Eco-Informatics & Decision Making – BDEI3
December 13-15, 2004
Breakout Session I – DRAFT Focus Statements

Policy – Areas for discussion include (but are not limited to) the policies organizations (across all sectors, public, private and nonprofit) place on: (1) the provision and production of eco-informatics tools; (2) the use (and possible abuse) of eco-informatics tools or information and their effectiveness; (3) the cross-organizational sharing of eco-informatics tools or information; and (4) the communication (or lack thereof) of public policy decisions grounded upon eco-informatics-based analysis.

Tools – Areas for discussion include (but are not limited to) an examination of: (1) problems facing decision makers using existing ecoinformatic tools as criteria for in developing and/or carrying out environmental policy; (2) problems using ecoinformatic research tools in support of decision making; and (3) future needs for strengthening ecoinformatics as effective support tools for decision makers.

Indicators – Indicators help communicate actionable information, drawn from often-complex data sources, to decision-makers. Biodiversity and ecosystem indicators should function to help decision-makers understand the status of and trends in ecological condition in a place and time frame of interest, and give those decision-makers a better basis for evaluating threats, possible management responses, and effectiveness of management actions taken. Areas for discussion in this session include (but aren't limited to) challenges, opportunities, and techniques for developing useful ecological indicators and putting them to use in ecosystem management. It might be very useful to discuss specific indicators that have proven useful in practice for addressing major issues such as loss of biodiversity, invasive exotic species, emerging diseases, and measuring outcomes of management programs.

Data Gaps – Areas for discussion include (but are not limited to) the problems stemming from geographic data gaps between biodiversity-rich land areas and conservation-managed land areas and the potential impact of these data gaps on decision making which may rely on ecological and environmental information.

Data Presentation – Areas for discussion include (but are not limited to): (1) the user population; (2) issues with the current software and user information products; and (3) things to remember about future software information products.

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Breakout Session I
Assignments

Policy Sem 2 A 1105
Schweik, Charlie - Leader
Bowker, Geoffrey
Duke, Cliff
Guldin, Rich
Jensen, Stefan
Pascual, Pasky
Rossignol, Phil
Wilson, Tyrone
Sonntag, William

Tools Sem 2 A 3105
Frame, Mike - Leader
Jones, Julia
Klarin, Paul
Landis, Eric
Wright, Dawn
Sanchez, Gigi
Fulop, Janos
Bargmeier, Bruce

Data Gaps Sem 2 A 2107
Gergley, Kevin – Leader
Delcambre, Lois
Biasi, Frank
Denn, Marie
Beard, Thomas
Sweeney, Louis
Simonson, Mark
Wilson, Andy

Data Presentation Sem 2 A 2105
Hert, Carol - Leader
Hovy, Ed
Cushing, Judy
Hutchison, Vivian
Fiala, Anne
Pittman, Sherry
Sugarbaker, Larry
Tolle, Tim
Tosta, Nancy

Indicators Sem 2 A 3107
Young, Steve - Leader
Schnase, John
O'Neill, Molly
Backous, William
Palmer, Craig
Neiman, Brand
Borning, Alan

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Breakout Session II – DRAFT Focus Statements

These definitions were adapted from research issue definitions developed BDEI2 Workshop (The BDEI Prinicipal Investigators' Meeting in 2003). They will likely need to be revised for the purposes of resource management and other decision support purposes, but constitute a starting place for the BDEI3 workshop.

Integration – Data needed to address critical questions in ecology are scattered, heterogeneous, and complex, and large volumes of diverse data types must be semantically integrated. Early integration efforts generally assumed that terms and formats (syntax) and meaning of terms (semantics) were the same. In the web environment and in the decentralized, heterogeneous information collections relevant to ecological decision-making, such simplifying assumptions do not hold. Research approaches for information integration include thesauri, ontologies, and metadata services. Existing digital gazetteers such as USGS GNIS and NIMA GNS (now GNA) are a good start for geo-location and spatial integration, but typically lack ecology-specific data structures.

Ontologies – Ontologies are a promising research approach for information integration involving eco-informatics and decisiom making. Several disciplines have progreseds by defining domain-specific ontologies to support their research (e.g., G*ene Ontology* for Genomics Research). Ecology needs similar formal definition of common ecological concepts in order to solve critical problems using informatics tools, and, additionally, sub-disciplines within ecology should undertake formal definition of more specialized terms and concepts. The field presents a particular challenge in ontology development in that many concepts are complexly and dynamically linked, and many of the conceptual relations are not easy to define formally as they are not fully understood, still hypothetical, or understood differently by different groups. Research in the area of ontology development should address some of the complex conceptual specification issues of the ecology domain: 1) Ontology development tools for specifying complex dynamic relations among concepts, 2) Support for flexible ontology specifications that capture and specify incomplete or evolving knowledge, 3) Ontology integration tools for merging ontologies developed by separate disciplines or sub-disciplines and for resolving knowledge conflicts.

Data Quality – Data are indirect, massively unbalanced with missing observations, and subject to many sources of stochastic variability. Data exhibit variability, uncertainty, and complexity, and ways to deal with incomplete knowledge are required, and inference methods for high dimensional problems, critical for all BDEI modeling applications, are lacking in most. Metadata are critical for sharing information and allow others to judge it for quality and relevance to their needs. Heretofore the scientific paper written for a specific and often limited peer group was the only means of sharing information. The ability to share smaller and less focused information over the web, such as a single specimen record from a museum collection, presents many new opportunities. Alternatively, the web offers the possibility of sharing vast amounts of data that have not been reduced to final form for a paper. These new opportunities require a clear definition of the audience and what the audience needs to know in order to understand the information; see, for example, the metadata requirements set forth in a recent workshop on Scalable Information Networks for the Environment[1] or the Ecological Metadata Language (EML).[2] Many trained scientists are skeptical of citizen science efforts because of quality control issues. If community science activities are to be successful, such programs will need the active involvement of scientists and a review process with the appropriate scientific societies such as the

[1] See **http://www.sdsc.edu/pbi/sine_workshop_agenda.html.**
[2] For information about the ecological metadata language, see http://knb.ecoinformatics.org/software/eml/.

Ecological Society of America akin to the process that the Environmental Protection Agency (EPA) has for water quality monitoring programs.

Modeling/Simulation – Informatics technology is not currently adequate for model developers and users, even though modeling and forecasting are critical for gaining both theoretical and practical understanding of biodiversity and ecosystem issues. Furthermore, resource management and policy-making will require models that reduce vast quantities of data. Advanced frameworks, including hardware for adaptive and intelligent systems and high performance computing are required, including the coupling of computational models, hardware grids, and distributed computing and information sources to provision data and computation at multiple places. Model-data interactions are key since many ecological problems could be informed by existing large data sets. the models themselves are often difficult to use because (for example) hidden parameters are often more like variables. Processes interact at a range of scales and a better theoretical understanding how to span spatio-temporal scales and techniques for high dimensional problems, as well as better derived data products, are needed. More than just "pictures", meaningful visualization must be part of working models on which measurements could be made and change simulated. Community models, i.e., those maintained by a community of users, are a possibly valuable future alternative for this field.

Human Centeredness – Advancement of the overall eco-informatics agenda hinges on closing various "digital divides", shaping an eco-informatics culture and developing socio-technological partnerships. We must solve social and ethical conundrums among various players: industry and science; bio-informatics and eco-informatics; ecologists conducting "big environmental science" and traditional individual ecologists working in relative isolation; scientists and information managers; professional and citizen scientists; and the triumvirate of scientists, resource managers and policy makers.

R&D budgets of telecommunications and consumer electronics companies as well as the defense and the health services industries, and even bio-informatics, dwarf eco-informatics budgets; eco-informatics, and biodiversity and ecosystem, researchers should therefore look to those areas for technologies to adapt and transfer, keeping in mind some unique requirements. Stakeholders should adapt open source models to enable technologies, for example for specialized robots to digitize museum collections. Even if the needed technology were available, however, extensive user training will be required. Finally, just creating the technology is not enough. Questions such as who should contribute information, who should have access and how should information be shared, and how many research resources should be allocated for information management, all need serious consideration. This breakout group might include best practices, training, technology transfer, HCI, and other relevant areas.

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Breakout Session II Assignments

Human Centeredness Sem 2 A 1105

Erik Landis – Leader

Schweik	Charlie
Tosta	Nancy
Duke	Cliff
Hert	Carol
Wilson	Tyrone
Young	Steve
Sonntag	William
Beard	Thomas (Doug)

Integration Sem 2 A 3105

Lois Delcambre – Leader

Denn	Marie
Frame	Mike
Guldin	Rich
Sweeny	Louis
Simonson	Mark
Jensen	Stefan
Nieman	Brand

Modeling/Simulation Sem 2 A 2105

Alan Borning – Leader

Cushing	Judy
Fulop	Janos
Klarin	Paul
Rossignol	Phil
Wilson	Andy
Fiala	Anne
Crist	Patrick

Ontologies Sem 2 A 3107

Ed Hovy – Leader

Bargmeier	Bruce
Biasi	Frank
Bowker	Geoffrey
Hutchison	Vivian
O'Neill	Molly
Wright	Dawn
Tolle	Tim

Data Quality Sem 2 A 2107

Julia Jones – Leader

Palmer	Craig
Pascual	Pasky
Backous	William
Schnase	John
Pittam	Sherry
Sugarbaker	Larry
Gergely	Kevin

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Breakout Session III – DRAFT Focus Statements

Individual Breakout III Sessions do not have a topic definition – the topic is the same as for Breakout II, but the objective is to find a scenario from the Breakout I Session that would be solved by one of the research issues your breakout group identified in Breakout II.

A third breakout sessions will both refine their set of research issues and illustrate the research issues with a scenario that shows how the research will address a real-world problems identified Monday evening and in the first breakout session. A written list of problems identified in BreakOut I and of research issues from BreakOut II will be available to all participants Wednesday morning.

Your mission is to refine your set of research issues in light of the plenary session comments, and to illustrate the research issues with a scenario that shows how the research will address a real-world problems identified Monday evening and in the first breakout session.

In other words, you are to flesh out a single domain problem in light of one of your research issues. This part of the breakout III results will morph into the "who gives a d… if we do and who gives a d… if we don't" part of the BDEI3 report.