Geophysical Research Abstracts
Vol. 16, EGU2014-6172-2, 2014
EGU General Assembly 2014

Phytolith analysis as a tool for palaeo-environmental studies: a case study of the reconstruction of the historical extent of oak savanna in the Willamette Valley, Oregon

Renske Kirchholtes (1), Jan van Mourik (2), and Bart Johnson (3)

(1) University of California, Berkely, USA, (2) University of Amsterdam, Amsterdam, Netherlands, (3) University of Oregan, Eugene, USA

Landscape-level restorations can be costly, so the effectiveness of the approach and the objectives of the restoration should be supported by a comprehensive investigation. The goal of the research presented here is to provide the basis for such a restoration effort using phytolith analyses.

Fire suppression and loss of indigenous burning in the Willamette Valley, Oregon (USA) has led to near disappearance of the Oregon white oak savanna. Under suppressed fire regimes the shade-intolerant Garry oaks (Quercus garryana) are outcompeted by Douglas-fir (Pseudotsuga menziesii). As a consequence, the Oregon white oak savanna has been reduced to <5% of its former extent. This range contraction has had significant impacts on regional biodiversity due to habitat loss and fragmentation of the many savanna-dependent plant and animal species.

Landscape-level restorations of oak savannas are needed to conserve biodiversity. Creating a more open landscape in which wildfires play a vital role, ties in with efforts to reduce fuel loads. Under a warming climate and changing precipitation patterns, reducing fire risk, fire intensity and fuel loading is critical.

Frequent, low-intensity burning of both natural and Native American origin created open spaces in the otherwise densely forested hills and mountains of the Cascade Range. Thus, determining an appropriate “restoration point” (estimate of percent forest cover,) requires a pre-settlement paleoenvironmental reconstruction. However, the conventional indicators used in floristic reconstructions (pollen and spores) are seldom preserved in the dry, oxidized sediments of savannahs, meaning an alternative line of evidence is required for their historical study.

Phytoliths are small yet robust silica particles produced by most plants. Many phytoliths take on cell shapes diagnostic of specific plant lineages, acting as indicators of their past presence. Unlike pollen grains, phytoliths readily preserve in well-drained soils during intermittent dry periods characteristic of sites such as the Jim’s Creek research area. By reconstructing locality-scale pre-settlement vegetation patterns at the Jim’s Creek Research Area using phytoliths, we confirm the broader-scale pattern of tree encroachment. However, phytolith assemblages from over 150 years ago document the presence of pines and firs, suggesting savannas in the Willamette Valley were not necessarily always dominated by oaks.