Introduction
The accurate reconstruction of vegetation history is key to addressing current debates regarding the nature and scale of pre-Columbian human impacts on Amazonian ecosystems. The interpretation of palaeoenvironmental records, including fossil phytolith assemblages, relies on the existence of appropriate modern reference analogues. As part of a project integrating archaeology and palaeoecology to investigate human land use in the Bolivian Amazon, we analyzed modern phytolith assemblages from the soils of ten distinctive Neotropical vegetation formations, ranging from humus evergreen forest to permanently inundated savannas.

Vegetation Formations
Selected vegetation formations and associated phytoliths.

Sample Locations and Methods
Soil monoliths were taken from 10 of the vegetation study plots in and around Noel Kempff Mercado National Park (NKMP), and two additional locations in the large basin savanna ecotone (Fig. 1). They were divided in to silt (2-50 µm) and sand (50-250 µm) fractions, and phytoliths were extracted using standard procedures.

Results
The ratio of grass (Poaceae) to arboreal phytoliths distinguishes savanna and forest ecosystems (Fig. 2). Evergreen forest have higher frequencies of arboreal (Araucaria), Cyperaceae, Phyllanthus, and Moraceae-type, and lower frequencies of Bambusoidae and irregular trilete trachaeids, than semi-deciduous dry forests (Fig. 2A). Woodland and upland savannas are distinguished from inundated savannas by more arboreal phytoliths, and less Oryzoideae grasses, Cyperaceae sedges (including Scirpus, Cyperus, and Heliconia), and Marantaceae herbs (Fig. 2B). Differences between vegetation formations within each broad ecosystem class are more clearly distinguished by phytolith assemblages. Principal Component Analysis (PCA) confirms trends observed in the frequency diagrams. D- and E- fraction phytolith assemblages from these formations could not be included in the C- fraction (CA) because they yielded few or no large diagnostic phytoliths.

Conclusions
Broad ecosystem classes are clearly distinguished by phytolith assemblages. Differences between vegetation formations within each class are more subtle, but still distinguishable. Some phytolith taxa are under- or over-represented based on standing vegetation. However, by using an assemblage-based approach and looking at associations of taxa, different vegetation formations can be distinguished. Moreover, when phytolith data are combined with pollen records and stable carbon isotope analysis from the same plots, economic and ecological resolution is improved. The results of this study will aid in interpreting palaeoenvironmental records from the Bolivian Amazon, necessary for understanding the nature and level of landscape alteration by people in the past.

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References