Wildfires

Splash November 15, 2020

Clair Travis

August complex, Mendocino National Forest

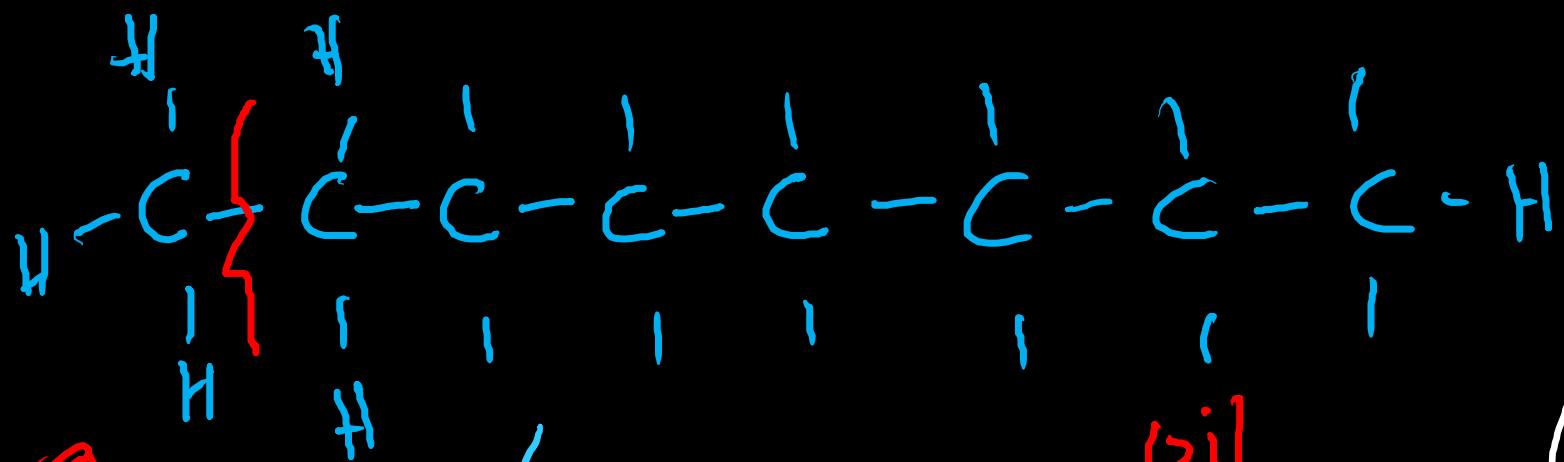
City Fires vs. Wildfires

Terminology

- **Acre**: 1/640th of a square mile or about 1/250th of a square km. Fires are generally reported in acres
- **Fireline**: Trenches or brush clearing usually ~10ft wide to stop a fire
- **Containment**: The percentage of a fire's perimeter that has a fireline around it so the fire won't spread in that direction.
- **Fuels**: Any organic material that can burn, generally plant manner
- **Complex**: Two or more fires that aren't continuously connected but are from the same source
- **Spotting**: When embers are carried by wind and start fires away from main fire

Some Chemistry

- What are the main ingredients of a fire?
  - Fuel (gasoline, sugars, wood, biomass)
    - Generally requires carbon-carbon bonds
  - Oxygen
  - Heat (to start the fire)
- How do we quench fire?
  - Separates the oxygen from the fuel
  - Remove oxygen
  - Remove fuel



octane

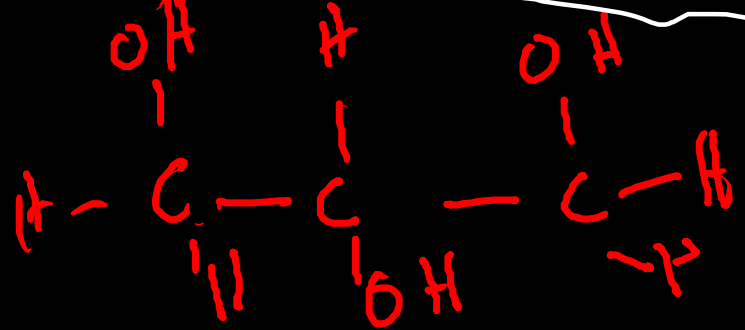
oil

oxygen

$CO_2 + H_2O + \text{energy}$

smoke

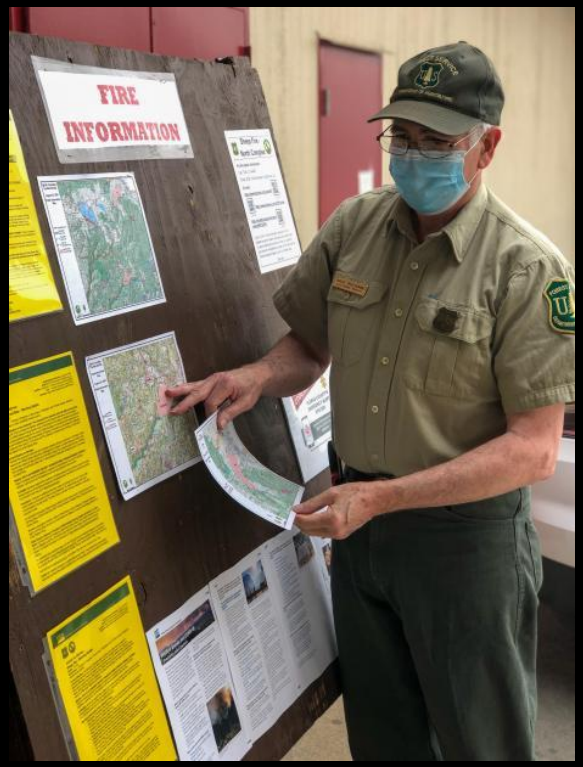
wood made of sugars



↳ sugars have more Oxygen

How are large wildfires fought?

How Wildfires are fought: Basecamp



How Wildfires are fought: By Air

Long term Flame retardant (extra notes)

- Forest Service uses *Phos-Chek* products, sticky/soapy-like mixture
- Diluted in water before application, and only applied to small areas like the edge of a fire
- Often composed of **ammonium** and **phosphate**, like fertilizer
  - Generally low toxicity molecules, also found in soaps
  - Important micronutrient (nitrogen and phosphorus) sources, used in fertilizer
  - Possible over nutrient effects (ie algae blooms) in runoff water
  - Interacts with sugars in wood to form fire resistant coating on plants
- Generally considered to be safe *at levels used*
  - Some reports of additive toxicity to some aquatic life
  - Some mild toxicity to select species of plants
- Red color is for visual information (ie where to drop it, where it is)

How Wildfires are fought: Firelines

How Wildfires are fought: Engines

How Wildfires are fought: Ground Crews

Notable Crews this year

- For fires, crews are pulled from all over the country. In particularly bad years they come from further or different backgrounds…

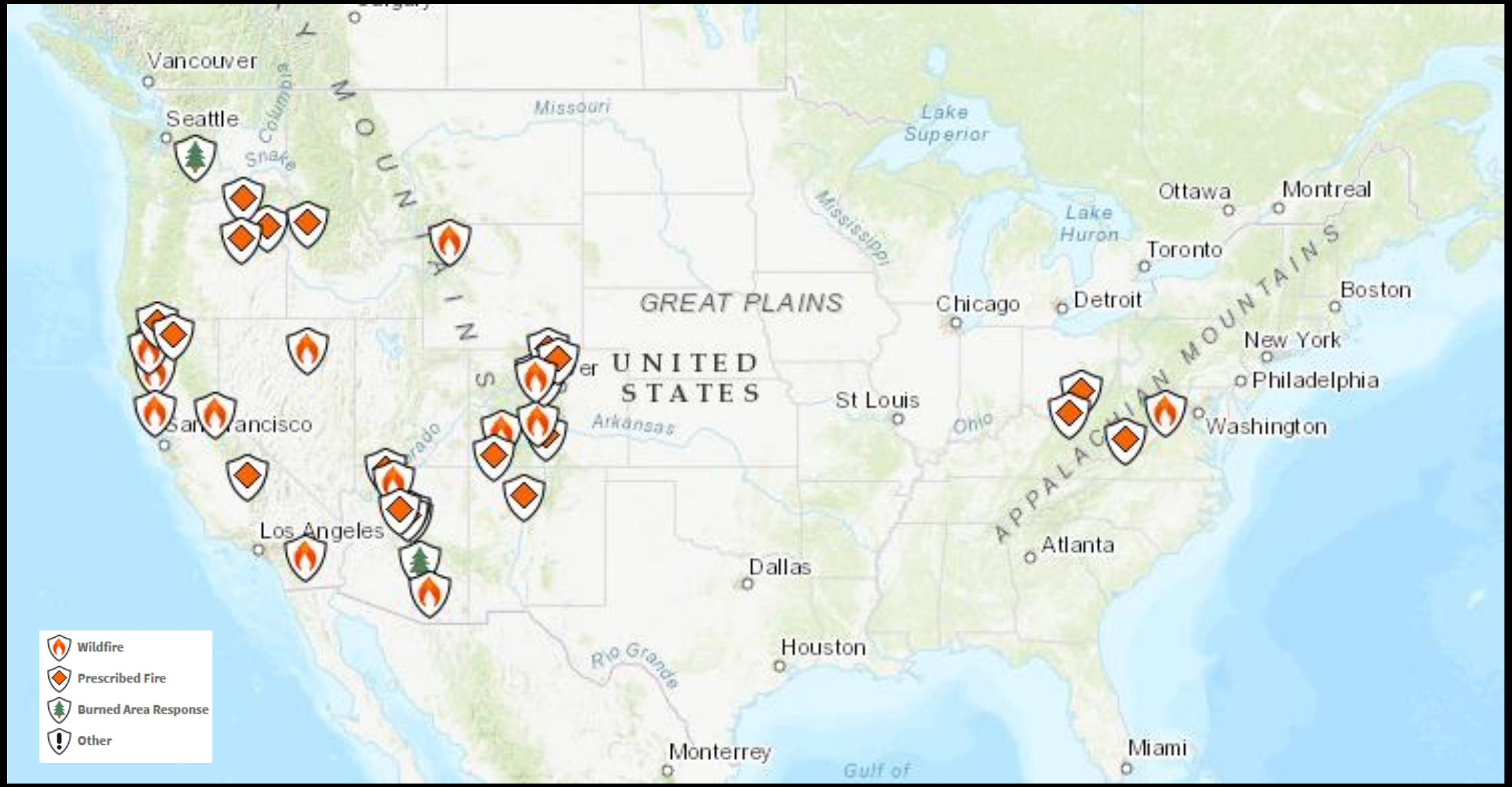
Marines from Charlie Company, 7th Engineer Support Battalion undergoing firefighting training (North Complex)

Crews from Mexico and Australia (not shown)

Various National Guard Blackhawk helicopter crews

Army's 14th Brigade Engineer Battalion (August Complex)

Inciweb: Fires this time last year



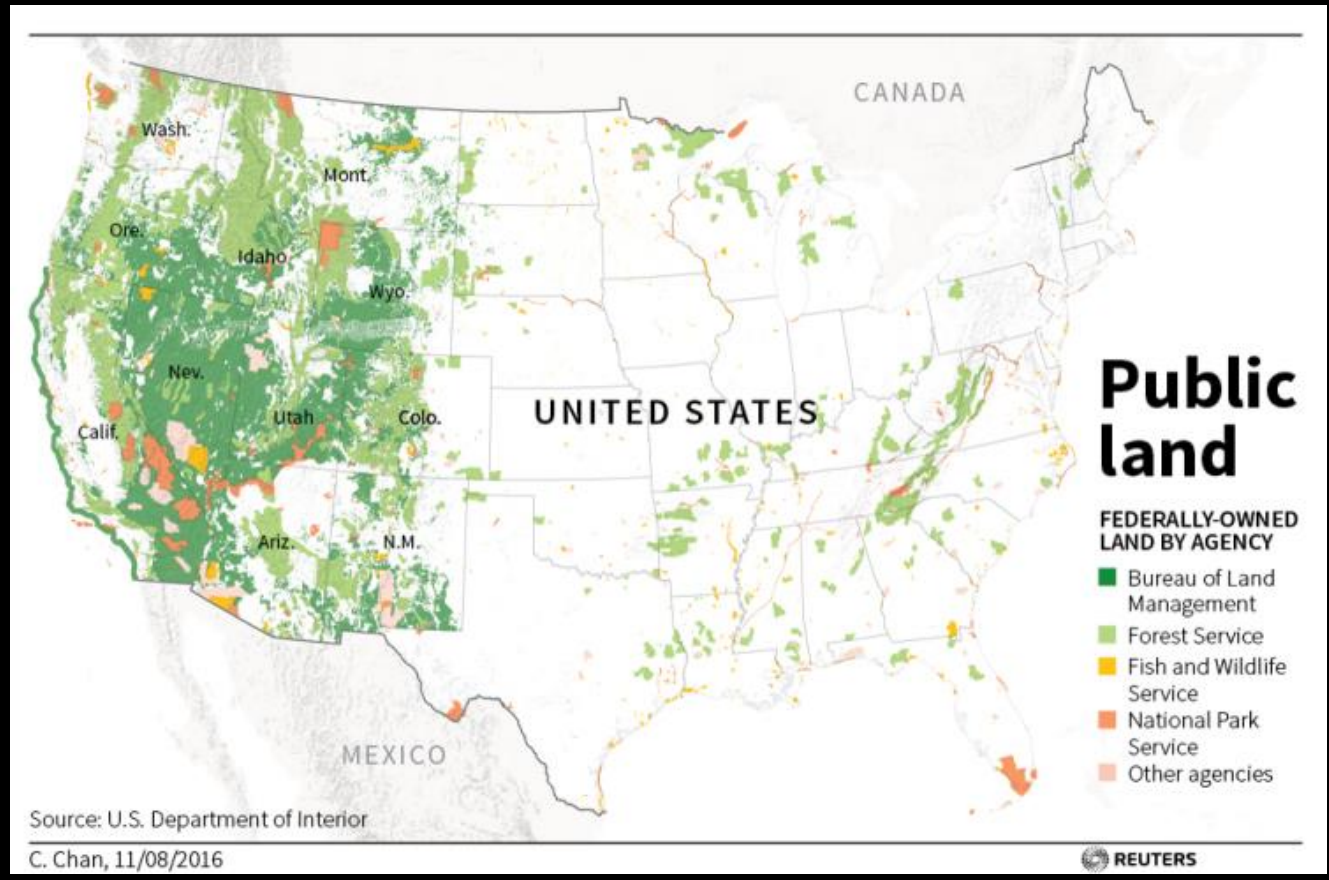
Inciweb: Current Fires and Controlled Burns

Understanding some wildland ecology

Why so many fires in the West?

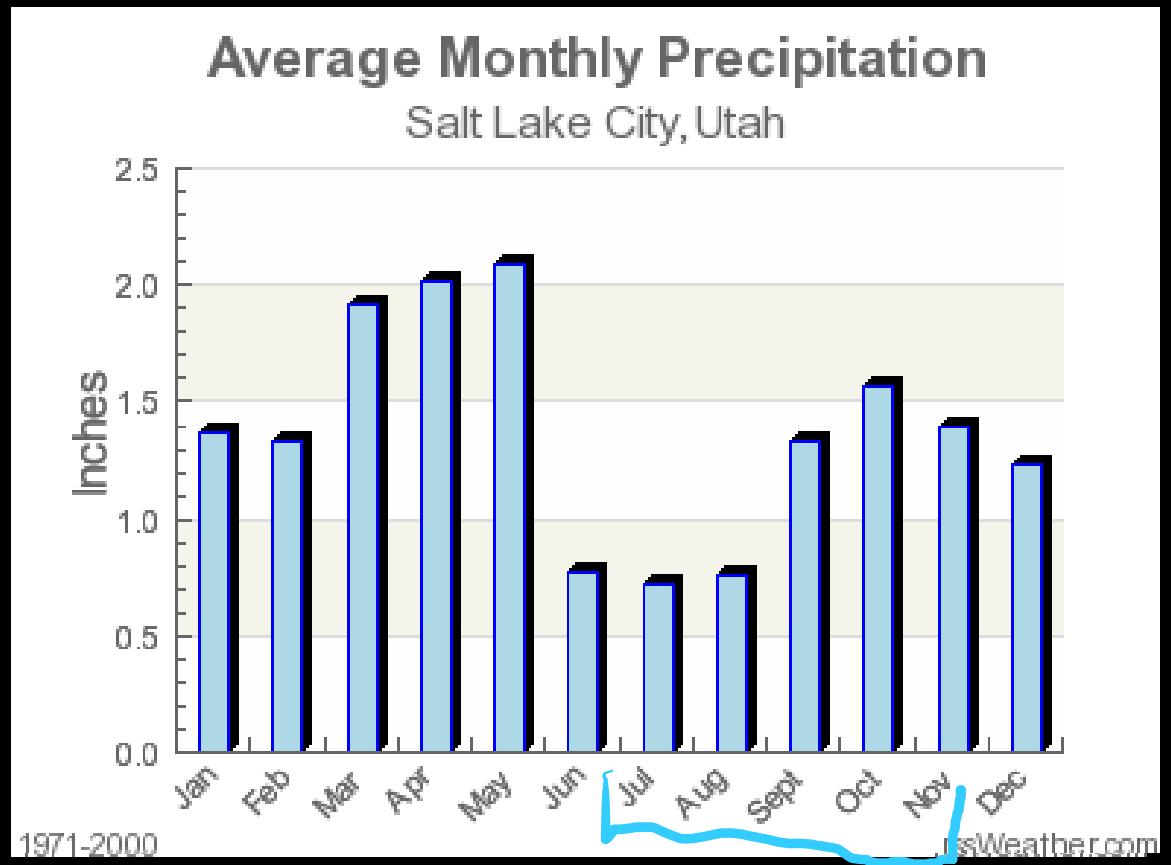
Land Management

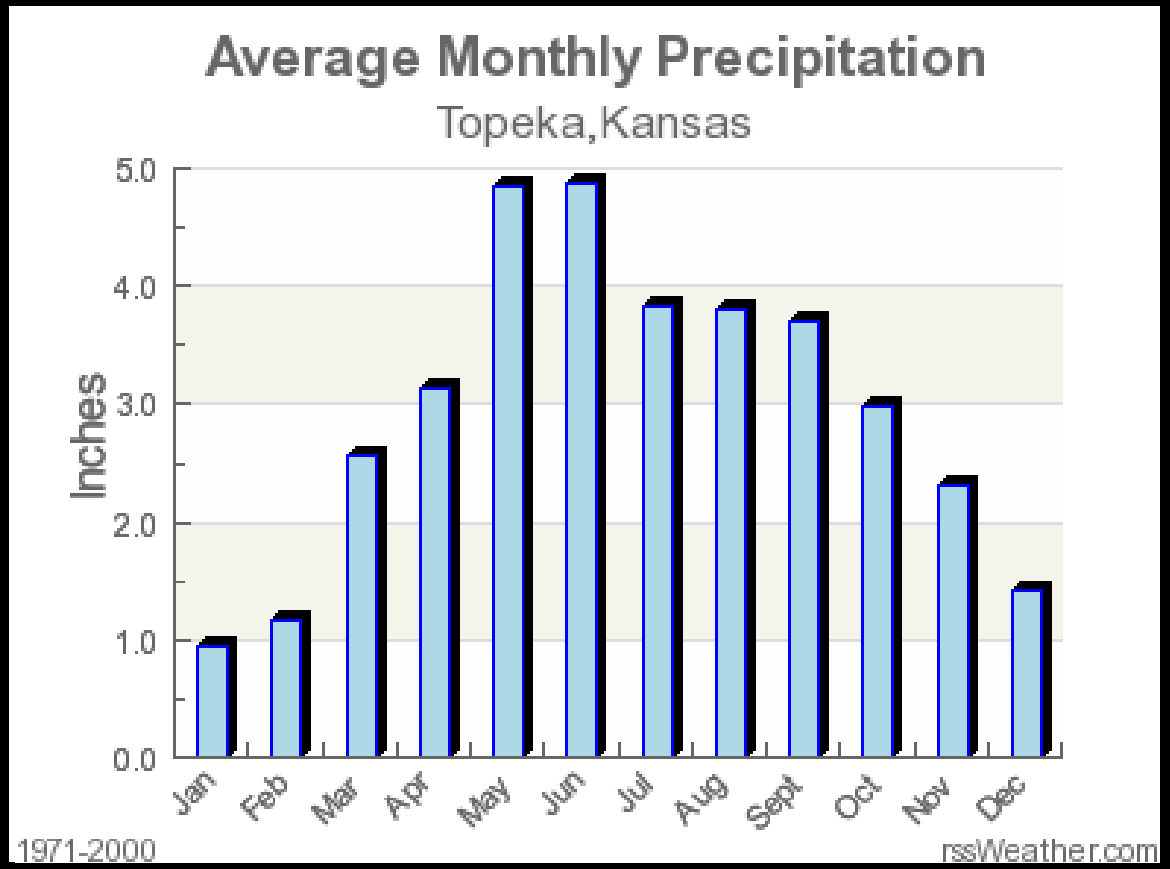
- Private land
- Federal Public land: 27% US land
  - Forest Service: 8.5% of US land
  - Bureau of Land Management: 10.8% of US land
  - National Park Service: 3.7% of US land
  - US Fish and Wildlife Service: 4.2% of US land
- Most Federal Public land is in the Western states



https://wilderness.org/sites/default/files/Fact%20Sheet%20America%27s%20Public%20Lands%20.pdf

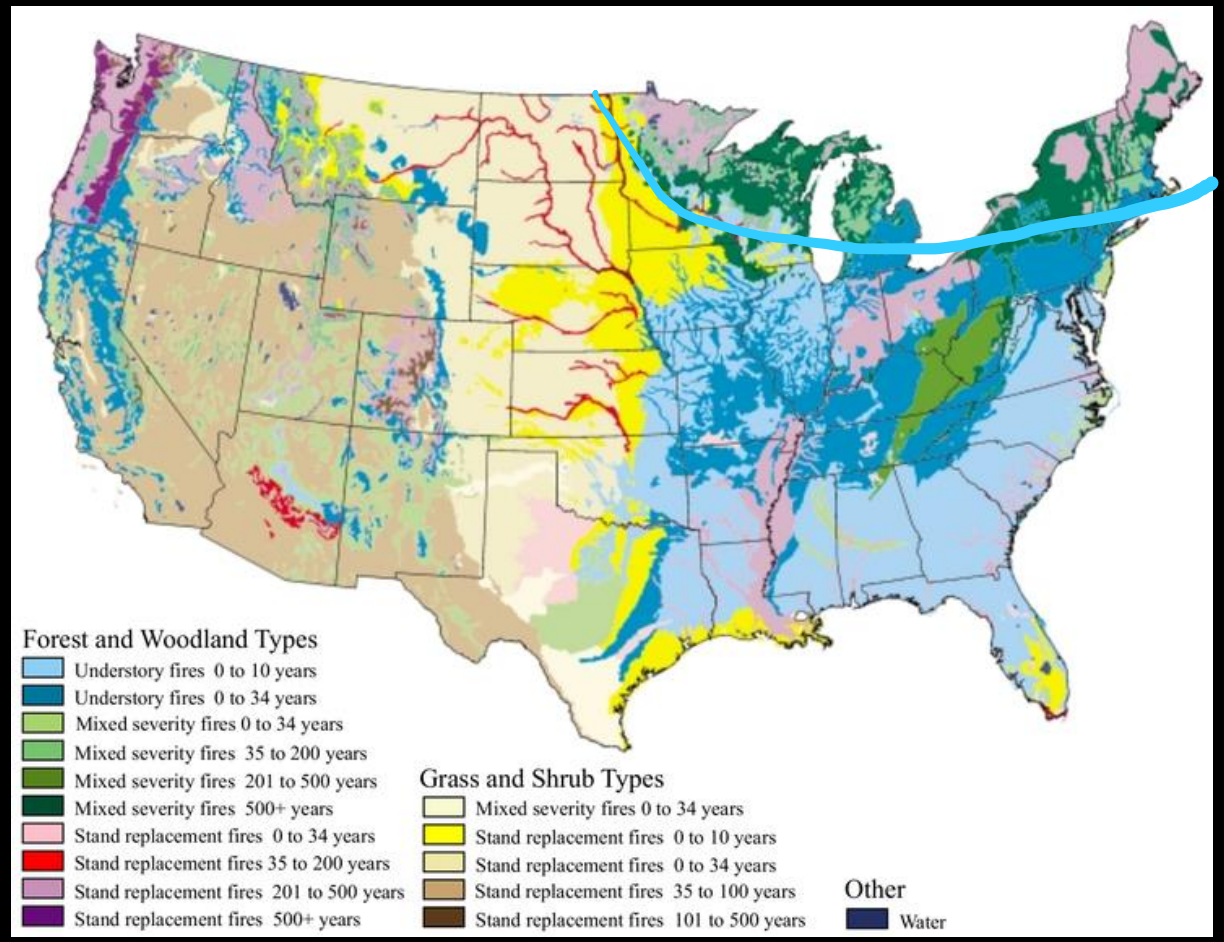
Rainfall in the US

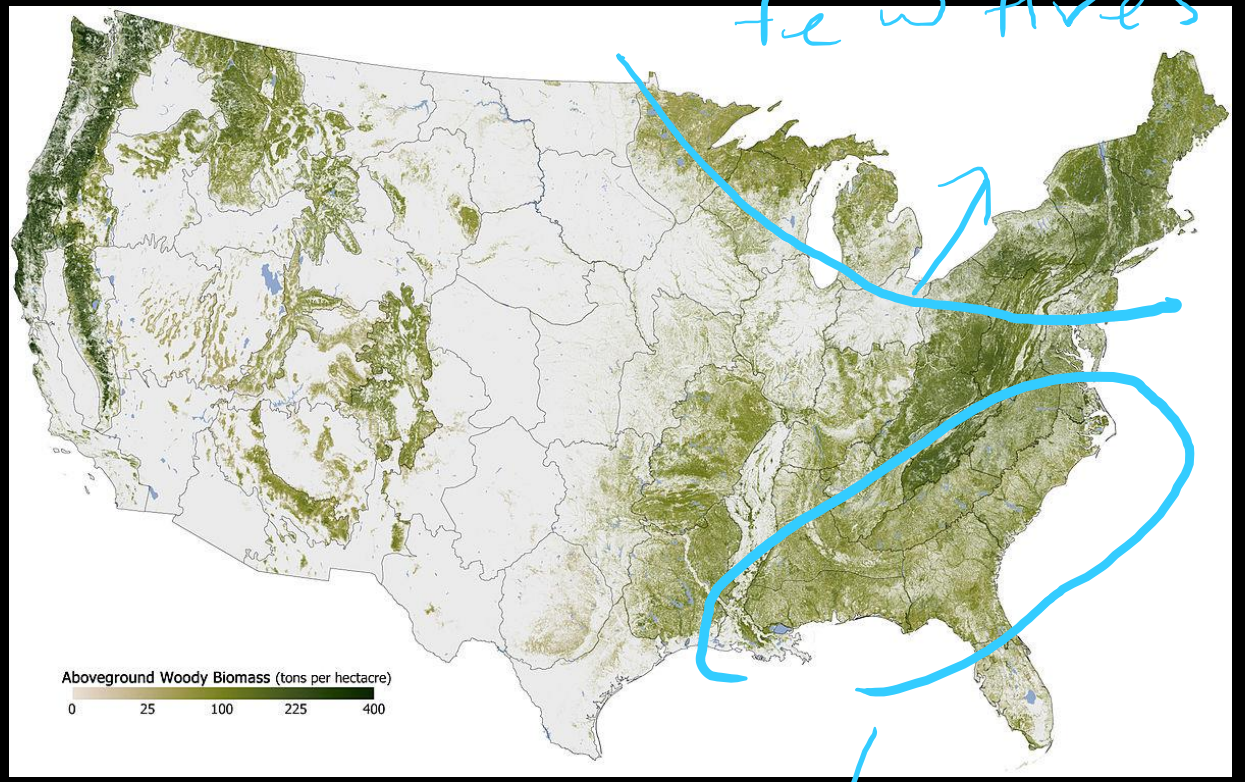




↳ Fire season in West

Natural Fires





few fires

spotty forests → private land

understory — brush, not trees burned

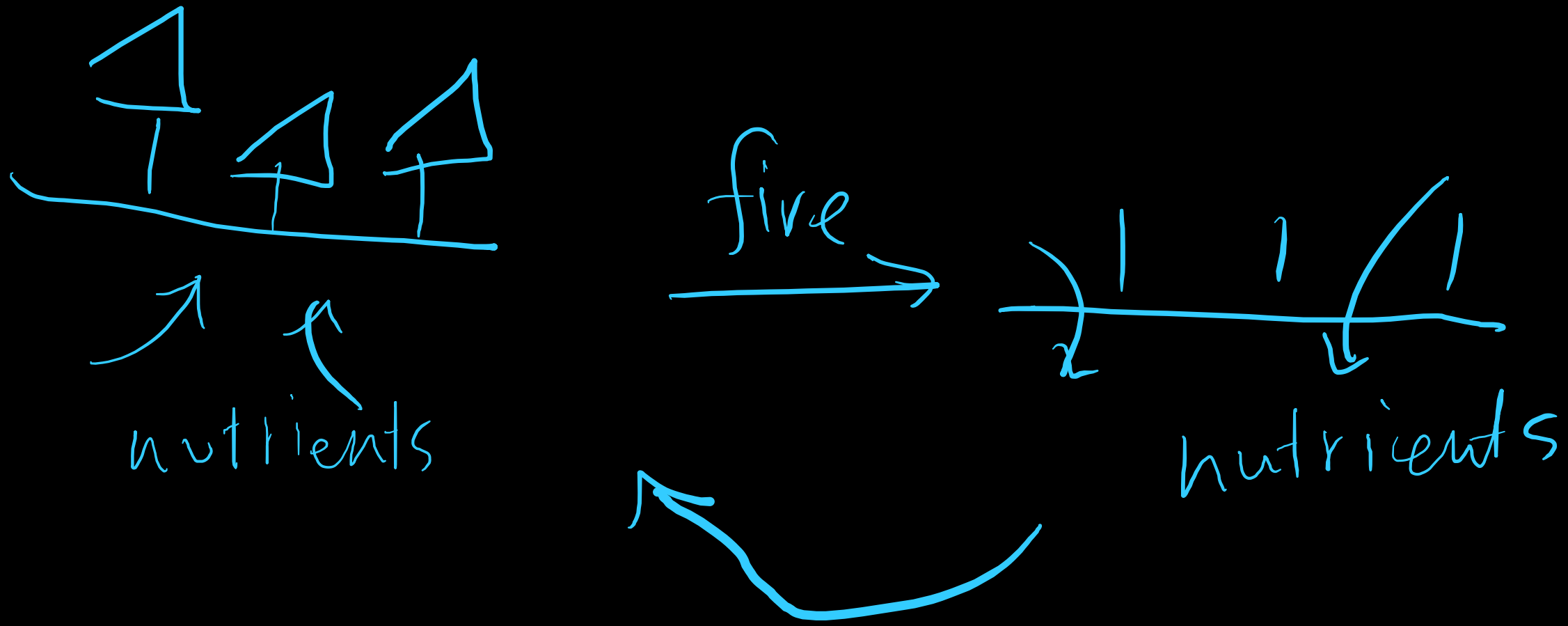
Brown, James K.; Smith, Jane Kapler (2000). Wildland Fire in Ecosystems: Effects of Fire on Flora.

Exercise: What micronutrients do plants need?

- Nitrogen
- Sodium
- Sulfur
- Oxygen
- Magnesium
- Silicon
- Phosphorus
- Boron
- Fluorine
- Calcium
- Iron
- Potassium

Key micronutrients

Fires for a healthier forest?



Giant Sequoia

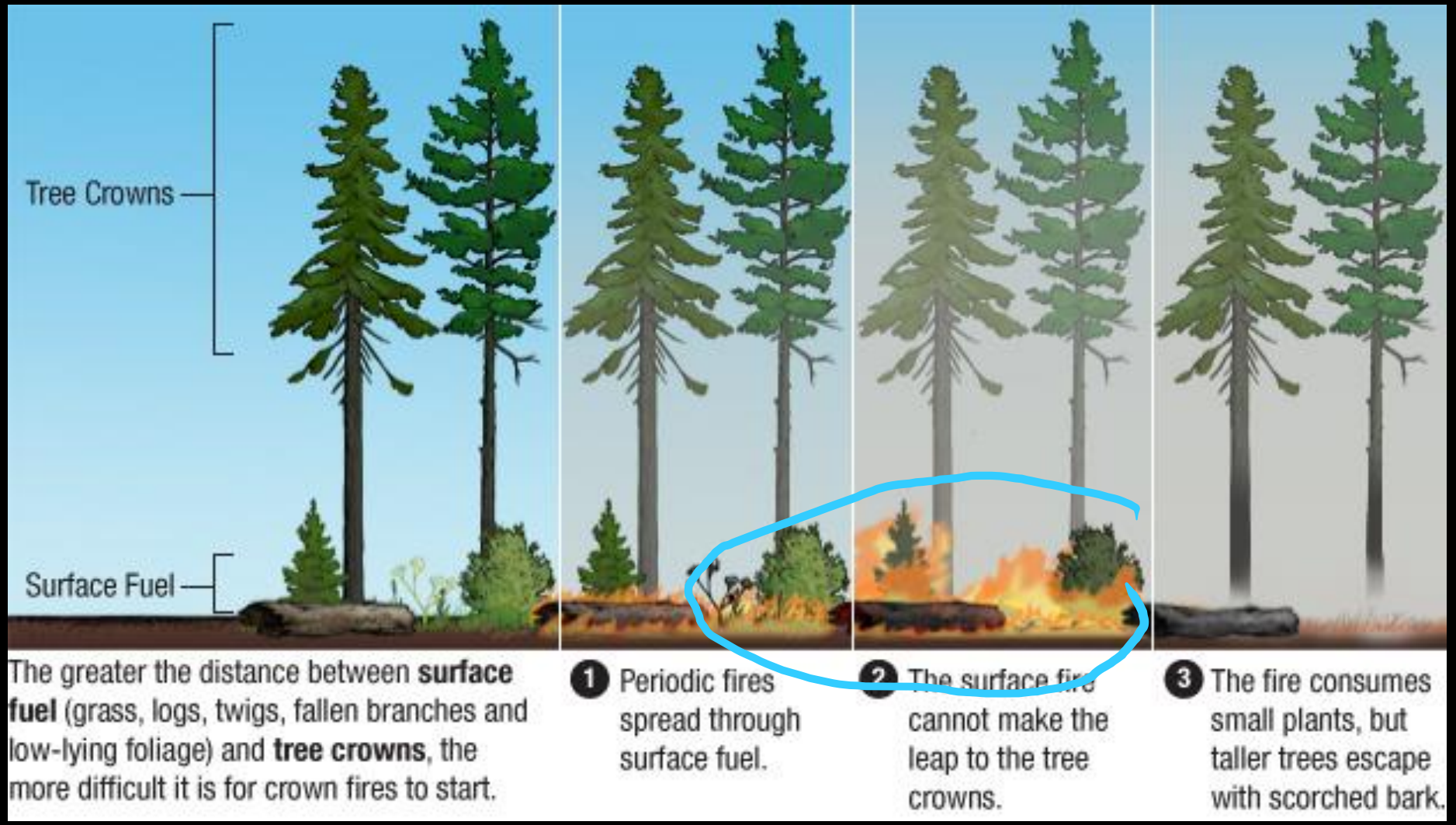
→ loves fires

Conclusions?

- Fires put nutrients back in soil
- Land use, public/private land affects fires
- Rainfall / temp patterns
  - ↳ Burn cycles in West ~6-30 yrs (naturally)

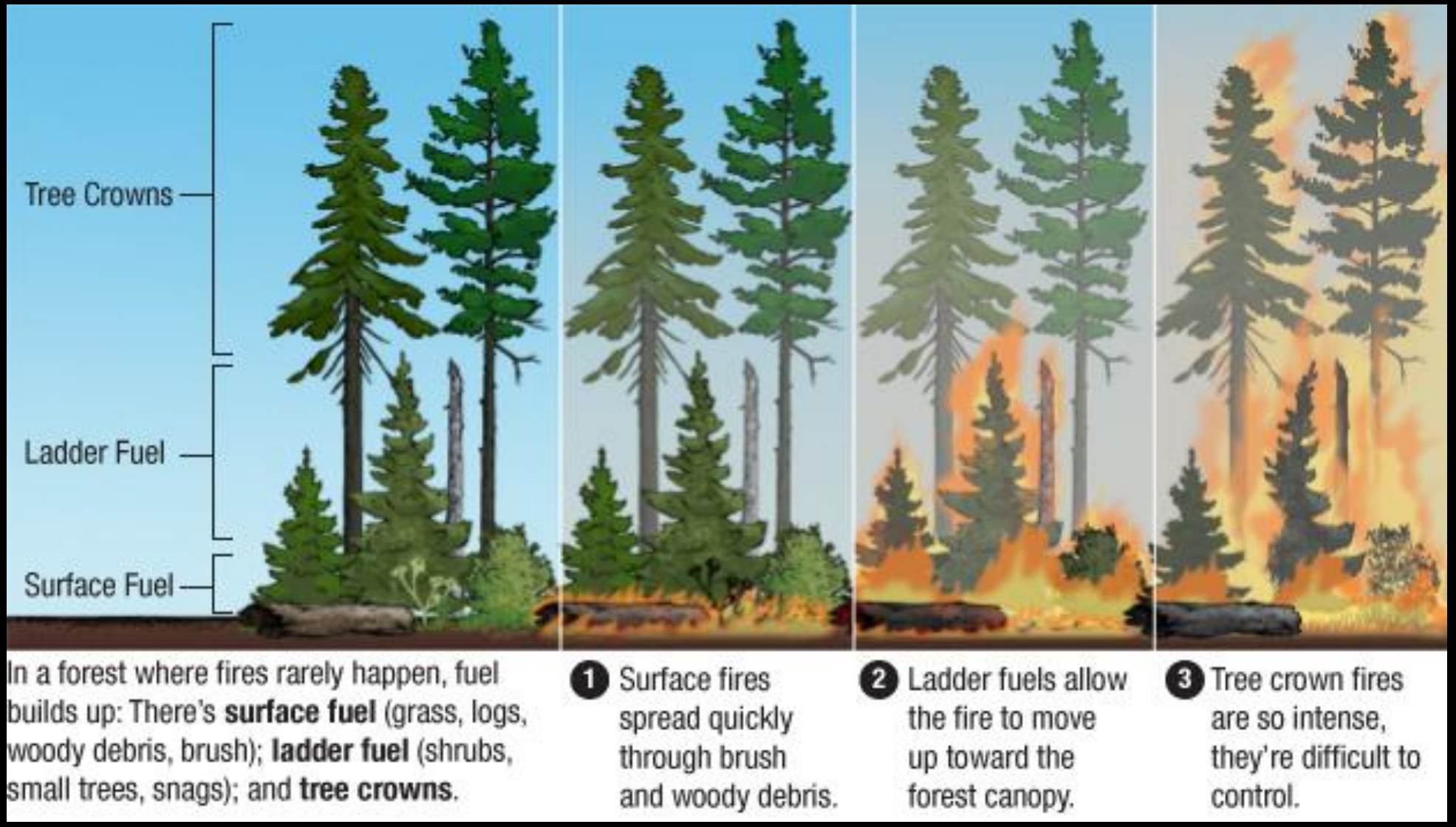
Are forest fires in the Western United States getting worse?

Fire Suppression



https://www.npr.org/2012/08/23/159373770/the-new-normal-for-wildfires-forest-killing-megablazes

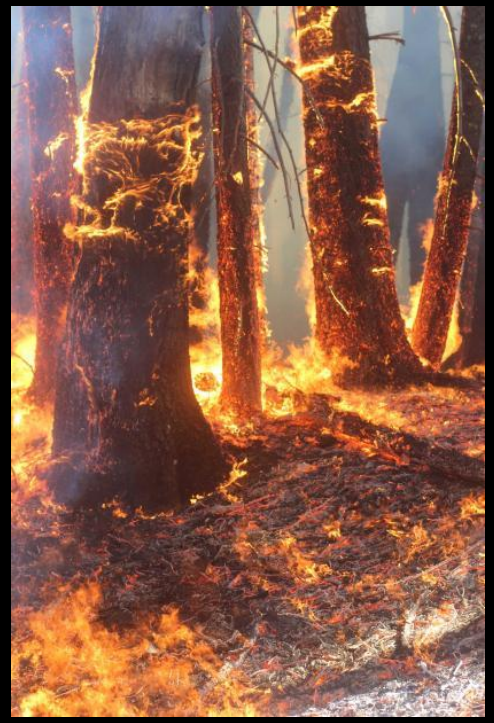
Fire Suppression



https://www.npr.org/2012/08/23/159373770/the-new-normal-for-wildfires-forest-killing-megablazes

Understory vs. Stand replacement fires

whole trees, everything burned



Other Effects of Fire suppression

California Drought 2012 - 2016

Human proximity

- Humans start fires in various ways
  - Car fires
  - Campfires
  - Smoking
  - Downed power lines
  - Arson
- Humans start **84%** of Wildfires
- Greater population also means more structures and people are at risk when a fire starts

Balch, J. K., et.al (2017). Human-started wildfires expand the fire niche across the United States. *Proceedings of the National Academy of Sciences, 114*(11), 2946-2951. doi:10.1073/pnas.1617394114

Climate Change

Climate change exacerbates fire problems caused by fire suppression and human proximity in the Western United States

Acknowledgements

- Devin and Diane Travis
- Forest Service (fs.fed.us)
- Inciweb
  - August Complex
  - Pine Gulch Fire
  - North Complex
  - Creek Fire
  - El Dorado Fire
  - Archie Creek Fire
  - Red Salmon Complex
  - SQF Complex