PROPOSAL TO ACCESS THE "OPEN POLICY" FLUXNET DATA

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Collaborators needing access to data: See attached list.

Affiliations: See attached list

TITLE OF PAPER AND OUTLINE

Biodiversity and the Functioning of Ecosystems: Translating Results from Model Experiments into Functional Reality.

Working Group Proposal to the National Center for Ecological Analysis and Synthesis

Please see attached summary.

PROPOSED RULES FOR CO-AUTHORSHIP

- All workshop participants involved in Objective 3 would be listed as co-authors in order of contribution to the manuscript, or, in the case of equal effort, alphabetically with notation of such.
- Co-authorship by "FLUXNET members" would be included per FLUXNET policy.
- Site-specific FLUXNET data providers would be included as co-authors where analyses dictate higher resolution information from particular locations.

Biodiversity and the Functioning of Ecosystems: Translating Results from Model Experiments into Functional Reality.

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Note: This is the third activity of this proposed workshop and the only one that involves the FLUXNET data.

Objective 3: Translate the impacts of biodiversity on ecological processes measured in BEF experiments into ecosystem services that are important to society. The central tenet of BEF research is that BIODIVERSITY → ECOSYSTEM FUNCTIONING → ECOSYSTEM 'SERVICES' → HUMAN WELLBEING. However, ecologists have had difficulty converting the ecological 'functions' measured in experiments into ecosystem 'services' that influence human well-being. We will make the link between 'function' and 'service' quantitatively explicit for the particular case study of how plant biodiversity influences CO_2 uptake and storage. We have chosen to focus on C storage as an ecosystem service for two reasons. First, a large number of BEF experiments have measured how producer diversity impacts net primary production (NPP), but translating these relationships into longer-term storage relevant to carbon sequestration and climate change remains an important challenge. Second, a variety of datasets are now available to explore the relationship between NPP and net ecosystem production (NEP) to help make that link. Pregitzer and Euskirchen (2004) found a strong correlation between median NPP and median NEP across ecosystems. We propose to evaluate differences *within* biomes controlling for environmental variables, time since disturbance, management, species composition, and plant traits. We will then test the extent to which species richness vs. NPP relationships from biodiversity experiments can be combined with NPP vs. NEP relationships from ecosystem experiments, to give more information on how species richness may influence NEP.

Task 3a: Update and collate estimates on how terrestrial plant biodiversity impacts net primary production (NPP) in various ecosystems. For herbaceous plants, such as those used in grassland studies, the meta-analysis data of Cardinale et al. (2007) has already summarized 200+ estimates of how biodiversity impacts annual net primary production, primarily in grasslands. We can complement these data with recent reviews that have compared rates of productivity of trees in mono- vs. polyculture plantations and in natural forested stands of differing diversity (e.g., Scherer-Lorenzen et al. 2005). We will collate these datasets and subject them to a common meta-analysis so that we can quantify plant biodiversity effects on NPP in a range of herbaceous and woody terrestrial ecosystems.

Task 3b: Test relationships between NPP and NEP that allow us to quantify effects of changing biodiversity on long-term carbon storage. We propose to estimate relationships between NPP and NEP for grasslands and forests using FLUXNET databases, while controlling for several environmental, management, and compositional variables likely to be important. The main database contains grassland sites (http://www.fluxdata.org/default.aspx). In addition, the dataset of Luyssaert et al. (Luyssaert et al. 2007, Luyssaert et al. 2009) contains carbon balance data for 528 forested sites world-wide with known disturbance histories and successional ages http://daac.ornl.gov/VEGETATION/guides/forest_carbon_flux.html). We will aim to develop robust relationships using variables also available in the dataset of Cardinale et al. (2007) to link regressions for species richness effects on NPP to regressions of NPP relationships with NEP.

LITERATURE CITED

Cardinale, B. J., J. P. Wright, M. W. Cadotte, I. T. Carroll, A. Hector, D. S. Srivastava, M. Loreau, and J. J. Weis. 2007. Impacts of plant diversity on biomass production increase through time because of species complementarity. Proceedings of the National Academy of Science USA **104**:18125-18128.

Luyssaert, S., I. Inglima, and M. Jung. 2009. Global Forest Ecosystem Structure and Function Data for Carbon Balance Research. Data set. Available on-line [http://daac.ornl.gov/] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Luyssaert, S., I. Inglima, M. Jung, A. D. Richardson, M. Reichsteins, D. Papale, S. L. Piao, E. D. Schulzes, L. Wingate, G. Matteucci, L. Aragao, M. Aubinet, C. Beers, C. Bernhoffer, K. G. Black, D. Bonal, J. M. Bonnefond, J. Chambers, P. Ciais, B. Cook, K. J. Davis, A. J. Dolman, B. Gielen, M. Goulden, J. Grace, A. Granier, A. Grelle, T. Griffis, T. Grunwald, G. Guidolotti, P. J. Hanson, R. Harding, D. Y. Hollinger, L. R. Hutyra, P. Kolar, B. Kruijt, W. Kutsch, F. Lagergren, T. Laurila, B. E. Law, G. Le Maire, A. Lindroth, D. Loustau, Y. Malhi, J. Mateus, M. Migliavacca, L. Misson, L. Montagnani, J. Moncrieff, E. Moors, J. W. Munger, E. Nikinmaa, S. V. Ollinger, G. Pita, C. Rebmann, O. Roupsard, N. Saigusa, M. J. Sanz, G. Seufert, C. Sierra, M. L. Smith, J. Tang, R. Valentini, T. Vesala, and I. A. Janssens. 2007. CO2 balance of boreal, temperate, and tropical forests derived from a global database. Global Change Biology **13**:2509-2537.

Pregitzer, K. S., and E. S. Euskirchen. 2004. Carbon cycling and storage in world forests: biome patterns related to forest age. Global Change Biology **10**:2052-2077.

Scherer-Lorenzen, M., C. Körner, and E.-D. Schultze, editors. 2005. Forest Diversity and Function: Temperate and Boreal Systems. Springer-Verlag, New York.

Note: We anticipate that the core workshop group and the potential participants listed below would be the ones needing access to the FLUXNET data. Additional potential rotating participants will be involved in other aspects of the workshop not dealing with these data.

Participants: We will assemble 12 individuals that form a core working group composed of researchers who have expertise divided evenly among our three objectives, and whose expertise with various organisms and ecosystems are complementary. In addition to these core members, we will invite three additional experts to each meeting in order to establish the critical mass needed to meet emerging objectives as the working group progresses.

Participant	Affiliation	Expertise
CORE WORKING GROUP PARTICIPANTS		
[1]Robert Bagchi	Postdoc	Multivariate BEF relationships (Objective 2) Herbaceous grassland plants
[1]Patricia Balvanera	Professor, Universidad Nacional Autónoma de México	Biodiversity and carbon storage (Objective 3) Tropical dry forests
[1,3]Bradley Cardinale	Asst professor, Univ California – Santa Barbara	Scaling BEF relationships (Objective 1, lead) Freshwater microalgae & invertebrates
[1]Emmett Duffy	Professor, Virginia Inst Marine Science	Multivariate BEF relationships (Objective 2, lead) Marine macroalgae& invertebrates
Joe Fargione	Regional Science Director The Nature Conservancy	Biodiversity and carbon storage (Objective 3) Herbaceous grassland plants
[1]Lars Gamfeldt	Postdoc University of Gothenburg	Multivariate BEF relationships (Objective 2) Marine microalgae & invertebrates
[1]Andrew Gonzalez	Assoc professor, McGill Univ	Scaling BEF relationships (Objective 1) Terrestrial invertebrates
[1]David Hooper	Assoc Professor Western Washington Univ	Biodiversity and carbon storage (Objective 3, lead) Herbaceous grassland plants
[1]Jonathan Lefcheck	Ph.D. student, Virginia Inst Marine Science	Multivariate BEF relationships (Objective 2) Marine macroalgae & invertebrates
[1]Shahid Naeem	Professor, Columbia Univ.	Scaling BEF relationships (Objective 1) Herbaceous grassland plants
[1]Daniel Piotto	Ph.D. student Yale	Biodiversity and carbon storage (Objective 3) Plantation forest trees
Catherine Potvin	Professor, McGill University	Biodiversity and carbon storage (Objective 3) Tropical forest trees
POTENTIAL ROTATING COLLABORATORS FOR OBJECTIVE 3		
Han Y.H. Chen	Professor, Lakehead University	Biodiversity and carbon storage (Objective 3) Forest ecosystems
Andy Hector	Asst Professor Univ Zurich	Multivariate BEF relationships (Objective 3) Terrestrial grassland plants
Sarah Hobbie	Assoc Professor Univ Minnesota	Biodiversity and carbon storage (Objective 3) Herbaceous grassland plants
Elizabeth Carol Adair	NCEAS Post-doc	Biodiversity and carbon storage (Objective 3) Herbaceous grassland plants
Christian Körner	Professor, University of Basel	Biodiversity and carbon storage (Objective 3) Forest ecosystems
Daniel Rothman	Professor, MIT	Carbon cycles over geologic time (Objectives 1, 3) Terrestrial / plants

Michael Scherer-Lorenzen	Professor, ETH Zurich	Biodiversity and carbon storage (Objective 3) Forest ecosystems
Nina Buchman	Professor, ETH Zurich	Biodiversity and carbon storage (Objective 3) Grassland ecosystems

[1]Confirmed, [2]Will serve as technical liaison for NCEAS computing, [3]Responsible for compliance with NCEAS Data and Information policy.