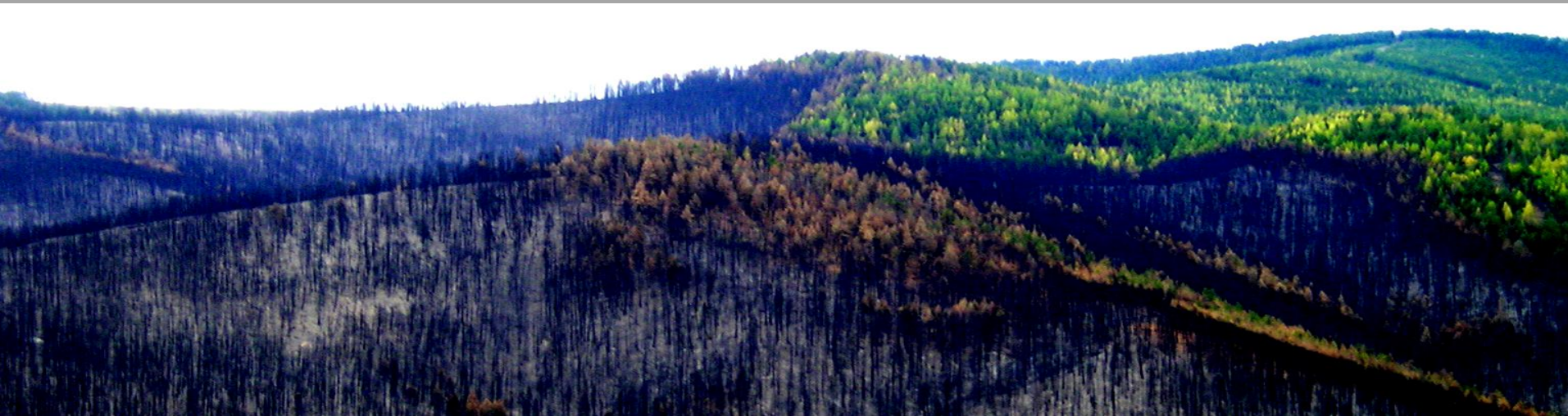
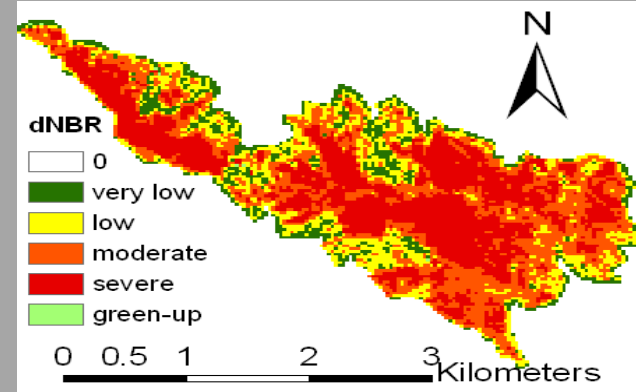


# Burn severity: Past, present and future



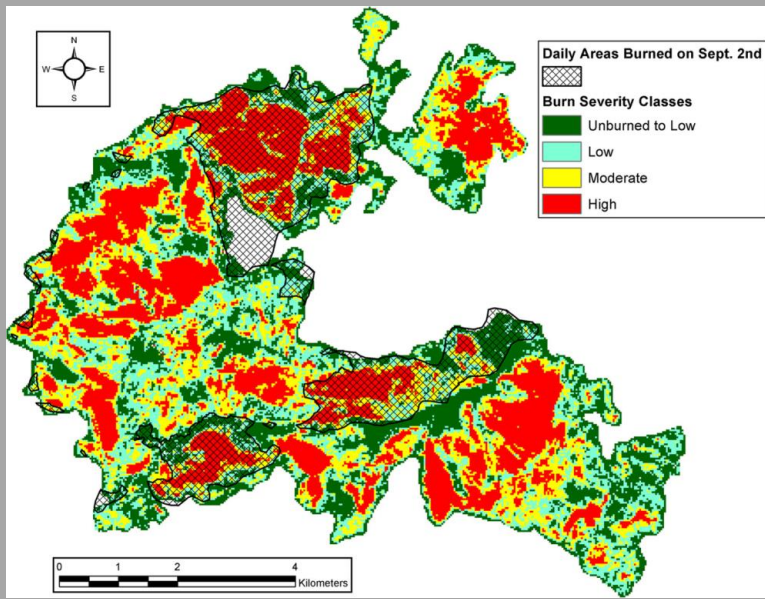
Penny Morgan  
University of Idaho  
pmorgan@uidaho.edu

# Burn Severity: Ecological Change



Just after the Cooney Ridge Fire, near Missoula, MT. Photo by Andy Hudak





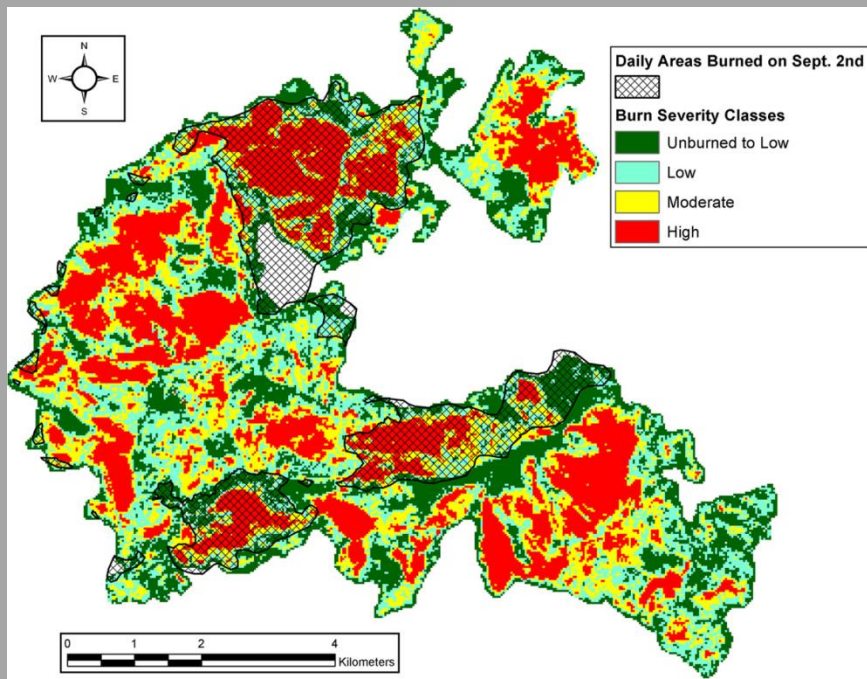
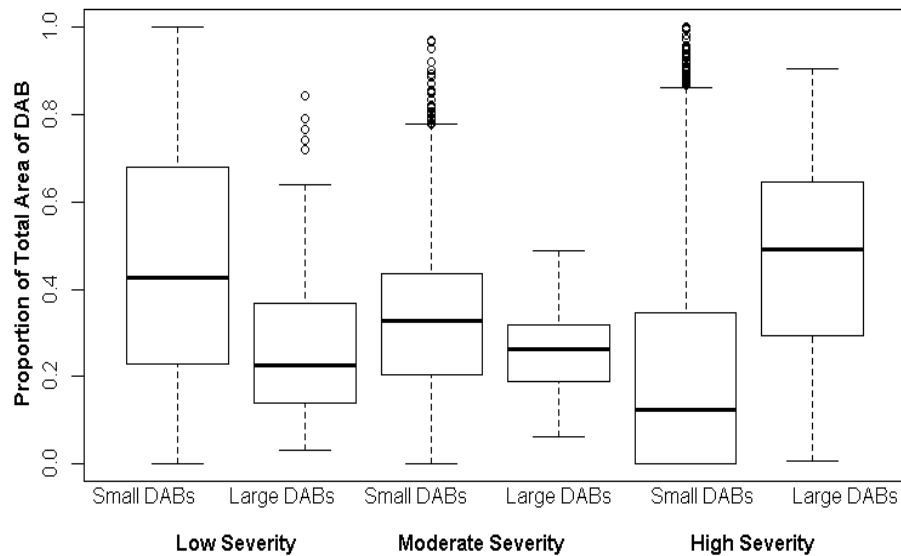
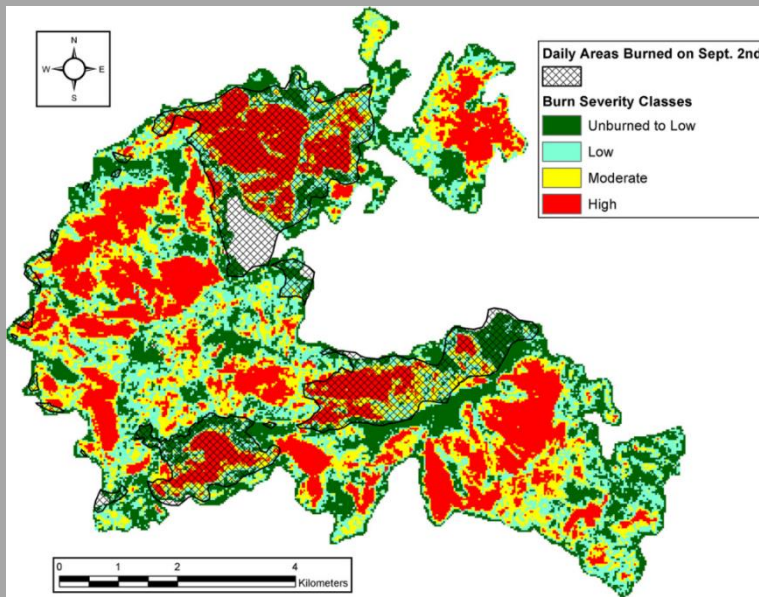


Photo by Bob Tincher



Birch DS, Morgan P, Kolden CA, Hudak AT, Smith AMS (2014)  
 Is proportion burned severely related to daily area burned?  
 Environ Res Letters 9, 064011  
 doi:10.1088/1748-9326/9/6/064011





- Even large fire runs leave a mosaic of fire effects (<13% area burned with high severity on most days; often <50% in largest “runs” (Birch et al. 2015)
- 75% of area burned in 21 large fires (2000 and 2007) were within “reach” of seed sources (Kemp et al. 2015)

Existing Vegetation Cover (%)

Slope Cosine Aspect Index (Stage 1976)

Wind Speed Percentile

Fuels Characteristics Classification System

Environmental Site Potential

Fine Fuel Moisture Code Percentile

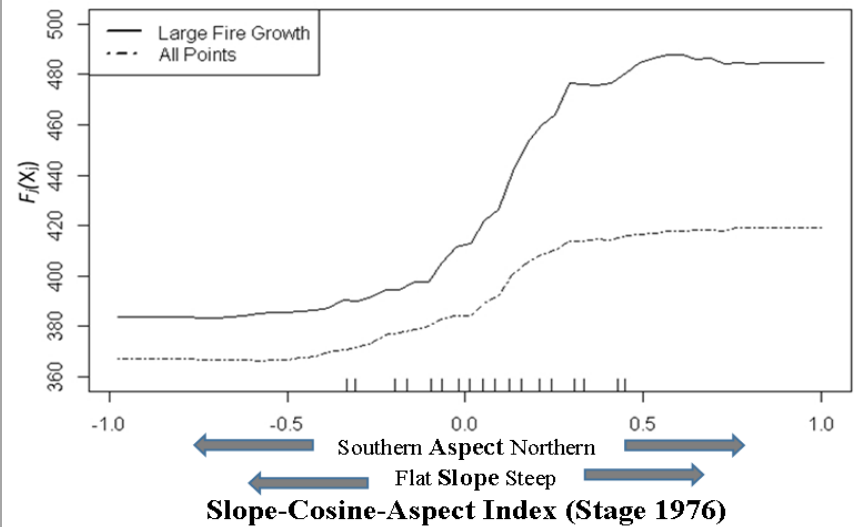
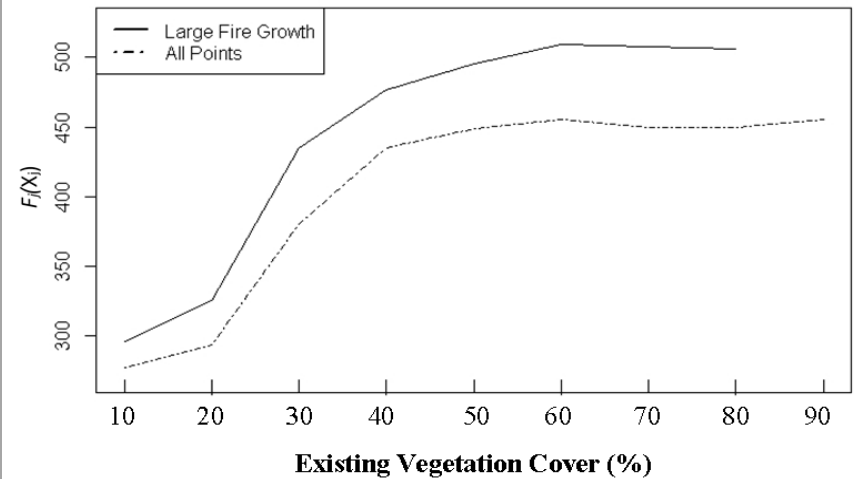
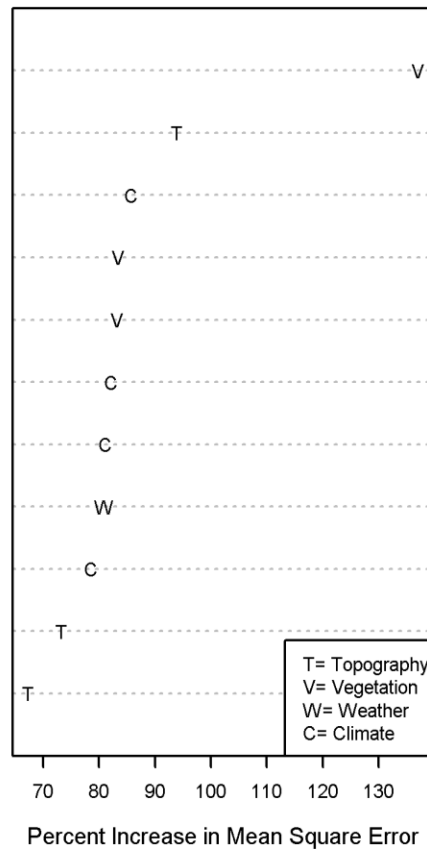
Burning Index Percentile

Minimum Relative Humidity

Downward Shortwave Radiation Percentile

Heat Load Index (McCune and Keon 2002)

Topographic Position Index 2000m (Weiss 2001)



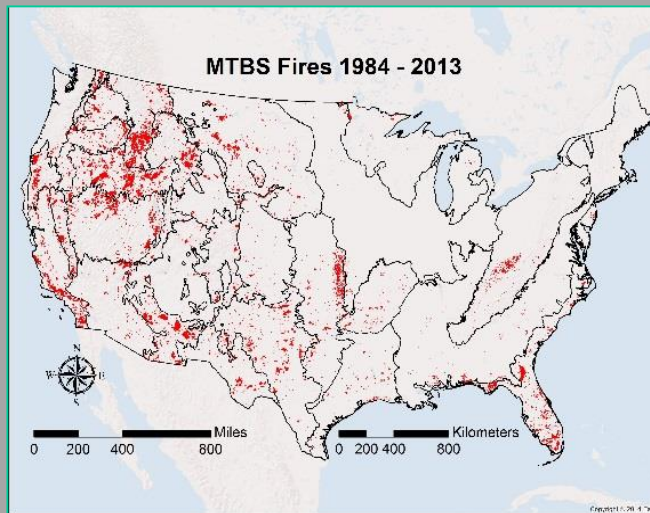
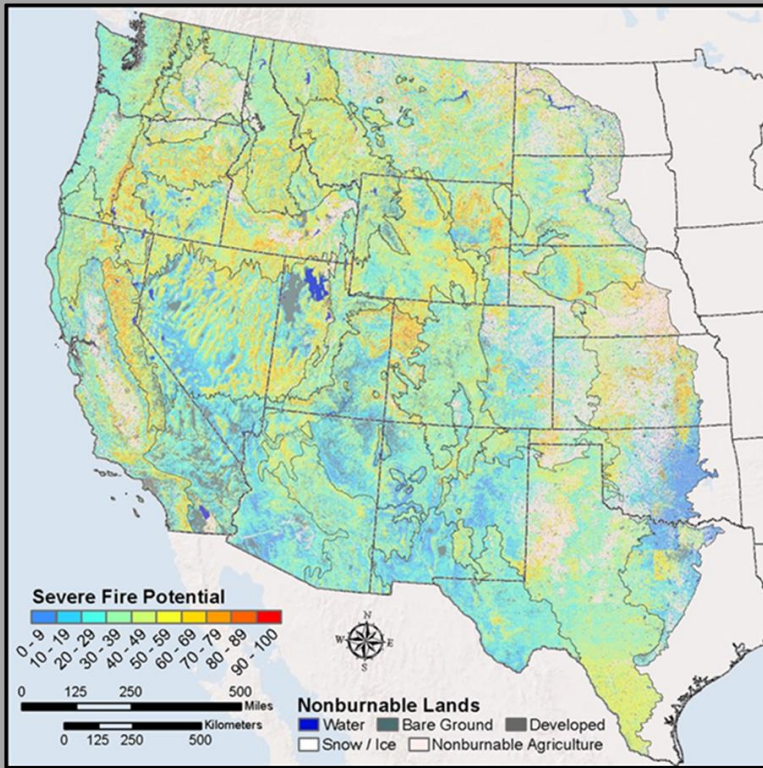
## Largest DABs

>600 ha (~1500 ac), 0.5% of all

Birch et al. 2015. Ecosphere 6(1):17. <http://dx.doi.org/10.1890/ES14-00213.1>



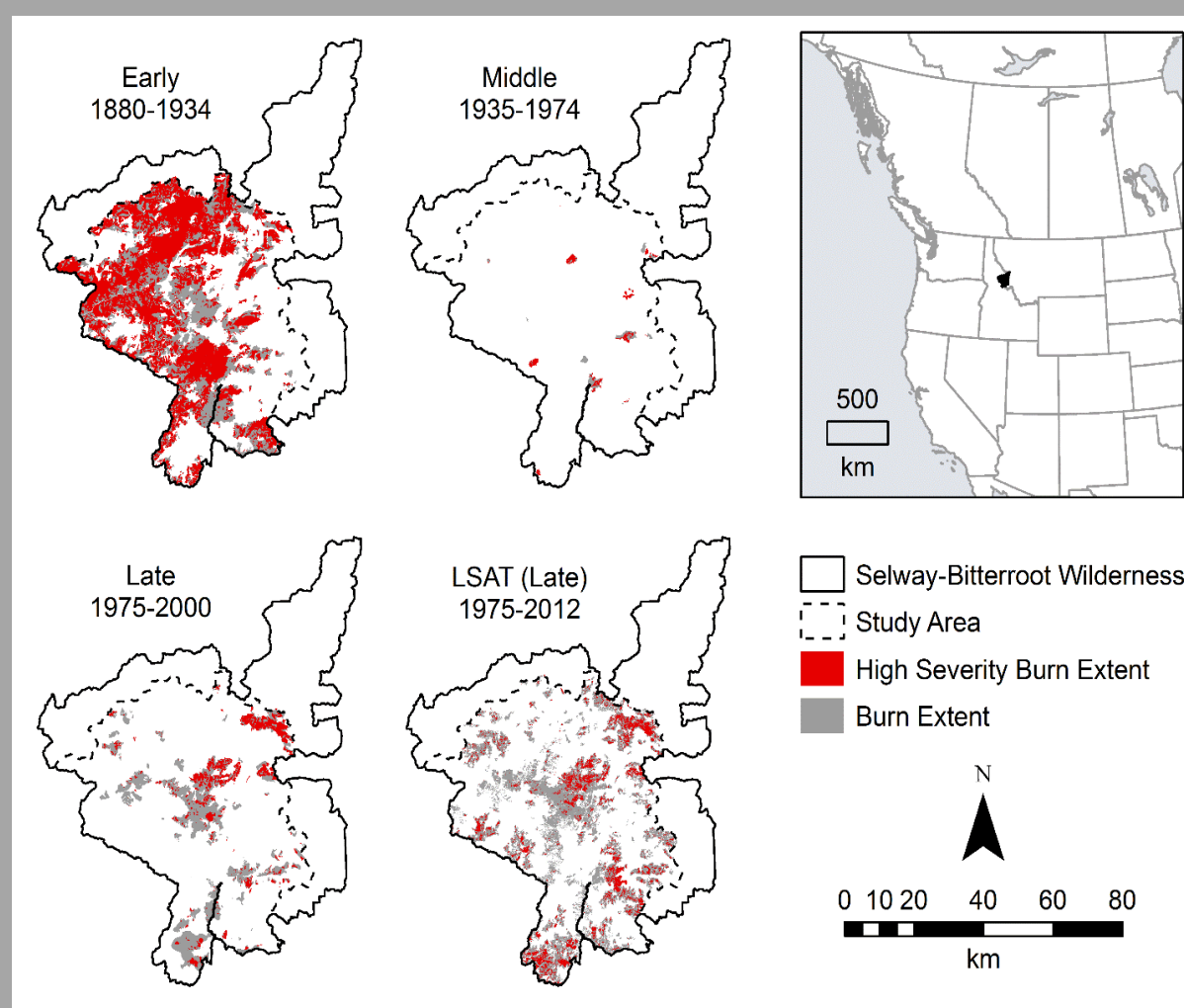




+ topography  
+ vegetation  
+ weather  
By ecoregion

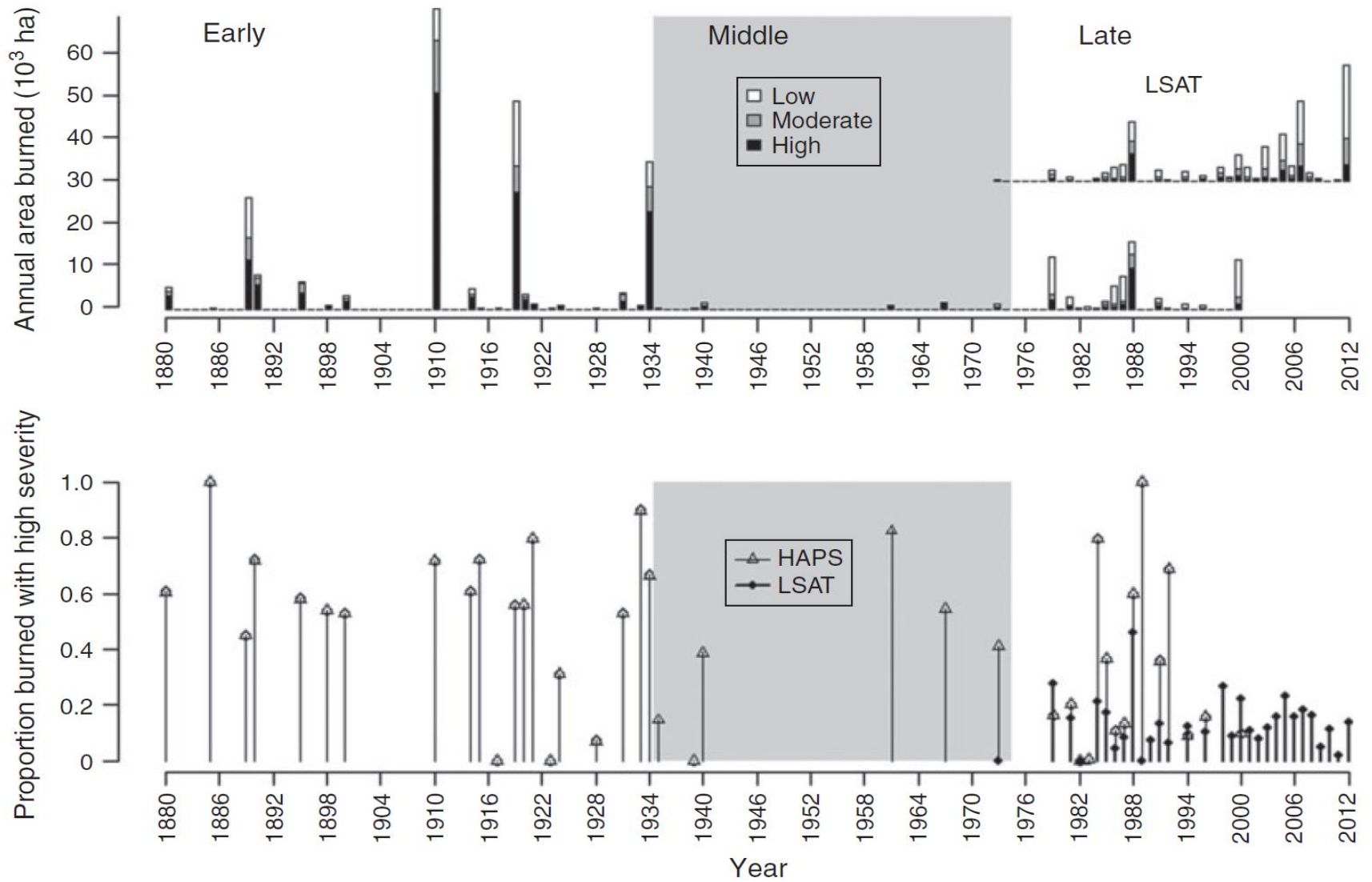
WFDSS, IFTDSS

# Selway-Bitterroot Wilderness



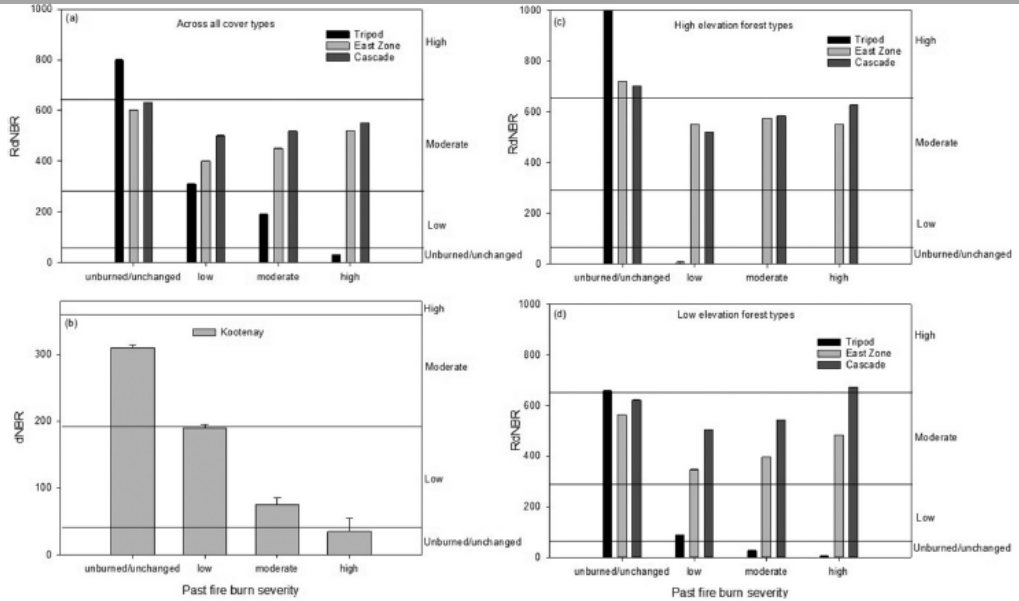
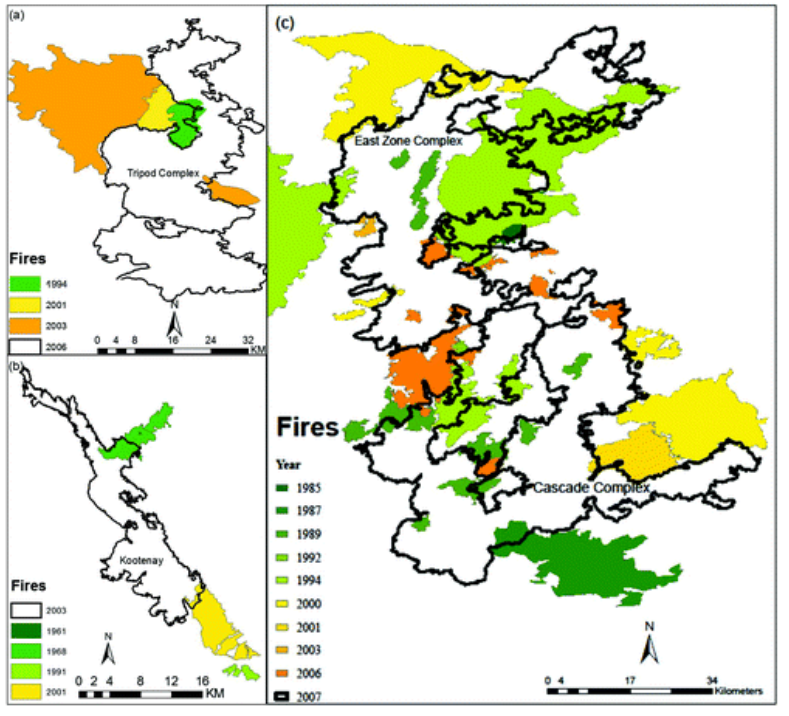
- 346K ha (855K acres)
- Historical aerial photographs 1880-2000
- Satellite imagery 1977-2012



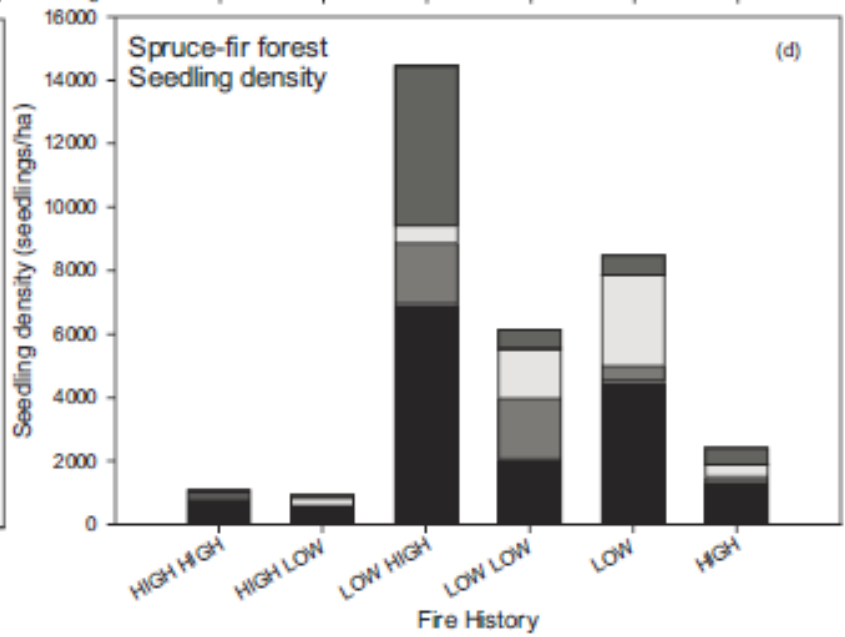
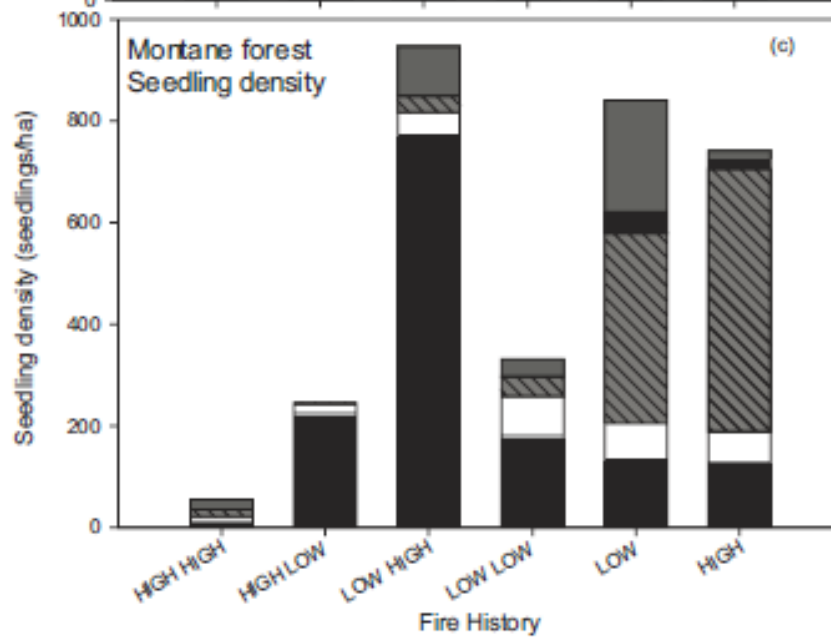
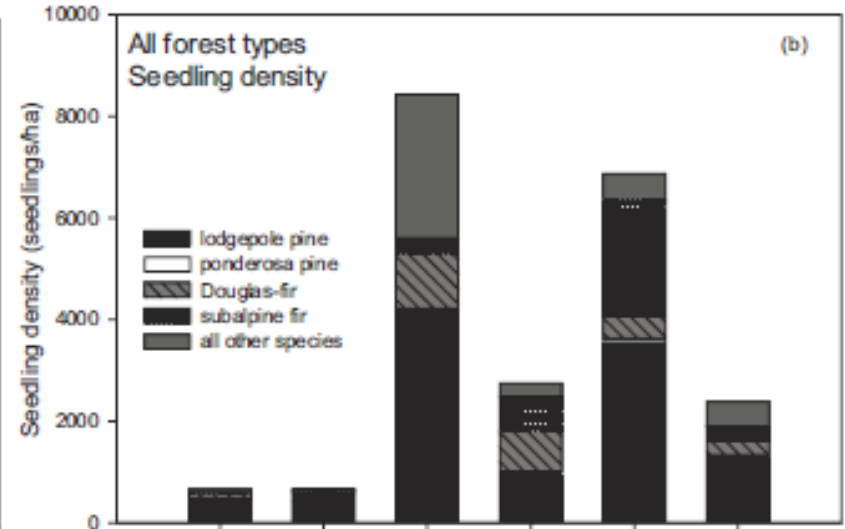
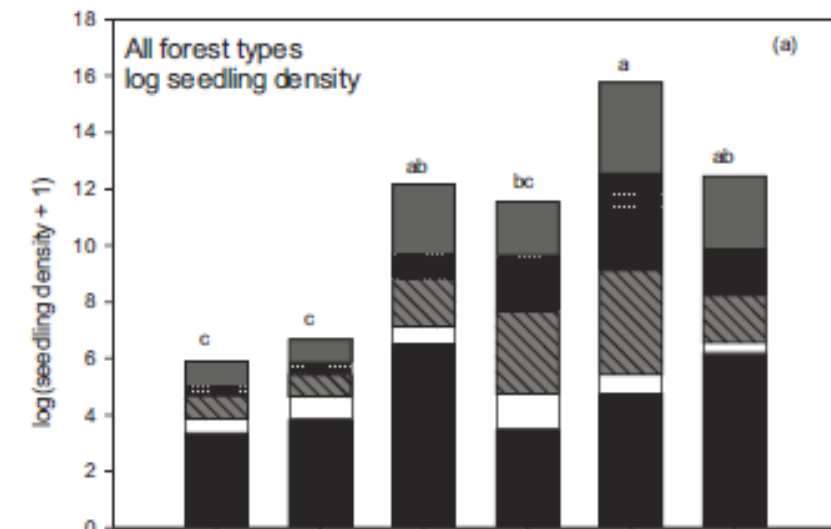


Morgan P et al. (2017) Multidecadal trends in area burned with high severity in the Selway-Bitterroot Wilderness Area 1880-2012. *Int. J. Wildland Fire* 26(11), 930-943

# Prior wildfires influence burn severity



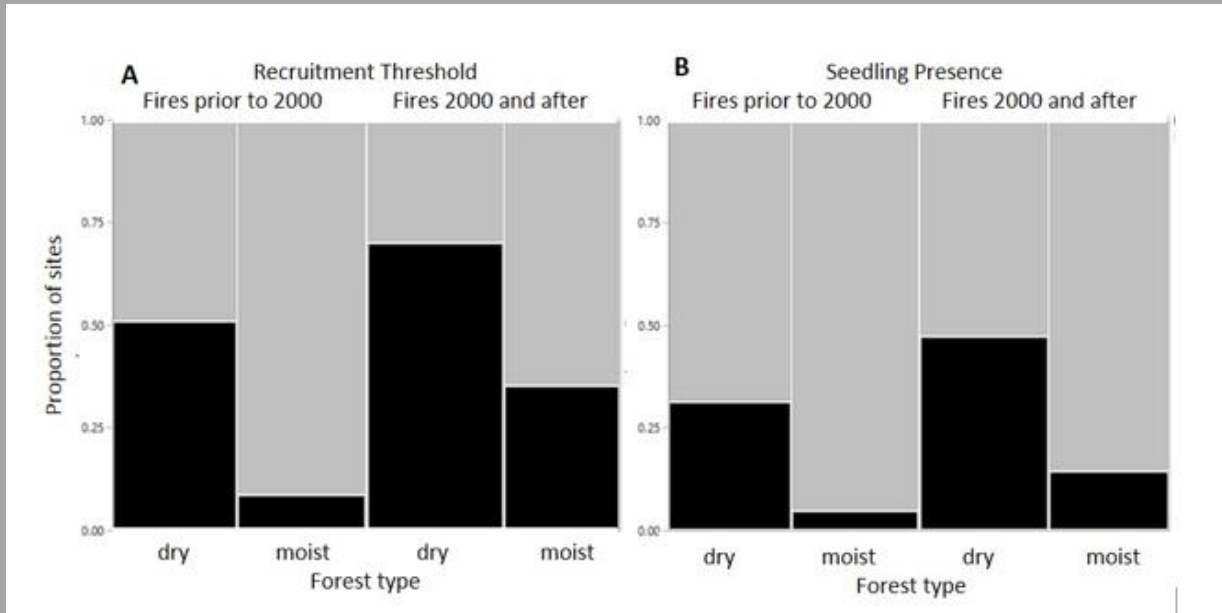
Lower burn severity where prior fires of any severity burned in last 30 yr ... even under extreme fire weather



Stevens-Rumann CS, Morgan P (2016) Repeated wildfires alter forest recovery of mixed-conifer ecosystems. *Ecol Applic* doi: 10.1890/15-1521.1



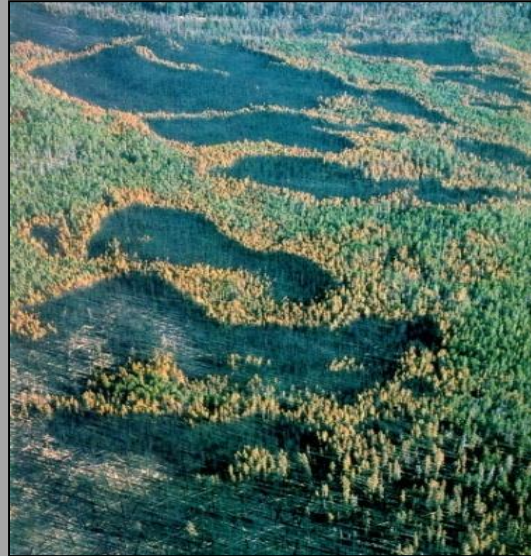
# Post-fire tree regeneration



Stevens-Rumann CS et al (2018) Evidence for declining forest resilience to wildfires under climate change Ecology Letters 21, 243-252 DOI: 10.1111/ele.12889

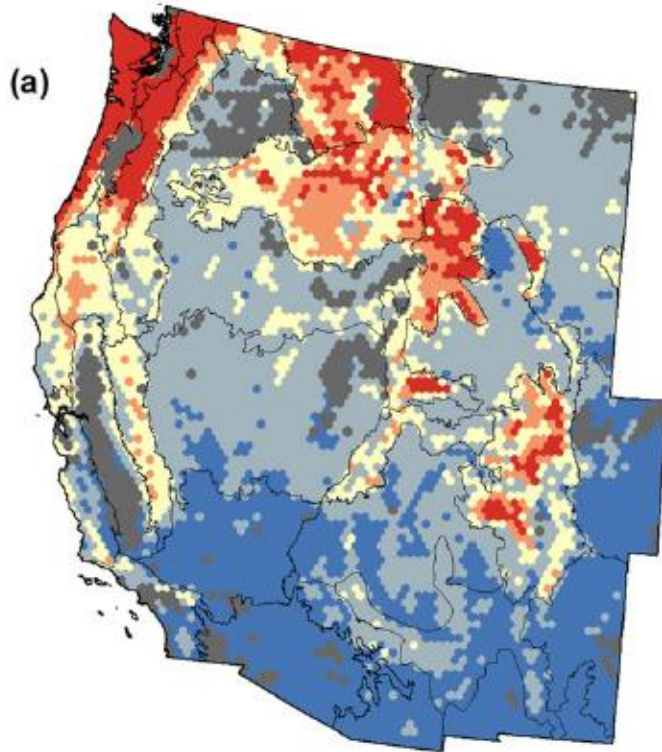
# Will future fires burn with high severity?

Climate? Fuels? Or Both?

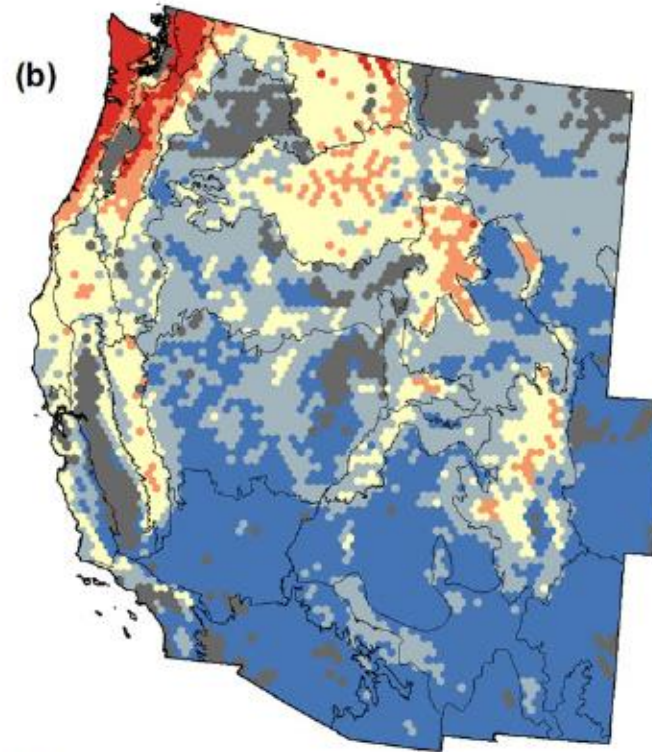




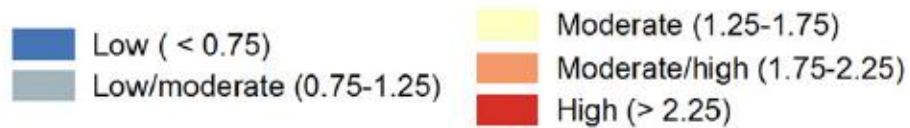
Fire severity (1984-2012)



Fire severity (2040-2069)



Fire severity (inferred CBI)





# Burn severity



- Do large fire “runs” burn with high severity?
- Has the proportion burned with high severity increased? Will it?
- Is burn severity influenced more by topography, vegetation or climate?
- How does burn severity influence tree regeneration?





Thank you  
Coauthors  
Students  
Funding





# Conversations Through the Smoke

Open Call  
for Art Submissions



NORTHERN ROCKIES  
**FIRE SCIENCE**  
NETWORK