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

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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

**A. Temperature**
- $R^2 = 0.15$
- $p = 0.056$

**B. Precipitation**
- $R^2 = 0.009$
- $p = 0.65$

**Graphs:**
- **Temperature** graph showing data points from 1988 to 2010.
- **Precipitation** graph showing data points from 1988 to 2010.
Long Term Monitoring: Study Sites

6 Sites
4 focus
3 burned
1 not
Pre-climate change: Fire often altered amount & timing of runoff
PRE CLIMATE CHANGE
Commonly Observed Results of Post-fire
Snow-melt Runoff

Cutting & Widening
Scouring
Depositing
PRE CLIMATE CHANGE

Biotic Index vs. Time (log years)

- Pre-fire
- Fire

Time (log years): 1, 2, 3, 10, 100, 300
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
Results: Richness

Macroinvertebrate Taxon Richness

- **Unburned (COU)**: $r=0.57$, $p=0.002$
- **Burned (PIO)**: $r=0.68$, $p=0.0005$
- **Burned (CLI)**: $r=0.47$, $p=0.006$
- **Burned (CAV)**: $r=0.43$, $p=0.009$
Results: NMDS biomass

Black = post-fire years

stress = 0.17
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.
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