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2017 Coastal Master Plan

Attachment C5-2: Additional Comments

Report: Final

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1.0 Science and Engineering Board Comments

The Science and Engineering Board consisted of 10 members, and their role was to provide insight and guidance for the entire 2017 Coastal Master Plan effort. Appendix G provides more background on the SEB and includes summaries of their meetings. Although the SEB did not specifically focus on the modeling effort, as did the PM-TAC, they did have suggestions for model improvements. Specific recommendations on modeling are provided in Table 1. Note that as these have been extracted from summary meeting reports, some slight changes in wording have been made to provide context for the individual obersvations.

Table 1: Science and Engineering Board Observations on Modeling.

Topic	**Source**
SEB Report 1 – October 2015	**Main Report**
Land	The output of the land building components of the ICM is central to the selection of projects and to the decision making process in general. Thus, it would be very useful to compare the output of structurally distinct modeling approaches for diversion-induced land building in both a hind-cast and a forecast scenario. Such an inter-comparison would better constrain uncertainties associated with the land building formulations within ICM, help guide future iterative improvements in ICM.
ADCIRC/SWAN	The SWAN wave modeling does not include damping of waves propagating through dense vegetation/forest, apparently due to a problem in linking ADCIRC to SWAN. The ADCIRC-SWAN model implemented by CPRA handles wave damping by friction, so damping effects are not ignored entirely. This means that in some occasions the wave height near levees and the associated overtopping volumes might be considerably overestimated, making the risk calculation for these very conservative. The overall impact may not be that large but should be explored for the 2022 plan.
SEB Report 4 – December 2016	**Member Reflections - Note that the reflections may represent different points of view, among SEB members**
Flooding	The 2022 Master Plan needs a metric that is about "sunny day" flooding, or flooding that is not storm driven. One suggestion is to define a threshold elevation which will create nuisance flooding and then report on changes in the frequency of nuisance flooding as a metric.
Flooding	To reflect the degree of recurrent flooding of communities a relatively simple metric might be the future number of days per year that flood water up to a given depth is predicted to be present over a given community and/or on specific areas of individual communities.
Ecosystem outcomes	CPRA should consider more sophisticated metrics regarding the creation and maintenance of land – for example, the value of ecosystem services that wetlands provide.
HSI/EwE	Both the HSI and EwE can be improved and strengthened as CPRA moves forward with the 2022 Master Plan. New ecosystem models (e.g., ATLANTIS) and management strategy evaluations are worth considering. The EwE modeling is very good but may not be as reliable as the Appendix C-3-20 write-up suggests. As planning for 2022 gets underway, the team should update/correct EwE and HSIs information, assumptions and parameters.
HSI/EwE	Long-term temperature changes and tolerance limits of organisms should

	be modeled. High temperature limits for extended habitation and successful reproduction are mostly near 32 C (with a few exceptions), a temperature that may prevail for prolonged periods in the future.
Boundary conditions	The 2017 modeling approach introduces system 'tipping points' related to the use of historical time series (storms, Mississippi flows) as boundary conditions. These 'tipping points' have a large impact on the results of simulations. Consider using a Monte-Carlo or other probabilistic approach to reduce this impact, and to assess sensitivity of the method to episodic impacts (hurricanes, droughts).

2.0 External Reviewer Comments

Early in the 2017 Coastal Master Plan modeling effort, a group of subject matter experts were asked to review the model improvement reports. They were asked to focus on the following questions:

- Does the documentation clearly / adequately reflect the modeling process?
- Is the overall strategy appropriate for large scale (entire Louisiana coast), long-term (50 year) planning efforts?
- Are the technical assumptions and use of equations acceptable?
- Are there any fundamental flaws or otherwise that should be noted and/or revised for future coastal planning efforts?

Although many of their suggestions were incorporated in the 2017 modeling effort, there were a number of recommendations that were not able to be implemented due to time constraints. These were cataloged for future consideration and are included in Table 2 to provide additional ideas for the future modeling efforts. Note that as these have been extracted from summary meeting reports, some slight changes in wording have been made to provide context for the individual obersvations.

Table 2: Future Considerations for Model Improvements as Recommended by External Reviewers.

Topic	Comment
Sediment Distribution	
Settling velocities	Settling velocity calculations could be improved by not only considering the concentration dependence, but also a shear rate dependence. This is relevant to estuaries where time variation in shear is important at tidal timescales but could also be important where there are quite large spatial gradients in turbulence (e.g. in the vicinity of diversions and transitions from open water to marsh).

Topic	Comment
Hurricane-related sediment processes	Improve mechanistic modeling of hurricane effects on sediment mobilization and distribution. One issue is that storm effects are hard to disaggregate from wetland sediment studies based on geological data (sediment cores) and may not be represented in short-term trap deployments (which may not survive the event). The decay in deposition away from the marsh boundary and therefore the two-zone simplification of deposition will likely not apply under these conditions. This would benefit from a bit more thought. 'Closing' the problem with a constant 1000g/m2/yr storm deposition seems both arbitrary and crude. Even the revised spatial distribution scheme proposed for 2017 seems dependent on imposing a total storm supply that is somehow separate from any resuspension generated within the model. This may be necessary as a boundary condition, but separating external source from storm-resuspension/reworking seems to be an issue. Whatever the approach, an uncertainty analysis would be appropriate, perhaps including the magnitude of the sediment source as a variable along with the meteorological characteristics of simulated storms.
Shear strength/ belowground biomass	If vegetation density is included in the marsh deposition subroutine (i.e., Kadlec equations) can/should those data also be used to inform the marsh edge erosion subroutine? Presumably some relationship could be included to account for increases in shear strength related to below ground biomass.
Soil oxidation	It is unclear how variables/parameters in this modeling process account for longer time scale processes related to subsidence or soil oxidation processes.
Homogeneity of substrate	The approach, out of necessity, assumes a certain level of homogeneity in terms of sediment and substrate composition, but is this valid for the entire coast line?
Marsh Edge Erosion	
Sediment budget	Suggest adding a section that provides context for the sediment yield from marsh retreat by providing a summary of the overall sediment budget for the LA coast. What is the overall sediment budget for the different sources, including marsh edge erosion? An example: South Bay Salt Pond geomorphic assessment: http://www.southbayrestoration.org/pdf_files/SBSP_EIR_Final/Appendix%20I%20South%20Bay%20Geomorphic%20Assessment%20Final%20EIS_R.pdf
Bio-erosion	The fact that we do not have enough information on bio-erosion mechanisms for these sites should not be the reason to neglect it.

Topic	Comment
Gulf-facing marsh	Calculate a marsh edge retreat rate for Gulf-facing marshes that were excluded.
Barrier Island Model	
Calculation frequency	Carry out calculations on something like a daily (or shorter) basis so the episodic events in the WIS data base can be taken into account. Time demanding components could be carried out with a longer time space and will provide a minimal effect to the shoreline changes. Carrying out the calculations based on a data base, (e.g., WIS), such that the matching of the probabilities is not required would remove several of the uncertainties in the effort.
Calculation frequency	Are calculations of wave period, height, direction based on monthly "defensible" wave conditions, or hourly wave data? Focus on hourly data to the extent possible.
Assumptions regarding bathymetry	Longshore sediment transport formulas, (e.g., the CERC formula is a strong function of wave angle). How well can straight and parallel contour represent the realistic bathymetry and what is the influence of this assumption on wave calculation, especially for large storm waves?
Assumptions regarding wave breaking	The model calculates wave angle with respect to the local shoreline orientation based on shoreline positions at adjacent modeled profiles. Given that longshore transport is a strong function of wave angle, this could introduce substantial uncertainties which need to be understood.
Limited sediment availability, mixed sediment content in island substrate, and the erodibility of cohesive materials	Understand the importance of key assumptions regarding barrier island sediments: What are the implications of the assumption that cohesive sediments can serve as "anchor" to a certain extent for wave-induced erosion? For sediment starved coast, the full transport potential may not be materialized. Could sediment availability be considered? All the longshore transport formulas are for non-cohesive sand. What about mixed sand and mud sediments? Understand the implications of shallow vs. deep cohesive core sediment for breach evolution. What evidence is there to support the assumption that cohesive sediment is more resistant to wave induced sediment transport than the fine sand?

Topic	Comment
Hydrology/ BIMODE	Coupling the hydrology and barrier shoreline subroutines should consider sediment availability and account for cohesive sediments (or core sediments).
Vegetation	
Drivers	For several submodels (namely barrier island vegetation and perhaps the swamp and bottom land hardwood submodels) consider moving away from the emphasis on using elevation as the driving variable. For barrier vegetation, distance to ocean, successional history, and spatial transformation of geomorphology over time are important aspects. For swamps and bottomland hardwoods, perhaps flooding frequency rather than elevation is more important.
Drivers	In terms of "weighted annual statistics for water level variability (m) for each species," data for the mean seems to indicate that water level variation is roughly similar for all species – but the frequency or the distribution of these events could be very different among the species. For example, *Nyssa* may be subject to large seasonal rainfall pulses that follow a different frequency than the standard daily up and down of *Spartina alterniflora*. Considered refinements of water level variability to improve representation of vegetation response to hydrology.
Gleasonian vs Clementsian	Consider moving from Gleasonian individualistic dynamics into Clementsian community-unit/superorganism. For individualistic only takes into account response at that place and time, yet spatial dynamics emerge over time as information/materials/energy are passed from one space-time to another – and this allows community-level dynamics to emerge, requiring foreknowledge that goes beyond the environmental conditions at that one spot in time. After looking further at the description of the spatial dynamics and adjacency, the authors might want to look at the following citation to better describe what their model is doing relative to Gleasonian/Clementsian dynamics: Feagin, R.A., Wu, X.B., Smeins, F.E., Whisenant, S.G. & Grant, W.E. (2005). Individual versus community processes and pattern formation in a model of sand dune succession. *Ecological Modelling*, *183*, pp. 435-449.

Topic	Comment
Dune species	For the dune species *Uniola* than *Panicum* or *Sporobolus* consider including some temporal components not just simple elevation. The Western Gulf variety of *Uniola* disappears pretty quickly with any kind of erosion, overgrazing, or housing development, because it cannot replace itself very quickly by rhizome, and the seeds are not viable. Variations among species in ability to migrate or colonize could impact their distribution over time.
Ecopath with Ecosim	
Data needs	Some parameters, (e.g., shrimp discards), seem to beset qualitatively. It might be useful to apply data another system or similar gear if necessary, and understand the sensitivity to the estimations.
Calibration	One of the best ways of ensuring that the EwE model is a useful model is by having Ecosim fit longer time series with contrast. A short (10-yr) calibration does not offer much opportunity to do this. Perhaps a model with an earlier base year (1980's or earlier) could be used to calibrate a longer-term Ecosim model. If the purpose of this modeling approach is to simulate long-term effects, then it would be good to have some calibration to long-term data.
Oyster modeling	A large-scale, spatial oyster population model that uses similar habitat and water quality and habitat drivers as this EwE/TroSim approach should be developed and applied for evaluating planned restoration efforts.
Time step	It would be interesting to evaluate how well EwE's variable speed splitting algorithm works for high turnover species. EwE automatically reduces the time step for groups above some PB threshold (2.4 I believe).
Positional error	The need to rescale the projection used by Ecospace is unclear. Would it be possible to estimate the positional error relative to the size of the features you are modelling?
Equilibrium assumption	By using a flat line in the base Ecosim run (i.e., using biomass accumulations of zero for all groups) there is an assumption made that the ecosystem is at equilibrium and therefore that all fisheries are sustainable. Ideally, the biomass accumulation rates should match the recent history of biomass changes from observational data. If the biomasses have been going down recently, but the system is modeled as being at equilibrium, then the model will overestimate productivity of stocks, safe removal rates and species resiliency. It may be that the biomasses have been stable lately, in which case this assumption is fine, but this should ideally be compared against the observational data and the assumption explicitly acknowledged.

Topic	Comment
Equilibrium analysis	Equilibrium catch and biomass curves. It is possible to use the automated routine for this; however, this routine has a limitation in that it can only increment F for one functional group at a time. This is a problem for multistanza groups where fishing occurs on both the juvenile and adult phases. For those groups it is better to determine the equilibrium position manually by incrementing F in Ecosim and recording the catch and biomass after a long simulation (e.g., 30 years). Equilibrium analysis allows you to see graphically how hard groups are being fished (i.e., what fraction of MSY), but be aware that this analysis would take some time.
Habitat affinity	Consider increasing habitat affinities in non-preferred habitats for largemouth bass and blue catfish. The partitioning of biomass does not seem realistic.
Fishing effort assumption	Explore sensitivity to the assumption that fishing effort remains constant. An increasing fishing trend could be used for comparison.
Seasonality	Unless the (very rarely used) seasonality functions in EwE are included within-year variation will not be captured. It is important to acknowledge that the model only captures the seasonal environmental forcing not the movement of species within the domain and outside of the domain. EwE can be used for this but due to the extensive effort required exploratory analysis if the need/sensitivity might be considered.
Storm Surge and Risk	
Storm suite	The modeling is very dependent on the inherited set of hurricane tracks, central pressures, radii etc. originally developed for a FEMA insurance rate map study in 2008. Clearly the population of hurricanes will change into the future and even today should not be based on the averages of history.
Wind drag/error	Test the relative merits of wind drag coefficient from Garratt compared to the Powell sector based wind drag formulation to see which gives the lowest residual error associated with the reconstruction of key measured storm surges – such as Katrina and Rita.