



Using Biochar and Traditional Ecological Knowledge to Revitalize Legacy Landscapes in the Sierra Nevada

MMSA

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The Sierra Fund is a non-profit located in the heart of the Sierra Nevada. Since 2001, we have spearheaded an extremely effective effort to address Gold Rush impacts in our headwaters.

- We have led pilot projects that demonstrate methods to restore ecosystem function and resiliency and to protect public health.
- Raised millions from public and private sources to support collaborative activities to restore and protect the headwaters.
- And sponsored successful state legislation, establishing the Sierra Nevada Conservancy and securing significant mining law reforms to protect communities and water quality.

It is my pleasure to be here today to tell you a bit more about our work – past, present, and future.

Legacy Landscapes in the Sierra Nevada

-Federally Recognized and Traditional Tribes

Fuel Reduction and Erosion Control Projects in Forests, Mines and Meadows of the Sierra

Hydraulic Mine Remediation Benefits:

- *Improved soil health, water quality, revegetation, and reduced fire risk*
- *Belowground carbon sequestration with biochar*



Biochar as a Soil Amendment

Forest to Farm Biochar Model

Recovery of heat and electricity

Transport to biochar plant

Biochar Production Process

Hydraulic Mine Remediation

Biochar

Recovery of condensable liquids

Wildfire risk reduction treatments

Aldehyde

Carbonyl Group

Ketone

1. Collected Hydraulic Mine Debris
2. Passed clean water through debris columns with 0, 2, 5% BioChar
3. Collected Turbidity, THg and f-Hg

0%

2%

5%

biochar made of lignin has the ability for Hg sorption

Lignin, a compound found in trees, is composed of many aromatic groups.

Lignin has the potential to become the functional groups present on the left when biochar is created, which are crucial for Hg sorption

Biochar pyrolysis temperature and organic material determine the binding sites present

To create biochar with high sorption capacity for Hg, low pyrolysis temperature (300-400C) combined with organic material high in lignin creates more effective biochar compared to other temperatures and feedstocks

Under low pyrolysis temperatures, increased concentrations of aromatic compounds are produced,

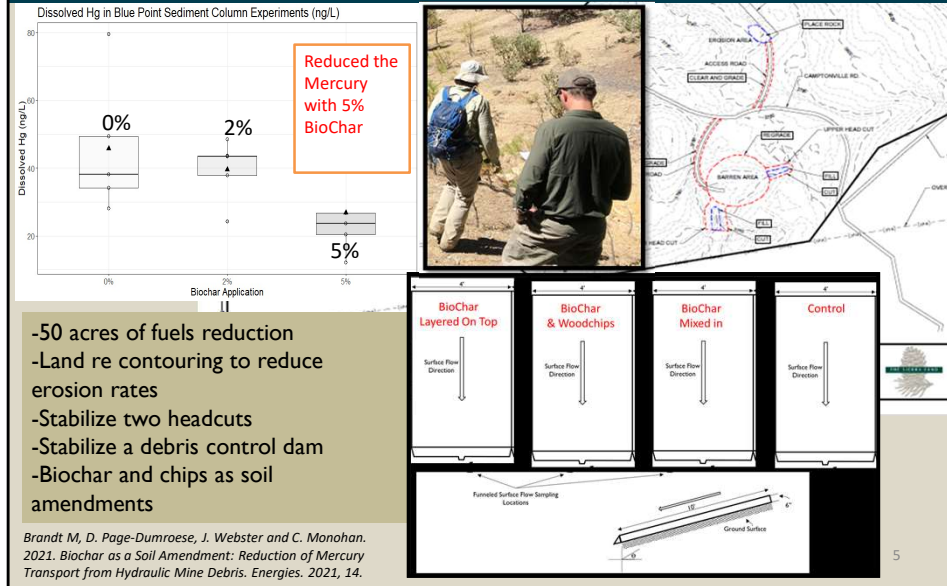
Organic material selected also contributes to the presence of chemical functional groups

Lignin is depolymerized under pyrolysis, and produces higher concentrations of ketones, aldehydes and carboxylic acids, as compared to grass derived biochars

These compounds contain negatively charged functional groups which have increased sorption capacity for heavy metals like Hg

Grizzly Creek Pilot Project

Biochar Test Plots for Soil, Water Quality and Vegetation



In sediment columns experiments biochar reduced both total and dissolved Hg
 The left side graph indicates that biochar additions of 5% significantly reduced total Hg,



Thank you!

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