IDENTIFYING ALTERNATIVE INDICATORS FOR THE DETECTION OF ABRUPT TRANSITIONS IN ECOSYSTEMS: A CONSIDERATION OF TIME SCALE AND COMMUNITY PARAMETERS

2012 LTER ASM

FINAL WORKING GROUP REPORT – SEPTEMBER 18, 2012

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SUMMARY

As climate change continues to accelerate, many ecosystems are poised for frequent abrupt and irreversible transitions (Millenium Ecosystem Assessment, 2005). In order to enhance prediction and management of these changes across ecosystems, Bestelmeyer *et al.* (2011) developed a systematic approach for identifying the occurrence of transitions, the leading indicators, and the underlying mechanisms. Their analyses revealed that the choice of the leading indicator, the biological response used to detect the transitions (*e.g.* the abundance of a particular species), generates many limitations.

In our work group meeting on Tuesday, September 11, 2012, we explored the identification and use of alternative leading indicators, including abundance of species with a variety of life spans, abundance of functional groups, community parameters, and physiological parameters. We identified additional LTER and external time series (from those used by Bestelmeyer *et al.* 2011) of driver and response variables that have the potential to satisfy the requirements for these analyses. Our future publication will explore the selection of appropriate drivers and biological responses, as well as the temporal scale necessary for these measurements, with the goal that this information may be incorporated in the design of future monitoring efforts and data collection protocols. Additionally, the application of our developed approach to datasets from multiple ecosystems will facilitate comparisons across sites to examine how the signal of disturbance and state change is translated through different food webs and communities.

PARTICIPANTS

The participants of this working group included a wide range of scientists – from graduate students to lead site PIs – that represented 15 LTER sites.

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PROCEEDINGS OF WORKING GROUP

The following agenda was followed in this working group

10:00 – 10:30 am

1. Short introductory presentation on Bestelmeyer *et al.* 2011
2. Discussion of analyses and case studies used in the paper
3. Discussion of limitations of their analysis and motivation for our theme

10:30 - 11:10 am

1. Led discussion about alternative indicators and compiled list

a. What indicators or response variables are the best/ideal/used for detecting abrupt transitions in ecosystems?
b. Are they tractable?
c. Under what time scale do they operate?

11:10 – 11:50 am

1. Information-sharing discussion about similar datasets and ongoing research at other LTER sites
    a. At your LTER or external research site, what are transitions in ecosystems that have already been identified?
    b. What datasets do you know of that may satisfy the requirements of this analysis?

11:50 – 12:00 pm

1. Statement of final goals and future directions

We envision this working group will generate cross-site collaborations and discussions that will continue following the LTER ASM meeting. We intend to form a group of committed graduate student and higher-level participants to bring data from multiple sites for analysis and the creation of a manuscript.

DISCUSSION OF WORKING GROUP

See file titled "Rivest_Davis – Notes from Working Group," on this Work Group's page on the 2012 LTER ASM website.

EXPECTED PRODUCTS

We are communicating with the work group participants via e-mail to discuss directions for publication(s) based on analyses stemming from the discussion in this work group. We plan to submit a proposal for post-ASM funding to host a workshop, in which we will perform the discussed analyses and draft a manuscript surrounding the topic of this work group.

References

Bestelmeyer, BT *et al.* 2011. Analysis of abrupt transitions in ecological systems. Ecosphere 2(12):129. doi:10.1890/ES11-00216.1

Millenium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.