

BioMERGE

Adaptive Synthesis Workshop I

"The interface between intrinsic and extrinsic drivers."

Seattle, WA

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ASW I Participants

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Mahesh Sankaran, Colorado State

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Survey

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What is Bio. M. E. R. G. E.?

Biotic
Mechanisms of
Ecosystem
Regulation
in the **G**lobal
Environment



What is Bio. M. E. R. G. E.?

In a nutshell:

**Bring together those that study the diversity
of our biota with those that study its
functioning.**



ASW I Goals

1. Clear statement of question and issues
2. Concise terminology
3. A model community
4. A model of the approach
5. A worked example

ASW I Activities

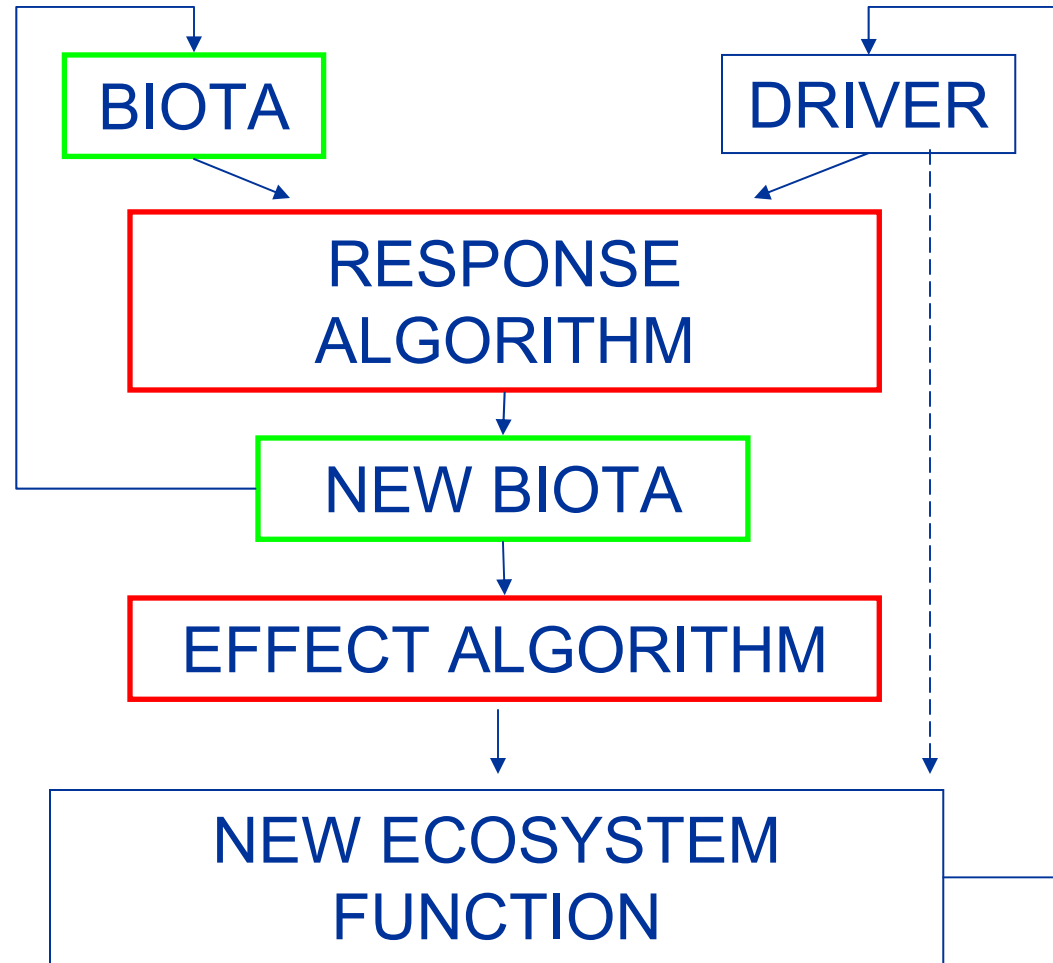
- Discussed roles of biocomplexity and dynamics, taxonomic classification schemes and databases, functional classification and databases, and “filters” for translating taxonomic classifications into functional classifications
- Developed conceptual model for integrating intrinsic and extrinsic drivers of changes in biodiversity and ecosystem function
- Drafted hypothetical data sets to analyze conceptual model and uncover key challenges



ASW I Results

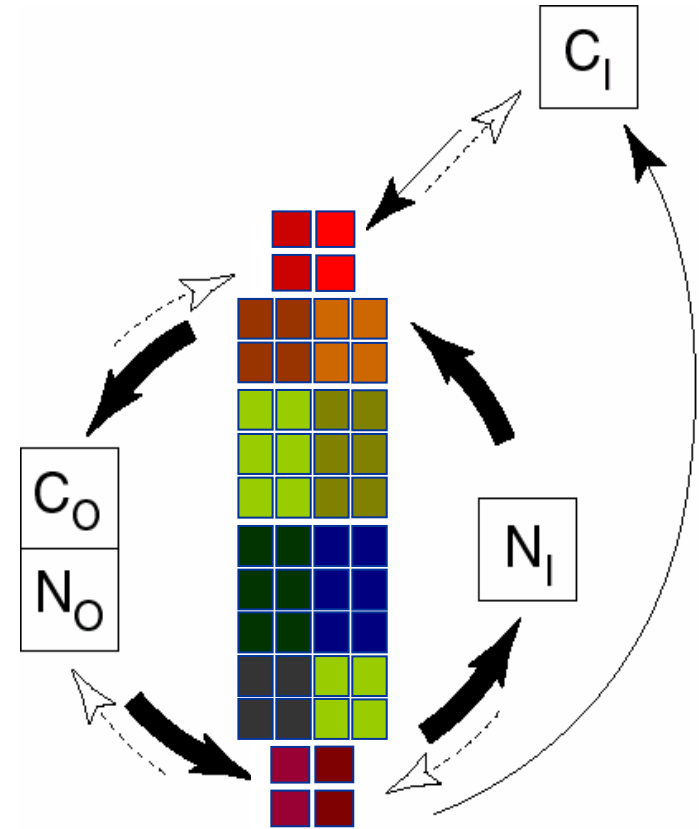
- Developed general conceptual model for linking changes in taxonomic and functional biodiversity with changes in ecosystem function
- Approved general model of ecosystems to explore the effects of different drivers on biodiversity
- Worked through two examples using synthesized data – first using a verbal model and then using appropriate algorithms. This exercise established criteria for suitable data for further analyses.
- Defined a set of important questions to be addressed at ASW II

BioMERGE Conceptual Model



BioMERGE Model Ecosystem

- Consumers link producers and decomposers
- Functional groups are not necessarily nested within trophic levels nor or trophic groups cleanly definable as functional groups



Dashed arrows indicate minor flows while solid arrows indicate major flows.

C_1 = inorganic carbon, C_0 = organic carbon, N_1 = inorganic nutrients, and N_0 = organic nutrients.

ASW I Unresolved Issues 1

- Biodiversity is clearly more than just species richness and must include information on relative abundance, dynamics, interactions, strengths of interactions, trophic status, and other more complex characteristics such as ecosystem engineering. While this is hardly a novel finding, the success of BioMERGE rests critically upon successfully addressing these issues than other ecological challenges such.
- In many cases, it is probably more useful to focus on functional traits than trying to construct functional groups.
- The set of traits that determine how species respond to changes in the environment is not necessarily the same as the set of traits that determine the effect of a species on ecosystem function.
- Drivers need to be defined and categorized more precisely for BioMERGE
- How do we construct “response” and “effect” algorithms in real systems where we may have to deal simultaneously with too many and too few data?



ASW I Unresolved Issues 2

- Which traits are likely to have the largest effects on community and ecosystem processes and to what extent trait occurrences correlated between species (i.e. if two species share one important trait, how likely are they to share another)?
- Can one extrapolate from known species functionality to the function of unstudied species using phylogeny?
- How to deal with the one-to many problem versus the many to one problem of driver -effect or trait – function.
- How to conserve biological idiosyncracies while producing general models?
- Getting members of different scientific communities to communicate is necessary if we want to solve the complex problems we are interested in. Understanding these issues also requires bringing together theoretical, experimental and observational approaches. Scale is important and we are likely to see considerable context dependency in our results.

Agenda for ASW II

- Can we use biogeography to scale up and understand how changes in drivers might alter the biota at large spatial scales?
- How to deal with trophic, intra-trophic, and trans-trophic functions?
- Review progress on general algorithms of conceptual framework
- Work on three real systems
 - Terrestrial – tropical
 - Aquatic – wetland or streams
 - Marine – coastal
- Format:
 - Presentations on above topics by invited speakers
 - Working groups in afternoons – comparing results of analyses of different data sets
 - Product Joint paper to Science or Nature
 - ASW III venue

