FORMATION OF LITHIC ASSEMBLAGES V.1
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Preliminary Documentation

OVERVIEW

This model was developed in order to carry out systematic experiments in the effects of social and environmental parameters on the formation of lithic (chipped stone artifact) assemblages in archaeological sites.

Agents represent forager (or hunter-gather) bands who move, collect, and use resources within a territory. The only resources explicitly modeled here are stone.

Two different land-use strategies can be modeled, representing different ways of using the territory and acquiring resources. Logistical mobility (also known as central-place foraging) involves foragers having a base camp from which they make forays to targeted resource camps to collect resources and return them to the base camp for consumption. With residential mobility, foragers move their camp to various locals within the territory, and collect and use resources at the the camp. The model is designed so that a single land-use strategy can be used for an entire simulation run or land-use strategy can alternate during a simulation run. When land-use can alternate between strategies, <LMS-pct> determines what fraction of the time logistical mobility is used and (by default) the fraction of time residential mobility is used.

Foragers can carry a number of lithic artifacts with them. The maximum a forager agent can carry normally is determined by the <lithic-stock> variable. Whenever a forager band stops at a new camp, it uses lithic artifacts at a rate determined by a random number within the range of the <maximum-use-intensity> variable. As an artifact is used, it is transformed through four states: from unused to used to retouched to exhausted. When an artifact is exhausted, it is discarded. When an agent leaves a camp, it carries with it all non-exhausted lithic artifacts.

As forager agents move from camp to camp (including from base camp to targeted resource extraction camp and back), they may encounter raw material sources (naturally occuring stone outcrops) on the landscape. The density of lithic sources is determined at the beginning of a simulation run by the <sources> variable. An agent's ability to perceive a raw material source is determined by the <source-visibility> variable. If an agent has less than the <lithic-stock> number of unused lithic artifacts and perceives a raw material source, it will move to the source to replenish its stock of lithic artifacts. It replaces all used, retouched, and exhausted artifacts with fresh, unused ones (discarding the artifacts replaced). It collects enough additional artifacts to ensure that it leaves the raw material source site with unused artifacts equal to <lithic-stock>, continuing enroute to the next camp.

A forager agent temporarily can carry lithic material above what it normally carries (i.e., deterimined by <lithic-stock>) to provision the next camp it reaches after visiting a lithic source. The amount extra that can be carried from a source to a basecamp is determined by the

<basecamp-provision> variable; the amount extra that can be carried to all other types of camps is deterimined by the <camp-provision> variable. Before leaving a camp, a forager agent will discard all extra lithic artifacts so that it leaves with a set of the "best" (i.e., most unused) artifacts possible to carry to the next camp, the size of this artifact set being determined by the <lithic-stock> variable. Optionally, and determined by the <prov-from-site variable>, if there are artifacts deposited at a camp from a previous visit, a forager agent can replace its most used artifacts (e.g., retouched) with less used or unused artifacts from the artifacts accumulated in a camp before leaving to ensure that it leaves with the "best" artifact set possible.

The number of artifacts in use and their condition is constantly tracked and can be viewed in monitors. The number of artifacts deposited in each patch and their condition is also tracked and can be collected and analyzed at the end of a simulation. These artifacts in a patch simulate the lithic assemblages that accumulate in archaeological sites over the course of time, as mobile foragers move from camp to camp and acquire, use, and discard lithic artifacts.

USING THE MODEL

Each of the variables described above can be set by sliders or, in the case of <prov-from-site> a switch. The count of artifacts of in different conditions can be displayed in each patch via selections in the <show-lithics> chooser, and the paths that forager agents travel can be displayed as tracks wiht the <tracks> switch.

Entry fields allow the user to control the behavior of the simulation with respect to "cycles" and "runs". A cycle can simply be a timer tick (= the movement of each agent 1 patch), or it can represent a "trip"--from basecamp to targeted resource extaction camp for logistical mobility or from camp to camp for residential mobility--set with the <cycle-type> variable chooser.

A "run" is the completion of the preset number of cycles. Before each run, the land-use strategy can change stochastically, with the probability of logistical mobility deterimined by <LMS-pct> variable. (The probability of residential mobility is simply 100% - <LMS-pct>). A single simulation can consist of multiple runs, which can vary with repect to land-use strategy, of multiple cycles.

CREDITS AND REFERENCES

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Associated with MS submitted to Journal of Archaeological Science 2013
Barton, C. Michael and Julien Riel-Salvatore (in review). The formation of lithic assemblages. Submitted to *Journal of Archaeological Sciences,* 4 May 2913.