

**Title: Biodiversity effects on ecosystem resistance to and recovery from perturbations**

**Organizers:** Nico Eisenhauer, Forest Isbell

**Post-docs:** Dylan Craven, Will Pearse

## **Summary**

The principal objective of this workshop was to develop a mechanistic framework to explore the drivers of resistance, resilience, and temporal stability of communities and species within experimental grasslands.

We formed two working groups to address community- and species-level questions separately. The working group focusing on community-level questions developed a hypothetical framework to determine the extent to which functional trait values associated with the ‘fast-slow’ continuum (Reich et al. 2014) , variation in ‘fast-slow’ traits (functional diversity), or phylogenetic dissimilarity) drove variation in temporal stability, resistance, and resilience.

Hypothetical framework developed in community-level working group, illustrating how phylogenetic dissimilarity, community-weighted means of ‘fast-slow’ traits, and functional trait diversity mediate temporal stability of experimental grassland communities. Co-variance among diversity measures are not shown.

The working group focusing on using phylogenetic tools and functional traits to investigate mechanisms that differentiate species’ stability in mono- and polycultures. We anticipate that two high-impact publications will emerge from this workshop, which will be led by Dylan Craven and Will Pearse.

Framework developed in species-level stability working group. Plots stability of species in monoculture versus stability in polyculture, under the expectation that biotic interactions will drive deviation from a 1:1 line.

## **Accomplishments**

1. Assembled data set consisting of species-level biomass at the plot level for 39 sites across North America and Europe.
2. Built phylogeny of 186 species that are used across all experimental grasslands
3. Compiled functional trait data from extant databases (TRY, LEDA, Biolflor)
4. Calculated temporal stability and synchrony across the entire dataset
5. Integrated resistance and resilience to extreme climatic events into database
6. Agreed to continue using the ‘opt out’ authorship, for workshop participants and data contributors.

## **Next Steps**

1. Expand initial data request to TRY for more functional traits
2. Calculate resistance and resilience to extreme climatic events at the species-level
3. Data analysis for each working group will be coordinated by Dylan Craven and Will Pearse
4. Collaborative online tools (possibly github) will be created to facilitate interaction between workshop participants involved in data analysis
5. All workshop participants will be provided updates at semi-regular intervals

## **Updates on ongoing projects**

### *I. Climate Extremes*

Forest Isbell presented recently updated results of his analysis of resistance and resilience of experimental grasslands to extreme climatic events. In consultation with Michel Loreau, Forest developed new measures of resistance and resilience that are consistent with dynamical systems theory and independent of one another. He has circulated a draft of the manuscript to co-authors recently and will receive and integrate comments until Nov. 9<sup>th</sup>.

### *II. Resource Alterations*

Dylan Craven presented results of his analysis in which he tested for interactions between resource alterations and diversity in experimental grasslands. Workshop participants provided helpful suggestions that he will incorporate in the final analysis, which he hopes to circulate to workshop participants and data contributors shortly.

## **Additional projects**

Sebastian Meyer and Alexandra Wright proposed to use the database compiled for this workshop to address a different set of questions. Sebastian would like to quantify and explain differences in the strength of biodiversity effects in grassland experiments using characteristics of growing conditions. Alexandra will assess the changes in overyielding of drought sensitive and drought tolerant species in response to drought and temperature stress across experimental sites.

## Participants

Participant	Institution	Country
John Connolly	University College Dublin	Ireland
Dylan Craven	iDiv	Germany
Anne Ebeling	Friedrich Schiller University	Germany
Nico Eisenhauer	iDiv	Germany
John Griffin	Swansea University	U.K.
Stan Harpole	iDiv	Germany
Yann Hautier	University of Oxford	U.K.
Jessica Hines	iDiv	Germany
Forest Isbell	University of Georgia	U.S.A.
Anke Jentsch	University of Bayreuth	Germany
Pete Manning	University of Bern	Switzerland
Sebastian Meyer	Technische Universität München	Germany
Will Pearse	University of Minnesota	U.S.A.
Christiane Roscher	Helmholtz Centre for Environmental Research	Germany
Jasper van Ruijven	Wageningen University	the Netherlands
Melinda Smith	Colorado State University	U.S.A.