

A climate and water relationship



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Citizen's Climate Lobby

August 21, 2023

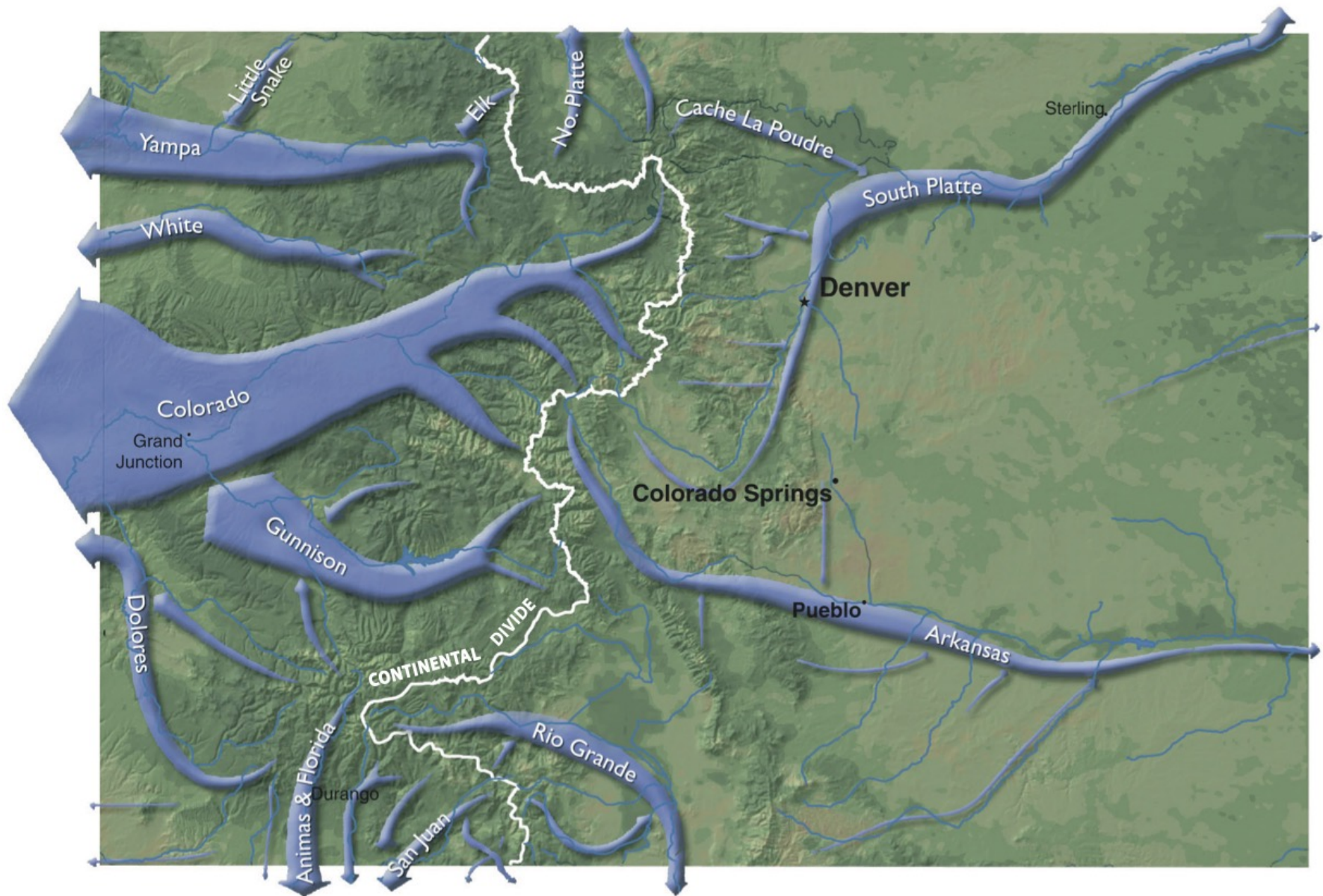


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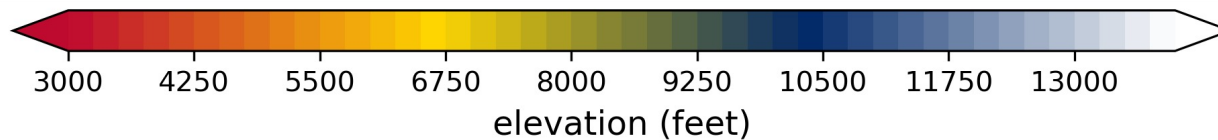
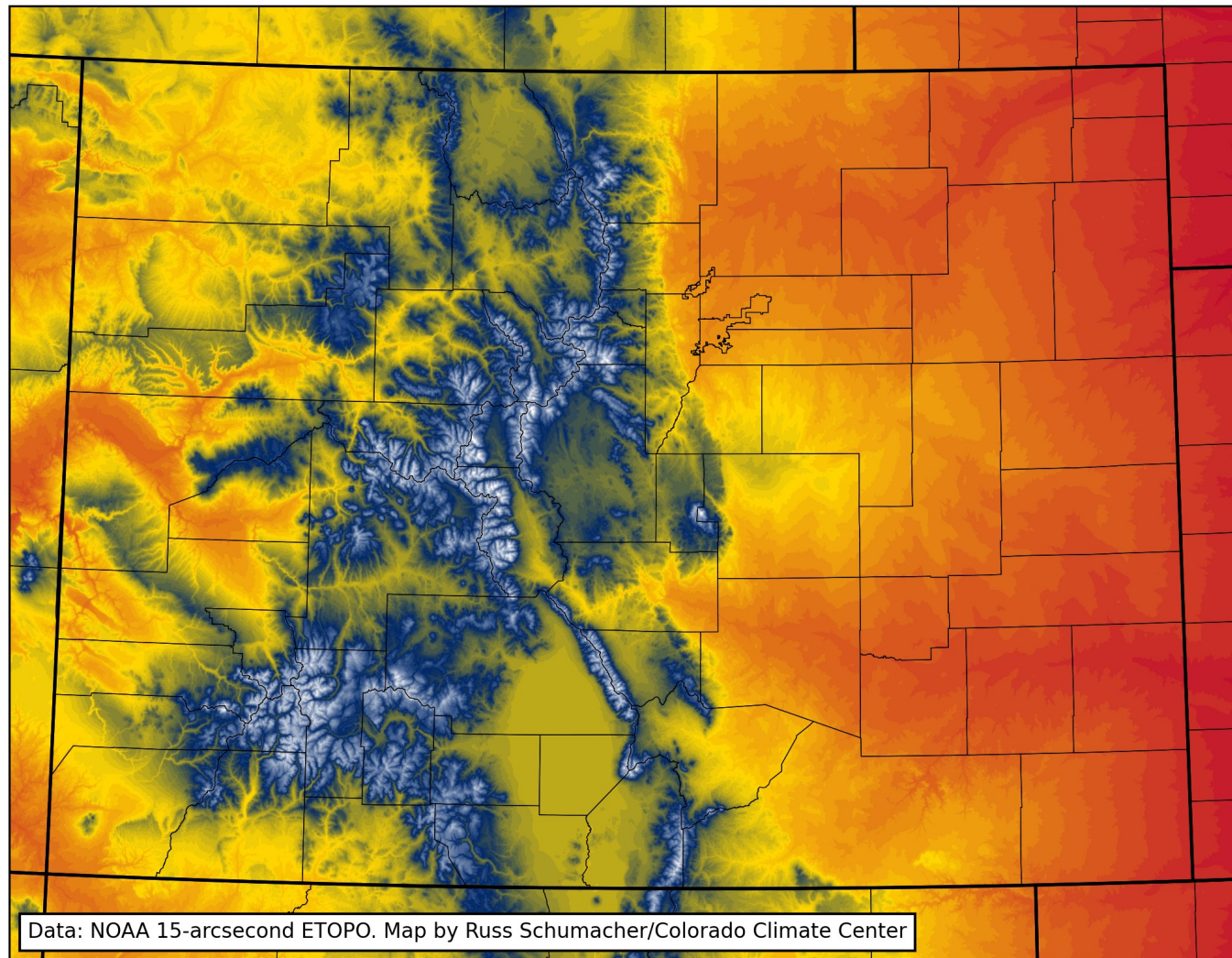
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Colorado is a “headwater state”



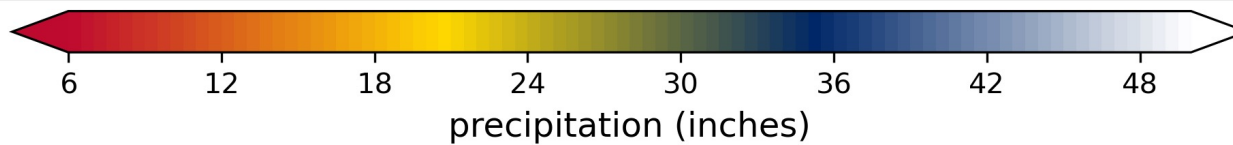
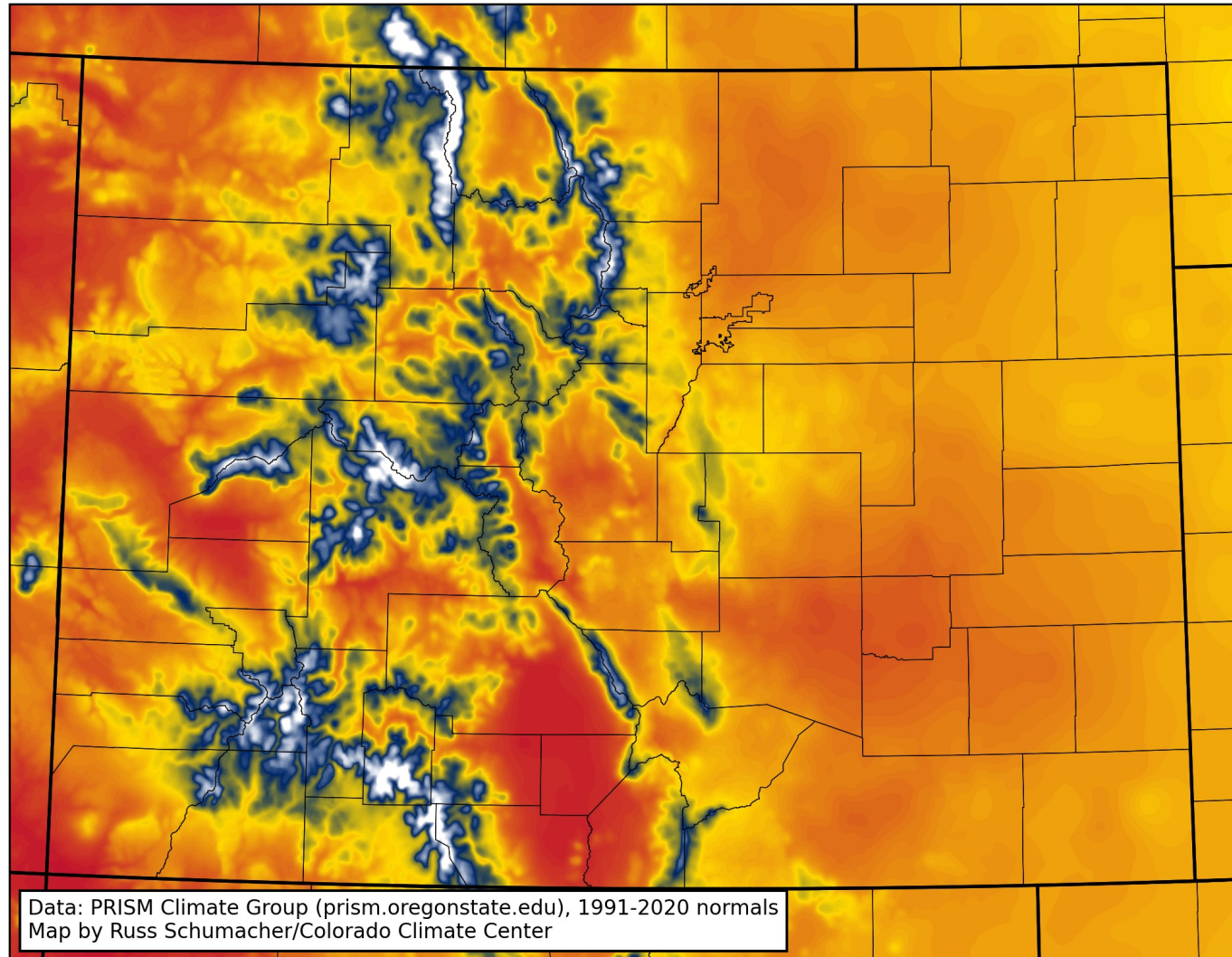
Our mountains are a defining feature...

Colorado topography

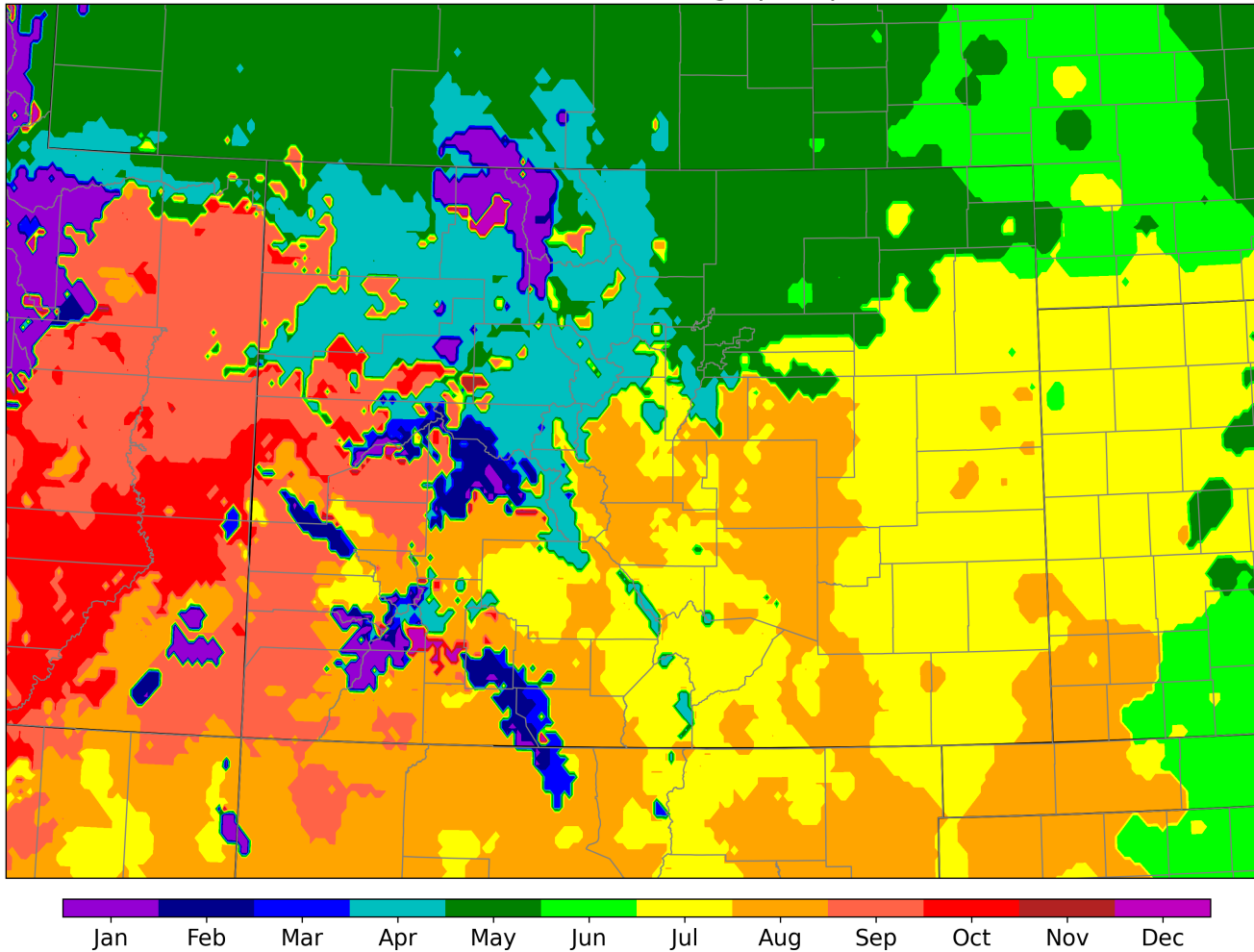


...and dominate our state's water supply

Colorado annual average precipitation



month of maximum average precipitation



Colorado: the only state where every month is the wettest month on average somewhere

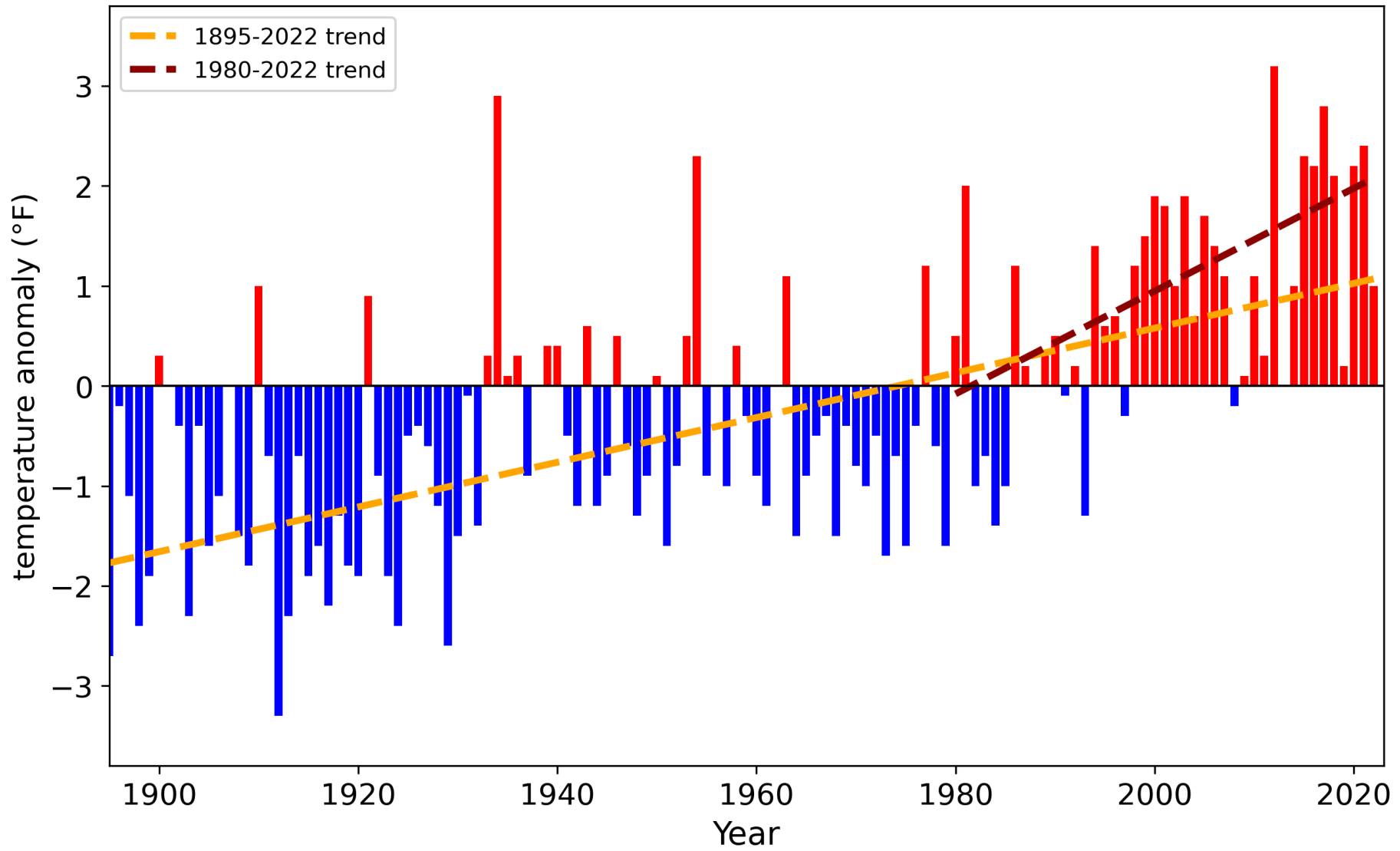
Month of maximum average precip
Data: PRISM Climate Group,
prism.oregonstate.edu,
1991-2020 normals

Figure: Russ Schumacher/Colorado Climate Center
Data: PRISM climate group (prism.oregonstate.edu), 1991-2020 normals



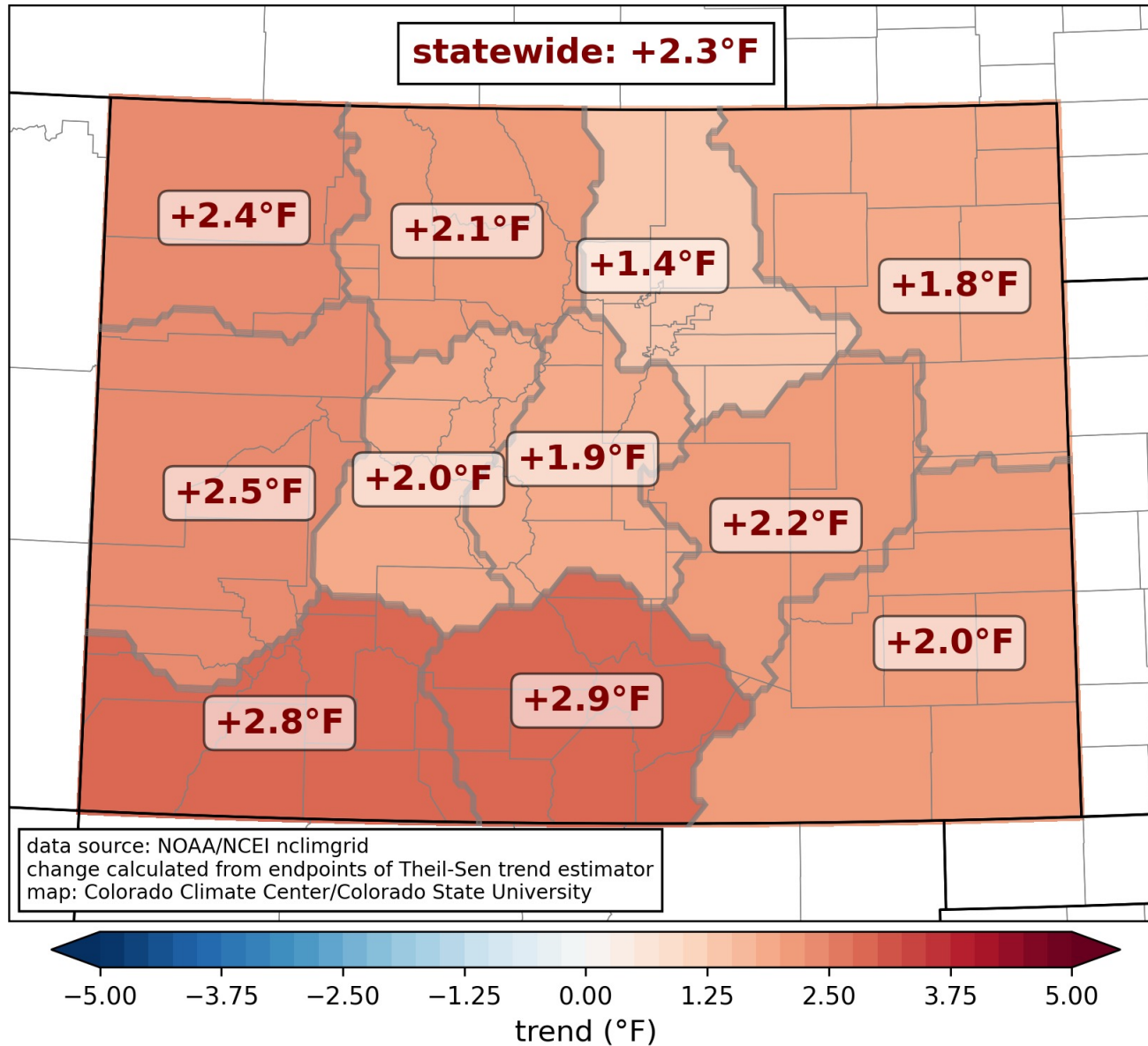
Temperatures have warmed significantly

Colorado statewide annual temperature anomaly (°F), with respect to 1971-2000 average



Warming around the state

average temperature change, annual, 1980-2022

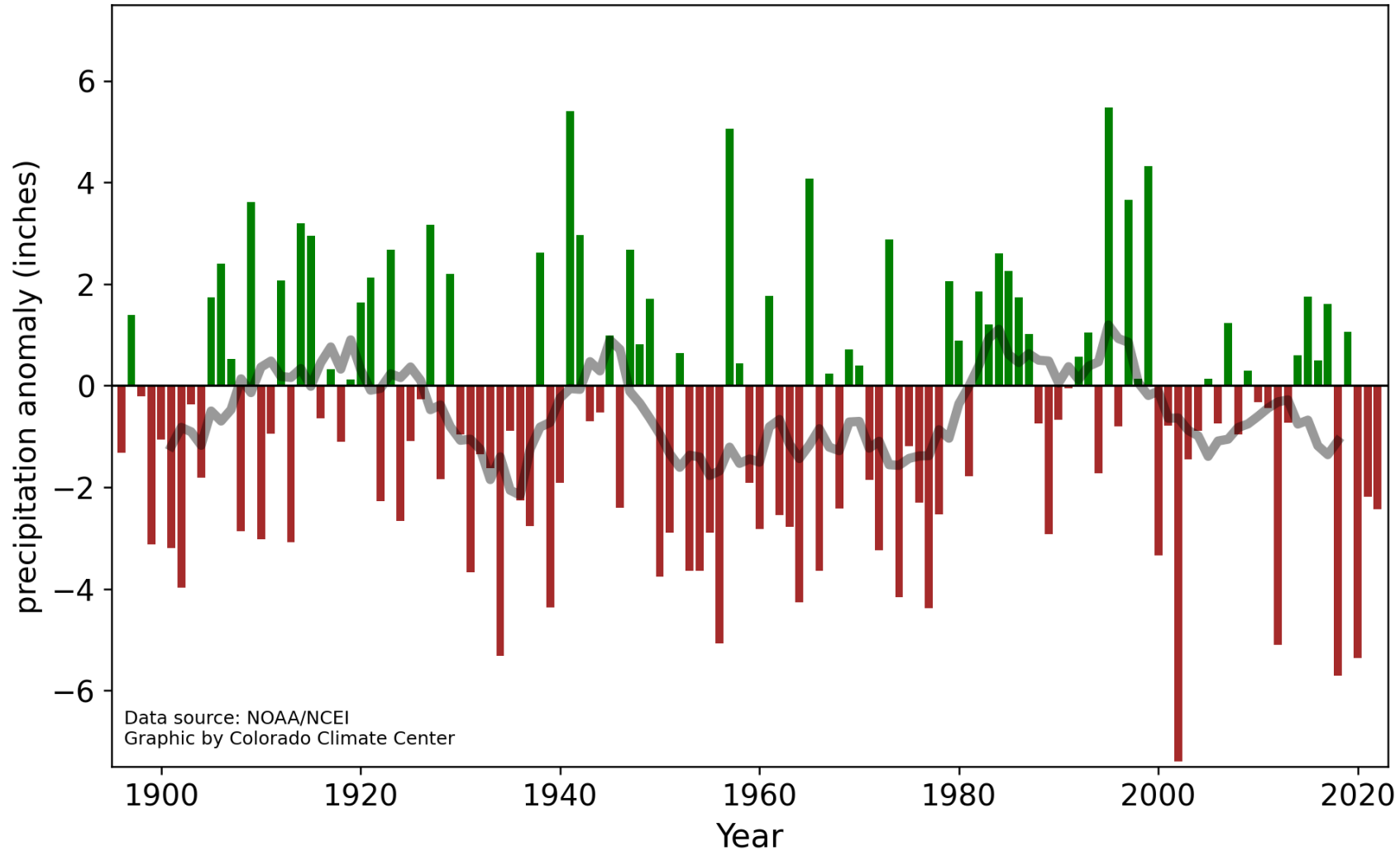


https://climate.colostate.edu/div_trends.html



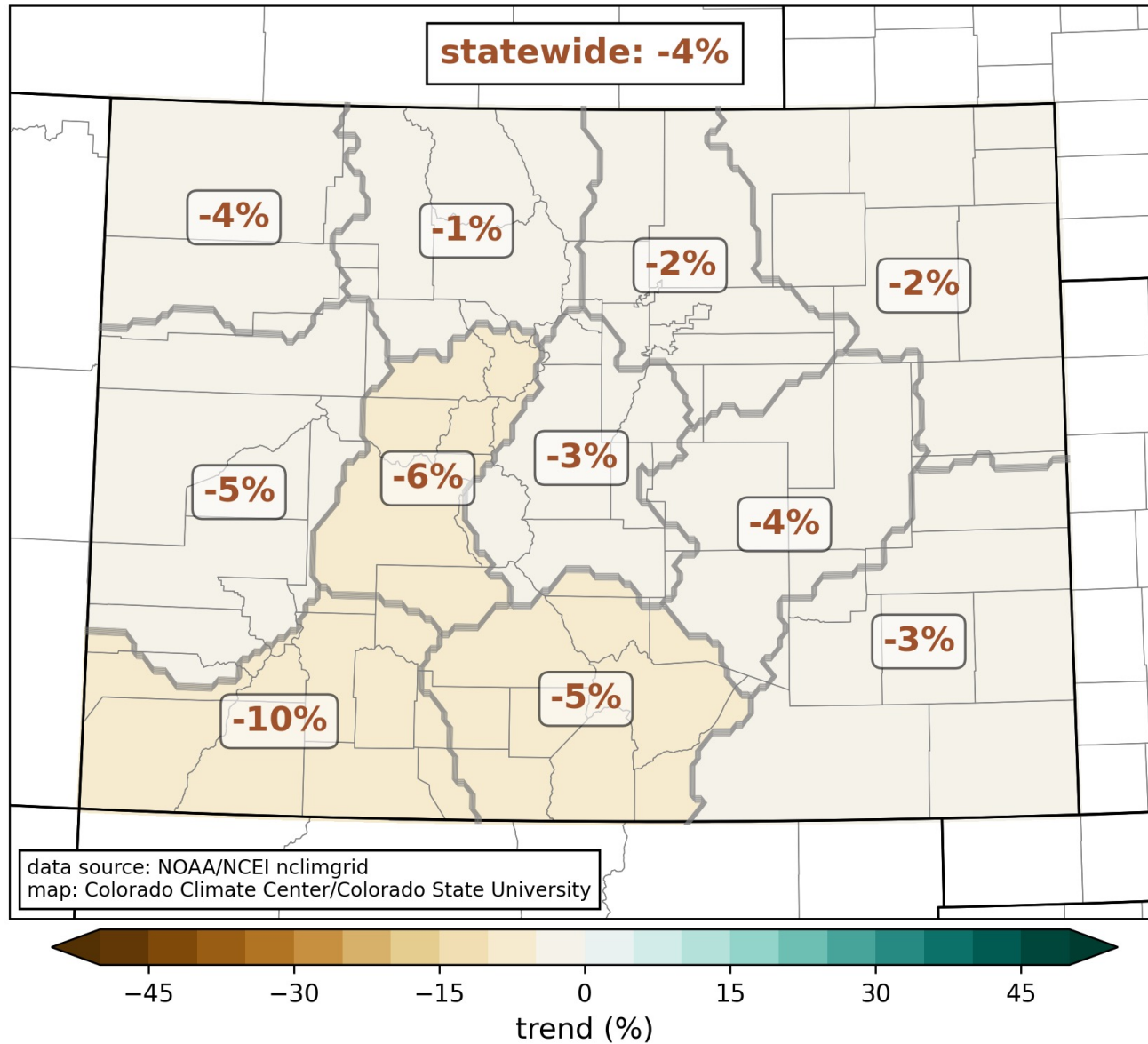
Precipitation trends are less clear

Colorado statewide water year precipitation anomaly (inches), with respect to 1971-2000 average



Precipitation changes around the state

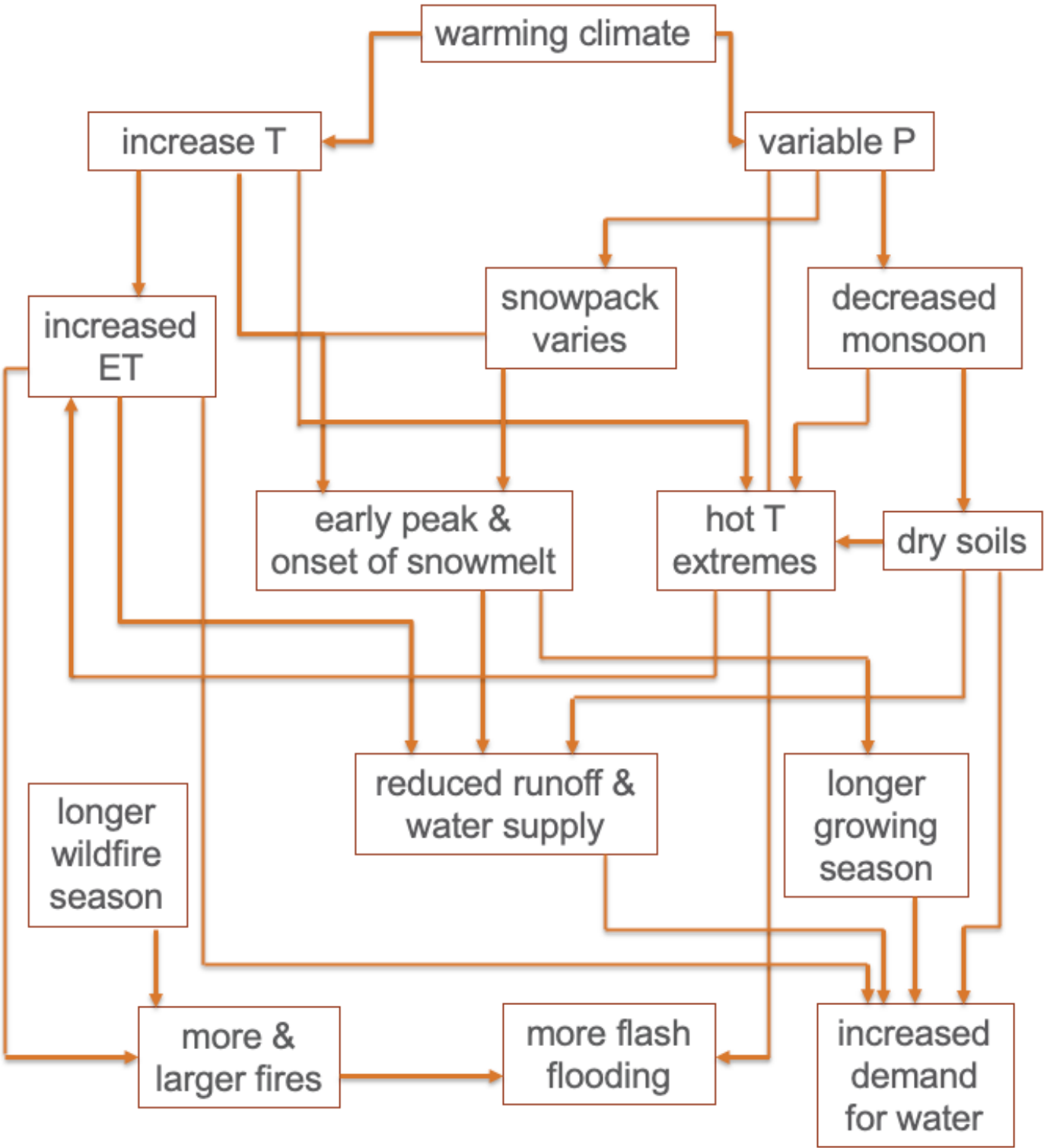
precipitation percent change, annual, 2001-2022 minus 1951-2000



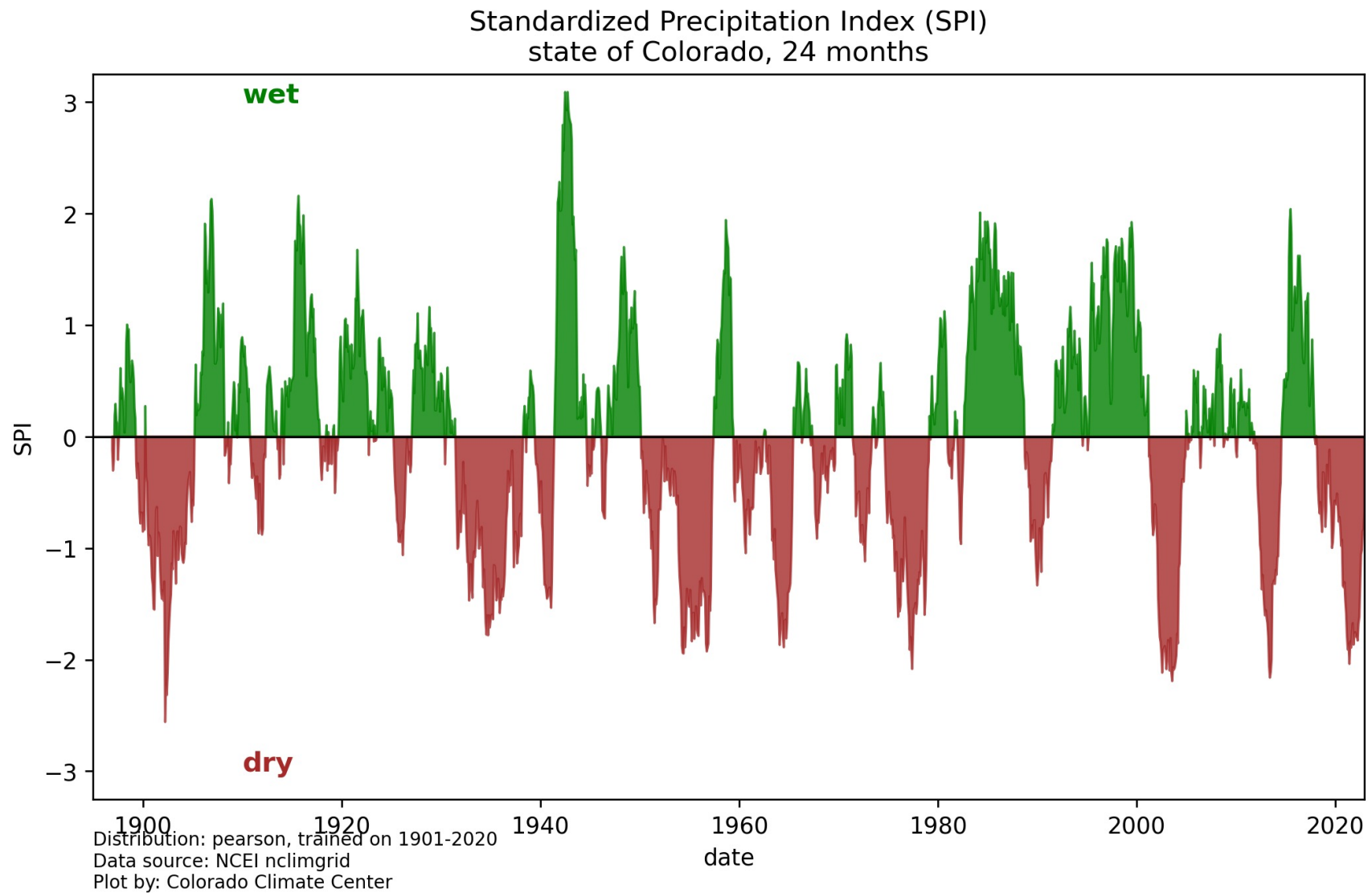
https://climate.colostate.edu/div_trends.html



The complicated web of drought and climate

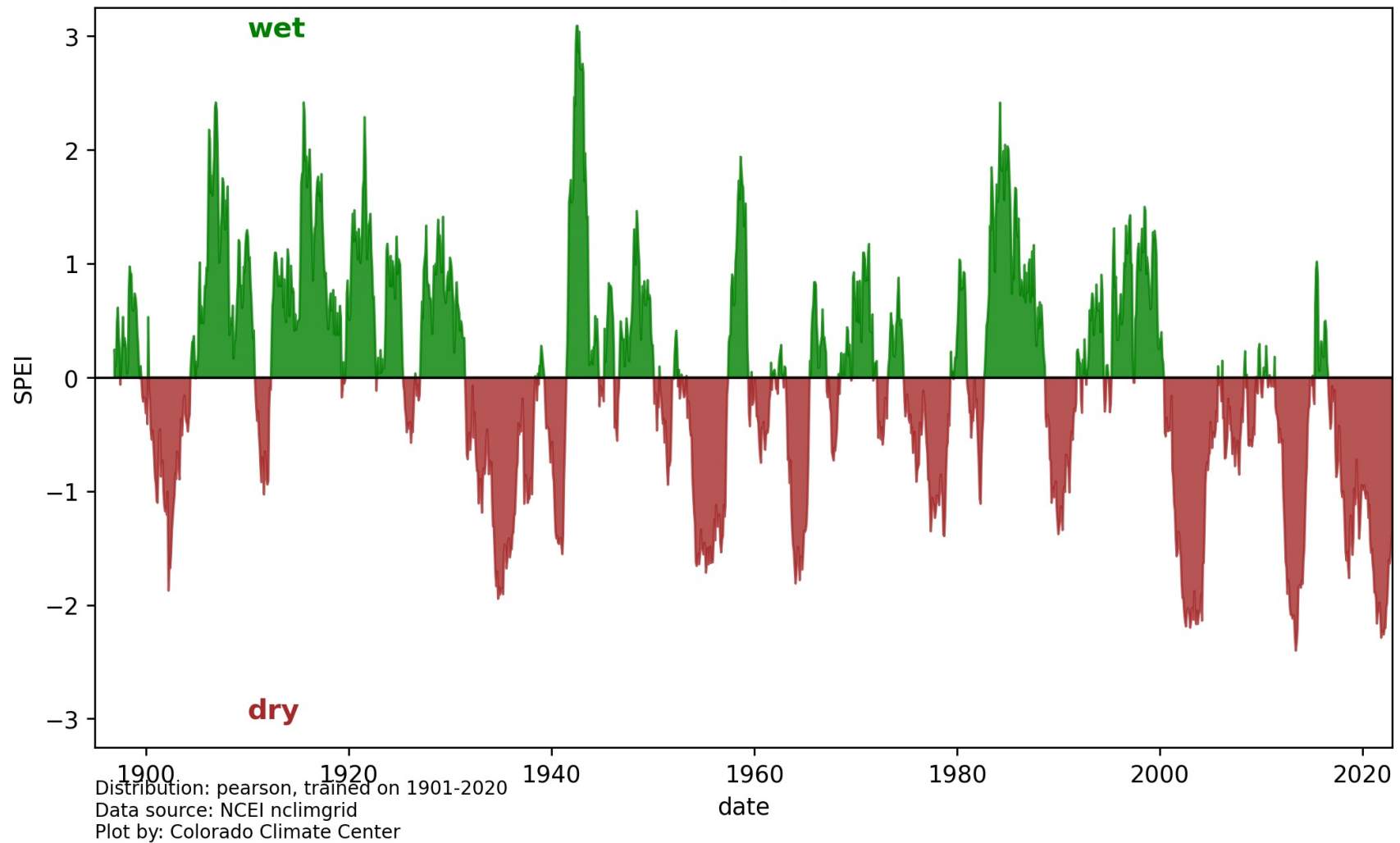


Temperature impacts precipitation variability



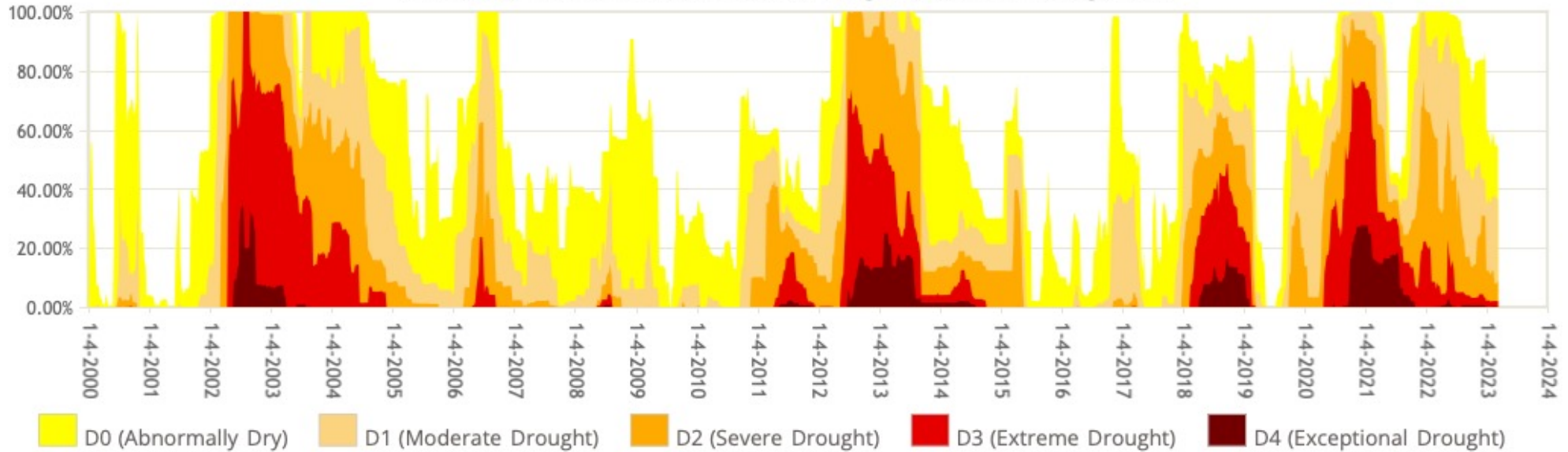
Temperature impacts precipitation variability

Standardized Precipitation-Evapotranspiration Index (SPEI)
state of Colorado, 24 months



We're no stranger to drought

Colorado Percent Area in U.S. Drought Monitor Categories



D3 drought is a 1-in-20 to 1-in-50 year event

D4 drought is a 1-in-50 to 1-in-100 year event

We've had 4 of these droughts in the last 20 years

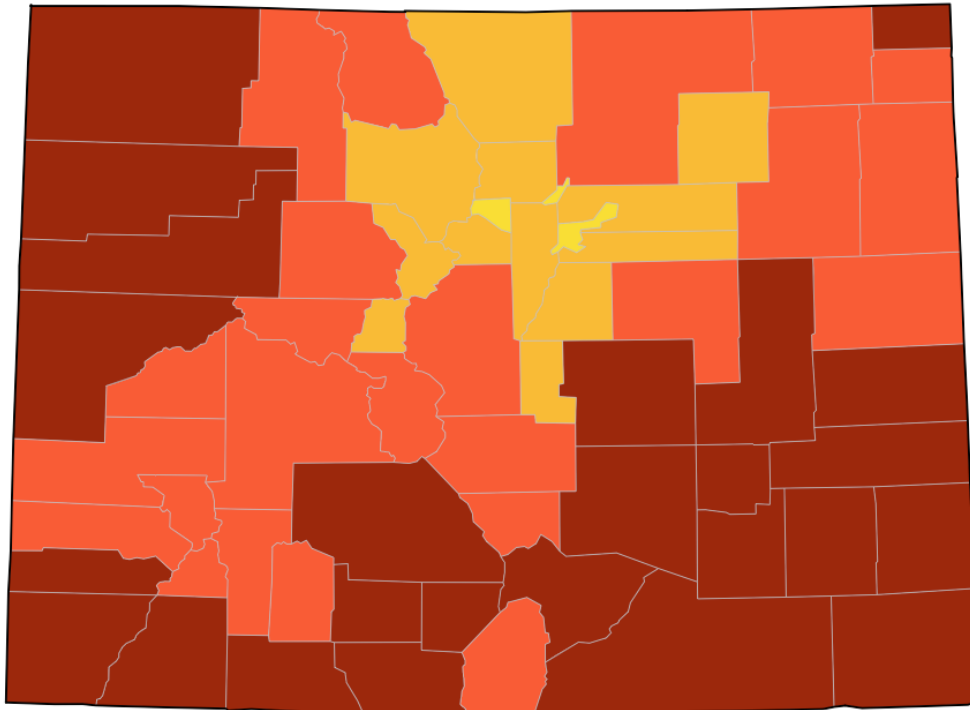
droughtmonitor.unl.edu



Where is drought most frequent?

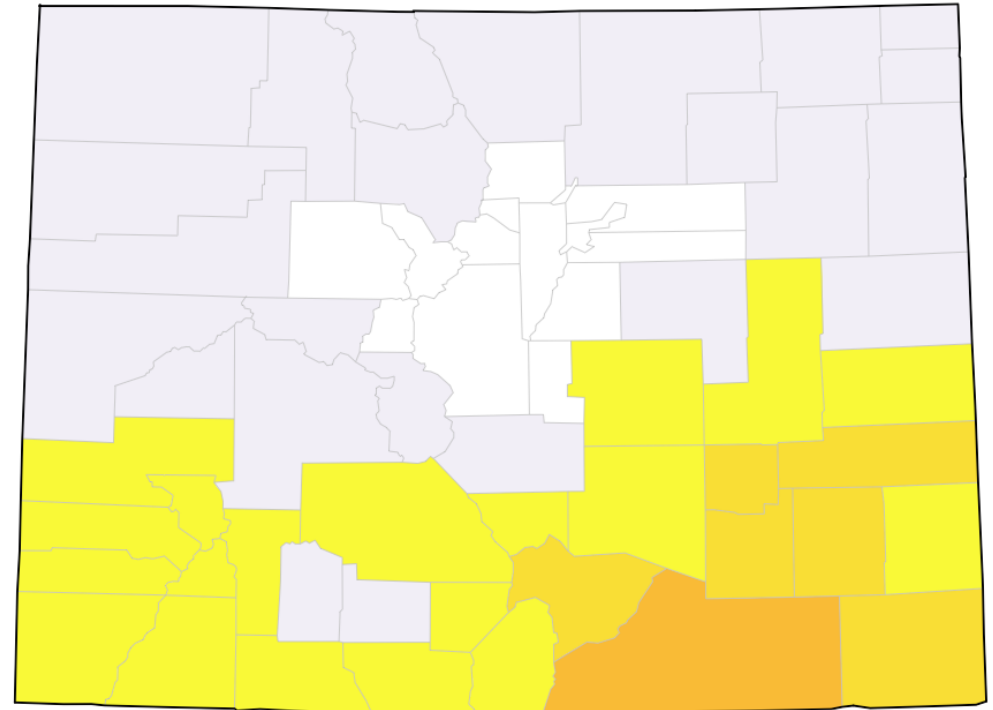
Number of Weeks in D2/D3/D4 Drought

Data from U.S. Drought Monitor, 2000 - 2019

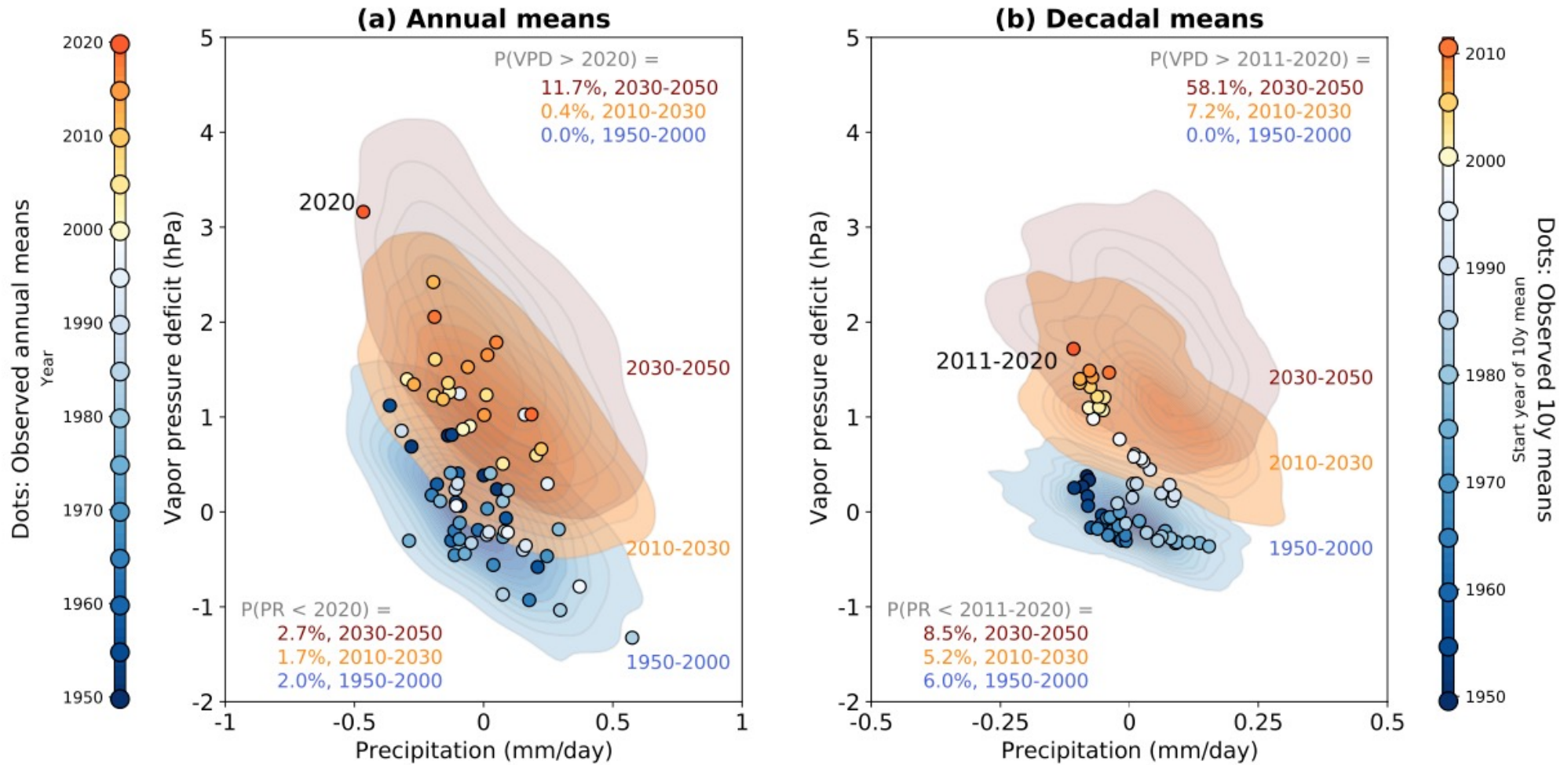


Number of Weeks in D4 Drought

Data from U.S. Drought Monitor, 2000 - 2019



Our air is getting drier

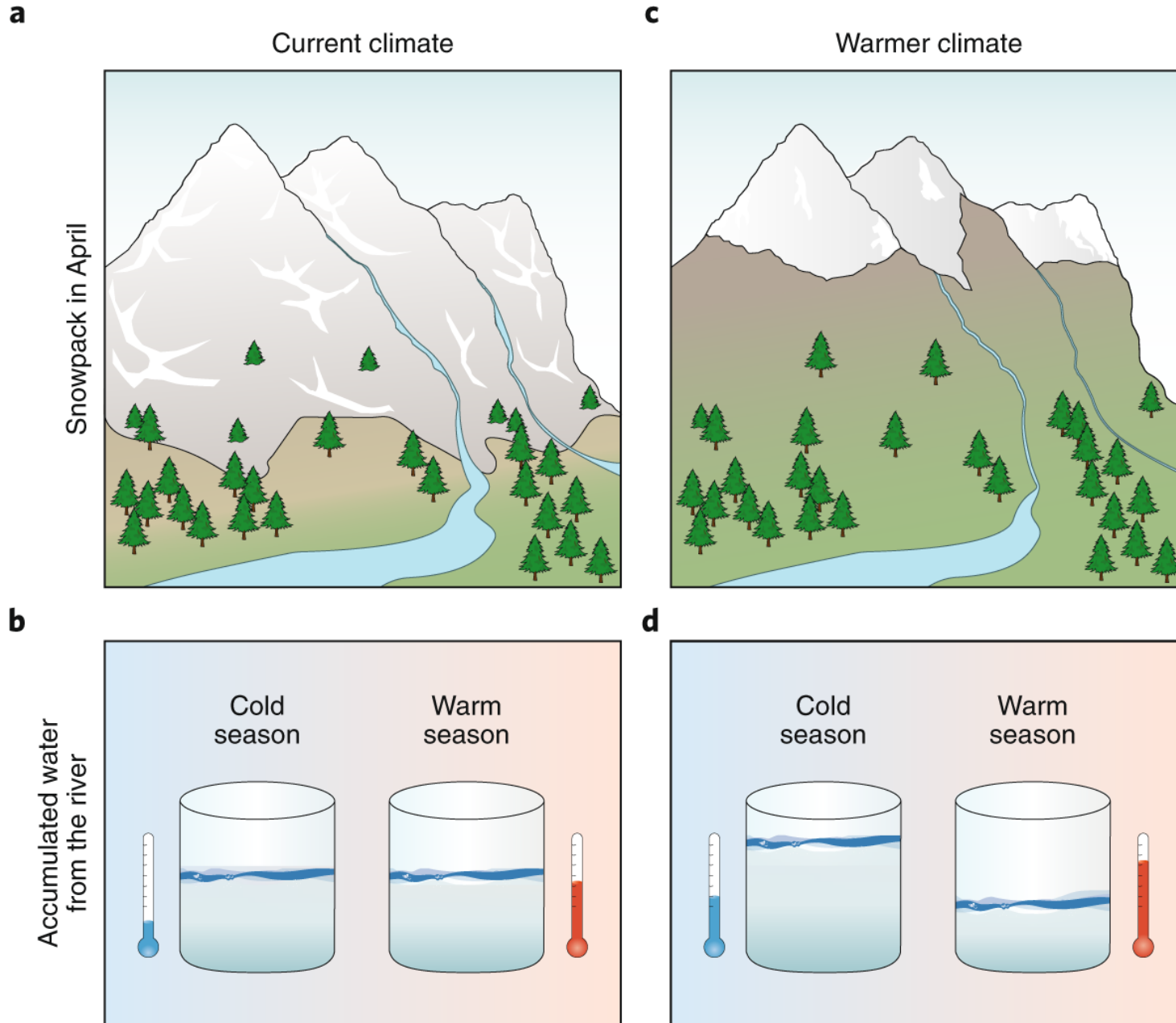


Contours: Modelled joint probability of VPD and precip from three time periods

NOAA Drought Task Force Report on the 2020–2021
Southwestern U.S. Drought, 2021, Drought.gov



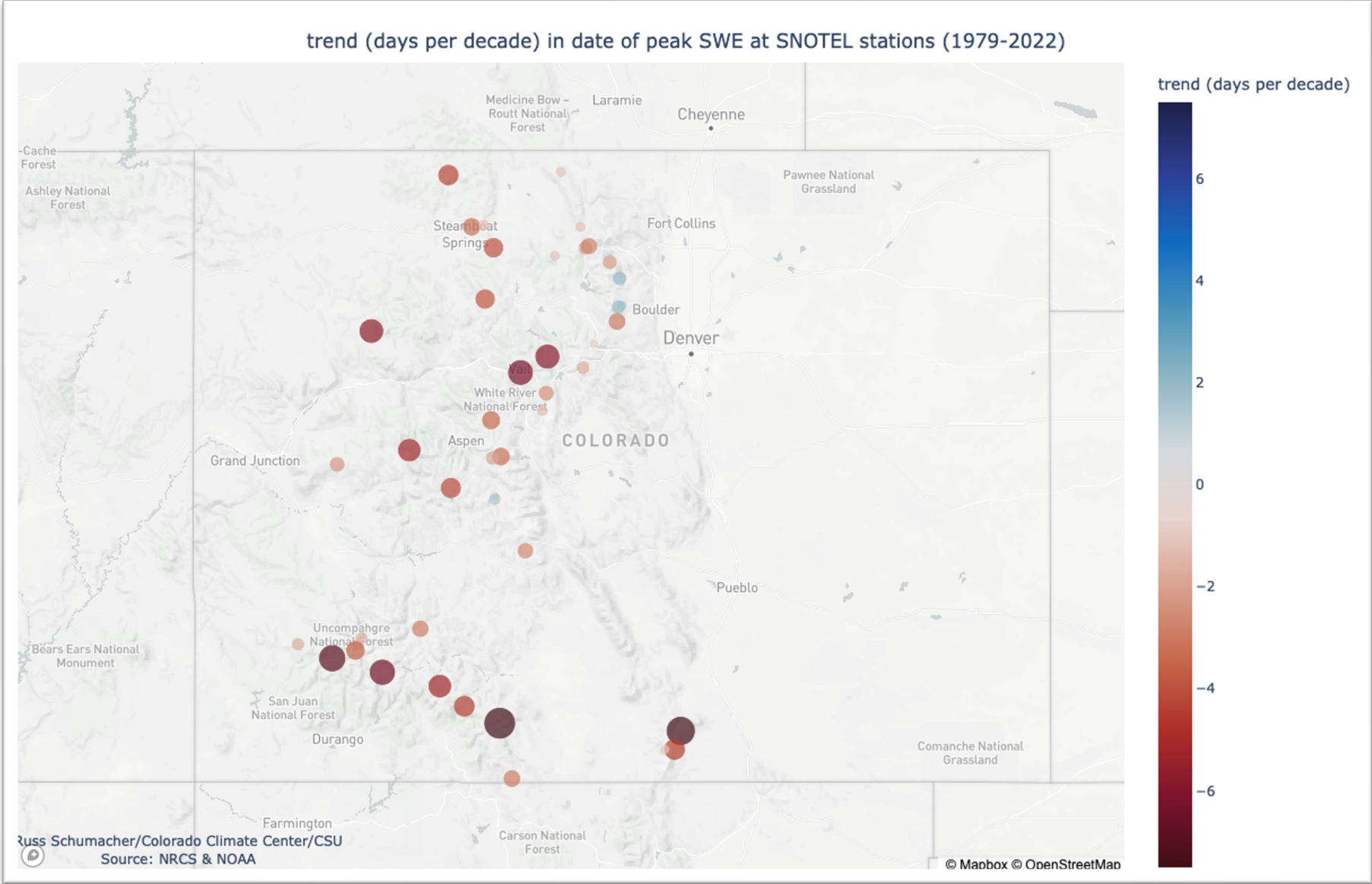
Warming temperatures affects our snowpack



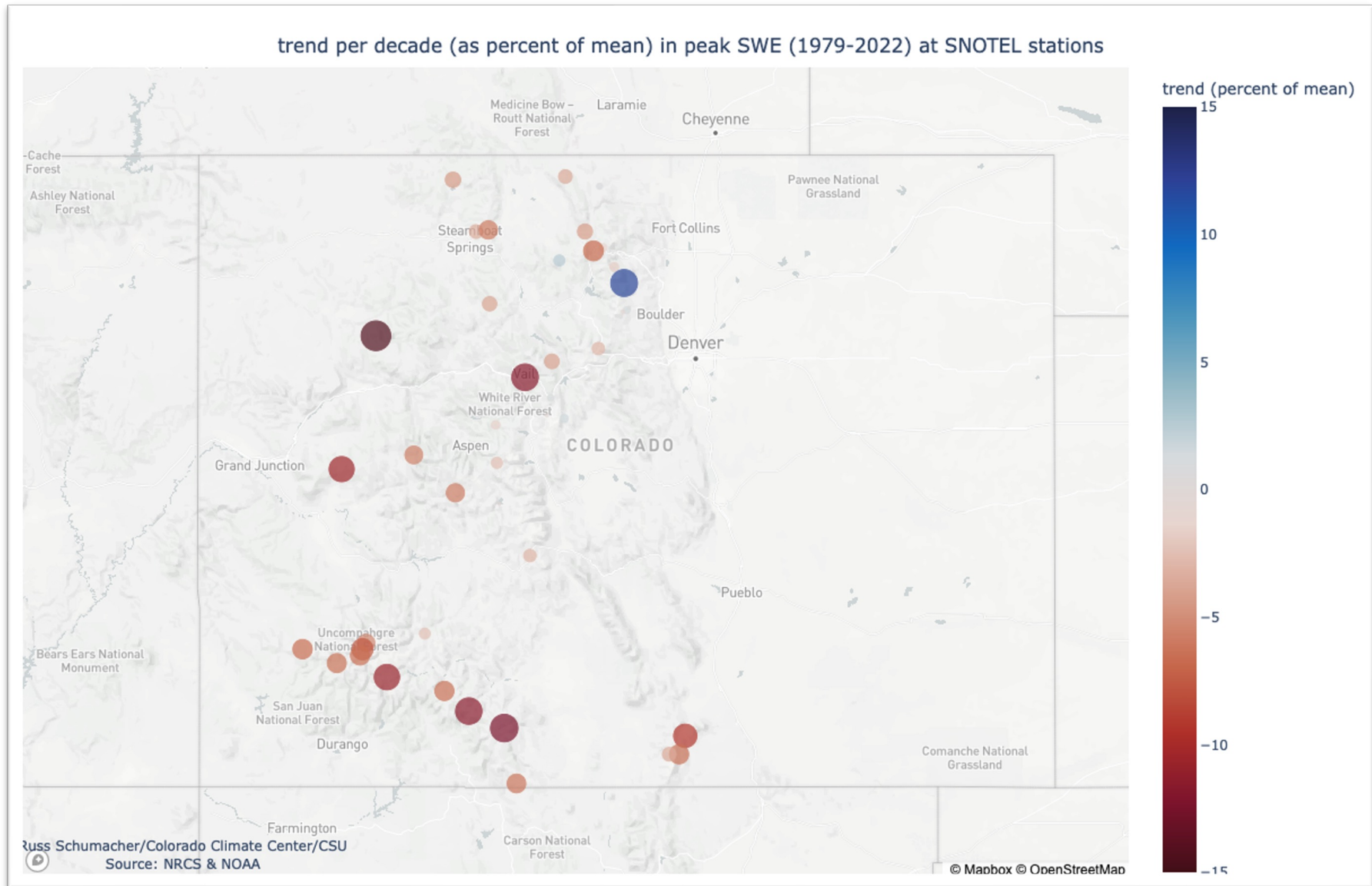
Nature
Vano, J., 2020



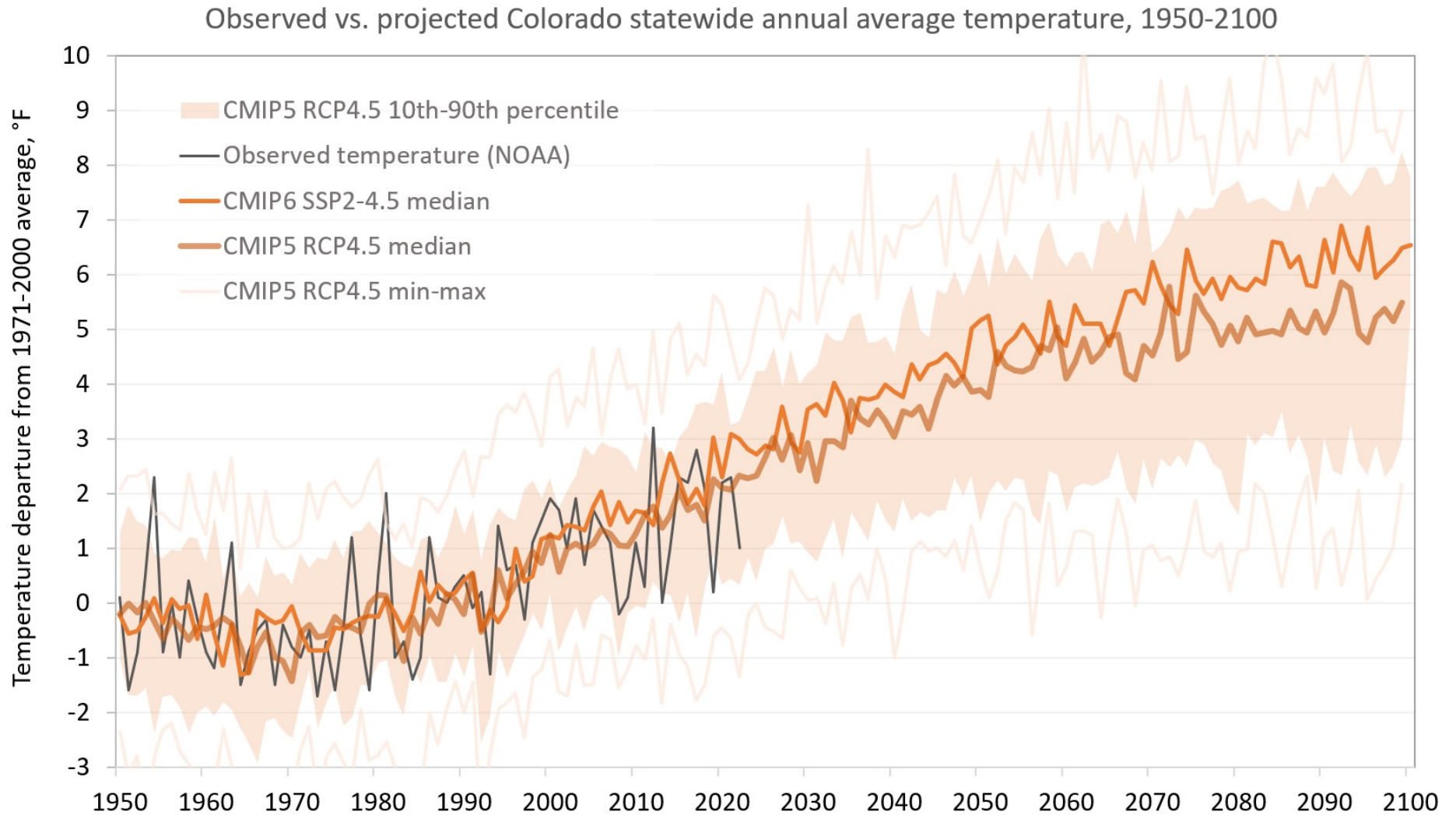
Recent trends in snowpack - date



Recent trends in snowpack - amount

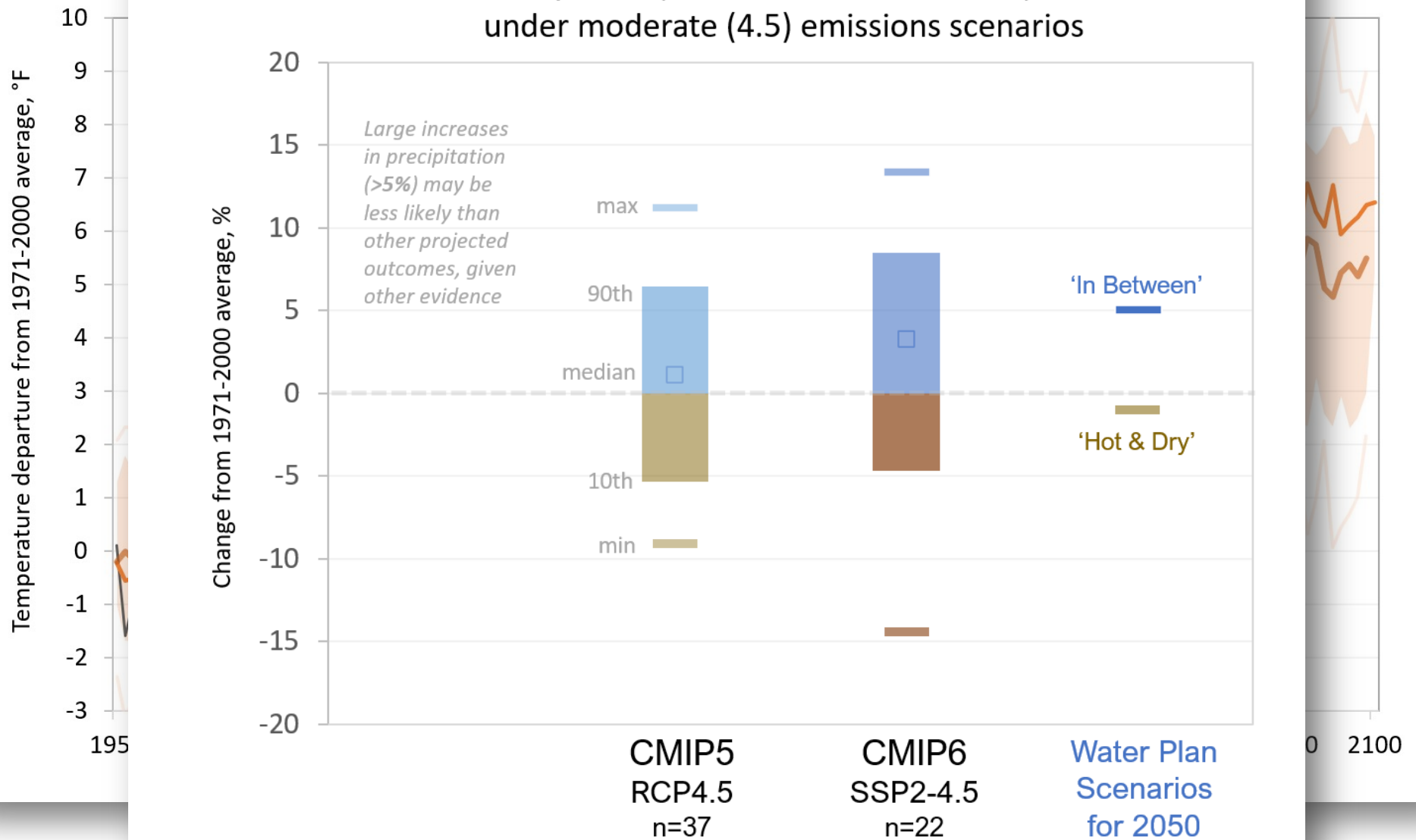


Future projections for our water



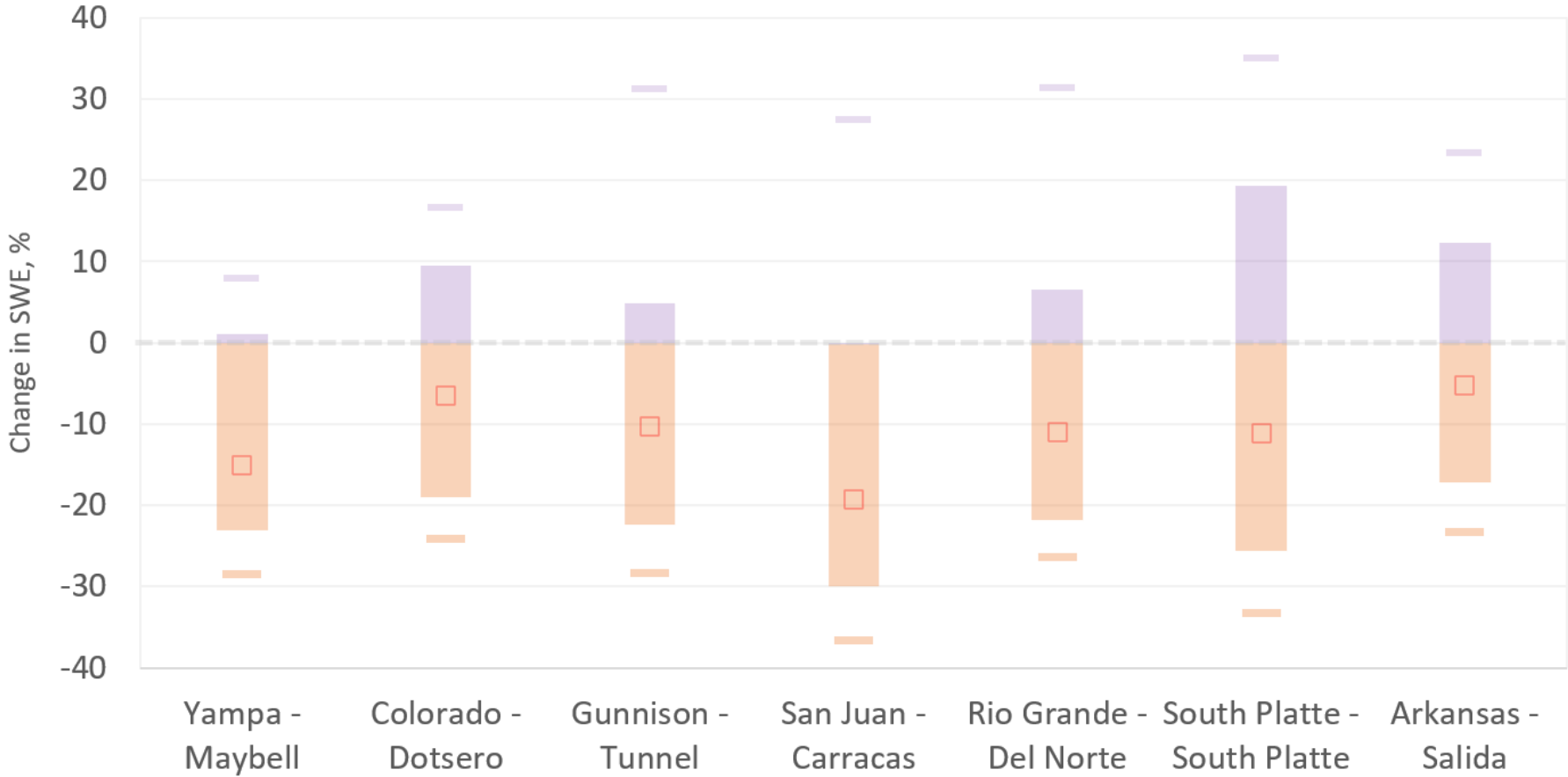
Future projections for our water

Colorado projected annual precipitation change by 2050 (1971-2000 to 2035-2064) under moderate (4.5) emissions scenarios



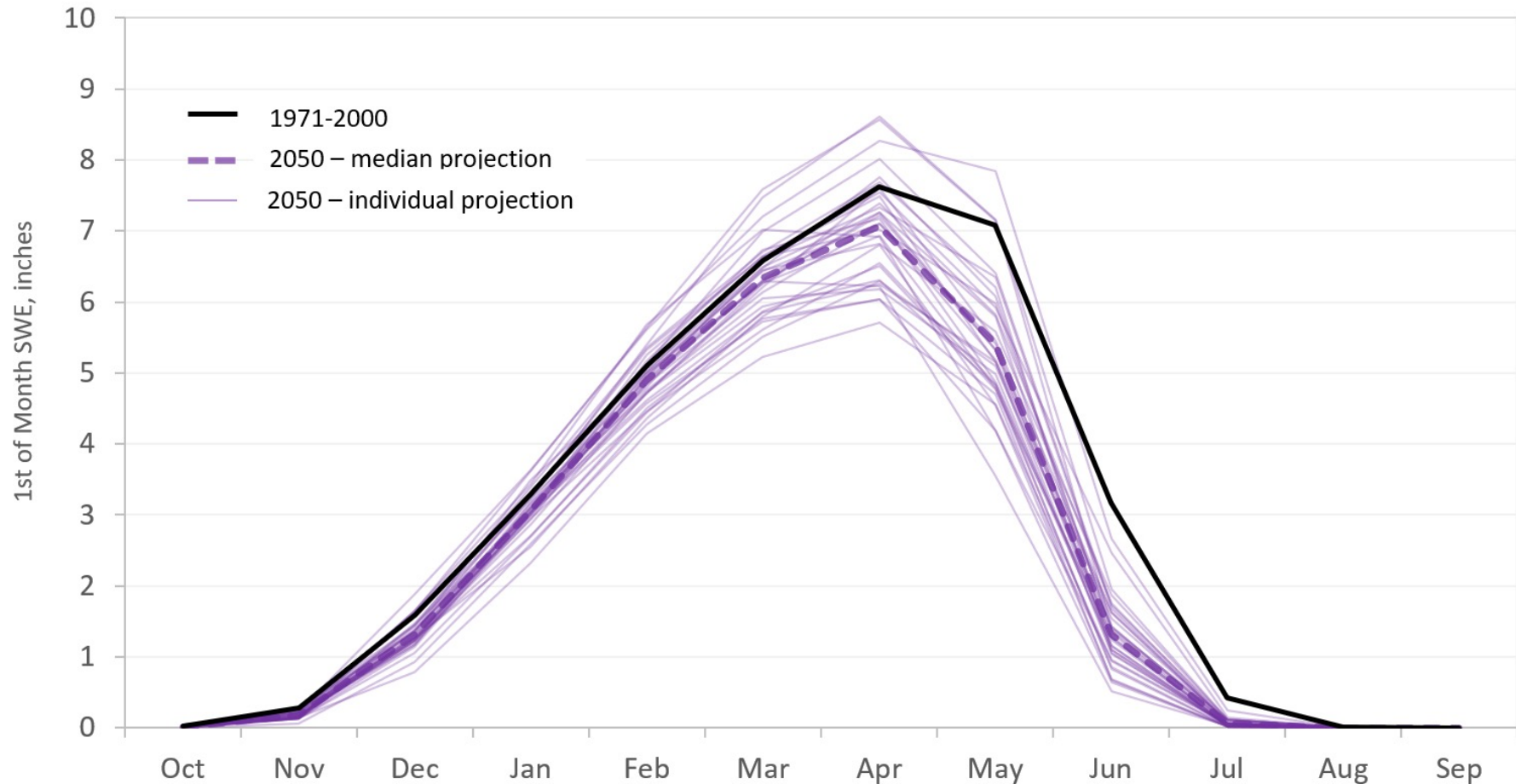
Future projections for our water

Projected April 1 SWE change, 1971-2000 to 2035-2064, CMIP5-LOCA-VIC, RCP4.5



Future projections for our water

Colorado River headwaters - Projected 1st of month SWE, 1971-2000 vs. 2050 (2035-2064)
CMIP5-LOCA-VIC under moderate emissions scenario

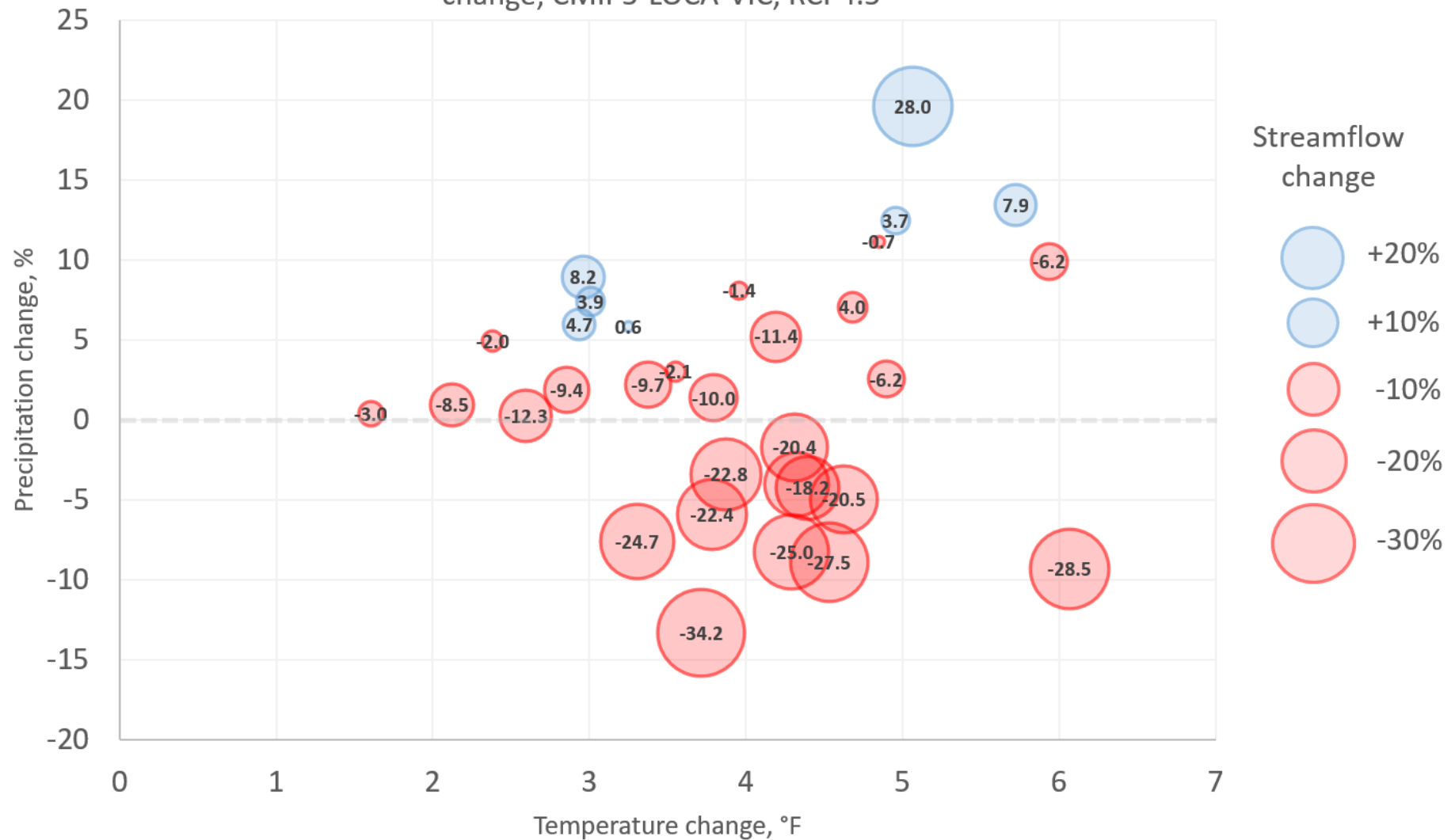


Similar peak date, lower peak, earlier meltout



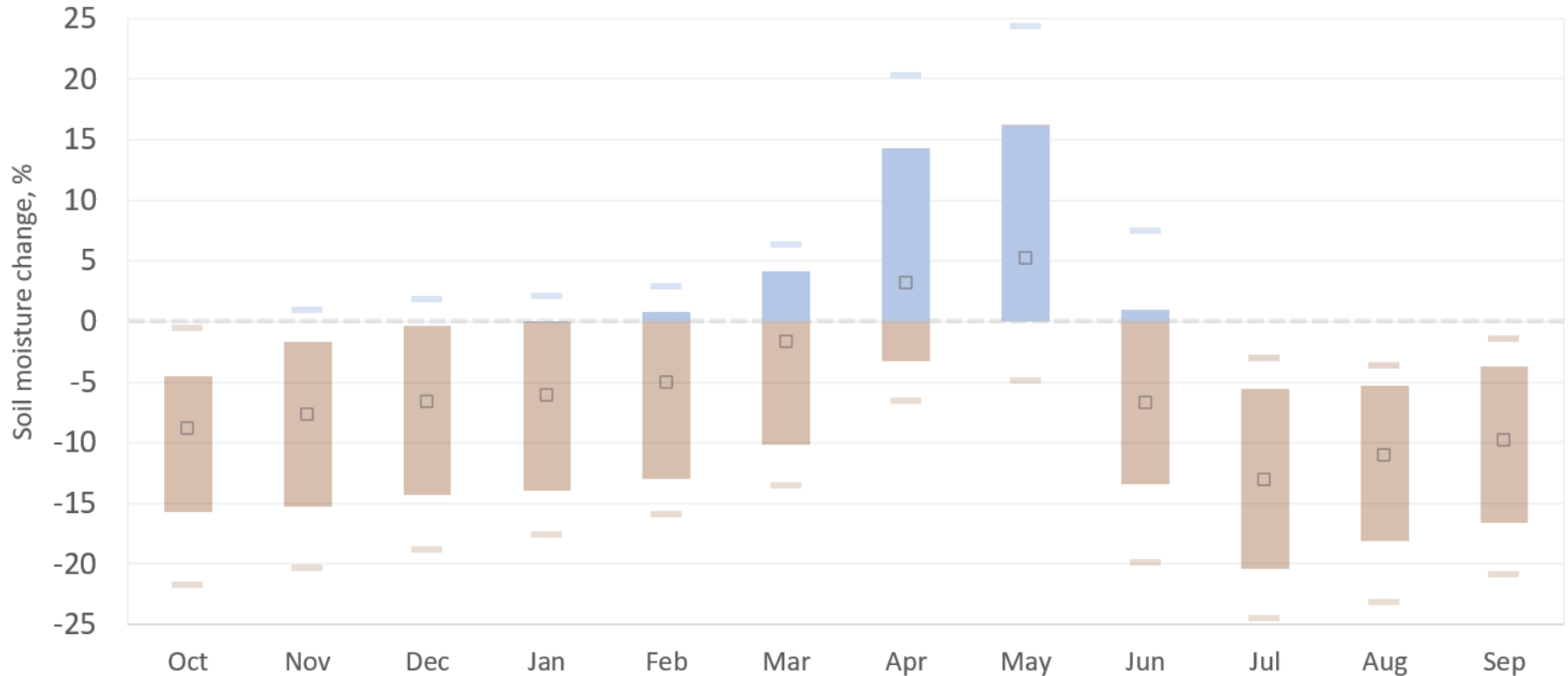
Future projections for our water

Projected change in annual streamflow, Colorado R. near Dotsero, 1971-2000 to 2050 (2035-2064) as a function of temperature change and precipitation change, CMIP5-LOCA-VIC, RCP4.5



Future projections for our water

Colorado River headwaters, projected change in monthly soil moisture (0-2 m depth), 1971-2000 to 2050 (2035-2064), CMIP5-LOCA-VIC, RCP4.5



Earlier runoff increases moisture in the spring, less moisture in the summer



Key takeaways

- ❑ Temperatures have warmed for CO and will continue to warm
- ❑ Precipitation is highly variable, droughts are common
- ❑ Warmer temperatures worsen drought and decrease benefit of wetter years
- ❑ It is likely our water supply will continue to decrease as our water demand increases





What can we do???

- ❑ ~30 minutes of doom and gloom
- ❑ So here's your 30 seconds of hope!! 😊
- ❑ Do what you're doing now – stay climate aware and keep learning!
- ❑ Knowing what's coming increases our preparedness and planning
- ❑ There are lots of national, state, and local efforts focused on adaptation and ensuring we all get through this
- ❑ There's a lot of excitement in the world of mitigation, renewable energy, etc.
- ❑ Stay involved with your communities and local governments
- ❑ See state planning documents for more information:
 - ❑ Colorado Water Plan
 - ❑ Climate Change in Colorado
 - ❑ Colorado Climate Change Vulnerability Study
 - ❑ Colorado Climate Plan



Climate Change in Colorado

Full report coming in late 2023.

Report

Executive Summary

Data and graphics

Resources

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climate.colostate.edu

Thank you



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