

## The Effects of Forest Fire on the Release of Mercury from Soil



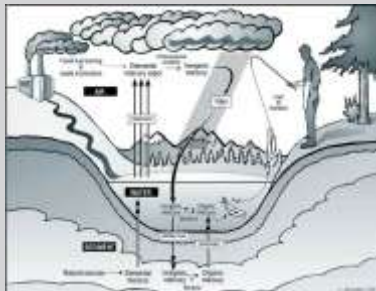
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## Overview

- Background information
- Analysis Methods
- Results
- Conclusion/Further work
- Questions

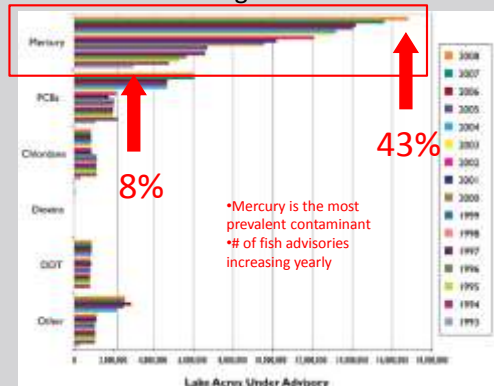
## Background

### Mercury Cycle



- Mercury poses human and ecological health risks
- Methylmercury (MeHg) is a neurotoxin
- Fish absorb by bioaccumulation and are the main exposure of mercury to humans
- It can be accumulated to toxic levels in humans

## Background



## Background

### Mercury in the West

- Mercury is a global contaminant but also a local contaminant
- Coal fired-power plants in the United States release about 20-50 kg y<sup>-1</sup> of mercury per plant (EPA , 1997)
- Mesa Verde: 416 ng/L
- We are interested in the distribution of mercury in watersheds

## Background

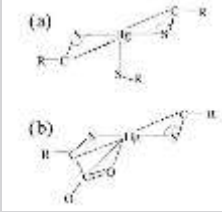
- Study the release of mercury in forest fire
- In aquatic environments mercury can be methylated and is accumulated in fish which humans then consume
- Vallecito Reservoir
- We think one problem for mercury transport is forest fire
- Arid region= Increasing fire



### Background

- The strong association between mercury and organic matter is reduced sulfur. Forest fire may be oxidizing sulfur and reducing bond strength.

- (a) Strong binding of mercury with reduced sulfur
- (b) Weak binding of mercury with reduced sulfur and oxygen or nitrogen



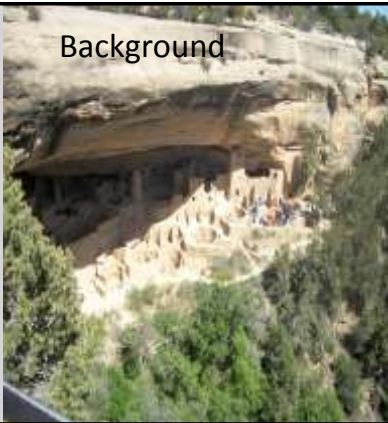
Oxidation = ?

### Background Power Plants Near Mesa Verde NP

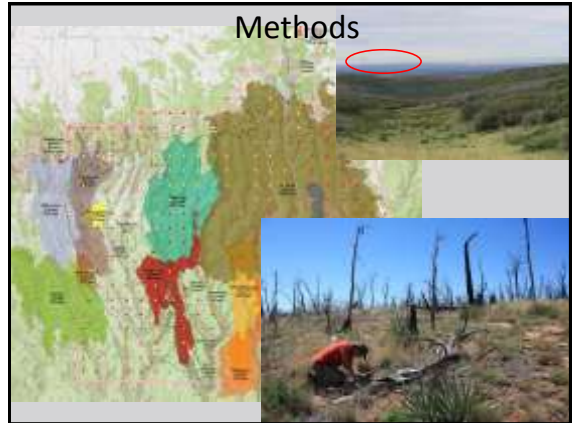


- Home of the ancient ruins of the Anasazi Indians
- Mesa Verde has 600 cliff dwellings
- Covers 52,000 acres
- World Heritage Site

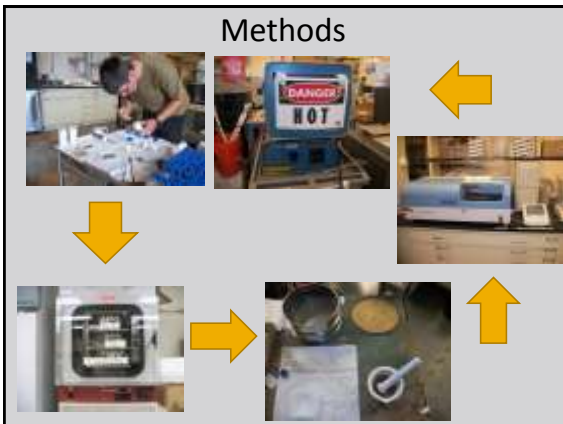
### Background



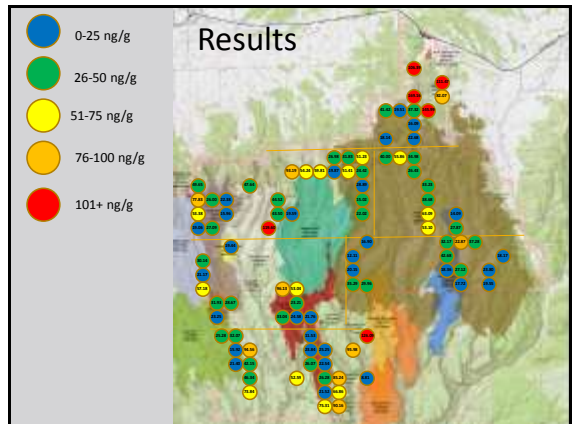
### Methods

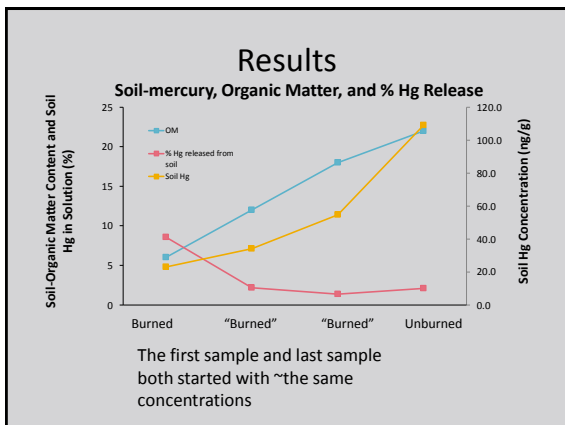
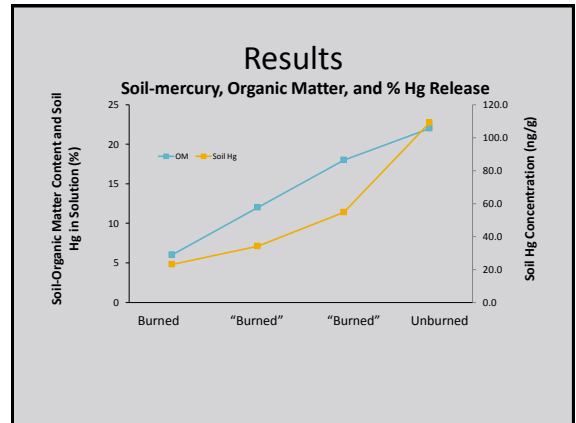
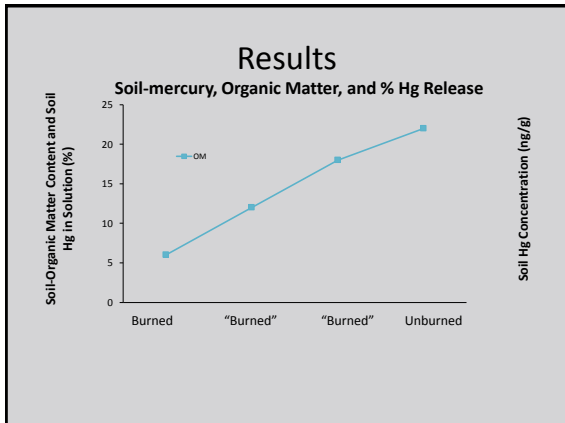
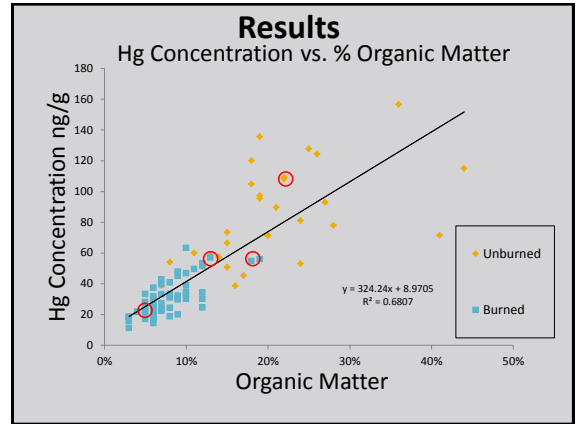
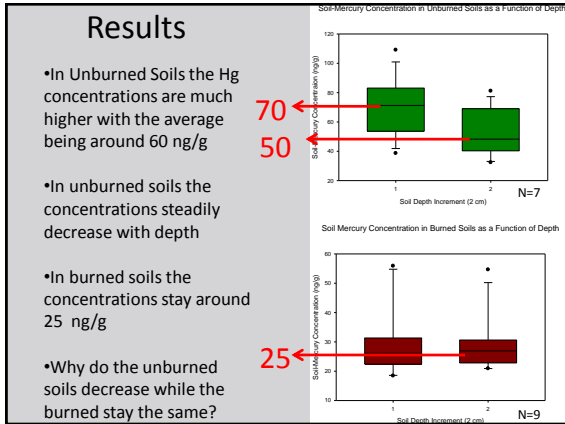


### Methods



### Results





### Conclusions

- There is a strong correlation between Organic Matter and Hg concentrations.
- Areas that are burned have lower mercury concentrations and unburned areas have higher concentrations.
- Preliminary release experiments show that high burn areas have the highest percent release

## Implications

•Mercury is staying in the soils and being transported to surface waters



•When weak binding occurs, more mercury is likely to dissociate and become more available for uptake

## Future Work

- Continue release experiments to determine if greater mercury release is caused by greater fire intensity.
- XANES(X-ray absorption near edge spectroscopy) to determine if sulfur oxidation is responsible for weaker Hg-OM binding.
- Determine what the Hg-OM binding constants are in fire affected soils.

## Funding

- National Science Foundation
- National Park Service George Melendez Wright Climate Change Fellowship
- REU Environmental Engineering Summer Program

## References

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QUESTIONS?