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EPA, Wildland Fire and Smoke

- The mission of EPA is to protect human health and the environment
- Wildland fires are a national challenge impacting population health and ecological health through complex multi-media pathways
- While there are ecological benefits, uncontrolled wildfires and use of prescribed burning for fire control and agricultural cycling are increasingly raising questions related to potential impacts on:
 - Ambient air quality
 - Land management
 - Water quality
 - Effects of ecosystem services
 - Public health
- The magnitude and frequency of these events is expected to worsen with our changing environment

Systems approach: no hard lines
between these areas





Wildland Fire Water Impacts

Wildfire Impacts on Water Resources

- Soil Erosion/Sedimentation/Turbidity
- Pollutant Mobilization
 - Low dissolved oxygen (DO)
 - Increased ammonia from fire retardants
 - Elevated phosphorus, metals, iron, manganese, and nitrate
- Hydrologic Impacts
 - Increased Flooding
 - Debris flow

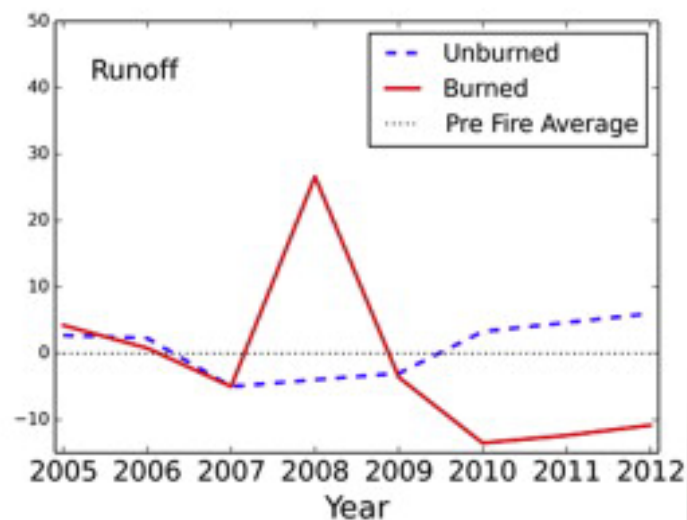
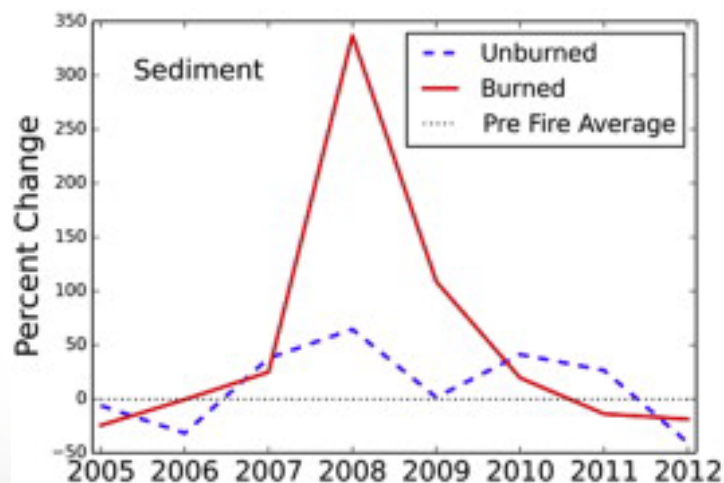
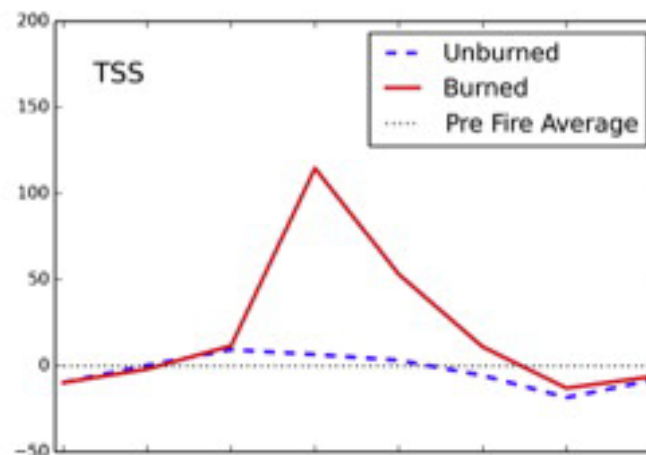
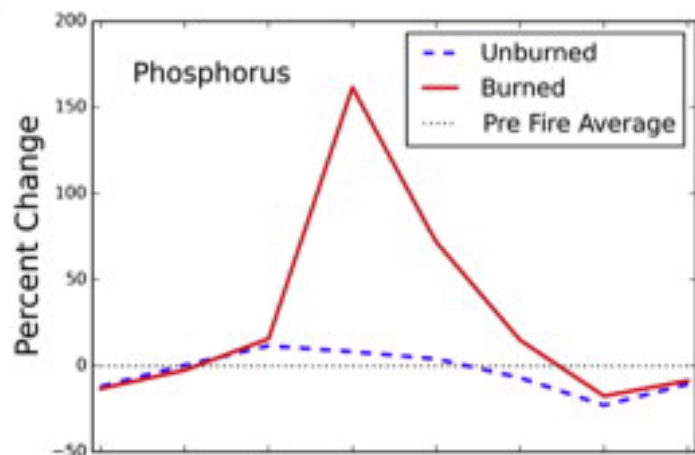


Wildfire and Drinking Water Systems

- Fire Impacts on Facilities
- Post Fire/Stormwater Impacts
 - Treatment Plants (pollutants mobilized, debris management)
 - Source Water Management (watershed stabilization, relocating intakes, dredging reservoirs, new water sources)



Wildfire Impacts: Surface Water Pollution



Tree roots hold soil and rocks. When fires come through and damages trees, what happens when it rains?

Mudslides



2014 NCA: Key Findings: Extreme Events

- Average precipitation has increased since 1900
- Heavy downpours are increasing nationally
- Recent trend towards increased heavy precipitation events will continue even in regions where total precipitation is projected to decrease, such as the Southwest

Increased sediment generation and transport in streams can impact source water supplies for drinking as well as other uses, including dam operations, water quality and aquatic life

Changes in USFS fire fighting and post fire approaches due to funding availability (>50% of budget goes to fire fighting)



Courtesy of Jeff Peterson (Retired-Office of Water, EPA)

Research question:

What are the post-wildland fire impacts on public water systems due to erosion?

What are viable protection strategies?

Current state practices do not appear protective against stream temperature increases

Leverage existing resilience and recovery/restoration research like fish population models to inform water quality assessments and watershed planning



Source: Western Rivers Conservancy

Research question:

What are current and projected impacts of wildland fire (i.e. stream temperature effects) and fire management practices on cold water refugia?



Forest Health and Water Quality

Forests moderate the effects of extreme climate events such as drought or heavy rainfall, thus minimizing downstream impacts on aquatic ecosystems and human communities such as flooding, low flows, or reduced water quality

Disturbances such as WLF, droughts, logging, insects and disease, and air pollution affect streamflow and water quality



Source: Cal Fire

Research question:
How does the interaction
between air pollution,
pests, and disease
influence forest
susceptibility to wildfire?

Which fuel treatments are
most effective, and how do
they each impact water
quality?



Fire Retardants and Combustion Byproducts

Wildland fires can be the source of water and soil contamination through high temperature burning of organic matter producing PAHs, as well as from the application of fire suppressant chemicals



Source: Seattle Times

Research question:

What is the soil and water distribution and abundance of fire retardants and combustion byproducts?

What risk do they pose to human and eco health?

Wildland fires are known sources of nitrogen and phosphorous and other substances (nutrients and organics) in the atmosphere

Leverage existing atmospheric modeling research



Source: Bay Nature

Research question:
To what extent do wildland fires contribute to nutrient loads in vulnerable ecosystems?

To what extent do these fires contribute to the currently unexplained increasing trend of phosphorous loads in remote sites across the US?



Examples of Wildfire-Water Research

- Characterizing watershed vulnerability to wildfire-caused degradation of water quality
- Understanding impacts of wildfire on cold water refugia
- Forest health and water quality: assessment of how effects of disease and pests impact forest susceptibility to wildfire, and how these dead trees as fuel lead to water quality issues



Courtesy of Jeff Peterson (Retired-Office of Water, EPA)



Thank you

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Thank you for listening!

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