Pile Age and Fire Effects

Santa Clara Pueblo fire crew preparing to burn experimental piles.

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Forest Guild

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Context and Background

- Why do we care about pile burning?
  - Common fuel/debris disposal treatment
  - Long duration burning, including smoldering
  - Lots of piles being burned, especially in the West

Voice of the Rocky Mountain Empire

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WILDFIRE MITIGATION

Foresters have 180,000 piles of trees to burn

By Bruce Finley *The Denver Post*

PINEWOOD LAKE» A federal forester flicked a Bic, igniting a first bone-dry pile of culled young pines — testing conditions for the looming task of torching 180,000 similar piles across Colorado.

The continued construction of houses in burn zones is forcing this effort to thin overly dense forests and reduce the risk of super-intense wildfires.

For years, federal forest managers have targeted young trees in areas near homes to try to prevent the sort of devastating wildfires that exploded across thousands of acres in Colorado last year, killing six people and destroying hundreds of homes.

Ecologists question the strategy of manually thinning by targeting young trees, warning that this could kill the capacity of forests to regenerate.

But the most immediate challenge for fuel technicians Matt Champa and Joe Parr, and their counterparts statewide, is getting the already-cut piles burned.

As flames licked upward amid mature

BURN » 8A

U.S. Forest Service assistant fuels technician Joe Parr throws a partly burned ponderosa pine log back onto a fire in the Arapaho and Roosevelt National Forests west of Loveland on Thursday morning. *Andy Cross, The Denver Post*

October 9 2012:

7,000 acres × 15-20 piles acre = 105,000 to 140,000 piles

"I've got 2,000+ acres of critical pile burning to get done, plus another 5,000 acres backed up on me."

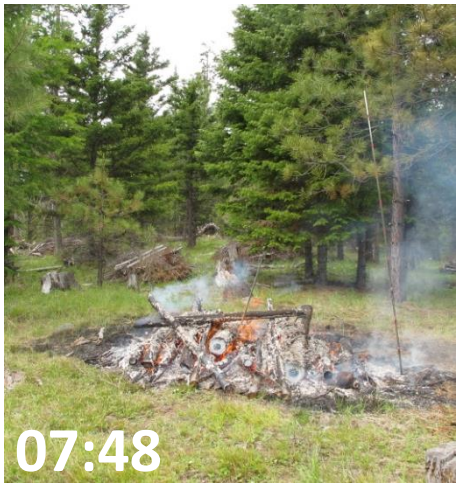
– Jim Bailey *Fuels Planner, Naches Ranger District, Okanogan-Wenatchee National Forest*

Context and Background

- Why do we care about pile burning?
  - Common fuel/debris disposal treatment
  - Long duration burning, including smoldering
  - Lots of piles being burned, especially in the West
  - Concentrated impacts spatially
  - Don’t really know the repercussions – need a baseline
- Why is pile age important?
  - Backlog of piles to burn
  - Pile characteristics change (size, packing ratio, decay status)
- Does age affect combustion, consumption, soils, vegetation?

What are we studying?

- Combustion
  - Flame height
  - Duration
- Fuel Consumption
  - Completeness
  - Charcoal formation

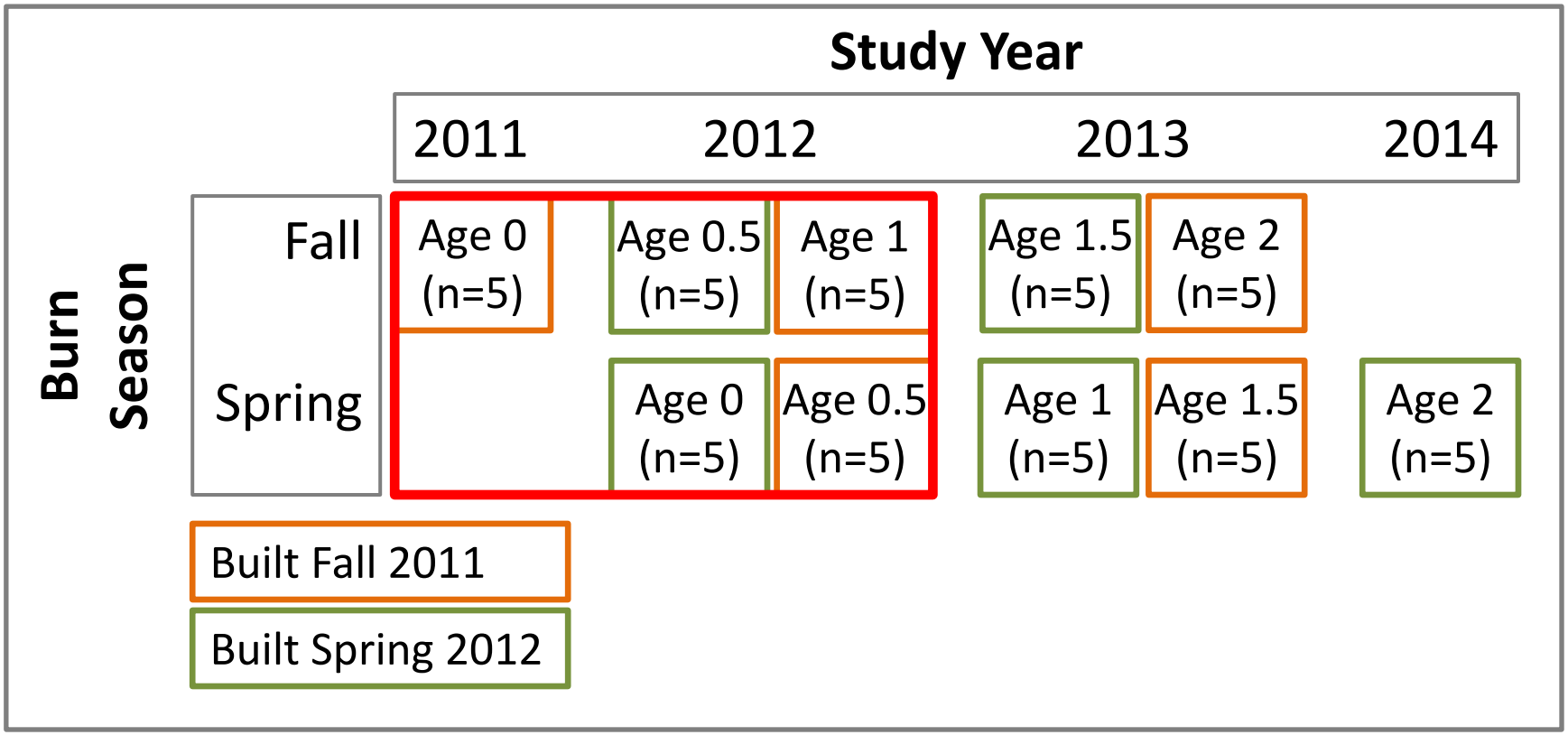


What are we studying?

- Effects on soils
  - Biology
  - Chemistry (N, P, C, SOM)
  - Erosion potential
- Effects on vegetation
  - Crown damage
  - Species composition

Study Design

- Built 50 piles in two locations
- Burn 5-10 piles per season



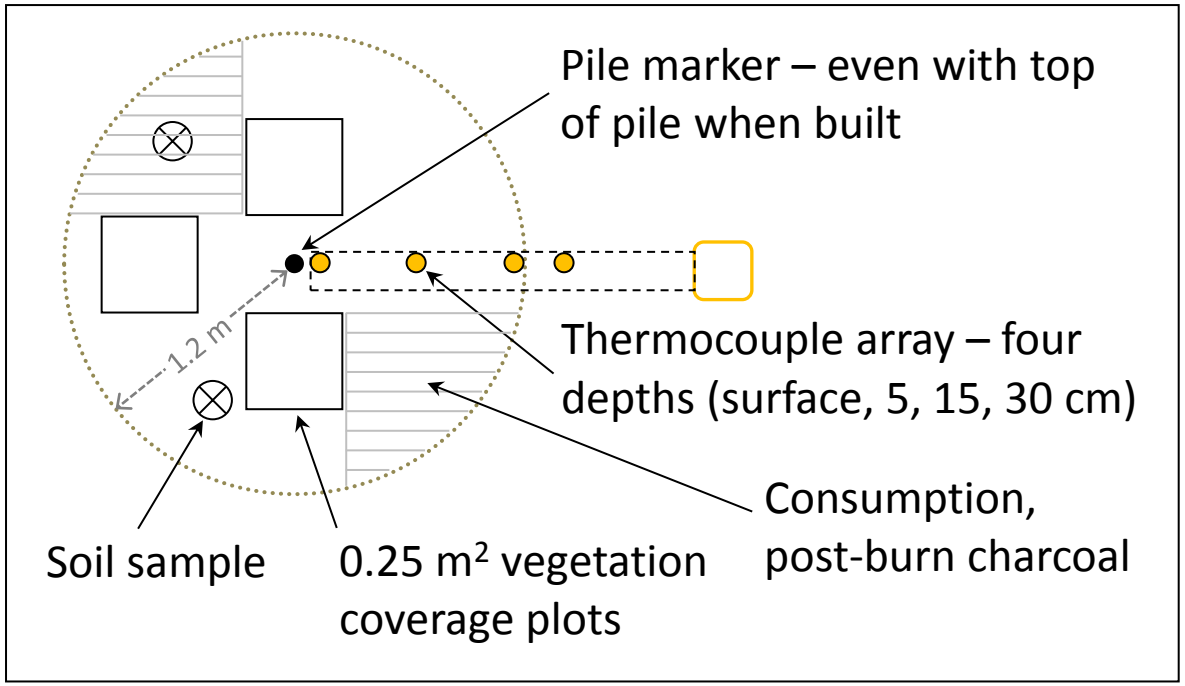
Study Locations

- **North-central New Mexico**
  - Santa Clara Pueblo
  - Ponderosa pine forest
  - Thin & hand pile, no boles

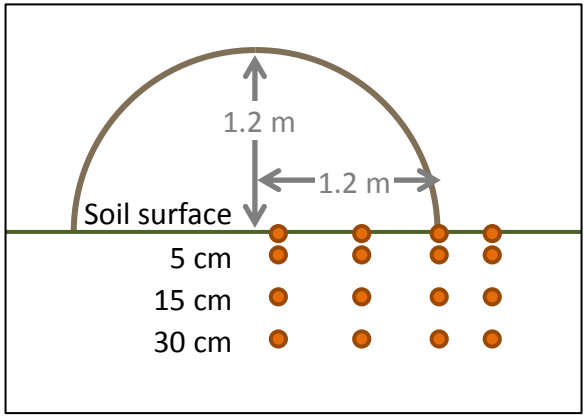
- **Central Washington**
  - Naches Ranger District
  - Ponderosa pine/Douglas-fir/grand fir forest
  - Thin & hand pile, with boles

Methods

- Combustion
- Soil chemistry
- Soil heating
- Fuel consumption
- Charcoal formation
- Vegetation composition

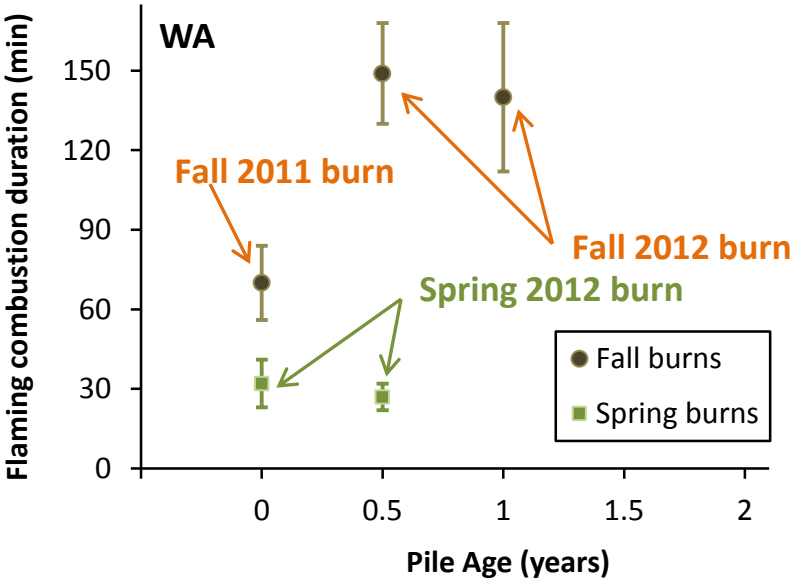


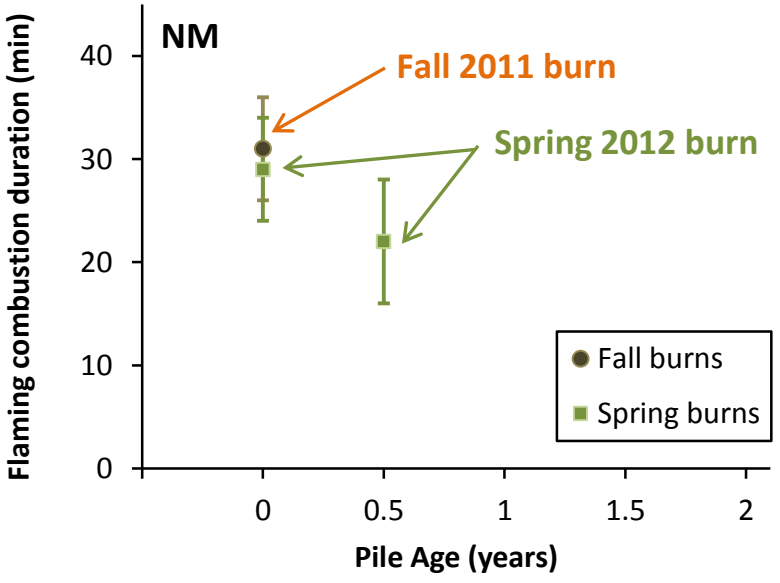
Thermocouple Array



Combustion

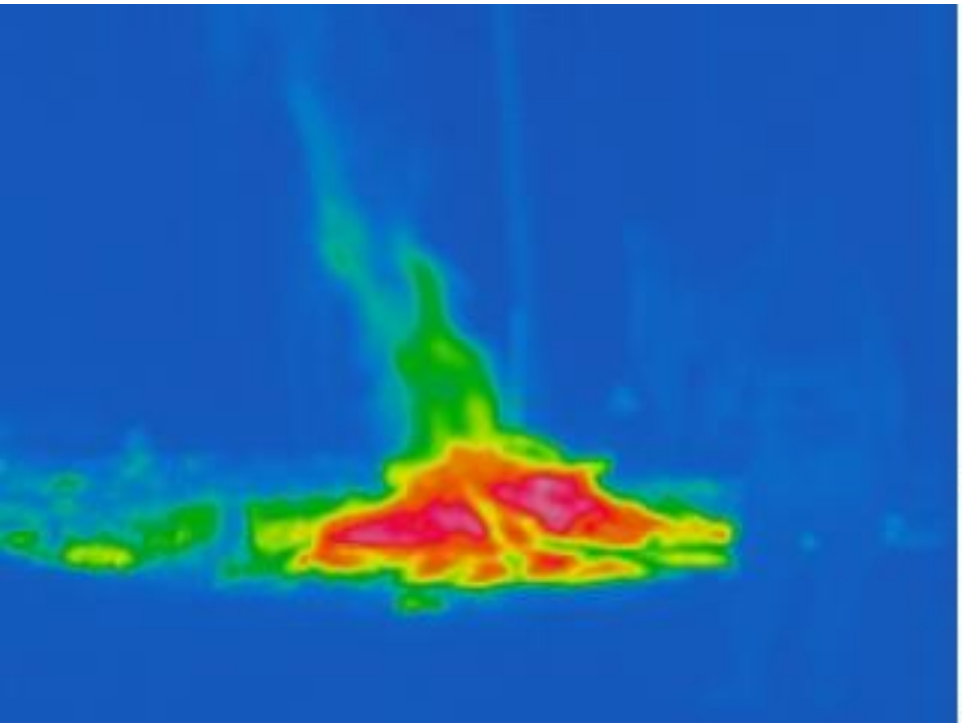
- Day-of-burn conditions had a larger effect than pile age
- Older piles → shorter flaming duration
  - Implications for emissions
  - May be more important for piles with large wood





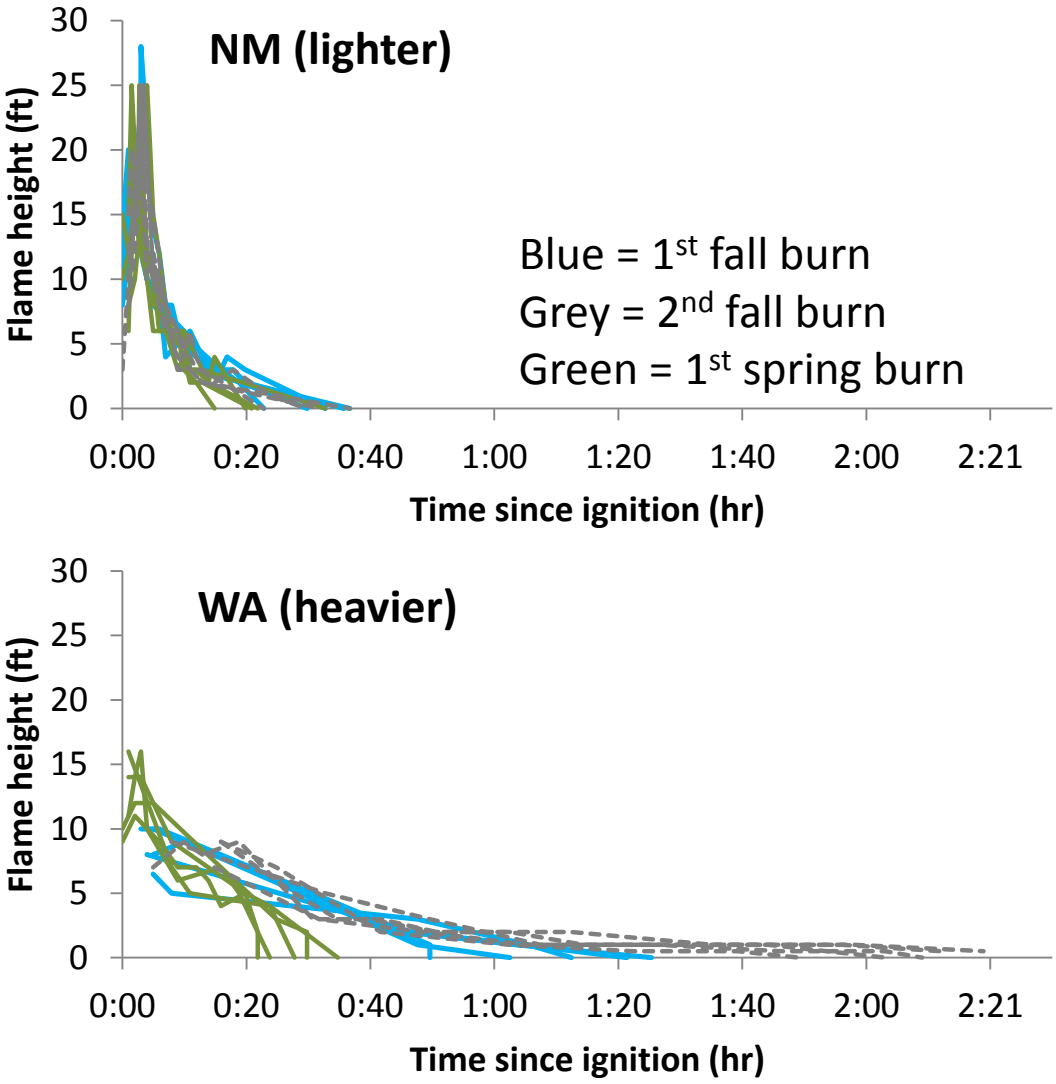
Combustion

- High temperatures (800 °C+) in the flaming zone
- Temperature drops rapidly above the flames



Combustion

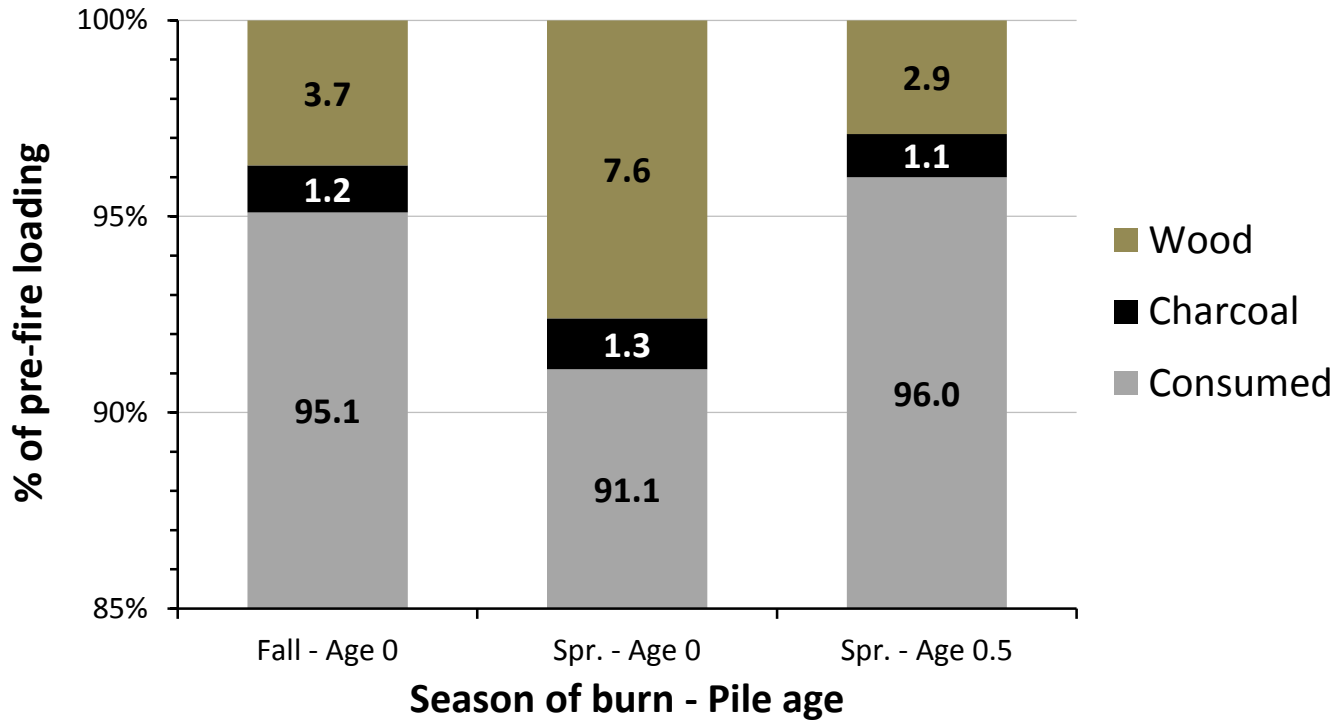
- Lighter piles → higher flame ht
  - Greater potential for crown damage?
- Heavier piles → longer flaming combustion
  - Large fuels a heat sink that depress flame height?



Fuel Consumption & Charcoal

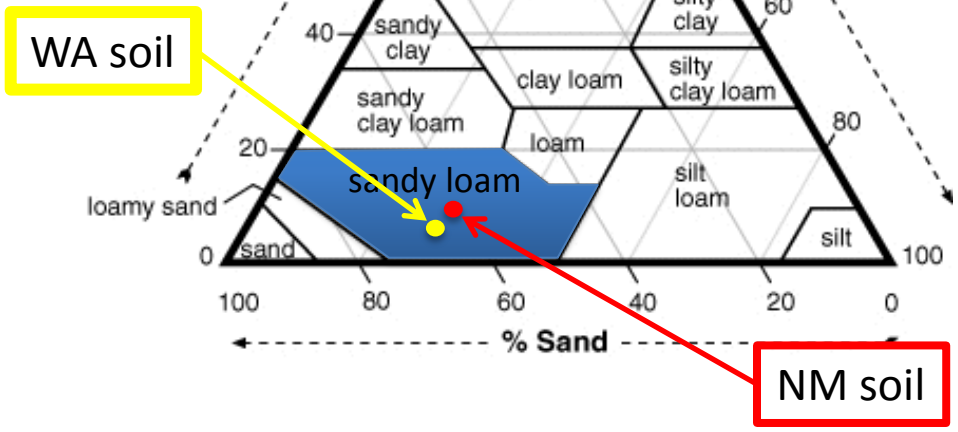
Washington site (so far):

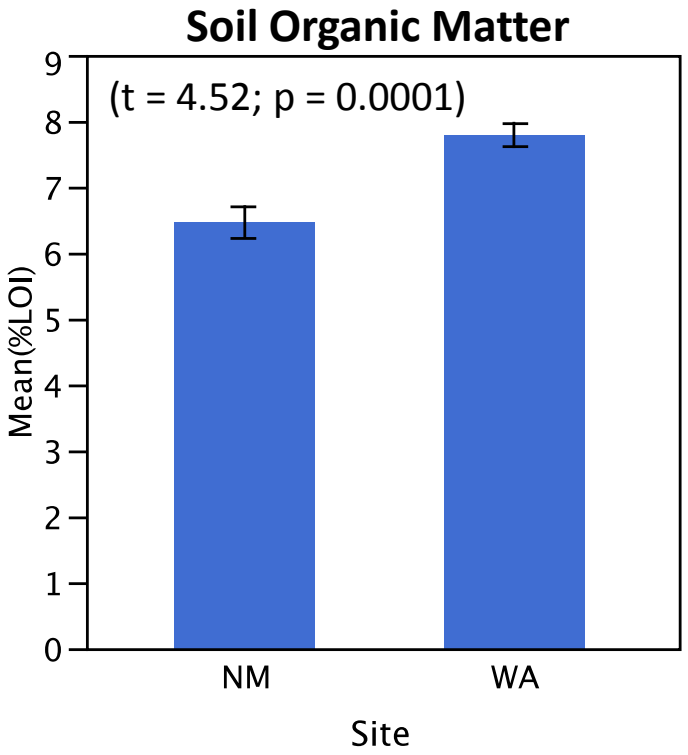
- Consumption >90%
- ±1.2% turned to charcoal



Soils

- WA and NM sites have similar soil texture
- WA soils have higher organic matter content

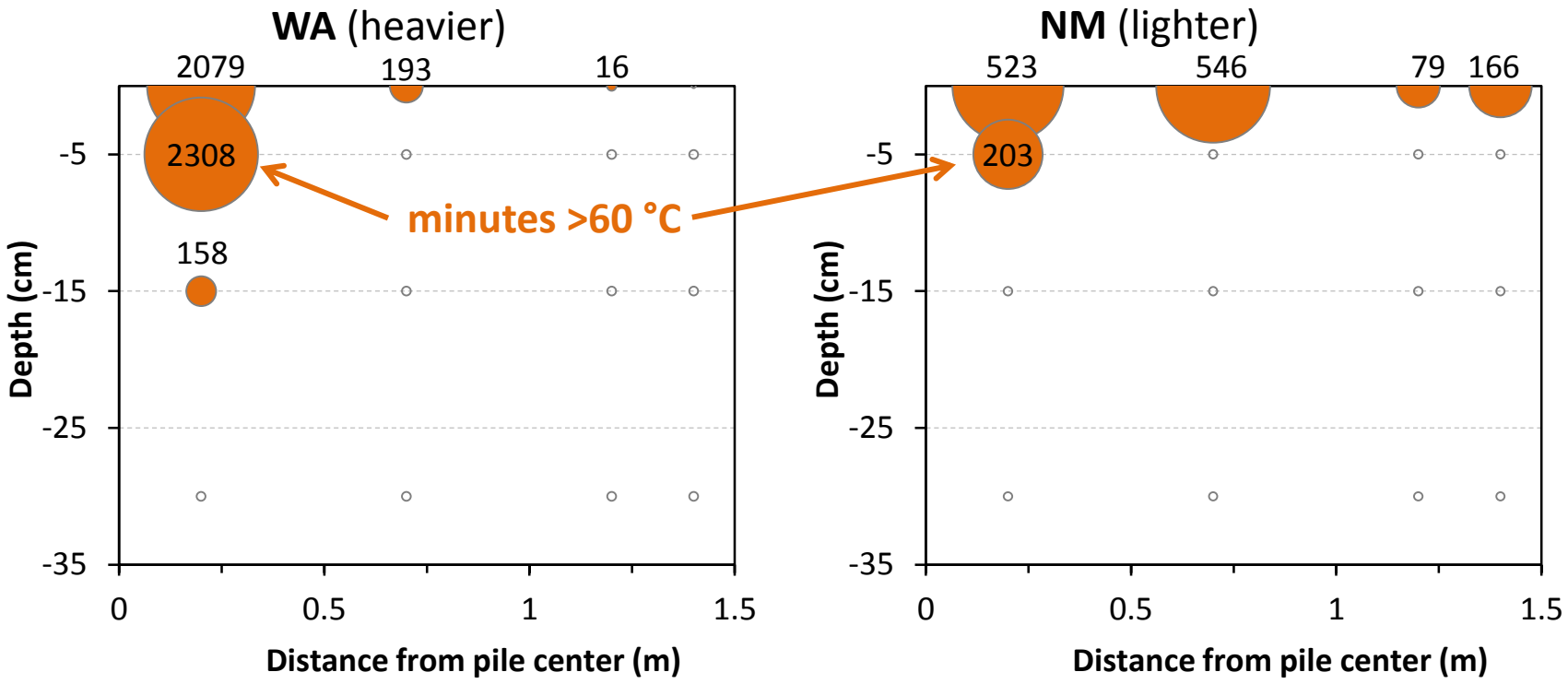




Soils

Heating

- Heavier piles → deeper & longer “lethal” heating
- Lighter piles → larger heating “footprint” at surface
- All piles → no lethal heating at depth, except in center



Vegetation

- Almost no re-vegetation after one year
- Erosion potential?

Work in progress…

- Half-way through treatment schedule
- Just begun data organization and analysis
- Acknowledgements:
  - Joint Fire Science Program
  - Santa Clara Pueblo Forestry Program
  - Naches Ranger District, Okanogan-Wenatchee NF
  - Field crew from the Pacific Wildland Fire Sciences Laboratory