CLIMATE MODERATED RESPONSES TO WILDFIRE BY PERIPHYTON & INVERTEBRATES IN MONTANE WILDERNESS STREAMS

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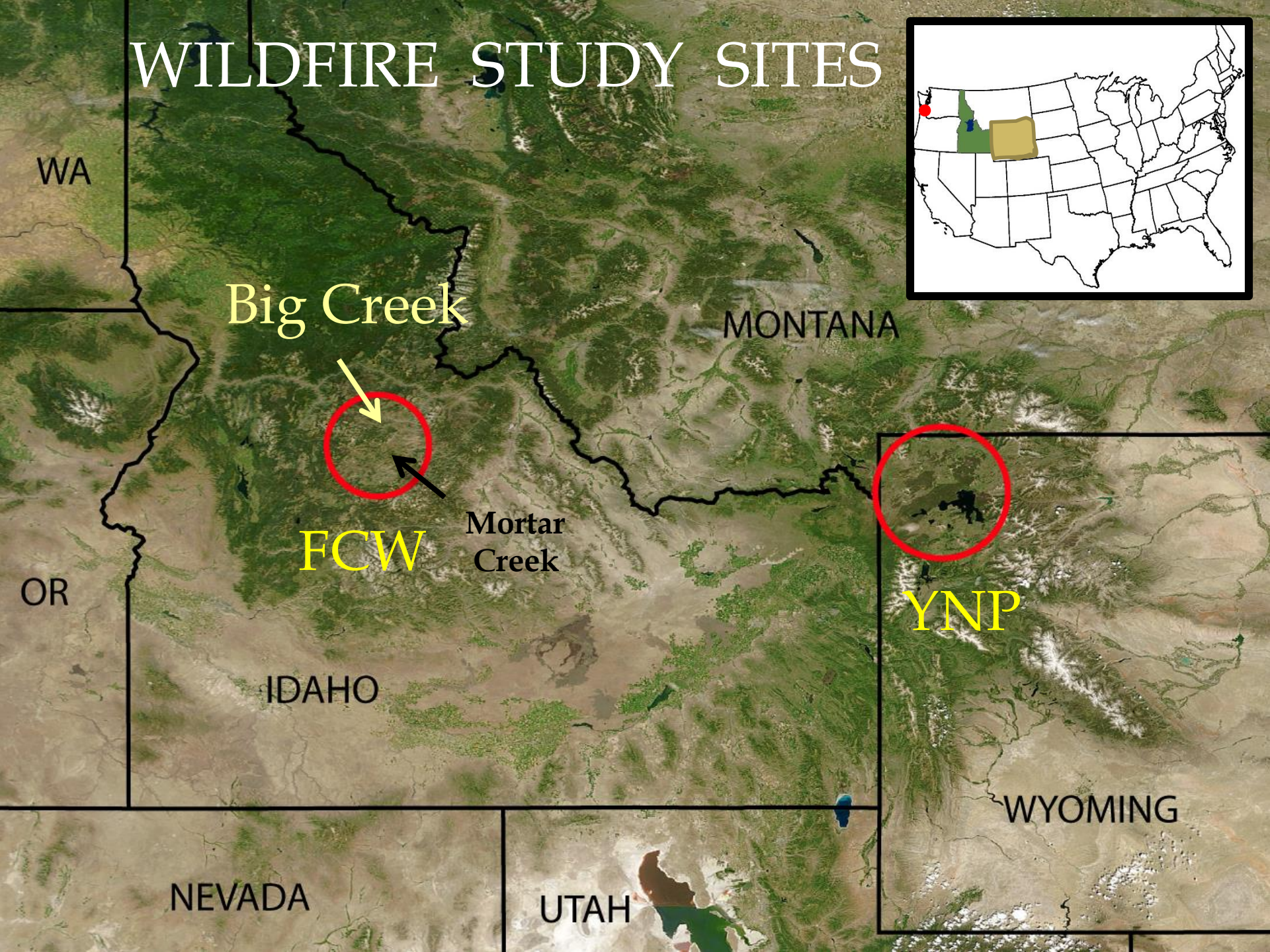
WILDFIRE STUDY SITES



Introduction

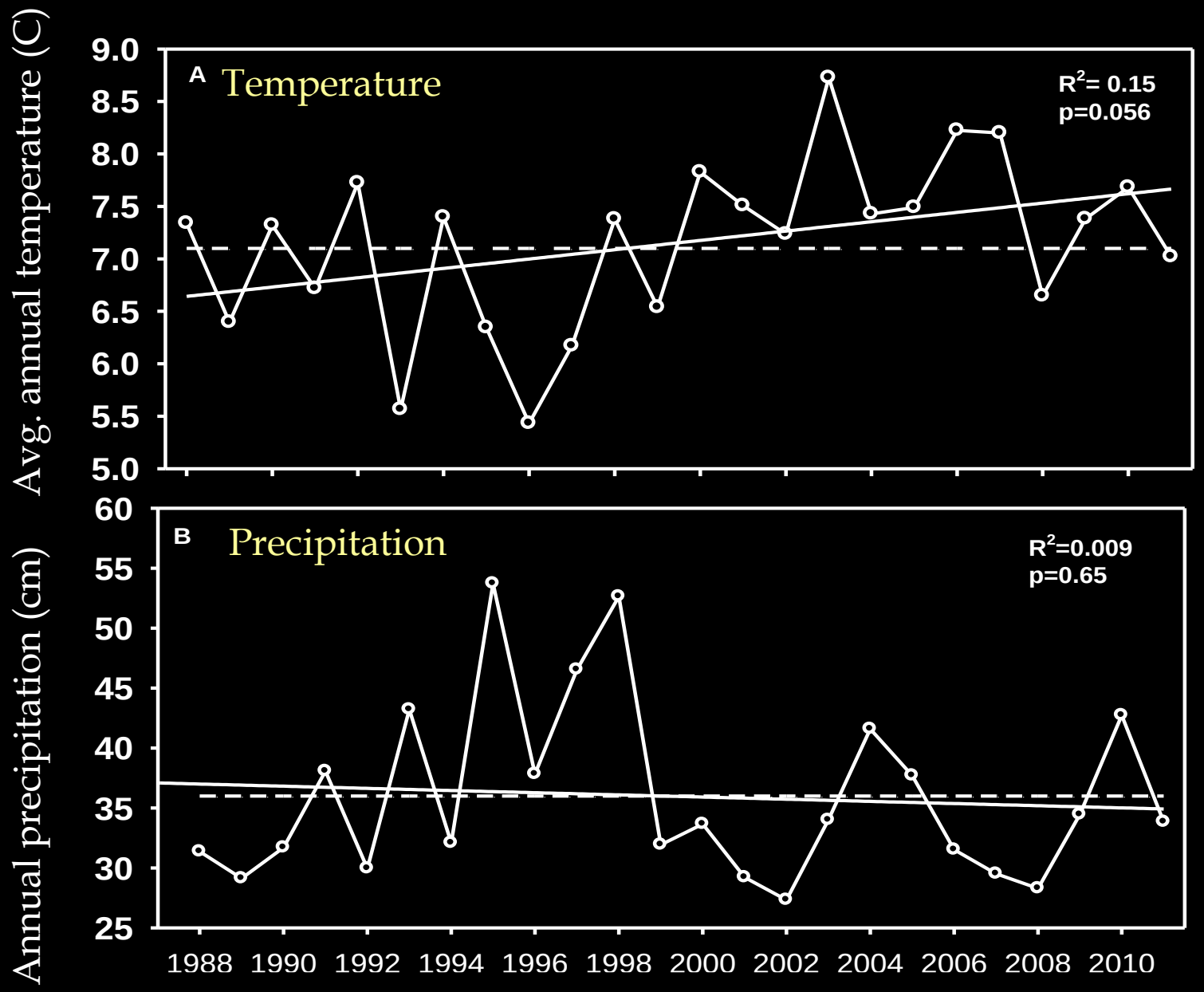
Shift to warmer climate has resulted in drier summers & increased fire frequency and severity

In Intermountain West, effect of warming has been:

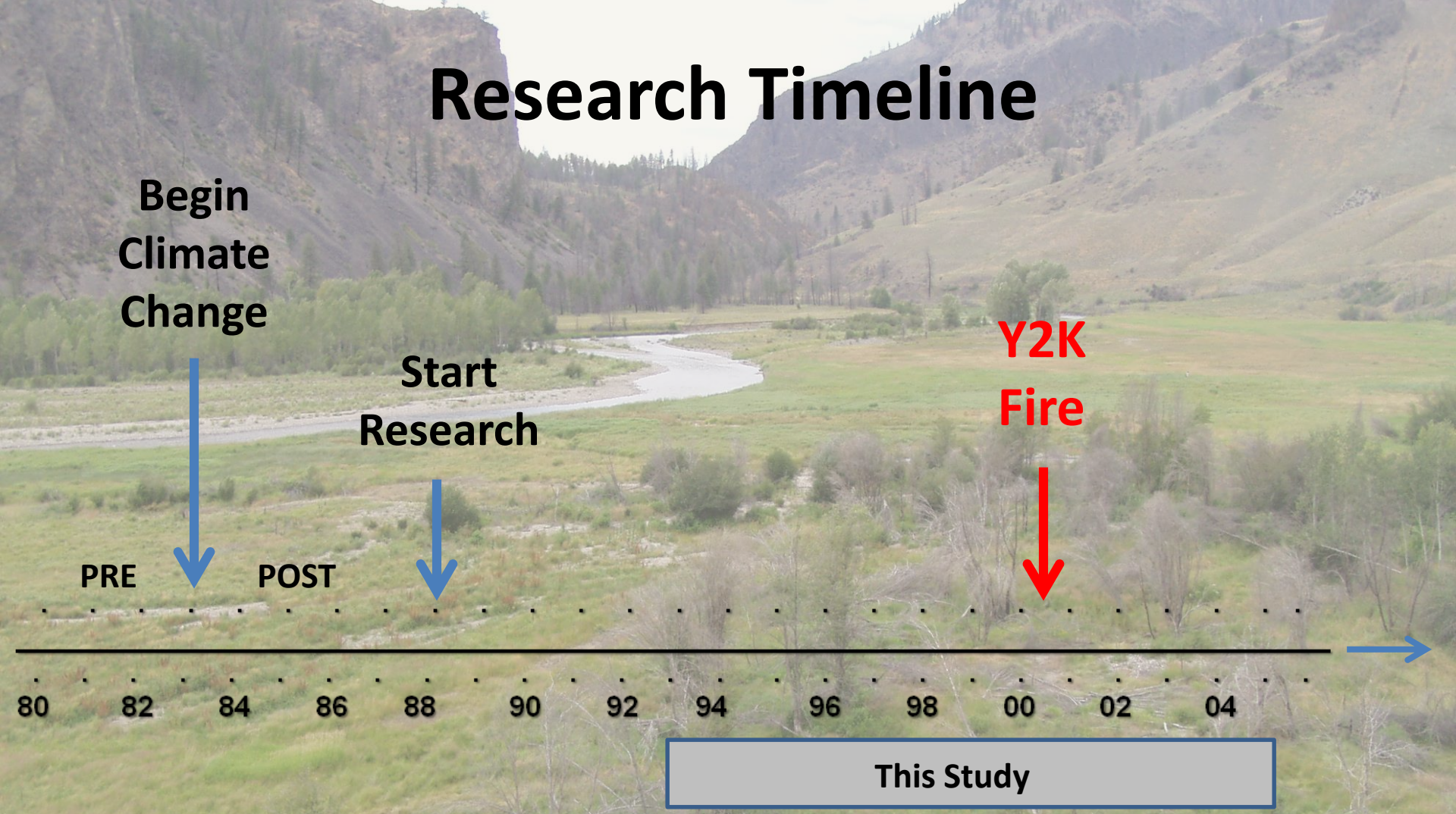
- less precipitation falling as snow
-earlier snowmelt & drying of vegetation

-resulting in the **suppression of snow-melt runoff** & occurrence of several large fires since the mid 1980s

Climatic Variables



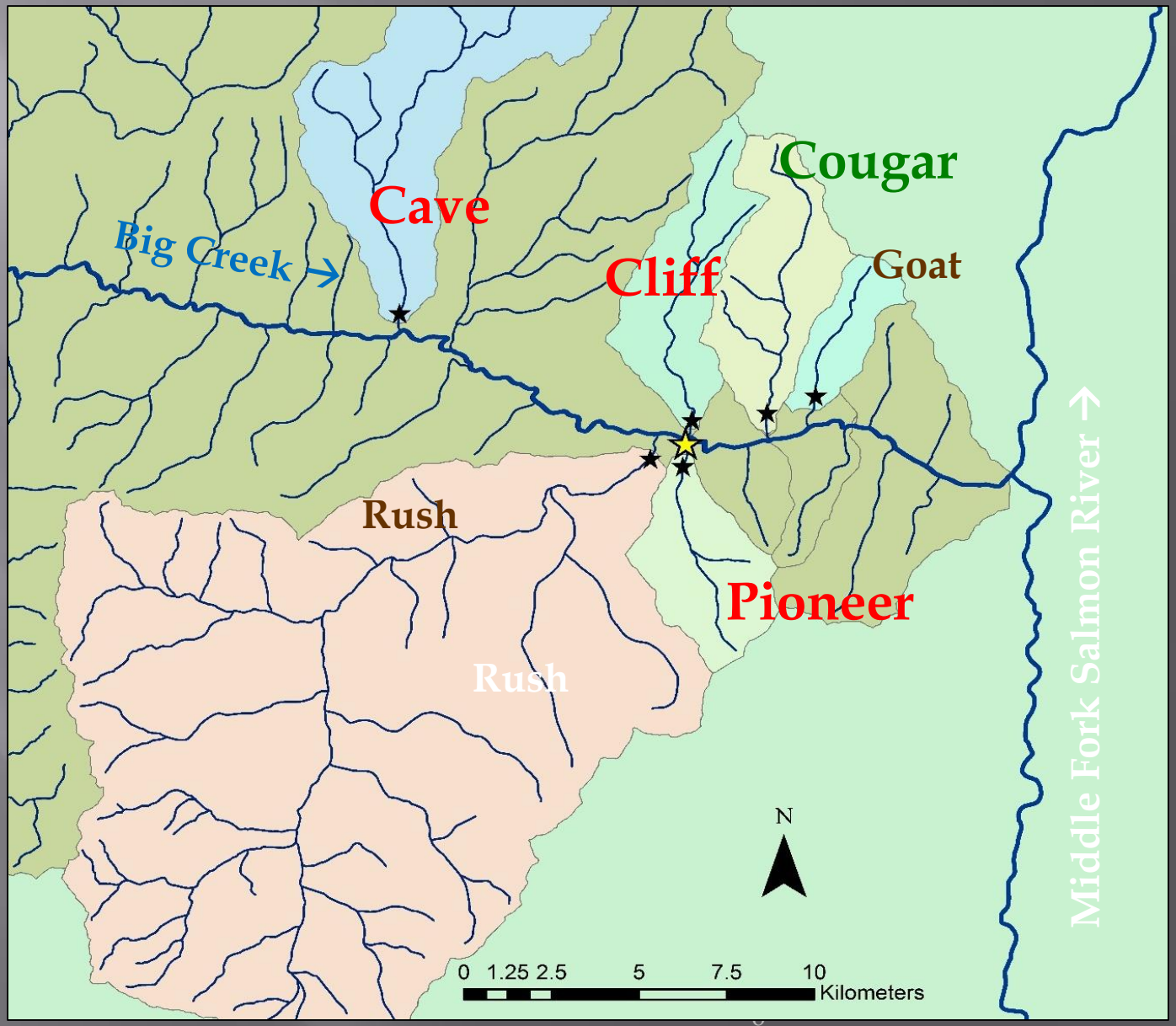
Research Timeline



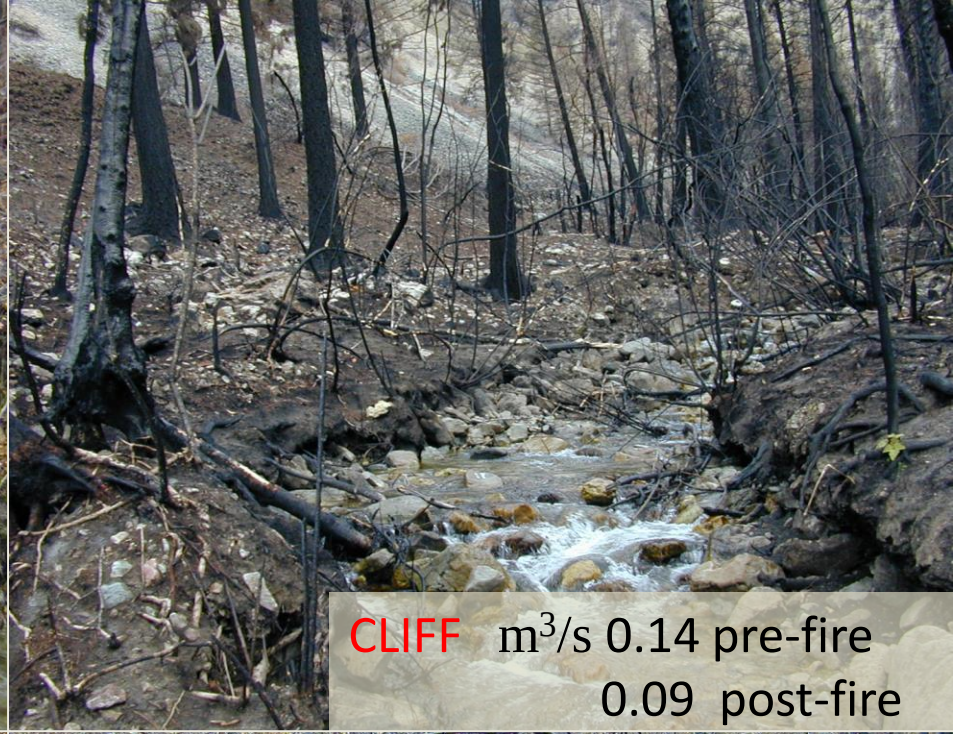
Rugenski, A. T., and G.W. Minshall. 2014. Climate-moderated responses to wildfire by macroinvertebrates and basal food resources in montane wilderness streams. Ecosphere 5(3):25.

Long Term Monitoring: Study Sites

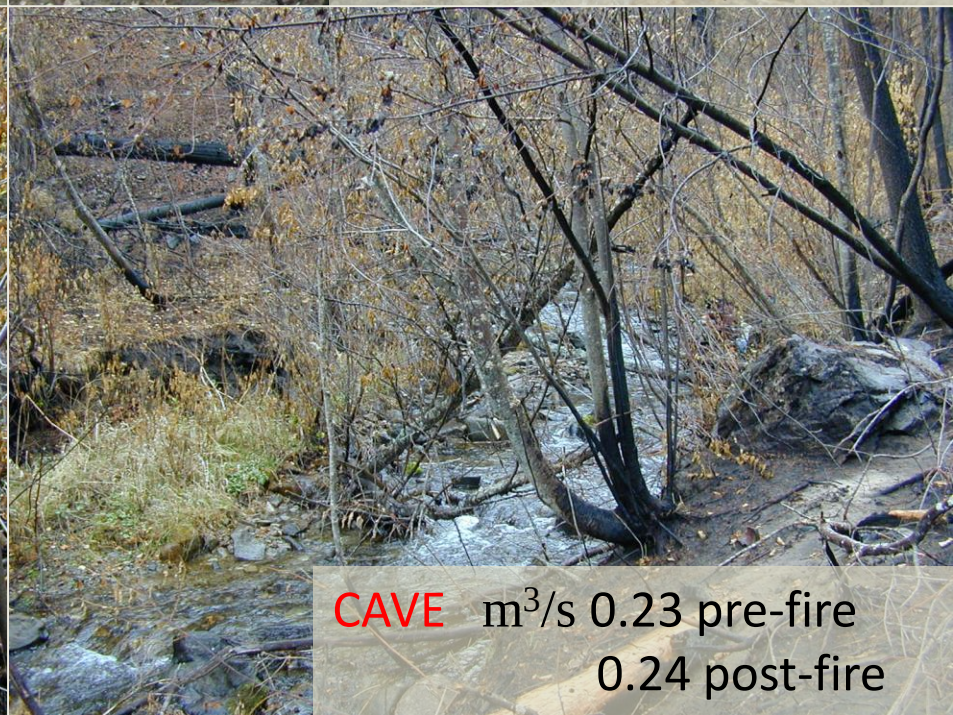
6 Sites
4 focus
3 burned
1 not



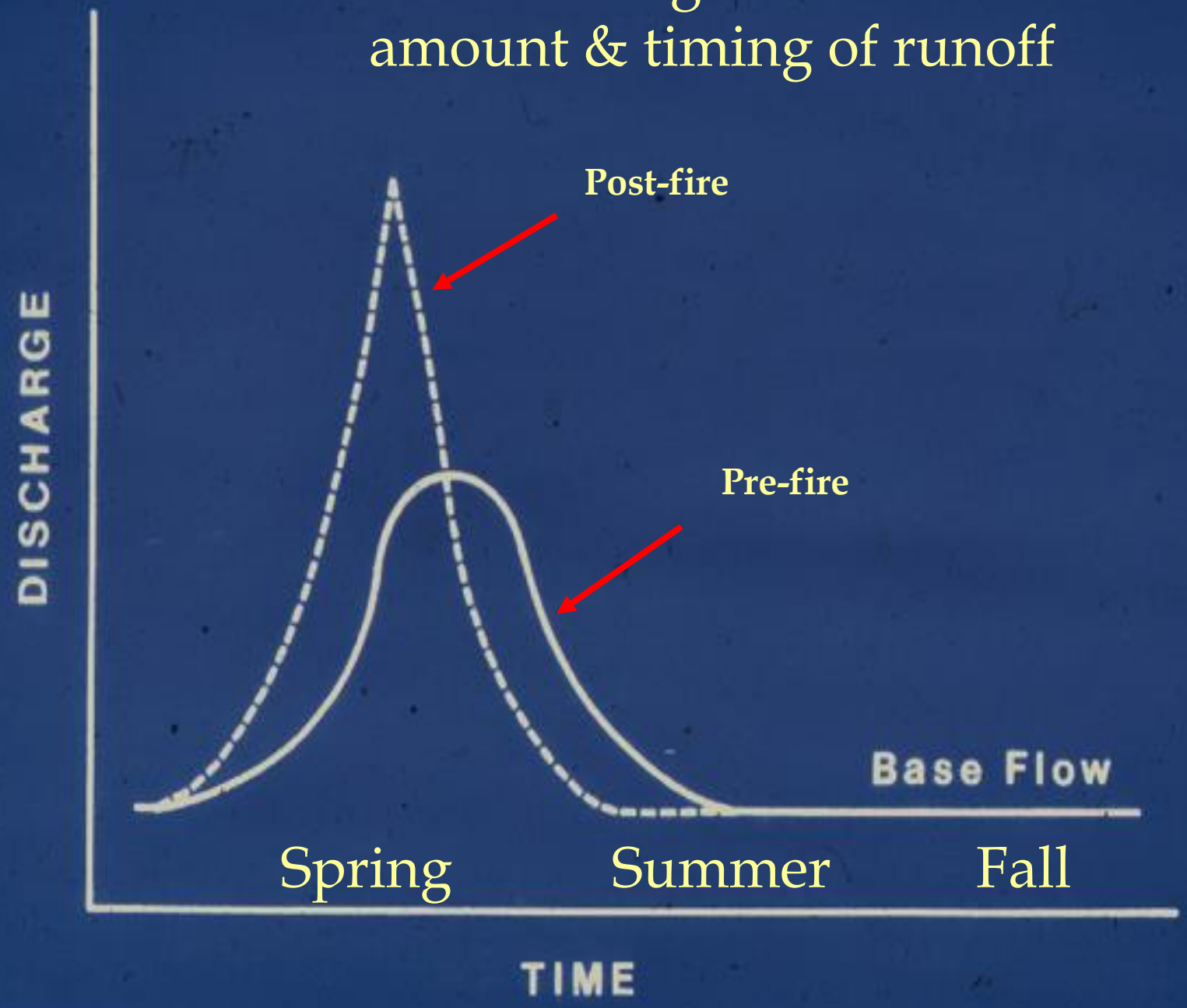
COUGAR m^3/s 0.03 pre-fire
0.01 post-fire


CLIFF m^3/s 0.14 pre-fire
0.09 post-fire

PIONEER m^3/s 0.16 pre-fire
0.09 post-fire

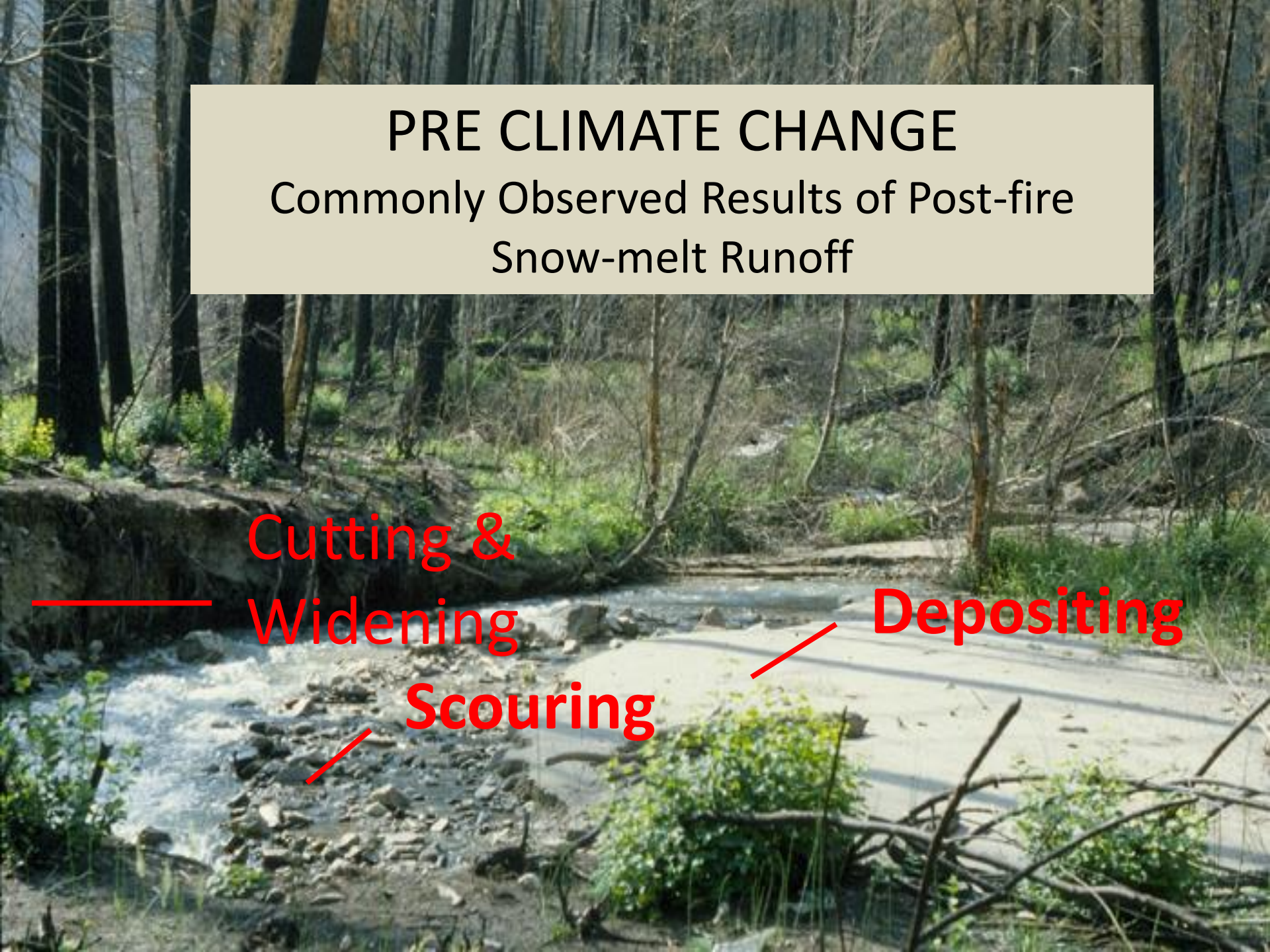

CAVE m^3/s 0.23 pre-fire
0.24 post-fire

Pre-climate change: Fire often altered amount & timing of runoff

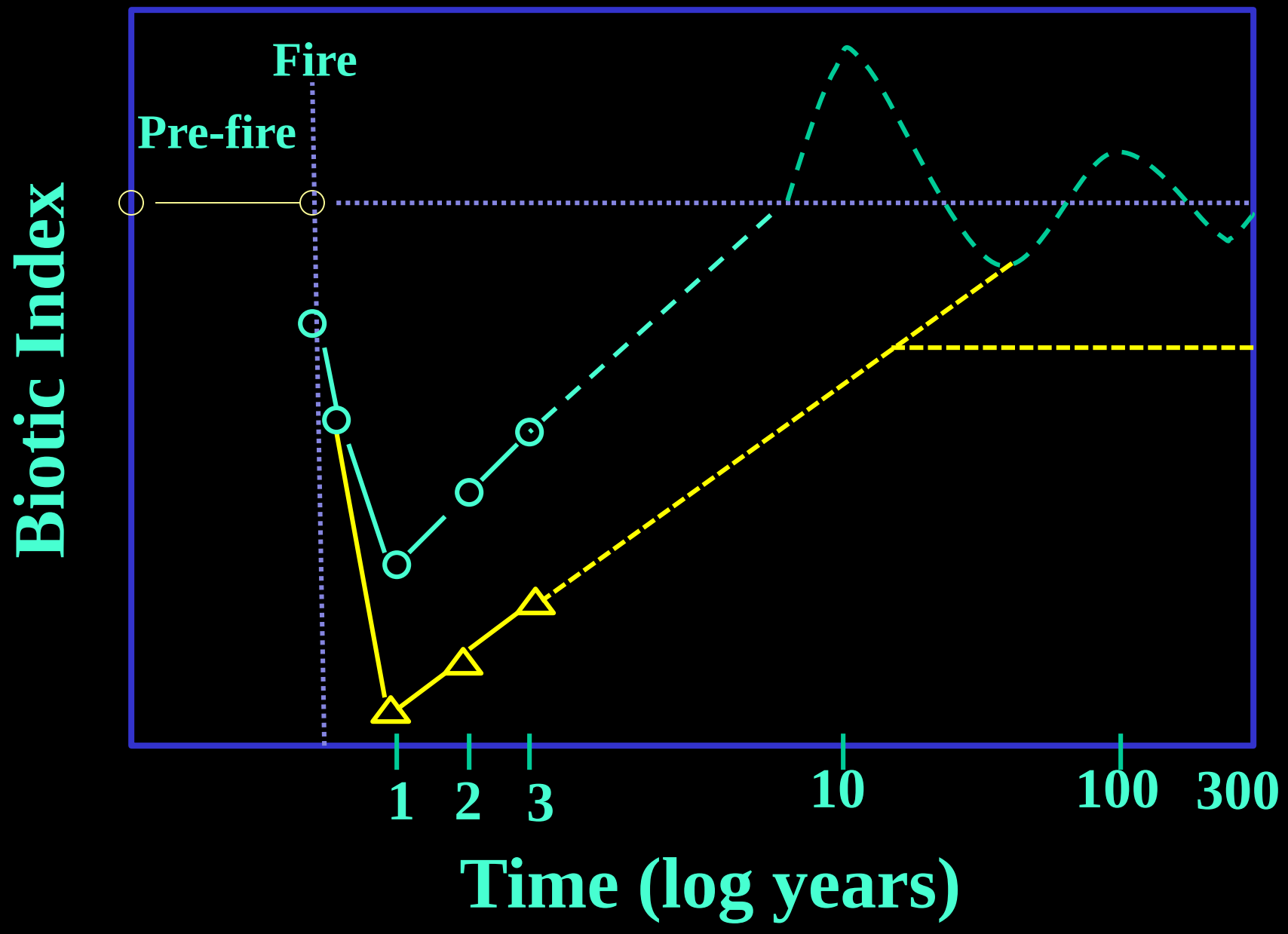


PRE CLIMATE CHANGE

Commonly Observed Results of Post-fire Snow-melt Runoff



PRE CLIMATE CHANGE



18 y of Peak Discharge Estimates Based on Manning Equation

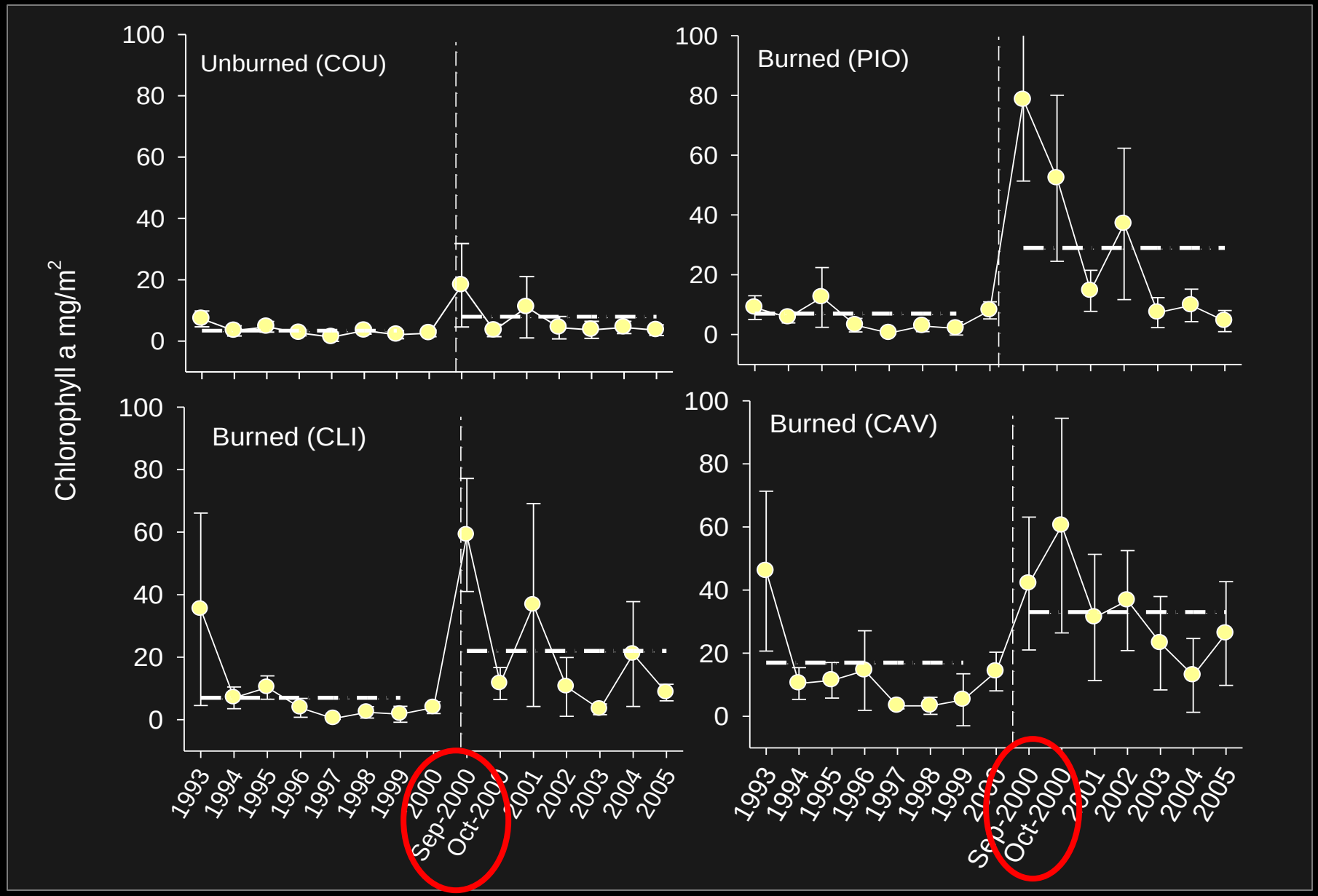
Comparing Pre- versus Post-fire

- No significant change in any of the 4

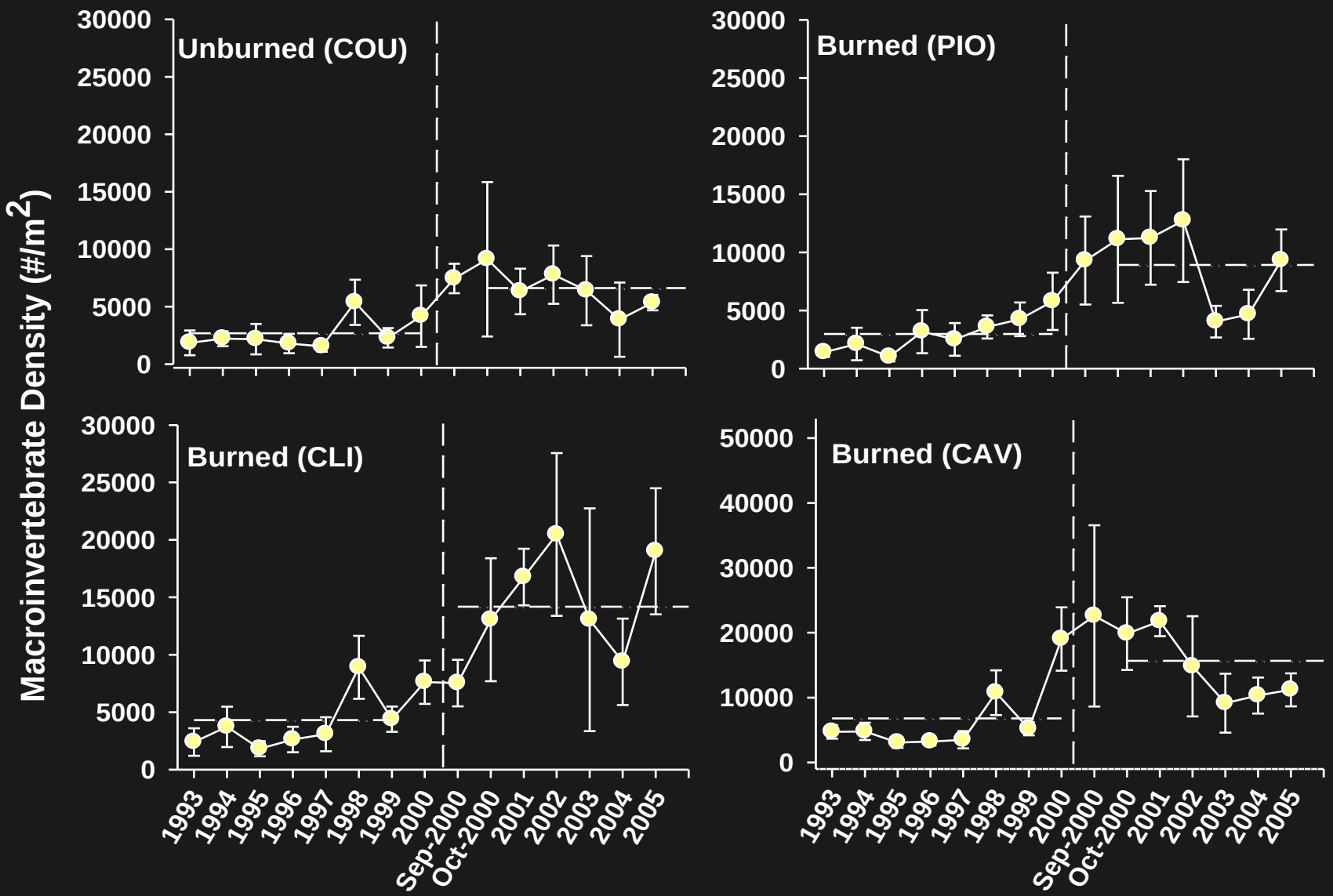
- Some increase about the time of the fire
  - Cougar - unburned & started before the fire
  - Cliff - sufficient to affect the biota

Therefore – no fire effect in 2 of the 3

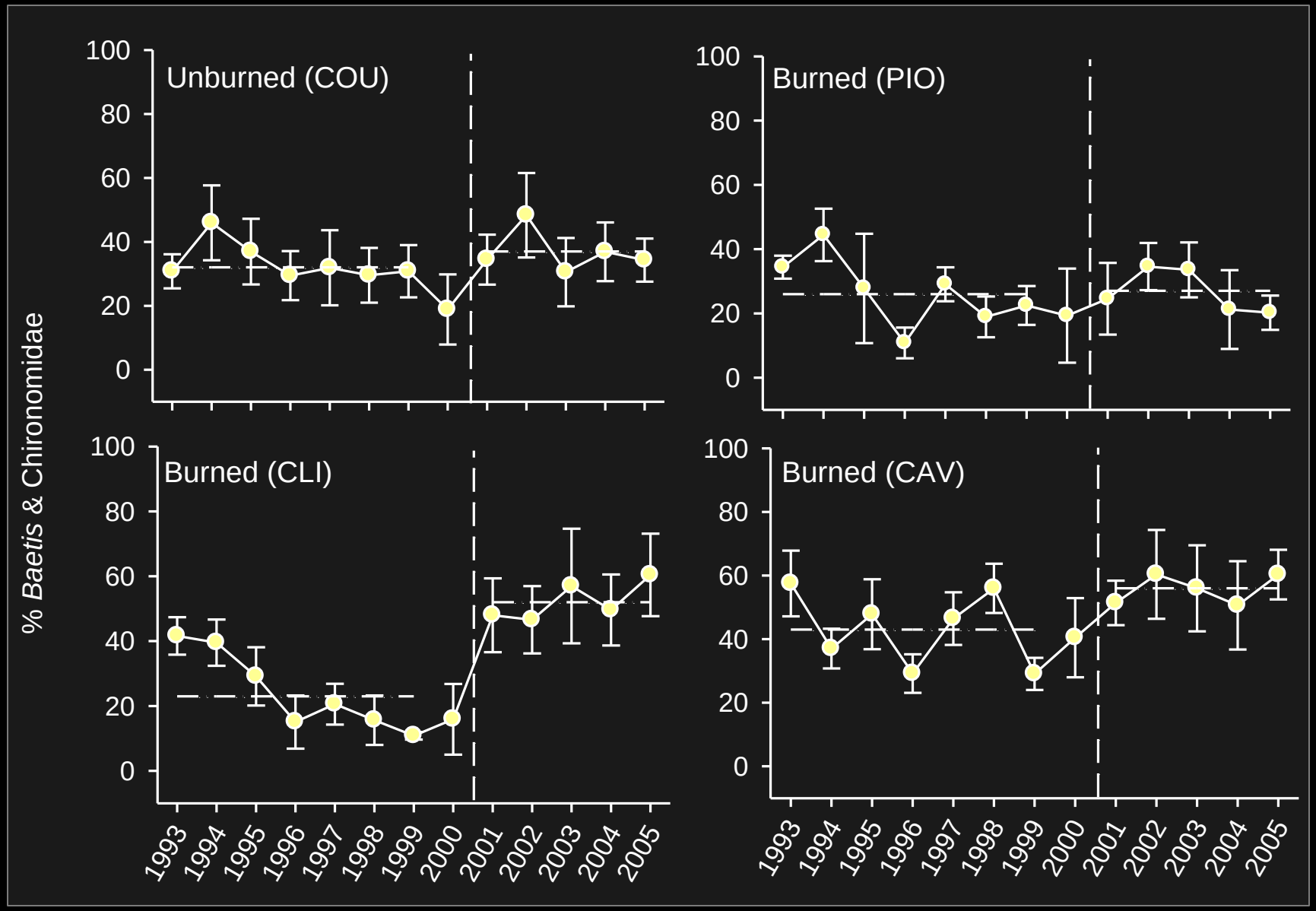
Results: Chlorophyll *a*



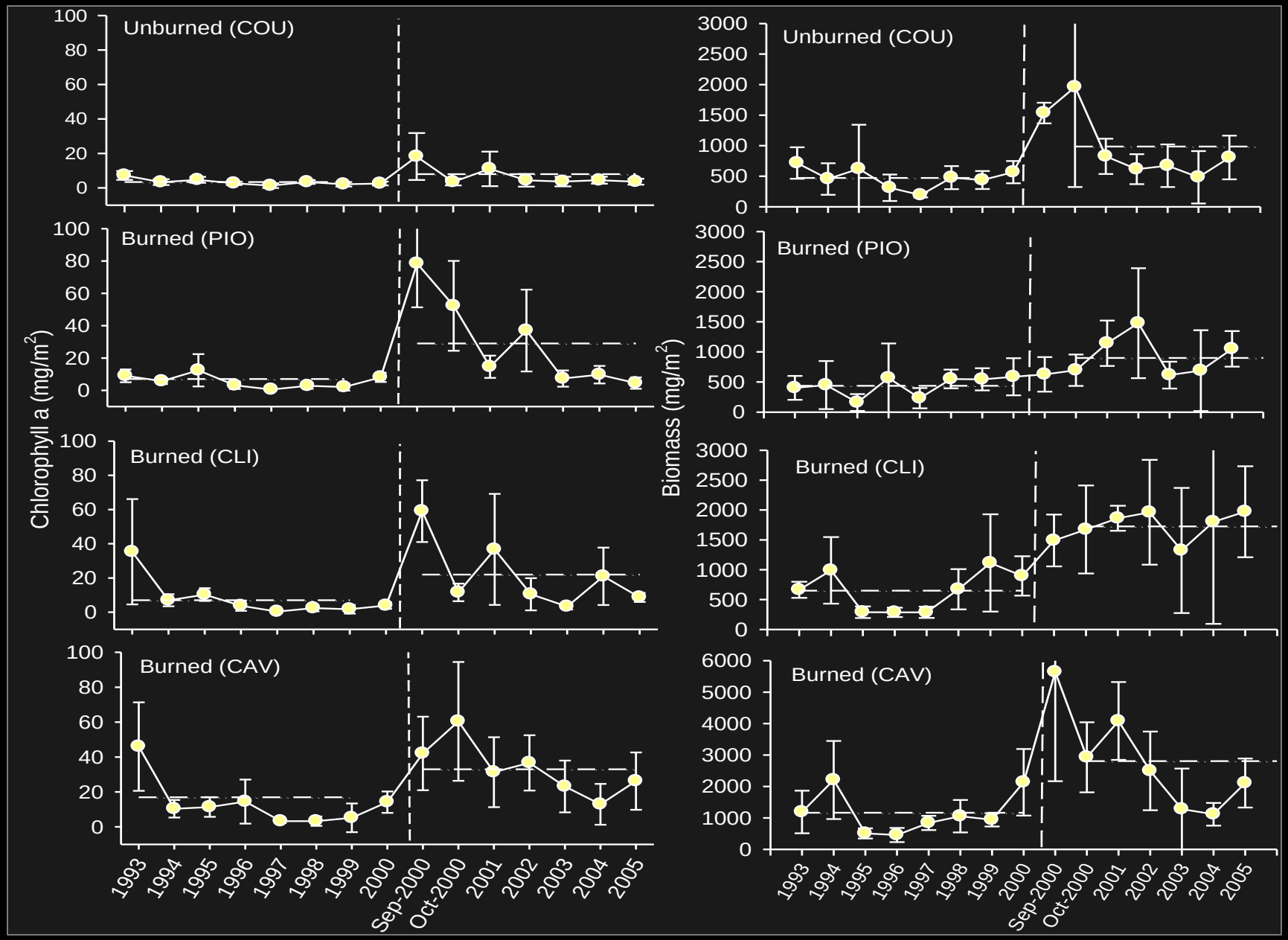
Results: Density



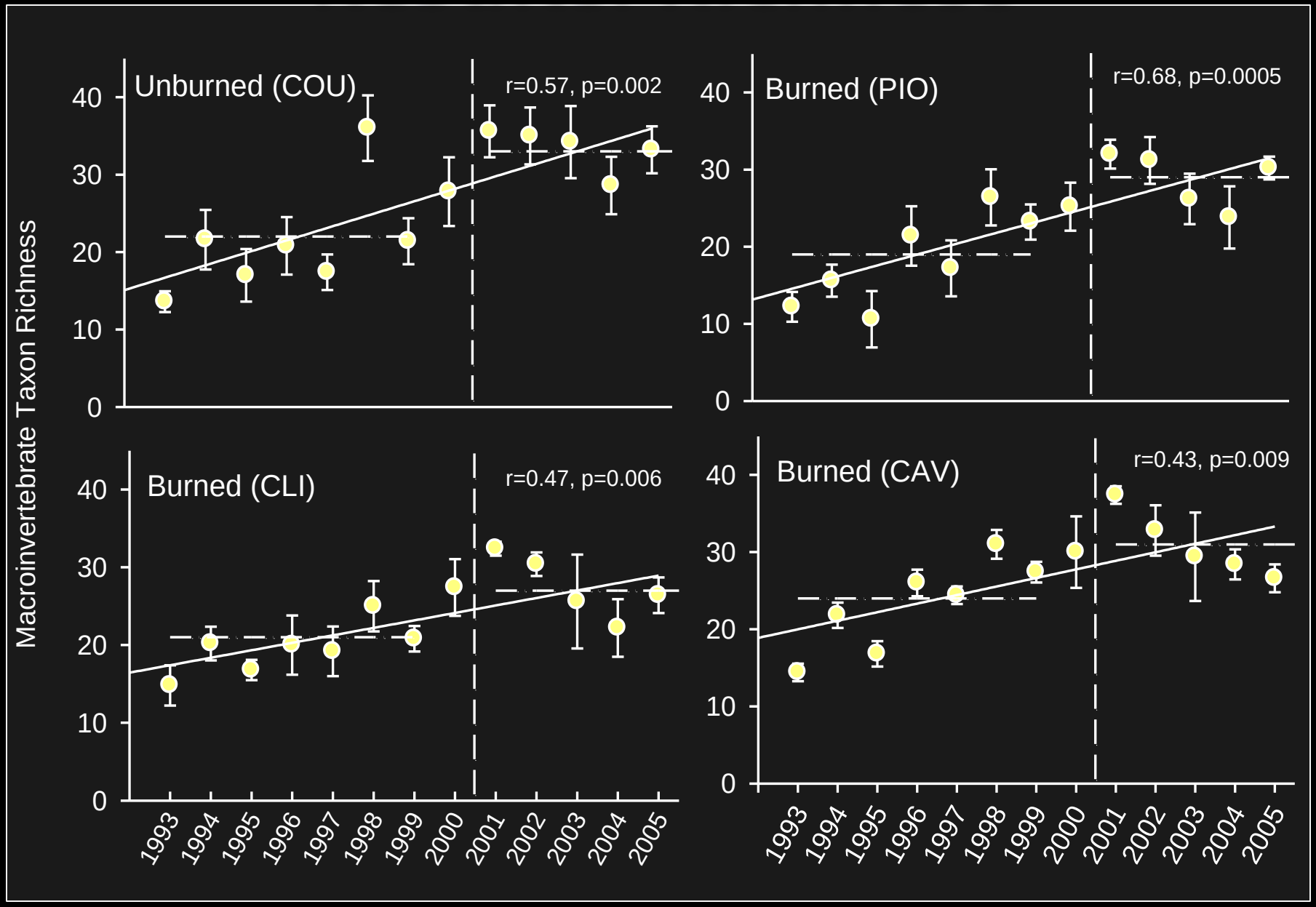
Results: *Baetis* + Chironomidae



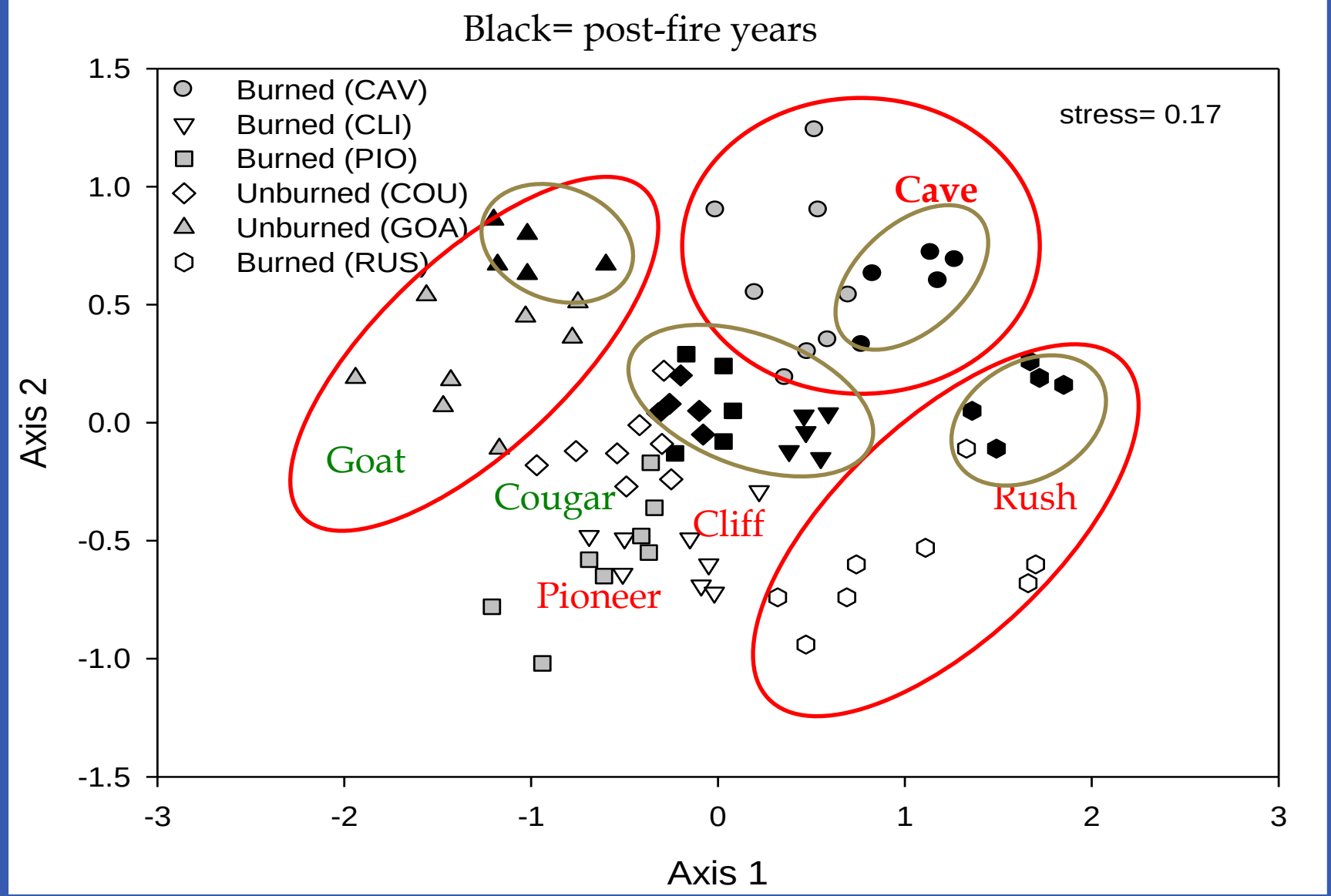
Chl *a* Invert Biomass



Results: Richness



Results: NMDS biomass



NMDS Summary

Using NMDS in a separate analysis of individual streams, we found:

Significant correlations between invertebrate community structure and precipitation, temperature, & discharge in all streams

Higher chlorophyll concentrations were significantly associated with post -fire years in unburned Cougar & burned Pioneer & Cave

Conclusion

A shift in climate away from snowmelt runoff reduced adverse effects of wildfire on periphyton & macroinvertebrates.

Rare species became less so, leading to increased richness w/ no apparent effect of fire.

Standing crops of periphyton increased post-fire as did macroinvertebrate abundance & biomass; apparently enhanced by fire.

Acknowledgments

Colden Baxter, Jeff Barger, Jeff Davis, Paul Dey, Kate Harris, Jessica Hopkins, Pam Hulet, Adam Kleven, Peter Koetsier, Deron Lawrence, Justin Mann, Tim Mihuc, Judy Minshall, Mike Monaghan, Jim Morris, Dave Moser, Cary Myler, Sara Owen, Aaron Prussian, Heather Ray, Christina Relyea, Scott Relyea, Chris Robinson, Todd Royer, Jesse Schomberg, Eric Snyder, Reuben Snyder, Lynn VanEvery, Robin Vannote, Jeff Varricchione