

PREDICTS Newsletter



Projecting Responses of Ecological Diversity In Changing Terrestrial Systems

From PREDICTS 1 to PREDICTS 2:

It's about time



Figure: Satellite images of the change of land use overtime in the Amazon (Image from: <http://deforestationamazonrainforest.blogspot.co.uk/>)

PREDICTS has furthered our understanding of how different aspects of biodiversity respond to land-use pressures across the globe. It has benefitted greatly from the vast amount of data shared by our many contributors and collaborators; the dataset is reasonably representative both taxonomically and geographically, allowing focus on or comparisons among particular taxa or regions. This approach let us look at how land use affects local biodiversity, and had the advantage that there are many such comparisons in the literature. However, there are limits to what we can learn about land-use impacts from data like these, because they can't tell us directly how diversity has changed over time.

We have therefore started a second phase of PREDICTS, funded by NERC, in which we are trying to collate biodiversity data from temporal comparisons, where terrestrial sites have been surveyed both before and after a change in land use or land-use intensity.

Adriana De Palma is the postdoc on the new project; Samantha Hill and Sara Contu are technicians; Lawrence Hudson oversees the informatics and Andy Purvis is the principal investigator. We also have a wide range of project partners from many different organisations: Amanda Bates, Luca Börger, Neil Burgess, Stuart Butchart, Simon Ferrier, Jens Kattge, Phil Martin, Tim Newbold, Samraat Pawar, Will Pearse and Jorn Scharlemann.

Our main questions are:

- Which happens first when land use changes: loss of current diversity or gain of new diversity?
- Which aspects of assemblage structure and function are most sensitive to land-use change?
- How much difference does 'biotic lag' make to the models from PREDICTS so far?
- When do species' traits and phylogeny predict their responses to change?
- Which species are both sensitive and

exposed to land-use change?

- What mediates the resistance or resilience of a community to a land-use change?
- How quickly do communities recover after a land-use pressure is removed?

As with "PREDICTS v1", we aim to develop an extensive, openly available database of such biodiversity data and all contributors will again be offered co-authorship on a manuscript that describes that database. We would love to hear from any researchers who would like to contribute data to PREDICTS v2 (enquiries@predicts.org.uk). We are particularly interested in obtaining before-after-control impact studies, but are also looking for before-after comparisons (which do not have control sites) and control-impact studies that sample for several years at known times after a land-use change.

We understand that as the project as now changed its focus to temporal comparison some of our Mailing list contacts may not want to receive our quarterly newsletter and PREDICTS 2 related communications anymore. If you wish to unsubscribe from our newsletter you can click the 'unsubscribe' button at the bottom of the email we just sent you.

The danger of data bias: a study on bees

After three and a bit years, the PREDICTS project, with the help of our many data contributors, has amassed a large, taxonomically and geographically representative database of biodiversity facing different land-use pressures.



By USGS Native Bee Inventory and Monitoring Laboratory from Beltsville, USA [CC BY 2.0 (<http://creativecommons.org/licenses/by/2.0/>)], via Wikimedia Commons

This is a remarkable achievement; for most fields in ecology, we're still well off the mark. In pollination ecology in particular, unrepresentative data has been recognised as an issue; ecological data on bees are often most readily available in North America and Western Europe, a geographic bias that also leads to a taxonomic one, as bumblebees are common in these areas. This bias is potentially a big problem: if different regions and taxa show different responses to land use, then biases in the underlying data can lead to misleading predictions when we try to generalize models to future impacts or to other regions and taxa. However, until recently, it wasn't really clear whether these biases in data really affected our inferences. In the most [recent paper](#) to come from my PhD work and in collaboration with many contributors of bee data, we explored this question. As suspected, we found strong regionally-based responses of total abundance, species richness and Simpson's diversity of bees to land use, caused by variation in the sensitivity of species (with bumblebees often responding differently from other bees) and potentially in the nature of threats. These results suggest that global extrapolation of models based on geographically and taxonomically restricted data may underestimate the true uncertainty, increasing the risk of ecological surprises.

Dr Adriana De Palma, Natural History Museum

De Palma et al (2016) [Predicting bee community responses to land-use changes: Effects of geographic and taxonomic biases](#), *Scientific Reports* 6: 31153, doi: 10.1038/srep31153

Communities found in primary habitats are distinct - paper published in [Ecography](#)

Most of the models we have developed so far in the PREDICTS Project have focused on understanding differences in local biodiversity in different land uses. However, losses of some species can be offset by gains in others, and it is also interesting to ask whether the particular species found in natural vegetation are also found in other land uses. We can do this by looking at patterns of beta diversity between sampled sites, i.e. the similarity in the lists of species sampled at those sites. In a paper published in [Ecography](#), we do just this. We show that if you look at pairs of sites in the same land use, the similarity in the lists of species present does not depend much on which land use you are looking at. However, comparing sites in different land uses, we find that most land uses have distinct sets of species compared with primary habitat. This is true even of secondary habitat (natural habitat recovering after a past disturbance or after past human land use), which has similar numbers of species to primary habitat but a distinct set of species. The distinctness of ecological assemblages in non-primary habitat is especially pronounced in the tropics compared with more northern latitudes. An exploratory analysis suggests that this is because tropical areas contain more narrow-ranged species (which will probably be more sensitive to disturbance) and have a less variable climate (which might mean that these species are less tolerant of environmental change).



By J. Luc Viatour, CC BY-SA 3.0 (<https://commons.wikimedia.org/wiki/File:photo20120401-99841>)

Students and interns

Emma Caton, MRes Ecology, Evolution and Conservation at Imperial College London I am exploring how local biodiversity is influenced by characteristics of the crops found in agricultural sites. This work will enable PREDICTS models to be linked with the next generation of land-use scenarios.

Greg Counsell, MRes Ecology, Evolution and Conservation at Imperial College London My project uses time series data to investigate how land-use change impacts biodiversity, with a focus on agricultural abandonment.

Felipe Espinoza De Janon, MSc Taxonomy and Biodiversity at Imperial College London and the Natural History Museum I am looking at how biodiversity is impacted by grazing, with a specific focus on the differences between managed pastures and rangelands. This work will enable the PREDICTS models to be linked with the next generation of land-use scenarios. I am funded by a scholarship from the Ecuadorian government (SENESCYT).

Harriet Lambert, MRes Ecology, Evolution and Conservation at Imperial College London My project focuses on land use impacts on bee diversity, extending an ongoing analysis of bees in Europe to assess how different assemblages respond to human pressures over time.

Alex Raposo, MRes Ecology, Evolution and Conservation at Imperial College London My research aims to understand the effects of logging on biodiversity through time, with a focus on selective logging practices.

Sasha Suryometaram, MRes Ecology, Evolution and Conservation at Imperial College London My project focuses on the land-use impacts on soil macro-invertebrate biodiversity.

Mark Titley, intern at UNEP-World Conservation Monitoring Centre My internship uses the newly-produced Temporal WDPa to assess the impact of changes to protected areas on local biodiversity.

PREDICTS team members' recent published articles:

- Echeverría-Londoño, S. et al, (2016), [Modelling and projecting the response of local assemblage composition to land use change across Colombia](#). doi:10.1111/ddi.12478
- Hill, S.L.L. et al (2016), [Reconciling Biodiversity Indicators to Guide Understanding and Action](#). *Conservation Letters*. doi:10.1111/conl.12291

Thanks to Domenico Tozzi for producing the PREDICTS logo.

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