Idaho Forest Fire Ecology

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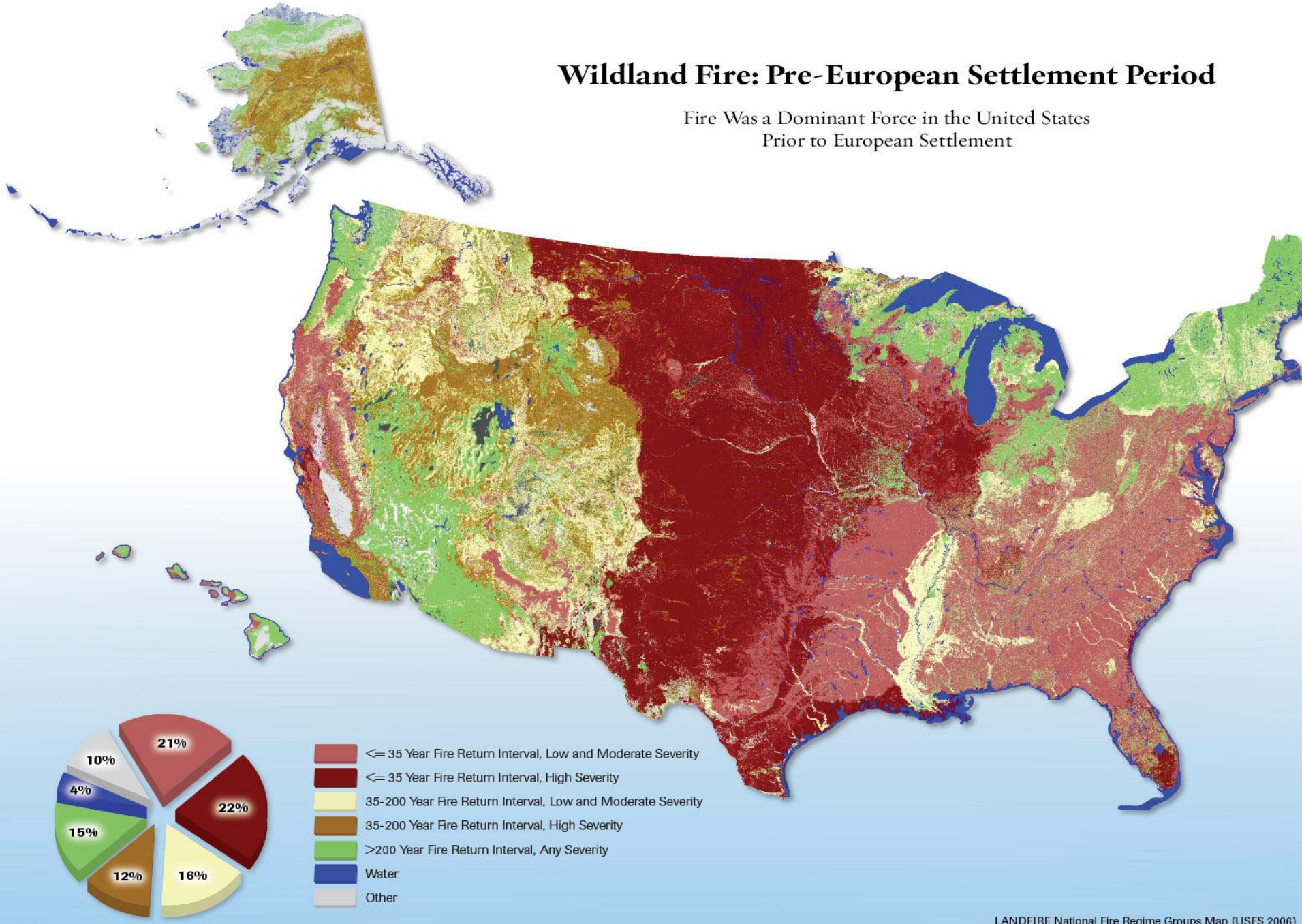
University of Idaho
A LEGACY OF LEADING

Fires

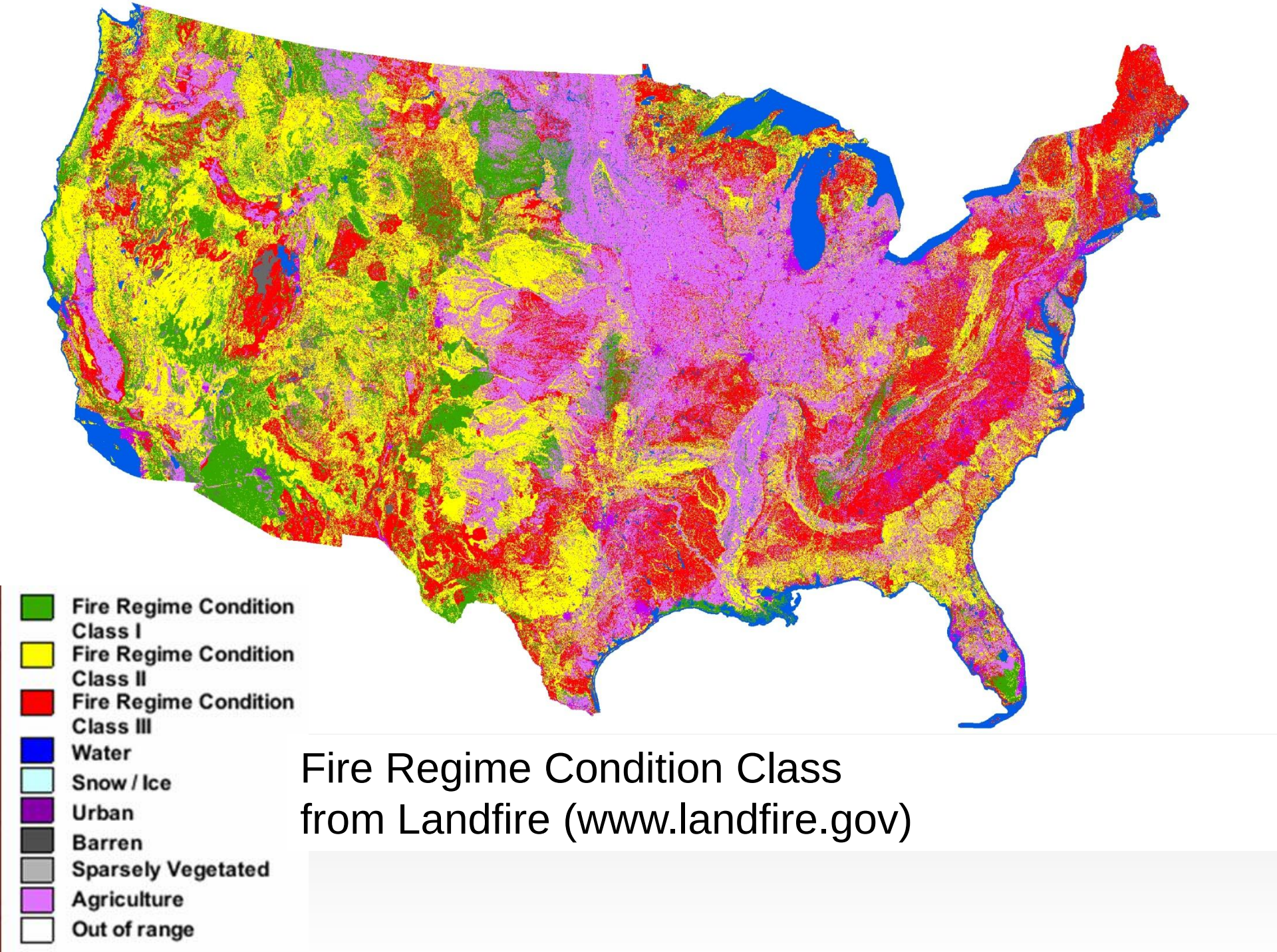
- Alter vegetation structure and composition
- Recycle nutrients
- Change wildlife habitat
- Affect diversity of species, communities, and landscapes
- Regulate biomass and fuels
- Threaten people and property
- Affect soils, streams, and watersheds

Wildland Fire: Pre-European Settlement Period

Fire Was a Dominant Force in the United States
Prior to European Settlement



LANDFIRE National Fire Regime Groups Map (USFS 2006)

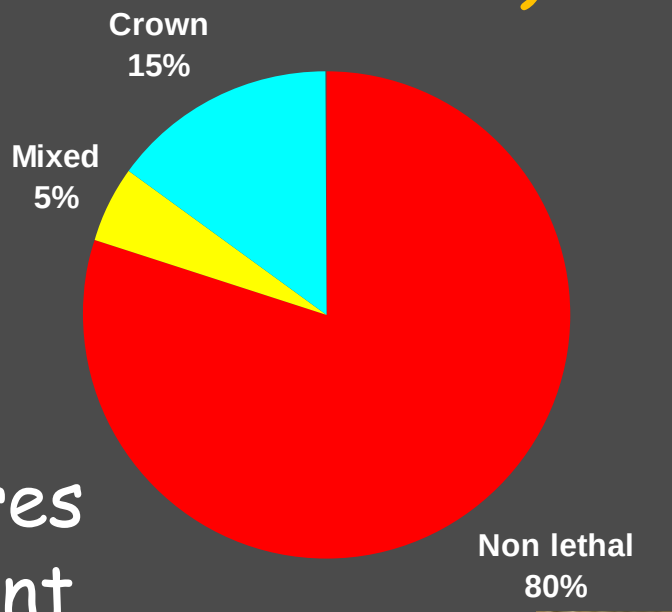


Fire Regime Condition Class
from Landfire (www.landfire.gov)

Dry Forests

Dry forests
(Ponderosa pine dominated)

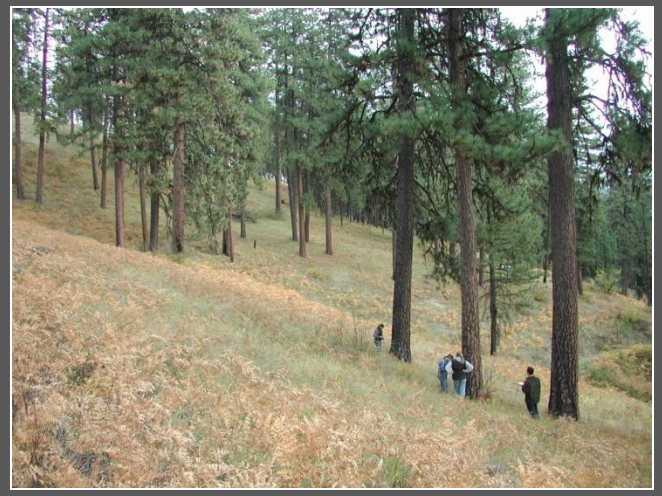
Historically : frequent fires of low and mixed severity



Currently : Fires are less frequent, and more severe

Restoration and fuels management

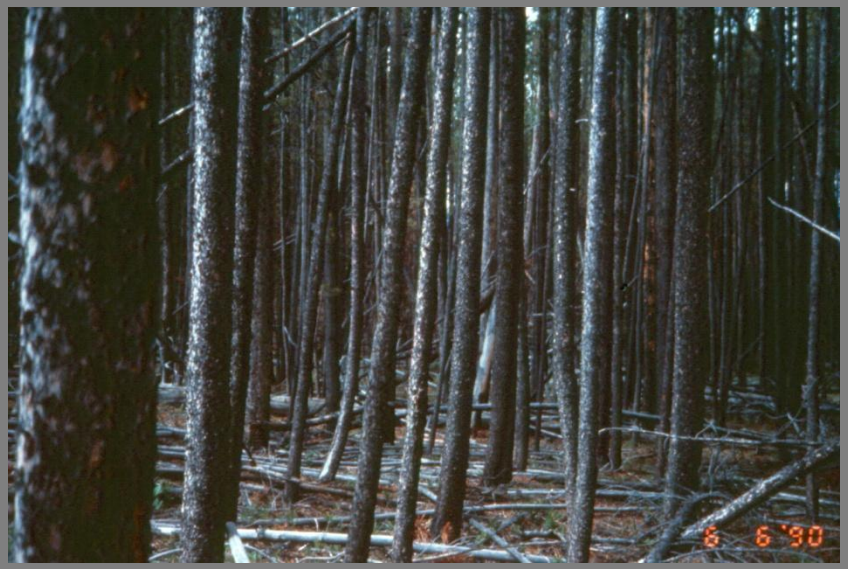
- Restore resilience
- Thinning "from below"
  - Reduce vertical continuity
  - Reduce horizontal continuity
- Leave many of the old & large trees
- Reintroduce fire
- Can improve habitat for many birds and plants, visual appeal, and resilience to future fires



Heyburn State Park

This area in Gila Wilderness burned 7 times in last 60 yr

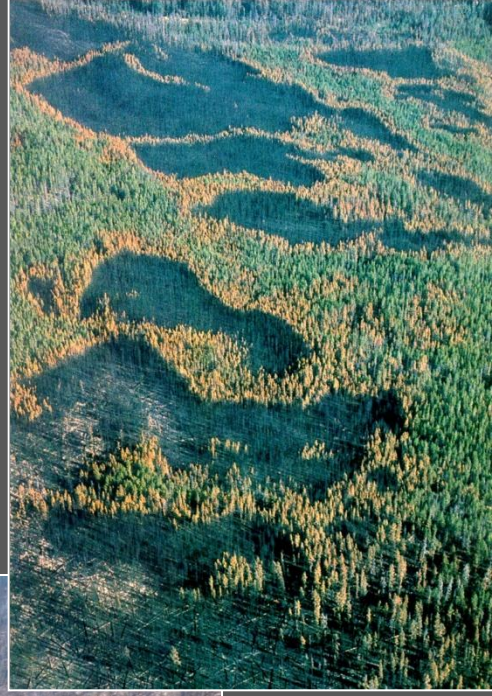
Cold Forests

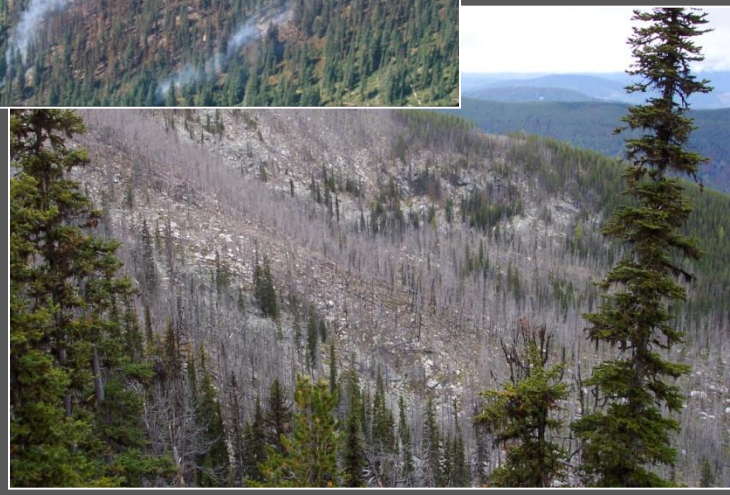


Cold forests

(subalpine fir, lodgepole pine, spruce)

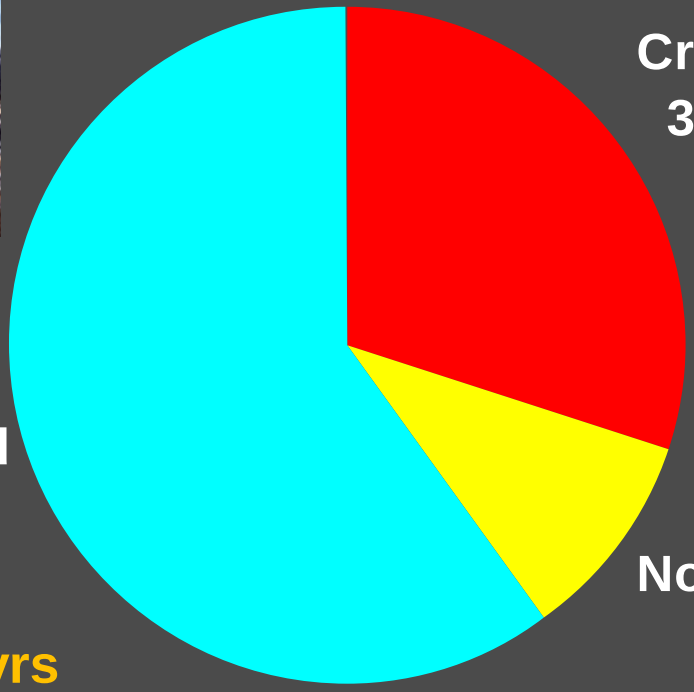
- *Historically :*
  - Mixed severity and stand-replacing fires
  - Some v. large
- *Currently*
  - Fires are less frequent
  - Still mixed and stand-replacing severity
  - Mostly small but some very large





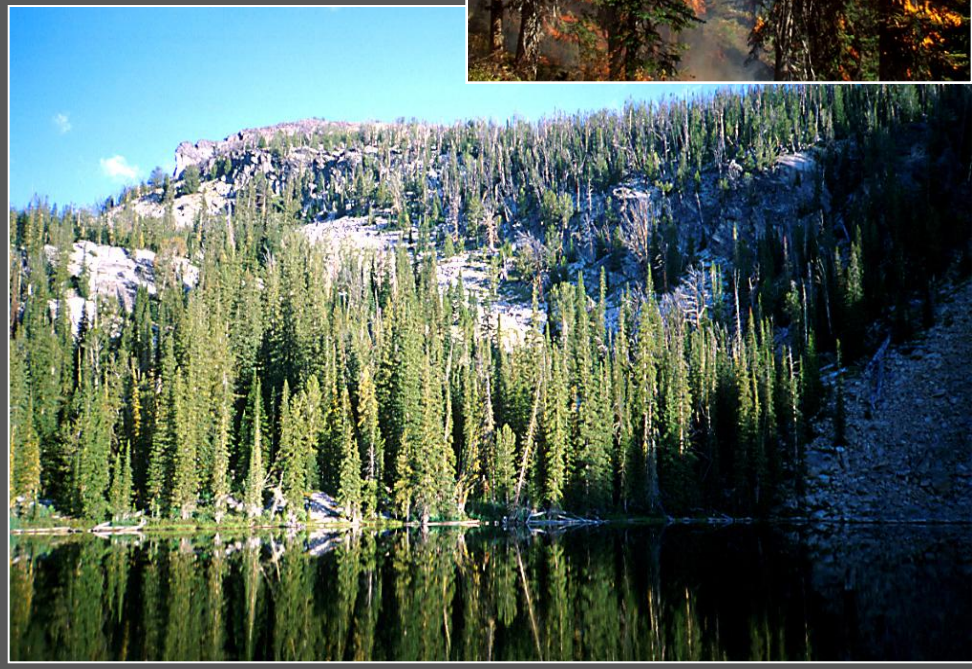
Climate limited, not fuel limited

Historical and Current Fires in Cold Forests



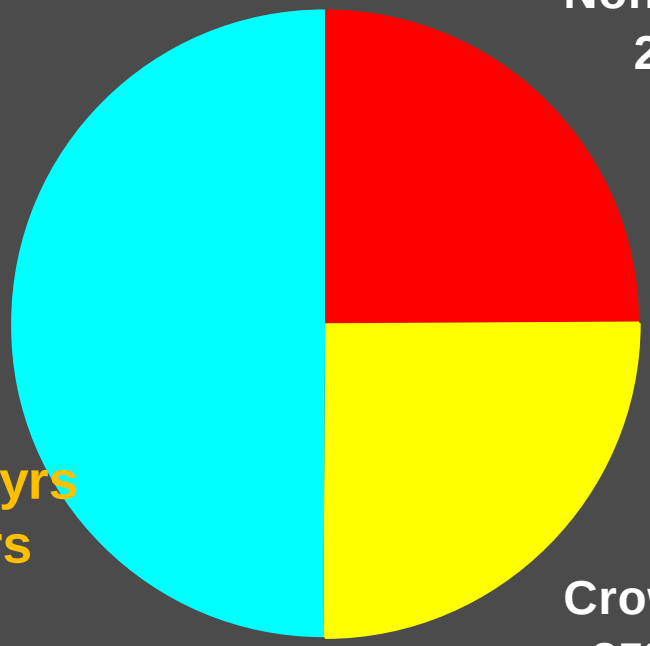
Cold forests

- Fuels management is less effective at protecting people and property except when it is next to buildings
- Drought and wind are major contributors to large fires
- Human-induced changes are less pronounced than in dry forests and woodlands



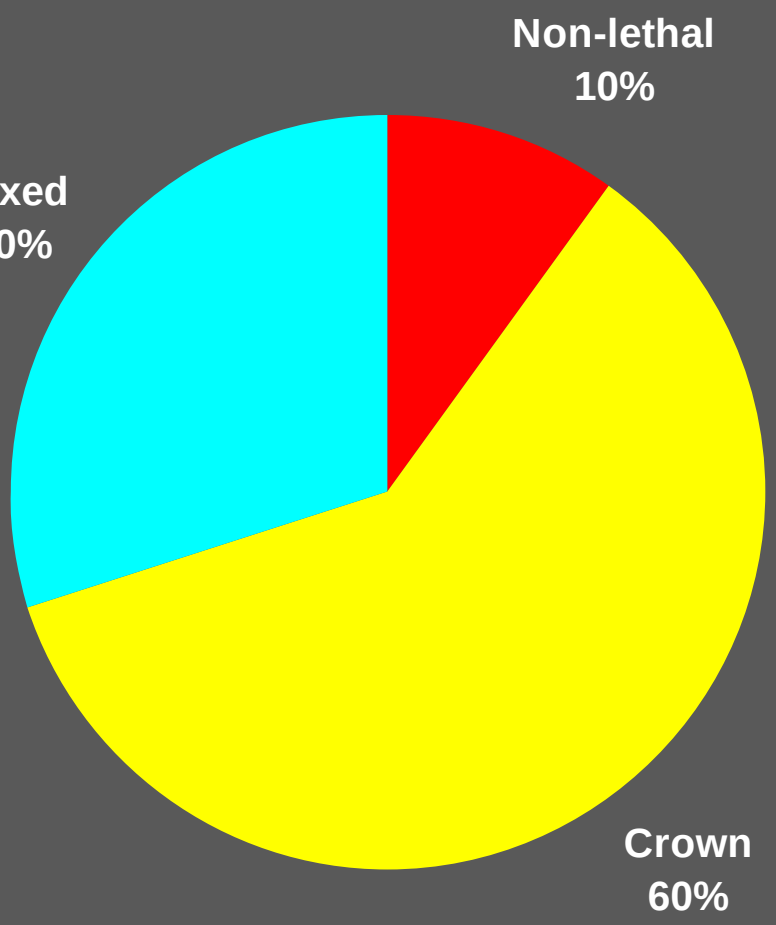
Moist forests

Historical Fires in Moist Forests



Current Moist Forests

Current Fires in Moist Forests



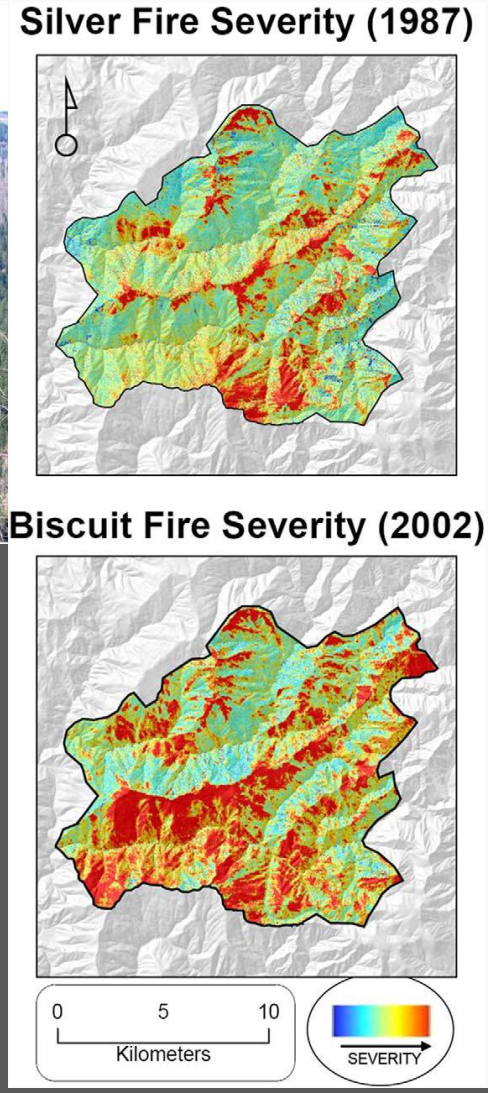
Moist forests
(grand fir, larch, Douglas-fir, white pine, western redcedar)

- *Historically*
  - Mixed severity fires every 50-125 yr
  - With more severe and very large fires at ~150-250 yr
- *Currently*
  - Fires are less frequent
  - Very large, severe fires are possible
  - Mixed severity fires

Mixed severity fires

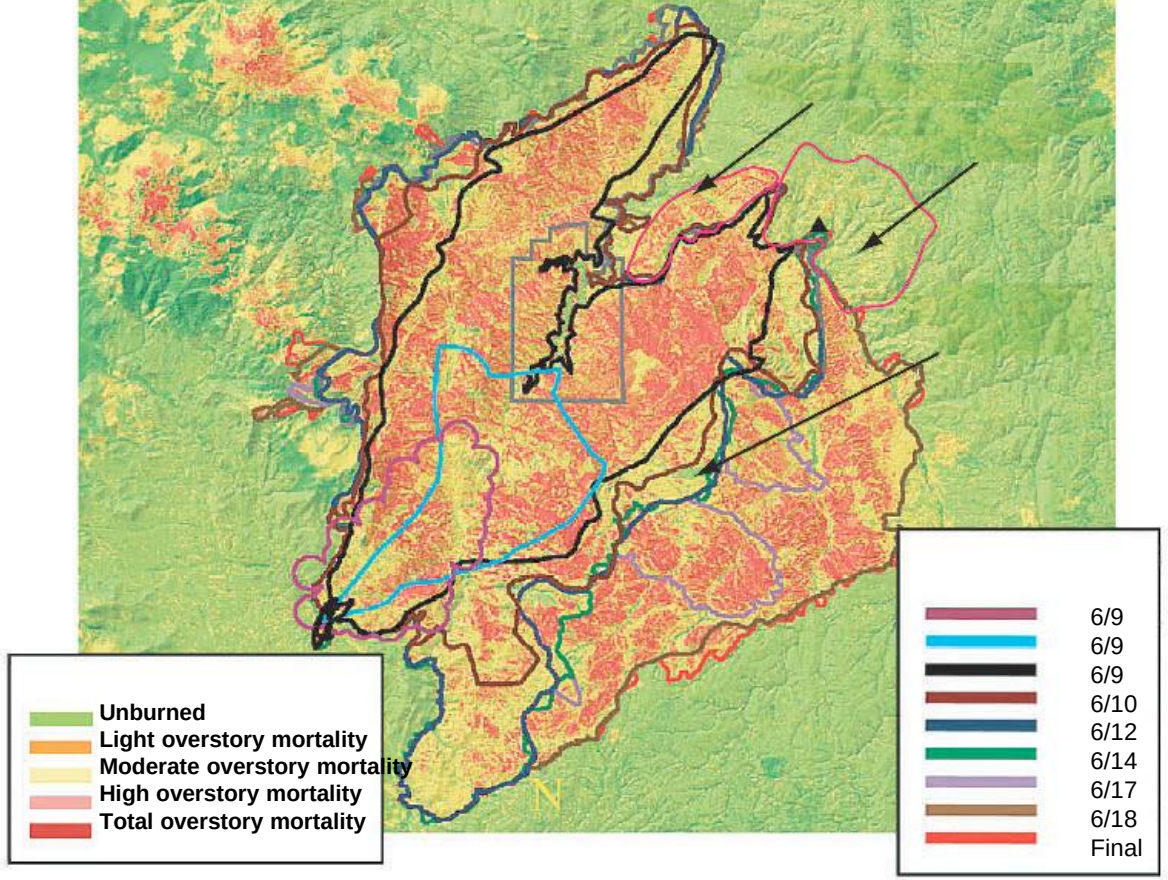
Mixed severity fire effects on Biscuit
fire, Photo by T. Spies, from Halofsky et al. 2011, Ecosphere

- Mixed fire effects, stand replacing to nonlethal
- Intermixed patches, some even-aged, some uneven aged
- Many patches with 20-70% mortality (Agee 1990, 1993)
- Complex, poorly understood



Both the Silver and Biscuit fire burned with mixed severity in the same area in Oregon. From Halofsky et al. 2011

- High diversity
- Variable over time and space
- Many landscapes have become more homogeneous (depends on land use)

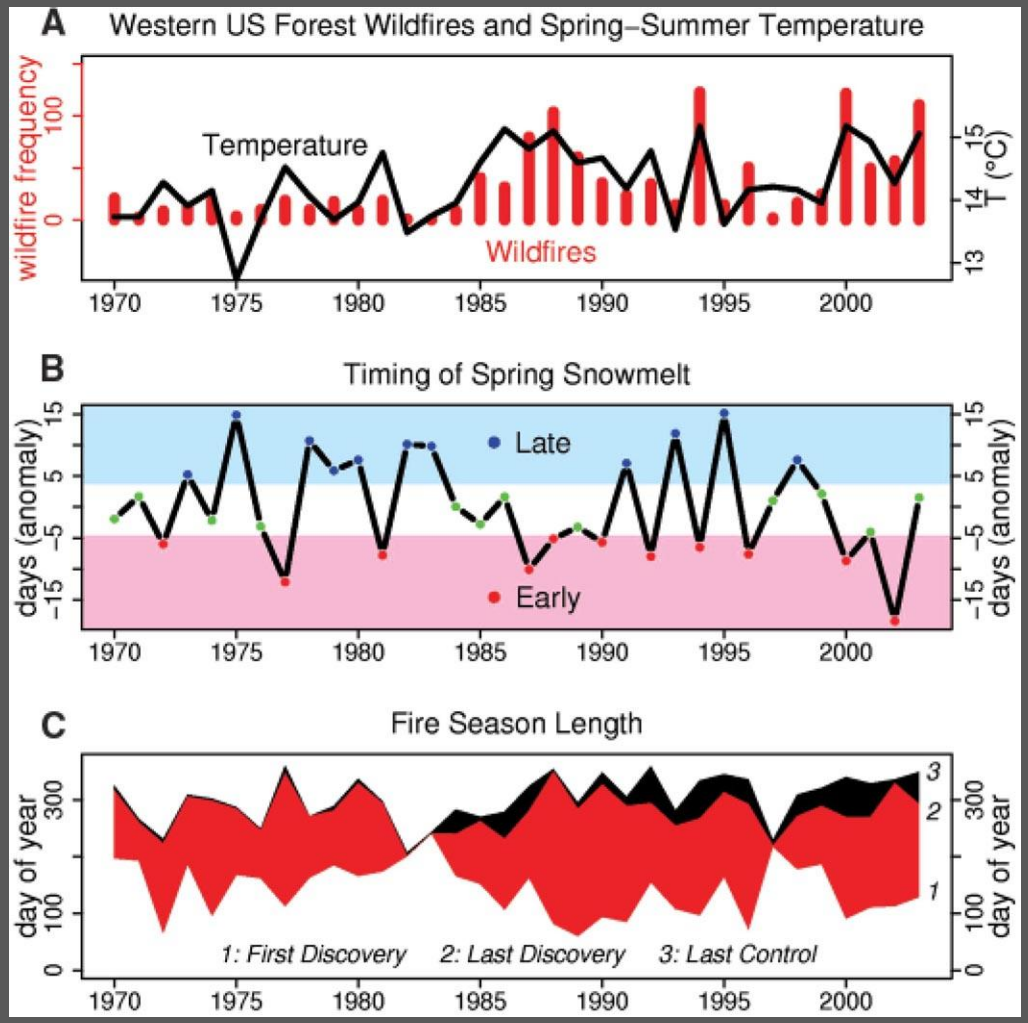


Burn severity and fire extent in the 2002 Hayman fire. Most of the 138,110 ac burned in a few days (e.g. *9 June (black line) and 18 June (brown line). Burn severity interpreted from classes interpreted from satellite imagery using dNBR. From Schoennagel et al. 2004 who modified it from Finney et al. 2003).*

Fire and bark beetles

- Bark beetles are native, and most are tree-specific
- Crown fire hazard differs for green, red, and gray stages (time since outbreak)
- Crown fire hazard differs with % mortality

Movie



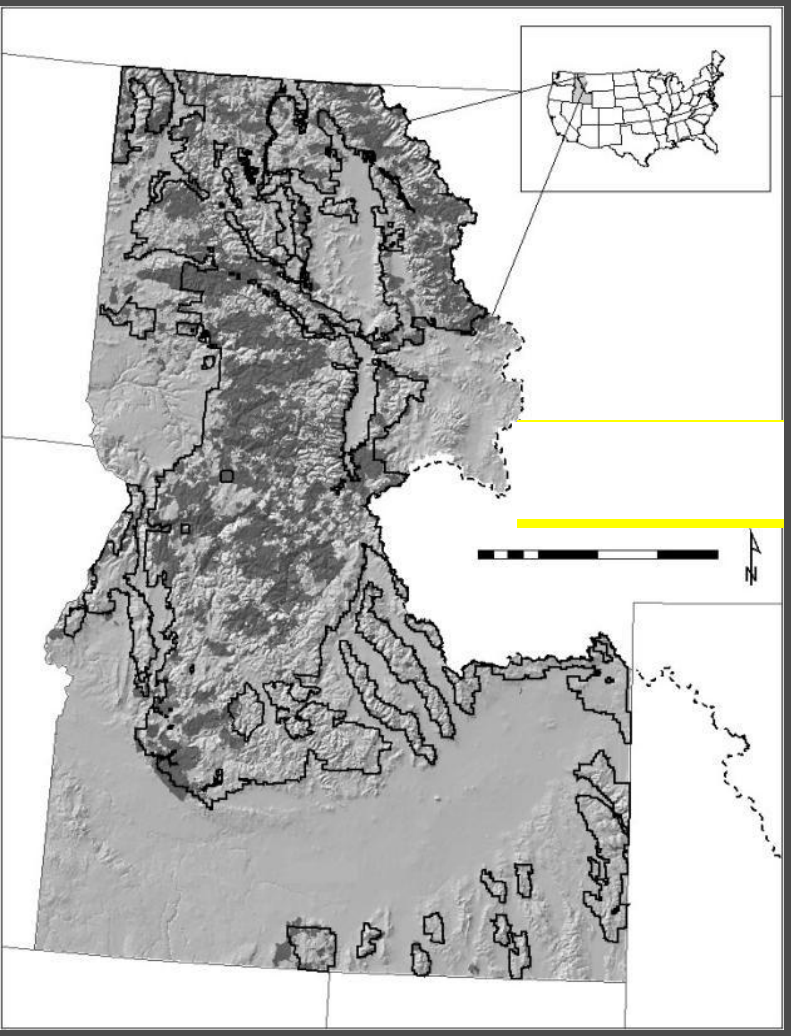
year

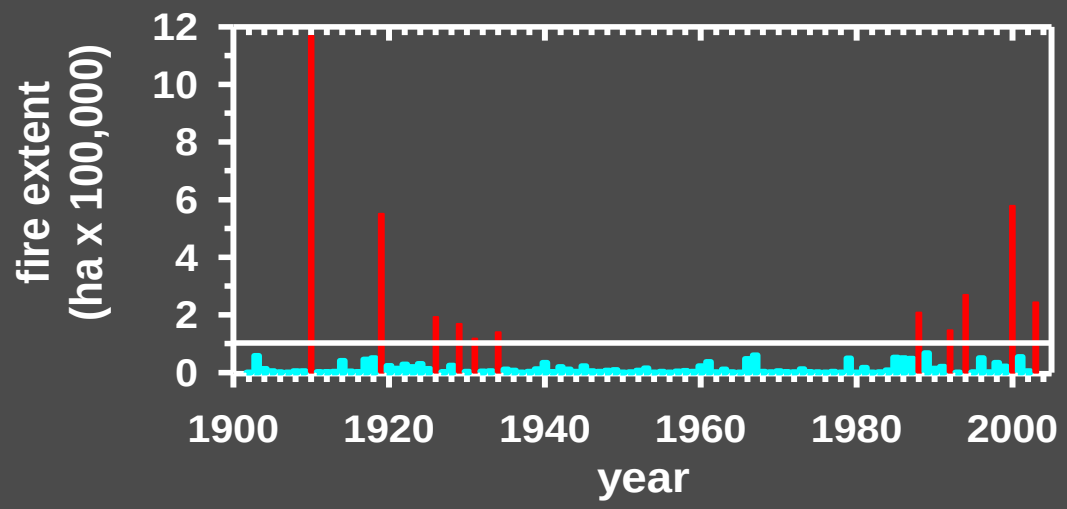
Westerling et al. 2006

- "Since 1986, longer, warmer summers have resulted in
  - 4X major wildfires and
  - 6X area of forest burned, compared to 1970-1986"
- "Length of active wildfire season (when fires are actively burning) in the western US has increased by 78 days, and that the average burn duration of large fires has increased from 7.5 to 37.1 days"
- "…critical factors—early snowmelt, higher summer temperatures, longer fire season…are combining to produce the observed increase in fire activity"

(from Running 2006)

What climate conditions are associated with years of widespread fires?

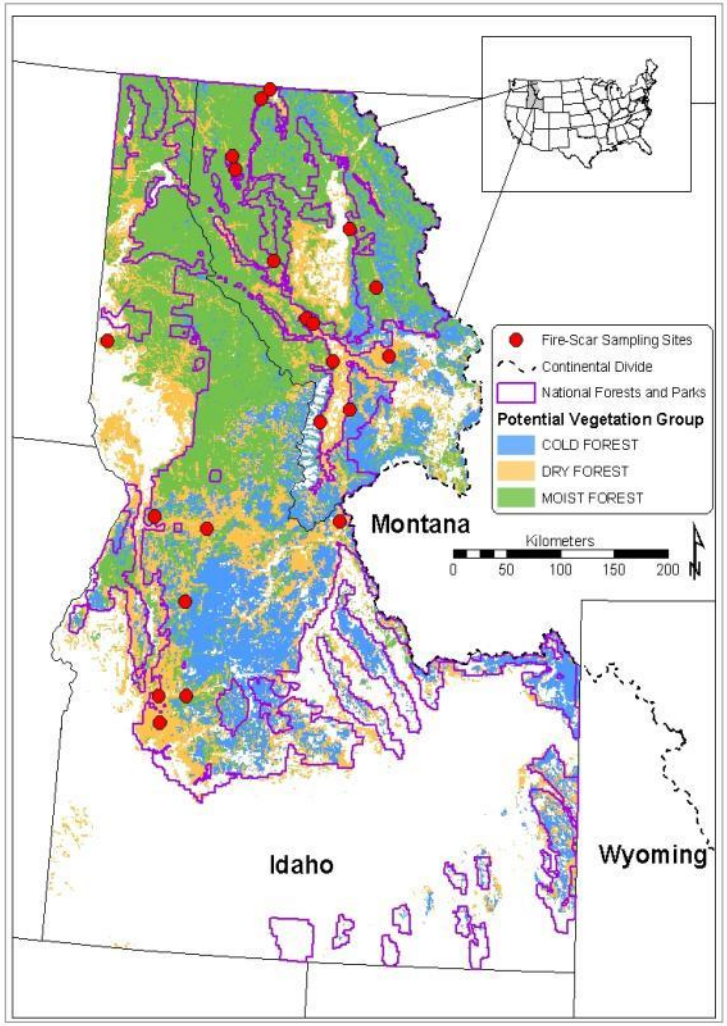




- Forests in US northern Rockies
- 39% burned at least once
- 82% of total area burned in 11 yr

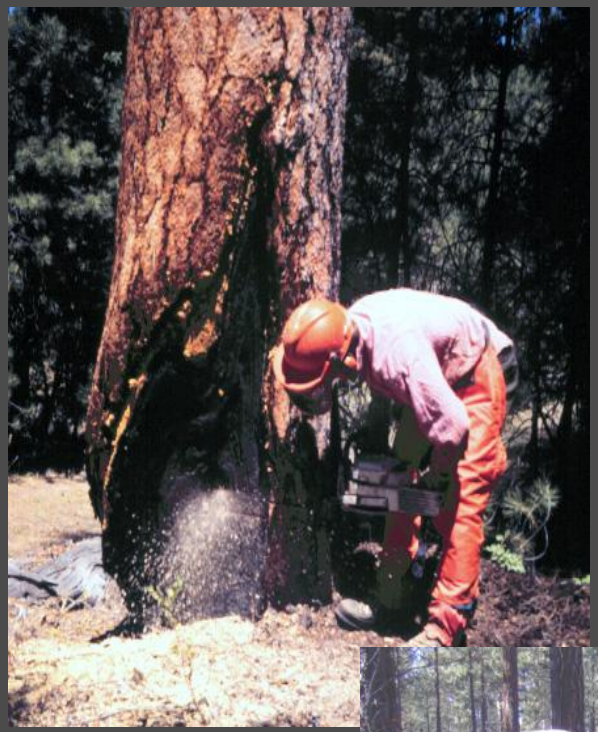
Morgan et al. 2008

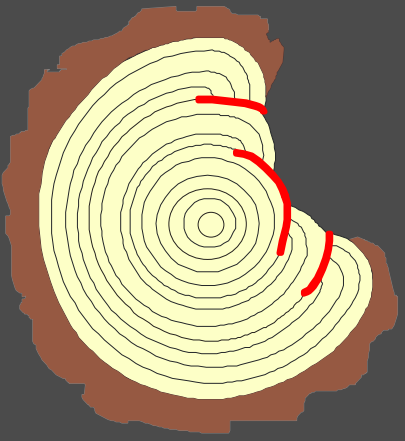
Fire-scar sampling sites



- 21 sites in dry forests
- ~ 10,000 dated fire scars
- 1630-1900
- 29 regional fire years (11%)

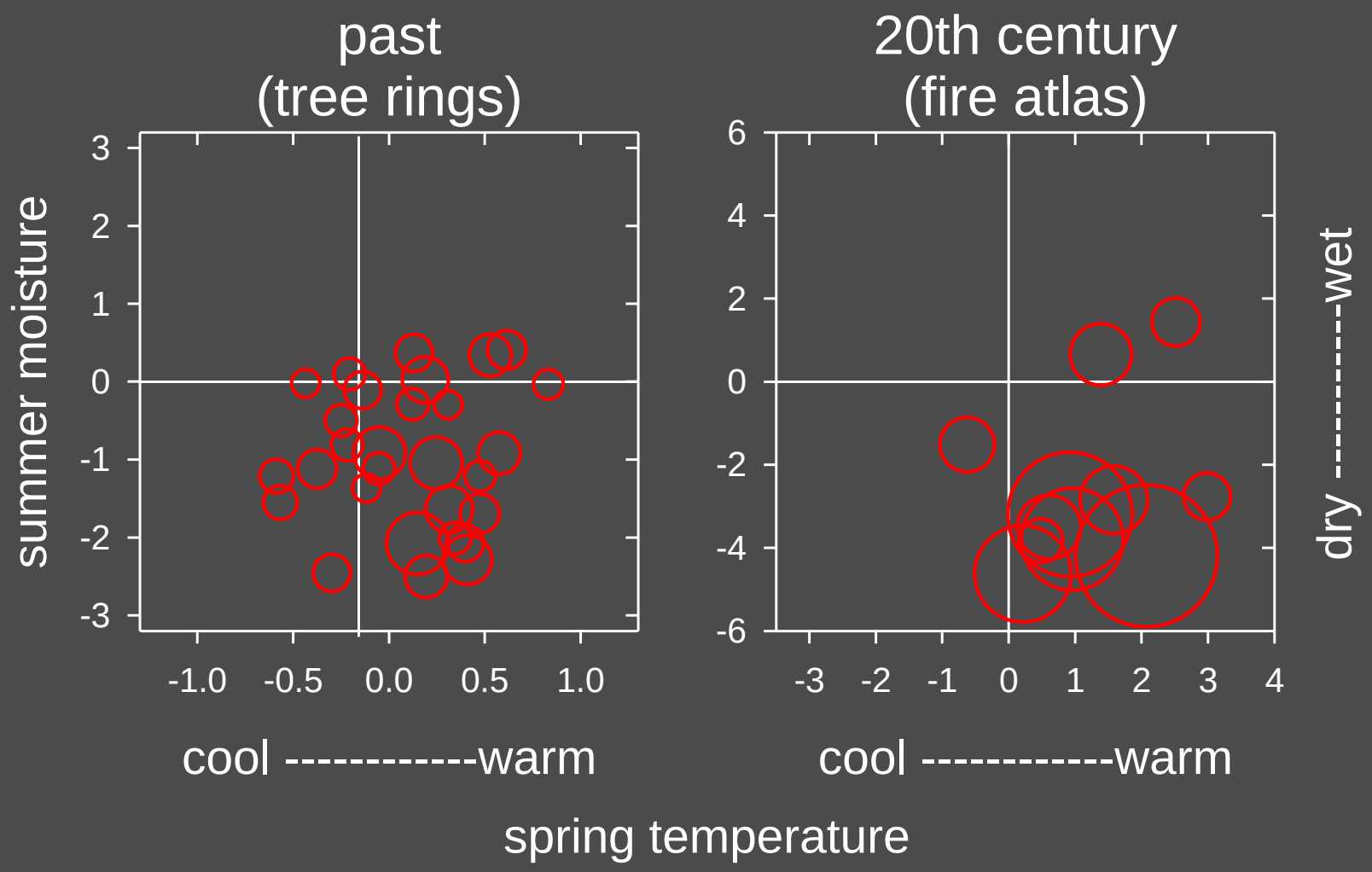
Sampling fire-scarred trees





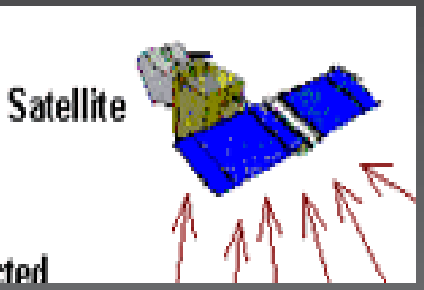
Anderson *et al.* 1987

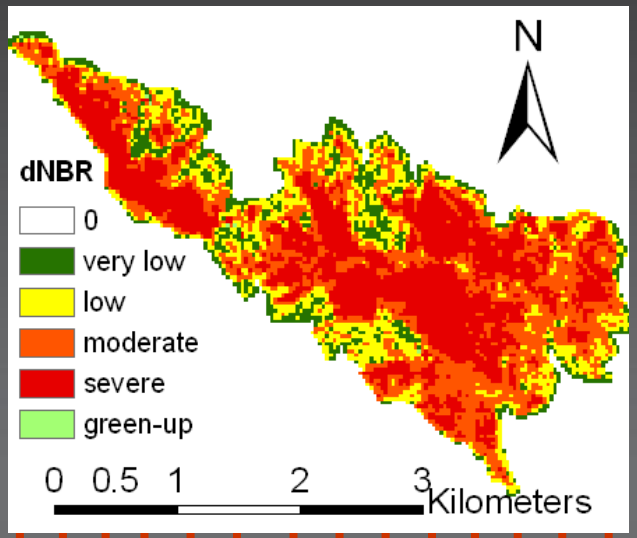
Widespread fires when dry summers follow warm springs

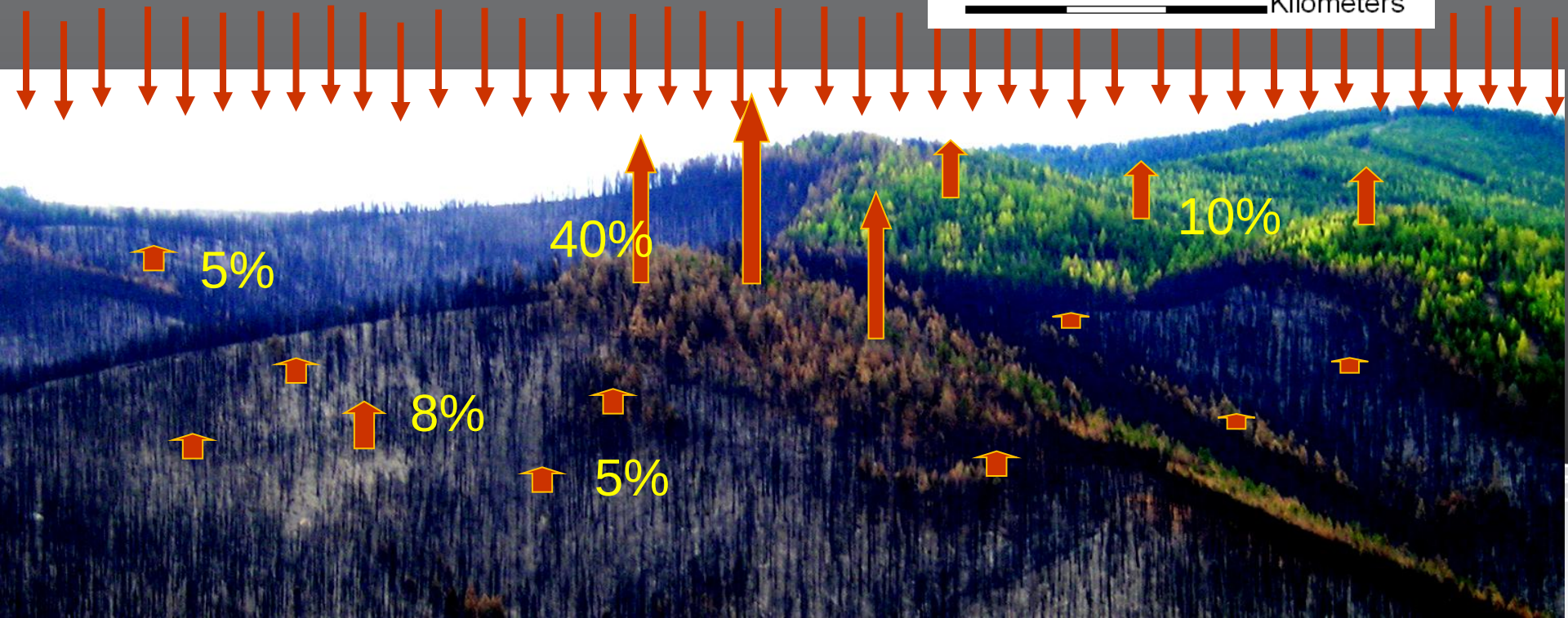


Heyerdahl et al. 2008, Morgan et al. 2008

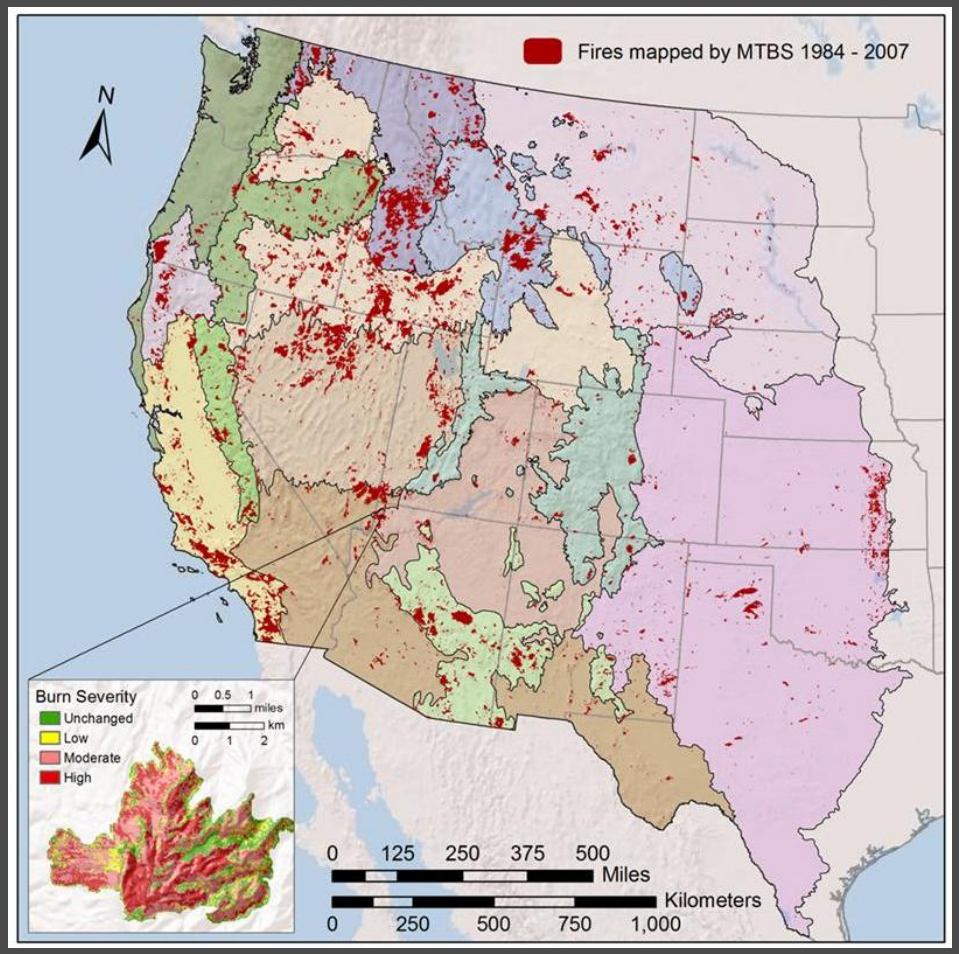
Burn severity: ecological change

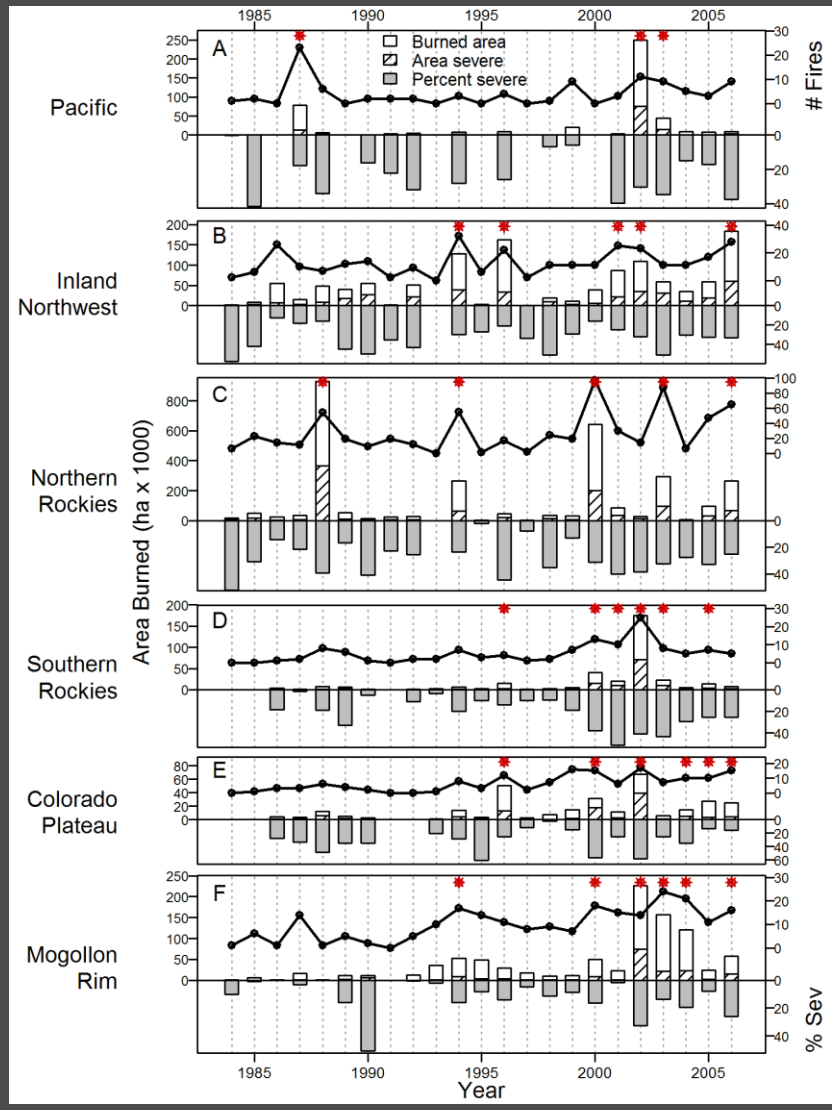






Mapping probability of high severity fires





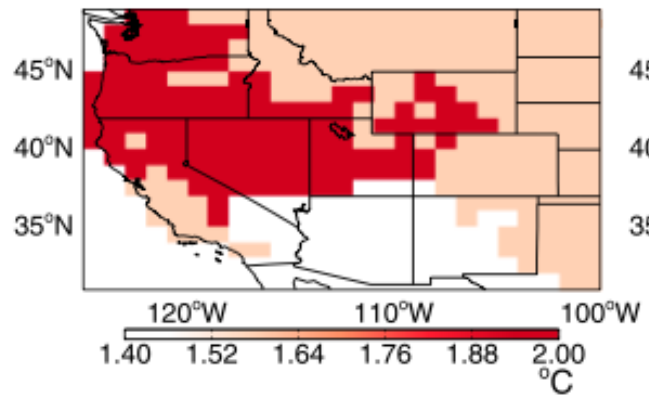
Dillon et al. 2011. Ecosphere

Future: Large, changing fires

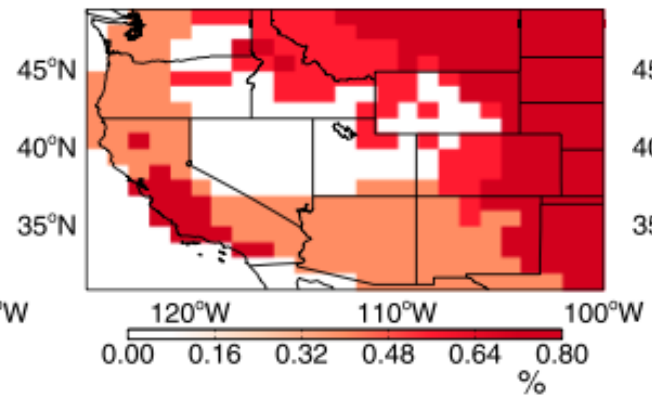
- Most area burns in a few large fires, and when we get many fires at once
- Years of widespread fires have warm, dry summers following warm springs
- Area burned likely to increase in northern Rockies

Western US: climate and fire, 2045-2055

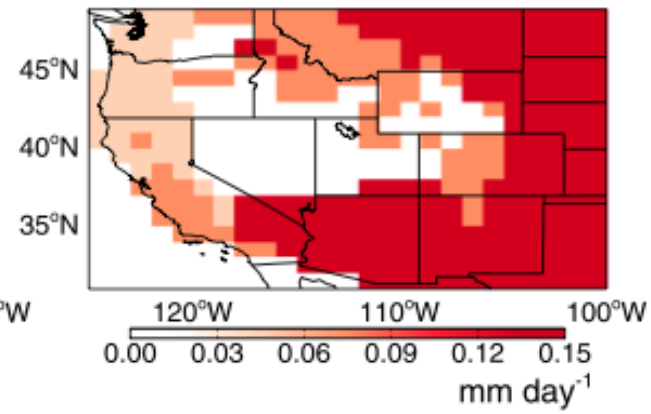
Δ Temperature



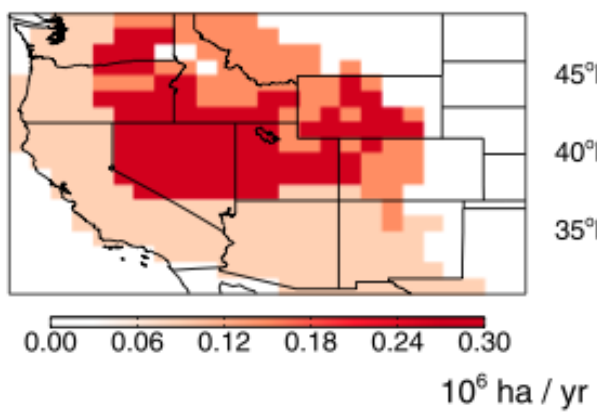
Δ Humidity



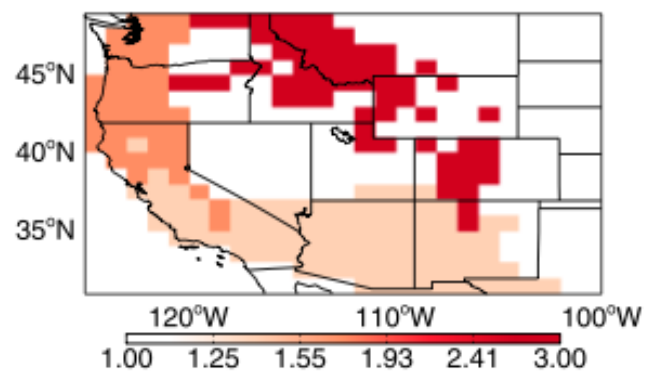
Δ Precipitation



Present day Area Burned



Future / Present



Rocky Mountain forests: *2.75 x increase by 2050s*

Western US: *1.54 x increase by 2050*

Spracklen et al. 2009. Climate Change, Wildfire and Aerosols. Geophysical Research Letters.

Lessons for the Future

- Large fires will happen
- Spring and summer climate will influence fire extent and severity despite major land-use change and fire suppression efforts
- Fire is influenced by climate (top-down) and fuels/vegetation/topography (bottom-up)

Warmer springs

- Earlier snowmelt, changing stream flow
- Changes in plant establishment
- Dates of flowering
- Increased bark beetle activity – longer growing season, higher elevations

Photo courtesy Dan Isaak

Climate Change

- Rapid, evident, implications
- Learn, observe and adapt management accordingly

Fire is a bad master, but a good servant

Finnish Proverb, www.paradox.org

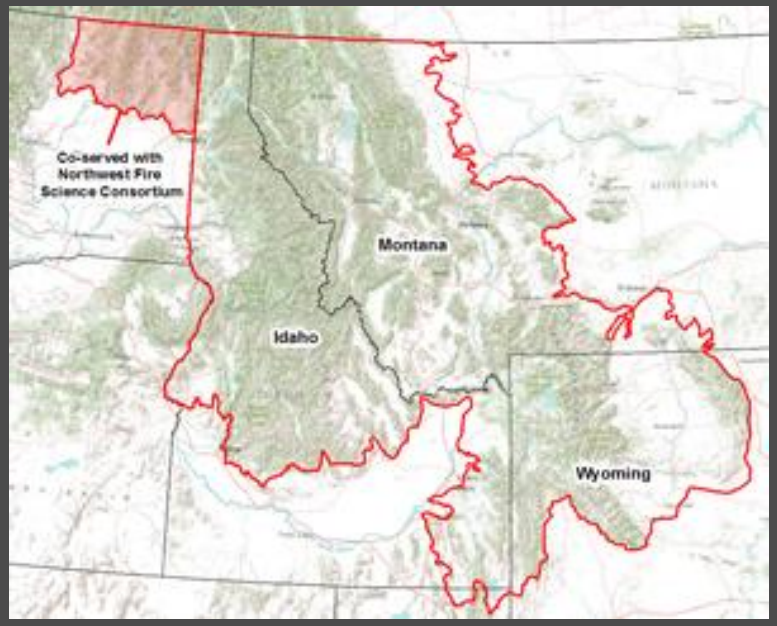
- "Reestablish fire as a natural process…"
- Goal is to "facilitate the reduction of wildfire management costs, including through reestablishing natural fire regimes and reducing the risk of uncharacteristic wildfire"
- "Fire-smart" landscape – fires can occur without undue threat to the values and ecosystem elements we care about

Key elements restoring future forest resilience

- More than fuels management in WUI
- Must consider landscapes
  - Context for prioritizing places for treatment
  - All lands
  - Complementary objectives/potentials
  - Include roads, streams, wildlife habitat
- People, jobs, communities
- Monitor for adaptive management
- Unintended consequences
- Fires and disturbances will happen

IGERT team

- Enhance communication
- Facilitate interactions
- Identify fire and fuel research needs
- Improve access to knowledge and tools



http://nrfirescience.org/

Mission and vision

- Nationally distinctive
- Increase knowledge
- Fire as a physical, ecological and social process

Wildland Fire Program
University of Idaho

Wildland Fire Program at University of Idaho

(**http://www.uidaho.edu/cnr/frfs/fire**)

- Educating leaders, working with leaders, being leaders
- Teaching, Research & Outreach
- Important to state, region, & world

Courses and programs

- 0→103 majors
- 25+ other students
- >800 students from 34 states and 5 countries in online courses
- Service learning with The Nature Conservancy

Wildland Fire Program
University of Idaho

Literature Cited

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