Metabolomics Assessment of Burned Vegetation Leachates

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Background and Objectives

Background:

-Wildfires are natural ecosystem disturbances that impact water quality, carbon cycling, and vegetation structure.[1]

- In the Pacific Northwest, USA, wildfire severity and size have dramatically increased since the mid twentieth century in Douglas-fir dominated forests largely driven by climate change.[2]

-Knowledge gap: What metabolites are flushed into watersheds after wildfires and, how will aquatic biogeochemical cycling be impacted?[2]

Objectives:

-Determine the metabolomic content of burned Douglas-Fir material

-Investigate how the metabolomic profile and specific metabolite abundances compare across a burn severity gradient

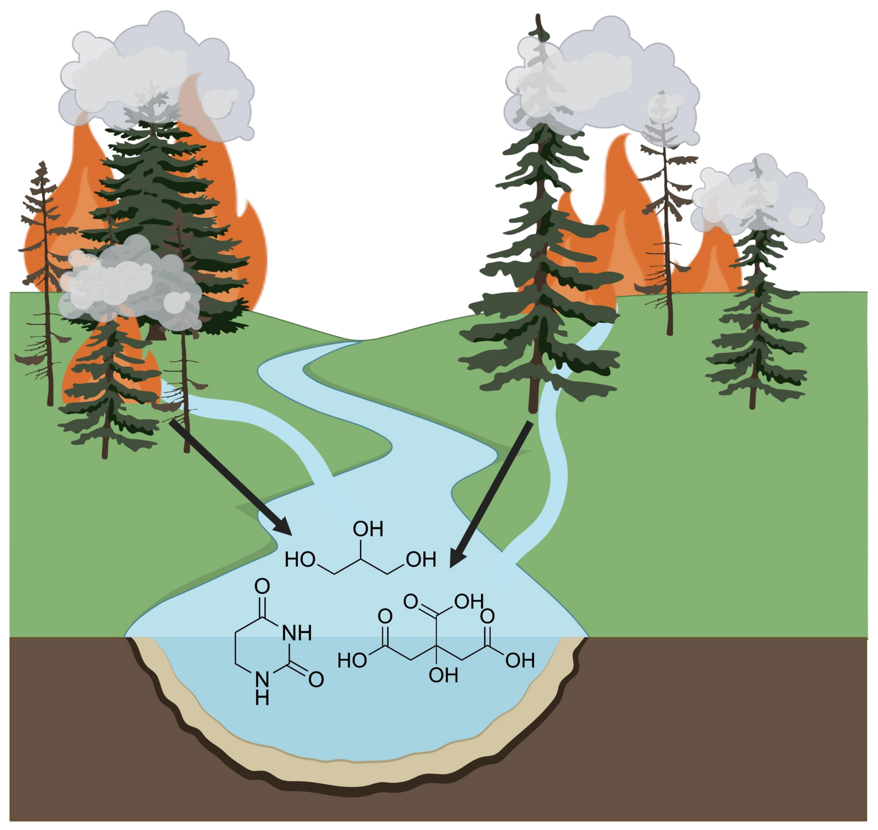

Figure 1: Wildfire impacts on watershed quality

Principal Component Analysis

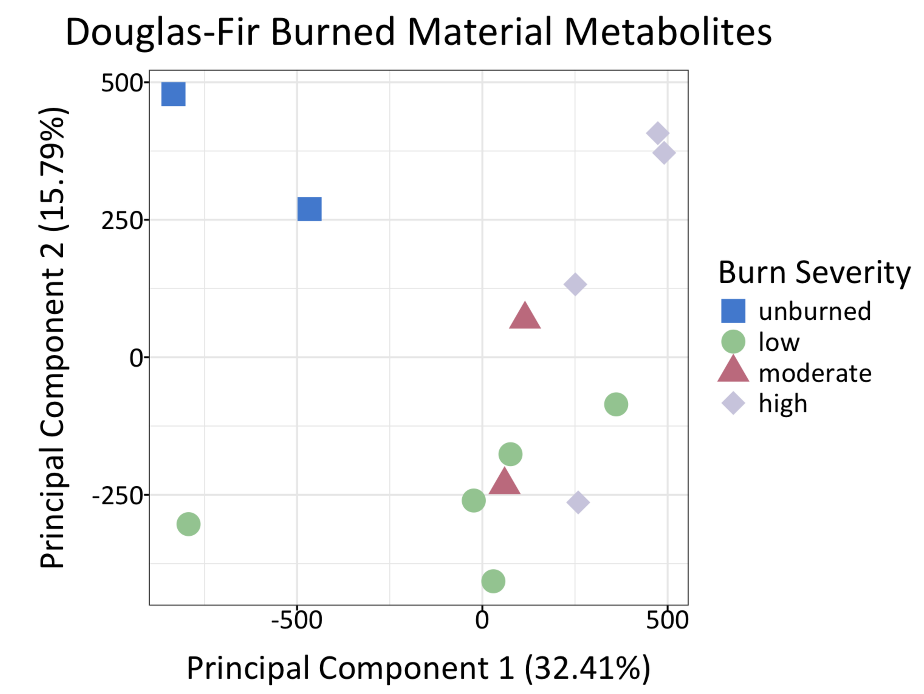

Figure 5: Principal component scores plot of the 291 features that were detected across the 13 samples through non-targeted GC-MS analysis. The input data were internal standard-normalized, Pareto scaled peak areas.

Methods

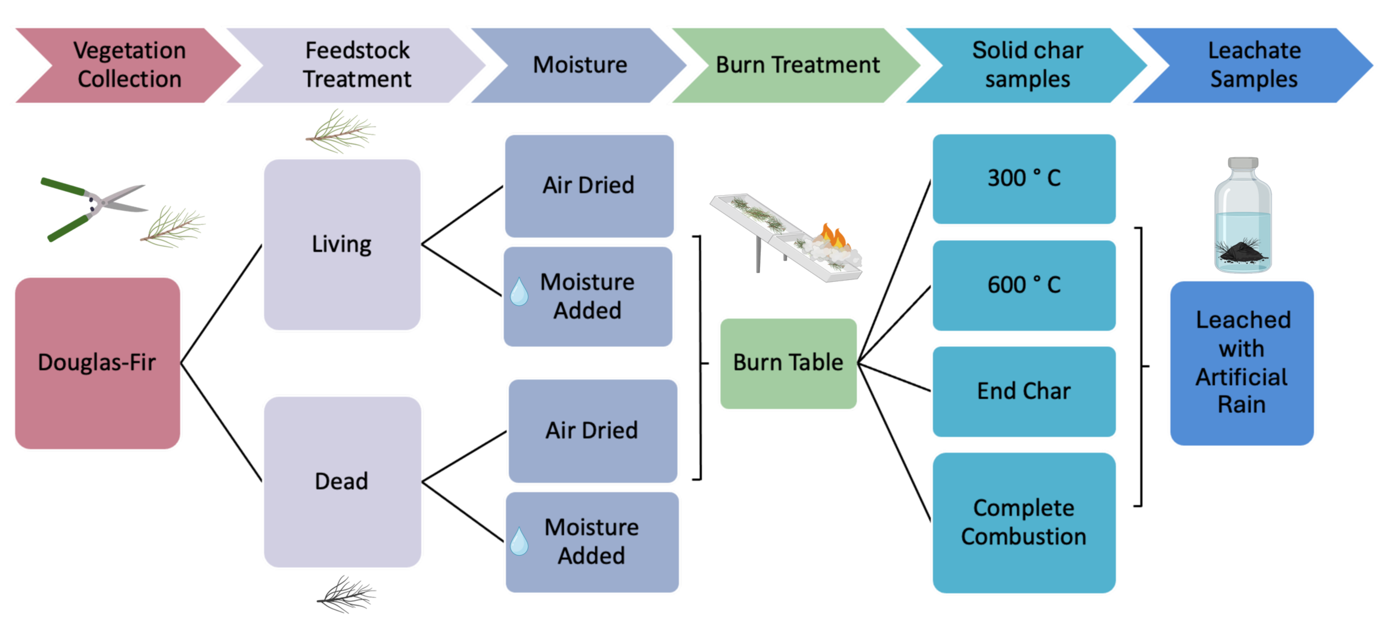

Figure 2: Flow diagram of the sample treatment for burning and leaching the vegetation.[3] The 13 samples all received different treatments varying in the feedstock treatment, moisture content, and char grab sample.

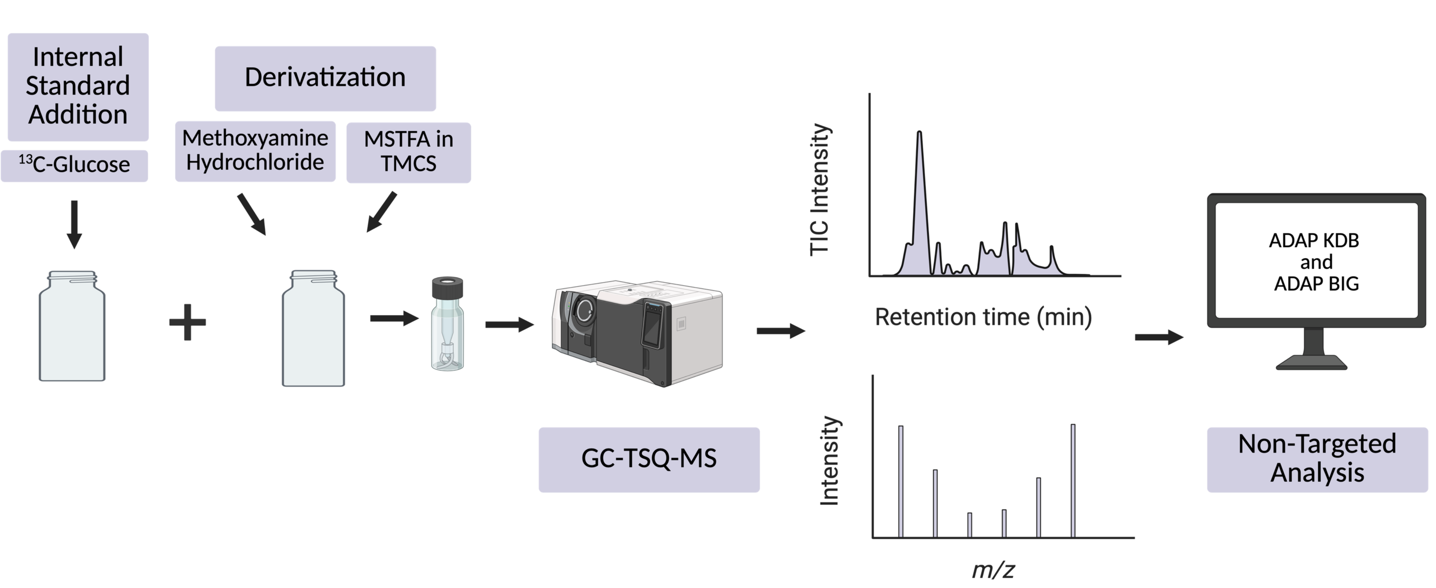

Figure 3: GC-MS method for non-targeted metabolomics. An internal standard (^{13}C-Glucose) was added to each sample followed by derivatization via methoximation and silylation. The samples were analyzed with a Thermo Scientific TSQ 8000 Evo Triple Quadrupole GC-MS featuring an electron impact ionization source and a split-less liner.

Annotated Metabolites

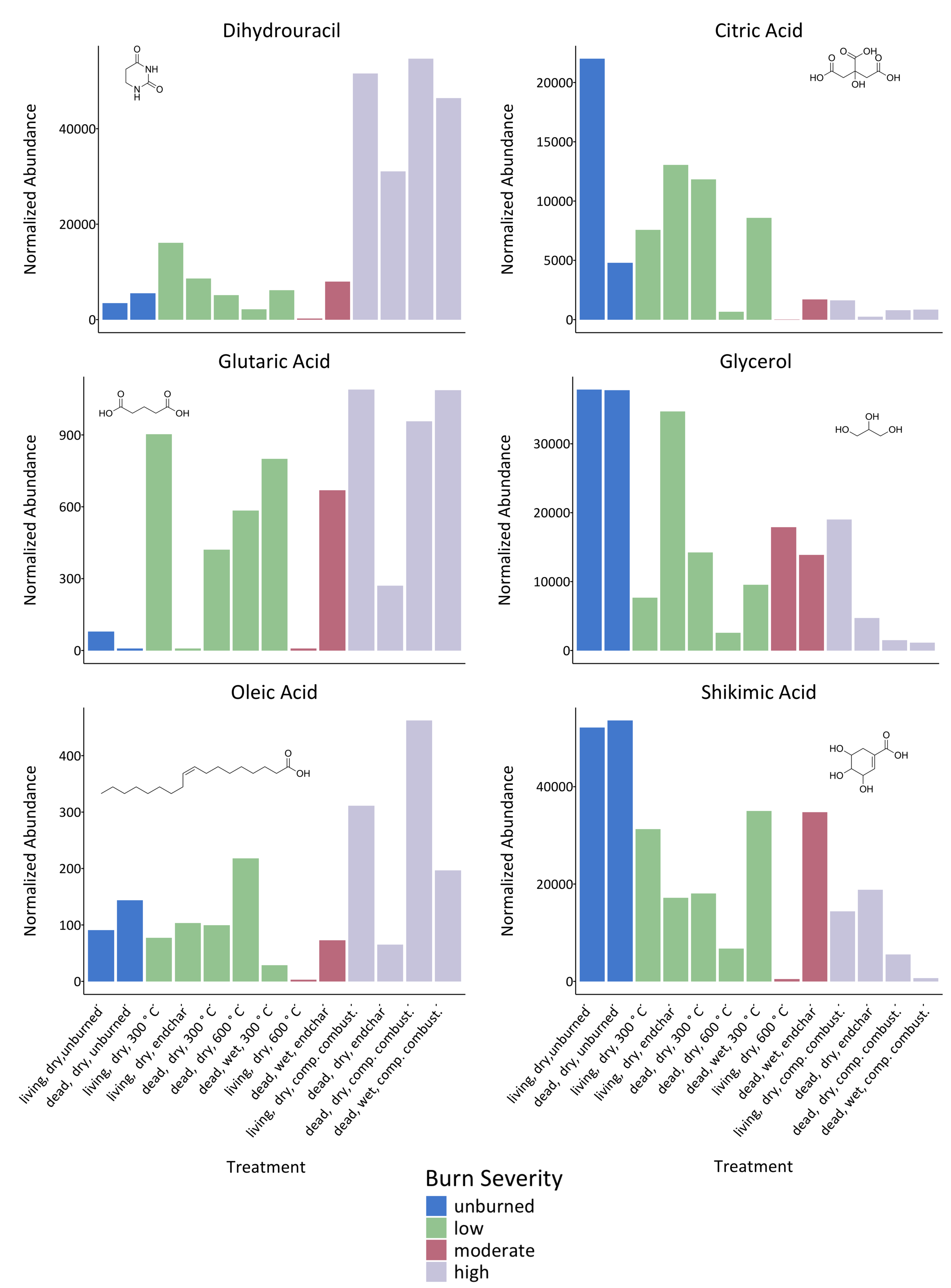

Figure 4: Six biologically relevant[4,5,6] annotated metabolites out of 21 annotated features. The metabolites' abundances were normalized to the internal standard.

Conclusions and Future Directions

Conclusions

-Abundances of annotated metabolites vary across a burn severity gradient

-The metabolomic profiles of unburned and burned samples were distinct

Future Directions

-Metabolomics after incubating leached Douglas fir material with riverbed sediment

-Broaden analytical approach to detect metabolites:

  - GC-TSQ-MS and LC-QTOF-MS metabolomics

- Objective: Explore how burned Douglas-Fir material and the metabolomic profile is transformed by microbes in riverbed sediment

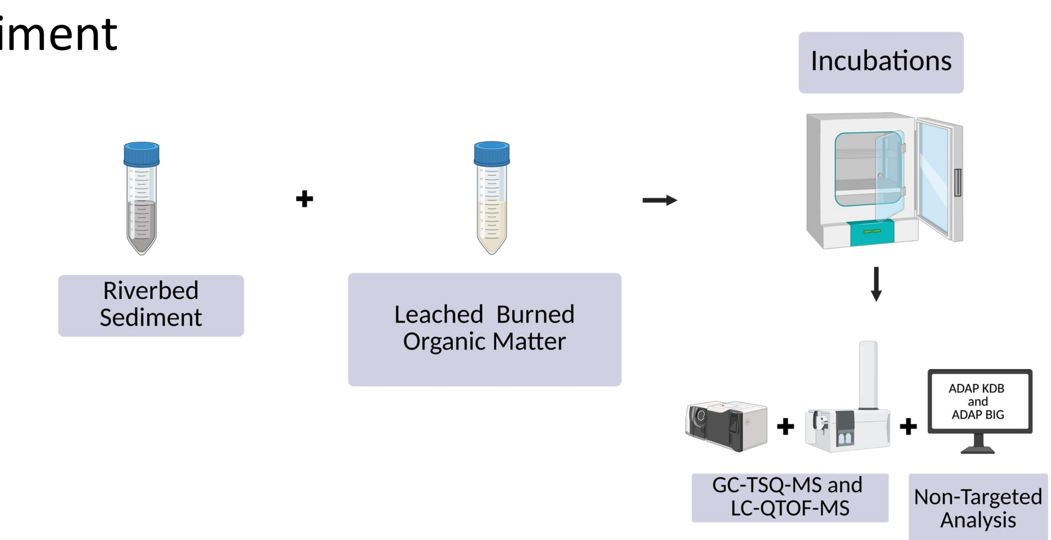

Figure 6: Flow diagram for future incubations of samples, with non-targeted metabolomics

Acknowledgements

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