Northern Estuaries Salinity Envelope Performance Measure Comment Response Matrix for RECOVER-wide, Agency and public review April 28 - May 28, 2020.
Final Documentation Sheet Approved July 7, 2020

LETTER/ EMAIL	Date Received	AGENCY/PUBLIC COMMENT	RECOVER RESPONSE
Federal			
Congressman Brian Mast (Mast)			
Mast-1	5/26/2020	The proposed performance metric states that the optimum flow envelope for the St. Lucie Estuary is 150 to 1400 cubic feet per second "from all sources of inflow, including groundwater, surface water, and Lake Okeechobee." While I understand that "the Salinity Envelope [Performance Measure] is not designed to address water quality or HABs," I am concerned that by lumping in unnatural Lake Okeechobee regulatory releases with beneficial natural flows, the performance metric will be used to validate discharges from Lake Okeechobee as beneficial to the St. Lucie Estuary when decades of experience and research has proven that releases are extremely harmful.	RECOVER ecological performance measures are designed to address the health of a given region or indicator. This salinity envelope performance measure addresses the flows and salinities in the St. Lucie and Caloosahatchee River estuaries based on current flows and predicted future flows. Flows from Lake Okeechobee provide significant freshwater flows to both estuaries and impact the salinities, and are measured for the purposes of CERP evaluation. Additional hydrologic outputs from RSM-Basins will provide details as to contributions of Lake Okeechobee Regulatory Releases and basin runoff, and with CERP implementation it is expected that Lake Okeechobee releases will decrease. RECOVER recommends that concerns over Lake Okeechobee regulatory releases be addressed as part of the LORS 2008 Periodic scientist calls and LOSOM planning process to revise the Lake Okeechobee regulatory schedule. Optimum could be met completely by basin flow, or from multiple sources. the performance measure is a technical document only and doesn't make operations recommendation
Mast-2	5/26/2020	Furthermore, the report rightly notes that "significant effects to changes in salinity in the [St. Lucie Estuary] are caused by high volumes of inflow from the watershed and Lake Okeechobee Regulatory Releases during periods of high precipitation in the wet season… For example, following Hurricane Irma in September 2017, large volumes of inflow to the estuary caused the entire system to become fresh." Despite making this observation, the conclusions drawn in the report ignore the harmful impacts of discharges from Lake Okeechobee. I urge you to clarify in the final performance metric that the optimum level of regulatory discharges from Lake Okeechobee to the St. Lucie Estuary is zero cubic feet per second and that any volume of discharge from Lake Okeechobee is harmful to the St. Lucie Estuary.	Releases for flood control, such as those deployed during and following Hurricane Irma, are an issue of Lake Okeechobee Regulatory operations as well as local runoff. While RECOVER recognizes that excessive inflows from any source will reduce salinities to the detriment of the ecological indicator species, this PM includes an evaluation of what volume of flows are expected to result in optimum salinities to support SLE ecology regardless of source. RECOVER focused on science based ecological targets linked to flows (regardless of source) and their effects on salinity. This PM also describes outputs to be generated from the Regional Simulation Model (Basins [RSM-BN]) for the purpose of RECOVER System-Wide Evaluation of CERP Project alternative plans. The above flow regimes, as well as several qualitative hydrologic targets based on the duration and return frequency of sub-optimum flow conditions, are summarized. First, the sum of all 14-day moving average flow periods over the entire POR ("events") in each Flow Envelope: ideally, project alternative simulations over the POR would yield no more than two (2) consecutive 14-day moving average flow events in the Stress Flow Envelope, and no more than one (1) consecutive 14-day moving average flow event in the Damaging Flow Envelope, in either the SLE or CRE. To state "any volume of discharge from Lake Okeechobee is harmful" would reach beyond the purpose of this performance measure, and would not be based on science conducted during this PM update process. Additional PM tools that are needed to address other environmental parameters impacting system ecology are outlined in Appendix C. Finally, the concerns raised by both scientists and the public regarding water quality, algal blooms, etc. are impacted by inflows sourced from Lake Okeechobee and basin runoff both.
Mast-3	5/26/2020	In short, as you know, the ecology of the northern estuaries is critically important to our environment, public health and economy. We cannot afford to have a performance metric in place guiding Everglades restoration that does not distinguish between Lake Okeechobee discharges and other sources of fresh water. Before finalizing your report, I urge you to make the necessary changes to differentiate between harmful regulatory discharges and beneficial natural flows.	Additional tools are needed to develop specific targets based on source, and must be considered within the context of setting restoration targets based on ecosystem function vs. some historical reference condition that is not possible to replicate. This PM does distinguish between Lake Okeechobee Regulatory Releases and other sources of freshwater (i.e. basin runoff) in Section 3, Evaluation Application, in which RSM-BN model outputs include those high discharge events triggered by either source. This will allow RECOVER teams to determine the relative improvements made from either with the implementation of CERP. More specifically, as additional storage capacity becomes available, high discharge events caused Lake Okeechobee Regulatory Releases are expected to decrease (edits have been made in the Documentation Sheet to reflect this; and see Section 3, Performance Measure Post-Processing Tools, in Appendix B, which has been expanded).
State			
Florida Fish and Wildlife Conservation Commission (FWC)			
FWC-1	5/22/2020	The Northern Estuaries are dynamic ecosystems in which many recreationally and ecologically important organisms rely heavily on the habitat formed by key species such as oysters and seagrasses. Managing salinity ranges that are greatly influenced by freshwater input is vital in maintaining these habitats. The proposed new optimum salinity envelopes of 150-1400 CFS for the St. Lucie and 750-2100 CFS for the Caloosahatchee River improve on the previous performance measures by utilizing a newer model that includes multiple locations throughout the estuaries as well as incorporating data from a longer and more recent period of record.	Thank you for the comment.
FWC-2	5/22/2020	FWC staff support this updated approach along with the incorporation of a categorical gradient, including "Optimum," "Stress," and "Damaging" flow and salinity envelopes for each location and indicator species.	Thank you for the comment.
FWC-3	5/22/2020	The increased flexibility of the model and adjusted salinity envelopes of the new Performance Measures for the St. Lucie Estuary and Caloosahatchee River Estuary is an improvement over the 2007 PM's and should provide for greater long-term sustainability of these estuaries and their associated inhabitants.	Thank you for the comment.
FWC-4	5/22/2020	FWC staff appreciate the opportunity to participate in the review and support the proposed Draft RECOVER Northern Estuaries Salinity Envelope Performance Measure. This Performance Measure acknowledges the importance of salinity on vital habitat-forming species and their role in maintaining a healthy estuarine ecosystem.	Thank you for the comment.
Local			
Palm Beach County (PBC)			

PBC-1	5/28/2020	Palm Beach County is committed to protecting the interests of its residents and the natural environment in which they live and work. Lake Worth Lagoon (LWL) is a critical component to achieving environmental restoration, navigation, tourism and recreation objectives in South Florida. As such, Palm Beach County residents, taxpayers and visitors depend on a healthy ecosystem within LWL to sustain a robust and diverse economy.	Thank you for the comment.
PBC-2	5/28/2020	As you are aware, the 1999 Central and South Florida (C&SF) Project Comprehensive Review Study (Restudy) Final Integrated Feasibility Report and Programmatic Environmental Impact Statement's recommended plan (now known as the Comprehensive Everglades Restoration Plan or CERP), which was approved by Congress in 2000, includes projects to improve ecological and water quality conditions in the LWL by reducing undesirable discharges from the C&SF system.	The list of CERP projects has changed over time since 2000; projects expected to directly impact LWL (i.e. North Palm Beach project) have been removed from the list of planned projects.
PBC-3	5/28/2020	In addition, ecosystem science has been the basis for water management decisions by the U.S. Army Corps of Engineers (USACE) and South Florida Water Management District (SFWMD) for many decades prior to CERP and the Restoration Coordination and Verification (RECOVER) program. All science, including the science completed under the auspices of RECOVER, has routinely been used for numerous water policy, planning and operational decisions outside of CERP, including Minimum Flows and Levels, Adaptive Protocols, and Total Maximum Daily Loads.	Thank you for the comment.
PBC-4	5/28/2020	Both the St. Lucie Estuary (SLE) and Caloosahatchee River Estuary (CRE) have different issues than LWL and do deserve a special focus with regard to Lake Okeechobee releases. However, due to extreme stakeholder pressure, these systems have enjoyed major investments by SFWMD, USACE and CERP RECOVER budgets to better understand and mitigate the impacts of damaging freshwater discharges through project implementation and changes to C&SF operations.	Thank you for the comment. The hydrologic models also include these estuaries, whereas we do not have a hydrological model for Loxahatchee Estuary or Lake Worth Lagoon. Project-level performance measures have been developed as-needed for Loxahatchee, and for LOSOM, the team is working on project-level metrics to address LOSOM impacts to LWL.
PBC-5	5/28/2020	The level of refinement and detail presented for the SLE and CRE in the Draft Performance Measure (PM) underscores the significant advantage that these investments have had on these two ecosystems and illuminate the discrepancy that exists between L WL and other coastal systems within South Florida. Knowledge and understanding of LWL science needs to be continued and expanded, not discarded.	SFWMD staff has been coordinating with Palm Beach County staff and provided details on the modeling and data requirements needed to update a hydrodynamic salinity model for the LWL, which is to be written as an Action Plan in the upcoming LWL Management Plan update as a high-priority task for restoration practitioners. We agree that LWL science needs to be continued and expanded, but that is not currently within the scope of RECOVER workplan tasks. RECOVER has focused science efforts to develop science and tools supporting CERP projects in planning, design, and construction, as described in the CERP Integrated Delivery Schedule (IDS).
PBC-6	5/28/2020	History has shown that ecosystems with less science are often subject to operational decisions and environmental outcomes that are less advantageous to those ecosystems. Accordingly, ecosystems excluded from CERP RECOVER PMs are at a distinct disadvantage when making system-wide C&SF operational recommendations, including operations related to Lake Okeechobee.	This RECOVER PM is only one tool to be used by the team looking at Lake Okeechobee operations within LOSOM. Project teams have been encouraged to develop project-level performance metrics for those ecosystems not currently included in the existing scope of system-wide restoration science.
PBC-7	5/28/2020	It is undeniable that LWL is impacted by C&SF Project and Lake Okeechobee operations as both the L-8 and C-51 Canals are major C&SF outlets that convey Lake Okeechobee discharges to LWL. The C-51 Canal is a critical element of the C&SF Project and this fact has long provided a scientific nexus for both the evaluation of ecosystem health and subsequent restoration efforts as they relate to water management operations, including the USACE Section 1135 Continuing Authorities Program.	Lake Worth Lagoon is impacted by the C&SF project, and Lake Okeechobee Operations indirectly affect C-51 Canal and S-155 operations that can impact LWL. The LOSOM evaluation and CAP projects may impact LWL, and the LOSOM team is currently working with the County to develop a project-level performance metrics for schedule evaluation.
PBC-8	5/28/2020	Therefore, the removal of LWL from the proposed Draft CERP RECOVER Northern Estuaries Salinity Envelope PM due to the lack of a planned CERP project intended to address LWL is especially alarming since this Draft CERP RECOVER PM is proposed for use in the ongoing Lake Okeechobee System Operation Manual (LOSOM) effort, which your agency has determined not to be a CERP project.	RECOVER focuses solely on CERP projects. Removal of LWL from the CERP RECOVER Northern Estuaries region was done because there is no longer a CERP scheduled project that impacts LWL. That does not mean that there are other non-CERP and operation projects that would affect LWL in the forseeable future, but that RECOVER is not the program to look at those impacts. LOSOM will be using RECOVER PMs where they are appropriate, but many other tools and PMs are being employed, or in fact developed as deemed necessary, for this non-CERP activity. The LOSOM team is working on project-level metrics to address impacts to LWL.
PBC-9	5/28/2020	LWL was originally included in the Northern Estuaries as part of the Comprehensive Everglades Restoration Plan (CERP) North Palm Beach County-Part 1 project and was subject to evaluation with the NE-2 Lake Worth Lagoon Salinity Envelope PM. Both the original NE-2 PM and subsequent 2007 Northern Estuaries Salinity Envelope PM included specific flow limitations to achieve salinity targets within LWL of 23 parts per thousand (ppt) and 20 ppt, respectively. Flow limitations focused on maintaining inflows under 500 cubic feet per second (cfs) and eliminating high flow (~1,000 cfs) events into LWL that could result in extended periods of damaging low salinity and poor turbidity.	These PMs were developed with the best science at the time, and have been provided to the LOSOM team. The IMC has addressed the limitations of the RSM model to simulate flows in this area, as well as within the temporal scale as defined by those earlier PMs. The LOSOM team is working on project-level metrics to address impacts to LWL.
PBC-10	5/28/2020	Such a flow regime would include limited positive flow into LWL (0 - 500 cfs) during the dry season (November - May) and the elimination of long periods of high flow during the wet season (June - October). This is requested to protect the ecological resources and water quality within the LWL, as well as to ensure that L WL is not subject to undesirable and ecologically damaging high flow conditions and associated salinity extremes resulting from any potential future management decisions to redirect Lake Okeechobee releases away from the SLE or CRE.	These PMs were developed with the best science at the time, and have been provided to the LOSOM team. The IMC has addressed the limitations of the RSM model to simulate flows in this area, as well as within the temporal scale as defined by those earlier PMs. The LOSOM team is working on project-level metrics to address impacts to LWL.
PBC-11	5/28/2020	A CERP RECOVER PM for the LWL remains an important consideration for regional water management planning and decision making. Removing LWL from the Draft PM would be shortsighted from a system-wide perspective and would result in the loss of a key variable to accurately gauge ecological response to CERP Projects and C&SF Project (including Lake Okeechobee) operations. While the focus of the CERP RECOVER Draft PM is clearly on the SLE and CRE, LWL needs to be referenced as an affected environment and afforded previous considerations by being included within the PM to maintain a suitable flow regime and salinity conditions. At a minimum, the Draft PM should not supersede NE-2 Lake Worth Lagoon Salinity Envelope, as the Draft PM clearly does not address this resource area and incorrectly states that it does in Section 6 (Notes) of the subject PM.	LWL is an important piece for regional water management planning. However, there are no CERP projects currently scheduled for planning or implementation that would effect LWL. RECOVER prioritized its resources to evaluate and assess impacts affected by CERP projects identified in the IDS. The South Florida Ecosystem Restoration Task Force's Science Coordination Group is responsible for the coordination of science for all of the south Florida projects, not just CERP, and that group and any other non-CERP projects that are impacting LWL should be broached with this group to expand on the science and restoration targets for LWL.
Martin County (MC)			

MC-1	5/28/2020	The 2020 draft revision of the RECOVER salinity performance measure is a vast improvement over the 2007 version. The time and effort that the Northern Estuaries Team put into the performance measure update is apparent and much appreciated. Strengths of the updated version include the identification of new flow and salinity categories (optimal, stressful and damaging), use of a common modeling platform to relate flow and salinity, and definition of evaluation criteria that will be used to assess CERP Projects. Comments on the February 2020 Draft were previously provided to the RECOVER Northern Estuaries Team. Many of these comments have been adequately addressed in this new version.	Thank you for the comment.
MC-2	5/28/2020	A few clarifications, detailed below, would improve the April Draft, these include: providing statistical measures of the uncertainty in CH3D model predictions of salinity, clear definition of how 14-day average salinities were computed, clear description of how the flow boundary between stressful and damaging flows (For the St. Lucie: 1700 cfs) was derived and justification of the evaluation targets for stressful (no more than 2) and damaging (no more than 1) flow events in a 51-year period of record.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
MC-3	5/28/2020	Lastly, the previously supplied thoughts on application of the performance criteria to LOSOM are reiterated and expanded.	Thank you for the comment.
MC-4	5/28/2020	CH3D Model: The CH3D is a numeric model that can represent hydrodynamic processes occurring in an estuary including vertical and horizontal transport. In the current draft, an additional appendix, Appendix A, detailing the CH3D hydrodynamic model has been added and many aspects of its use in deriving flow envelopes have been clarified in the CERP System-wide Performance Measure Documentation Sheet. In short, a 51-year record (1965-2015) of daily freshwater inflow, tides and other climatic data were used as input to drive the model. Freshwater inflows, used as input, were a combination of flows measured at coastal structures (e.g. S-79) and modeled inflows for ungauged sources (e.g. tidal basins). The CH3D model output was a 51- year POR of "14-day averaged" (see Appendix A: lines 40-41) salinity for each cell in the model grid. Neither the February nor April draft sufficiently discussed uncertainty in model predictions, particularly of salinity. It is claimed that "Uncertainty associated with the CH3D model validation of modeled versus observed salinity is very low (R >0.9; Appendix A)" (see lines 805-806 in Documentation Sheet). The CH3D model can predict salinity on many time scales (see lines 42-43 of Appendix A). What time scale is referred to here (e.g. daily salinity, 14-day average salinity, 14-day moving average salinity)? Furthermore, reading of Appendix A will show that no data concerning model uncertainty in the prediction of salinity are presented for either estuary. Since the "major output application for this Salinity Performance Measure was 14- day averaged salinity at every grid cell" (see lines 41-42 of Appendix A), at the very least, uncertainty in prediction of this 14-day average salinity should be presented for both estuaries.	The R^2 are for daily salinities and it's greater than 0.8 at most stations . More details have been added to Appendix A.
MC-5	5/28/2020	A knowledge of model uncertainty is critical for interpretation of results and tells us how much confidence we should have in them. Presenting statistical measures of model uncertainty is standard practice and should be followed here.	Since this is a concern, a table of statistics has been added to Appendix A.
MC-6	5/28/2020	Derivation of Flow Envelopes: The description of the derivation of flow envelopes is much better in this draft, but further clarification is necessary. Using information from the literature and results from laboratory experiments and field monitoring, optimal, stressful, and damaging salinity ranges for each of three indicator species (eastern oyster, shoal grass, tape grass) were identified. These ranges are strongly supported and are a strength of the document.	Thank you for the comment. The main Documentation Sheet includes some added information on the derivation of flow envelopes, specifically, the differentiation between Stress and Damaging Flow Envelopes.
MC-7	5/28/2020	The derivation of the Optimal Flow Envelopes is described in Appendix B: A Conceptual Habitat Area-Based Approach for Flow Envelope Alternatives. The area in each estuary that experienced optimal salinities under the 2007 PM flow envelopes was calculated. For the St. Lucie, the 2007 PM envelope was 350 to 2000 cfs. The upper bound and lower flow bounds were incrementally adjusted, with area of optimal salinity being calculated for each adjustment. This analysis resulted in a series of sensitivity curves showing the change in area of optimal salinity as a function of different upper and lower envelope bounds, relative to the 2007 PM area. This analysis was conducted for each indicator with final selection of an envelope that "best balanced benefits across all species" (see Appendix B lines 90-91). For the St. Lucie, "Selecting Optimum Flow Envelope alternatives for the SLE was straightforward in that shoal grass was not a sensitive indicator for the flow envelopes tested "(see lines 98-99 Appendix B). Flow envelopes for the St. Lucie were ostensibly based on salinity tolerances of shoal grass and oysters. Since shoal grass turned out to be an insensitive indicator, the Optimum Flow envelope for the St. Lucie is arguably based only on salinity tolerances of the Eastern Oyster.	We agree with this statement. Text in the main Documentation Sheet as well as Appendix B and C include how the SLE would benefit from additional ecological indicators that are sensitive to different flows.

MC-8	5/28/2020	A few thoughts are offered in this regard. It can be reasonably argued that the restoration of the St. Lucie estuarine ecosystem is primarily based on restoring oysters, which amounts to single species management. The document does state that the indicator species chosen “perform a key function in an ecosystem including the provision of habitat as living spaces, refugia, and foraging ground for other desirable species” (see lines 244-245 in Documentation Sheet). The RECOVER team should add a paragraph detailing the ecosystem services provided by oyster reefs and SAV beds. This would only take a sentence or two for each indicator. Further, a project to identify additional sensitive indicators in the St. Lucie should be added to the supporting science program (See Appendix C).	Oysters and SAV were both selected as eco indicators based on the EPA's valued ecosystem component (VEC) approach, which as stated here aims to focus on those which "perform a key function in an ecosystem including the provision of habitat as living spaces, refugia, and foraging ground for other desirable species." Added additional information regarding the ecosystem services provided by oysters and SAV in Section 2.1 in the main Documentation Sheet.
MC-9	5/28/2020	To derive stressful and damaging flow ranges: “The same modeling exercise was conducted for incremental ranges of flow greater than the Optimum Flow Envelope for the SLE and CRE. The manner in which Stress Flows and Damaging Flows were differentiated was based on resulting salinity maps where salinities were within the Stress Salinity Envelope and Damaging Salinity Envelope (Table 1), respectively” (see lines 684-687 of Documentation Sheet). This is the only description of the derivation of Stressful and Damaging flows given in the Documentation Sheet or in Appendix B and it is too vague. More clarification of what is meant by “The same modeling exercise was conducted for incremental ranges of flow greater than the Optimum Flow Envelope for the SLE and CRE.” While it is easy to determine the area of a particular salinity range at any given flow, how was the flow boundary between stressful and damaging flows determined?	Some additional work was included in the Documentation Sheet to explain this process. Generally speaking, changes in salinity in different reaches of the estuary were compared using the salinity maps. A precautionary approach was used based on 1) extent of the "stress" or "damaging zone" generated from each alternative flow envelope and 2) evaluating salinity in areas where current populations of indicator species are supported, areas of transition, or where ecological impacts can be detected based on the current RECOVER monitoring/sampling.
MC-10	5/28/2020	Salinity Average: The use of a standard averaging period (14-days) for flow and salinity for both estuaries is important and a strength of the revised performance measures. It is equally important to justify this averaging period. In other words, why was it chosen? Why is it more relevant than a 7-day, 21-day or monthly averaging period? For example, the document states that the average residence time of water in the St. Lucie Estuary is 7-days. Based on this information wouldn’t a 7-day average salinity be more representative of conditions that the indicator species experience in the St. Lucie? Lack of such justification was a deficiency of the February Draft as well.	14 days (rather than 1 month) was chosen so as to be conservative to the tolerance of organisms such as vulnerable life history stages (e.g., oyster larvae) to tolerance outside the optimum envelope. While some indicator species such as SAV, that have below ground biomass, which can help to last through prolonged periods of stress, or adult oysters, which may tolerate longer periods of stress, the 14-day was chosen as an ecological response threshold for the more sensitive life history stages of one of the indicators.
MC-11	5/28/2020	It is equally important to accurately define how the average was calculated as this will allow independent verification of salinity and flow performance by stakeholders. In the documentation sheet, the salinity average is described as a 14-day moving average 10 times and as a 14-day average 2 times. In Appendix A, model output is described as a 14-day average.	We worked on consistency throughout the text. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
MC-12	5/28/2020	A moving average is a method for smoothing a time series by averaging a fixed number of consecutive terms. The averaging “moves” over time, in that each point in the time series is sequentially included in the averaging, while the oldest data point in the span of the average is removed. For example, the POR begins on Jan 1, 1965. The first 14-day moving average would include salinities for Jan 1 through Jan 14, the second moving average would include Jan 2 through Jan 15, the third average would include Jan 3 through Jan 16 and so on.	14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion. For a field output that covers every model grid, the CH3D model does not have an output for moving average
MC-13	5/28/2020	In Appendix B, the salinity average is defined mathematically as “S is salinity averaged over a 14-day period, and i is the number of 14-day periods counted from January 1, 1965.” (see lines 48-49 in Appendix B). This definition implies that the time series has been divided into consecutive, nonoverlapping 14-day periods and an average of salinity (or flow) calculated for each 14-day period. This is not a moving average. Rather, it is a 14-day average (analogous to a monthly average, weekly average, or daily average). For example, the first 14-day average would include salinities from Jan 1, 1965 through Jan 14, the second average would include Jan 15 through Jan 28 and the third Jan 29 through February 11.	14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion. For a field output that covers every model grid, the CH3D model does not have an output for moving average
MC-14	5/28/2020	It is imperative that somewhere in the Documentation Sheet a definition of 14-day average be given so that PM’s may be calculated and independently verified by all interested parties.	14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion. For a field output that covers every model grid, the CH3D model does not have an output for moving average.

MC-15	5/28/2020	Evaluation: This most recent draft includes an expanded discussion of how the performance measures and other related data that will be used to evaluate CERP projects and progress towards restoration. Table 3, which summarizes the evaluation measures, is an excellent addition. The spreadsheet of monthly average flows is a great tool for evaluating the timing and duration of stressful and damaging events. However, some concerns raised during review of the February draft remain. The updated performance measures address the frequency and duration of Stress and Damaging Flows with the following statement (see lines 38-44 of the Documentation Sheet): "For the purposes of CERP project alternative evaluation, the distribution of 14-day moving average flows over the 50-year modeling period of record (POR) in each Flow Envelope will be generated from the Regional Simulation Model (-Basins [RSM-BN]). Ideally, project alternative simulations over the POR would yield no more than two (2) consecutive 14-day moving average flow periods in the Stress Flow Envelope, and no more than one (1) consecutive 14-day moving average flow periods in the Damaging Flow Envelope, in either the SLE or CRE. More Optimum Flows and fewer repeated Stress or Damaging Flows are better." 1. "14-day moving average" should be changed to "14-day average". 2. "50-year modeling period" should be changed to "51-year modeling period" as the period Jan 1, 1965 – December 31, 2015 encompasses 51 years. 3. The basis for the frequency of 2 stress events and 1 damaging flow event over the POR should be justified. Currently, these constraints seem arbitrary and require some ecological justification.	Edits and additional information pertaining to the point #3 has been added in Section 3, Evaluation Application.
MC-16	5/28/2020	The addition of Figure 5, showing an example of RSM model output of the evaluation criteria addresses another concern raised during the review of the February Draft. However, it would be instructive to know which alternatives of which CERP projects are being compared. This would add some realism to the results depicted in the figure which are now lacking.	RSM model outputs based on the updated Optimum Flow Envelope for expected performance using four condition simulations (2 "existing", pre- and post-LORS 2008; and 2 "future" conditions which include currently authorized CERP project implementation), have been added to both the main Documentation Sheet (Section 3) and Appendix B
MC-17	5/28/2020	Application to LOSOM: The review of the February Draft included some thoughts regarding application of these performance measures to the LOSOM project. They are reproduced and expanded here.	Thank you for the comment.
MC-18	5/28/2020	The revised RECOVER Salinity Performance Measures are certainly applicable to LOSOM and can be used to help distinguish between alternative Lake Regulation Schedules. However, the lower bound for Damaging Flows for both systems is relatively low when compared to the range of high deleterious flows that these systems experience. In short, high flows that may be damaging to downstream lagoons (e.g. Indian River), Bays (e.g. San Carlos) and offshore ecosystems are not identified or quantified. The frequency and duration of such flows is an important consideration in formulating and choosing a regulation schedule for Lake Okeechobee. Because the lower limit for damaging flows is 1700 cfs, the PMs do not address or permit evaluation of the higher flows that the St. Lucie experiences.	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
MC-19	5/28/2020	The Documentation Sheet (lines 749-750) states that "Additional flows were modeled in iterations of several hundred cfs between 1700–3000 cfs, none of which caused Damaging salinities to move downstream of the US1 Roosevelt Bridge for either indicator species." Comments on the February Draft noted that these results seemed at variance with previous modeling and empirical analysis of salinity-flow relationships in the SLE. We also know however, that freshwater discharges do in fact cause damage below the US1 Bridge, in the middle and lower estuary, the Indian River Lagoon and offshore. As a rule of thumb, as freshwater discharge increases stressful and damaging salinities are translated down-stream and the area of the estuary that is negatively impacted by these flows increases. According to the CH3D model, what are damaging and/or stressful flows to these areas?	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
MC-20	5/28/2020	The RECOVER Salinity PM will have to be expanded in order to fairly assess alternative Lake Regulation Schedules because the PM does not address higher flows that cause stress and damage to areas downstream of the US1 Bridge. As flows increase above the current high flow boundary of 1700 cfs, the area impacted downstream increases progressively (i.e. 3500 cfs will affect a larger area than 1750 cfs). The current PM does not quantify this progressive damage. Two weeks of flow at 1750 cfs is equivalent to two weeks of flow at 3500 cfs, despite the fact that 3500 cfs will affect a larger area.	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
MC-21	5/28/2020	It is recommended that high flow categories, at flows greater than 1700 cfs be established for areas beyond the SLR, which are impacted by freshwater discharges to the SLE, including the IRL and areas offshore of the St. Lucie Inlet. We suggest starting with the following flow categories (in cfs): <150 – Stressful 150 -1400 -Optimal 1400 – 1700 Stressful 1700 – 4000 Damaging Lower Estuary > 4000 Damaging Indian River Lagoon and Offshore Reef Resources	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.

MC-22	5/28/2020	The 4000 cfs limit for damaging flows to the IRL and offshore areas is based on an analysis of salinity data from the FAU Harbor Branch LOBO monitoring network (spanning 2015 to present) and daily flows reported by SFWMD at structures that discharge to the SLE (S-80, S-48, S-49 and S-71). Figures 1 and 2 present a comparison of daily average salinity data to total daily flow into the St. Lucie Estuary from all measured sources over the last several years. The dashed lines show the prediction interval (PI) of the linear fit of the data, and contain 95% of the measured values. As a 'first cut' we recommend that the lower salinity range represented by the PI would be appropriate limits for "high flow" model scenarios.	Thank you for the figure. We will be sure to look at these figures and consult as we move forward - please see the previous comments.
MC-23	5/28/2020	From the stand-point of protecting various resources, the following limits are recommended: seagrass in the Indian River Lagoon less than 20 ppt salinity on average and offshore coral in the Atlantic Ocean off the St. Lucie Inlet station of less than 25 ppt salinity on average. It is assumed that flows that would drop average salinity values below these levels would be damaging to ecological resources in the region seaward of the St. Lucie Estuary. Both criteria indicate a maximum total freshwater inflow of 4,000 cfs to ensure protection of the lower estuarine and offshore waters. However, the RECOVER team should consult with their seagrass and coral reef experts to determine whether these resources can tolerate these lower salinities (particularly the corals), even for a short period. (see figure in letter)	Thank you for the figure. We will be sure to look at these figures and consult as we move forward - please see the previous comments.
MC-24	5/28/2020	Analysis of Freshwater Inflow Sources: Martin County has always advocated that local basin and groundwater input to the estuary is more than sufficient to support estuarine health. We asked our consultants at Applied Coastal to assist us in demonstrating this point. Daily average flow data were accessed from the SFWMD DBHYDRO environmental database, for stations at • S-308 (C-44 canal at Lake Okeechobee), • S-80 (C-44 canal at St Lucie River lock and dam), • S-48 (C-23 discharge to Bessey Creek), • S-49 (C-24 discharge to north fork of St Lucie River) and • S-71-1 (Ten Mile Creek at Gordy Road).	The model has input from S-80, S-48, S-49 and Gordy Road, plus tidal basin runoff. Flow sources at S-80 flow can be from S-308 and/or C-44 basin. The separation of the two sources is a separate issue.
MC-25	5/28/2020	The maximum coterminous record from these five stations is between July 1999 and present, which is the maximum duration of measurements available from the Ten Mile Creek gauging station. Daily total freshwater discharge to the SLE was determined with and without flows from Lake Okeechobee. Discharges from S-80 are a combination of runoff from the C-44 watershed and discharges from Lake Okeechobee via S-308. The flow contribution from the C-44 watershed was separated from the discharge from Lake Okeechobee at S-308 in order to determine what the flow through S-80 to the SLE would result with the Lake discharge removed from the total flow.	The model has input from S-80, S-48, S-49 and Gordy Road, plus tidal basin runoff. Flow sources at S-80 flow can be from S-308 and/or C-44 basin. The separation of the two sources is a separate issue.
MC-26	5/28/2020	In addition to the measured flows, an average direct groundwater discharge to SLE of 150 cfs was added to the daily flow input of the estuary, based on the proposed RECOVER flow envelope minimum (USACE, 2020).	This groundwater is included in tidal basin runoff which is estimated by an independent tidal basin model.
MC-27	5/28/2020	The 14-day running average of the total measured freshwater flow to the SLE with and without Lake O discharges are presented in Figures 3 and 4, respectively. In these plots, the RECOVER flow envelope maximum for the updated optimum salinity envelope (1400 cfs) is plotted with the daily running 14-day average flow. A 14-day running average was used in this comparison to be consistent with the averaging method used in the RECOVER analysis to determine the relative performance of the modeled scenarios. To reiterate the point made previously, the averaging methodology utilized in the RECOVER analysis is not clearly defined nor consistently described, but a 14-day running average for these plots was used. (See figures in letter)	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
MC-28	5/28/2020	Using the 14-day running average of total freshwater flow to SLE, the percentage of time when the 1400 cfs minimum flowrate for stressful salinity conditions, and the 1700 cfs minimum flowrate for damaging conditions (as specified by the updated RECOVER analysis) were determined (Table 1). Table 1. Average annual percent time and number of days when RECOVER limits for stressful (1400 cfs) and damaging (1700 cfs) flow conditions have been exceeded from 1999 to present, with and without Lake O discharges to the C-44 canal. Scenario Avg. % exceeded per year Avg. days per year exceeded 1400 cfs, no Lake O 15.2 55 1400 cfs, with Lake O 25.1 92 1700 cfs, no Lake O 10.6 39 1700 cfs, with Lake O 19.1 70 In addition to the above statistics, an evaluation of long-term freshwater flow exceedance also was developed. Figure 5 represents the total daily flow exceedance for all freshwater entering the St. Lucie Estuary from both watersheds and Lake Okeechobee. At present, the flows exceeded on an annual basis are in excess of the targeted salinity envelope presented in the RECOVER document. In addition, the watershed flows without contributions from the Lake also exceed the target envelope, based on average annual flow values. Therefore, it is anticipated that future RECOVER efforts will need to prioritize reducing discharges from Lake Okeechobee, as well as 'unnatural' discharges from the expanded/channelized watershed, to effectively restore the St. Lucie Estuary and surrounding waterbodies.	Some additional information, including RSM model outputs based on the updated Optimum Flow Envelope for expected performance using four condition simulations (2 "existing", pre- and post-LORS 2008; and 2 "future" conditions which include currently authorized CERP project implementation), have been added to both the main Documentation Sheet (Section 3) and Appendix B. We do see an expected reduction in damaging flow events triggered by Lake Okeechobee Regulatory Releases, likely an impact of additional storage made available with the implementation of the aforementioned CERP projects. We also address in Appendix C that additional work is needed to identify tools for setting flow targets based on inflow sources (i.e. Lake Regulatory Releases vs. basin runoff).

MC-29	5/28/2020	It should be noted that high flow conditions (e.g. the 20-year events) can have freshwater inflow values in excess of 10-times the value that will be ecologically damaging to the upper estuarine waters. The influence of these frequent high sustained freshwater inflows into the estuary also should be considered as part of the RECOVER evaluation. (See figure in letter)	This is interesting information that we will take into account as we continue to identify tools and available data to further revise this PM. We agree that the return frequency of these major damaging flow events (e.g. 20-year, 100-year events) should be considered in future updates - namely, can we predict the ecological response for different scenarios in which these flow events are more of less frequent in the future? This will also be important as it relates to future climate.
MC-30	5/28/2020	Martin County is confident that the RECOVER Salinity Performance Measure will be a valuable tool in the LOSOM alternative evaluation process, and we kindly ask that our review and recommendations are considered during that process. We will continue to remain engaged to advocate for the most effective use of this performance measure in practice. We thank you for the opportunity to provide feedback and sincerely appreciate your efforts in developing this performance measure. Should you or your staff have any questions, please do not hesitate to contact me.	Thank you for the comment.
Lee County, City of Sanibel and City of Cape Coral (LC)			
LC-1	5/23/2020	The April 2020 draft revision of the RECOVER salinity performance measure is a vast improvement over the 2007 version. The time and effort that the Northern Estuaries Team put into the performance measure update is apparent and much appreciated. Comments on the February 20202 Draft were previously provided to the Northern estuaries RECOVER Team and changes made in April Draft address many of them. Prominent among the improvements is the addition of Appendix A which provides details of the CH3D hydrodynamic model and an expanded discussion of the process and measures that will be used to evaluate CERP Projects and RSM Model output. The latter is relevant to LOSOM.	Thank you for the comment
LC-2	5/23/2020	A few clarifications, detailed below, would improve the April Draft, These include: providing statistical measures of the uncertainty in CH3D model predictions of salinity, clear definition of how 14-day average salinities were computed, clear description of how the flow boundary between stressful and damaging flows (for the Caloosahatchee 2600 cfs) was derived and justification of the evaluation targets for stressful (no more than 2) and damaging (no more than 1) flow events in a 51-year period of record. Lastly, comments on application of the performance criteria to LOSOM are presented.	More statistics on daily salinity will be added to Appendix A. Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-3	5/23/2020	General Comments: The 2020 draft revision of the RECOVER salinity performance measure is a vast improvement over the 2007 version. The time and effort that the Northern Estuaries Team put into the performance measure update is apparent and much appreciated. Strengths of the updated version include: identification of new flow and salinity categories (optimal, stressful and damaging), use of a common modeling platform to relate flow and salinity and definition of evaluation criteria that will be used to assess CERP Projects. Comments on February 2020 Draft were previously provided to the RECOVER Northern Estuaries Team. Many of these comments have been adequately addressed in this new version.	Thank you for the comment
LC-4	5/23/2020	CH3D Model: The CH3D is a numeric model that can represent hydrodynamic processes occurring in an estuary including vertical and horizontal transport. In the current draft, an additional appendix, Appendix A, detailing the CH3D hydrodynamic model has been added and many aspects of its use in deriving flow envelopes have been clarified in the CERP System-wide Performance Measure Documentation Sheet. In short, a 51-year record (1965-2015) of daily freshwater inflow, tides and other climatic data were used as input to drive the model. Freshwater inflows, used as input, were a combination of flows measured at coastal structures (e.g. S-79) and modeled inflows for ungauged sources (e.g. tidal basins). The CH3D model output was a 51-year POR of "14-day averaged" (see Appendix A: lines 40-41) salinity for each cell in the model grid.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-5	5/23/2020	The February draft did not sufficiently discuss uncertainty in model predictions, particularly of salinity. A knowledge of model uncertainty is critical for interpretation of results and tells us how much confidence we should have in them. Presenting statistical measures of model uncertainty is standard practice and should be followed here. It is claimed that "Uncertainty associated with the CH3D model validation of modeled versus observed salinity is very low (R2>0.9; Appendix A)" (see lines 805-806 in Documentation Sheet). The CH3D model can predict salinity on many time scales (see lines 42-43 of Appendix A). What time scale is referred to here (e.g. daily salinity, 14-day average salinity, 14-day moving average salinity)? Furthermore, reading of Appendix A will show that no data concerning model uncertainty in the prediction of salinity are presented for either estuary. Since the "major output application for this Salinity Performance Measure was 14- day averaged salinity at every grid cell" (see lines 41-42 of Appendix A), at the very least, uncertainty in prediction of this 14-day average salinity should be presented for both estuaries.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-6	5/23/2020	Derivation of Flow Envelopes: The description of the derivation of flow envelopes is much better in this draft, but further clarification is necessary. Using information from the literature and results from laboratory experiments and field monitoring, optimal, stressful, and damaging salinity ranges for each of three indicator species (eastern oyster, shoal grass, tape grass) were identified. These ranges are strongly supported and are a strength of the document.	See below response to comment LC-10.

LC-7	5/23/2020	The derivation of the Optimal Flow Envelopes is described in Appendix B: A Conceptual Habitat Area-Based Approach for Flow Envelope Alternatives. The area in each estuary that experienced optimal salinities under the 2007 PM flow envelopes were calculated. For the Caloosahatchee this was 450 to 2800 cfs. The upper bound and lower flow bounds were incrementally adjusted, with area of optimal salinity being calculated for each adjustment. This analysis resulted in a series of sensitivity curves showing the change in area of optimal salinity as a function of different upper and lower envelope bounds, relative to the 2007 PM area. This analysis was conducted for each indicator with final selection of an envelope that "best balanced benefits across all species" (see Appendix B lines 90-91). The indicator specific analysis is understandable. I did not find an explanation of the process used to select the optimal envelope that "best balanced benefits across all species" either in Appendix B or in the Documentation Sheet. How was this final selection accomplished?	Some additional editing was done in Appendix B to further explain this process.
LC-8	5/23/2020	To derive stressful and damaging flow ranges: "The same modeling exercise was conducted for incremental ranges of flow greater than the Optimum Flow Envelope for the SLE and CRE. The manner in which Stress Flows and Damaging Flows were differentiated was based on resulting salinity maps where salinities were within the Stress Salinity Envelope and Damaging Salinity Envelope (Table 1), respectively" (see lines 684-687 of Documentation Sheet). This is the only description of the derivation of Stressful and Damaging flows given in the Documentation Sheet or in Appendix B and it is too vague. More clarification of what is meant by "The same modeling exercise was conducted for incremental ranges of flow greater than the Optimum Flow Envelope for the SLE and CRE." While it is easy to determine the area of a particular salinity range at any given flow, how was the flow boundary between stressful and damaging flows determined?	Some additional work was included in the Documentation Sheet to explain this process. Generally speaking, changes in salinity in different reaches of the estuary were compared using the salinity maps. A precautionary approach was used based on 1) extent of the "stress" or "damaging zone" generated from each alternative flow envelope and 2) evaluating salinity in areas where current populations of indicator species are supported, areas of transition, or where ecological impacts can be detected based on the current RECOVER monitoring/sampling.
LC-9	5/23/2020	Salinity Average: The use of a standard averaging period (14-days) for flow and salinity for both estuaries is important and a strength of the revised performance measures. It is equally important to justify this averaging period. In other words, why was it chosen? Why is it more relevant than a 7-day, 21-day or monthly averaging period? For example, the document states that the average residence time of water in the St. Lucie Estuary is 7-days. Based on this information wouldn't a 7-day average salinity be more representative of conditions that the indicator species experience in the St. Lucie. Lack of such justification was a deficiency of the February Draft as well.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-10	5/23/2020	It is equally important to accurately define how the average was calculated as this will allow independent verification of salinity and flow performance by stakeholders. The salinity average is described as a 14-day moving average 10 times and as a 14-day average 2 times in the documentation sheet. In Appendix A, model output is described as a 14-day average.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-11	5/23/2020	A moving average is a method for smoothing a time series by averaging a fixed number of consecutive terms. The averaging "moves" over time, in that each point in the time series is sequentially included in the averaging, while the oldest data point in the span of the average is removed. For example, the POR begins on Jan 1, 1965. The first 14-day moving average would include salinities for Jan 1 through Jan 14, the second moving average would include Jan 2 through Jan 15, the third average would include Jan 3 through Jan 16 and so on.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-12	5/23/2020	In Appendix B, the salinity average is defined mathematically as "S is salinity averaged over a 14-day period, and i is the number of 14-day periods counted from January 1, 1965." (see lines 48-49 in Appendix B). This definition implies that the time series has been divided into consecutive, non-overlapping 14-day periods and an average of salinity (or flow) calculated for each 14-day period. This is not a moving average, rather it is a 14-day average (analogous to a monthly average). For example, the first 14-day average would include salinities from Jan 1, 1965 through Jan 14, the second average would include Jan 15 through Jan 28 and the third Jan 29 through February 11.	14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion. For a field output that covers every model grid, the CH3D model does not have an output for moving average
LC-13	5/23/2020	It is imperative that somewhere in the Documentation Sheet a definition of 14-day average be given so that PM's may be calculated and independently verified by all interested parties.	Performance statistics have been added to Appendix A. 14-day salinity was computed every 14-days, but it's not a moving average. The flow data is based on 14-day moving average. Edits have been made throughout the documents to be consistent with this fact and clarify any confusion.
LC-14	5/23/2020	Evaluation: This most recent draft includes an expanded discussion of how the performance measures and other related data that will be used to evaluate CERP projects and progress towards restoration. Table 3, which summarizes the evaluation measures, is an excellent addition. The spreadsheet of monthly average flows is a great tool for evaluating the timing and duration of stressful and damaging events. However, some concerns raised during review of the February draft remain.	Thank you for the comment.
LC-15	5/23/2020	The updated performance measures address the frequency and duration of Stress and Damaging Flows with the following statement (see lines 38-44 of the Documentation Sheet) 1. "14-day moving average" should be changed to "14-day average". 2. "50-year modeling period" should be changed to "51-year modeling period" as the period Jan 1, 1965 – December 31, 2015 encompasses 51 years. 3. The basis for the frequency of 2 stress events and 1 damaging flow event over the POR should be justified. Currently, these constraints seem arbitrary and require some ecological justification.	Edits and additional information pertaining to the point #3 has been added.

LC-16	5/23/2020	The addition of Figure 5, showing an example of RSM model output of the evaluation criteria addresses another concern raised during the review of the February Draft. However, it would be instructive to know which alternatives of which CERP project are being compared. This would add some realism to the results depicted in the figure which are now lacking.	RSM model outputs based on the updated Optimum Flow Envelope for expected performance using four condition simulations (2 "existing", pre- and post-LORS 2008; and 2 "future" conditions which include currently authorized CERP project implementation), have been added to both the main Documentation Sheet (Section 3) and Appendix B.
LC-17	5/23/2020	The review of the February Draft included some thoughts regarding application of these performance measures to the LOSOM project. They are reproduced here.	Thank you for the comment
LC-18	5/23/2020	The revised RECOVER Salinity Performance Measures are certainly applicable to LOSOM and can be used to help distinguish between alternative Lake Regulation Schedules. However, the lower bound for Damaging Flows for both systems is relatively low when compared to the range of high deleterious flows that these systems experience. In short, high flows that may be damaging to downstream lagoons (e.g. Indian River), Bays (e.g. San Carlos) and offshore ecosystems are not identified or quantified. The frequency and duration of such flows is an important consideration in formulating and choosing a regulation schedule for Lake Okeechobee.	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
LC-19	5/23/2020	Another reason for adding additional flow ranges or "bins" for LOSOM analysis is that a considerable amount of information is left unused by the RECOVER PMs. In my experience (formulation of LORS2008, Adaptive Protocols) the flow distributions, with 3 or 4 bins are fairly good at distinguishing between different Lake Schedules such as WSE and LORS2008. These distributions are less helpful at distinguishing between alternatives of the same schedule (e.g. different alternative formulations of LORS2008). Often differences are small, 2 or 3 months in a given flow category. Whether such differences would have an ecological effect can become a matter of considerable debate.	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
LC-20	5/23/2020	The categories below are suggested as a starting point, but these should be evaluated using the CH3D Model. This will ensure that any flow categories added for the LOSOM effort are commensurate with the RECOVER Salinity Performance Measure flow categories. <457 cfs: potentially harmful to upper estuary based on current MFL 457 – 750 cfs: Stressful (for upper estuary) 750-2100 cfs: Optimum 2100 – 2600 cfs: Stress 2600 – 4500 cfs damaging to lower estuary (Iona Cove, Sal <5) 4500 – 6500 cfs Damaging to San Carlos Bay (salinity < 20) >6500 cfs:	As a response to comments received from the LOSOM PDT members, additional flow categories in the Damaging Flow envelope and their impacts on the downstream systems (e.g. Indian River Lagoon, San Carlos Bay) will be evaluated during a later step in the LOSOM process. We will be employing CH3D and some older literature for this purpose. Provided time allows, RECOVER could potentially add these additional categories in an addendum to this PM.
City of Stuart (Stuart)			
Stuart - 1	5/28/2020	Optimum flow targets into the SLE should be bifurcated from those considered optimal for the Caloosahatchee as illustrated in the updated 2022 flow envelope goals, but the target flow rates for the SLE still do not harmonize with the restoration of natural flow. Unlike the Caloosahatchee River Basin, no freshwater discharges are required to recharge the natural basin and prevent saltwater intrusion in the SLE. However, freshwater discharge flows to the SLE, even those identified currently as "optimum" have been both stressful and catastrophically damaging to the entire estuarial ecology; indicative of limited data and imperfect science. As a result, SLE optimum flow targets in the 2022 LOSOM should account for natural average runoff rates ONLY and should NOT include any additional discharges from infrastructure managed by either USACE or the SFWMD. Any additional rates of flow above this average should be identified as either the "stress" or "damaging" flows categories. In order to make such necessary adjustments, we request the USACE identify every natural basin and respective flow contribution in order to clearly distinguish between local inflow and freshwater discharged to the SLE from other sources.	RECOVER ecological performance measures are designed to address the health of a given region or indicator. This salinity envelope performance measure addresses the flows and salinities in the St. Lucie and Caloosahatchee River estuaries based on current flows and predicted future flows. Flows from Lake Okeechobee provide significant freshwater flows to both estuaries and impact the salinities, and are measured for the purposes of CERP evaluation. Additional hydrologic outputs from RSM-Basins will provide details as to contributions of Lake Okeechobee Regulatory Releases and basin runoff, and with CERP implementation it is expected that Lake Okeechobee releases will decrease. RECOVER recommends that concerns over Lake Okeechobee regulatory releases be addressed as part of the LORS 2008 Periodic scientist calls and LOSOM planning process to revise the Lake Okeechobee regulatory schedule. We would be interested in seeing the source/citation/etc. for this following statement: " freshwater discharge flows to the SLE, even those identified currently as 'optimum' have been both stressful and catastrophically damaging to the entire estuarial ecology; indicative of limited data and imperfect science." With respect to differentiating Lake Okeechobee Regulatory Releases vs. basin runoff that trigger damaging flow events, these are metrics included in Section 3, Evaluation Application. Appendix A describes where the flow measurements are derived. Optimum could be met completely by basin flow, or from multiple sources. the performance measure is a technical document only and doesn't make operations recommendations. For the purposes of LOSOM, suggestions on additional metrics should be submitted to the LOSOM team.
Stuart - 2	5/28/2020	We also recognize that the salinity envelope PM is not the most appropriate place to identify and measure other water quality factors such as those that cause Harmful Algal Blooms in the modeling associated with this RECOVER performance measure.	This Salinity Performance Measure does not include any other water quality parameters. This PM looks solely at flows and the associated salinities. RECOVER is currently evaluating what other water quality parameters and data are available to develop separate performance measures, e.g., CDOM.
Stuart - 3	5/28/2020	We oppose any implication that assumes the existing catastrophic damage to oyster and grass ecology in the SLE is more a consequence of this unknown variable, than of historic salinity figures from freshwater discharges. While water quality impacts from nutrient pollution is absolutely a contributing factor to environmental degradation in the estuary, we have evidenced year after year during high discharge events, extended periods of less than optimum, stressful, and damaging salinity levels. The priority of the RECOVER assessment should be to restore optimum flow rates to natural flow targets ONLY. However, it is clear the currently drafted optimum flow rate envelope for the SLE is not limited to natural flow alone. This decision we cannot support and must be remedied to provide a performance measure for flows in the SLE that are truly "optimum" for restoring natural baseline conditions.	The watershed and greater landscape have been altered to a degree in which restoring to a pre-drainage condition is not possible due to the competing needs from a number of users. Thus, flow targets as described in this PM are based on flow-salinity relationships that would support the Northern Estuaries ecological indicator species, based on our current knowledge of species response to change in salinity, and as predicted using well-vetted hydrodynamic models (see Appendix A & B). Also, please see the Indian River Lagoon-South PIR/EIS, which provides some additional context to uncertainties around the pre-drainage, historical flow distribution pattern in Annex E. RECOVER recognizes that this PM is only addresses salinity and is limited. RECOVER is currently evaluating what other water quality parameters and data are available to develop new performance measures, e.g., CDOM, dissolved oxygen, etc. Please see Appendix C, which outlines data gaps and what tools are desired to support restoration, including setting targets based on sources of inflow.
Stuart - 4	5/28/2020	We cannot stress enough how important it is to more clearly define measurable targets for "recovery, restoration, and resiliency," of the Saint Lucie Estuary respectively. The system cannot be resilient if it has not been restored with modern protections in place, and it certainly cannot be restored until it has been given the opportunity to recover from decades of disastrous freshwater discharges.	There are a few studies ongoing that address recovery periods needed for organisms such as oysters and SAV which will be built in to future iterations of the Salinity Envelope PM, as well as mechanistic, predictive ecological modeling (and developed into their own PMs). "Recovery," "restoration," and "resiliency" are terms that need to be better defined for RECOVER, CERP, and the greater environmental/ecological restoration community at large, especially in light of climate change and sea level rise. RECOVER did not provide definitions for these in this PM Documentation Sheet, but we recognize its importance and plan to address them as the aforementioned studies are completed, and our science progresses. See Appendix C for where would like to improve/expand our science.

Stuart - 5	5/28/2020	The USACE through the RECOVER program should make meaningful strides to categorize what measurable targets should be achieved from a flow management system to allow for the SLE to first recover, then to be restored - if not practicably to pre-drainage conditions, then at least as close to natural flow conditions as possible. The 2007 Salinity Envelope performance measures established flow envelopes of 350-2000 cubic feet per second from all sources of inflow but failed to distinguish the episodic and temporal nature of not only the flows while they are occurring, but their long-term impacts. In example, through the 2008 LORS, an "optimum" flow rate in the SLE may be comprised of inflow from any and all sources below 1,400 cfs over a 14-day moving average. However, the estuary may experience an extended timeframe of stressful or damaging (low) salinity levels following a major discharge event, irrespective of the 14-day average flow rate. We understand there are experiments in the pipeline designed to answer some of these questions, but we hope these considerations will be included in the 2022 evaluation criteria with a more weighted calculation to the modeling.	As stated, current studies are in the pipeline. Applying this data and information to ecological modeling tools will be key to setting targets associated with the magnitude, duration, and return frequency of stressful and damaging flows in future updates to the performance measure.
Stuart - 6	5/28/2020	We appreciate the revisions to the (RECOVER 2007), which limited salinity impact assessment to species in a singular location within either estuary, which will now account for spatially-explicit components of salinity envelopes relative to the whole system. The additional consideration of frequency and duration of violations outside the desired flow envelopes will more accurately depict human impact to the natural system and allow for a more holistic management effort. With this said, these additional considerations will be limited in desired effect if the optimum flow target PMs for the SLE are still above and beyond what is attributed to inflow from local runoff sources alone.	RECOVER recognizes the need to evaluate magnitude, return frequency, and duration of stressful and damaging flows, and set targets based on these metrics. Please see Appendix C.
Stuart - 7	5/28/2020	The SLE has no ecological need based in science for outside sources of freshwater. Additionally, limited data on groundwater inflows are a primary motivator for the need to provide new "assumptions" in the variable data set accounting for a better estimation of local inflow. From there, we could ensure that this estimated variable could be included with other known inflow data variables to give a more accurate evaluation of natural (not from Lake O.) inflows to the SLE. Whatever the final tabulated 14-day average inflow (cfs) rate is with these new considerations - that rate should be all that is defined as "optimum flow" into the Saint Lucie Estuary. Any inflows and flow rates from other sources in exceedance of this estimated natural inflow should fall within a new category, or one of the other existing categories (stressed/damaging).	Please see response to comment Stuart-3.
Stuart - 8	5/28/2020	For the purpose of evaluating CERP project plans, it makes even less scientific sense to quantify “optimum” flows in the SLE as anything above and beyond that which is contributed from natural or local sources. Water discharged from other sources needs to be quantified and omitted from the optimum flow category for SLE performance. Science has not indicated that flows under 1400 cfs have not stressed or damaged the ecology within the SLE, but observation and data following high-discharge events indicates both. As a 2018 SFWMD Environmental Report states, "In contrast to the CRE, the SLE has different inflow and salinity targets given the differences in estuarine geomorphology, volume, flushing, and inflow characteristics (Buzzelli et al. 2013b). Oyster habitat provides the biotic indicator of salinity and freshwater discharge in the SLE (USACE and SFWMD 2004, Buzzelli et al. 2013d)." (Estuarine Habitats as Indicators of Inflow, page 8C-5, St. Lucie and Caloosahatchee River Watershed Research and Water Quality Monitoring Results and Activities, https://apps.sfwmd.gov/sfwmd/SFER/2018_sfer_draft/v1/chapters/v1_ch8c.pdf). We know as a result of the scientific studies over the past 20 years, and as cited in the RECOVER document, the Eastern Oyster experiences stress / damage at either end of the 5-40 tolerance (salinity) range - and certainly beyond this range. However, it is evident that of the two extremes, the lower salinity has proven far more damaging to oyster health in the SLE with little to no threat of high salinity conditions within the estuarine system, naturally or otherwise. And it is unknown just how destructive historical flow targets have been to the eastern oyster in the SLE due to restoration efforts provided by local researchers and field scientists. While oysters are the primary biotic indicator for the SLE, conversely, based on scientific evidence, it is more prudent to use tape grass as a primary indicator of salinity health and tolerance of the estuarine biology in the Caloosahatchee. Considering these nuances, both estuarial systems deserve individualized approaches and target salinity envelopes. History has shown disastrous results when we refuse to concede to this scientific evidence and instead, apply the same solution broadly.	Previous modeling studies estimating the pre-drainage SLE watershed flows have indeed estimated that even "natural" low flows may have caused stress in oligohaline reaches of the estuary, and the St. Lucie River. Please see Appendix B and the Indian River Lagoon-South PIR/EIS for more information. RECOVER would also caution that there is "little to no threat" of high salinity conditions to oysters. These have not been observed as a function of the hydrologic conditions measured during the period in which we have monitored oysters (i.e. the system has been impacted primarily by these high volume inflows and low salinity conditions), but literature from other systems have well-documented data that suggests higher salinities/hypersaline conditions have negative impacts to oysters and oyster reef habitat. Anecdotal information from the CRE regarding presence of organisms such as the boring sponge (*Cliona* spp.) observed in oysters collected from San Carlos Bay exemplify the potential risk of hypersaline conditions to local populations. It is not scientifically prudent to make generalizations or assumptions about a lack of risk from hypersaline conditions based on a historical dataset in which we do not have oyster monitoring data exposed to said conditions. Finally, we argue that, while the salinity categories as defined in the Documentation Sheet (i.e., Optimum, Stressful, Damaging Salinities) are the same across the ecological indicators found in both estuaries, the approaches are still individualized from an estuary-specific perspective. Modeled salinity throughout each of the estuaries was evaluated for this very purpose; for example, tape grass as an indicator of low flows for the CRE is balanced with oysters as an indicator of high flows, such that we identified a flow regime that is expected to provide substantial benefits to both organisms in their respective reaches throughout the estuarine salinity gradient. For future updates, the PM will continue to provide improvements by utilizing multiple indicators that respond to the oligohaline, polyhaline and mesohaline conditions of a healthy estuary to best inform management and measure performance.
PRIVATE			
United States Sugar Corporation (USSC)			

USSC-1	5/28/2020	**USSC Supports the Comprehensive Everglades Restoration Plan (CERP), including LOSOM's Development as a CERP Lake Operating Manual** As USSC has previously commented, USSC has long supported Everglades restoration and continues this position by actively participating in and supporting LOSOM's development. LOSOM is an opportunity to accomplish all originally authorized Central and Southern Florida Flood Control Project (C&SF Project) purposes and incrementally improve ecologic restoration performance consistent with CERP. LOSOM includes several CERP components and, as a CERP operating manual, will synchronize Lake operation with new infrastructure per alternative evaluations based on CERP performance measures. The C-43 Reservoir and C-44 Reservoir and Stormwater Treatment Areas are examples of new CERP infrastructure that will synchronize, via LOSOM, with existing infrastructure and Lake operation; all are directly related to the subject, draft NE PMs, particularly because the Corps has stated its intent to finalize the NE PM and use it in evaluating LOSOM. Considering Congressional authorizations for the C&SF Project, proposed modified operation for ecologic restoration purposes, evaluating LOSOM using CERP System-Wide Performance Measures such as the NE PM, and operating the Lake together with numerous CERP infrastructure components demonstrates that LOSOM is a CERP operating manual.	RECOVER's mission is to look at CERP projects from a system-wide perspective. LOSOM will be using RECOVER PMs where they are appropriate and that is why they will be using this PM because it does address CERP impacts to the Caloosahatchee and St. Lucie estuaries. However, the LOSOM project itself is not a CERP project.
USSC-2	5/28/2020	**LOSOM's Alternatives Evaluation Is a Welcomed Opportunity to Accomplish All Authorized C&SF Project Purposes and to Incrementally Step Toward CERP's Objectives** The on-going LOSOM process continues to gradually build toward alternatives and evaluation metrics. Corps staff has thoughtfully engaged with the public to foster understanding, build relationships, and address alternatives evaluation and metrics it will use. USSC looks forward to continued participation and learning how the draft NE PM will be scored, weighted and applied in comparison to other environmental and non-environmental performance measures and in light of state and federal laws and programs. We are optimistic the process will be geared toward best fulfilling all authorized C&SF Project purposes. Together, we are engaged in a multidecade, multi-billion dollar effort to add storage infrastructure and change operations to meet all C&SF Project purposes. LOSOM presents a near-term avenue to accomplish these goals in providing water for originally authorized C&SF Project purposes while incrementally fulfilling CERP's objectives.	Thank you for the comment. This RECOVER PM is one piece of the evaluation for LOSOM. The LOSOM team, not RECOVER, will be determining how this NE PM will be weighted and applied in comparison to other environmental and non-environmental performance measures and in light of state and federal laws and programs.
USSC-3	5/28/2020	Because we are collaboratively and concurrently engaged in crafting the LOSOM alternatives and their evaluation, it is difficult to fully assess the import of a single or isolated performance measure. Learning more about LOSOM's overall scoring metrics will help resolve concerns for how LOSOM reliably will improve South Florida water availability. As we understand LOSOM's evaluation process better, we expect the path to accomplishing these shared objectives will become clearer.	This is a RECOVER ecological performance measure is just one of many tools that will be used by many project teams and programs. The PM focuses on the salinity envelope and will provide information solely on flows and salinities.
USSC-4	5/28/2020	Based on what is now known about the on-going LOSOM evaluation process and this draft NE PM, both seem to be proceeding without recognition of well-established bounds. Thus, LOSOM's ability to serve the C&SF Project purposes and incrementally accomplish the shared CERP objectives may be compromised, particularly without changes to the draft NE PM. More detailed, technical comments on the draft NE PM are attached as Exhibit B for your consideration.	This RECOVER PM is a stand-alone document to assess and evaluate flows and salinities to the St. Lucie and Caloosahatchee Estuaries. This is an ecological performance measure that does not take into account other impacts or effects on the estuaries.
USSC-5	5/28/2020	**RECOVER Performance Measures Must Recognize Established Boundaries To Assure CERP's Intended Implementation** Congressional authorizations for the C&SF Project and CERP's operational and infrastructure changes establish the Corps' program for ecologic and hydrologic restoration activities. The program is well defined and understood, as was necessary to garner support for both state and federal laws and sustain multi-decadal funding. Planning for South Florida's existing and new hydrologic infrastructure to provide the right quantity, quality, timing and distribution of water to accomplish authorized C&SF Project purposes and restoration performance is a fair summary of CERP, and LOSOM will yield meaningful steps. Yet, all C&SF Project modification efforts must occur within authorized boundaries. Thus, as a starting point, it is appropriate to identify and respect the authorized program's bounds; these are the commitments made by Congress and Florida, the Corps' "equal partner" enacting parallel laws. Scientific effort that does not recognize established boundaries cannot be implemented and, therefore, affords limited utility and may inappropriately skew results. Brief review of these defined boundaries is offered to help identify modifications to the draft NE PM to foster implementation.	Thank you for the comment
USSC-6	5/28/2020	From Corps' standpoint, Congressional authorizations are the agency's polestars. Likewise, Florida Statutes and other agency implementing rules bracket state agency actions. In sum, original Congressional authorizations for Lake Okeechobee, the C-43 and C-44 canals and C&SF Project structures designated the estuarine-related infrastructure as outlets for flood protection, Lake management and navigation. For the first time, the comprehensive CERP, authorized by WRDA 2000, established the framework for adding new objectives to the C&SF Project - to restore the region's ecology while also providing for other water-related needs of the region, including water supply and flood protection. These Congressional authorizations direct the program today and set bounds for meaningful performance measures. Further, the C-43 Reservoir Project Implementation Report, authorized by WRDA 2014 tracks the WRDA 2000 authorization boundaries. Likewise, and in accord with Florida Statutes, the South Florida Water Management District ("SFWMD") adopted various, parallel rules and plans pursuant to that State agency's Legislatively defined authority.	Thank you for the comment

USSC-7	5/28/2020	SFWMD's 2017 Lower West Coast Water Supply Plan Update states in the Appendix describing the estuary's Recovery Strategy: In 2001, when the MFL for the Caloosahatchee River was adopted, the MFL criteria were projected to be exceeded until storage could be constructed and operated in the watershed to capture excess surface water flows for release to the river during times of need. Therefore, a recovery strategy was adopted for the river simultaneously with MFL adoption. The recovery strategy has two parts: 1) the construction of the Comprehensive Everglades Restoration Plan (CERP) Caloosahatchee River (C-43) West Basin Storage Reservoir, and 2) the adoption of a Water Reservation rule [Subsection 40E-10.041(3), F.A.C.] to protect the water in the reservoir for fish and wildlife in the CRE and to ensure the intended benefits of the reservoir. The Water Reservation rule was adopted in 2014. CERP identifies restoration of the CRE as an integral step in achieving system-wide benefits in the South Florida ecosystem. Promoting a balanced and healthy salinity regime in the CRE is essential for maintaining the ecological integrity and associated economic benefits of this unique habitat on Florida's southwest coast. Construction of the Caloosahatchee River (C-43) West Basin Storage Reservoir serves to address these CERP objectives as well as SFWMD objectives to improve flows to the CRE to meet MFL criteria.	Thank you for the comment
USSC-8	5/28/2020	Simply put, Lake Okeechobee is not a continuous dry condition water supply source for the Caloosahatchee Estuary's restoration or minimum flow recovery. These points make evident the critical need to design a balanced Lake regulation schedule, one capable of aptly serving its defined, diverse purposes. Making appropriate use of Lake storage, after Herbert Hoover Dike repairs, is a worthwhile starting point that will benefit all.	This performance measure is just one of the many tools and performance measures that will be used by LOSOM and other CERP projects to score different alternatives. This performance measure focuses solely on the ecology of the estuaries. Other Performance Measures either exist, or are being developed to address metrics associated with Lake ecology, water supply, economics, etc.
USSC-9	5/28/2020	USSC requests the draft NE PM be revised to reflect all federal and state agency authorizations.	This PM is not a regulation schedule and is entirely independent of the LOSOM development process. This PM is based solely the ecology of the estuaries and sets ecological targets. LOSOM and project teams use these ecological PMs as one tool in evaluating operation schedules and project alternatives. LOSOM and project teams are the ones that ensure that all federal and state agency authorizations are appropriate.
USSC-10	5/28/2020	**Request for Adherence to RECOVER Procedures** We appreciate the Corps providing the opportunity to review and comment on the draft NE PM. USSC sees agency transparency and stakeholder involvement as an important component in developing appropriate performance measures. Since inception of the Everglades restoration program, USSC has been at the table, with its respected technical consulting team, working side by side with agency staff and other stakeholders to successfully develop all aspects of CERP. Unfortunately, for example, we noticed many links with RECOVER's materials are "under construction." We also encourage RECOVER to review the CERP Programmatic Regulations and more closely follow its procedures, particularly as to public meetings, implementation procedures, agency decision-making and Working Group participants.	Thank you for the comment.
USSC-11	5/28/2020	**Recommendation** USSC recognizes estuarine ecology and hydrology is complex. Scientific understanding of physical, hydrological, and biological processes is a work in progress. All of South Florida's estuaries are subject to many overwhelming variables. Rainfall, wind, hurricanes, droughts, temperature changes, water clarity, tides, sea level rise, urban development, herbivory, and a multitude of other influences are examples. Stochastic events, both high and low, directly and dramatically influence the region, including Lake Okeechobee and its discharges, or lack thereof. Thoughtful use of the overall scoring metrics and appropriate weighting or eliminating uninformative, un-implementable metrics is recommended to assure all components of the transitioning C&SF Project operate within defined bounds.	This performance measure is just one of the many tools and performance measures that will be used by LOSOM and other CERP projects to score different alternatives. This performance measure focuses solely on the ecology and salinity targets of the estuaries.
USSC-12	5/28/2020	**Technical Comments** 1. The change from a single range of flows measured at a specific location in the 2007 estuary performance measures to the proposed 2020 hydrodynamic evaluation of salinity throughout the estuary in response to varying range of flows appears to better capture the dynamic nature of estuarine systems. How and when will this proposed metric change be aligned with existing state and federal programs?	RECOVER ecological performance measures are designed specifically to address the health of a given region or indicator. This salinity envelope performance measure addresses the flows and salinities in the St. Lucie and Caloosahatchee River estuaries based on current flows and predicted future flows for oysters and SAV, based solely on the ecology of the estuaries. RECOVER performance measures are not regulatory nor decision-making documents. A project may use this performance measure as one piece of a project evaluation. This performance measure will be changed to address new science when available, not to align with state or federal programs.
USSC-13	5/28/2020	2. The range within the proposed flow envelopes appears to be so significantly skewed to "2020 Optimum" so as to make the "2020 Stress" relatively meaningless – essentially resulting in flow envelopes of either "Optimum" or "Damaging". The 2020 Optimum flow envelope for the St. Lucie has a range of 1250 cfs, while the 2020 Stress flow envelope has a range of only 300 cfs. Similarly, the Caloosahatchee Optimum range is 1350 cfs with 500 cfs for the Stress range. These narrowly defined Stress flow envelopes do not appear well-suited to helping parse out the effects of changing flows in the estuary.	The stress flows were based upon the respective stress salinity ranges for the organisms. At the low salinity end, both shoal grass and oysters have a relatively narrow salinity stress range before hyposalinity conditions become physiologically damaging, and the freshwater/oligohaline species tape grass has a narrow range of low salinity between optimum and damaging.
USSC-14	5/28/2020	3. As defined, the 2020 Optimum Salinity Envelopes are "salinities yielding the greatest performance of measured response variables"; while the Stress Salinity Envelopes are "salinities yielding a decline in performance of one or more of the response variables, but tolerable for short-term exposures. Prolonged durations of exposures to stressful salinities may result in loss of the indicator". What appears missing between "greatest performance" and "loss of the indicator" is a sustainable salinity envelope.	The Optimum, which was chosen to benefit each indicator in their respective zones in the estuary, is what is recommended to be the conditions for which the system should be managed. The Stress envelope is a condition that an organism can withstand for a period of time, though not a sustained period of time. While lines 40-43 make recommendations of number of excursions to stress and damaging envelopes, there will be recommendations made with future modeling efforts to fine tune duration and return frequency as results from current research studies of indicator species becomes available.

USSC-15	5/28/2020	4. As described in Section 2.4, the response of tape grass to salinity can be confounded by other environmental factors. With increasing flows to the estuary, salinities may be within the preferred range of 0 to 10, but the response of tape grass may be adversely impacted by reduced light availability as light attenuation from color (CDOM) increases. Experience has shown that even when salinity in the upper Caloosahatchee has been ideal for tape grass, there has been very little restoration or recolonization of the tape grass community. Use of tape grass as an indicator species without consideration of the effects of CDOM appears problematic.	True. Additionally, information as to sources for recolonization would be warranted for restoration efforts to be successful. It is noted that for future updates and modeling efforts, CDOM and light attenuation for SAV is needed. The SAV HSI currently in development includes salinity, substrate, and light (which models salinity and CDOM relationships in the CRE). However, more mechanistic models would assist to better fine tune species responses to conditions.
USSC-16	5/28/2020	5. Section 6 notes that the minimum flow and level for the Caloosahatchee estuary was recently updated to a threshold of 457 cfs to prevent significant harm. The document states that "For setting flow targets conducive to supporting healthy estuarine systems, 450 cfs was assumed too low for the purposes of this PM. The new low flow bound target of 750 cfs as (sic) should improve salinities in the upstream CRE for tape grass habitat". What is the basis for selecting 750 cfs as the new low flow bound?	750 cfs as the new low flow bound for the CRE was determined by first using a Potential Habitat Area conceptual approach (see Appendix B), followed by modeling of salinity using an extensive period of record of flow data (see the main Documentation Sheet). We added some additional explanation compared to the previous version. For the purpose of understanding the difference between targets to the CRE in this Salinity Envelope PM and the revised CRE MFL: the Salinity Envelope PM provides biologically and ecologically-driven guidance to the CERP for establishing and maintaining salinity regimes to sustain healthy estuarine ecosystems, and are "restoration-based" targets; whereas the MFL is the limit at which further withdrawals would be "significantly harmful" to the water resources or ecology of the area (Section 373.042[1], Florida Statutes), and based on the significant harm threshold of "temporary loss of water resource functions, which result from a change in surface or ground water hydrology that takes more than two (2) years to recover (Subsection 40E-8.021[31]), F.A.C.)." Additionally, while this PM uses three (3) ecological indicator species (based on the EPA's VEC approach described in Section 2.1) to identify salinity-to-flow relationships for restoration purposes, the MFL included analysis and modeling using data from 11 different indicator species to address the thresholds described above (SFWMD 2020b). To differentiate restoration and recovery, in this PM, restoration is referred to in the context of "renewing degraded, damaged, or destroyed ecosystems and habitats in the environment through human actions and active intervention"; whereas the Recovery Strategy outlined in the MFL includes the "development of additional water supplies and other actions, consistent with the authority granted by Chapter 40E-8, FAC to: 1) Achieve recovery to the established minimum flow or minimum water level as soon as practicable..."
USSC-17	5/28/2020	6. The NE PM's utility for the LOSOM schedule is limited. It does not account for the resiliency of the estuaries. By identifying the high flows as "Damaging", the NE PM does not acknowledge that the estuaries can and do recover from damaging high flow years.	The extent in which we can address issues of magnitude, duration, and return frequency of stressful and damaging flows still need to be determined. Please see Appendix C.
USSC-18	5/28/2020	7. Please explain why Lake Worth Lagoon is not included in these Draft RECOVER performance measures. What metrics will be used to analyzed effect on this waterbody?	In 2015, RECOVER removed Lake Worth Lagoon (LWL) from the Northern Estuaries Region because the North Palm Beach project was removed from the list of planned CERP Projects identified in the Integrated Delvier Schedule. RECOVER is a CERP program and focuses solely on CERP projects, and no other CERP projects were expected to have impacts on LWL in the near future.. Other non-CERP and operations projects will impact LWL, and traditionally where RECOVER PMs cannot address project-specific impacts, project-level performance measures are developed within the project teams. LOSOM will be using RECOVER PMs where they are appropriate, in this case, flows affecting salinity in the Caloosahatchee and St. Lucie estuaries. That being said, the LOSOM team is working to develop project-level PMs to evaluate impacts to LWL. Further, SFWMD staff has been coordinating with Palm Beach County staff and provided details on the modeling and data requirements needed to update a hydrodynamic salinity model for the LWL, which is to be written as an Action Plan in the upcoming LWL Management Plan update as a high-priority task for restoration practitioners. Finally, the RSM-BN model space is being expanded to include these areas, but RECOVER is not familiar with the timeline in which that is expected to be completed.
Conservancy of Southwest Florida (CSWF)			
CSWF-1	5/28/2020	The Conservancy of Southwest Florida, on behalf of our 7,000 supporting families, submits the following comments on the draft RECOVER Northern Estuaries Salinity Envelopment Performance Measures (PMs) for the Caloosahatchee River and Estuary (CRE). Developing biologically and ecologically protective PMs will help ensure that Comprehensive Everglades Restoration Plan (CERP) project alternative analyses are able to most accurately evaluate and select project alternatives that will provide the greatest ecosystem benefits for the Everglades and the northern estuaries. Both indicator species studies as well as real-time monitoring data have demonstrated that the 2007 PMs for the CRE (450-2800 cfs) are not conducive to sustaining healthy ecosystems, particularly in the low flow bound. The proposed draft RECOVER PMs for the CRE are a significant improvement on the 2007 PMs, and the Conservancy supports the following aspects of the draft PMs: -Identifying Optimum, Stress, and Damaging ranges for both the flow envelopes and the salinity envelopes for the ecological indicator species -Adjusting the Optimum flow envelope to 750-2100 cfs, with the ability to refine in the future based on new data -Utilizing a salinity gradient approach, as opposed to a fixed salinity target based on a single location	Thank you for the comment
CSWF-2	5/28/2020	As the draft RECOVER PMs are finalized, please consider the following recommendations and questions to further refine the PMs ability to evaluate and assess CERP project planning and implementation.	Thank you for the comment
CSWF-3	5/28/2020	**Develop Low Flow PMs for Stress and Damaging Envelopes** The draft CRE PMs currently do not include low flow PMs (< 750 cfs). The Conservancy recommends identifying low flow PMs utilizing the corresponding salinity PMs for indicator species. At minimum, an interim target should identify flow between 750 and 457 cfs as Stress, and < 457 (the 2019 updated minimum flow and level) as Damaging.	In coordination with the LOSOM team, we discussed the issue of low flows and were careful not to define "stress" and "damaging" definitions as described in the Documentation Sheet because these low flow conditions were not modeled. We also did not want to conflate the differing approaches used here to define damaging salinities/flows, with those developed as part of the MFL and definition of "harm" or "significant harm." As part of the LOSOM effort, additional work will be done using CH3D to look at both low and high flows, and some of that information can be included in an addendum to this Salinity Envelope PM.

CSWF-4	5/28/2020	**Stress and Damaging Duration Periods** The draft states, "Ideally, project alternative simulations over the POR would yield no more than two (2) consecutive 14-day moving average flow periods in the Stress Flow Envelope, and no more than one (1) consecutive 14-day moving average flow periods in the Damaging Flow Envelope, in either the SLE or CRE" (Lines 40-43). It is unclear how the 14-day averages were derived as duration criteria, thus, we have several questions relating to the duration periods. For example, a 7-day average may correlate more closely to indicator species responses to changing conditions. Why was 14-days chosen over 7-days? In addition, what is the ecological impact, based on the indicators, of two consecutive 14-day moving average flow periods in the Stress Flow Envelope? Furthermore, how is the Stress and Damaging envelopes differentiated? 28 days at 2600 cfs could be significantly more stressful – or even damaging – than the same period of time at the lower end of the stress flow envelope. And 14 days at 2650 cfs in the Damaging Flow Envelope is likely to cause less harm to the resource than 28 days at 2550 cfs. The prior example is clearly an oversimplification since flows will fluctuate during those time periods, however, it does illustrate the need to describe how the Stress and Damaging flow transition/boundary was developed.	14-day average has been clarified. These boundary flows at high and or low ends are provided, and duration recommended, but how they are delivered is then a component of operations, for which additional recommendations by other components/scientific staff are provided. 14 days (rather than 1 month) was chosen so as to be conservative to the tolerance of organisms such as vulnerable life history stages (e.g., oyster larvae) as to tolerance outside the optimum envelope. While some indicator species such as SAV, that have below ground biomass, which can help to last through prolonged periods of stress, or adult oysters, which may tolerate longer periods of stress, the 14-day was chosen as an ecological response threshold for the more sensitive life history stages of one of the indicators.
CSWF-5	5/28/2020	**Conclusion** Overall, the Conservancy of Southwest Florida supports the draft RECOVER Northern Estuaries Salinity Envelope Performance Measures update, and appreciates the opportunity to provide questions and comments. Please do not hesitate to contact us should you wish to discuss these comments.	Thank you for the comment.
Friends of the Everglades (FoE)			
FoE-1	5/28/2020	While inflows to the SLE from Lake Okeechobee are 27% of total inflows on an average annual basis, these lake releases to the SLE represent the single largest source of damage to the SLE and are directly linked to Harmful Algal Blooms. The 27% figure should be put into that context, making clear that Lake Okeechobee flows have an outsized impact, as documented by satellite imagery of algae blooms in the lake.	RECOVER understands that major disturbances in salinity occur after high rainfall and tropical storm events, from which Lake Okeechobee Regulatory Releases are initiated at ecologically damaging levels in response to flood control needs. Regarding algal blooms, this PM only addresses salinity - RECOVER wants to develop PMs that address other water quality parameters, such as CDOM; and for the purposes of LOSOM, algal blooms metrics are being considered and will be worked in to conceptual plan formulation and release guidance by the LOSOM team.
FoE-2	5/28/2020	We encourage the ACOE to expedite development of modeling tools that will allow the water quality PMs to take into account the effects of Harmful Algal Blooms and nutrient pollution on the SLE and CRE systems.	Thank you for your comment. Please see Appendix C regarding data gaps and tools RECOVER identifies as needed for the Northern Estuaries. Additionally, the LOSOM team is developing their own project-specific metrics to address other factors, including algal blooms and nutrient loading.
FoE-3	5/28/2020	Full restoration targets for the SLE in 2007 should have included Zero (0) Lake Okeechobee Regulatory Discharges of any volume.	Additional tools are needed to develop specific targets based on source, and must be considered within the context of setting restoration targets based on ecosystem function vs. some historical reference condition that is not possible to replicate. This PM does distinguish between Lake Okeechobee Regulatory Releases and other sources of freshwater (i.e. basin runoff) in Section 3, Evaluation Application, in which RSM-BN model outputs include those high discharge events triggered by either source. This will allow RECOVER teams to determine the relative improvements made from either with the implementation of CERP. More specifically, as additional storage capacity becomes available, high discharge events caused Lake Okeechobee Regulatory Releases are expected to decrease (edits have been made in the Documentation Sheet to reflect this; and see Section 3, Performance Measure Post-Processing Tools, in Appendix B, which has been expanded).
FoE-4	5/28/2020	In Table 3, the target for "High Discharge Events by Source in the SLE" should be ZERO periods of high discharge "events" triggered by Lake Okeechobee Regulatory Releases. The same should apply to "High Discharge Events by Source in the CRE," where only beneficial dry-season flows are necessary.	Additional tools are needed to develop specific targets based on source, and must be considered within the context of setting restoration targets based on ecosystem function vs. some historical reference condition that is not possible to replicate. RECOVER focused on science based ecological targets linked to flows (regardless of source) and their effects salinity. This PM also describes outputs to be generated from the Regional Simulation Model (Basins [RSM-BN]) for the purpose of RECOVER System-Wide Evaluation of CERP Project alternative plans. The above flow regimes, as well as several qualitative hydrologic targets based on the duration and return frequency of sub-optimum flow conditions, are summarized. First, the sum of all 14-day moving average flow periods over the entire POR ("events") in each Flow Envelope: ideally, project alternative simulations over the POR would yield no more than two (2) consecutive 14-day moving average flow events in the Stress Flow Envelope, and no more than one (1) consecutive 14-day moving average flow event in the Damaging Flow Envelope, in either the SLE or CRE.
Public			
Maggy Hurchella (MH)-1	5/28/2020	These comments will be limited to the SLE. The study is an improvement. It's got new science and new modeling and tries harder to address the biological complexities of a sustainable environmental system. Please send a "Thank you" to everyone who worked on it.	Thank you for the comment.
MH-2	5/28/2020	My biggest concern is the failure to address HABs. I've been told that we can't consider HABs because the Corps has no control over water quality. Recover is not the Corps. You are an interagency team trying to make sure we have the estuary we love when we get through spending billions on CERP.	This PM only addresses salinity - RECOVER wants to develop PMs that address other water quality parameters, such as CDOM; and for the purposes of LOSOM, algal blooms metrics are being considered and will be worked in to conceptual plan formulation and release guidance by the LOSOM team. See Appendix C which outlines data gaps and additional tools RECOVER would like to include in our future science work.
MH-3	5/28/2020	HABs are real. Their harmful impacts are real. At this point, no one has a plan that will reduce regular HABs blooms in Lake Okeechobee.	The LOSOM team is looking at developing an Algal Bloom performance metric.
MH-4	5/28/2020	We need to go to war with the water we have. Lake Okeechobee summer water is frequently going to be full of HABs. We can't recover the estuary and pretend they are not there.	Thank you for the comment.

MH-5	5/28/2020	**Line 10 - The purpose of the Northern Estuaries Salinity Envelope Performance Measure (PM) is to provide biologically- and ecologically-driven metrics for evaluation and assessment of salinity regimes that sustain healthy ecosystems of the Northern Estuaries** One would hope that the purpose of Recover was to continue to use new biological understanding, new data, and new models to measure what's needed to maintain the St. Lucie Estuary as a healthy ecological system. Salinity is a good measure for oysters and to some degree for seagrass (eg: oysters don't care if light is limited, seagrass does). Salinity alone without considering seasonality and return frequency might prove deadly to endangered species. The biological diversity of the Indian River Lagoon at the St. Lucie Inlet is unique. While these things are harder to model they are critical to the success of what Recover is all about. It is not down to streamlining the flora and fauna to certain species happy with a certain salinity envelope when other characteristics of discharges to the estuary affect survival and sustainability of the estuary's diversity.	There will be future Performance Measures to be developed for the NE as are in other RECOVER regions, with the addition of data from ongoing research and updated modeling and current monitoring efforts. However, this is a specific Salinity PM, from which updated flows could be developed; a key update being multiple indicators in each estuary and improved spatial coverage, rather than single locations for the systems. As noted, modeling efforts regarding SAV and seagrass are in development to incorporate the light environment/flow relationships.
MH-6	5/28/2020	**Line 36 - Flow Envelopes in cubic feet per second (cfs) Estuary 2007 PM Target 2020 Optimum 2020 Stress 2020 Damaging St. Lucie 350–2000 150–1400 1400–1700 >1700 Caloosahatchee 450–2800 750–2100 2100–2600 >2600** The new envelopes are an improvement for the St. Lucie. More use of recent data is likely to further reduce acceptable flow levels.	RECOVER is working on a few studies to help us further refine salinity impacts to these organisms, especially pertaining to the magnitude, duration, and return frequency of stressful and damaging flows. We also need to develop additional tools to set targets based on sources of inflow.
MH-7	5/28/2020	**Line 44 - Flows and fewer repeated Stress or Damaging Flows are better. Additional RSM-BN outputs described in the Evaluation Application (Section 3) will be generated to inform project alternative performance relating to magnitude, duration, and return frequency of flows, and relative contributions from Lake Okeechobee Regulatory Releases and basin runoff, for which specific targets need to be developed for future Salinity Envelope PM updates**. This is an important promise. Resources need to be made available to make sure it can be kept. It is reassuring to see that "relative contributions from the Lake" should be considered. Watershed runoff to the estuary is natural. It is what makes it an estuary. The over-drained watershed is currently dumping excess water which stresses the estuary. The IRL - South component of CERP is supposed to address that. It is important to note that the C44 reservoir/STA is only a small part of the projects that need to be completed to fix the watershed runoff. Lake discharges to the SLE are different. First, there were never any discharges from the Lake to the SLE in the natural system. There is no benefit from those discharges and there is harm from all of them - even smaller discharges. The nutrient levels in the Lake are different . In the 1990s when SLE suffered from lesion fish there were alternately and together large discharges from the watershed and the Lake. A study by the SFWMD (never published) found the lesion fish were related to Lake discharges. When the same quantity of freshwater entered the estuary from the watershed, lesioned fish were not present. The same has been true with HABs blooms.	The next step in updating this Performance Measure includes how to model or develop targets based on sources of inflow, as well as issues of magnitude, duration, and return frequency of these flows. Additionally there are several studies ongoing to address how organisms respond to these hydrologic criteria.
MH-8	5/28/2020	**Line 61 - to provide biologically and ecologically driven guidance for establishing and maintaining salinity regimes that sustain healthy estuarine ecosystems in the St. Lucie Estuary** Again, it needs to be noted that salinity alone will not sustain a healthy SLE. Recover must be expanded to take in the information necessary to sustain a healthy estuarine ecosystem in the SLE.	This performance measure focuses solely on flows and how they relate to salinity. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-9	5/28/2020	**Line 86 - Historically, the SLE was a freshwater system only occasionally exposed to the ocean through ephemeral passes in the barrier islands (SFWMD 2020a). The St. Lucie Inlet was permanently opened in 1892 (SFWMD 2020a)** I question the ephemerality of the estuarine environment. Shell mounds along the IRL-South show a large oyster population throughout the period the Calusa Indians inhabited the area. There are numerous historical accounts of sailing into the St. Lucie Inlet. The Inlet was closed for an extended period in the late 1800s and was entirely freshwater. The very existence of the river and its outlet through Sewall's Pt and Rocky Pt. suggest an Inlet that was open as often as it was closed. At the very least it has been an estuary for over 100 years. It has developed a unique ecological diversity that should be recognized as real rather than artificial.	Thank you for your comment.
MH-10	5/28/2020	**Line 88 - The SLE receives water from Lake Okeechobee, which is conveyed through the S-308 water control structure at the lake, through the C-44 canal, and out of the S-80 structure into the South Fork** It should be clearly noted that the connection to the Lake is not natural and has not been beneficial to the estuary.	The Documentation Sheet includes history that details the man-made connection of the regional south Florida system.

MH-11	5/28/2020	**Line 93 - The long-term (WY1997– WY2019) annual average inflow and percent contribution of inflow from Lake Okeechobee are 0.31 million acre-feet (ac-ft) and 27%, respectively; and long-term annual average inflows and contributions from basin runoff are 0.7 million ac-ft and 73%, respectively (SFWMD 2020a).** When percentages of inflow and volume of flows over time are listed, it needs to be made clear that "timing is all". One large discharge of long duration will destroy grassbeds and oysters. Averaged over a five year period and compared to watershed (natural every year inflow) the Lake discharges can appear benign.	Please see Section Three, Evaluation Application. These describe recommended metrics that get at the timing of stressful and damaging flows.
MH-12	5/28/2020	**Line 111 - Other impacts to the SLE include harmful algal blooms (HABs), exacerbated by nutrient-laden inflows or by transport of phytoplankton from upstream sources; but the Salinity Envelope PM is not designed to address water quality or HABs, and any future evaluation and assessment water quality PMs would require predictive modeling tools not available at this time.** HABs cannot be ignored. We now know that "non-harmful pulse releases" to the estuary that maintained the salinity envelope actually enhanced blooms of toxic microcytis. Recover is aware of studies that show that when freshwater cyanobacteria meet the lower salinities upstream in the estuary it causes the algae (we know it's a bacteria, algae just a shorter word) to bloom. The enhanced bloom begins to lyse and die as it hits higher salinities. Toxins do not die and accumulate in sediments where they can last for months. The study of sea otter deaths in Monterey Bay is an ugly example. Freshwater runoff entered the Bay from farm areas with high nutrient loads and microcystis blooms. The microcystis die in saltwater. The toxins were entrained in the food chain and caused a significant die off o marine mammals. While Microcystis is the dominant cyanobacteria in Lake Okeechobee, numerous other toxic cyanobacteria are present. All of them are capable of producing a number of toxins. Microcystin is the dominant toxin from the Lake discharges. The state does not test for BMAA but it has been identified by reputable private labs in Lake discharges. Dolphin strandings in the IRL have been tied to BMBMAA has been identified in fish and mammals. The list could go on and on of the environmental impacts of cyanobacteria blooms. The threat is new and much of the information is new but it can't simply be ignored because the salinity envelope is maintained. Predictive modeling of HABs is difficult. It is possible with information from the past five years. It is predictable based on increased warming and no hope of immediate decline in Lake nutrients. It would seem that any plan to recover a sustainable estuary would include the fact that it was safe for humans to live around it. Human health and safety has to be considered OR Recover needs to make clear that it will not be an issue in evaluating alternative projects. Even if bureaucratic rules require that people's health be ignored, the cumulative impact of HABs - apart from the salinity envelope, must be considered. This is especially true when alternatives do NOT increase "optimal discharges" but only reduce "damaging" discharges by reducing them to multiple stressor discharges. Those low flow stressor discharges are highly likely to carry cyanobacteria blooms from the Lake.	The Performance Measure only addresses salinity. RECOVER recognizes the need to develop other performance measures that address other environmental parameters important to system ecology. See Appendix C which outlines data gaps and additional tools RECOVER would like to include in our future science work. Finally, the LOSOM team will be developing other project-specific/project-level metrics that address algal blooms.
MH-13	5/28/2020	**Line 117 - The 2007 Salinity Envelope PM established flow envelopes of 350–2000 cubic feet per second 118 (cfs) from all sources of inflow, including groundwater, surface water, and Lake Okeechobee 119 water as suitable to maintain salinities conducive to shoal grass and oysters (salinity 12–20) at 120 the US1 Roosevelt Bridge (RECOVER 2007a).** It's good to point out that the optimal inflows are not "Lake discharges". The Lake discharges should be minimal in comparison to more natural discharges from the watershed. line 117 The 2007 Salinity Envelope PM established flow envelopes of 350–2000 cubic feet per second 118 (cfs) from all sources of inflow, including groundwater, surface water, and Lake Okeechobee 119 water as suitable to maintain salinities conducive to shoal grass and oysters (salinity 12–20) at 120 the US1 Roosevelt Bridge (RECOVER 2007a). It's good to point out that the optimal inflows are not "Lake discharges". The Lake discharges should be minimal in comparison to more natural discharges from the watershed.	Thank you for your comment.
MH-14	5/28/2020	**Line 207 - A restoration goal consistent with a pre-drainage condition is not tenable in the Northern Estuaries (e.g., the St. Lucie was a freshwater body whose modern connection to the Atlantic Ocean through the St. Lucie Inlet is, pragmatically if not literally, irreversible).** See the comment above. Yes. You can't close the St. Lucie Inlet. The wonderfully diverse estuary that has developed in the more than 100 years the Inlet has been open does have adequate information on a pre-drainage history as well as a very large body of information on changes to the pre-drainage system that have harmed the river.	Thank you for your comment.

MH-15	5/28/2020	**Line 215 - Therefore, in the context of "Restoration," what CERP aims and has the capacity to do in the Northern Estuaries is restore critical hydrologic characteristics with the reduction in incidences of flows that would result in salinity conditions not conducive to supporting the health and diversity of the existing estuarine ecosystems.** To save the St. Lucie with a salinity envelope while it dies from HABs discharges is not a tenable goal. In addition to HABs there should be attention paid to other harmful impacts of lower discharges including nutrient and sediment loads and lack of water clarity.	The Performance Measure only addresses salinity. RECOVER recognizes the need to develop other performance measures that address other environmental parameters important to system ecology.
MH-16	5/28/2020	**Line 218 - Total CERP Implementation Goals include a reduction in 80% volume of flows and undesirable high discharge events to the Northern Estuaries.** The chart below shows what happened to the SLE in the last 11 years. Five times it got wiped out completely. Four more times it got more than 20,000 AF from the Lake. Is SLE going to get only two bad tears? And will that translate to 10 years of multiple lower discharges that we simply call "stressors"? /5/2008 12/27/2008 104,190 acre feet 114 days 7/28/09 8/15/09 10,369 acre feet 9 days 3/27/10 8/17/10 244,673 acre feet 144 days 9/3/10 10/2/10 9,890 acre feer 30 days 9/20/12 11/23/12 69,624 acre feet 45 days 4/15/13 4/17/13 821 acre feet 3 days 5/9/13 10/24/13 418,483 acre feet 166 days 1/17/15 4/1/15 73,045 acre feet 75 days 5/4/15 5/28/15 30,144 acre feet 25 days 1/30/2016 11/4/16 673,242 acre feet 280 days 9/6/2017 1/9/18 585,322 acre feet 126 days 6/1/2018 10/5/18 265,616 acre feet 127 days 2/23/19 3/24/19 24,806 acre feet 30 days	This would have to be modeled, but some details added to Appendix B provide the currently modeled performance based on a couple future scenarios in which CERP projects are implemented, which get us closer restoration targets.
MH-17	5/28/2020	**Line 220 Additional RECOVER PMs for oyster habitat and SAV based on acreages were developed in 2007 (RECOVER 2007b; 2007c, respectively), but these require future updates as evaluation tools are not currently available.** Resources need to be available to develop those tools. Just building projects without adequate metrics for evaluating real success is not a good strategy. Decision makers need to be convinced that science is not a frill.	RECOVER agrees.
MH-18	5/28/2020	**Line 233 - the updated Salinity Envelope PM aims to add a spatially-explicit component by setting salinity envelopes relevant to the whole system along the gradient of the estuary, rather than at a single location; and to the extent possible consider other factors such as duration and return frequency of flows outside the chosen envelope for each estuary** This is a good example of the good stuff that has been added to Recover AND of the additional good stuff we need.	Thank you for your comment.
MH-19	5/28/2020	**Line 245 . The indicator species for the Northern Estuaries include the Eastern oyster (C. virginica) and species of SAV adapted to varying salinity regimes (e.g. tape grass [V. americana]; shoal grass [H. wrightii]). Key hypotheses supporting the selection of these species as ecological indicators are outlined in the RECOVER 2009 Monitoring and Assessment Plan (MAP) (RECOVER 2009).** Again, oysters and seagrass are not enough. Salinity alone is not enough. More work is needed on: more variety in species with particular attention to the species unique to SLE; more attention to return frequency and duration in stressor discharges; and more attention to seasonality and the hydrological and biological difference of impacts at different time.	The Performance Measure only addresses salinity. RECOVER recognizes the need to develop other performance measures that address other environmental parameters important to system ecology. Also, please see Appendix C regarding the needs RECOVER has identified for additional indicator species.
MH-20	5/28/2020	**Line 296 • Stress Salinity Envelopes – salinities yielding a decline in performance of one or more response variables, but tolerable for short-term exposures. Prolonged durations of exposure to stressful salinities may result in loss of the indicator.** good point	Thank you for your comment.
MH-21	5/28/2020	**Line 451 As multiple indicators with different optimum salinities were used to develop targets, it was imperative to develop a single Optimum Flow Envelope for each estuary to benefit all indicator species to the greatest extent possible.** Also a good point - especially if applied to indicators other than oysters and seagrass.	Thank you for your comment.

MH-22	5/28/2020	line 485 The scenarios which are compared include 486 the distribution of flows assuming the following infrastructure or operations: (1) an Existing 487 Base Condition (ECB), which includes existing infrastructure or operations during the project 488 planning phase; (2) a Future Without Project (FWO) that includes a future scenario in which all currently authorized projects are completed, but excludes the current project being planned; and (3) future scenarios in which all currently authorized projects are completed, and include one of several different project plans (i.e., Alternative 1, Alternative 2, Alternative 3…) representing different structures or operational plans. More periods in the Optimum Flows is better, and fewer periods in the low flows or Stress and Damaging Flows is better. Trying to understand: 1 would be what is online now and LORs. 2. What are currently authorized projects that are being planned? 3. What are all current authorized projects It's unclear what the brown bar is since only four color boxes are shown. The labeling of this table is too confusing to make it useful. One thing does stand out in the three alternatives: reducing damaging discharges does result in increasing stressor discharges. It does not appear to increase optimum discharges. As discussed elsewhere, an evaluation that trades large damaging discharges for increased repetition and duration of stressor discharges is not likely to end with a sustainable ecological system - better, but still going downhill. This discussion also brings back the issue of how much of the damaging and stressor discharges are Lake Okeechobee flow. The make up of Lake discharges at certain time (high water hurricane season) is substantially different from SLE watershed runoff.	Changes have been made to this figure to be consistent with additional material added to Appendix B - hopefully these help make clear how this information is applied to Evaluation of CERP projects. Please visit the USACE website for more details on the authorized projects, including the Integrated Delivery Schedule.
MH-23	5/28/2020	Recover is not the Corps. It is a multi-agency task force. The study is an improvement. It includes 15 years of new science and new modeling. It's conclusions are not affected by the size of the EAA reservoir. RATHER, it attempts to tell the ideal and the damaging and an "in-between" for the salinity envelope.	Thank you for the comment.
MH-24	5/28/2020	**It's weakness:** It is mostly oysters. There is not enough sea grass data. That may be an indicator of the fact the seagrass has not grown back fast enough which is in itself and indicator of lasting damage.	RECOVER has been monitoring SAV in the SLE and CRE for a number of years. RECOVER agrees that additional ecological indicator species are warranted to strengthen our performance measures.
MH-25	5/28/2020	It does not include damage to endangered species which could be damaged at lower levels depending on seasonality and duration	Oysters and SAV were both selected as eco indicators based on the EPA's valued ecosystem component (VEC) approach, which as stated here aims to focus on those which "perform a key function in an ecosystem including the provision of habitat as living spaces, refugia, and foraging ground for other desirable species." RECOVER agrees that additional ecological indicator species are warranted to strengthen our performance measures.
MH-26	5/28/2020	It does not adequately address seasonality - spawning of different species needs to be balanced	RECOVER recognized this is a need for future performance measure iterations.
MH-27	5/28/2020	It does not address duration and return frequency adequately. 2000 cfs for three days is not a problem but for 3 weeks it could be a problem. Repeated ten times in a row both are a problem.	RECOVER recognized this is a need for future performance measure iterations. In the meantime, please see Section 3, Evaluation Application, where we attempt to define some conservative durations of exposure to stressful or damaging flows.
MH-28	5/28/2020	Salinity is the dominant stressor - EXCEPT - when light, nutrients, suspended solids and HABs are the problem.	This performance measure focuses solely on flows and how they relate to salinity. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-29	5/28/2020	An ideal salinity envelope can be and is damaging IF high nutrient levels cause blooms in the estuary or low light levels stress and kill grassbeds.	This performance measure focuses solely on flows and how they relate to salinity. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-30	5/28/2020	An ideal salinity can cause HABs to expand. Microcystis multiplies at the lower salinity levels where freshwater meets the normal estuarine salinities. When it hits higher salinities it lyses and dies and causes extreme damage from hydrogen sulfide, low oxygen levels, and lack of light.	This performance measure focuses solely on flows and how they relate to salinity. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-31	5/28/2020	It is not scientifically accurate to set a salinity envelope that claims to ensure that discharges will not cause continued degradation of the estuary IF HABs are not considered. Saying that the Corps does not control water quality is not a valid answer. They go to war with the water quality they have. We know now and we did NOT know when the first Recover studies were done in 2004, that HABs are now a regular summer event in Lake Okeechobee. Given research from global trends we can expect that unless and until nutrient inflows to the Lake are dramatically reduced, HABs will continue to be a regular part of discharges.	This performance measure focuses solely on flows and how they relate to salinity. This PM is based on flows and modeled salinities that are expected to be optimum, stressful, and damaging to ecological indicator species, or more specifically, oysters and SAV. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-32	5/28/2020	While the document is a step forward, it needs to recognize and include information from the past five years that gives better data on the damage that is not directly related to salinity.	This performance measure focuses solely on flows and how they relate to salinity. RECOVER recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.
MH-33	5/28/2020	We would suggest that given the missing pieces, 2000 cfs is too high unless more strictly limited in terms of those damaging aspects of the discharge that are not directly related to salinity as well as salinity effects exacerbated by seasonal biological events and the duration and frequency.	2000 cfs would be considered "damaging flows" based on the definitions used in this update.
MH-34	5/28/2020	While the salinity envelope is easiest to model, nature does not pay attention to what is easiest for us. The goal of Recover is RECOVERY and lower more restricted discharges will be necessary for the SLE to recover.	Salinity changes with flow conditions. CERP projects are expected to improve the incidence of stressful and damaging flows to the estuaries. RECOVER also recognizes the need to develop performance measures that address other environmental parameters important to estuarine health.