

Brendan Bohannon, University of Oregon; Director, Institute of Ecology and Evolution <http://ie2.uoregon.edu/>, and Professor of Environmental Studies and Biology http://ie2.uoregon.edu/faculty_pages/Bohannon/index.html

Response of Microbial Biodiversity to Land Use Change in the Amazon Rainforest

Abstract: Land use change (the human modification of the Earth's terrestrial surface) is one of the greatest threats to biodiversity worldwide. This is especially true in the Tropics, where land use change is causing an unprecedented loss of biological diversity. However estimates of diversity loss - as many as 50 to 100 species a day – are based exclusively on information for plants and animals. It is unclear how the majority of the biodiversity on Earth – microbial biodiversity – is responding to these extraordinary rates of land use change. To fully understand how land use change will impact biodiversity, and how best to mitigate these impacts, more information is needed regarding how microbes respond to such changes.

The Amazon Rainforest Microbial Observatory (ARMO) was established in 2009 to examine the impact of land use change on microorganisms. In particular, ARMO is focused on understanding how conversion of the Amazon Rainforest to agricultural uses impacts the biodiversity of microorganisms. ARMO has three overarching goals: to search for biological novelty, to describe the microbial communities of the Amazon Rainforest, and to determine the effect of agricultural conversion on these communities. We use intensive and extensive culture-independent methods, combined with novel culture-dependent methods, to achieve these goals.

In my seminar I'll provide an overview of ARMO and discuss our most recent results. We have discovered, for example, that conversion of the Amazon Rainforest into cattle pasture significantly increases local taxonomic richness and phylogenetic diversity of soil bacteria, but decreases community turnover and average similarity, resulting in a net loss of diversity at the landscape scale. This homogenization of bacterial biodiversity is driven in part by the loss of forest soil bacteria with restricted ranges (endemics), ecological specialists that may play an important role in ecosystem functioning. Furthermore, the specific response we observed - an increase in "alpha diversity" and a decrease in "beta diversity" following environmental disturbance - has been suggested by ecologists as an "early warning signal" for future biodiversity loss. Our results suggest that it is important that microbial biodiversity loss be taken into account when assessing the impact of land use change in tropical forests.