

Charcoal Laboratory Processing Methodology
Snitker Paleofire Lab – USFS-SRS
Updated Nov. 2021

The methodology outlined below is based on the following published methods:

Rhodes, A.N., 1998. A method for the preparation and quantification of microscopic charcoal from terrestrial and lacustrine sediment cores. *The Holocene* 8, 113–117.
<https://doi.org/10.1191/095968398671104653>

Roos, C.I., 2008. Fire, climate, and social-ecological systems in the ancient southwest: alluvial geoarchaeology and applied historical ecology. University of Arizona, Tucson.

Schlachter, K.J., Horn, S.P., 2010. Sample preparation methods and replicability in macroscopic charcoal analysis. *J. Paleolimnol.* 44, 701–708.
<https://doi.org/10.1007/s10933-009-9305-z>

Snitker, G., 2019. Anthropogenic Fire and the Development of Neolithic Agricultural Landscapes: Connecting Archaeology, Paleoecology, and Fire Science to Evaluate Human Impacts on Fire Regimes (PhD Dissertation). Arizona State University, Tempe, AZ.

Whitlock, C., Anderson, R.S., 2003. Fire History Reconstructions Based on Sediment Records from Lakes and Wetlands, in: T. T. Veblen, W. L. Baker, G.M. and T.W.S. (Ed.), *Fire and Climatic Change in Temperate Ecosystems of the Western Americas*. Ecological Studies, Vol. 160, Springer, New York, pp. 3–31. https://doi.org/10.1007/0-387-21710-X_1

Exact steps:

1. Subsample sediment and dry for at least 24 hours at 40 °C in drying oven. Record the mass of the dried sample. The minimum recommended volume for each sample is 2cm³, however up to 5cm³ can be used.
2. Transfer to sample to a 200ml beaker and add 75ml DI water.
3. Add 10ml of 10% Na-hexametaphosphate to deflocculate the sample.
4. Add 50ml of diluted (3%) H₂O₂ to digest and lighten the color of unburned plant materials. Diluted (3%) H₂O₂ is recommended over the traditional 6% H₂O₂ following research suggesting higher concentrations of H₂O₂ may partially oxidize charcoal fragments (see Schlachter and Horn 2010).
5. Cover beaker with aluminum foil and allow to react at room temperature for 48 hours.
6. Transfer sample into a sedimentology sieve (150µm).

7. Using the spray nozzle attached to a faucet, gently spray the surface of the top sieve for 1.5 to 2 minutes so that the entire subsample is washed through the sieves (see Whitlock and Anderson, 2003:13).
8. Gently wash the sediment to one side of each sieve. Turn the sieve so that its surface is perpendicular to the countertop and the sediment is at the bottom (closest to the counter) (Whitlock and Anderson, 2003:13). Use a wash bottle with DI water to wash charcoal into a polystyrene petri dish (100mm diameter).
9. Allow sample to dry at room temperature until no more liquid remains. Alternatively, petri dishes may be put under a fume hood on in a low temperature drying oven (40 °C maximum) to speed up drying.
10. Quantify charcoal fragments using CharTool (<http://doi.org/10.5281/zenodo.1434478>) at 50x magnification.
11. Save the results table for each petri dish for later analysis in R.