PEER REVIEW OF THE EVERGLADES LANDSCAPE MODEL (ELM)

WORKSHOP II

Summary of Public Workshop for Expert Review Panel Deliberations on the ELM Model and Development of a Final Report

December 6-7, 2006
West Palm Beach, Florida

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January 4, 2007

TABLE OF CONTENTS

1. PREFACE

This document is a summary of the proceedings of a public workshop for Expert Review Panel questions and comments on the Everglades Landscape Model (ELM), Version 2.5. The workshop was held at South Florida Water Management District (SFWMD) Headquarters on December 6-7, 2006 in West Palm Beach, Florida. It was conducted as part of the ongoing independent peer review of the ELM, initiated on July 10, 2006 with the public release of ELM v2.5 documentation on the SFWMD web site dedicated to the ELM (http://my.sfwmd.gov/elm). Information on the process and the science of the peer review, including the full schedule is provided under the "Peer Review" tab of the ELM web site.

The December workshop was the second of two public workshops dedicated to the ELM Peer Review process. The first workshop was held on August 1-2, 2006. Both workshop summaries are posted on the ELM web site. There were four teleconferences between the first and second workshops. The agendae for these teleconferences, along with meeting summaries are also posted on the ELM web site.

This summary was prepared by Dr. Victor J. Bierman, Jr. and Wendy M. Larson of Limno-Tech/HydroQual, LLC. Dr. Bierman is the scientific facilitator for the ELM peer review process. In that capacity, his primary responsibility is to support the review panel so that they can best meet the goals of the peer review, and to facilitate clear and open communications among the Panelists and Model Developers. The SFWMD project manager, Dr. H. Carl Fitz, was responsible for workshop logistics and for audio/video recording of all workshop sessions. These recordings contain the complete details from the workshop and can be obtained on request from Dr. Fitz (see ELM web site for contact information).

2. INTRODUCTION

The ELM is a regional-scale, integrated ecological assessment tool designed to understand and predict the landscape response to different water management scenarios in south Florida. In simulating changes to habitat distributions, the ELM dynamically integrates hydrology, water quality, soils, periphyton, and vegetation in the Everglades region. The model has been developed through a multi-disciplinary, collaborative effort among a wide variety of scientists and engineers, under the direction of the SFWMD.

The overall goal of the ELM peer review is to "*Judge the quality and credibility of the science of the ELM, particularly in its applicability to decision-making for Everglades management*", finding critical defects and suggesting remedies for any such problems. Panelists were selected based on professional credentials in integrated modeling, or combinations of landscape, water quality and hydrologic modeling, in addition to experience in peer review of modeling efforts. More detail on the qualifications and responsibilities of the Panelists is provided on the ELM web site, Peer Review tab.

The independent experts who are serving on the Peer Review Panel are:

Dr. William J. Mitsch, Panel Chair
Distinguished Professor of Natural Resources and Environmental Science
The Ohio State University

Dr. Lawrence E. Band
Voit Gilmore Distinguished Professor
University of North Carolina at Chapel Hill

Dr. Carl F. Cerco
Research Hydrologist
U.S. Army Engineer Research and Development Center

The Scientific Facilitator is Dr. Victor J. Bierman, Jr. of Limno-Tech/HydroQual, LLC.

The agenda for Workshop II follows.

Peer Review of the Everglades Landscape Model (ELM): Agenda for Workshop II

Topic: **Public Workshop for expert Review Panel deliberation on ELM documentation, and development of a Final Report (due January 16).**

Date: **December 6, 2006: 9:00 am – 5:15 pm**
December 7, 2006: 9:00 am – 12:15 pm

Location: **Headquarters Building B1 of the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach, FL**

Meeting rooms: **December 6: Storch Room (3rd floor)**
December 7: Auditorium (1st floor)

ELM information: **Model documentation and current Peer Review Schedule & Agenda found at: http://my.sfwmd.gov/elm**

6-Dec			
	9:00 - 9:15	**Introductions, peer review process**	Vic Bierman
	9:15 - 10:15	**Results from Model Perturbation Experiments**	Carl Fitz
	10:15 - 10:45	**Panel Questions to SFWMD**	Panel
	10:45 - 11:00	***Break***	
	11:00 - 12:00	**Panel Deliberations**	Panel
	12:00 - 13:30	***Lunch***	*Cafeteria available in building*
	13:30 - 14:30	**Questions and Discussion**	Audience
	14:30 - 15:15	**Panel Deliberations**	Panel
	15:15 - 15:30	***Break***	
	15:30 - 16:45	**Panel Review/Discuss Draft Report**	Panel
	16:45 - 17:00	**Public comment**	Audience
	17:00 - 17:15	**Concluding Remarks for Day 1**	Vic Bierman
7-Dec			
	9:00 - 9:15	**Welcome back**	Vic Bierman
	9:15 - 10:30	**Panel Review/Discuss Draft Report**	Panel
	10:30 - 10:45	***Break***	
	10:45 - 11:45	**Final Panel Deliberations**	Panel
	11:45 - 12:00	**Public comment**	Audience
	12:00 - 12:15	**Concluding Remarks**	Vic Bierman

3. WORKSHOP PRESENTATIONS

There were three brief presentations on Day 1 of the workshop, which are summarized below. The remaining time during Workshop II was used for questions, comments, discussion, deliberations, and editing of the final content of the Peer Review Panel Report.

Introduction

Dr. Bierman introduced the panel and briefly reviewed the objectives of the peer review and the charge to Panelists.

Results of Perturbation Experiments

One of the Model Developers, Dr. H. Carl Fitz (Lead Environmental Scientist, Hydrologic and Environmental Systems Modeling Department, SFWMD) described the results of the perturbation experiments requested by the Peer Review Panel. Large changes were made to the phosphorus initial conditions and external loads, allowing evaluations of the model behavior under extreme conditions. Dr. Fitz presented the results, with a focus on the 100-year simulations. The results of the 20- and 100-year simulations are described in the November 22, 2006 draft of Chapter 11, Model Perturbation Experiments (see ELM web site, Implementation: v2.5 tab).

Model Uncertainty

Dr. Jayantha Obeysekera (Director, Hydrologic and Environmental Systems Modeling Department, SFWMD) described SFWMD efforts to address model uncertainty. An Experts' workshop was conducted about 10 years ago on model sensitivity; a more recent (2002) Expert Panel was convened for a workshop on model uncertainty; and, in 2006 a consulting firm provided further analysis of SFWMD model uncertainties. Several reports on those topics resulted. The SFWMD has been working to implement the recommendations that came out of these activities, and is open to ideas on how to assess uncertainty. Dr. Obeysekera also discussed future model development including the incorporation of ELM water quality algorithms into the SFWMD Regional Simulation Model (RSM).

4. RESPONSES TO PANEL INFORMATION REQUESTS

During the course of the peer review, Panelists made recommendations and requested specific information from the Model Developers. These requests were summarized in late October 2006 and prioritization was requested to aid the ELM developers in their responses (see ELM web site, Peer Review: Comments tab). In early December, before Workshop II, a broad overview of the Panelists' comments and the Model Developers' responses was prepared (see ELM web site, Peer Review: Comments tab). Many of the requests have been addressed through direct responses to the Panelists, additional analyses, and/or revisions to the model documentation report as described below. Others will be addressed through future model refinements.

Perturbation Runs: 20- and 100-Year Simulations

The Panel requested perturbation runs to better understand variations in the behavior of multiple ecosystem variables among locations, and model responses to altered forcing functions. Perturbation runs of 20 and 100 years in duration were conducted. The results of the 20- and 100-year simulations are described in the Nov 22, 2006 draft of Chapter 11, Model Perturbation Experiments (see ELM web site, Implementation: v2.5 tab).

Spatial Trends in Model Performance Statistics

The Peer Review Panel requested enhanced summaries of the ELM "water quality" performance in relation to distance from source waters of the constituents. These supplementary analyses of the model performance statistics were conducted and results are reported in a draft document summarizing performance relative to distance (see ELM web site, Implementation: v2.5 tab). The results were discussed during the September 22 Peer Review Panel teleconference.

Constituent Dispersion Algorithm

The Panel requested more explanation of the constituent dispersion algorithm, along with output examples. This information was provided on November 22, 2006 in an Addendum to the Model Structure Chapter 5 (see ELM web site, Implementation: v2.5 tab).

Alternative Methods of Developing Input Data

The Panel requested an evaluation of alternative methods of developing input data for habitat-specific parameters and atmospheric phosphorus deposition. Several new data methods were implemented, and the resulting model performance was compared with that of ELM v2.5. This information is described in an Addendum to Data Chapter 4 (see ELM web site, Implementation: v2.5 tab). Related requests will be addressed during the course of future model refinements and document revisions.

5. STAKEHOLDER QUESTIONS AND COMMENTS

During Workshop II, verbal comments and questions from attending Stakeholders generally focused on the contents of the ELM documentation, the draft Peer Review Panel Report, and other specific aspects of the ELM. During Day 1, Stakeholder comment periods were provided at the end of the morning session, the beginning of the afternoon session, and towards the end of the afternoon session. During Day 2, Stakeholder comment periods were provided at the beginning and towards the end of the morning session. During the workshop, Dr. Fitz responded to these comments and questions, which the Panel was able to consider during their deliberations. The Stakeholder comments and questions are summarized below:

- What are the plans for application of the increased resolution model for Water Conservation Area 1? A comparison to the 1 km resolution model will be useful in understanding how much would be gained with a higher resolution model (e.g., will it better address transition zones?)
- How does the model transport phosphorus from one cell to another?
- Explain the interaction of periphyton growth and phosphorus availability.
- What is the time period for the "historical" dataset?
- Are there enough chloride data to assess the temporal distribution of chlorides?
- What will the model output look like (i.e., how will the performance measures be shown?)
- Was the output from the 2x2 model used in this model?
- Can you use ELM to look at the impact of removing levees?
- The model assumes a constant atmospheric deposition rate but the data are highly variable. This may explain why you are not matching data.
- With regard to the issue of model sensitivity to initial conditions and "spin up time", the peer review report should be specific about how this issue should be addressed and for what applications.
- Many of the former model deficiencies have been addressed. It is important to recognize where the model is not working well, and to use judgment to understand what the model is doing.
- A comparison of Water Conservation Area 1 water column phosphorus concentrations to paired simulated values from ELM version 2.5 suggests that the model is not responsive to observed values. A lot of calibration work needs to be done.

All written comments received from Stakeholders throughout the peer review process are posted on the ELM web site, Peer Review: Comments tab.

6. PANEL DELIBERATIONS

As indicated in the planned Agenda, most of Workshop II was devoted to: (a) final Panel deliberation on the suitability of the ELM for its intended application(s); and, (b) Panel refinement of the Peer Review Panel Report towards a final version. During the Day 1 Model Developer presentation, the Panel posed numerous questions to the Model Developers, and deliberated on their opinions of the adequacy of the science used in ELM development and application. As reflected in their Peer Review Panel Report (Mitsch et al. 2006), the Panel devoted significant attention to questions (and Model Developer responses) concerning the Model Perturbation Experiments.

During the majority of the time of the Day 1 afternoon session and the Day 2 morning (final) session, the Panel interactively edited their draft of the Peer Review Panel Report. The Panel Chair led this discussion and editing session, directly editing the draft on a computer. During this process, the Panel continued to ask questions of the Model Developers, and deliberated on their opinions of the ELM and its application. The end result of these deliberations is captured in the Peer Review Panel Report.

7. PEER REVIEW PANEL REPORT

During the peer review process, the Panelists prepared three drafts (October – December, 2006) of the review report, all of which are posted on the ELM web site, Peer Review: Comments tab. The near-final draft version 3.0 (Mitsch, et al., 2006) was completed during Panel deliberations of Days 1 and 2 of Workshop II. Written Stakeholder comments on the implementation of the ELM (dated December 14, 2006) were received (and posted on the ELM web site) after the workshop. The comments were reviewed by each Panelist, and a unanimous decision was made (December 15, see ELM web site, Peer Review: Comments tab) that there was no need to further revise the content of the report based on these comments. The Facilitator (Limno-Tech/HydroQual, LLC) then made minor editorial (e.g., formatting) revisions to the draft version 3.0 report, resulting in the final version. The Final Peer Review Panel Report (Mitsch, et al., 2007) was submitted to SFWMD on January 3, 2007, and is published on the ELM web site, Peer Review: Comments tab.

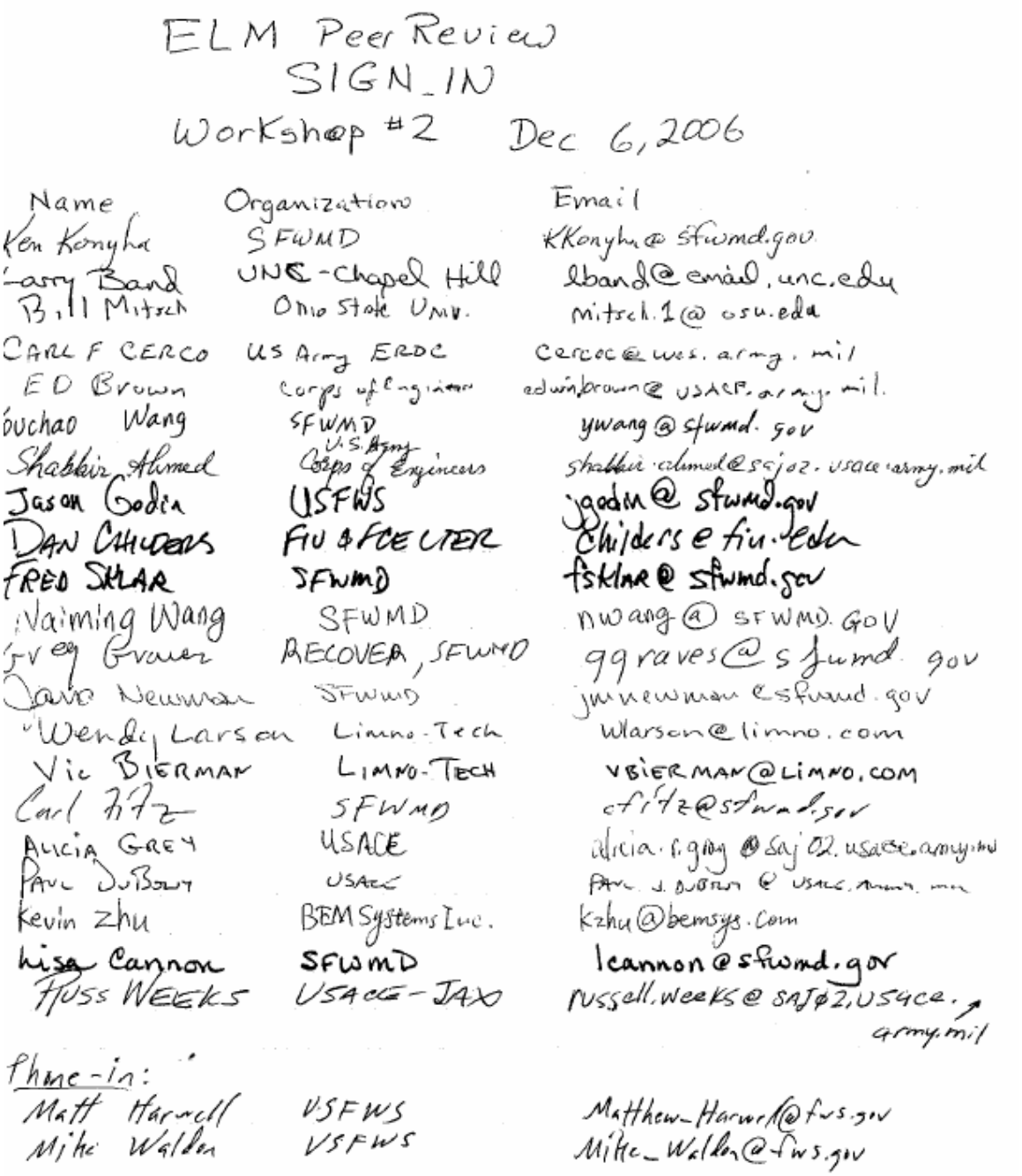
8. REFERENCES

Mitsch, W.J., L.E. Band, and C.F. Cerco. 2006. Everglades Landscape Model (ELM), Version 2.5: Peer Review Panel Report. Draft 3.0. December 11, 2006. "Peer Review: Comments" tab in http://my.sfwmd.gov/elm

Mitsch, W.J., L.E. Band, and C.F. Cerco. 2007. Everglades Landscape Model (ELM), Version 2.5: Peer Review Panel Report. January 3, 2007. "Peer Review: Comments" tab in http://my.sfwmd.gov/elm

9. ATTENDANCE LIST

Below is a pdf of the handwritten sign-in list for Workshop II.



ELM Peer Review
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Workshop #2 Dec 6, 2006

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