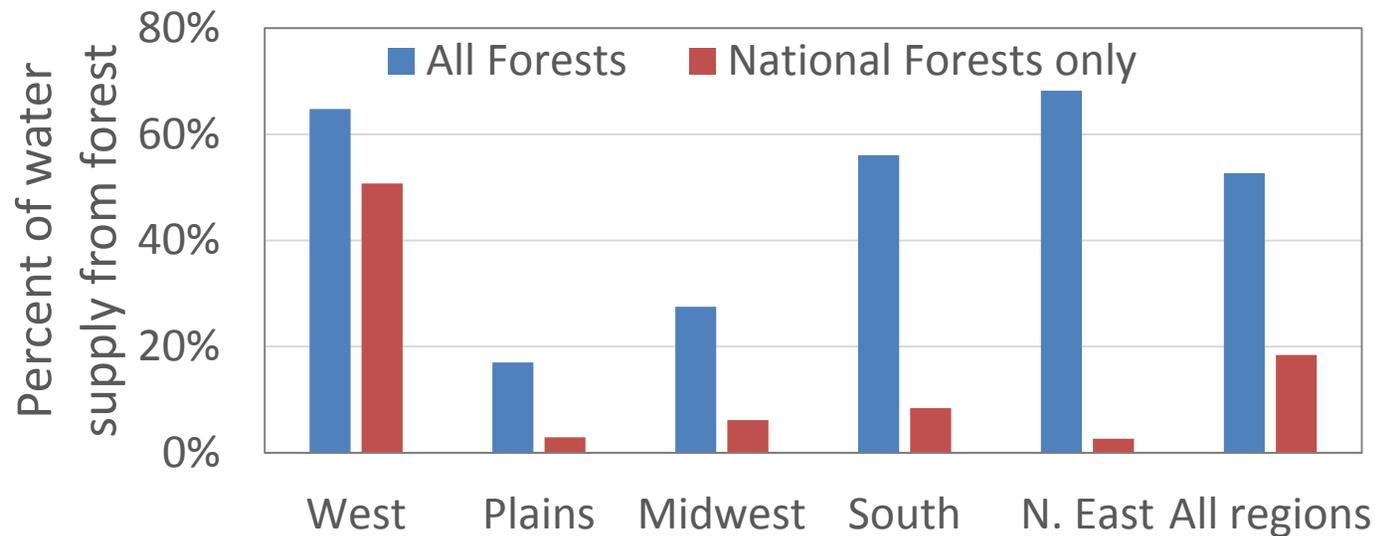


*Brown et al., 2008*





# Importance of forests for water supply



Forests comprise 29% of land area, but provide 53% of water supply

*Brown et al., 2008*





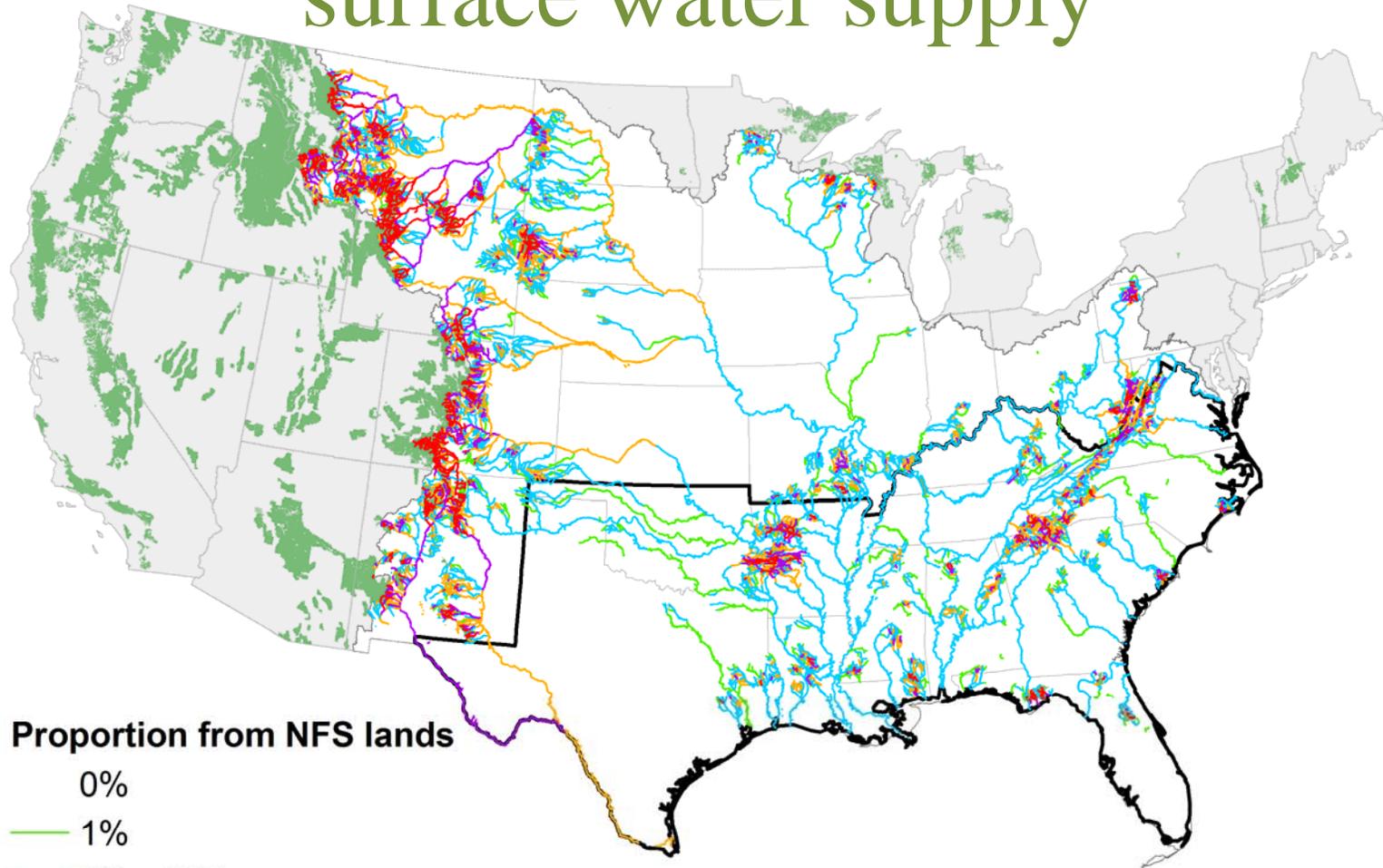
United States Department of Agriculture

## Quantifying the Role of National Forest System Lands in Providing Surface Drinking Water Supply for the Southern United States

Peter Caldwell, Corinne Muldoon, Chelcy Ford Miniati, Erika Cohen, Suzanne Krieger,  
Ge Sun, Steven McNulty, and Paul V. Bolstad



# National Forest contribution to surface water supply



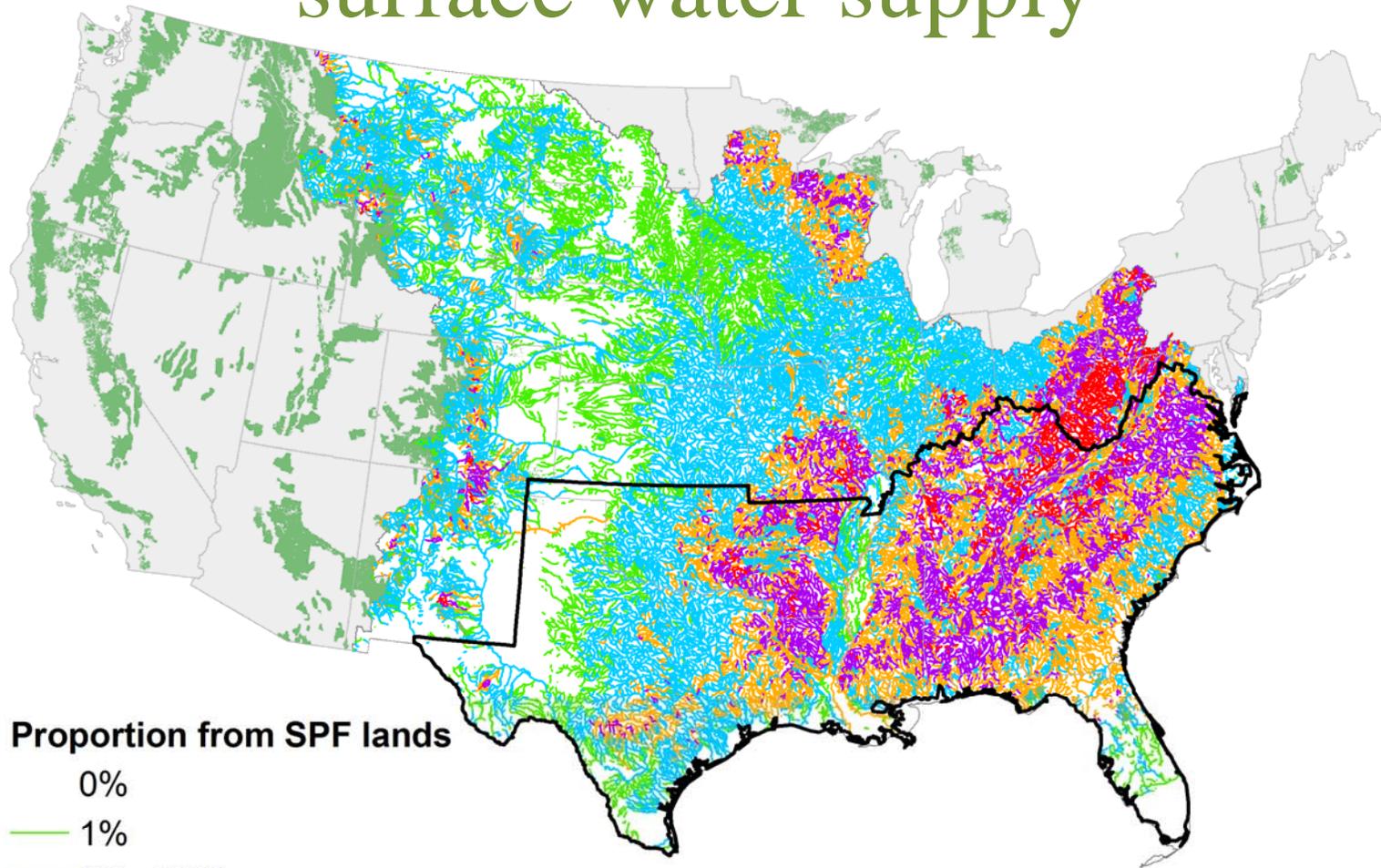
## Proportion from NFS lands

- 0%
- 1%
- 2% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

- Southern States of USFS Region 8
- National Forest System Lands
- Study Area



# State and Private Forest contribution to surface water supply



## Proportion from SPF lands

0%

1%

2% - 25%

26% - 50%

51% - 75%

76% - 100%

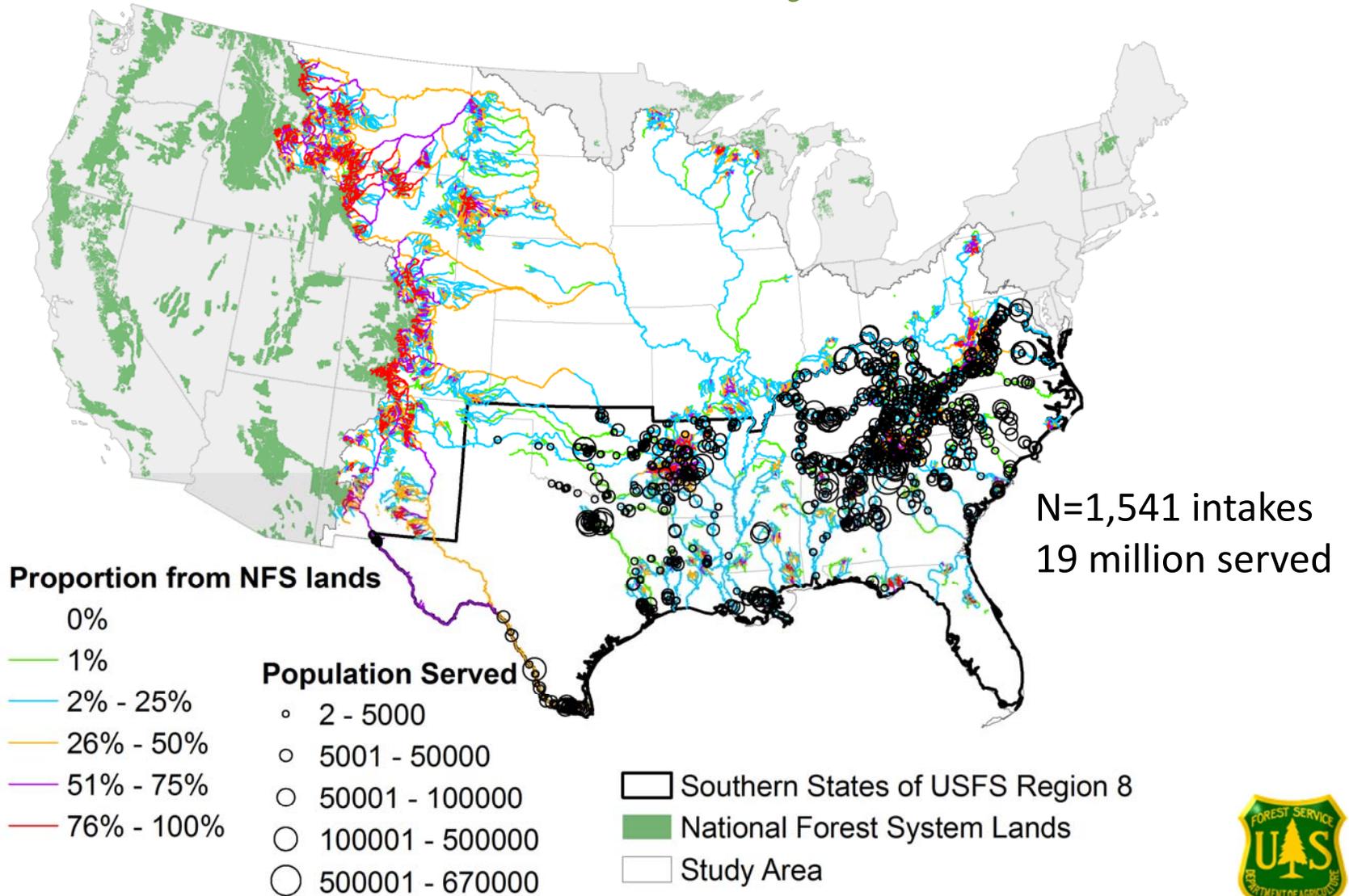
□ Southern States of USFS Region 8

■ National Forest System Lands

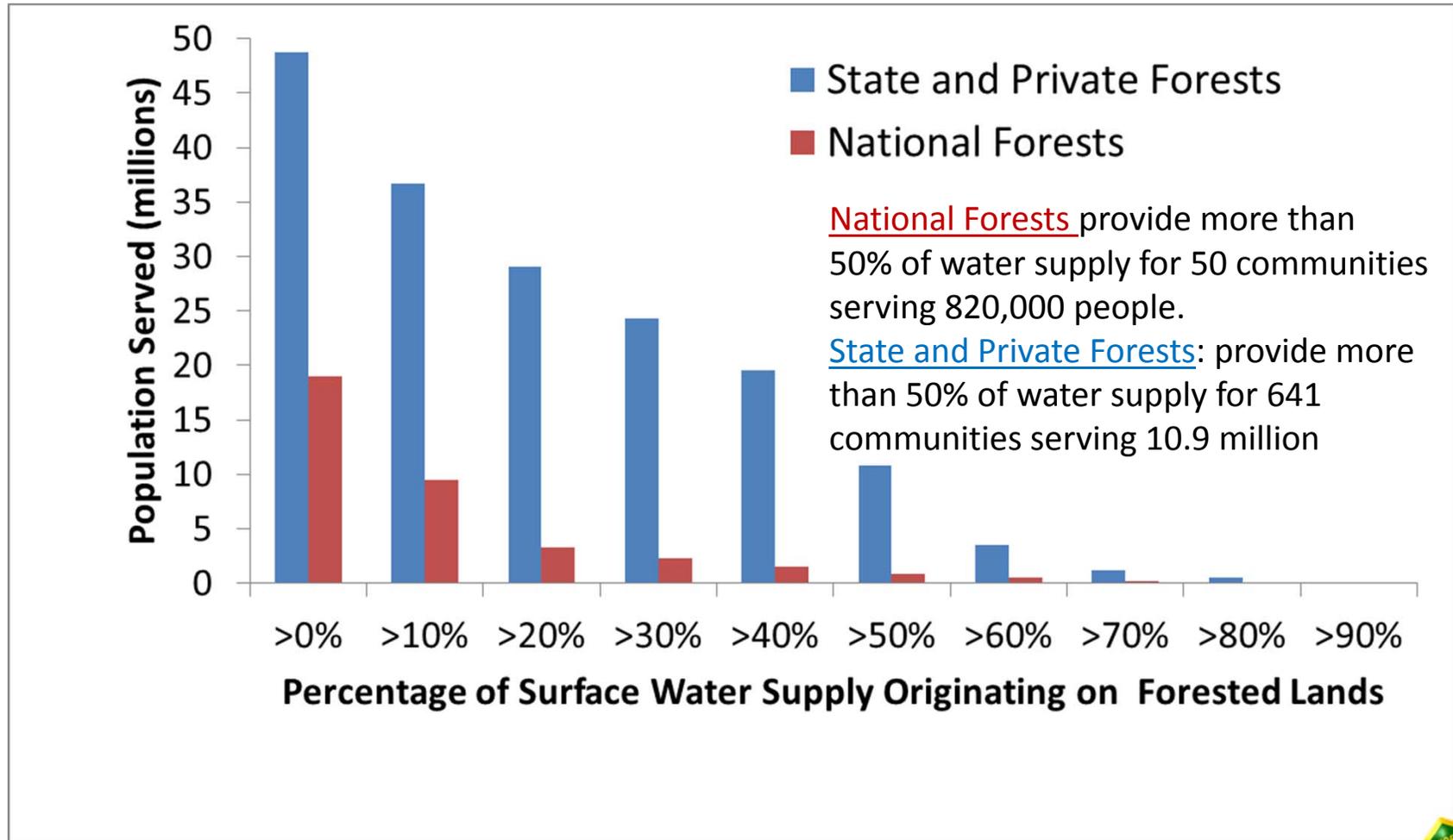
□ Study Area



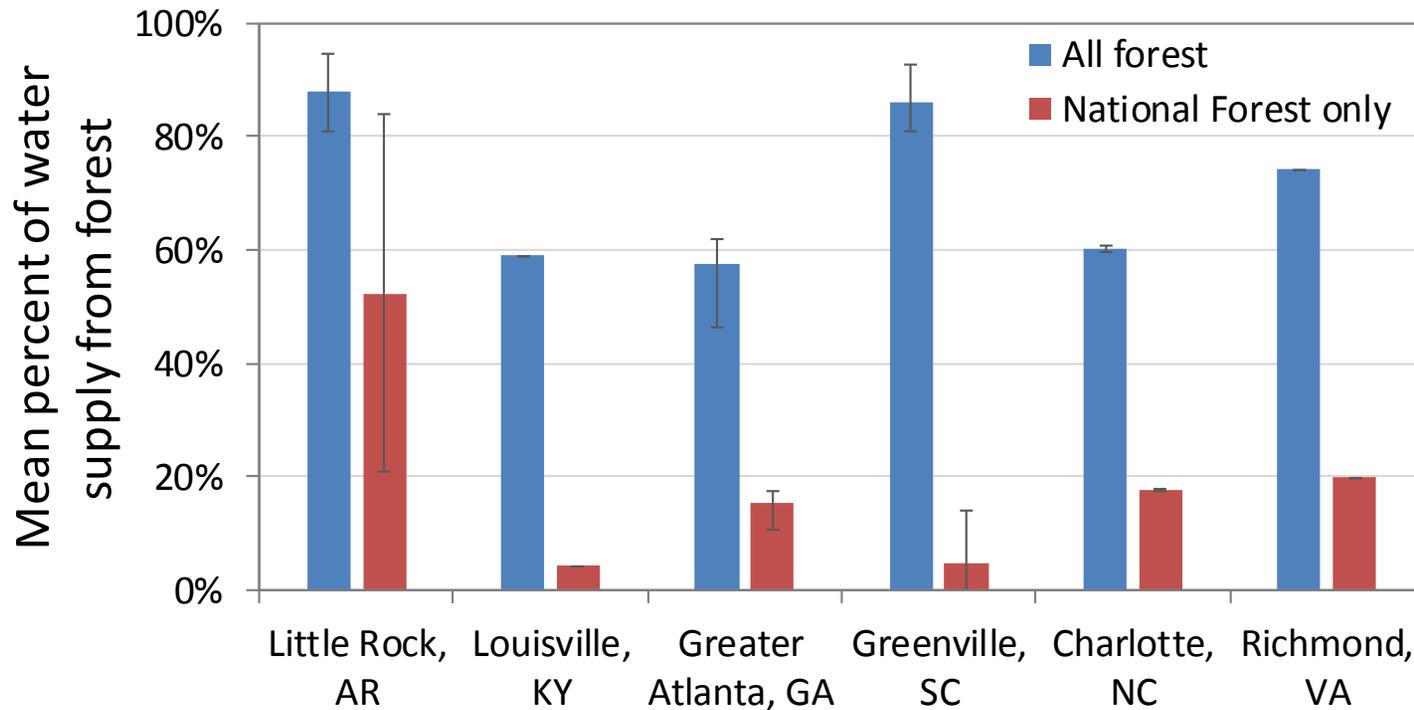
# Drinking water intakes receiving water from National Forest System Lands



# Millions in the South depend on water originating on forested lands



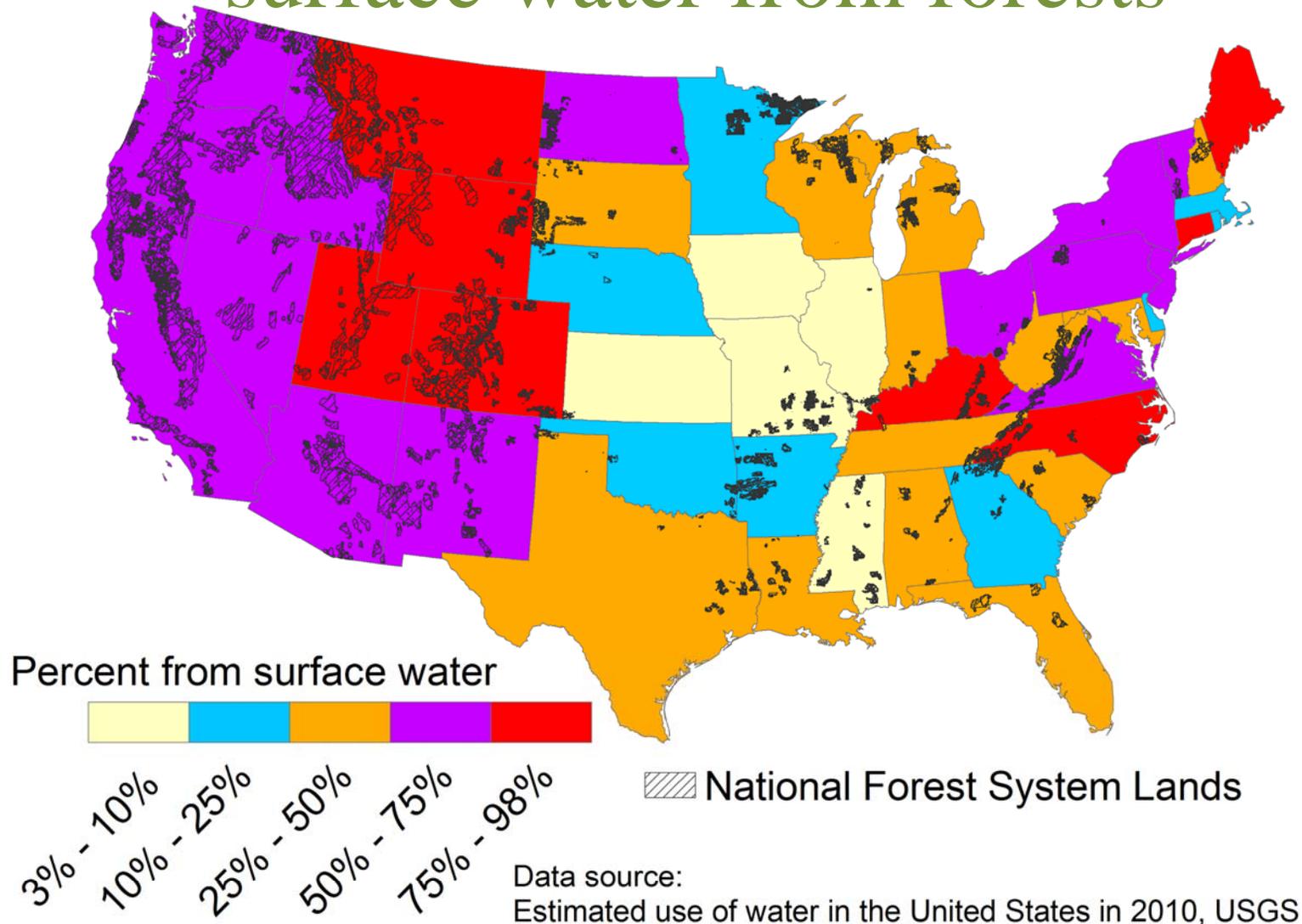
# Some example communities



Population served (millions)	0.8	2.2	0.4	0.2	0.2	0.7
Number of intakes	2	5	3	2	1	2



# Irrigated agriculture depends on surface water from forests





United States Department of Agriculture

# Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis



Forest Service Gen. Tech. Report WO-93b January 2016

*Vose et al., 2016*



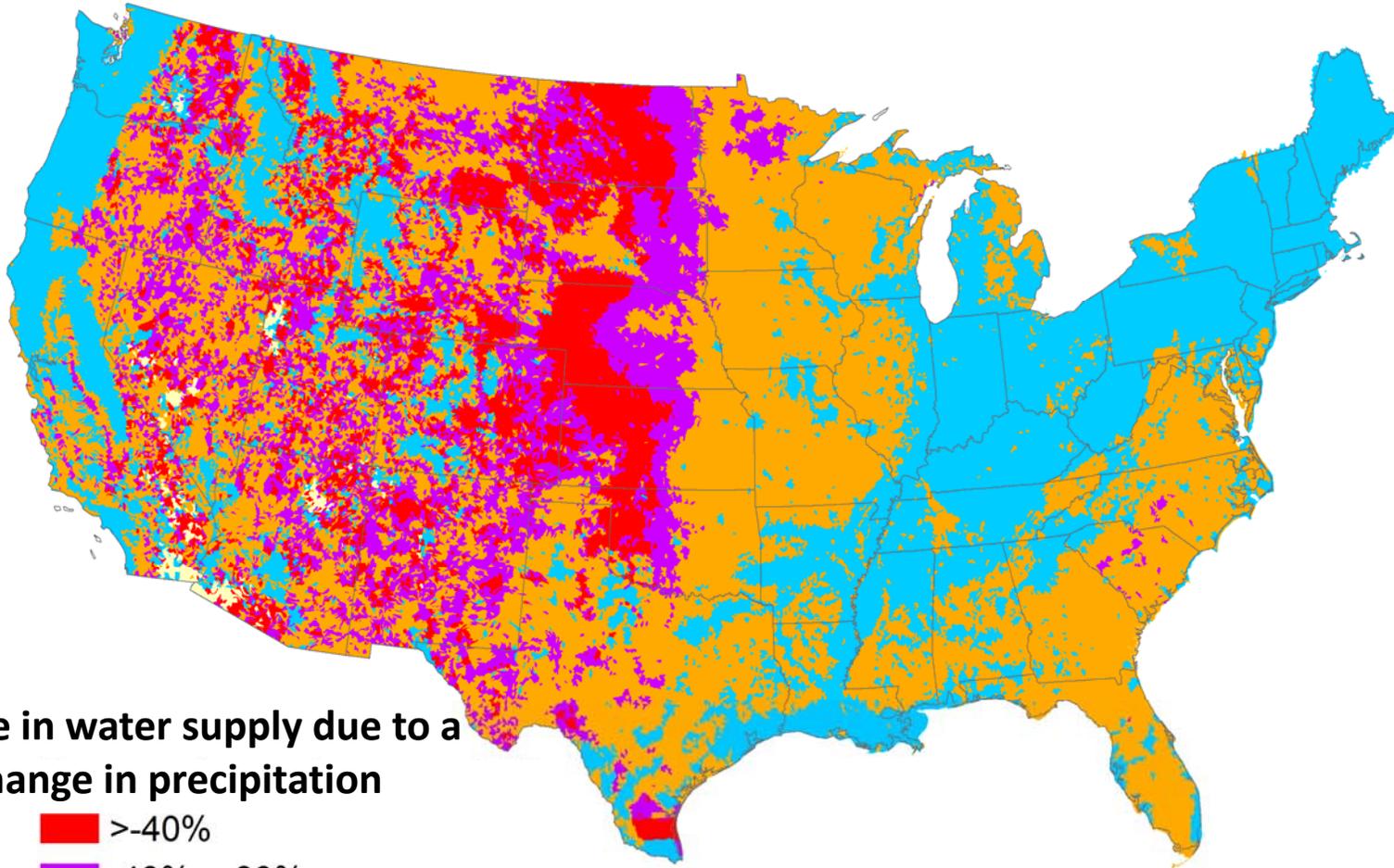
# Drought impacts on forests and related ecosystem services

- Impacts on forests
  - Mortality
  - Altered nutrient, carbon, and water cycling
  - Increased susceptibility to invasion of non-native species, insect outbreaks and wildfire
- Impacts on ecosystem services
  - Water supply production
  - Water quality
  - Productivity

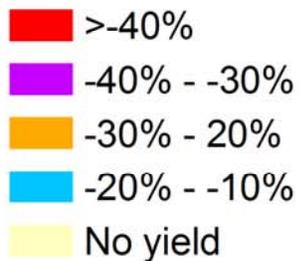
*Vose et al., 2016*



# Sensitivity of water supply to drought



Change in water supply due to a  
10% change in precipitation

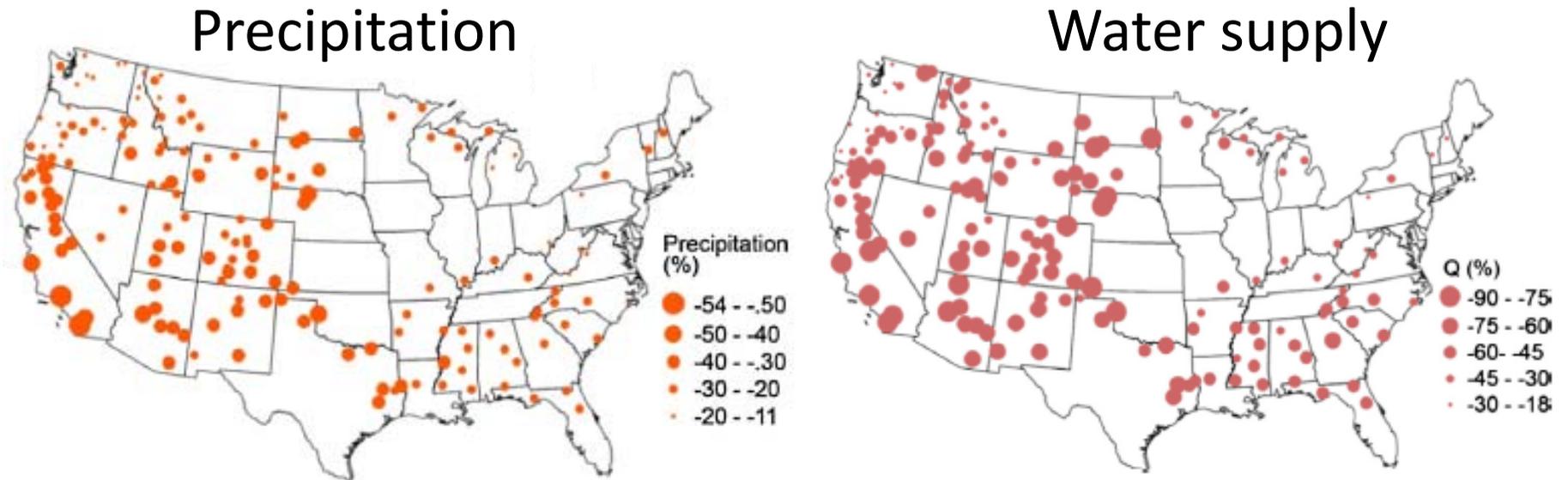


Modified from *Sun et al., 2015*



# Drought impacts on water supply from National Forests

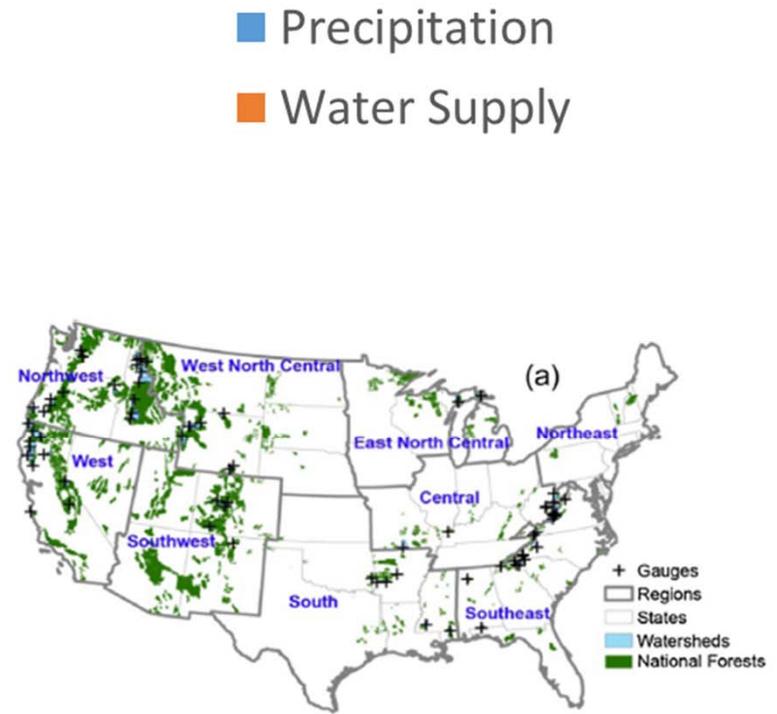
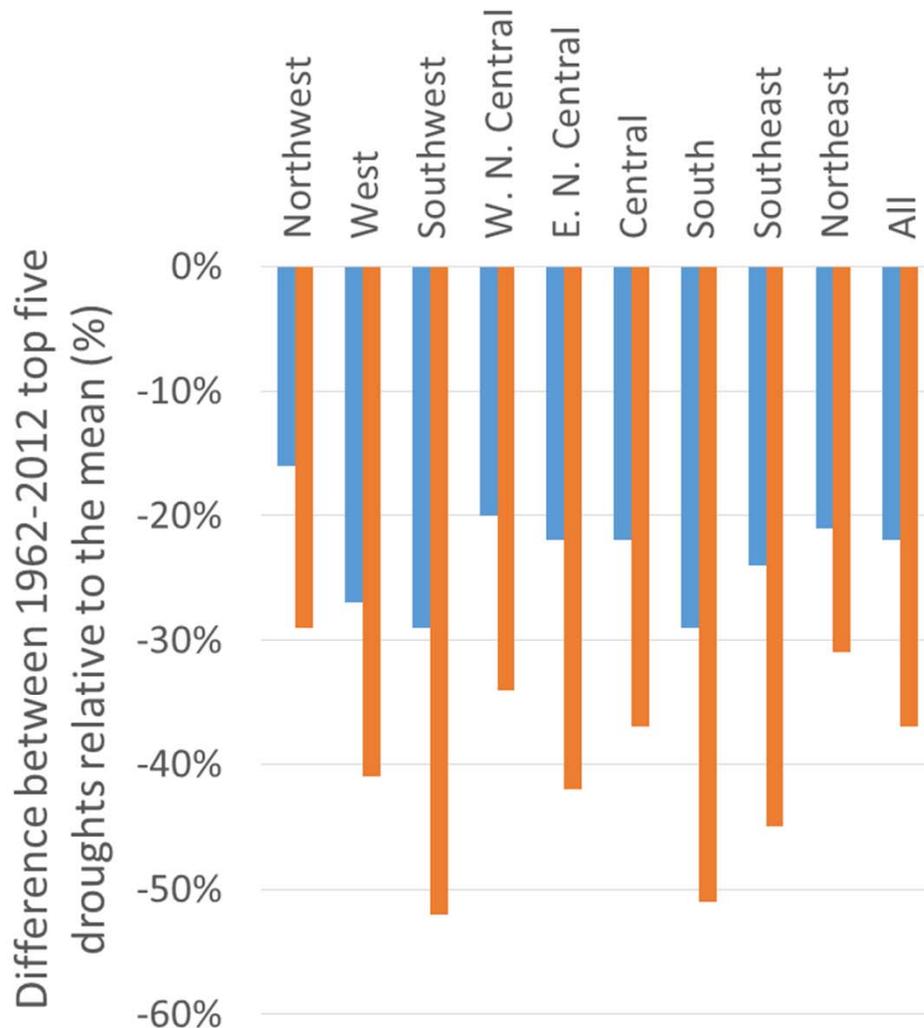
Difference during “top-five”  
drought years of 1962-2012 relative to mean



*Sun et al., 2015*



# Drought impacts on water supply from National Forests



Sun et al., 2015



# Droughts over time

- Trends in drought frequency and intensity are difficult to detect or project
  - lack of direct observations
  - methodological uncertainties
  - geographical inconsistencies in the trends.
- Low confidence there was a global-scale trend in drought since the mid-20th century
- Droughts will continue to occur, and are projected to become more prolonged and severe in some regions



# How could forest management help?

- Reduce vulnerability
  - Thinning/fuel management to reduce water use and reduce risk of wildfire
  - Increase species and age-class diversity within stands to reduce insect attack intensity
- Facilitate transition to a new condition
  - Change forest composition to drought tolerant species that use less water

*Vose et al., 2016*



# Summary

- Forested lands are important for water supply; droughts can have a major impact
- Drought trends difficult to detect, but droughts will continue to occur and we will need to adapt
- Active forest management could help mitigate drought impacts

