# The role of climate in regulating postfire nitrogen cycling and export in chaparral

Erin J. Hanan, Joshua P. Schimel, Christina (Naomi) Tague
Ecology, Evolution & Marine Biology, UC Santa Barbara, Santa Barbara, California 931016

## INTRODUCTION

Models predict that interannual rainfall variability will increase in CA over the next several decades. Following fire, winter rains can leach N into streams. But the long-term impacts of changing rainfall patterns remain unknown.

## QUESTIONS

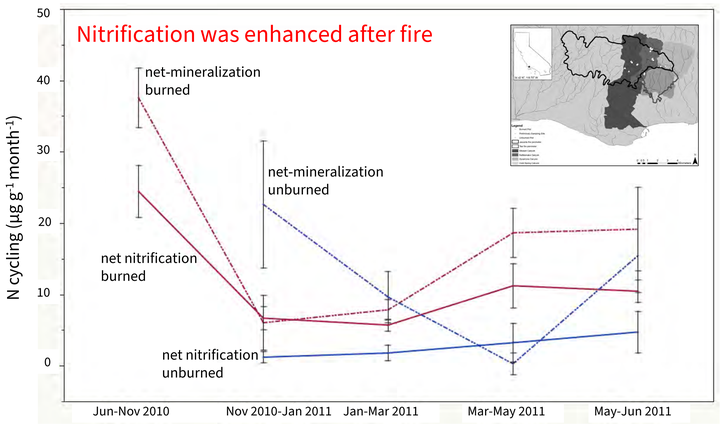
1. How does interannual rainfall variability affect postfire N export?
2. Do the effects of precipitation patterns in the years before or after fire extend over time to influence decadal scale recovery?

## MEASUREMENT-MODELING APPROACH

- Field and lab analyses to evaluate controls over N cycling after fire
- Modeling to project the effects of fire timing on N dynamics & ecosystem recovery.

## FIELD

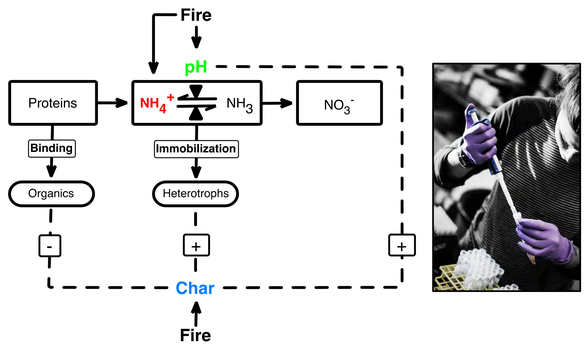
Evaluated soil C and N dynamics after fire for two years




Enhanced nitrification coincided with increased NH4+ supply, elevated pH and suppressed microbial biomass

## LABORATORY INCUBATION

To evaluate controls over N cycling and microbial dynamics along a wildfire-structured age graident





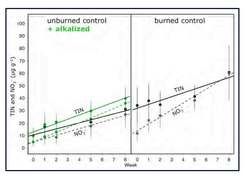

4 age classes:

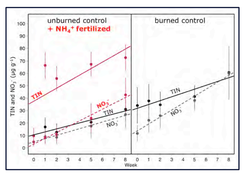
- Unburned (23 and 49-year-old)
- Burned ( 1.5 and 4-year-old)
- 3 plots per age

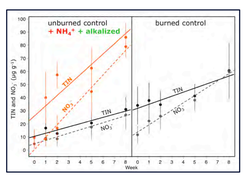
Incubated 8 weeks

- 4 levels of pH
- w/wo NH4+
- w/wo char

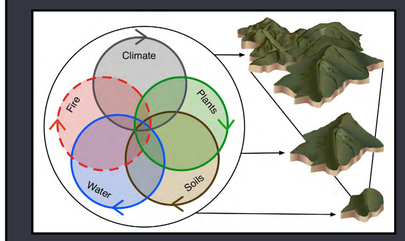
Substrate supply and pH interact to activate nitrifier populations, then trade off (or amplify one another) to sustain nitrification




## MODELING




Ecohydrologic model RHESSys

15 SIMULATIONS
45 years
Fire in one of middle 15 years
Classified fire years as dry, intermediate, or wet, based on ET

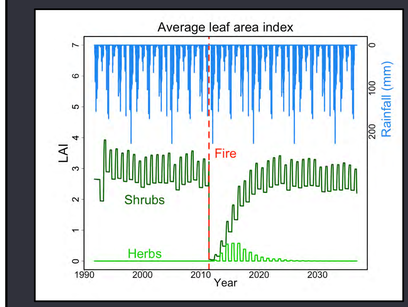
## MODELING EXPERIMENT

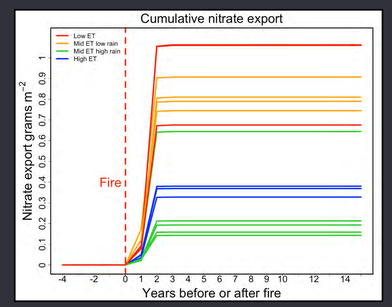
Evaluate how climate conditions before & after fire influence N cycling

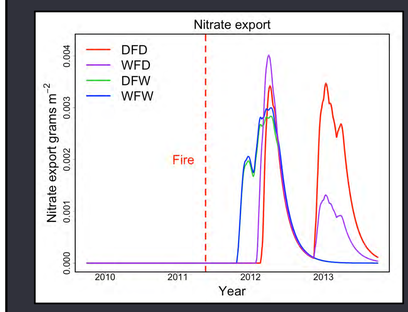
1. DFD: dry – fire – dry
2. WFD: wet – fire – dry
3. DFW: dry – fire – wet
4. WFW: wet – fire – wet

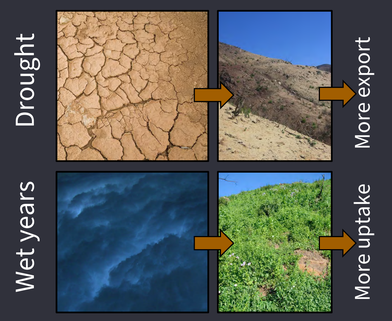
## MODELING RESULTS

Export was up to an order of magnitude higher during drought



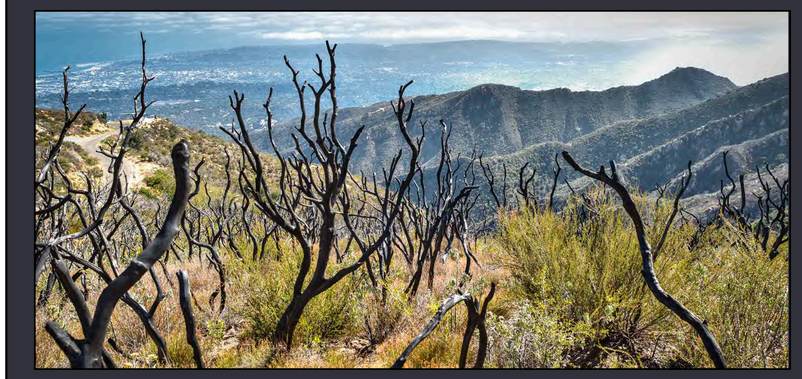

## CONCLUSIONS

Nitrification ⇧ after fire

- Stimulated by ⇧ $NH_4^+$ supply & pH, sustained by low microbial biomass

Plants immobilized N quickly
Most export occurs in the early stages of recovery

- During this time, N export increases when fire is followed by drought due to the effects of drought on plant recovery



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For more information:
Please contact: hanan@lifesci.ucsb.edu
More info can be found at: https://labs.eemb.ucsb.edu/schimel/josh/index.html