Heuristic Model Break-Out Group

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There are two main items to be focused upon:

1. Development of a comprehensive *conceptual* heuristic model for the Everglades ecosystem (deliverables: a set of graphics and a report for FCE-LTER)
2. Review paper that describes the various models already in place for the Everglades ecosystem, as well as the linkages between the models: both work in progress and possible links for future development (deliverables: review paper, actual linkages between models with spinoff papers by respective developers)

Item 1: Development of a comprehensive conceptual heuristic model for the Everglades ecosystem

Need for such a model as expressed by the NSF reviewers (2009):

"The review panel suggests that a comprehensive, heuristic model of the Everglades Ecosystem would be helpful for conceptualizing interactions of the multiple factors and processes that are foci of the different working groups. Most of the possible components of this model (runoff, phosphorus, lightning, solar energy, introduced species, people, rainfall, fossil fuels, importation of materials including drugs, frost, storms, tides, and sea level increase, etc.) were articulated at one time or another during the review, but never presented as a whole. The model should include all external forces that drive the complexity of the Everglades and show interactions among different parts of the system, including human dominated sectors."—FCE NSF external examiner review 2009

Our next steps:

Have a brainstorming session using whiteboards on developing a graphical representation of the various linkages / interdependancies of processes in the Everglades ecosystem. Hydrology would be central, that affects most other processes, from hydroperiods to nutrient transport to water quality. In turn this affects flora and fauna as well as ecosystem services for humans such as aquifer recharge and tourism. The linkages between hydrology and the ecosystem are two-way, so the model should also depict the feedbacks, such as nutrient pollution from ag/lawns/stormwater.

We can achieve this by laying out a barebones schematic on whiteboards, and then stimulating a discussion on different processes. The final output would be a graphic model, or series of graphical models, as well as a small report.

The graphic model can have several levels:

i. A top level representing the natural ecosystem, climate and urban ecosystem as the three main modules, with the linkages between them.
ii. Each module can then have a detailed graphic illustrating the various processes that have interdependancies with factors external to that module.
iii. Finally there can be process-oriented graphics for specific important cases, such as water management and effects on natural and urban systems.

Purpose of the model: The main purpose of creating the heuristic model is to have the linkages and interdependancies laid out in a series of easily understood figures, so as to both highlight the interdependent nature of the ecosystem components (modules) as well as subsequently help identify the various processes that can be affected by climate change and sea level rise. For instance, sea level rise can wipe out coastal freshwater-using plant communities and associated fauna in the natural ecosystem. Sea level rise can also lead to saltwater intrusion in groundwater as well as increase episodes of flooding in coastal urban areas.

This then leads to actual models and their linkages, after a brief intermission

Item 2: Integrating the heuristic model within the scope of the FCE modeling/synthesis review paper (started in the June 09 workshop) that serves as a road-map for the long-term goals and objectives of FCE modeling/synthesis

During a workshop in June 2009, we generated a draft outline for a modeling/synthesis review manuscript with the following objectives: (1) to provide a "snap-shot" of the degree of development and applicability of FCE models for addressing FCE hypotheses and ultimately for restoration planning and water managmeent; (2) to identify the potential links among models or novel modeling/synthesis efforts required for achieving both FCE and restoration objectives; and (3) document successful initiatives that can be used as blue prints to expand and improve hydro-ecological modeling efforts.

For this second half of the discussion, our tasks are to conduct follow-ups on the review paper:

1) to see how best to “blend” the new heuristic model(s) within the framework of the review manuscript

2) use the new heuristic model(s) to identify potentially new linkages (ELM-hydrology within ENP, the HD models and data collection, etc), modifications to previously proposed linkages/research priorities

3) establish a timeline and authorship responsibilities for completing a first draft of the review paper (or papers / a special issue?), including “special-teams” as needed to refine the heuristic model(s) initiated in the first part of the discussion

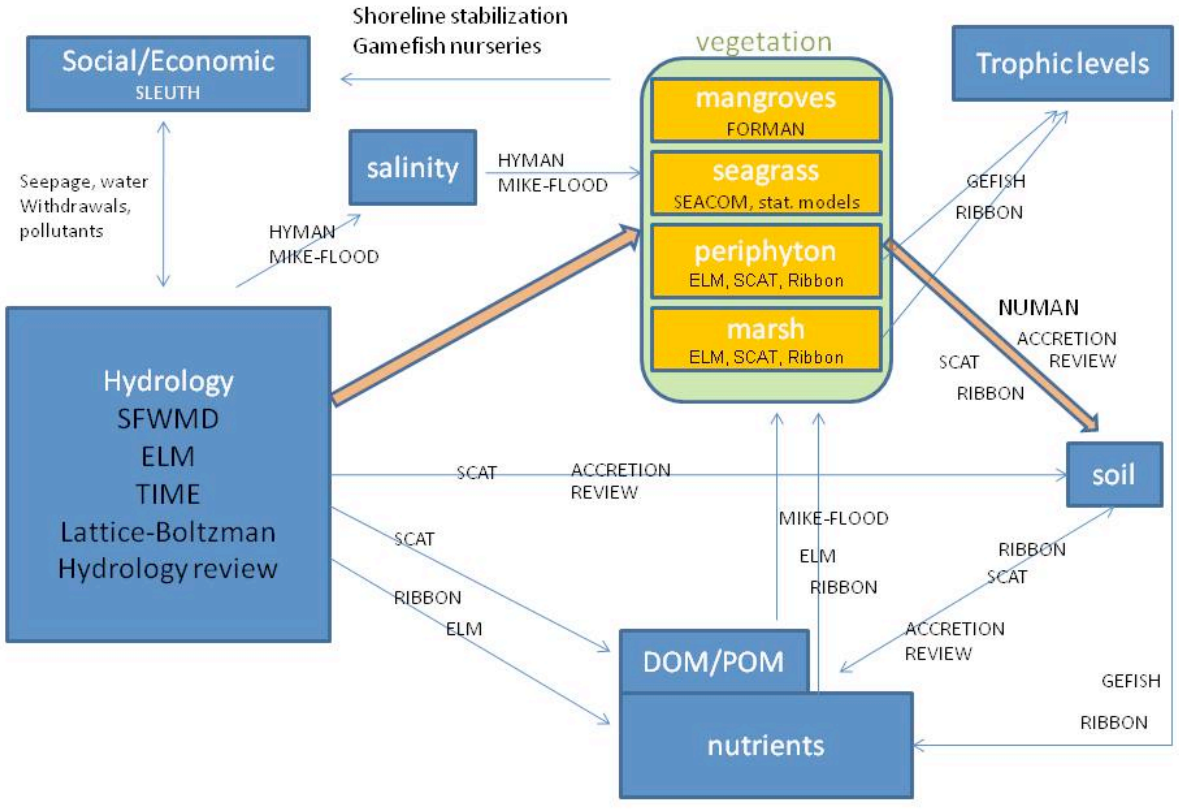

Fig 1 : an example of the linkages possible between existing models that was drawn up at the Modeling workshop, June 2009