

# **Appendix 1-2: Peer-Review Panel Comments on the Draft 2009 South Florida Environmental Report – Volume I**

In September 2008, these comments were provided to the public on the District's WebBoard (<http://www.sfwmd.gov/sfer>). With the exception of reformatting some information for better readability, this appendix was not edited or spellchecked by the SFER production staff and appears as posted verbatim on the WebBoard.

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 1**

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**Reviewer:** Jeff Jordan

**Subject:** Comments on Chapter 1

**Posted:** 09 Sep 2008 11:34 AM

1. Not sure of the point of Figure 1-1.
2. Figure 1-2: In the larger map, the blue line that separates North from South needs to be better highlighted.
3. Line 130: Any need to also mention that high water levels affect the integrity of the levee around the lake?
4. Line 131: Citing Figure 2-1 in chapter 1 is confusing.
5. Line 146: A quick mention that recent weather events have changed this and that WY2009 will look much different may be needed since this report comes out later.
6. In the section "System wide Challenges and Initiatives" the narrative moves around in introducing topics in various upcoming chapters. This section might be better understood if it were preceded by the section "Report Objectives and Content" line 190-231.
7. Is the section on legal and reporting requirements still necessary here? Could it be appendix information?
8. The many reporting requirements noted in the section of chapter 1 clarifies that the SFER has indeed replaced a number of separate reports. However it is not clear that chapters 10-12 of the SFER meet the reporting requirements noted on page 1-14 (beginning on line 284) for Lake Okeechobee?
9. At what stage does the SFER outputs impact the overall strategic plan of the District. It seems that the production of the SFER is out of sync with other aspects of the plan and as a result is always one year behind the planning process. Is this a correct interpretation?
10. Table 1-3 is an invaluable tool to better understanding the SFER and its various components. Is there a way to add a row that would cross-reference the most important inter-relationships between sectors (e.g., water quality x flood control; flood control x natural systems, etc.)? If this could be accomplished, this table would serve as a guide to reading the SFER on a sector basis as well as on a cross sector (integrated) basis. The difficulty will be in determining the level of comparison as the matrix could become quite complex.

**Reviewer:** Jeff Jordan and Robert Ward

**Subject:** water quality reengineering

**Posted:** 11 Sep 2008 10:47 AM

Robert Ward and I took a special interest in the update regarding water quality reengineering on pages 18-21 in Chapter 1. Over the years the panel has looked at the issue of the project-by-project approach to water quality monitoring. The WCA-2A pilot is a good start at looking at the issues. Robert Ward has six questions to be considered (although they may be addressed in the technical publication that is currently being produced):

1. What are the overall water quality information goals being used in the WCA-2A monitoring reengineering pilot study?

2. How are the long-term (e.g. Everglade restoration accountability) and short-term (e.g. project completion accountability ) information needs being addressed within a coordinated monitoring design?
3. Are there subsets of sampling sites associated with describing ‘what’ is happening to water quality in WCA-2A (e.g. criteria achievement over the long term) while others answer ‘why’ questions (e.g. why changes are, or are not, occurring, with a more short-term research orientation)?
4. Is there an opportunity to use common sampling and laboratory methods across WCA-2A in the reengineered monitoring program? Or are there specific requirements associated with various projects and/or agencies that preclude using common sampling and laboratory methods? If there are separate methods, are they being documented in the data storage system?
5. Is DBHYDRO able to serve the data storage needs of the reengineering monitoring system without modification?
6. Are other local, state, and Federal agencies collaborating with the reengineering effort or is the effort limited to SFWMD monitoring?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 2 AND RELATED APPENDICES**

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**Reviewer:** posted by Neal Armstrong  
**Subject:** Chapter 2 Hydrology (Armstrong)  
**Posted:** 15 Sep 2008 09:44 AM

Chapter 2: Hydrology of the South Florida Environment

Date of Chapter Draft: 08/26/2008

Authors: Neal E. Armstrong (AA), Robert Ward (A), and Otto Stein (B)

Level of Panel Review: Accountability (Primary) and Integrative (X)

Chapter 2: Hydrology of the South Florida Environment is to receive review primarily at the Accountability level with consideration at the Integrative level. Accordingly, the following questions are addressed in this review of Chapter 2:

1. Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?
2. Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?
3. Are findings linked to management goals and objectives?
4. Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the Report?
5. Is the chapter cross referenced in a thorough and consistent manner?
6. Is there any constructive criticism and guidance to offer for the District's large-scale programs?

These questions are addressed below.

Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?

As noted in the 2008 SFER report review, this chapter on hydrology is a mainstay of the SFER reports as it is the management of water that is one of the primary missions of the SFWMD, and it is the presence and movement of that water that influences water quality and ecological resources throughout the District's jurisdiction.

Modifications have been made to the chapter organization so that it now includes an overview of selected hydrologic components (the "20,000 ft" level description of the hydrologic system), detailed description of the state of the system hydrology in WY2008, and the hydrologic feature of the year – the 2006-08 drought. This arrangement and content serves very well to introduce readers to the water resources mission and the water management system of the SFWMD while highlighting current water resource challenges facing South Florida. Even with the high level overview, the content of the chapter, except for the challenges being faced, is becoming routine.

Even the challenges can be viewed as drought or flooding. To reduce the need to repeat the drought/flooding history in each SFER, a concise, readable, description of drought/flooding

patterns in South Florida could be prepared separately of the SFER. An example of this type of drought description, over a large political jurisdiction, can be viewed at:

<http://www.cwi.colostate.edu/publications/wb/9.pdf>.

Again as the 2008 SFER chapter made clear, the hydrologic system is an immensely complex one, and the chapter is still replete with facts about those factors that influence water sources, storage, flows, etc., and the chapter still assigns little meaning to the facts so the reader is left with a staggering amount of information with little sense of its consequence unless the reader is intimately familiar with the system. Thus, some of the same suggestions made last year to strengthen the chapter are made again this year, and there are a few new suggestions as follows:

1. There are two suggestions concerning the Overview of Selected Hydrologic Components section (lines 288-341).
  - a) It should be a main section of the chapter at a level with the INTRODUCTION, DROUGHT IN SOUTH FLORIDA: AN OVERVIEW, etc.;
  - b) The sections appears to be at the “40,000 ft” level rather than the “20,000 ft” level, i.e., it is too brief an overview to provide the reader with a real sense of the hydrologic system, how it operates, how it responds to spatial and temporal amounts of rainfall, how the system has been operated to accommodate the availability of water, and particularly the consequences of having too much, just the right amount, or too little water in terms of meeting management objectives.
    - i. Some of the SUMMARY material could be moved to this Overview such as Figures 2-1 and 2-2 and the text in lines 38-73.
    - ii. Figure 2-1 should show watershed as well as political boundaries like Figure 4-1.
    - iii. The information given in lines 50-73 could be incorporated into Table 2- 10 which itself could be moved to the Overview and differences between WY2008 values and normal values calculated to show the extent of the drought conditions. WY rainfall amounts could also be added to show the spatial effects of rainfall.
    - iv. The arrows in Figure 2-2 need to be adjusted so the size of the arrow more accurately reflects flow magnitude. A second figure that shows average flows is needed so the reader can easily compare WY2008 flows to what is average – drought/flood conditions will be easily evident with such a visual comparison. These two figures then become the focal point of much more descriptive text about the hydrology in the study area and the management of that hydrology.
2. It is suggested again that the District consider developing on a set of “dashboard” metrics that describes how the hydrologic system has been operated and managed in the past water year and in a historical context so the reader has a quick grasp of the “state of the hydrologic system” in space and time. The Districts response to this suggestion last year notes the kinds of problems that would have to be taken into account if such a system were developed, and those problems are appreciated but can be overcome. The regulation schedules and the actual WY water stages provide an excellent opportunity to pursue this further, and the District might look at some of the methods described in Chapter 16 Confirmation of Mechanistic Water Quality models in Steven Chapra and Kenneth Reckow. 1983. Engineering Approaches for Lake Management, Volume 2: Mechanistic Modeling that could be used. Most of these are statistically or probabilistically based, and one or more could provide the basis for a risk-based analysis of hydrology system management. It is strongly suggested that the District look at this opportunity again.

Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?

Yes, the material is presented in a logical manner, and there is general continuity with previous versions of the report. The adjustments made to the format/outline of the chapter have already been noted, and this was a point of discussion during the last SFER review.

Are findings linked to management goals and objectives?

As noted in last year's 2008 SFER comments, a significant enhancement to this chapter would be to tie hydrology more strongly to water management goals and objectives. The District's response to the suggestions raised describe the complexity of the system due to natural variability, project purpose change over time, and other things that suggest that measuring success may be difficult. Still, the District is evaluated by its stakeholders in how well it meets its water management objectives and some ways of measuring achievement of those objectives have likely been developed, but perhaps not.

Two questions are posed here regarding management goals and objectives:

1. If the District was going to develop performance measures for meeting its water management goals and objectives, what form might those take?
2. Last year a question was raised about the role that risk management played in operating water management systems? The District's response suggested a future incorporation of risk management, and the question is what progress has been made to this point to do so.

Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the Report?

As noted above, the chapter could benefit from closer links to management goals and objectives as expressed in other areas of the SFER. Clearly, the hydrologic system has great impact on water quality, stormwater treatment areas, water conservation areas, restoration and management of Lake Okeechobee, the Kissimmee Basin, the Everglades National Park, and coastal estuaries.

Is the chapter cross referenced in a thorough and consistent manner?

Again, the chapter could benefit from closer links to Chapter 3A Water Quality, Chapter 5 Stormwater Treatment Areas, Chapter 10 Lake Okeechobee, the Chapter 11 Kissimmee Basin, Chapter 12 Coastal Ecosystems, and the role that water management has on these areas and the role that management of these areas has on water management. Perhaps some introductory wording referencing the other chapters would be helpful to integrating the report for the reader.

The wording could be similar to that in lines 119-122 in Chapter 7A.

### **Editorial Suggestions**

Lines 22-29: Suggest the rainfall deficit for the whole region (given as -3.8 inches later in the chapter) be added so these sub-regional rainfalls can be compared to the total. Line 38: There appears to be a contradiction in this sentence when it is stated that the Kissimmee "basins were dry, resulting in ..."; the reader might anticipate that "dry" means no flow would result.

Line 97: "examples" should be "example"

Lines 115-118: Once a watershed map is added, how might this paragraph be changed?

Line 132: A subtitle "Water Management" appears in line 132 on page 2-7. The subsection "Water Management in 2008" on page 2-31 is followed by a subsection entitled "Water Levels, Flows, and Management". From these subtitles, it is hard to determine what distinct information appears in the subsections (especially, the difference between the second and

third). Would it be possible to adjust the subtitle wording to be more clear as to the contents of each. From reviewing past SFER Chapter 2's, I gather the information included under the 'Water Management' subtitle in the page 2-31 area of the text was more extensive. The shorter version in 2009, without a corresponding adjustment of subtitles, appears to be part of the problem. Line 551's reference to details being provided elsewhere gives me an indication of a change in subtitle content.

Line 158: In Table 2-1, the entries in the table "cells" need to be "top justified" so that, for example, "Lake Okeechobee" doesn't start at S351 but at CULV. Also, are figures available in the chapter that show the locations all of these structures? If so, need to reference them.

Lines 170-178: Is there a figure available that shows the locations of all these structures? If so, need to reference it.

Line 187: The "secondary system" is never described like primary and tertiary are.

Line 199: Isn't the lack of topographic relief the main point, i.e., it dominates the water control system in South Florida.

Lines 276-286: Why not add WY2008 ending storage ac-ft to this table for each lake/impoundment to show the effects of the drought?

Line 373: Shouldn't this line read "Historically, drastic declines in Lake Okeechobee stage are associated with droughts" rather than the other way around? Droughts cause the declines, not the other way around.

Line 417: The term "Phase III" needs to be described.

Lines 433-440: Suggest adding the normal inflow to the paragraph so the WY number can be put into perspective.

Lines 452-458: Should the text referring to Phases be moved to page 2-22 where Phase III is mentioned so that all the text is in one place?

Lines 486-487: What should the reader expect to take away from the figures in Appendix 2-1?

Line 535: Shouldn't the title for Figure 2-14 be more tightly associated with the figure?

Line 576: Some wording appears to be missing, or mixed up, on this line.

Lines 633-645: Need to add some text that says what maps in the chapter or report can be used to locate the myriad of structures mentioned in this section on Water Levels, Flows, and Management.

Line 876: Could there be some reminder as to what factors drive the lake regulation schedules for the lakes other than Lake Okeechobee (which has its factors listed on page 2-43)?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 3A AND RELATED APPENDICES**

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**Reviewer:** posted by R. Ward  
**Subject:** Chapter 3A Review - Ward  
**Posted:** 12 Sep 2008 11:40 AM

SFER 2009

Chapter 3A Review

Chapter Title: Status of Water Quality in the Everglades Protection Area

### Opening Remarks

Over the ten years of consolidated reporting on environmental quality of South Florida (currently referred to as the South Florida Environmental Report – SFER), water quality has been a key component addressed. During this time, new knowledge has permitted water quality assessments in South Florida to become much more scientifically based. These developments include: (1) site specific criteria for dissolved oxygen; (2) a numeric interpretation of the narrative phosphorus criterion; (3) protocols for screening existing data to assess water quality conditions; and (4) use of the binomial hypothesis test to compute criteria achievement. As the new knowledge was being developed, separate sub-chapters, in the consolidated and SFER reports, summarized the annual developments. Even today, Chapter 3B reflects the continuing uncertainty regarding mercury and sulfur in the Everglades.

The 2009 Chapter 3A reflects a new step in the incorporation of maturing research into a more integrated reporting of water quality conditions in the Everglades Protection Area. In addition, monitoring results from related ‘project’ monitoring networks are being included in Chapter 3A. Given the legal requirements that Chapter 3A must satisfy, the Panel wants to compliment the authors in balancing the incorporation of new science and new monitoring results into an expanded and broader presentation of water quality conditions in the EPA.

Prior to 2009, Chapter 3A reported on water quality constituents that did not meet water quality criteria as specified in Section 62-302-530, Florida Administrative Code. For the 2009 water quality assessment in the Everglades Protection Area, Chapter 3A adds the comprehensive overview of the current nutrient status in the Everglades (which appeared as Chapter 3C in 2008) and the water quality assessment associated with protection of the Cape Sable Seaside Sparrow. It continues to make statements about the constituents that do not have criteria, such as sulfur, including comments about the concentrations across all of South Florida (e.g. lines 67-68). As a result, Chapter 3A presents a more integrated overview of water quality conditions, especially in the EPA – the title of the chapter is much better matched to its content than at any time in the past.

The excursion analysis and phosphorus/nitrogen subsections are, in particular, evolving into highly readable and understandable summaries of core water quality conditions in the EPA. These sections have been a part of the SFER, and its predecessor reports, for the past 10 years and reflect the benefit of this experience (i.e. undergoing annual development and refinement). The consistency of the presentation format, developed over the past few years, greatly assists in readily transmitting water quality understanding. The phosphorus criterion achievement subsection needs a few more years of data to be complete, given the five years of data needed for two of the four criteria. However, the preliminary evaluation of the phosphorus criterion

achievement, provided for the past few years, is beginning to yield a picture of emerging compliance patterns as well as accustom readers to the presentation format.

#### Progress Review: Accountability

Chapter 3A has components that are reporting the current year's performance within a standard context of tables, figures and wording. Such components include the Class III standard compliance assessment, assessment for the non-ECP structures, total phosphorus status within the Everglades Protection Area (EPA), phosphorus loads to the EPA, and total nitrogen concentrations within the EPA. The phosphorus criterion achievement section has not reached the point where its monitoring network is able to support a complete assessment (several of the criteria require five years of data before a final assessment can be made). The Cape Sable Seaside Sparrow section represents the fifth annual report, but only the first time these results have been included as part of the SFER. Thus, the Panel is not comfortable concluding about the routine nature of this subsection.

There is a potential change in the methods used to generate the water quality assessment presented in Chapter 3A that is of concern to the Panel – the monitoring system reengineering currently underway. In theory, this change should not affect the reporting process in Chapter 3A, but it could change the data available to support the assessment. Data available to support Chapter 3A has been of concern to the Panel for a number of years. For example, data used for the assessment are drawn from DBHYDRO via a data screening process. In other words, the data are not designed to support the water quality assessment in Chapter 3A – they are collected for a variety of projects and programs which are coordinated with the water quality assessment staff. However, there is no assurance that funding will be provided to collect data consistently over the long term and in the amount called for by use of the binomial hypothesis test (28 samples per year). If the monitoring system reengineering helps provide this assurance, Chapter 3A will have a stronger scientific footing as well as the consistency needed to produce comparable information for management over the long term.

For those SFER results that are becoming standard enough to consider reducing peer review to a five year review of methods, can the accountability results be presented in a manner that could be read directly by the public? At present the results are presented in 50 to 100-page chapters – a format designed to support an annual scientific peer review. If the peer review is redirected to a five year methods review, then the information reporting goal of Chapter 3A could take on a more public accounting for achieving water quality criteria in the EPA and, eventually, all of South Florida. This would require a major shift in the nature of Chapter 3A – perhaps moving more toward a situation similar to that faced by drinking water providers in the mid 1990s. The 1996 Safe Drinking Water Act required drinking water providers distribute a one-page summary of their water quality conditions each year via a 'Consumer Confidence Report'. The format and content of these one page summaries have been evolving, as most drinking water consumers have observed over the years. Perhaps the next step in SFER reporting, where methods have become standard, is to consider extending the simplification of reporting directly to the public. By placing the standard methods documentation (including methods for reporting to the public) in a document (peer reviewed every five years) the SFER may be sharply reduced in size while greatly increasing its effectiveness in informing the public about South Florida water quality conditions.

#### Project Review: Technical

The methods employed to produce the information presented in Chapter 3A are well reviewed, if not by the panel, apparently by others (for example, sampling and laboratory analysis methods employed in placing data into DBHYDRO). The methods employed to screen DBHYDRO data are well reviewed as are the ways in which the data are analyzed to determine if

criteria are not achieved. The reporting approaches (tables, figures and general wording) employed in the chapter have been consistently used for several years now.

In many ways, the remaining research component of Chapter 3A is how to integrate water quality reporting, not only across the Everglades Protection Area (now addressed by the Chapter), but across all South Florida. Chapter 3A is not as mature in its reporting as Chapter 2 (one illustration of this fact is to compare the ‘Table of Contents’ for the two Chapters). The addition of the phosphorus and Cape Sable Seaside Sparrow sections to Chapter 3A (along with the Non-ECP section which has been included for several years), while highly desirable in presenting a larger water quality picture, adds some confusion to the reader. Much of this confusion comes from a lack of consistency in use of subtitles and writing style across the chapter. To illustrate, the ‘contents’ section of Chapter 3A, provided separately from the Chapter, does not list the major sections (such as ‘Summary’ and ‘Water Year 2008 Results’). Also, the subtitles do not follow a consistent hierarchy – no indentation in the Chapter 3A Table of Contents is provided for the first 19 subtitles, implying that they are all equal. To get a handle on the Chapter’s organization, the Panel attempted to create a ‘Table of Contents’ that seems to capture the manner in which the information is presented. (See the ‘Table of Contents’ Comments below)

The Cape Sable Seaside Sparrow section to the Chapter (new for 2009) is a welcomed addition. It helps put the Non-ECP monitoring into a larger context. In other words, there are core monitoring efforts associated with management of the EPA (e.g. standards compliance) while there are also more narrow monitoring efforts addressing potential water quality problems around the edge of the EPA (e.g. Non-ECP and Cape Sable Seaside Sparrow project monitoring). These additions help the Chapter present a larger and more complete view of water quality in the EPA. There are several other water quality monitoring efforts around the EPA, such as the L-8 Restoration Project permit monitoring and the C-111 basin, that might also be considered for inclusion.

Bringing new water quality results into Chapter 3A, however, will require careful structuring of the expanded Chapter as well as careful editing for a common reporting style and format. To illustrate Chapter structuring, one possible ordering of material could present the core water standard/criteria compliance first, followed by the special emphasis on phosphorus. Such requirements are applicable to broad areas of the EPA and/or South Florida. Likewise, water quality constituents important to the entire EPA/South Florida, for which there are no criteria at present (e.g. sulfur), could follow the standard/criteria compliance section. Finally, the chapter could end with a sequence of sections addressing water quality assessments associated with more narrow projects, such as the Non-ECP, Cape Sable Seaside Sparrow, and others, as appropriate.

#### Specific Questions:

1. Why were the table summaries for the excursion analysis results removed from the ‘Summary’ section in 2009? This table contained elements of public accounting for criteria non-achievement that could evolve into a type of ‘Consumer Confidence Report’ for water quality management in South Florida.
2. Sulfate is not included in the list of constituents evaluated (page 3A-15), yet the chapter contains comments about sulfate (page 3A-29). Why?
3. Table 3A-2 is presented in the ‘Methods’ (page 3A-18) section when it clearly contains results. Was there a reason for this placement?
4. Lines 411-412 note it is assumed that no trends exist over five years of data in order to assess excursions where data is limited. Is there sufficient data available now to test the validity of this assumption? Or to at least note the percent of times it may not be a valid assumption?
5. Footnote 2, Table 3A-2 does not include a definition of ‘NC’ – needed for completeness.

6. Why are there few subtitles in the Non-ECP section and many in the Cape Sable Seaside Sparrow section? A common strategy for summarizing larger reports (e.g. Appendices 3A-4 and 3A-5) into Chapter 3A sections would be helpful to the overall communication effectiveness of the chapter.
7. It was noted that Appendices 3A-4 and 3A-5 (as well as Appendix 7A-4) present very similar, if not exactly the same, material regarding the design and operation of water quality monitoring (e.g. the excursion analysis, how data are retrieved from DBHYDRO, and the Class III criteria). In the current reengineering of water quality monitoring system, would it be possible to develop one monitoring design/operation description for all common water quality monitoring components and reduce presentation duplication in the SFER?
8. The Cape Sable Seaside Sparrow section, as well as its supporting appendix, do not make clear the connection between protecting the species and the water quality monitoring. Is the connection simply the need to insure Class III water quality standards are met during construction? Or is there a water quality goal associated with species protection?
9. The Cape Sable Seaside Sparrow section was added to the SFER this year after operating outside of SFER for the four previous years. What caused this section to be added to Chapter 3A this year? Are there other monitoring efforts that should be considered for inclusion in Chapter 3A, to further complete the total picture of water quality monitoring in the EPA?
10. Under the 'Total Phosphorus' subtitle, there are three presentations that address, basically, the following: (1) concentrations – pages 52–65; (2) loads – pages 66-72; and (3) criterion achievement assessment – pages 73-74. Why is the term 'status' used to title the presentation of concentrations across the EPA when the other two subsections also deal with status? More clarification of subsection content is needed.
11. Given the continuity of presentation for the excursion analysis and phosphorus/nitrogen subsections, are these subsections ready for further streamlining into shorter annual summaries? For example, the 'methods' appear to be settling into a standard form, thereby lending themselves to an appendix where interested new readers of the report can reference. This general type of inclusive document, for a large scale network in Florida, appears to have been prepared by the Florida DEP for monitoring across the state (<http://www.dep.state.fl.us/water/monitoring/docs/SamplingManual.pdf>). Perhaps the reengineering of the monitoring program can consider this possibility and coordination.
12. In line 1390 reference is made to Appendix 3A-3. Should this not be Appendix 3A-8?
13. Table 1 in Appendix 3A-8 summarizes current criterion assessment with available data. Unless one studies the table carefully, it is difficult to interpret network means. Is it possible to remove lines for individual sites in the network means columns?

'Table of Contents' Comments:

Chapter 3A, while presenting a more integrated and complete picture of water quality in the Everglades Protection Area, was not an easy chapter to read logically, primarily due to confusion about its organization. Below is the Table of Contents of the Chapter with the Panel's best guess as to the ordering of subtitles around a logical grouping of the information content. This listing was developed from the subtitles in the text, not those in the Table of Contents provided with the report.

The bold subtitles are assumed to be the major topics of the chapter. Those marked with \* are assumed to be major subtitles under the "Water Year 2008 Results". We say, assumed, because there does not appear to be a distinction between, for example, the subtitle size/boldness of 'Water Quality Criteria Excursion Analysis' and that of the individual constituent subtitles listed

under the larger subtitle. Also, there are a group of major subtitles, such as ‘Water Year 2008 Results’, that appear to be equal. For example, ‘Water Quality Monitoring and Analysis for Non-ECP Structures’, a presentation of WY 2008 results, has the same level of subtitling at the ‘Water Year 2008 Results’. Same holds for the following subtitles:

Summary Annual Water Quality Monitoring Report for Interim Operation Plan for Protection of the Cape Sable Seaside Sparrow’

Phosphorus and Nitrogen in the Everglades Protection Area’

And then, under the last subtitle above, ‘Total Phosphorus’ and ‘Total Nitrogen’ have the same level of subtitling.

From the Table of Contents below it is possible to note that various sections of the chapter appear to employ different strategies for subtitling, further adding to confusion when reading the chapter. For example, the subtitle ‘Summary Annual Water Quality Monitoring Report for Interim Operation Plan for Protection of the Cape Sable Seaside Sparrow’ is only five pages long, but has 20 subtitles. The remainder of the chapter employs subtitles more sparsely, often including different areas being sampled, such as inflow, interior and outflows, within tables that are then discussed under one subtitle, not a separate subtitle for each category.

The chapter would benefit from a careful review of the subtitle strategy.

## Table of Contents

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 3B AND RELATED APPENDICES**

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**Reviewer:** J. Burger and others

**Subject:** 3B Comments

**Posted:** 12 Sep 2008 11:19 AM

CHAPTER 3B MERCURY AND SULFUR MONITORING    Technical Review

J. Burger and others

The Mercury and Sulfur Monitoring, Research and Environmental Assessment chapter (3B) is an excellent overview of the mercury and sulfur problems in the Everglades, how mercury and sulfur interact with other nutrients (and with each other), on-going research with biota and mercury, the role of sulfur, and the new initiatives to understand mercury cycling. It clearly notes the importance of more data on sulfur cycling, and highlights the need for detailed examination of hotspots where mercury levels are high in fish, coupled with an engineering mass balance approach to at STA (or similar area).

The major problems are noted, along with new research needed to understand how to reduce mercury levels further, particularly in fish, and in the Everglades National Park. The data, models and conclusions in chapter 3B reflect the complex problem faced by many agencies dealing with mercury and sulfur in freshwater ecosystems. The data generated by the SFWMD are proving useful for other aquatic ecosystems throughout the United States. The summary is excellent, and hits the high points. It is particularly useful to have a bulleted summary of all the major findings from the overall mercury program. Research with mercury and sulfur in the Everglades ecosystem continues to be a productive collaboration between different agencies in understanding the complex issues, and this collaboration should be fostered.

The authors are to be commended on writing a chapter that is very readable and accessible to a broad range of readers. It is written in a style that can be easily followed, and that make the main points clear. Further, this years report more clearly describes the research findings, with appropriate references to the primary literature. This year's summary will be particularly useful to a wide range of stakeholders, including those new to the Everglades process, although there should be more references to where naive readers can find the full documentation for some of the past conclusions and research. This year's report is readable, concise, and presents clear data. Further, the report makes the data readily accessible to scientists not previously familiar with the Everglades. They have effectively used bass and Great Egrets as bioindicators of mercury exposure (although data on a short-lived species such as mosquitofish would also be useful), and have one of the longest running such data sets in the country from one region. The inability to use Great Egret feathers this year is problematic, and hopefully, can be rectified next year. Further, no other bird data has been included.

The chapter accurately and fairly reflects the state of the knowledge about mercury fate and effects in wildlife, and sulfur effects within the system. Questions still remain about the relationship between sulfur and methylation (including levels that inhibit and enhance it). For example, do Hg and S concentrations vary by annual variations in hydrology?

Unlike many models to understand the fate and effects of mercury, the Everglades Mercury Cycling Model is dynamic and makes use of additional data as it becomes available. This is a key point that will increase our general understanding of mercury cycling. The suggestion that further modeling is required to understand how to reduce mercury still further is a move in the right

direction. Integration of sulfur into the models is an important step in understanding chemical dynamics within the Everglades, and should be given high priority. The models would profit from data that examine mercury and sulfur levels in water and biota from the same location at the same time (at greater frequency) and an in-depth and transparent peer-review.

The findings are exciting in that they include three important areas: 1) Continued biomonitoring to explore temporal and spatial trends in mercury (both the bass and sunfish data are extremely important within this context), 2) Results of experiments to determine if the mercury levels are having effects on key bioindicators (wading birds), and 3) The relationship between mercury and sulfur. The inclusion of previous findings is also very important because it provides a context for the current work, and allows the general reader to get up to speed with previous work. The inclusion of sufficient references in the previous findings was extremely helpful, and continues to be important in each report.

Finally, however we note that it is difficult to perform an in-depth technical review when the chapter itself is mainly a review of existing information and studies. The studies are not described here in enough detail to evaluate, and the overview lacks a regional context. This leads to overall questions of a longer time span than simply to one year report. For example, How does the MeHg in fish tissue problem in the WCA and ENP compare to other non-impacted sites in Florida and other SE US locations. Is it typical for the median level to exceed human ingestion standards? Recent levels are much lower than in the 1990's and the observed median levels outside of ENP are "close" to the standard. Have such trends been observed elsewhere? Simply, is the South Florida problem unique or symptomatic of a larger regional problem. While this would be a short introductory section, it would give the reader not intricately involved in the research much-needed context.

### **Mercury in Everglades Fish and Wildlife**

This year the introduction to this (and other sections) is much clearer, and provides a context for each area of research. However, the report then goes directly to methods and results without giving a clear objective for the work (it can easily be inferred, but it should be stated). The long data sets for several sites for mercury in largemouth bass is extremely useful in both showing long-term trends, and in identifying where mercury levels have not declined, but are indeed rising. A fuller discussion of possible mechanisms would be in order; these anomalies require extensive data collection and experimentation in order to determine causes.

It is unfortunate that bird feathers could not be collected in 2008, and it suggests that perhaps feathers should be routinely collected from at least 2 species so that this bioindicator is present each year. Further, the lack of wet deposition of mercury data is unfortunate (especially as it is the second year).

The detailed studies of site specific trends is quite useful in beginning to understand movement of mercury through the ecosystem, and should be continued. Research funds need to be focused toward understanding firstly why mercury levels remain high in fish from some areas of the Everglades, why these are shifting, and what the slight increase in feather levels is a result of. The clear increases in Holey Land Wildlife Management Area are disturbing in light of other decreases within the system.

### **Sulfur in the Everglades**

The introduction to this section is very clear, and lays out the problem very nicely. It is well-written, and at a level to provide basic background for a wide range of stakeholders. There is, however, insufficient discussion of the mechanisms and real relationships between sulfur and methylation in the Everglades. Continued work on defining the biogeochemical relationship between the mercury and sulfur cycles continues to be a clear and important goal for those

working with mercury. Sufficient support (money and personnel) should be directed toward the creation and refinement of this model

The studies being undertaken to evaluate sulfur effects on South Florida wetlands are important and key. They appear to be well thought out, although the methods and approaches are not clear from this report (perhaps this material could be placed in an appendix). However, some questions were not addressed, such as linkages between this years sulfate water quality data and previous years.

### **Discussion**

This is a laudable section, and important to address comments and concerns from previous reviews.

The wading bird exposure studies are extremely important to understanding the effect of mercury on these indicators. Studies have found that seabirds have evolved with mercury (naturally-occurring in the ocean), and can tolerate higher levels than traditional laboratory animals. These no-effect level studies with white ibis will help determine whether wading birds are more like seabirds or laboratory animals. Every attempt should be made to continue this study.

The explanation of the future activities of the mercury program is an outstanding addition to the report in its present form. The collaborations are well-thought out, and involve the necessary expertises. Some consideration should be given to the selection of the four sampling sites, with special emphasis on those sites with abnormally high mercury levels.

It would be useful if the authors would write a Conclusion to this chapter that relates in a concise manner the findings, the data gaps, the relationship between on-going components of the program, and the research currently being undertaken. The chapter is excellent, but a section that ties it together would make it more useful for a range of stakeholders.

### **CHAPTER 3B - Accountability**

This chapter provides the necessary information to evaluate whether mercury levels in the Everglades are meeting appropriate state and federal criteria. The provision of the criteria, and the notations of the locations where mercury levels in fish exceed the EPA level of 0.3 ppm in edible fish tissue is key to understanding the importance and relevance of both past and current levels, and of regions where special consideration should be given. The data provided also help the state and local stakeholders understand the need for and importance of Do Not Eat advisories. It could be improved by having one map (with accompanying table) that shows EPA mercury exceedances for fish.

### **CHAPTER 3B – Integration**

Understanding Mercury and Sulfur levels and distribution throughout the Everglades Protection Area is critical to the restoration goals because both affect the structure and function of ecosystems and their component parts. Sulfur affects methylation, who in turn affects mercury levels, and since mercury has both long-term and short-term effects on biota, including people, data on levels is a bioindicator of overall ecosystem health. This chapter, in connection with 3A, integrates information on sulfur and mercury cycles.

Mercury and sulfur dynamics within the Everglades is an issue that cross-cut several different chapters, including Status of water quality (3A), Ecology of the Everglades (6), and Invasive exotic species (9), since in the later case, species are differentially affected by mercury. Mercury and sulfur issues should be integrated among the chapters, and within chapter 3b. Further, the mercury chapter should provide an overview of how the data they are collection, and they

mercury cycling information that are accumulating, relate to overall restoration and management within the Everglades, as well as to specific regulations and acts or laws.

**QUESTIONS** from J. Burger, O. Stein, and others:

**General Impressions and Suggestions:**

The abstract could be improved by adding more quantitative data, such as percents and exceedances.

It might be useful to consider making a table that lists the major bioindicators used (bass, sunfish, birds etc) across the top and the areas sampled down, and give where they exceed human or wildlife criteria or effects levels.

It would help if the beginning of each research section clearly stated the objectives. There is a nice section on historical levels of mercury (for example, on page 3B-4), but then the authors go directly into sampling without given an overall objective for this research.

There should be some mention of the goal of buying out the sugarcane farmers, and the implications for these cycles, including potential time constraints.

**Questions:**

1. Lines 20-23. It might be useful here to provide some quantitative data, such as they have decreased by 70 %.
2. Lines 29-31: Give the general areas where they have met the criterion.
3. Lines 37-38. Give some indication of how this might be done.
4. Lines 56 you need to define LMB here (as you did earlier with WCA
5. Line 61, it is not only high bioaccumulation, but it clearly provides a human health risk<sup>92-96</sup> Units seem a little confusing: mg/L in LMB? On line 126 authors state units are reported as ppm, which seems more appropriate.
6. Line 110 It would help if there were a clear statement of the objectives for this years sampling, with why snook were selected.
7. 114 What is the size of legally harvestable fish?
8. Lines 130-137: This should go much earlier as it partly answers the objectives question above.
9. Line 164-165: Why will Snook provide this information? The use of, and advantages of Snook need a little explanation, especially since so few have been collected overall
10. 138-146 Is ALL reported data normalized to 3 years? It seems that data in Figs3B-2 and 3B-3 are raw data for all fish regardless of size and or age classification, but it is not clear either way.
11. Line 168 Are you talking about in all fish, only in bass? Or in what?
12. Lines 168-174. Maybe a regression analysis using year AND location would help separate some of these effects. There might be a much greater decline in some areas, and this is being masked by the stability and increases in other areas.
13. Line 178 – you need to mention the areas that exceeded 1.0 ppm (lines 179, is it only Shark River Slough?)
14. Lines 194 – you need to make the objectives clearer for Snook (the data are quite nice)

15. Lines 209: Are there elevated levels in organisms other than bass and snook, as this comment implies
16. 210-212 I could not agree with this statement more and this should be used as a guiding statement in preparation of this document. The linkage between this statement and the research projects outlined at the end of the chapter could be clearer.>
17. Line 214: You might add a sentence that explains what your overall sampling plan and objectives were for this section.
18. Lines 219-265. Again, a table showing these trends among the sites might be useful (Table 3B-2 is excellent, although the title is not clear (POR is there twice).
19. 250 In last years comments we discussed the possibility of a wave of mercury methylation moving through the system could this observation be evidence of a second wave moving through?
20. 260-269 Is the hydrology (water sources) of the HOLEY site unique compared to the STA and WCAs? Why is this site unique?
21. Fig 3B-2 and 3: Last year these figures were combined, into two panels of one figure, which was easier to read. That format should be continued. Are these data normalized to age 3 yr fish (if so please state).
22. Fig 3B-4-9. In some years the measured average is used rather than the regression for 3rd year fish. This seems to be a new method. Please explain the reason and justification. What criteria were applied to use average over regression?
23. Line 309 Does fisheating include other fish, birds and mammals here?
24. Line 318 – Did all colonial birds fail? Are feathers from other colonial birds routinely collected?
25. Line 378 Any idea why levels are going up in L-7 canal?
26. Line 393 Any idea why there was such great variation in 2006 for Area 1W?. In this regard, it is hard to evaluate the variances in these graphs without knowing the sample sizes.
27. Lines 398: Holeyland seems to be rising more than other areas – why would this be if it was simply geographical movement through the Everglades?
28. Line 419: It would help to have subheadings here (like Introduction)
29. Line 442: Here is would be useful to have a heading about Sulfur Studies or Objectives
30. 451: Exhibit a general decrease in a north to south...
31. 465-471 The wording in this paragraph led me to believe the comparison in subsequent text (and Fig3B-12) was for pre S10-E closure, but after a couple of re-reads I got a different interpretation (comparing post S10-E closure to post WCA water release to the location. This could be re-worded for clarity.
32. 472 ...increases during the post... (over implies a comparison to something)
33. Fig 3B-12 Are there any pre 1997 data?
34. Figure 3B-11: The symbols should be slightly larger on the figure itself
35. Figure 3B-12: Would it e possible to put circles around the pre-hydropattern values (not everyone will have color). Further, are there any pre-1997 data?
36. Lines 500-504 (References should be made to the literature and previous reports)

37. Lines 493-497. This section needs a clear statement of goals and what will be discussed in this section.
38. Line 519. For how long were they exposed. Are they provided with it every day all year?
39. Lines 518-527: This section is a little confusing. Are you saying that males nest homosexually, but there are eggs in their nests?
40. Line 522: Similar to nature for all colonies, a couple of colonies, a subsample of one colony>
41. Lines 534-540. While correct, this section needs reference to the literature.
42. Line 587: Are these lakes near or within the Everglades system, or mainly external to the system?
43. Line 600: This should especially take into account sulfur.
44. Lines 606-614. There should be some comparative work with fish from other coastal areas along the East coast to determine if these levels are similar to, or higher than fish from other nearby coastal regions.
45. Lines 615-625. More details of this study are required in order to evaluate it.

Additional issues for future activities include the following. Please address these:

We are concerned that a comprehensive TMDL by 2012 is very optimistic considering additional monitoring is only being initiated in 2008. The listed elements look appropriate, but can this be done in the given time frame?

What is the progress of the regional sulfur mass balance study? Last years comments suggested this should be a priority and provided considerable input/suggestions for how this study might be conducted. It seems as if a detailed plan has, to date, not been developed. When might we expect a more detailed presentation of the research plan and what mechanism is there to know if previous suggestions have been incorporated?

The outline of projects for evaluation of sulfate effects is good to see. More information on the expected timeline for results would be useful however.

Project#2 At what scale and at what sampling intensity will this study be conducted. What location(s) have been selected to make these field observations? As with the mass balance study the panel offered several specific suggestions for how to conduct these experiments, but there is no way to know how these might have been implemented.

Text (lines 684-688) suggests the ACME study has collected much more data than the MeHg in fish data reported earlier in the chapter. Is monitoring for other parameters continuing, and if so, why are updates on the other data not included? When will data from this study (lines 696-700) be available?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 4 AND RELATED APPENDICES**

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**Reviewer:** Jeff Jordan

**Subject:** Comments on Chapter 8 (*Note: comments were posted under Chapter 4*)

**Posted:** 10 Sep 2008 10:10 AM

This chapter is in a state of transition “in that it combines all source controls programs for all water sheds to give a comprehensive presentation of existing, evolving, and future nutrient source control programs.” Further, the chapter is going to focus not only on the watersheds south of Lake Okeechobee as in past SFERs but those north as well, which are currently covered in Chapters 10, 11, and 12. This result is phosphorus inputs to Lake Okeechobee being presented and discussed in one chapter, which will help the understanding of phosphorus loading, sources of phosphorus, and the effectiveness of BMPs and of regulatory activities. The legal and regulatory context for phosphorus control in various parts of the watershed are included which is most helpful to understanding the management approaches and implementation strategies taken.

The authors have responded very well to the Panel’s suggestions during the 2008 SFER review. Specifically, descriptions of the BMP equivalents approach documented in Appendix 4-1 have been expanded as have the compliance models for the various basins in Appendix 4-3. Further, the authors have moved regulatory performance text from the chapter to Appendices 4-2 and 4-4 which has “tightened” the chapter significantly.

Like last year, this chapter is very well written and an excellent example of how an accountability chapter should be constructed. The text is concise, to the point, and communicated effectively.

**Reviewer:** Jeff Jordan

**Subject:** Additional Chapter 4 comments

**Posted:** 10 Sep 2008 03:30 PM

As mentioned in the previous post, Chapter 4 works well in terms of accountability. That being said, the first part of the chapter dealing with the Lake watershed is very short on content. Obviously, BMP efforts, and the reduction in TP in the EAA Basin as a result, are impressive. Efforts in the Lake watershed are only getting started. However, the discussion in the first part of the chapter is so vague and redundant (numerous repeats of NEEP and other legislative matters) it lacks any analysis that would help the reader get a better idea of what is going on.

It is hard to tell how the success of in the EAA is to be duplicated in the lake watershed.

The most glaring omission is any discussion of the reason for large TP flows from East Lake Okeechobee into the lake. According to table 4-1 45% of the TP load into the lake is from ELO. More important, 72% is from non-ag sources. Yet most of the discussion of future work mentions BMPs that are usually ag related. What is going on in ELO and why is that not a priority is getting TMDL for the lake down to 140 mt? This chapter has become so heavily weighted to just reporting legislative requirements that very little information is provided, particularly in the first half of the chapter on the Lake watershed.

line 1002: Where is EBWCD? Not on the map in 4-1. Is there a relation to ELO?

line 1102: Two tables 4-8. Should table on page 4-42 be 4-7?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 5 AND RELATED APPENDICES**

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**Reviewer:** posted by Otto Stein

**Subject:** Consolidated Panel Review comments submitted by Stein (AA)

**Posted:** 12 Sep 2008 01:00 PM

Combined Review of 2008 SFER Chapter 5 STA performance, Compliance and Optimization

### **General comments**

This lengthy chapter summarizes the many efforts that are in progress or being initiated to manage and optimize the phosphorus (P) removal performance of six major constructed shallow freshwater marshes, known as stormwater treatment areas (STAs). The chapter includes hydrologic information, water-column phosphorus concentrations and loadings, other environmental conditions in the water and soils, a summary of research in areas downstream from STA discharges (Water Conservation Area [WCA]-2A and the Rotenberger Wildlife Management Area [RWMA]), evaluation of the performance of the STAs including a demonstration Periphyton Stormwater Treatment Area (PSTA), and evaluation of rehabilitation/restoration efforts for some STA components (cells). Maintenance of constructed wetlands to function sustainably in pollutant removal is extremely challenging, and the District is renowned for its leadership in this field. An enormous amount of work and excellent effort is represented in this Chapter, such as the remarkable undertakings involved in converting cells from EAV to SAV, in the large-scale experiments described, and in rehabilitating STAs that accumulate soil deposits high in P over time. Interesting information is given about the use of STAs for various recreational activities. The question format on pp.5-74 and 5-78 is helpful for readers, and the statistics describing the District's progress to date since 1994 (p.5-3) are impressive, as is the clearly constant adaptive management that considers new information, as it becomes available, to improve STA performance.

### **Accountability review**

The Chapter 5 draft presents a defensible scientific account of data and findings for the areas addressed. The findings, in general, are clearly linked to management goals and objectives. For example, the chapter describes many ongoing, diligent efforts to track STA performance for P removal, major rehabilitation efforts for STAs that decline in efficiency, and an active research program maintained by the District for optimizing and sustaining STA performance. In addition, the chapter explains the technology-based effluent limitation (TBEL) requirement for all STAs except STA-3/4, and an analysis showing that the STAs were all in compliance with NPDES permits and TBELs in WY2008.

The overall organization of this chapter is somewhat unclear, however – the present version includes many sections, some of which seem incomplete (below), and organized in some cases without clear relationship or logical flow. Also missing from the writing is a clear explanation of how accountability will be evaluated as restoration efforts continue.

**Questions** (other are included by line number below).

Water Quality Permit Requirements (p.5-14) – STAs are considered to be in compliance if the annual average outflow does not cause or contribute to violations of Class III water quality standards – what is done to determine whether a STA is contributing to violations?

In Figure 5-18, why do the data for STA-3/4 begin so late (2005), when this STA was permitted in 1994?

How is background defined for conductivity and turbidity? (Table 5, Water quality parameters with Florida Class III criteria...; also affects Tables 5-9, 5-12, and 5-14, lines 836-839, 896-897, and interpretations)

STA-5 had statistically higher N concentrations at the outflows for 36% of the samples (n = 12 of 33), yet was evaluated as in compliance because no numeric criterion exists for total nitrogen (p.5-21). Is there any plan to establish a numeric criterion?

Why are criteria for NH<sub>3</sub>, TDN, and TDP only established for STA-3/4 (older permit, Table 5-6)? Why are there no diel requirements in the permit for STA-6 (lines 448-449)?

Why are the accepted limits (mean annual SSAC limit) for DO so low (Table 5-8)? Would such limits support healthy fish life?

What may have contributed to the increase in mercury concentrations in mosquitofish and sunfish from all STAs during 2007 as compared to 2006, versus minimal change in largemouth bass (p.5-28)? What may have contributed to the decrease in mercury burden for fish species in STA-1E, and the major increase in STA-1W?

Why were cores split into 0-2 cm and 2-10 cm layers for analysis, but results were presented as 0-10 cm (lines 612-613, 748-754)?

What is planned next in the sawgrass mesocosm assessment (lines 1134-1139)?

Exotic species are well-represented in the STAs (e.g. lines 1421-1422 – 26% of the [vascular] plant taxa are exotics). Moreover, some exotics such as hydrilla are considered beneficial as SAV taking up P. What management strategies for exotic species other than hydrilla are planned for the STAs?

What are the effects of recreational alligator hunting (harvest of 151 alligators from STA-1W and 58 alligators from STA-5) on the alligator populations (line 1533)? Similarly, what are the effects of duck hunting (more than 17,000 ducks harvested by more than 4,600 hunters) on duck populations? Are there disturbance effects that should be considered, for example, from so many duck hunters, or have these effects been assessed and found to be negligible?

Rehabilitation projects describe removal of hundreds of thousands of cubic yards of P-rich soils. What was involved in disposal of these soils, and where were they disposed?

### **Technical Review**

The figures and tables are nicely designed and most are very helpful. The Water Year 2008 Highlights and Individual STA Highlights sections, figures (5-2, 5-3, 5-4), and Table 5-2 were especially helpful. Suggestions are given below for altering the writing to include more supporting information and to enhance clarity.

An available (see below) appendix with acronyms and their definitions would be very useful to the reader. (Note: Every reviewer commented on this!) While they are generally defined the first time they are presented (not always e.g. DO SSAC, Table 5-2, p.5-8; defined on p.5-20) the overwhelming number makes for repeated digging for the definition when encountered again. A listing in a single source would be really helpful to the reader.

It is not possible to evaluate various parts of this Chapter without access to the many appendices (15?) that repeatedly are cited (lines 261, 263, 271...). Moreover, the appendices are cited out of order (p.5-14: the first a=Appendix cited is #5, then #6, then #10; p.5-16 – appendix #2 is cited, etc.).

The Table of Contents does not match the text.

The use of English and metric units, often in the same short paragraph (e.g. lines 538-542 – acre-feet, metric tonnes) should be altered. It is recommended that metric be used, with English given in parentheses.

Page Specific Review by line number where appropriate, typically suggested text changes in italics):

16-80 This section, lengthy for a summary, combines summary information with information that normally is included in an Introduction and would benefit from restructuring.

18-19 The difference between overall acreage and effective treatment area should be briefly defined (as on p.5-8 or p.5-10).

19-20 Should be changed; STA-5 Southern Flow-way (Cells 3A, 3B) is described as not having passed start-up but actually the tests have not been possible because of lack of water (according to p.5-12).

Table 5-1 The title should be re-worded or (better still ) an additional column with total as well as effective treatment area should be provided (FYI Area units are missing).

104-105 Where is supporting text for this statement?

124-125, 1068 Should be changed; these were not really field studies but, rather, large greenhouse and mesocosm studies.

Figures 5-2, 5-15, 5-16, 5-17 Need a scale.

Table 5-2 Please define the operational envelope and excursions (also see lines 348-350; should be defined for each STA in Table 5-3 or in a separate table).

149-150 It would be helpful to briefly describe the positive results.

204-210 It would very helpful if a Table (or text) were added to explain the various levels under the TBEL permitting system. It is not clear, but it looks like a hierarchy is; stabilization phase, then Interim performance ?then normal flow?? This explanation should done before the descriptions of which STA's are in what phase.

211 ...and this phase ends... (drop "is")

230-231 Brief explanation should be added for why flows to STA-1W are expected to be higher than anticipated in the EAA Regional Feasibility Study for WY2006-2009.

240-242 When will STA 3-4 be given a new permit under the TBEL criteria? Is this in the works or will the current one expire at some point? Comment applies to Table 5-4 too. Add units (50 ppb)

Table 5-3 legend, line 3 ...are listed below;

265-266; 603-604 Please add information on frequency of data collection.

Table 5-4 Define AO. 1st line of legend - ...and reporting criteria

234, For STA-1E Should be a new paragraph.

283 Types of performance enhancement projects should be briefly explained, or readers should be referred to the appropriate later section/page.

311 Should refer to Table 5-2 for TBEL limits.

312-314 Is an important point, but for supporting information readers are referred to unavailable Appendix 5-2. It would be helpful to add some supporting information (graph etc.) here.

416-417 Wouldn't it be much easier to just say none of the data was normally distributed by the Shapiro-Wilkes test therefore we used the Mann-Whitney test for all data?

Table 5-7, footnote, 2nd line ...not be calculated and

459 ...assessment of possible

463 Biweekly...

465 ...limits is provided...

538 ...water were discharged

584 1803 dominant

604-723 (depth > 10...

Fig 5-7. The trends look encouraging even though there are only two years of data. Low flow years might be indicative of low DO too. Question however, can the SSAC limit vary by year or are the trend due solely to changes in concentration? Also, it would be instructive to include comparison of 2006 as a non-drought year.

497-514 Have these data been linked to Chapter 3B? I didn't notice any Hg in fish data from the STA's in that chapter. This section requires additional explanation (see question section above). Information should be added to explain the U.S. Fish and Wildlife Service and U.S. EPA predator protection criteria. It would be helpful to explain why the THg (fish tissue) parameter is so useful (approximates methylmercury, integrates etc.)

514-912 The organization of this entire section, the Effects of Hydroperiod on downstream areas, could be organized better. The section starts with the RWMA then to data from the transects immediately below STA2 (N, C, S, and FS transects) then jumps to a more global presentation of data in the LNWR (same as WCA1) then comes back to some new and repeated transects near STA2 (AN, AS and FS) then jumps back to the RWMA. We suggest that the presentation be re-organized by geographic location (it seems the RWMA and WCA1 are geographically distinct so that they could be presented separately). For the WCA2 which receives flow from ST-1W, STA-1E and STA2 organization could be by where the water comes from. Tables 5-14 and 5-15 are more or less organized around this format but it seems data in Tables 5-9 and 5-12 could be included in those tables. The box and whisker plots are a good way to present the transect data, this could be done for all the transects including those in the RWMA and organized as suggested above. More specific comments on this section are provided below.

520 Explanation should be added about how well the natural hydroperiod is known, and supporting data.

535-536 Brief explanation should be added about why these sites were selected.

542 The TP load should be added.

Figs 5-9 and 5-10. If there was no outflow through the G410 structures how could there be an outflow? Oh, graph is for a period much longer than WY08; That would be worth mentioning.

565-601 and Fig 5-11. Does the annual variation in target stage allow for annual cycles of inundated and dry soils? That is, what is the management goal for stage to meet the vegetation goal. Will this need to be modified in light of the subsidence and its influence on vegetation as shown in Fig 5-12?

678-691 The chapter states that the accuracy of the depth recorder measurements was estimated during 2006-2007 by comparing them with periodic field measurements. The reasons for the discrepancy between the two approaches should be explained, and the

- percent difference between field-measured water depth and depth recorder measurements should be included in Table 5-11 (means, medians, and range).
- 722-725 Brief explanation should be added about why these parameters were selected.
- Table 5-12, and lines 727-743 Brief explanation should be added about desirable levels for these parameters.
- Table 5-13 Brief explanation should be added about the concentration thresholds that indicate “impacted” vs. “unimpacted” wetlands, to assist in interpreting this table (the related information on p.5-43 should precede this table or be included in its legend, and the basis for the thresholds should be explained).
- 759 characterization of the effects of STA...
- 764 ...for each transect are
- 805 ...data were retrieved...
- Figure 5-15 Should identify Transects 1 and 2 (to match Table 5-14).
- Figure 5-16 Should precede Tables 5-14 and 5-15; Figure 5-17 – should precede Table 5-15.
- Figures 5-18, 5-19 - Legends should explain x’s and o’s.
- Figure 5-18 to Figure 5-20 legends - It would be helpful to add, parallel to the chapter text, that these STAs discharge into the Loxahatchee National Wildlife Refuge (Figure 5-18), the WCA-2A (Figure 5-19), and the RWMA (Figure 20).
- 829 ...in the Loxahatchee National Wildlife Refuge (Refuge)...
- 913-1040 For organizational purposes this section dealing specifically with the STAs performance should come before the previous section describing the influence of the effluent on the on the downstream receiving sections. It is a little disheartening to see virtually no trend between outflow concentration and loading rate (either HLR or PLR), globally or by individual STA however it is possible that a better relationship might be seen if removal rate or removal efficiency (rather than outflow concentration) were plotted. Worth a try or maybe include both. More specific comments on this section are provided below.
- 915, 940 seem misleading, as the period of record has not been since 1994 for most of the STAs.
- 937-939 The changes are credited to rehabilitation, which seems misleading since the drought alone could have been responsible for the changes (in lines 1732-1736 the authors acknowledge the difficulty in discerning rehabilitation from drought effects).
- 948-950 These statements do not seem to match the information contained in Figures 5-21 and 5-22.
- 957-963 Further interpretation of the interesting Figure 5-23 would be helpful.
- Figure 5-21 Climatic influences (hurricanes, droughts), by year, should be added to the top of this figure. Also, the legend should explain the apparent discrepancy between the years shown in this figure versus the initiation dates given in Table 5-2.
- Figure 5-22, legend line 3 - (PLR) is by...; and from sentence beginning “The long-term...” on, the writing should be omitted as it is redundant with the chapter text.
- Fig 5-24 It is not clear what data has gone into the performance analysis. Fig 5-22B shows many years of data by STA (STA5 for example) and since data in Fig 5-24A is separated

- by flow way, it would seem that it should have even more data points available, but clearly does not. Therefore it does not appear to be a POR data. The loading rate scales are not consistent either: the magnitudes look similar but one read mg and the other g. Fig 5-24B shows a relationship between k and Cout, but that really is nothing more than a plot of Eq. 1. The real question is why does k vary at all, not how does variation in k influence Cout.
- 1042-1227 This section summarizes the research projects initiated or ongoing in WY2008 that have been designed to strengthen understanding about the mechanisms that control STA performance. They include vegetation surveys, soil sampling, monitoring of newly rehabilitated STA cells, assessment of floc soil biogeochemistry, and several large-scale experiments that have examined biomass effects on SAV establishment and the influences of hydrologic extremes on cattail growth and survival to help identify stress indicators. This section clearly demonstrates the importance SFWMD puts on maintaining and improving performance of the STAs. The breadth and of studies is quite impressive and the overall format; a more detailed presentation of studies initiated this year followed by a brief summary of continuing studies, is effective. However that structure could be emphasized a bit more. More specific comments on this section are provided below.
- 1060-1075 and 1093-1110 Since these two studies are newly initiated the year (or at least newly reported) a more expansive description of the studies is warranted.
- 1060-1075 For the drought study it appears there are two treatments, water depth and time that depth is maintained, not one as suggested. What does the term “a 5 block random design” mean in light of the one (or two) treatments? I would suggest that the number of replicated pots per treatment/depth combination be given and state that these were placed in randomize block design would be a more appropriate of stating it (if that is what was done). Statements as to what will be measured to assess the physiological response and the expected length of the study are warranted. How were the plants established before the study was begun? Explanation should be added about the pot size, with justification from supporting literature because pot size can skew results for cattail growth. A brief explanation should be added as to how realistic the selected treatments are in simulating wet/dry conditions/durations in the STAs.
- 1093-1110 The description of the deep water stress study is a little closer to the suggested format, however what will be measured is not clear here either.
- 1112-1227 As these studies appear to be ongoing a more abbreviated description is warranted, but for each study it would good to provide the initiation date, expected completion date, and where (or when) data are available. Is there an expectation that some of these studies might be published in scientific journals or is the expectation that they will be for internal management decisions only?
- 1113-1126 Explanation should be added as to why STA-2 was selected for this study. Information is also needed about the number of stations (water quality, soil) and frequency of sampling.
- 1169 Suggested study title: EAV Vegetation Resistance Assessment
- 1186-1187 versus line 1195 Both describe small changes in TP, yet the former is depicted as “only marginal improvement” while the latter is depicted as more substantial changes. The writing should be altered to be more consistent.
- 1194 Provide values for “High” and “Low”
- 1203 column P concentrations

- 1206 This statement is a little misleading, the lowest FWMA concentration from any STA is 20 ppb. Is there some significance to the value of 10 ppb?
- Line 1237 ...suggests that periphyton;
- 1243-1244 Please clarify – would there be any residual adverse effects of glyphosate after two months?
- Line 1270 - ...indicate that beds...
- Throughout section, black-necked stilt - the “s” in stilt should not be capitalized
- 1336 The common name for the eagles should be included.
- 1360-1361 Sentence needs some editing.
- 1391-1392 Stilts were picked as an indicator species because their nest sites are most critical for water depth variation. But are they “conservative” in regards to breeding timing and operation management for moving and levee maintenance?
- 1436 ...similar to that of the...;
- 1442 ...comparable to that of fish...
- 1443 vs. line 1456 Does line 1443 refer only to STA-1W and STA-5? Explanation should be added as to whether the other STAs have been surveyed and, if not, whether there are plans to survey the bird species in the other STAs.
- 1488 Something is missing.
- 1490-1491 Sentence needs some editing.
- 1529 delete “the way”
- 1546, 1555, 1558 Brief explanation should be added about why these STAs were selected for opening to bird-watching activities.
- 1560-1916 There is a lot of information on the rehabilitation efforts for STA-1W in this section and one gets the impression that the overall effort, especially the more recent efforts, have been rather successful in promoting the desired vegetation and outflow P concentrations. However authors should develop a more-easily-understood method to present this interesting information. As a suggestion: For each individual cell present the information in an expanded text-containing table that follows a clear time progression from the earliest pre-STA condition to the present. Items would include the target vegetation, the observed vegetation, the suspected cause (if those two are not equal) the remediation strategy and the analysis for success. The impression the reader gets is that several things were tried (sometimes due to a serendipitous event such as dewatering due to drought) and, through a trial-and-error approach, the current strategies have become largely successful. This format would allow an observation of the progression of the currently-successful management strategy and at the same time demonstrate the need for continued research projects to further optimize the management strategy. The main point is that the SFWMD is essentially negotiating uncharted territory as to management of wetlands of this size, and, overall, has done a very good job. Tell us how you got there!
- 1567, 1568 Brief explanation should be added for these two bullets.
- 1587 Brief explanation/description of the Everglades Nutrient Removal Project should be included.
- 1569-1571 Should not be bullets; they are not likely causes for the need for rehabilitation (line 1564).

- 1640-1642 – Brief explanation or speculation about why this effort was unsuccessful should be added.
- 1652-1950 This section on STA-1W Post-Rehabilitation Monitoring presents interesting and valuable information, but it is difficult to decipher because of poor organization and certain statements made to not appear to be justified (below).
- 1650 macroalgal; pp. 5-74 - 5-85 should be checked for use of hyphens.
- 1676-1677 ...total suspended solids...
- 1682-1683 States that outflow TP concentrations have decreased steadily over the past two water years, implied (line 1681) to have been because of rehabilitation efforts. The drought should be mentioned here, however, as a strong influence on the data.
- 1694 ...(Figure 5-36)
- 1711 ...(Figure 5-36)
- P.5-75 “Jumps” from previous Figure 5-27 to Figures 5-35 and 5-36, then to Figure 5-28, then to Figure 5-37. This problem creates considerable confusion and difficulty in following the text versus supporting data in figures. The text and figure numbers need to be altered to conform with the rest of the chapter.
- 1722 MK-9 should be added to a map in this chapter
- 1780 ...particular cell.
- 1807 Chara does not have seeds. Macroalgal potential inocula should be referred to as spore beds.
- 1814-1815 Brief clarification should be added to inform readers of the source of the SAV.
- 1820 was successfully... ; Throughout, spelling should be *Potamogeton illinoiensis*.
- 1857 seems misleading or somewhat inaccurate in stating that pondweed (*Potamogeton illinoiensis*) was successfully transplanted into both cells, especially regarding STA-1W Cell 3. Also note that *P. illinoiensis* looks unhealthy in Figure 5-32 (no broad leaves apparent).
- 1883 ...which is similar to, although lower than, the organic...
- 1900 ...years that this...
- 1903-1904 Explanation should be added for this statement, with supporting reference(s).
- 1914 ...data look very...
- Figure 5-36 Explanation should be added as to why turbidity is given (upper right panel) rather than SS.
- Figure 5-37 A very good overview of the vegetation change with time but cannot be read unless one blows it up to 300% or normal size; labels need to be enlarged, both dates and the turbidity scale are unreadable.
- Figures 5-37, 5-40 The meaning of the species density scale (lines 1948-1949) should be added to the legend to help explain the keys.
- 1924-1925 omit definition for SAV (was defined earlier).
- 1994 ...respectively) (Figure 5-37).
- 2001 ...period (Figure 5-37).

- P.5-86 Although the stated intent was to operate the PSTA and Lower SAV cells in parallel, the two cells had to be operated differently, so it is not possible to compare their efficiencies without the confounding factor of differential flushing (discharge). In addition, the areal surface-water TP loading rate in the PSTA was only about half that in the Lower SAV cell (lines 1992-1994, Table 5-18). Therefore, the comparison given in lines 1995-1997 seems misleading and should be reworded. Considering these difficulties, explanation should be added of future plans regarding operation and use of the demonstration PSTA.
- 210-2173 This well-designed section on Evaluation of STA Soil Data (including nice figures) convinces readers of the great value of soils data in assessing and interpreting STA overall “health”. Counsel forthcoming from the review of the entire STA soil monitoring program should make these data even more valuable for assessing P storage and stability, and other key parameters and processes that affect P uptake and release. The planned assessment of the quality and usability of the different soils datasets (lines 2167-2173) is an excellent action of the District, and the panel looks forward to seeing the key results from this validation process and comprehensive data analysis.
- 2020 It should be made clear that higher AFDW corresponds to higher OM.
- 2011-2016 The number of replicates per cell should be clarified. Brief explanation of the reasons for floc occurrence/accumulation would be helpful.
- 2047-2066 and Fig 5-42 The description of the pre and post rehabilitation conditions is a bit confusing. It looks from the figure that TP went down but OM went up after rehabilitation but that doesn’t seem consistent (maybe the answer is given on line 2070?). Also when was the rehabilitation process conducted relative to the sampling event; was only cell4 measured pre and post rehabilitation?
- 2079 Emergent cells (plural)
- 2144 ...are in Appendix...
- 2156-2160 Additional explanation of use of HA/FA ratios (rationale, ranges for “good” vs. “poor” ratios) should be included. Ranges and median values of the HA/FA ratios in peat versus floc should be given.
- 2161-2162 Microbial biomass P generally was low (mostly...) in floc...; however, it was...
- 2161-2165 Explanation is needed as a basis for interpreting this information (please explain what these ranges mean with respect to the health of soils in the STAs).
- 2241 ...the data are...
- 2176-2187 The Compartment B Build-out project should be explained first.
- 2243-2245 Since no activities for the Operational Strategy project were scheduled or completed, why is this section included?
- 2213-2214 A brief description of this Long-Term Plan is needed.
- 2219-2228 Brief explanation is needed for how improved flow equations were created.

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 6**

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**Reviewers:** J. Burkholder, J. Burger and E. van Donk

**Subject:** Burkholder Burger van Donk Review of Chapter 11 (*Note: posted under Chapter 6*)

**Posted:** 10 Sep 2008 09:27 PM

Chapter 6: Ecology of the Everglades Protection Area

### **Questions**

Were the nest abandonments by wading birds correlated directly to water levels or food, and were they highly synchronized (lines 294-298)?

Why were cattle egrets not included in the nesting data counts (lines 267-268)? Might data on this undesirable species provide insights about how restoration efforts are encouraging some non-target species, of potential value in adaptive management?

How will the results from the observations described in lines 364-385 influence hydrology manipulation in the Everglades? In other words, what is the relationship of these research findings to management?

Are there plans to test the other 12 exotic fish species for temperature tolerance (lines 477-479)?

Are there plans to report on the distribution of the other four exotic plant species on tree islands in WCA-3A and WCA-3B (pp. 6-25 to 6-28)?

In the Plant Ecology – Lygodium subsection (lines 570-577), how will the management implications be translated into actions (and who will be responsible)?

While the emphasis on trees is laudable (p. 6-29), is the District also examining the role of herbaceous vegetation on tree islands?

Were supporting water-column and floc sediment C, N and P data taken in the Decomposition study (pp. 6-52 to 6-54)?

How is creation of openings in the Everglades expected to affect secretive birds (p.6-57)?

When is completion of nutrient budgets planned to examine carbon cycling in the CHIP (lines 1208-1209)?

Redox data can provide valuable insights about geochemical processes and the general “health” of wetland ecosystems. Are there plans to conduct a more detailed redox study that captures the important 0-2 cm sediment depth? (p.6-64)

In the study estimating tree island nutrient fluxes, is it reasonable to assume that nitrogen fixation and denitrification are negligible (lines 1520-1521)?

Is there any way to relate the new trap (bottomless pull trap) to previously used traps, at least for the openwater area (lines 1119-1125)? This would allow correlation between old and new methods, and improve data continuity.

Revisited from WY2007: In the 2008 SFER, the authors aptly called for further work to allow better characterization of the role of hydrology x food limitation on nesting success, especially how dry conditions and a rain-induced reversal event affect nesting success. Since “wet year” data will be important for overall interpretations, the authors had hoped for a wet year in

WY2008, but an average precipitation year with aberrant timing occurred instead. Since the wet year did not occur, can the experimental study be extended when a wet year occurs?

### **General Comments**

Overall, this chapter contained a wealth of excellent information. It also was interesting because it examined the biological components of some of the bioindicators and processes used to assess the health and well-being of the Everglades, as well as performance measures. The clarification of section authors was nicely done, and will aid in ownership and overall improvements in the quality of the report.

### **Integrative Review**

The 2009 SFER version of Chapter 6, as in previous years, presents hydrologic patterns (1 project) followed by a focus on four main areas including wildlife ecology (3 projects), plant ecology (5 projects), ecosystem ecology (5 projects), and landscape (4 projects), thus covering 18 projects in total. The stated aim continues to be selection of projects based upon District short-term operational needs and long-term restoration goals.

With few exceptions, the projects were presented so that overall goals were clear and well-linked to management and restoration goals. As in the 2008 SFER version, however, there still was little crossreferencing to other chapters, which would not be difficult, and little by way of integrative data summaries and analyses bridging projects, which would be more challenging.

Table 6-1 is excellent, very valuable in providing an overview framework of Chapter 6. Its legend makes the important integrative point (reinforced in various sections throughout the chapter) that the research projects described in the chapter are related to one to seven operational mandates, listed specifically for each of the 18 projects described. The hydrological set-up section also was excellent in integrating key processes (e.g. wading bird nesting) and made the descriptions of the water conditions both more understandable and more readable. Any such inclusions make it easier for policy makers and the general public to understand the significance of the findings. The first two of three subsections of the Wildlife section were well integrated, as were three of the four subsections of the Landscape section. Parts of the Plant Ecology and Ecosystem sections were integrated, but both sections would benefit from introductory discussion relating the “pieces”, perhaps assisted by a supporting diagram. There was an integrative tie-in between the Tree Island Hydrodynamics (Ecosystem section) and the Plant Ecology section (lines 1432-1434), but it would be helpful to provide introductory explanation about other points of integration between these two sections, as well.

The inclusion of studies of invasive species is an excellent example of the integration of accountability (Chapter 9) and biological significance and functioning (this chapter). It would be useful to know whether the management implications are being taken to the next step (actual management).

It is suggested that Chapter 6 should have an overall “Conclusions” section that integrates the major findings and briefly describes at least short-term future directions (e.g. to be pursued in WY2009). The end of the Summary should then pull some highlight statements from the Conclusions section to briefly convey how the various subsections are being integrated to examine all of the levels of biological organization.

### **Technical Review**

As a general comment, hypotheses are stated for some studies but not for others, and should be treated consistently throughout the chapter.

### **Summary**

This well-written section provides a succinct, clear overview of the chapter.

Line 25 (vs. p.6-20) should be – ...and no or sparse slough vegetation.

Lines 35-50 – For some bullets, the significance of the findings is mentioned; this should be added for all.

Table 6-1 – Very helpful as mentioned; however, has some grammatical errors (below).

Line 52 – The periphyton polysaccharides section does not present information supporting that the production of these polysaccharides may be the most influential biological process associated with water quality, food webs, and floc sedimentary particle distribution. The writing should be changed to...and is hypothesized to be an influential...

Line 99 – The duration of the wet season and dry season should be defined.

### **Hydrological Patterns for WY2008**

In WY2008 although the Everglades Protection Area (EPA) received average rainfall, the onset of the wet season was delayed and the seasonal patterning was “backward”: water levels were low during the wet season and high during the dry season. As a result, the number wading bird nests initiated was at an all time low since the maximum in WY2002, even 50% lower than in extreme drought WY2007. This section was excellent (both writing and the table and figures) in providing clear explanation, area by area, of why these differences in nests initiated occurred – that is, as the author phrased it (lines 106-108), why “what might be expected from an [average or] above-average annual rainfall following a year of drought (i.e., a return to good foraging conditions for wading birds) did not come to fruition in WY2008”. It also presents logical, clear expectations, based upon the hydrologic data, for how wading birds will fare in each Water Conservation Area (WCA) and the Northeast Shark River Slough during WY2009.

Table 6-2 – Please define the historical period.

Lines 128-138 – It would be helpful, also, to highlight this information in a separate table.

### **Wildlife Ecology**

The District’s goals in studies on wildlife ecology in the EPA are (short-term) to prevent further environmental degradation and (long-term) to restore historical wildlife populations. Two of the three projects this year continued to focus upon interactions between wading birds, aquatic prey species, and hydrology. The wading bird studies provide a long-term dataset of great importance to the Everglades restoration program, and should be continued permanently. Similarly, the studies on fish tolerance to temperature have the potential to provide extremely useful information for management.

1. *Wading Bird Monitoring* – This subsection clearly describes a difficult time for wading birds in WY2008 and many nest abandonments throughout the system because of the aberrant hydrologic conditions, with many nest abandonments throughout the system. In addition, all species of focus had significantly reduced numbers of nests (compared to the past decade); most nests were in WCA-1, with few in WCA-3; breeding and nesting did not occur in the important Alley North colony for the second consecutive year; endangered wood storks did not initiate nests at the historically important Corkscrew colony for the second consecutive year, and the few nests initiated elsewhere all failed; and nesting effort in estuarine habitats was minimal, with the lowest nest numbers on record for roseate spoonbills.

In 2006-2008, two of four species/species groups (great egret and white ibis) considered in recovery parameter 1 (p.6-16) met the Comprehensive Everglades Restoration Plan (CERP) target. The other three recovery parameters (recovery of nesting in traditional rookeries in the southern mainland, return to early dry season nesting by wood storks, and increased frequency of supra-normal nesting events) were not met in WY2008. Specific comments:

P.6-16 – The performance measures should be clearly defined. The methods (frequency of observations etc.) should be briefly described.

Line 300 – It seems that “relatively” is not an apt descriptor for this difficult WY for wading birds.

Line 311 – Should identify the two groups that met the numeric nesting targets.

Lines 311-316 versus Table 6-3 – Seems confusingly written. Line 311 should identify the two groups that met the nesting targets. The “two other targets” described here (lines 313-324) are not included in Table 6-3 (readers go there to look for them because of the previous sentence).

Table 6-3 – Although great egret and whit ibis met the target, it is disturbing that both showed declines from 2004. If this trend continues, they will no longer meet the target.

2. *Factors Affecting Foraging Habitat Selection and Foraging Success of Wading Birds* – The Loxahatchee Impoundment Landscape Assessment (LILA) experimental study in January and March of WY2008 was described, emphasizing the effects of water depth and emergent vegetation (spike rush) on wading bird foraging habitats selection and foraging success. A clear description is included of the methods and experimental design. Wading birds were found to prefer sites with shallow water and sparse vegetation (habitats where higher prey densities were anticipated), but vegetation density did not affect foraging success.

Table 6-4 - The selection index should be defined.

Line 329 – Are the relevant scientists making predictions or modeling how these changes will affect prey availability?

3. *Non-Native Fish Minimum Temperature Tolerances* – Two exotic species, jewelfish and Mayan cichlid, found in freshwaters and estuaries, were examined for their tolerance to low temperatures as affected by salinity, considering two endpoints (loss of equilibrium [LOE] and death). The data indicate that these tropical exotic species use deep-water canal habitats, where temperatures are warmer than in surrounding marsh habitats, as a refuge to survive the winter season. Thus, the authors suggest that actions such as infilling canals and pools to water depths less than 1.5 meters in winter, if this can be done without adversely affecting water management, may reduce exotic fish populations.

Line 421 – The reason for the range in acclimation (13-32 days) should be explained.

Lines 433-436 – Description is needed as to how quickly the temperature was adjusted to 25°C.

Line 441 – Explanation is needed for the very low “n” value in the ENP deep water canal.

Line 466 – In contrast to this statement, the endpoints observed in the field did not match closely the endpoints determined in the laboratory – the field temperature decreased to 3.7°C (line 457) which was not tested in the laboratory

Salinity is mentioned as a major part of this experiment (lines 237, 422-423), including a description of the levels used (methods), yet the salinity data are not discussed (lines 411-414). Either the data should be included here, or the information about salinity should be removed.

### **Plant Ecology**

The focus of plant ecology studies in WY2008 was more synoptic or descriptive research than in WY2007, especially patterns across hydrologic gradients. As a general comment, the introduction of this section would benefit from description of the integration of the various subsections, and clearer rationale for these studies as related to management and evaluation of

restoration efforts. In contrast, the rationale and importance to management considerations is well explained within most study descriptions.

1. *Lygodinum Survey on Tree Islands in WCA-3A and WCA-3B* – Spatially stratified sampling was used to survey randomly selected tree islands in WCA-3A (136 islands) and WCA-3B (16 islands) with previously determined elevations. Thus far, fortunately, lygodinum was detected on relatively few tree islands (14%), and about half of these infestations consisted only of seedlings and juveniles within small affected areas.

Lines 534-548 vs. Results – WCA-3B seems to have been omitted inadvertently from this paragraph.

The authors suggest that small patches on tree islands may be effectively controlled by herbicides.

Should this point be added as a management implication (lines 569-578)?

2. *Woody Plant Recruitment and Survivorship Along a Hydrologic-Soil Nutrient Gradient on Two Tree*

*Islands in WCA-3* – The objectives of this study were to examine regenerative processes of woody species on tree islands, and to assess influences of local hydrologic conditions and soil characteristics on species recruitment, growth and survival. In an interesting approach, woody species were assessed on two tree islands with contrasting flood regimes (short or long hydroperiod) and soil properties (nutrient-rich, nutrient-poor). Seedling and sapling density and survival were the variables of focus. Preliminary results were described.

Line 607 – Seems to be in error; coastal plain willow is described as dominant, but it is not described as dominant elsewhere (lines 622-624, 628-631).

Table 6-5 - Standard errors should be added.

3. *Tree Island Ecophysiology as a Measure of Stress* – The objective of this study is to compare landscape-level changes in plant responses with ecophysiological responses (leaf instantaneous gas exchange and integrated CO<sub>2</sub> uptake patterns, stem predawn water potential, plant sap-flow patterns) in the head versus near-tail areas of four tree islands with contrasting hydrologic regimes. The overall goal is to strengthen understanding about the responses of the vegetation to hydrologic management.

Although the wet-dry seasons of WY2008 were muted, some interesting preliminary data were obtained, and the authors did a very nice job of clearly summarizing a lot of complex information for nine species (e.g. Figures 6-15, 6-16, Table 6-6). Although the data are preliminary, some important insights for management were gained. In addition, these physiologic measures appear to be sensitive, robust tools for assessing short-term plant response to hydrologic conditions.

Line 677 – Please check for accuracy; Line 687 - brief explanation should be added.

Lines 696-702 – Please include comment on the effects that the long-term trends in water cycle might have on the experiments, data, and management implications.

4. *Periphyton Polysaccharides* – The objective of this study was to quantify and characterize the periphyton assemblages and associated extracellular polymers (EPSs) in softwater and hardwater Everglades habitats.

Although periphyton assemblage structure can provide valuable information in interpreting water quality conditions, and although data on EPSs may be important, the general lack of data and/or data analysis (the data and variance on periphyton microalgal assemblages were not

shown; statistical analyses were not given or indicated) made this a less solid addition to an otherwise strong section.

Line 674 – What is the evidence for binding of heavy metals? Might this be an opportunity for integration between the mercury chapter (3B) and this chapter?

Lines 767-768 – Sentence needs a supporting reference.

Line 769 – Change autotrophic to phototrophic (most periphyton are auxotrophs).

Lines 773-774 - ...data) can exceed that... [the range given for the Everglades periphyton (10-20 mg/g) overlaps with the range given for periphyton found elsewhere (1-10 mg/g – only for estuarine mudflats – are data available for other benthic microalgal communities?).]

Line 780 – “grab samples” should be explained in more detail.

Line 781 – Simple, supporting environmental conditions should be included, such as the pH typical of the softwater and hardwater habitats.

Line 791 – Brief explanation should be included as to why these variables were selected, especially uronic acid and sulfate.

Line 796 – “dominated” should be defined (also pertinent to line 810).

Lines 824-837 – The authors had asserted (lines 777-778) that the data would provide insights about the role of periphyton EPSs in nutrient cycling, food web structure, and sediment stability. The data from this study did not provide such insights. The “significance of the findings...” subsection should be rewritten because it does not capture why the information from this study may be relevant to management or to restoration evaluation. It would also help to include some indication or summary of how water levels directly affect these differences in periphyton composition and structure.

Table 6-9 – Needs statistics; were any of these differences statistically significant?

*5. Experiment at LILA on Tree Survival and Growth:* – This large-scale experiment at the Loxahatchee Impoundment Landscape Assessment (LILA) facility is being conducted to improve understanding about the flood tolerances of tree island species. It is testing hydrologic effects on seedling growth/survivorship of eight species, and effects of tree spacing on individual tree and stand growth.

The complex experimental design is sound, nicely depicted in part in Figure 6-18. Based upon partial data (after two years), the cumulative (all species) average two-year survival was 63% and survival and growth were higher on drier sites. The study should yield valuable information to assist resource managers in maintenance and restoration of tree islands.

Lines 840-844 – Supporting references should be added. Line 842 – what are the cultural functions?

Lines 856-859 – The planned duration of the study should be included. How were the spacings selected?

### **Ecosystem Ecology**

The focus of the Ecosystem section on more specific functioning aspects is laudable. Understanding periphyton, fish communities, and wading bird foraging are all key aspects of Everglades structure and function, and serve as bioindicators for accountability. The section introduction includes an excellent explanation of the overall relevance of the studies to management and restoration efforts. The Conclusions section also generally was well written and summed up the main findings.

1. *Cattail Habitat Improvement Project (CHIP)* – The stated overall goal of this major *in situ*, large-scale experimental study is to examine whether/how habitat improvement of a (P-enriched) cattail zone is possible. The two major objectives are (i) to assess whether creating openings in P-enriched, dense cattail areas will cause a shift from emergent macrophytes to dominance by benthic microalgae or submersed aquatic vegetation and promote an increase in wildlife diversity and abundance; and (ii) to determine how well the created open areas function in comparison to natural Everglades habitats. As in the 2008 SFER, overall the results thus far support the hypothesis that openings are ecologically better for the Everglades ecosystem than thick, continuous emergent macrophyte growth.

Table 6-8, of hypotheses relevant to the various trophic components and processes, is a nice addition since the 2008 SFER. In characterizing the microbial consortia, phospholipid fatty acid (PLFA) biomarkers and metabolic status ratios hold promise as valuable indicators of restoration status. In the Fish Community Composition section, the findings should be presented in “historical” context by describing the community in the reference area (e.g. are mosquitofish and slough crayfish 2/3 of the fauna in the reference area also?). The finding that removal of large stands of emergent macrophytes increases periphyton net primary productivity is encouraging for Everglades restoration, and suggests that such management action can potentially shift the opened areas to dominance by more labile benthic microalgae and submersed aquatic vegetation. The dissolved oxygen data were also valuable and encouraging, although they suggest that it will take time to reduce the DO sags in the diel patterns. Inclusion in the Decomposition section of indicator parameters  $\beta$ -glucosidase, leucine aminopeptidase, and phosphatases is an interesting and sound approach to compare differences in carbon, nitrogen and phosphorus regimes among the sites. The authors nicely presented the findings in Figure 6-21. Finally, a strong dataset on wading bird foraging continues to support the premise that openings help to provide better foraging habitat, although the influence of nutrient enrichment is not yet clear. The Conclusions section nicely pulls together the WY2008 major findings and clearly interprets their significance.

Lines 925-934 – Although the CHIP subsection contributes valuable information to Chapter 6, there was no clear up-front explanation of the control E, T, and U sites. Readers instead are referred to a website or to a previous SFER to go on a hunt for this simple, brief information, which is basic to understanding the subsection. (Note that partial descriptions are provided in lines 991-993, incomplete and back in the Algal Composition section.) The following information should be added, either in written form or as a small table:

WCA-2A is a large shallow impoundment, part of which has been impacted by agricultural runoff for decades. The net result has been development of a well-established nutrient gradient and a monotypic stand of cattail (>11,000 hectares). In this experiment (n=3 each), *control plots* (E) are monotypic cattail in a highly P-enriched area (water TP > 50  $\mu\text{g/L}$ , sediment floc TP > 1,500 mg/kg); *transitional plots* (T) are a 50:50 mix of cattail and sawgrass in a moderately P-enriched area (TP > 15  $\mu\text{g/L}$ , sediment floc TP > 900 mg/kg); and reference plots (U) are in a more natural, nutrient-poor site (add the water TP and floc TP information). The designation O stands for open; C stands for “closed” or macrophyte-filled.

Line 946 – Brief description should be added about the approach and design for sample collection.

Line 962 – Needs a supporting reference. ; Line 970 - ...Actinomycetes (soil fungi) were...

Lines 995-1003, 1186-1192 – These differences in percentages for various algal groups in the enriched, transitional and reference sites may be statistically significant, but they are *very* small. The greens (average relative abundance 0.5-2%) seem hardly worth comparing, significant differences notwithstanding. It would be helpful (less confusing to readers) to add

a sentence acknowledging that the relative abundances of algal groups basically were similar among sites, although the slight differences were statistically significant.

Line 1004 – Crayfish are not vertebrates or fish but, rather, decopod macroinvertebrates. This title should be changed to Finfish and Crayfish.

Lines 1030-1031 – Ash-free dry mass is not biomass-specific; it includes organic detritus as well as living organisms. The text should be altered accordingly.

Table 6-9 – statistical significance should be indicated and P values added.

Lines 1067-1077 – “N” values should be included. A supporting reference should be added for use of the 1.6-mm mesh size, and checks at six-month intervals.

Lines 1112-1113 – Indicate whether the difference (ergosterol, EC vs. EO) was statistically significant.

Lines 1128-1131 – A sentence interpreting this information for readers should be added.

Lines 1132- - The writing indicates that all wading birds were surveyed regardless of their activity. Is there any indication of the percent foraging in different habitats?

Line 1165 – Are these the only secretive bird species of interest? Please clarify.

Line 1192 – Needs supporting references.

2. *Accelerating Recovery of Impacted Areas (Fire Project)* – The fire project is extremely important in identifying and examining impacts. The rationale for this major project is to assess whether repeated prescribed fire is effective in accelerating ecosystem recovery of cattail-dominated, P-enriched areas by favoring re-establishment of sawgrass and other native species. The two main objectives, presented together with clear hypotheses, are (i) to improve understanding about the fundamental impacts of fire on soil, water, and vegetation processes in Everglades wetlands; and (ii) to assess whether repeated prescribed fires in accelerating ecosystem recovery from P enrichment. The project is supported by productivity in peer-reviewed publications. The Project Milestones subsection is helpful in orienting readers with good background information. Four studies within this project were conducted in WY2008:

A. *Ash Nutrient Forms and Fire Intensity* – Cattail and sawgrass ash nutrient forms and concentrations were compared to assess possible effects of fire on nutrient balance and cycling. The authors nicely explain the information and its implications for management.

B. *Seasonal Variations of Seed Bank Germination and Response to Fire* – This interesting study has broad implications for Everglades restoration, and for potential controlled burns. Higher macrophyte seed bank density and species richness were found in P-enriched sites. Cattail germinated quickly (2-3 days) relative to sawgrass (4 weeks), and cattail seed bank survival was much higher after fire in summer than in winter.

Lines 1288 on: It would be useful to include further discussion about the potential management implications of controlled burns relative to ash and seed bank germination.

C. *Cattail Recovery Dynamics Following Fire* – Cattail populations were monitored before vs. throughout a year after fire treatment to gain insights about the underlying mechanisms that control recovery. The complex data suggested a tradeoff between ramet density and biomass during the recovery period, influenced by water depth/soil redox potential. After a year, leaf litter biomass remained depressed relative to pre-fire biomass

D. *Soil Redox Temporal and Spatial Patterns in WCA-2A* – The objective of this study was to assess the patterns and variability of soil redox in relation to water depth, dominant vegetation, and soil P concentrations. Redox data can provide valuable insights about geochemical processes

and the general “health” of wetland systems. Because of its design, this study “missed the action” at the sediment-water interface (depth 0-2 cm) where, as many studies have shown, the steep gradients typically occur. It would have been instructive to dissect the 0-2 cm-depth because such data could reveal more distinct patterns in soils with different vegetation and P content. The authors did nicely relate the importance of their findings about water level and redox to management considerations (lines 1397-1398).

Lines 1266-1274 – The study compared cattail and sawgrass, but focuses here only on cattail. Information should be added about sawgrass HCl-extractable P.

Line 1319 [fires, as in the Seed Germination study] vs. line 1402 [first burn], Table 6-12 (1 summer fire), vs. multiple summer and winter fires (lines 1405-1406) – The writing is very confusing because it variously refers to one fire and more than one fire. The writing and data presentation seem to focus mostly upon one summer fire. Are data available for a winter fire?

Lines 1321-1323 – Table 6-12 supports this statement for cohort 3, but not for cohort 4.

Lines 1323-1325 – It should be clarified whether this observation continued to hold after 12 weeks.

Line 1329 – Was density significantly greater?

Lines 1331-1332 – The interesting data on leaf litter mass should be shown.

Figure 6-26 – Should indicate significant differences.

Figure 6-27 – Curve fitting and statistics should be included.

Lines 1409-1410 – The only data presented in this subsection were about 1 fire or (seed germination) 2 fires. Thus, Summary (lines 1402-1418) – Mostly does not match the data presented from WY2008 studies except for the previous brief mention of leaf litter mass data, which were not shown. Should be restructured.

3. *Tree Island Hydrodynamics* – Groundwater and surface water interactions on tree islands were examined in this innovative study, which was conducted to improve understanding about the effects of managed surface water levels on tree island formation and restoration. An impressive dataset on surface water levels, groundwater levels, and temperature was collected at 15-minute intervals by 26 *in situ* 500-Troller™ pressure transducers, along with stage level recorders to supplement data collection on surface water levels. Helpful background information was included (e.g. geological differences between tree islands along a north-to-south trajectory, Lisse Effect, etc.). The data revealed that in the dry season, groundwater levels in limestone-core tree islands typically were lower than surface water levels, suggesting that surface water was recharging the groundwater (also supported by temperature data). In contrast, groundwater levels in peat-core tree islands were higher than surface water levels and the two were highly correlated, suggesting that groundwater was discharging to the surface water. The data indicate that managed surface water levels will affect groundwater-surface water interactions differently on peat-core vs. limestone-core tree islands and the important ecosystems that they support.

4. *Tree Island Nutrient Fluxes* – The stated (ambitious) objective of this field study and modeling exercise was to quantify the contribution of tree islands to the nutrient balance of the Everglades landscape. N and P budgets were estimated for the head and near-tail areas of one tree island, and preliminary data analyses were presented. A table of the values for all of the parameters should be included (with sources). The rationale should be explained for the assumption (lines 1520-1521) that Denitrification and nitrogen fixation are negligible. The relevance of the findings to management and restoration efforts should be more clearly explained. Planned next steps in this study should be mentioned.

5. *Evaluating P Flux – The Supplemental Sediment Core Study (SSCS)* – The overall objectives of the Reflux Study are to (i) quantify *in situ* sediment P fluxes to the water column; (ii) use enclosures to evaluate management practices (herbicides, burns) to immobilize P in the sediments (addressed in WY2008); and (iii) apply a dynamic model to simulate sediment P flux under different conditions. Unfortunately, the instructive information gained was not encouraging: There was a slow, continuous flux of sediment P to the water column from intact cattail cores. Herbicide application alone caused a high, prolonged P release from decomposing cattail tissues. Herbicide application followed by calcium carbonate treatment resulted in an initial flush of high-P water, followed by lower P concentrations in outflow waters than achieved in the herbicide-only control, but slightly higher concentrations than the outflow from the intact cattail cores. Countering expectations that iron chloride would sequester and immobilize sediment P, its addition after herbicide treatment actually caused the highest P release; the authors provide a clear explanation of the likely geochemical mechanisms involved. The only effective treatment, removal of the top 40 cm of sediment, greatly reduced P release but is cost-prohibitive.

Lines 1571-1575 – This nice description of WCA-2A should also be included in the chapter Introduction, together with a description of WCA-3A and -3B.

Pp. 6-71, 6-72 – A total of 34 cores were collected, but 30 were used? Please clarify.

Figure 6-31 – should mention where the outflow went/disposal. The legend should also define the labels.

Landscape. This exciting section describes three major milestones of progress in WY2008, and also a fourth study that evaluated decadal accretion rates in the mangrove salinity transition zone along Florida Bay to provide 9 insights about how climate change and/or reduced freshwater flows are affecting the area. Overall organizational suggestion: The introductory paragraph (lines 161-1658) should be restructured; the three milestone studies should be mentioned in the order in which they are discussed in the text, and the fourth study should also be mentioned.

1. *Landscape Pattern Change* – A time series of digitized maps was analyzed to evaluate more than six decades of changes in ridge-and-slough patterning (1940-2004). Historically (pre-drainage), the Everglades largely consisted of ridge-and-slough topography. Maps were created from digitized aerial photos (five years: 1940, 1953, 1972, 1984, 2004), and ridge and tree island measurements from 15 large study plots (4 x 6 km) for those years were used to provide spatial/temporal data on patterns at fixed sites over time. The quality of patterning was evaluated considering three variables as mean length/width ratios, total number of longer ridges and tree islands, and variability of ridge orientation within a plot. Six distinct pattern classes, detected for the 15 study plots for all five years, provide a quantitative measure of pattern changes in each plot over time. Local factors (water depths, flows) rather than regional factors controlled pattern changes, and the analysis showed that ridge-and-slough patterns can respond quickly to local hydrologic changes. Additional explanation (lines 1710-1711) would be helpful on what is planned next in this important effort.

2. *Relative Marsh and Tree Island Elevation: Spatial Patterns in WCA-3A and WCA-3B* – A comprehensive field survey of slough water depth measurement was completed for 258 tree islands in WCA-3. This study was conducted to address the management need for information about topographic differences across a broad spectrum of ridge-and-slough systems in order to estimate effects of proposed hydrologic changes on tree islands. Water depth was measured to calculate the ground-surface height in sloughs and marshes adjacent to 258 tree islands that have available hydrograph information. A consistent relationship was detected between elevation difference (between maximum tree island elevation and surrounding marsh/slough) and maximum tree island elevation.

3. *Vegetation Mapping* – WY2008 marked the completion of the first comprehensive vegetation map of the entire ecologically complex landscape of WCA-1, so that there is now a complete set of vegetation maps for the WCAs. For WCA-1, ~1,400 color-infrared aerial photos (scale 1:24,000) were collected beginning in 2004. All of these photos were then geo-referenced, with the last of this effort completed in WY2008. Photo-interpretation and ground-truthing procedures were described for final map accuracy assessments. Difficulties created by the complex ecological landscape were nicely described, interestingly, including extensive coverage of the exotic plants lygodium and melaleuca whose distribution was also mapped. The WCAs are to be remapped every six years for comparison with this powerful set of baseline maps.

4. *Elevation Change and Soil Accretion in the Mangrove Salinity Transition Zone (MSTZ)* – The objective of this decadal study (1998-) has been to evaluate how water management practices, sea level rise, and regional ecology are influencing long-term soil elevation changes in the mangrove transition zone of Florida Bay. The inclusion of helpful background information makes this study much easier for readers to understand (terrigenous should be defined). Elevation change and vertical accretion have been measured at transects in the upper (freshwater), middle (transition), and lower (mangrove) zones of three study sites. Sites were designated as non-flooded, seasonally flooded, or permanently flooded based on water depth and inundation data. Significant differences were not detected in (small) elevation changes among the sites, but the upper (non-flooded) zone, but vertical accretion was much less in non-flooded sites than in seasonally or permanently flooded sites. These data, considered together with previous studies which have shown that mangrove forests are migrating into previously freshwater environments, suggest that the area is not keeping pace with declines in freshwater flows and present sea level rise.

#### **Editorial changes**

##### Table 6-1

Wildlife Ecology, Factors Affecting Foraging Habitat..., Findings, line 1 – change moderate to no or sparse levels of vegetation (see p.6-20).

##### Plant Ecology

Lygodium Survey, Findings, line 1 – ...has expanded into...; line 3 - ...can be treated effectively with...

Algal Polysaccharides – title should be changed to Periphyton Polysaccharides.

Findings, line 2 – ...algae and other microorganisms – were found...

LILA Tree Survival and Growth – change title to: Experiment at LILA on Tree Survival and Growth

Line 215, confusing as written – should be: ...standard. These departures mostly...

Line 366 – ...had no apparent effect... ; Line 422 - salinity should not have units.

Line 431 – Celsius ; Line 433 - “Control fishes underwent the same treatment” should be reworded.

Line 467 – ...suggest that habitat has a critical role in the... ; Line 472 - ...Canals can act as a

Line 478 – ... (m) in winter, if ; Line 504 - ...exploration of periphyton ; Line 558 - ...was observed...

Figure 6-11 – WCA-3A and WCA-3B boundaries should be shown.

Figures 6-12, 6-13 – Head → Tail should be added over the top of each graph to help readers.

Lines 649-650 – ...water-tolerant...3AS5. More data are required to... ; Line 653 - ...and establish on...

Line 689 – ...on nine native species (n = 5 individuals each) ; Line 713 – ...in the shorter hydroperiod sites.

Figure 6-16, Table 6-6 - to help readers, the common names should also be given, since that is how the results were discussed in the text (p.6-35).

Tables 6-7 through 6-9 – there are two Table 6-9s; Table 6-6 is followed by one of them.

Line 772 - ...have suggested that... ; Line 776 - ...the softwater and hardwater...

Lines 780-794 - ...low-nutrient interior...(softwaters) and WCA-2A (hardwaters)...or glycocalyx matrix was determined from the water-soluble fraction (WS). The periphyton were treated...

Line 841 – an areal basis... ; Line 844 - ...tree islands is mainly

Line 928 – states that this subsection focuses upon an intensive sampling event in September – October 2007, but the wading birds information extends from October 2007 – May 2008 (lines 1132-1133).

Lines 927-928 - ...focuses on an intensive sampling event that occurred from...

Lines 971-973 – Sentence should be restructured.

Lines 987-988 (for parallelism with line 995 - ...Algal phyla (here, including blue-green algae or Cyanobacteria, also called Cyanophyta; green algae, Chlorophyta, and diatoms, Bacillariophyta) were compared...

Line 991 – UC is an oligotrophic site; sentence is confusing and should be restructured.

Lines 993-994 – (UC). Algal composition did... ; Line 1015 – differences, prey data were...

Line 1030 – biomass-specific; Line 1038 –...than that of the...; Line 1089 -...as indicated by...

Line 1103 – ...2005). These new... ; Lines 1103-1105 – sentence should be restructured.

Line 1111 – ...role. Other data suggest, in contrast, that fungal activity is...

Line 1123 – herbivores ; Line 1124 – detritivores

Line 1225 – ...largely depend on ; Line 1368 - ...The objective of... ; Line 1397 – spatial scale considered...

Line 1403 – ...all play important... ; Line 1411 - ...will depend...

Line 1455 – ...and tail canals.... ; Legends, Figures 6-28, 6-29 - ...a peat and a limestone...

Pp. 6-69, 6-70 – Throughout the chapter, “head” is used rather than “wet head” – alter for consistency?

Line 1537 – ...and the near-tail had a ; Line 1540 - ...DIN in the near-tail of

Lines 1542-1543 - ...less and, in fact, has net accumulations of nitrogen and phosphorus....

Line 1566 – ...phosphorus from... ; Line 1617 – ...glyphosate... ; Line 1631 – ...FeCl<sub>3</sub>...

Line 1770 ...are steeper... ; Line 1772 - ...of sawgrass,...

Table of Contents, Line 1862, Table 6-1 – Section title should be consistent.

**Reviewer:** Posted by Jeff Jordan

**Subject:** Response to questions from Meganck

**Posted:** 18 Sep 2008 10:04 AM

**Response to Peer Review Panel Comments from Chapter 8 Author Tracey Piccone<sup>1</sup>:**

*Comment 2: Please clarify because this comment appears to have been cut off at the end and it's not clear what question is being asked; some words appear to be missing from the end of the sentence. If not, then I don't understand the question that is being asked. Please reword to clarify what is being asked.*

**Response from R. Meganck.** The comment was not cut off, but rather a closed ) was inadvertently omitted. My comment was simply to note the substantial progress that had been made of the years in reducing to TP as a contribution to meeting the overall water quality goals. It is a simple comment and not a question.

*Comment 3: The chapter states that there is overlap between many CERP projects and Long-Term Plan projects, but there is very little overlap between Long-Term Plan projects and LOPP, LOER and NEEP projects. (The review comment is incorrect because the text does not say that there is little overlap between CERP, LOPP, LOER, on-farm BMPs.) The reason the text states that there is little overlap between the Long-Term Plan and LOPP, LOER and NEEP is mainly because of geography. The Long-Term Plan covers the projects in the geographic area called the EAA which is south of Lake Okeechobee (but not the estuaries) while the LOPP, LOER and NEEP programs cover areas either north of Lake Okeechobee or the areas including the estuaries. Please clarify the comment which states the chapter has contradictory logic.*

**[Response from R. Meganck.]** The comment is made in the context of the overall goals of the SFER regardless of geography. It is not a negative comment, but rather one that takes a broader view than that represented by the North and South Everglades distinction. It seemed to me after reading lines 102-105 that the progress realized to date in other parts of the regional were not considered as critical input to the overall water quality entering the EPA. Again, a comment and not a specific question.

Thank you for the opportunity to try to clarify my input prior to the public review. R. Meganck

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<sup>1</sup> The author's responses to comments are in Appendix 1-4 of this volume.

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 7A AND RELATED APPENDICES**

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**Reviewer:** posted by Jeff Jordan

**Subject:** Comment on 7A (Meganck AA)

**Posted:** 10 Sep 2008 10:04 AM

1. Relating to the decision to halt construction on the EAA A-1 reservoir referred to in lines 46-54:

1. The decision by the District to halt construction seems to be logical given the financial risks involved.

2. What are the specific points being raised by the NGOs filing the lawsuit? Filing a claim at this point is confusing as the project had been outlined at least since the 2005 SFER.

3. What are the possible impacts of halting construction from the point of view of the District?

4. Is there the potential for a chain reaction affecting project development and implementation as a result of the lawsuit referred to in lines 46-54? Could it potentially affect further submissions of PIRs to the U.S. Congress?

5. Is there any prognosis as to the timeframe for a decision on the issues raised by the consortium of NGOs that filed the claim?

6. Is there a line of communication with the litigants to preclude further disruption of this nature?

2. Referring to the lawsuit filed by a consortium of NGOs and its impact on a construction project in EAA A-1 reservoir (lines 46-54; 632-646), can you clarify if construction in additional STAs has been halted or otherwise impacted due to the lawsuit challenging federal construction permits? Can the District continue with project implementation in existing STAs or is it considered too risky from a financial point of view?

3. It is obvious that the goals of CERP and NEEPP overlap to a large degree. Are there any inter-agency issues (e.g., conflicting mandates, timetables, milestones, etc.) that might be catalyzed by this reality. Are there specific mechanisms to reduce any potential conflicts?

4. Referring to lines 218-220, are there any preliminary indications of the affects of the pilot studies of the Aquifer Storage and Recovery plan on the movement of chemicals to downstream portions of the Northern Everglades including the Lake?

5. Referring to the note in lines 244-255 on the potential re-establishment of SAV in the nearshore areas of the Lake, is there any indication as to whether torpedo grass and other undesirable plants will be able to be managed for the long term once normal lake levels return?

6. The Technical Plan for Lake Okeechobee restoration (line 263) notes several components (lines 283-297), including implementation of BMPs.

1. I was under the impression that all agricultural areas in the Lake watershed had already been required to implement a number of P-reducing BMPs selected from a suite of alternatives for the past several years. However, this seems not to be the case (line 284).

2. Are the regulations noted in line 285 specific to on-farm targets for TP and other chemicals for farms north of the Lake or do they also include the impact of STAs and other projects and therefore refer to water leaving the Northern Everglades and entering the Southern Everglades?

7. Is it a correct interpretation that the management goals of the USACE and the District are in conflict regarding the Herbert Hoover Dike? (line 334) The Corps will lower the average level of the Lake while this will increase the risk of water shortages (lines 337-339). Is there an agreement on the Lake level once the rehabilitation of the dike is completed?

8. The comment on the Ten Mile Creek Critical Restoration Project (lines 390-394) provides no indication as to the construction/design issues being confronted. Any comment on the potential impact/importance of resolving this issue, particularly to downstream areas, would be welcomed.

9. Is funding approved to ensure timely implementation of the St Lucie River and Caloosahatchee River Watershed Protection Plans, construction projects, and monitoring programs?

10. Is the methodology being used in undertaking the Southwest Florida Feasibility Study (SWFFS) being used in other parts of the Everglades system? It seems that it has applicability given the flexibility in evaluation and comparison of alternative management strategies.

11. Referring to the section on Lake Trafford Critical Restoration Project (line 613). Were the elevated levels of P and N exacerbated by the dredging project and the subsequent return to higher rainfall levels? I recall previous projects to plant native SAV species for nutrient absorption were considered successful. Have the test plots referred to in lines 627-629 provided any preliminary indications as to success rates?

12. The proposed benefits from including WCA-3/Northeast Shark River Slough in Decomp PIR 1 are substantial (lines 746-758) and quite clear. However, there is an outstanding question in reviewing the CERP website concerning the contention that the overall restoration efforts can be achieved earlier as the data generated to date seems to be preliminary. I raise this issue as the public will pick up on these types of statement and then demand to know why a certain milestone might not have been met, even though there might be mitigating or extenuating factors involved.

13. The statement in lines 770-771 that by diverting nutrient laden water the "area's sensitive ecosystem can be restored" may be a bit overstated. As has been clearly demonstrated by any number of studies, restoration is not achieved except through a complex of actions. Perhaps it could be better stated that this action will positively impact the chances or the plans to restore the Refuge.

14. I did not find any information on the water quality of the water being stored in the Palm Beach Aggregate's pond and referred to in line 959-971. Is there any concern in this regard?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 7B**

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**Reviewer:** posted by Jeff Jordan

**Subject:** Comments on 7B-Meganck AA

**Posted:** 11 Sep 2008 10:38 AM

A clear reference is made to the “strategic approach” that is being used to develop MAP 2008 in lines 53-68. Has the District or other agencies found an effective way to support those monitoring programs that have lost funding as noted in lines 45-52? If not, how has the MAP been adjusted to address the gaps, and particular the loss of continual datasets, created by these decisions? Simply stating that MAP 2008 will “provide the flexibility to adapt to changing budgets and management priorities” does not fully clarify the underlying impact of such decisions.

2. There has been limited criticism of models such as the Total System Conceptual Ecological Model (TSCEM) developed by Ogden and supported by the NRC related to the scale (level of detail) and cost of monitoring (lines 78-87). Additionally, the TSCEM does not distinguish between small but vital changes in a monitoring strategy, as management may demand, and more notable changes that have less overall impact to the degree of confidence in the results. Have these and other aspects of the model been considered and have any changes been made to its application in the case of MAP 2008? Perhaps your comments in lines 88-96 address these concerns, but I believe it to be more one of the confidence that “essential” elements have been properly identified as Tier I and Tier II elements.

3. When mention of using “temporal” scales as a factor in assigning a Tier I or Tier II ranking is made (lines 111-113), are you referring to “outcomes” over a period of time benefiting the restoration goals, the time it takes to install a particular action as reflecting overall implementation success, or the quality of the data as it allows the hypothesis to be assessed? There seems to be reference to each of these: outcomes (line 108 noting “success”), time (lines 122-123), and quality of data (lines 117-118). Perhaps the correct interpretation is that all of these factors have a place in the overall evaluation process, but that is not clearly expressed.

4. Comment: The concepts presented in the section on Desired Restoration Condition (line 178) is very important to understanding the reality of CERP and what it can help attain in the mid to long-term in South Florida. These concepts should be incorporated into other parts of the SFER in future years as is clearly noted in lines 242-245.

5. Comment: the sheetflow restoration indicator (line 267) is fundamental to the overall CERP process. The selection of transects seems logical, but is there an additional transect needed in WCA 2 given the impacts to that region from adjacent developed areas?

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER — VOLUME I, CHAPTER 8**

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**Reviewer:** posted by Jeff Jordan

**Subject:** Comments on Chapter 8 (Meganck AA)

**Posted:** 09 Sep 2008 10:53 AM

1. Comment: A specific reference in table 1-3 should be made to table 8-1 as the latter is a subset of greater detail of the former and may assist the reader with a specific interest in water quality throughout South Florida.

2. Comment: It is clear that, as stated in lines 99-102, until long-term plans have been implemented for a sufficient time period, it will be difficult to measure the “response of the EPA” to the actions of the program. While scientifically accurate, meeting the legal TP levels mandated in the EFA is also a valid goal and one that by all indications will have the intended impact on water quality. It seems that the comment in lines 102-105 is reported in a matter-of-fact manner, while the reductions in TP levels achieved to date represents measurable progress, and one towards which a substantial amount of public funds has been invested (BMPs, STAs, WCAs, etc.

3. Can the statement in lines 111-114 be substantiated to the degree implied? How can there be “overlap between many CERP projects and Long-Term Plan projects” and only “little overlap” between CERP and LOPP, LOER, on-farm BMPs, etc.? We have always assumed that the Everglades system included all lands and waters that impacted the Lake (including the Kissimmee drainage) and everything south of that to the EPA and the Bay. The logic presented in lines 124-135 seem to contradict or at least argue against the former statement.

4. Is it correct that inflow datasets related to monitoring implementation of the long-term plan will be updated in FY 2009? Are these data subsequently used to alter workplans or is there a specified number of collection periods that must be completed before there is sufficient confidence in the trend data to justify such changes?

5. Referring to the paragraph beginning on line 196. Have there been alterations in the location, size, design, etc. of EAA storage reservoirs as a result of data collected from CERP projects (inflow volumes and loads) or is this part of a longer term plan?

6. Referring to line 216. Do District scientists anticipate a marked increase in the percent of the water and load contributions to the STAs from the Lake in a wet cycle year or after several wet years?

7. What is the process for evaluating annual milestones or project goals in the implementation of the initial phase (pre-2016) of the long-term plan? Can corrections be implemented at any point in the implementation or is it considered necessary to implement the initial phase largely as designed before making adjustments to the process?

8. Lines 159-163: To clarify the DMSTA Long Term Plan refinement tasks for FY2008, it would be helpful if the changes made to DMSTA2 could be described here. It is not clear from the DMSTA website what changes were made to the model.

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## **PEER-REVIEW PANEL COMMENTS ON 2009 DRAFT SFER – VOLUME I, CHAPTER 9**

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**Reviewer:** posted by Joanna Burger

**Subject:** Chapter 9 Comments

**Posted:** 12 Sep 2008 11:20 AM

CHAPTER 9 Accountability Review J. Burger and others

### ACCOUNTABILITY REVIEW

CERP and the RECOVER programs for the Everglades have the potential to respond to new and emerging problems that the overall ecosystem faces. While the presence of nonindigenous species is an old problem, recognition of its severity and impacts on ecosystems is relatively new. The Everglades group is well ahead of other groups nationally in trying to understand, catalogue, and evaluate the effect of nonindigenous plants. The holistic approach of examining all nonindigenous plants that seem to be a problem in the Everglades is a daunting task, but an essential one, and this chapter is a thorough review of current knowledge. The inclusion of spotlight approach to key nonindigenous and invasive animals is an excellent start and focuses appropriate attention on the most severe problems. The chapter provides an excellent overview of the species biology of several nonindigenous invasive species that pose the greatest threat to ecosystem structure and function within the Everglades. This chapter does not include all nonindigenous species for which there is information (the reader is referred back to the 2008 report), it does include the ones considered to pose the greatest threat. While time and space constraints impose this limitation, it would be maximally useful to both agencies and organizations working with nonindigenous species if there were an updated appendix or document that did include current information about nonindigenous species so that managers, public-policy makers, scientists and other stakeholders could find all the updated information in one place.

This chapter is an excellent extension of previous work with nonindigenous species. It provides information and evaluations of the key issues concerning nonindigenous species, including legislative initiatives for animals, the role of pets, impacts of education, public health concerns, innovations needed, and the district's role (including expenditures). Unlike past years, there is no discussion of the relative potential for threats within each module. Instead, the approach is to select priority nonindigenous species and provide an overview of each, including the key issues, with spotlight information on each species. The selections include both plants and animals of concern. This approach is very useful for managers, public policy makers and the public to obtain a quick and readable account of the species of concern, management, and current severity of the problem.

However, although the new streamlined format is very helpful at the "key selected species" level (improvements: abbreviated writing, key issues), it does not seem to cover the topic as well as in previous years. It is recommended that a "hybrid" format be adopted which presents the introductory information, then includes an updated Table 9-2 (excellent overarching table from the 2008 SFER) with supporting discussion, and then explains that the chapter will highlight selected species.

The conclusions places the problem of nonindigenous species within the context of restoration in the Everglades, and appropriately indicates the overall lack of knowledge for many of these species. For the general public, it would be useful to have some overall observations or conclusions about the impacts of these species (and some indication of the key invasive and problematic ones) in the summary.

A number of agencies and organizations have recognized the problem of nonindigenous species, particularly nuisance plants and animals whose populations are affecting native species. The inclusion of the website where appropriate laws relating to nonindigenous species can be found is helpful to the public and managers. Several groups are working together to develop a database that can be used by all to track invasive species. The chapter rightly identifies one of the main problems: that invasive species work has centered around those with agricultural or other economic effects, rather than those species that cause ecosystem disruption. One of the key tools for management of invasive species is to track the spread and abundance of nonindigenous species so that the spatial and temporal aspects of the problem are known to all managers, public policy makers, and the public. Much of the monitoring is still aimed at the large, invasive tree species that can be easily monitored from the air to arrive at good estimates of acreage of each species. While this is useful for these species, it does not address smaller plants and most animals that would not be visible from the air.

#### Recommendations:

- Provide some quantitative information on both the extent of concern and of management. While the stoplight approach provides an excellent overview, it does not provide specifics of the spatial and temporal problem.
- The Summary should mention the worst exotic species problems (plant and animal), as well as some (albeit few) “success stories” in their management, control or eradication to show that, at least for some species, with concerted effort it *can* be achieved.
- Include a flow chart of agencies/entities engaged in assessment and management of which nonindigenous species within each module.
- Develop a companion document that has the latest information on all nonindigenous species so that the public and public policy makers can find the latest information on all species.
- Summarize the District’s major accomplishments with respect to management of invasive species.

#### TECHNICAL REVIEW

This year’s report is a summary of the most severe nonindigenous and invasive species, rather than an attempt to include as many as possible. While this is laudable, and addresses the accountability aspect of this work, the authors and organizations involved should consider a summary document that each year includes all the species so that public policy-makers, scientists, managers, the public, and other stakeholders do not have to go through several South Florida Environmental Reports to find this information. This chapter is sufficiently new that this could be done and updated each year. That is, whenever new information (and stoplights) is added, could be included or substituted for the last one.

The authors are to be commended for including animals in this chapter, despite the lower quantity and quality of much of the data. Table 9-2 of the 2008 Environmental Report was excellent, and was missing from this years report. It provided an excellent overview and should be reconsidered for inclusion.

The introduction provides an excellent statement of the problem of invasive species, the problem in the Everglades, the SFWMD role, and the agencies involved. The key issues rightly identifies most of the key issues, but inclusion of legislative initiatives for plants should be considered as an issue. What controls are there on garden shops and landscapers to avoid the use of all nonindigenous plant species that can, or have, become invasive?

The descriptions of priority nonindigenous species are excellent, and include a short history, effects, and where it occurs, the control measures. Where possible, some quantification of both the problem and its solution would be useful. For example, Australian Pine occurs over 100 % of the Everglades in appropriate habitats, and has been removed from ?? %.

The conclusion section summarizes the main findings in terms of issues, documented impacts, and needs for future control and management. The use of the early detection and rapid response system is excellent, and has the potential to prevent future problems, but this will only work if the gardening, landscaping, and pet trades are onboard and cooperate with agencies. Providing information on successes (e.g. Melaleuca) is an excellent tool for engaging both the public and managers.

## INTEGRATIVE REVIEW

Non-indigenous species have the potential to drastically affect almost every aspect of the structure and function of the Everglades area. Yet many of the other chapters, including Ecology of the Everglades (6), Comprehensive Everglades Restoration Plan (7A), Lake Okeechobee (10) and Kissimmee Basin (11) make little mention of their effects. Further, since nonindigenous species affect the efficacy of the performance measures, they can potentially have a great effect on evaluation of restoration progress.

### Recommendations

- Integrate the presence and effects of non-indigenous species into the overall research plans, including Everglades Research Plan and the Coastal Ecosystem Strategy (chap 12).
- Examine the effect of invasive species on performance measures, and on the other ecology studies (Chap 6).
- Relate nonindigenous species management and control to specific recovery goals, which relates to a management strategy and evaluation of the overall critical species to control. Integrate invasive species concerns in relevant chapters when a given invasive species affects ecosystem structure or function.
- Include a section on initiatives for plants. What are the controls against garden shops selling nonindigenous species that have the potential to be invasive and affect native species?
- Consider, evaluate, and discuss methods of evaluating potential impacts before species reach such critical stages of invasive effects.
- Consider putting some quantitative information in the individual species accounts. For example, what percent of Melaleuca has been controlled, what percent of the Everglades is it still a problem.
- Consider developing a permanent document that has the spotlight approach for all species. This would entail adding new ones as they occur, substituting those priority species that are updated each year, and placing all this information in one place (on a website or searchable document). This document should have a reference list associated with each species. If started now, this would not be so impossible to achieve.
- Organize the species accounts in some reasonable order (taxonomic or severity). As it is, the chapter skips around from plant to lizard, to weevil, and then back to lizards.
- Provide information on how the District plants to evaluate and refine performance measures that include invasive species.
- Provide a list of agencies involved with the invasive species work in this document.

### QUESTIONS:

1. Why not include a list of the key nonindigenous species in the summary?
2. How many non-native plants are in Florida (lines 36-8)
3. Why not include a legislative initiatives for plants section under key issues?
4. One of the pathways seems to be plants from garden shops and landscapers, shouldn't this be included (under key issues)
5. References for introduced pathways (lines 101-108) should be included.
6. What is being done to develop methods of risk analysis before a species becomes a problem (eg. Lines 109-116)
7. Lines 123: Is the number of pythons removed as of July 2008 similar to, or higher than, last years?
8. Has Florida, or any other state, considered providing places for people to deposit unwanted pets (lines 124)?
9. Am I to assume that there was an educational campaign about fish release ten years ago that might have had an effect on Sailfin Catfish? (lines 129-34)?
10. Some indication of any releases (or captures, removals) of the species mentioned in the paragraph starting at lines 176 should be included.
11. Lines 203. How ere the 13 highlighted priority species selected.
12. Lines 205 to 221: Can we assume that these species are not deemed important ? The inclusion of the relevant websites is important.
13. With so much more information needed in this chapter, it seems odd to have a full page picture of a helicopter (which everyone can picture)
14. Lines 238-244; What percent of the Melaleuca problem has been solved?
15. Lines 246-248: To what degree have they been successful
16. Lines 262-268: excellent summary of the problem, with appropriate references.
17. Lines 283 – what is the agent?
18. Lines 332 – very useful statistic, and more would be appreciated, and could be added without taking up more space.
19. Line 358: What kind of label changes? Why?
20. Line 362: What species use it, and has it become critical for any wildlife?
21. Lines 367 on: Need to add a little information on why District biologists feel it will become a priority invasive species?
22. Lines 425. Can you give any indication of the alarming rate? Are the only data available those relating to recoveries or captures?
23. Lines 459 – And what was the success?
24. Lines 464-5: And what were the results?
25. Lines 473-on: Is there any real evidence of adverse effects on native species?
26. Lines 546 on : this is a good quantitative statement.

Other questions:

1. Why has there been no information provided on the aquatic plant management program (especially if it is the country's largest (page 9).
2. The potential impacts of invasive species were described as an emerging, high priority for CERP planning. How does the District plan to consider exotic species, across South Florida ecosystems, in evaluating and refining performance measures based on desirable organisms or conditions that are adversely affected by them? As an example, how does the District plan to consider the serious threat that green mussels (which went unmentioned in the chapter) pose to use of eastern oyster populations as VECs/PMs in hydrologic restoration efforts throughout most of the Southern Estuaries?
3. Will the introduction of insects for biocontrol of invasive plants lead to induction of defense mechanisms (and thus be no longer effective?)

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## **PEER-REVIEW PANEL COMMENTS ON 2009 DRAFT SFER – VOLUME I, CHAPTER 10 AND APPENDIX 10-1**

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**Reviewer:** E. van Donk, N. Armstrong and R. Meganck  
**Subject:** Comments Chapter 10:van Donk/Amstrong/Meganck  
**Posted:** 05 Sep 2008 11:18 AM

### **TECHNICAL**

#### **General comments**

As this chapter matures toward accountability status, it is probably time to consider refocusing the watershed-oriented sections of the chapter on nutrient loading and nutrient load controls and the lake-oriented sections to lake status only. The watershed research and lake research-oriented sections can be integrated more closely within those two major sections. The management section should be expanded to include watershed management activities so there is a closer link between watershed management and lake management because the idea is to manage the water quality in the lake to support intended uses and that ultimately is linked to watershed management.

The assessments of watershed and in-lake management activities should now begin to include costs so that in addition to performance being measured in terms of nutrient removal that performance can also be measured as capitol and operating costs per unit nutrient removed. Ultimately, BMPs in the watershed and lake will need to be assessed in terms of nutrient removal and cost effectiveness, so there should be efforts in this direction now.

The Conclusions section on page 10-80 reads like a summary. There are no conclusions identified in the section.

#### **Specific comments and questions**

Page 10-2, line 7. Here you use for the first time the abbreviation TMDL, explain this here and not for the first time on line 29.

Write also in the summary that the TMDL is based on a five years average.

Page 10-20. On this page you state that “funding shortfalls for FY2008-FY2009 and anticipated additional shortfalls in FY2009-FY2010 and FY2010-FY2011 will delay BPM planning and implementation efforts”. My question is: why do you have these shortfalls and when will there be more money available??

Page 10-29. Does the Chemical Treatment Study also include a study to analyze whether direct suppletion of iron, aluminum or calcium to the lake may reduce the internal P load from the sediment to the lake?? You mention that as a potential measure on page 10-49.

Page 10-42. On this page you mention that the increased diatoms: cyanobacteria ratio may be linked to the current poor-light climate. I do not understand this because I thought that low light conditions are very beneficial for cyanobacteria.

At the end of the Lake Performance Measures section, the statement is made that implies that SAVs are responsible for the 6 ppb drop in the nearshore TP concentrations in WY2008. Is the drop due to the SAVs directly, to associated periphyton, or to both?

Page 10-49. Last paragraph. It is strange that you first state that in the deeper parts of the lake noalgal blooms were detected due to low light conditions resulting from high suspended solids

and that in the nearshore area no algal blooms were observed although the light conditions were good. I think that probably the presence of vegetation and the uptake of nutrients by these plants caused nutrient limitation in this area for algae as you also state on page 10-42. On page 10-57 is written that the increase in SAV was due to the growth of musk grass (*Chara*). This plant species may excrete allelopathic substances that inhibit algal growth. See reference paper

MULDERIJ G., E. VAN DONK & J. G. M. ROELOFS (2003). Differential sensitivity of green algae to allelopathic substances from *Chara*. *Hydrobiologia* 491: 261-271.

On page 10-54, 4<sup>th</sup> paragraph, the discussion about sensitivity of in-lake sulfate concentrations to surface-water inputs could be put into the context of simplified water quality models for conservative materials which would make clear the relationship of surface-water inputs to in-lake concentrations. Figure 10-11, panel B shows that the lake is a concentrator of sulfate either through evaporation or trapping of higher sulfate waters within the lake. Plotting surface-water loading on the X-axis would produce a similar plot and be more related to the simplified model analysis. The model would provide a predictive tool that would yield in-lake concentration changes with changes in the surface-water input.

Page 10-56. You give here information about the levels of mercury in the fish populations in the lake and state that this is a concern. Which measures will be taken to lower these levels of mercury?

Page 10-61. Perhaps *Chara* is the dominant SAV because it is a pioneer plant that grows on sediments that have temporally fallen dry

## **ACCOUNTABILITY**

Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?

The breadth of coverage is appropriate, but the depth could be greater. In the watershed section, there are significant opportunities to focus on nutrient management methods, their effectiveness, and unit costs. While these management methods are undoubtedly covered in other chapters, there was an absence of reference to those chapters. Likewise for the in-lake management methods.

Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?

The chapter this year is consistent with earlier versions, but suggestions about changes in the organization are made above.

Are findings linked to management goals and objectives?

Overall the findings are linked to management goals and objectives, but those management goals and objectives could have been reinforced much more had a better Conclusions section been provided.

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 11**

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**Reviewer:** J. Burkholder, J. Burger and R. Ward

**Subject:** Comments - Burkholder, Burger and Ward

**Posted:** 10 Sep 2008 08:29 PM

Chapter 11 Kissimmee River Restoration and Upper Basin Initiatives

### *Questions*

1. The writing states (line 34) that the primary goal of the KRRP is to restore ecological integrity. In light of comments in Chapter 7B under the subsection entitled “Desired Restoration Condition” (line 178), how is ecological integrity defined here? In other words, it is not possible to restore the system to pristine conditions; thus, what is the goal of the KRRP with respect to restoration goals/integrity?

2. The District conducts a water quality sampling program for five lakes and three main tributaries in the Kissimmee basin. What entities sample the other lakes for the KCOL LTMP (i.e. the other lake Management Areas described on pp. 11-63 to 11-64), and with what frequency for what parameters?

3. The authors frankly state that mercury data from fish tissues are sporadic and inconsistent, and that a larger and more representative dataset is needed for a definitive analysis of mercury levels in the Kissimmee watershed (lines 408-413, 438). Such a dataset would be valuable in helping to interpret restoration success since mercury contamination may adversely affect fish PMs. What is being done or planned to obtain more consistent data – for example, is the District engaged in planning efforts to assist in or coordinate an improved sampling effort?

4. The accelerating population growth and urbanization in the Kissimmee Planning Area are well described (p.11-17). Encroaching development, especially affecting the upper Kissimmee basin, poses a serious threat to the success of the KRRP. While this development cannot be controlled by the District, what studies are being conducted or planned that will enable the District to better assess impacts of this urbanization on the Kissimmee River and watershed?

5. Figure 11-8 shows an abrupt, major increase in discharge from ~250 cfs to nearly 2,000 cfs (also described in lines 629-630). What were the effects of this abrupt change on the river ecosystem, and could this change have been effected more gradually? Are there plans to avoid such extreme changes in the future within the interim water regulation schedule?

6. How does the District plan to integrate invasive species into restoration considerations for the Kissimmee watershed? [Examples: Hydrilla has been a serious problem in Lake Cypress in WY2008 (p.11-25); the noxious exotic bivalve *Corbicula fluminea* is the most abundant benthic macroinvertebrate in the restored segment (pp.11-49 to 11-50); and the exotic vermiculated sailfin catfish is an abundant fish in the restored Phase I segment (pp.11-54 to 11-55, 11-57).]

7. How is the extended herbicide treatment of hydrilla in Lake Cypress (p.11-25), imposed by FL DEP, affecting beneficial species in the lake/surrounding wetlands, and downstream waters?

8. Broadleaf marsh dominated the floodplain prior to channelization, and it has a deep hydroperiod requirement (0.3-1.1 m for 200 days or more; p.11-33). It would seem very important to reestablish for restoration success. Are there plans to move forward on development of broadleaf marsh as an additional hydrologic PM? (lines 692-694)

9. Is the District conducting or planning studies to address “location effects” of monitoring sites (lines 779-785)? The available information suggests that improved understanding of/accounting for these effects could be important in interpreting restoration progress and success.

10. The addition of two DO monitoring stations (one each in Pools A and D) with near-real-time monitoring near the surface and bottom of the water column will provide valuable data to evaluate the health of benthic biota and effects of restoration. Are there plans to add another to Pool C, which has been the focus of many of the studies to date?

11. As was mentioned in the chapter, low dissolved oxygen may play an important role in P release and increased P supplied downstream to Lake Okeechobee. Will the District include assessment of the effects of oxygen sags on P release from channel sediments (lines 934-940, 945-947)? Although the KRRP was not designed as a nutrient removal project, regarding how the restored system will influence P retention, have the data needs been clearly identified within the Kissimmee Basin P Project (line 1443)? 12. How does the monitoring plan discussed on p.11-61 interface with other hydrologic monitoring in South Florida?

13. Will the KCOL LTMP Monitoring and Assessment Program be established in a sustainable manner (p.11-65)? [In other sections of the SFER (e.g. Chapter 12), situations are described wherein sampling was suspended in the past and, therefore, it was not possible to assess long-term changes.]

#### *General comments*

As a major source of water, pollutants and other materials to Lake Okeechobee and downstream ecosystems, activities and conditions in the Kissimmee basin can have significant effects throughout South Florida. The major goal of the District under the Kissimmee River Restoration Project (KRRP) is to restore ecological integrity to the Kissimmee River and floodplain ecosystem, while retaining the existing level of flood control in the watershed as a whole. This chapter provides an update of environmental conditions and District activities toward restoration goals in WY2008; for an excellent historic account of Kissimmee River/watershed channelization impacts, readers are referred to the 2008 SFER. In addition to WY2008 environmental conditions and effects, the chapter highlights newly available data from the Kissimmee River restoration Evaluation Program (KRREP), recent planning efforts, and brief status updates on projects and other program activities.

Chapter 11 of the 2009 SFER is nicely organized into four main sections: *Introduction and Background*, *Cross-Watershed Activities* (watershed management and operations, water quality topics, and water supply planning), *Basin Conditions* (with emphasis on hydrologic conditions and their relationship to management decisions), and *Project Updates*. The chapter is intended primarily for accountability review (progress in District programs and projects during WY2008), and secondarily for technical review. This chapter was a pleasure to read, clear and well designed from the writing to the informative figures and tables. It is excellent in both accountability and technical merit.

#### *Accountability review*

Chapter 11 of the 2009 SFER describes the District’s restoration efforts in WY2008 through the extension of the severe drought of WY2007 and, finally, alleviation of the drought. It presents a highly defensible scientific account of data and findings for the Kissimmee River basin. The synthesis of events and progress in WY2008 is presented in a logical and complete manner, consistent with earlier versions of the Report but superior to them. The findings are clearly linked to management goals and objectives. Evaluation of the success of the Kissimmee River Restoration Project (KRRP) is being accomplished through assessment of 25 PMs that are based upon estimated pre-channelized system reference conditions (lines 185-190). From the writing it was clear that the authors had carefully considered the recommendations suggested by the panel

for Chapter 11 of the 2008 SFER, and addressed most of them in this year's chapter (the remaining recommendations concerned topic areas that were not addressed in WY2008).

Most points made throughout the chapter are accompanied by succinct, clear explanations of underlying rationale (e.g. the source of the material used for backfilling, explained in lines 131-133; expected outcomes, described in lines 160-169; the reason for the Phase number order, described in lines 179-182; how the District will monitor to assist in evaluation, described in lines 185-195 – many examples throughout the document). The maps of this year's chapter include nearly all of the locations mentioned in the text, and other interesting features besides. The four phases of backfilling in the KRRP are clearly explained with a helpful accompanying table (Table 11-1). Within a realistic framework, some encouraging information toward achieving restoration goals is presented, such as the fact that land acquisition for KRRP and KRHRP in the lower Kissimmee basin has been mostly completed, as well as the strategies for advancing progress in restoration through adaptive management (pp. 11-61 to 11-66).

The chapter reports on the District's actions (e.g. p.11-10) to coordinate among various governmental agencies and other entities involved in management to address watershed-scale water and natural systems issues not only in the Kissimmee basin, but in regions that are hydrologically connected to it. The District uses an emergency modeling team to guide operations during flood events in an attempt to minimize adverse effects on the Kissimmee and downstream ecosystems. Permanent revisions of the stage regulation schedules used for the C&SF Project structures in the Kissimmee watershed consider the potential for impacts on downstream systems through evaluation by the Kissimmee Basin Modeling and Operations Study (KB MOS). It would be helpful in the chapter, though, to provide more explanation about steps being taken to address water/natural systems issues in downstream regions.

Invasive species are briefly mentioned in various sections (e.g. lines 196-203), but there is a clear need to more clearly integrate them into restoration considerations for the Kissimmee watershed. The stated goal of vegetation management in the Kissimmee River ecosystem is to "achieve maintenance control", but little else is said other than referring readers to Chapter 9. The problem with this approach is that Chapter 9 considers exotic species from a much broader perspective than the Kissimmee basin. Therefore, more is needed in Chapter 11 about how invasive species are considered in adaptive management of the Kissimmee basin to achieve restoration goals, and the exotic/invasive species information should be better integrated with Chapter 9.

Table 11-3 is very helpful in listing PMs (Expectations) updates (2005-) on the status of information about them. Further explanation is needed about the five strategic plan success indicators (why [only] those?).

The subsection, *Phase II/III Restoration Evaluation/Planning*, is instructive in its explanation of how the "restoration strategy pieces" fit together, and exciting in its description of the overall progress that is being made toward restoration. The District will continue monitoring efforts to track progress in water quality (DO, P), geomorphological features, river channel and floodplain vegetation, and fauna (aquatic invertebrates, herpetofauna, fish, birds). A set of Integrated Studies is being conducted or planned in Pool D within the dominant river channel and floodplain habitats that will be restored, before and after reconstruction, with the goal of improved identification of relationships among individual ecosystem components. These Integrated Studies involve comparable designs and coordinated spatial/temporal sampling to enhance correlative analyses. Major mapping studies for the KRHRP are underway or planned for completion in the near future. The hydrologic monitoring network in Pool D is being expanded to include 15 additional stage monitoring sites on the floodplain and two stage/flow monitoring stations in remnant river channels that will be reconnected during Phase II/III.

The goal of District-initiated KBMOS (initiated in 2004, to be completed in 2009) is to identify alternative interim and long-term operating criteria for the Kissimmee basin water control structures that optimize ecosystem recovery within mandated hydrologic requirements. Alternative plan screening has begun, and the District has conducted Computer-Aided Participation Workshops to bring many end users together. In other District efforts, progress has been made in completing the KCOL LTMP to sustain or improve lake health, with the draft Plan expected in late 2008 and updates planned every five years.

Additional outreach efforts by the District have involved stakeholders in each of the seven Lake Management Areas (LMAs). Management goals and objectives have been linked to PM targets; missing or needed additional targets have been identified (please provide brief information as to what those targets are – line 1505); and issues and concerns for each LMA have been identified. The Monitoring and Assessment Program for the KCOL LTMP has been improved to include three types of monitoring (longterm assessment, more specific monitoring to assess effectiveness of management actions, and monitoring to improve scientific understanding). System assessments (line 1530), to be performed annually, will compare ecosystem conditions with PM targets. Adaptive management actions will be implemented based upon the recommendations and concerns identified from the assessments. The KCOL LTMP's agency action plan describes integration with partnering agencies and alignment with KCOL LTMP management goals and objectives.

Two smaller projects were also described: The Three Lakes Wildlife Management Restoration (within the KBMOS framework) is progressing toward its goal of restoring more natural hydrology and wetland function, and is in the second of four phases. In the second project, Rolling Meadows/Catfish Creek Wetland Restoration (2,300 acres), the preferred alternative restoration plan was selected.

#### *Technical review*

Summary – The findings and interpretations in this chapter are supported by “best available information”, and the only weak sections are the Summary and the Conclusions (below), so described because they do not do the rest of the chapter justice – that is, they do not give a clear picture of the objectives or of the many accomplishments in WY2008. The Summary section is important because it is all that some stakeholders will read. It should be restructured, including up-front statement of the overall objectives.

#### **Introduction and Background**

Lines 71-78 – It would be helpful to briefly describe the Plan here.

Figures 11-1, 11-2, 11-3 – These are great figures. Also mentioned in the text are the following entities that should be added: the G-11 structure and the Jackson Canal; stations PC61, PC11 and KRDR02 (e.g. from Figure 11-9); and Weir 1 (see Figure 11-12 – alternatively for Weir 1, the information on lines 779-780 should be added to the Figure 11-12 legend).

Table 11-1 – One point of explanation should be added to this great table: the legend should explain that the information pertains only to the restoration aspects that deal with backfilling).

#### **Cross-Watershed Activities**

The cross-watershed approach is excellent and has the potential to integrate science, data, and management. However, it is not clear as to how the greater coordination will occur between the Kissimmee Watershed Program and the downstream ecosystems.

Line 214 – Please briefly include how ecological integrity is defined for this system (and does it relate to downstream systems?).

Lines 331-334 – Although a good point is made about P in agricultural vs. urban runoff, mention should also be made of the many other chemical environmental contaminants besides P that are contributed by urban runoff and atmospheric pollution.

Lines 336-339 – Needs more explanation; it would be helpful to include a table of the impaired waters, to clarify which parameters are most widespread or severe.

Line 338 – lead and copper in the water column? (please clarify)

The bioaccumulation of mercury is described as a major water quality issue in the Kissimmee watershed, which includes 20 water bodies that are under some level of health advisory. The writing (p.11-13) includes a clear explanation of why mercury in fish tissues is important consideration, and why the District is not monitoring for mercury (purview of other agencies). Frank discussion is also provided of the status and quality of the available data on mercury contamination of fish. Mercury is a topic that could be more integrated among different chapters; it should be noted, for example, that there was little mention of the Kissimmee basin problem in Chapter 3B.

Lines 430-437 – This information needs to be coordinated with Chapter 3B; the U.S. EPA criterion is 0.3 ppm, and usually it is the States that issue advisories and not the EPA.

Table 11.2 – Sample sizes are small, and it is not clear what the sample event means. Does year refer to the year of highest reported value? In addition to maximal values, this table should also present means and variance. There could be a change from the maximum, but no real change in the mean values (and, thus, no change in risk). If the issue is fish consumption (by either humans or wildlife), then the mean values are of considerable interest. A person who regularly consumed fish would end up with mean values over long periods of time. Are these sites fished regularly and, if so, which sites, by whom?

Figures 11-4, 11-5 – Summary statistics and “n” values should be provided for these figures, which are otherwise excellent.

Kissimmee Basin Environmental Conditions in WY2008

P.11-18, water reservation – Sounds potentially very promising, but is difficult for readers to understand. Additional description would be helpful.

Lines 503-503, 546-548 – The endangered snail kite is first mentioned here. Brief explanation about the basic biology of this species and its requirements (food, habitat, nesting) should be included (e.g. it would be helpful to repeat lines 591-593 here).

### **Project Updates**

This section describes newly available data on system response to Phase I restoration from the KRREP, plans for Phase II/III restoration evaluation studies and pilot studies, and status of the Kissimmee Chain of Lakes Long-Term Management Plan (KCOL LTMP), the Kissimmee Basin Modeling and Operation Study (KB MOS), and several restoration projects). Overall, the text is well written and well supported by the figures and tables. The Water Quality sub-section focuses on dissolved oxygen and total phosphorus data, and describes the status of the Phase I restoration area in comparison to a “control” area (Pool A, channelized) and a reference condition (data from other, non-channelized streams).

A well-designed geomorphology monitoring pilot study should yield valuable data toward addressing the stability and sedimentation monitoring requirements. The study objectives are clearly stated, to assess post-restoration channel stability and floodplain sedimentation, and to assess the extent of in situ burial vs. erosion (downstream transport) of organic deposits accumulated in remnant Pool D river channels.

Preliminary results are described from a study of variability and stability of different types of channel cross-section. The subsection on river channel littoral vegetation tracks encouraging progress in transforming the restored segment from high to more moderate vegetation cover, and from dominance by floating and mat-forming species to dominance by emergent vegetation. The subsection on aquatic invertebrates describes progress toward the goal of transforming the benthic and snag-dwelling aquatic invertebrate communities from dominance by lentic taxa to dominance by lotic taxa. Encouraging progress is described especially for fish PMs: bowfin have declined nearly to the targeted level, Florida gar are declining, and centrarchids have dramatically increased. Helpful explanation is given as to why redbreast sunfish may require a longer period to respond to restoration efforts. Given the fact that there can be high inter-annual variability in fish populations, the District's plan to conduct fish sampling annually for the remainder of the restoration project will indeed strengthen interpretations about the response of fish populations to restoration.

The subsections on wading bird and waterfowl densities are well done and provide useful quantitative information that can be used to evaluate restoration. Figures 11-28 and 11-29 are excellent; they provide data that are easy to follow and will be useful in evaluating success. In this extended drought year, recovering from extreme drought conditions in WY2007, only 1 small colony of wading birds was described (with 2 great egret nests and 4 great blue heron nests; but was this really for the whole region? [line 1327]). The data for PMs wading bird density and waterfowl density were more encouraging: during the post-Phase I period from 2002-2008, both PMs were exceeded except in 2007.

Lines 336-348, 447-460 – Please provide a reference that describes the water quality monitoring program of the 34 water bodies in the Kissimmee Basin that is led by the Florida Department of Environmental Protection (it is assumed, then, that FDEP operates the monitoring program?). It should also be clarified as to where the data from this monitoring program are deposited (DBHYDRO? U.S. EPA STORET? State website?). It would be helpful to include a table of the water bodies that are excluded from TMDL development (lines 343-344). Chapter 10 is cited for further information about the Lake Okeechobee Watershed Assessment, but sources should also be provided for further details about ambient water quality monitoring in the remainder of the Kissimmee basin.

Table 11-3 – It would be helpful to indicate when indicators not addressed since 2005 are planned to be reevaluated (for example, the flow velocity indicator, herpetofauna indicators [not yet evaluated], etc.).

Line 688 – The first five of the 25 restoration expectations...

Lines 708-709 – Please clarify – based upon mean monthly discharge?

Line 720 – Please clarify that the “average groundwater elevation” refers to duration of floodplain elevation.

Line 795 – Figure 11-2 ; Lines 799-800 – The years involved should be mentioned.

P.11-35 versus p.11-24 – There seems to be a discrepancy in the durations of the wet vs. dry seasons –indicated as May – October and November – April on p.11-24, but stated as June – November and December – May on p.11-35. Please check/clarify.

Figure 11-15 legend – The station #s should be explained.

Figure 11-16 legend – The dates for baseline and post-construction data should be included.

Lines 808-817 – The components of PM (Expectation) 8 were clearly explained. Depth gradient data are mentioned for DO, and a graph of these data should be added. Did the reference streams have nearbottom DO data?

Figure 11-17 – Can standard errors be added?

Figure 11-18 – The depth and time of day where these data were taken should be added.

Line 877 – It would be helpful to explain how much filling of ditches and removal of cattle has occurred.

Lines 888-895 – Brief explanation should be added as to why there was such a large increase (from 51 mt/yr to 83 mt/yr) over such a relatively short distance, and why concentrations were greater during years of low flow.

Figures 11-19, 11-20 – It would be helpful to indicate years affected by droughts and major storms.

Line 939 – This seems to be a serious understatement that should be described differently, as the data indicate that there have been chronic problems with low DO (less than 4 mg/L, often less than 2 mg/L even toward the surface of the water column).

Lines 993-997 – Please clarify what was done to ensure that disturbance from motorboat access was minimal.

Lines 1053-1054 – Brief explanation should be added for why sampling was temporarily suspended in 2004-2006, and why sample transect size was reduced in 2007-2008.

Line 1064 – Explanation of midpoints would be helpful.

Lines 1071-1072 – Was vegetation in the water also considered? – please explain.

Aquatic Invertebrates subsection (pp.11-49 – 11-51) – Should include a clear statement of objectives.

Lines 1138-1140 – This writing describes encouraging progress toward restoration success. While some of the data for macroinvertebrates are indeed promising, the writing “overlooks” the fact that the major dominant benthic invertebrate is a noxious exotic species.

Lines 1161-1165 – Identifies one of the three reference rivers is the St. Johns, yet then states that this river is below the St. Johns drainage. Please clarify.

Lines 1178-1180, vs. lines 1211-1226 – Are the success measures, then, changes in relative abundance only?

Table 11-6 – It should be clarified as to whether differences among species in movement or seasonality patterns, or response to electroshocking, were accounted for.

P.11-61 – It should be clarified as to whether the hydrologic monitoring data that are discussed on this page will be deposited in DBHYDRO.

Lines 1464-1465 – Brief explanation is needed as to why the selected KBMOS water control structure operating criteria are not intended to deliver Kissimmee Basin inflows that meet the desired stage envelope.

Line 1485 – Which agencies and stakeholder groups?

Lines 1514-1529 – It would be helpful to explain, briefly, the types of monitoring that had been done previously so that readers can understand how the approach was further refined. A reference should be added that describes the KCOL LTMP Monitoring and Assessment Program in detail.

Conclusions – As mentioned, this section does not do the chapter justice and needs to be expanded to include more information about the progress that has been made in restoration, including additional qualitative and quantitative statements.

Comment regarding cross-system integration – Chapters 10, 11 and 12 provide overviews of Lake Okeechobee, the Kissimmee Basin, and the Coastal Estuaries as three separate components of the large, complex South Florida ecosystem. The panel appreciates that various separate laws and projects require distinct discussions, but from a scientific standpoint, more integration would be desirable. Chapter 11's

Cross-Watershed Activities section is commendable in that regard.

*Editorial changes*

Table of contents – the four main sections should be in bold or otherwise designated apart from subsections.

Line 139 – Shouldn't this be KRHRP rather than HRHRP?

Lines 172, 455 – The definition of what is meant by recarved (line 172) and remnant (line 455) is given much later (p.11-42), and, to help readers, should also be given where the terms are first used.

Line 311 - ...Chapters 10 and 12... ; Lines 306-307, 320 - underway

Line 327 – Please clarify the location of Osceola County (upper basin).

Line 531 – 2007 ; Figure 11-7 legend – Should explain the maroon-colored line in (B).

Lines 550-553 – Should refer to Figure 11-8B. Also, the wet season and dry season should be defined.

Line 582 – Why is S-65C called a headwater stage? (briefly explain)

Table 11-3 – The 2008 column needs to be completed.

Line 843 - ...for 252 days... ; Line 844 – Oxygen concentrations increased for...

Line 857 - ...However, two of the four... ; Line 860 – Persimmon Mound Run? remnant control?

Figure 11-22 legend – Should explain “left monument”; and 2<sup>nd</sup> line should be: ...and did not have a...

Lines 1071-1078 – This paragraph and the succeeding paragraph should also state what happened – that the PM was not attained (Figure 11-24).

Lines 1096-1097 –...more natural substratum composition, and more natural floodplain hydroperiods.

Line 1126 – Change dominant to common

Figure 11-27 – The common name should be included above each graph. The Y axis should be labeled.

Line 1152 - ...reptiles, birds, and mammals... ; Line 1158 – Restoration targets (below) for fish...

Line 1294 - ...before detectable shifts in their... ; Line 1363 - ...C.I. has...

Lines 1561-1567 – The acreage should be included.

Figure 11-32 – The key labels are too small to read; and Catfish Creek should be labeled.

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## **PEER-REVIEW PANEL COMMENTS ON THE DRAFT 2009 SFER – VOLUME I, CHAPTER 12**

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**Reviewer:** posted by Neal Armstrong  
**Subject:** Chapter 12 Coastal Systems (Armstrong)  
**Posted:** 15 Sep 2008 09:45 AM

Chapter 12: Management and Restoration of Coastal Ecosystems

Date of Chapter Draft: 08/22/2008

Authors: Neal E. Armstrong (AA), JoAnn Burkholder (A), and Robert Ward (B)

Level of Panel Review: Accountability (Primary) and Integrative (X)

Chapter 12: Management and Restoration of Coastal Ecosystems is to receive review primarily at the Accountability level with consideration at the Integrative level. Accordingly, the following questions are addressed in this review of Chapter 12:

1. Does the draft document present a defensible account of data and findings for the areas being addressed that is complete and appropriate?
2. Is the synthesis of this information presented in a logical manner, consistent with earlier versions of the report?
3. Are findings linked to management goals and objectives?
4. Are large programs presented so that the overall goals are clear and linked systematically to descriptions across the Report?
5. Is the chapter cross referenced in a thorough and consistent manner?
6. Is there any constructive criticism and guidance to offer for the District's large-scale programs?

### **The CED Science Plan Revisited**

Last year the Panel was asked to review the Coastal Ecosystems Division (CED) Science Plan (2008 SFER Appendix 12-1), and it was the Panel's first glimpse of the overarching approach being used to guide the research, management, and restoration of the District's coastal systems. It was noted that the Coastal Ecosystems Program (CEP) has constructed an approach for coastal ecosystem management that was basically sound as a solid starting point for managing the coastal ecosystems, the waters that flow to them, and their watersheds, but it was incomplete. It was further noted that the Plan was an integration of science, engineering, and management within the District and perhaps most importantly it began to elevate the value of freshwater inflows (and their needed spatial and temporal variability) to Florida's southern estuaries to a level commensurate with municipal, industrial, and agricultural water supply.

Points the Panel raised about the Alber's conceptual model, the narrow focus on salinity, and the exclusion of nutrients were addressed constructively by the CED in modifying Figure 2 of Appendix 12-1 in the 2008 SFER to reflect the inclusion of nutrients and nutrient processing.

One point raised by the Panel last year that was not addressed in the 2009 SFER draft was the use of simplified water quality models to address immediate study needs. It was pointed out in the initial review of the 2008 SFER Appendix 12-1 draft that finite segment, mass-balance based, spreadsheet-based, steady-state models would be powerful tools useful in each one of the coastal systems the District manages. Thomann and Mueller (1987) describe their application to the Wicomico Estuary in Maryland (one dimensional), Boston Harbor (two dimensional), and Lake

Erie (three dimensional). The District's response was "A cascade of CFSTRs (Continuous – Flow Stirred-Tank Reactors) model based on inflow concentration, residence time, and reaction rate, will be ideal for a river setting such as the Caloosahatchee River and the Northwest Fork of the Loxahatchee River. This approach will be extremely useful for long term simulations when the dominate water quality processes are understood [emphasis added]." This response and the lack of any mention of simplified models in the 2009 SFER draft suggests that a singular, very valuable point was not captured in the 2008 SFER review cycle. That point is the value of using simplified models to develop an understanding of an estuarine system and to drive the determination of the dominant water quality processes. One can determine whether hydrologic and hydrodynamic processes dominate water quality ones, the relative magnitude of biochemical and physical processes governing water quality changes, and the efficacy of alternative management approaches with simplified models that have taken substantially less time and cost to develop and use than more sophisticated models. This does not diminish the ultimate importance of the sophisticated water quality models, for it is recognition that such models take time and money to develop, but directed estuarine research and adaptive management need not wait on the development and application of sophisticated models to move forward. There will reach a point at which the simplified models may not provide enough information to decision makers and that the sophisticated models become the models to use, but the bridge from the early decisions based on reasonable understanding of the estuarine systems to later decisions based on an enhanced understanding is the simplified model. Such as been the practice in the water quality field for decades. There is still time to develop and use these simplified models. The District commented in response to the Panel's final 2008 SFER report that "our water quality modeling efforts have just begun [emphasis added]". The 2009 SFER Chapter 12 draft indicates clearly that hydrodynamic and water quality modeling of the District's estuarine systems is still in its early stages. Thus, the following recommendation is offered:

- The District is urged to seriously consider the use of simplified water quality models.

Now to the CSD Science Plan as reflected in the 2009 SFER Chapter 12 draft. The organization of material for each estuary includes the following parts: (a) a description of the estuary and major issues; (b) status and trends; (c) research strategies; and (d) key District and non-District projects. Items (b) and (c) reflect the Estuarine Conditions and Estuarine Resources components, respectively, of the Alber's conceptual model (Figure 2 of the 2008 SFER Appendix 12-1). The questions that arise out of the status and trends analysis are addressed in the research strategies section, and there are very helpful summaries at the end of the latter sections that summarize the research being done to address those questions and the status of that research. Summaries have also been added in the projects section, section (d). There is also material titled Integrated Modeling Framework material, addressed at the end of the Southern Indian River Lagoon and St. Lucie River Estuary and at the end of the Caloosahatchee River Estuary and Southern Charlotte Harbor sections that is related to the Integrated Modeling and Assessment Framework of the 2008 SFER Appendix 12-1 (and depicted in Figure 3 of that appendix), but these are the only two estuaries for which such material is present. Finally, there is Figure 12-3 in the draft 2009 SFER that is intended to describe the "relationship between applied research and modeling programs, driven by adaptive management, loads, salinity envelopes, and environmental operations." In the figure, the latter three appear to be end points, not drivers; water quality is normally considered to be the end point of modeling, not the other way around; and the role of adaptive management and alternative management systems are absent. In the end, the relationship of these three approaches is confusing and leads to the following questions:

- What is the current status of the Division's Science Plan, is it still in development, and how would one describe its coherency?

- How are the basic research, management, and restoration tenants of the Plan being incorporated into the management of the coastal systems described in this Chapter 12
- If one were to explain the interrelationships of the elements of Figure 12-3 of the 2009 SFER Chapter 12 draft, what would that explanation be?
- What is the relationships between Figures 2 and 3 in the 2008 SFER Coastal Ecosystem Science Plan (Appendix 12-1) and Figure 12-3 of the 2009 SFER Chapter 12 draft and how do they convey the workings of the CED Science Plan?

### **Accountability**

This chapter is to be reviewed primarily under Accountability (targets progress for chapters that are of a more routine nature). Yet the status of District activities and progress across the estuarine systems considered is far from routine, indicated this year even by the format which represents, in some portions, a striking departure from the excellent structure of last year's chapter. While Chapter 12 presents general summary information and WY2008 progress for each of the eight priority coastal ecosystems, the quality of the sections is not as uniform as in the previous year; some sections are excellent, while others seem to be works in progress.

The standard template employed across the different coastal estuaries/bays enhances the ability of the reader to access and understand a large amount of information in one chapter. The Panel appreciates the author's working together to produce a well organized and presented chapter.

The Caloosahatchee River and St. Lucie River estuaries were highlighted in this chapter for Water Year 2008 in a manner that was logical and informative. In particular, the order of providing a description/status update, followed by problem statement, management objective, methods, and a progress update, was well received by the Panel.

In the present addition, the excellent Tables 12-1 and 12-2 summarize information about the major estuarine systems and the status of modeling these systems, respectively. Both really are *outstanding* syntheses that allow rapid comparisons among the estuaries. The status of progress by all entities collectively toward restoring the estuaries is clearly, "at a glance", reflected in the modeling efforts – the underemphasized estuaries, Lake Worth Lagoon, Naples Bay, Estero Bay, and Southern Charlotte Harbor mostly are characterized as NA (assumed to mean, models not available), and model development is of critical importance in restoring these systems. From an Accountability perspective, one additional table is recommended that lists major District efforts and accomplishments for the Water Year in each of the estuaries. Thus,

- It is recommended that one additional table be added, one that lists major District efforts and accomplishments for the Water Year in each of the estuaries.

Besides the points raised above concerning the Science Plan and how it is being implemented as evidenced in this chapter, there are issues with this chapter that need to be addressed, and they are given below.

As noted in the review of the 2008 SFER Chapter 12 for each estuarine system, additional information should be provided routinely on an annual basis to get a sense of the "state of the bay", namely:

- a) Physical characteristics such as volume at mean tide, surface area at mean tide, average depth at mean tide, measures of tidal exchange such tidal prism, major currents, major geomorphic features;

- b) Hydrologic characteristics such as annual average inflows by year for previous 20 years at least, annual average hydraulic residence times by year, average annual constituent residence times, fraction of freshwater;
- c) Water quality characteristics such as annual average concentrations and temporal variations of key constituents (e.g., salinity, DO, organics, and nutrients) bay wide and spatially that conveys general information about water quality conditions throughout the estuary;
- d) Biological data such as general concentrations (volumetric, areal, etc. as appropriate) of primary producers (e.g., phytoplankton, submerged aquatic vegetation) and secondary producers (e.g., zooplankton, benthic organisms, key species/VECs), and associated organisms.

The District concurred by saying “that where data are available it would improve the chapter by including information characterizing each of the estuaries. We will consider including this type of information in future versions of the SFER for highlighted water bodies.” Some of this information has been added, particularly for water quality and biological data, but the physical and hydrologic characteristics data could be enhanced significantly. Thus,

- It is recommended that the four types of information listed above be made available for each estuarine system.

This year’s emphasis is on the St. Lucie Estuary (SLE, and the Indian River Lagoon – should be mentioned in line 6, in parallel with section title on p.12-16) and the Caloosahatchee River Estuary (CRE). Both systems are included in the newly implemented Northern Everglades initiative (Northern Everglades and Estuaries Protection Plan), and both have available draft water protection plans that were recently developed in response to state legislation (the Caloosahatchee and St. Lucie River Watershed Protection Plans, CRWPP and SLRWPP, respectively). In Chapter 12, a helpful section on the CRWPP and SLRWPP provides important background information preceding the reports on the SLE and CRE. They reflect the District’s comprehensive, systematic planning process that includes characterization of existing conditions; determination of planning problems, objectives and constraints; selection of performance measures and management measures; formulation and evaluation of alternatives; and selection and processing of the preferred plan. The CRWPP and SLRWPP will maximize nitrogen (N) and phosphorus (P) reductions to meet total maximum daily loads as they are established for the two systems. Each Plan includes three components, the Construction Project, Pollutant Control Program, and Research and Monitoring Program, the latter of which is under development. The Plans are to be updated at three-year intervals, including an evaluation of pollutant reduction goals and other specific goals, which effectively defines an adaptive management feedback loop (also see lines 831-834).

The well-written Strategy Overview section (pp.12-14,12-15) states the three major management goals for the SLE and CRE, to (i) reduce pollutant loads to non-harmful levels, (ii) ensure that freshwater loads sustain a healthy estuary, and (iii) maintain appropriate salinity envelopes. Goals are also identified regarding pollutant loads, salinity envelopes and freshwater inflow targets, and environmental operations. The importance of adaptive management is emphasized, and will be guided by a combination of models and experimental studies. Here and throughout the chapter, the clarification of section authors was nicely done, and will aid in ownership and overall improvements in the quality of the report. In both emphasized sections (SLE, CRE), however, a critical need is a planning chart that clearly presents priorities and time tables. Also, PMs are clearly stated in some parts of the sections (but not others (e.g., lines 427-428 –what are the target densities?))

- It is recommended that a table of PMs for each system should be added.

In various places throughout the chapter, it is not possible to evaluate accountability (progress...) because there is no indication as to whether suggestions will become concrete actions. For example, in lines 677-678, the authors state that “additional measures are required to determine the relative contribution of the sediments to the total nutrient load”. There is no indication as to whether this is going to be done. Similarly, in many other locations (e.g. lines 1310-1311, lines 1334-1335, line 1370, lines 1589-1591), readers are left with the statement “further studies are required” without information as to if/when these studies are planned, or statements that efforts will be undertaken with no indication of when (e.g., lines 1547-1549, 1590-1591, 1602-1603, 1611-1613, CRE). Or, insufficient information is given for evaluation. For example, under “Methodological Approach” (p.12-38), very little information is given about this important planned study. Almost no information is given to evaluate the caliber of a study of the estuarine turbidity maximum (lines 785-788) toward making progress in restoration. The title of the section in line 795 informs readers that research projects are prioritized, but no priorities are indicated in the tables to which readers are referred. For all of the empty boxes under the “Source” column in Table 12-6 (p.12-42), what is being planned to fill the boxes, and what is the prioritization? On p.12-43 (lines 841-844), the authors write that “In the future, a comprehensive modeling framework... would be ideal” (also see lines 904-905). Is it being concretely planned? If so, on what timeline? In Table 12-7 (a nice table that shows the status of modeling efforts for the SLE) and Table 12-8 (a nice table that identifies estuarine modeling needs), when will these needs be addressed, and what is the prioritization? Table 12-13 gives no information upon which to evaluate the adequacy of the design or the data, toward accountability.

- It is recommended that adequate information be provided for each estuarine system that permits one to evaluate accountability.

P.12-62 on e.g. Benthic Nutrient Fluxes, p.12-64; p.1265; Low Salinity Zone Project overview and background, pp. 12-66 to 12-67) – Repetition of the exact template for the CRE as for the SLE was not very informative. Rather than repeating virtually the exact same wording, the chapter should contain a preface to the sections on the two highlighted systems that contains this information. Then, within each section, the unique information for each system should be presented. In the Benthic Nutrient Fluxes approach, will 50 sites be examined no matter how big or small the estuary (SLE = CRE)? Is the exact same BOD monitoring planned for the SLE as for the CRE (#stations, frequency – Table 12-2)?

- It is recommended that repetition of text for sections that are repeated for each estuarine system be avoided by placing the text before these sections.

Lines 1367-1374, 1455-1471 – The CRE is supposed to be a highlighted estuary in this year’s chapter, and the very small section on actual progress in this system for WY2008 is insufficient. For accountability, this section should be expanded; instead, readers even find “template writing” here (lines 1312-1335, 1456-1462, same as for the SLE). What was found from the transect study? What was the nature of the demonstration study?

- It is recommended that progress being made in the CRE be provided in more detail.

### **Integrative Review**

The District’s overarching strategy within each of the coastal ecosystems is to apply an integrated modeling and assessment framework to help structure and organize priority needs, and to provide the framework for constructing detailed science plans. The described integrated, comprehensive modeling framework, once completed, will allow major milestones of progress in integrating the coastal ecosystems. Much more progress has been made toward achieving this goal in some coastal ecosystems, however, than in others. Some coastal ecosystems continue to languish year after year with no timelines on the horizon as to when fundamental baseline data will be collected and when major efforts will be made to tackle their serious ecosystem

degradation. A realistic timeline for restoration of each of the coastal ecosystems (establishment of MFLs, water reservations, needed models etc.) and for integration of their data should be developed.

- It is recommended that a realistic timeline for restoration of each coastal ecosystem and for integration of their data be developed.

What information could be provided to the authors of Chapter 2 to help them evaluate the effectiveness of water management in the system, i.e., when too much or too little water flow is being provided to coastal systems? Conversely, are there plans to measure in some fashion how well the coastal systems are managed relative to freshwater inflows, nutrient loads, etc.?

- Can the authors of this chapter interact with those of Chapter 2 to develop measures that reflect the management effectiveness of providing the amounts of water needed to sustain the SLE and CRE systems?

Integration of the coastal ecosystems would also be strengthened by adding a section to this chapter that considers linkages between them, such as wading birds and exotic species. Another potentially integrating force is climate change, which has not been addressed in this chapter.

- It is recommended that integration of the coastal ecosystems be strengthened through common linkages.

There are some missed opportunities in Chapter 12 for integration among the South Florida ecosystems. For example, p.12-60 states that ~50% of the TN loads and ~30% of the TP loads to the CRE are added by freshwater discharge, mainly from Lake Okeechobee. This is an opportunity to link to Chapter 10, and to recognize the importance of controlling N as well as P outputs from the Lake in controlling the health of downstream ecosystems. In describing roseate spoonbills in Florida Bay (lines 2801-2810), no attempt is made to link to the excellent information provided in Chapter 6. On the other hand, integration is shown in the Biscayne Bay section of this chapter (lines 2129-2130), where readers are referred to Chapter 7 for more information on the CERP Biscayne Bay Coastal Wetlands Project, which is designed to restore some overland freshwater flow to coastal wetlands in the southern Bay.

- It is also recommended that integration of the coastal ecosystems with inland systems like Lake Okeechobee be strengthened.

### **Other Comments and Suggestions**

The following comments and suggestions, general and by section, are submitted to improve the accountability and technical character of the chapter:

The Summary should state that that primary role of the Coastal Ecosystem Program is to provide the information needed to design effective restoration and protection measures for the District's eight priority Coastal Ecosystems. While some sections nicely report metric units with English units following in parentheses, other sections report a mix of English and metric units. The chapter should be edited for consistency in units and units presentation.

St. Lucie River Estuary and Southern Indian River Lagoon [order switched to emphasize the SLE] Major concerns for the SLE are described as altered hydrology because of managed discharges from Lake Okeechobee and other freshwater inflows (quantity, timing, quality), and degraded estuarine resources such as submersed aquatic vegetation (SAV), oyster communities, and fisheries. The SLE historically has not been emphasized in efforts by the District and other entities, and is only beginning to be given more rigorous attention. Accordingly, as illustrated by Table 12-2, and again by Tables 12-4 and 12-5, there are gaps in the data for this system in nearly all parameters needed to complete nutrient budgets and quantify dissolved oxygen (DO) dynamics. The section is somewhat confusingly presented in that it mixes information on the SLE

and the SIRL (the latter had gone unmentioned in the Summary), and some restructuring would improve the clarity for readers.

Lines 197-200 – define “excess water” and “existing condition” in a way that one can relate them to the “best combination of management measures to achieve overall project objectives for water quality and quantity.”

Lines 200-210 – it is inferred from this text that the alternatives to be considered have already been identified and incorporated into one of these four alternatives groupings. Is this the case or is there flexibility to incorporate other alternatives not yet identified. It would appear that an adaptive management approach would dictate the latter approach.

Lines 211-222: Are the Research and Water Quality Monitoring Plans discussed here coordinated with similar water quality monitoring efforts in the Kissimmee basin and Lake Okeechobee? Will the data be stored in DBHYDRO? Is there a brief outline, or citation, of such connections that could help the reader appreciate a total South Florida perspective is being taken with respect to water quality monitoring? Or are these connections to be developed as part of the water quality monitoring reengineering currently underway by the SFWMD?

Lines 316-317; also lines 2420-2426, Estero Bay; and p.12-133, Florida Bay – SAV typically refers to submersed vascular plants (see Day et al., 1989, *Estuarine Ecology*; Wetzel, 2001, *Limnology*). The “lumping together” of seagrasses and macroalgae can be a problem because macroalgae (including some species of *Caulerpa* – see p.12-22) are *not* considered good indicators of ecosystem health (see Burkholder et al. 2007, *Journal of Experimental Marine Biology and Ecology*, ‘Seagrasses and eutrophication’). Instead, macroalgae can be indicators of excessive nutrient pollution; under such conditions they commonly overgrow and kill seagrass meadows. Throughout the rest of p.12-18, seagrasses are mentioned without further mention of macroalgae. Please clarify - are macroalgae being included in the aerial photo analyses as “SAV” (Figure 12-5)?

Line 352 – It would be helpful to mention some environmental characteristics of Johnson’s seagrass.

Lines 356-347, Figure 12-6 – Notwithstanding this previous study, historic information that might be available for SAV coverage in the SLE should be mentioned here.

Figure 12-7 – Planned monitoring stations for SAV in the SLE should also be included.

Lines 465-489 – Is a similar floodplain vegetation study planned for the South Fork of the SLE?

Lines 493-495 – “Inflows less than 28 cfs”, monthly average, seems very low. “Inflows lower than this threshold for two consecutive years” – seems inadequate to protect key components of the SLE. The underlying rationale for both should be briefly explained.

Lines 502-503 – it is stated that maximum inflows were not exceeded implying that salinities in the St. Lucie River at Highway 1 did not fall below 7 psu during CY2007; however, it appears in Figure 12-23 does indeed fall below that level.

Figure 12-14 – this figure, currently on page 12-31, is not referenced until page 12-35 and should be moved to that page or later.

Table 12-3 – Information should be added on the nitrogen (especially nitrate and ammonium) and phosphorus component concentrations. Were these surface DO concentrations? Are bottom-water DO concentration data available? The legend should explain whether these are monthly data? Was the station added in 1997 included in these analyses?

Lines 522-541 – The Watershed Trends section requires expansion. Remarkably, these important data, some of the best for the SLE, are not even shown – not one graph or summary table –

and interpretation of the trends is also required. For example, the trends suggest a decrease in organic N – why would that be the case. Clarification is also needed for inclusion of the S-50 structure on the C-25 canal.

Lines 529-541 - As the number of samples in a time series increases over time and this data is then used, periodically, to ‘test’ for trends, there is a concern that at some point almost all time series will yield a statistically significant trend because of the large number of samples involved. Thus, if the Line 539 findings are statistically significant (and a large ‘n’ is used) are the changes nutrient significant? In other words, are the changes over 25 years significant from a nutrient point-of-view as well as a statistics test?

Lines 543-556 – loadings should be given in metric units. The data need to be interpreted relative to other estuaries of similar size/watershed size. The water quality targets should be stated.

Lines 567-580 – Please add a short description of the nutrient limitation bioassays performed or nutrient ratios calculated. There are significant misconceptions about the interpretation of results depending on the nature of the tests (batch or continuous flow), the concentrations used in the ratio (concentrations have to be in the realm of the Michaelis Constants for N and P before they are meaningful. Also, the concept of nutrient limitation should be expanded to include the importance of nutrient ratios (N:Si, N+P:SI, P:Si) because (i) in various eutrophic estuaries, nutrient co-management (N+P) has been shown to be important, and (ii) silica has been invoked as potentially limiting for diatoms in the SLE (lines 638-640). Also applies to the CRE (lines 1288-1290).

Lines 589-591 – What are “the appropriate nutrient loads” for the SLE – the targets, if developed (see lines 652-654), should be stated.

Table 12-4 – This “template” table, also used in modified form in the CRE section, requires further explanation. The legend states that the priority is indicated; they are missing and must be added.

Lines 628-640 – please see comments above for nutrient bioassays in Lines 567-580.

Line 628 – Please clarify - sampled for what? It would be very helpful in such assays to have information

on the dominant phytoplankton species.

Lines 641-646 – The MERLINS are an exciting addition. After  $\beta$ -testing, where will they be positioned?

Lines 647-651 – what will the MDLs be for each constituent? Will they be low enough for the nutrients to detect low concentrations in the estuary?

Lines 655-678 – has a nutrient budget been put together for the St. Lucie Estuary yet – even a preliminary one? In linear systems like this estuary, benthic flux only accounts for about 15% of the internal nutrient sources. Thus why is so much attention being focused on this potential source in this system and others right now when the larger components of the nutrient budget need to be tied down?

Lines 681-689 – The SLE is listed as impaired for low DO. The authors mention that BOD and/or chlorophyll *a* could be causative factors for the DO impairment, suggesting different origins. The BOD potential origin is explained; explanation similarly should be added for chlorophyll *a*.

Line 688 – need a period after “lagoon”.

Lines 697-705 – are sources being estimated as well? Need to be sure that dissolved oxygen reaeration is being estimated properly, i.e., using velocities actually occurring in the system or via direct measurement techniques.

Lines 713-715 – see comment for Lines 655-678.

Line 715, “Further measurements are required” – have they been planned?

Lines 727-729 – Sentence requires further explanation.

Lines 732-734 – The underlying logic here seems flawed (“An agricultural paradigm...”). The point needs to be made that excessive nutrient loads repeatedly have been shown to be detrimental to estuaries (see National Research Council 2000, *Clean Coastal Waters – Understanding and Reducing the Effects of Nutrient Pollution* – National Academy Press).

Lines 773-783 – what is the rationale for choosing these particulate constituents and biota? Why not nutrients as well?

Line 776 – Phytoplankton species also are mentioned in Table 12-6.

Line 783 – The depth where DO is to be measured should be clarified.

Table 12-6 – This table is confusing. Under Research Component – Canal Loads, why does water quality (color, turbidity, chlorophyll total suspended solids etc.) go unmentioned? (see comparable table for the CER, p.12-72). Shouldn’t hatchings (indicating “commonality”) be added for several boxes (e.g., benthic flux x low-salinity zone; denitrification x DO dynamics, larval/juvenile fish x DO dynamics)?

Line 824 – “possible of future scenarios” should be “possible future scenarios”

Line 879 – “verification” is a term that often implies the model has been calibrated to one set of conditions and applied successfully to one other set. “Confirmation” is often used to mean that the model has been applied successfully to a number of other sets and gains credibility with each confirmation. How is “verification” being defined here?

Caloosahatchee River Estuary and Southern Charlotte Harbor Major environmental concerns for the CRE extending into Southern Charlotte Harbor were identified as altered freshwater flows, nutrient enrichment, and habitat loss. The CRE ecosystem historically is better understood than the SLE in its hydrology, water quality, flora and fauna. A Minimum Flow and Level (MFL) rule for the CRE has been established, freshwater inflows are better tracked (Figure 12-20 is excellent), and six continuous monitoring sensors provide a high-frequency dataset on salinity. In interpreting the water quality data, comparison to Florida median data was helpful (p.12-58). Five aerial surveys for SAV have been conducted since 1999, complemented by monitoring efforts “on the ground” (lines 949-957 – should clarify when monitoring was initiated). SAV status ranges from fairly stable (shoal grass, *Halodule wrightii*) to depressed abundance (drought-related: *Thalassia testudinum*), to major sustained loss and near-disappearance (the important freshwater/brackish species, tape grass or *Valisneria americana*). Oysters have been monitored, through the District’s Caloosahatchee Estuary Oyster Monitoring Program, only since 2003, with plans to map adult oyster reef cover every three to five years. Other variables (adult size distribution, reproduction/recruitment, juvenile oyster growth and survival, physiological conditions, and dermo disease incidence) are also being tracked. While oyster densities in the CRE have been fairly high and relatively stable over the past five years, drought-related (high salinities) disease and predation pressure also have been high, and larval recruitment has been depressed.

Lines 942-948 – The use of hydroacoustic data to obtain information on SAV percent cover, mean canopy height, and edge of bed location in turbid areas should be briefly explained, including groundtruthing.

Lines 948-962, “Densities of shoal grass...matched or exceeded WY2007...” – does not seem to be supported by Figure 12-18. Was the decline in shoal grass during the dry season attributed to temperature, exposure, and/or other factor(s)?

Line 972-974 – A SAV planting event was described (April 2008) for the CRE in an effort to re-establish tape grass (*Valisneria americana*). Are there plans to repeat this effort under more favorable (nondrought) conditions?

Figure 12-18 – Error bars should be added.

Lines 1196-1199 – Writing should be altered unless bottom-water as well as surface DO data were available for consideration. This point should also be clarified in Table 12-10.

Table 12-10 – some illustrative graphs would also be very helpful.

Table 12-11 – need to put together a preliminary budget to gain perspective on the relative magnitudes of the various components. Also, for line 2 – explanation is needed for “could be better” – what is the actual status?

Lines 1200-1209 and Lines 1222-1223 - How were the trends reported here analyzed?

Lines 1282-1286 – data in Table 12-10 indicates that there is enough inorganic N to fully support maximum growth rates of algae. Any organic N that can be used is in excess.

Lines 1294-1335 – with a preliminary nutrient budget in hand, one could determine whether it is fruitful to give such a high priority to the degradation of riverine dissolved nitrogen and to benthic nutrient fluxes at this point.

Line 1342 – BOD stands for Biochemical Oxygen Demand, not Biological ....

Line 1295, organic N must be remineralized... - is in error; some phytoplankton can use dissolved organic N sources directly (e.g., see review by Burkholder et al. 2008, *Harmful Algae*, available online).

Line 1449 – There is no such thing as “benthic phytoplankton” – please change to benthic microalgae.

Line 1475 – “lad” should be “load”

Lines 1484-1485 – Maybe, maybe not – management may also significantly influence CDOM. Brief explanation should be added about what is known historically about CDOM levels.

Table 12-14 – Hatching is suggested for DO time series x nutrient budget, since DO can affect sediment nutrient regeneration, and for DO time series x light attenuation (phytoplankton interaction).

Loxahatchee River Estuary (LRE) The LRE, much better studied than the SLE or CRE, originally was freshwater until the Jupiter Inlet was opened in 1947 and other drainage alterations (e.g., C-18 canal) occurred. A MFL has been developed for the Northwest Fork (2003) and an excellent Restoration Plan is available for the Northwest Fork, based upon five VECs and corresponding PMs. Tide and salinity stations have been operable in the Loxahatchee River since 2002 (# stations?), and the Loxahatchee River District also maintains a water quality monitoring network at ~40 sites for ~30 parameters (frequency of sampling?). SAV, eastern oysters, and floodplain vegetation are monitored and strong datasets have been/are being developed. Surprisingly, until WY2008, information was not available about fish in the middle and upper Northwest Fork. A baseline survey over nearly a year detected 31 fish species including 5 exotics, and 8 more were found in the Loxahatchee Slough from a survey in 2006. A planned new study of fish species during low-flow conditions sounds promising, but brief additional description would be helpful.

Figure 12-23 – Should also show the Hobe Grove Ditch and (for average flow conditions) the oligohaline, mesohaline, and polyhaline areas (corresponding to p.12-76 and line 1755).

Lines 1714-1716 – What is the estimated percent decline in SAV (area)?

Figure 12-25 – It would be helpful to add a comparative figure showing SAV distribution prior to the drought. (also applies to Figure 12-42).

Lake Worth Lagoon (LWL) This well-written section describes the LWL system and its heavily urbanized watershed. Identified primary concerns are excessive freshwater inflows, sedimentation and turbidity, and it seems that toxic substance contamination should be added (see line 1998). PMs designed for LWL are targeted at limiting the discharges from the C-51 canal to achieve a more natural (less freshwater) salinity regime. However, no freshwater MFLs or reservation of water have been developed.

The lead agencies for LWL are the Palm Beach County Department of Environmental Resources Management (PBCERM) and the Florida Department of Environmental Protection, with whom the District collaborates. A Lake Worth Lagoon Management Plan Update (PBCERM 2008) is available. SAV mapping efforts (Palm Beach County, 1990, 2001) are being updated with aerial photos (taken in 2007); oysters have been monitored by the District since 2005; and data on sediment loading from the C-51 canal as well as muck sediment maps are being updated.

It was encouraging to learn that 12 new stations have been added to the (monthly) monitoring network as of October 2007, so that 22 water quality sites are being monitored for a suite of parameters including metals arsenic, copper, cadmium and lead. The addition of five high-frequency *in situ* sondes for water quality monitoring is also important progress and should greatly advance understanding about environmental conditions in LWL.

Line 1884: The Panel appreciates the effort this subsection represents – development of assessment indicators to better communicate Everglade restoration progress with the public.

Figures 12-31, 12-32, and 12-33 - Sites LWL-9 and LWL-11, and the C-51 canal (pp. 12-92 to 12-93) should be shown on a map or reference should be made to an existing map where these structures are shown.

Table 12-16 – Gaps in the data collection should also be indicated.

Lines 1934-1935: Are the past sampling locations and methods well documented so future use of the data from discontinued sites is possible in a sound science manner?

Lines 1968-1969: Similar question as above for Lines 529-541.

Lines 1971-1973 – Should be altered unless bottom-water DO data were available for consideration.

Lines 1980-1990 – The point should be made that trends are difficult to infer from datasets shorter than a decade.

Lines 1998-2002 – Brief clarification should be added as to whether there were exceedances for cadmium and lead.

Line 2058 - Similar to the comment for Lines 1934-1935, is the water quality monitoring expansion discussed in line 2058 coordinated with other monitoring efforts in South Florida?

Biscayne Bay This system, historically a freshwater estuary, is now mostly a marine lagoon because of hydrologic alterations. Its watershed contains the City of Miami. A primary concern is altered delivery of freshwater and, secondarily, water quality impairment. No MFL criteria or water reservations have been adopted for the Biscayne Bay ecosystem, although the District is now proceeding to develop a water reservation for the CERP Biscayne Bay Coastal Wetlands

Project. A strong dataset on salinity in BB has been collected since 1979 by the Miami-Dade Department of Environmental Resources Management (DERM), and indicates that bottom-water salinity can be excessive for supporting healthy aquatic life along the nearshore mainland (Biscayne National Park vicinity). Limited water quality data are also available from DERM (brief information should be added describing the #stations, frequency of sampling, and duration), and suggest that BB is enriched in inorganic nitrogen (lines 2156-2157). Its water quality appears good, nonetheless, in some locations, still even oligotrophic in areas with strong ocean influence. The present status of oyster populations is unknown.

Line 2159, “Inorganic N loads from nearby canals have not increased over time” – If the data were collected at low frequency, this sentence should be modified because the dataset may be insufficient to capture major loading events for trend analysis.

Lines 2169-2170 – It should be clarified as to whether there are problems with nuisance macroalgal growth in BB.

Lines 2198-2206 – Additional description should be added about the monitoring plan for coastal wetlands.

Naples Bay (NB) This section, also well written, describes another estuary that has been extremely altered by hydrologic changes, land development, and urbanization. Construction of the Golden Gate Canal system and other activities in the 1960s increased the NB watershed from 10 square miles to 130 square miles, increased freshwater inflows by 20- to 40-fold, and decreased suitable seagrass and oyster habitat by 80-90%. No MFL criteria or water reservations have been established; key inflow from the Golden Gate Canal only began to be monitored in 1994, and was not monitored at all from 2003-2007. A helpful chronological study, with aerial photos and interviews, was conducted in 2006 to document changes to the shoreline and bottom of NB prior to the 1950s, and showed large reductions in seagrass and eastern oysters. Results from a recent oyster reef demonstration project (2007) to test habitat suitability for oysters were not encouraging, and revealed low densities of live oysters in NB.

- The status of water quality monitoring requires clarification;
- Figure 12-42 shows numerous water quality stations (maintained by the City of Naples? – Line 2299), and the frequency/duration of data collection needs to be provided.
- Lines 2342-2344 state that water quality data are available since 1999 for only one station.

Estero Bay (EB) This ecosystem, Florida’s first Aquatic Preserve, is also poorly characterized. Identified issues of concern (p.12-120) are degraded estuarine water quality, altered freshwater inflows, altered sedimentation, and loss of beneficial aquatic flora and fauna. No MFL rule has been established, although the District has developed flow ranges to evaluate flows for three of the five major tributaries to EB, based upon salinity tolerances of the eastern oyster. Performance measures and recommended flows have been designed (helpful Table 12-7). Florida International University has maintained four water quality stations in EB since 1999 with monthly monitoring of salinity, chlorophyll *a*, dissolved inorganic N, and total P, and Lee County has been monitoring water quality at 14 stations in EB for 22 parameters (lines 2518-2519: please add duration, frequency, key parameters). The District has taken sets of aerial photos to monitor SAV cover (including macroalgae – see question 1 above) for several years during 1999-2006, with an additional set collected in WY2008. Florida Gulf Coast University is monitoring oyster reefs; data pre-WY2004 are not available.

- Sparse data are available on fish communities and benthic invertebrates.
- The lead entity(s) for EB should be identified.

- Additional explanation is needed about in-progress characterization of fish communities (lines 2468-2473).

Florida Bay (FB) FB has been emphasized in District activities, and in comparison to most other Coastal Ecosystems it is very well characterized. A MFL, in place for some time, is being updated. This section is well written with great graphics, and mainly describes the impressive programs of monitoring, research, and modeling maintained by the District in FB, the present status of FB, and WY2008 activities. An interesting analysis indicates that sponges have declined because of the major cyanobacterial bloom (2005-). Troubling information especially is reported for the status of the sentinel species roseate spoonbill. The District's planning for the C-111 project is innovative in its inclusion of investigation of short-term and long-term water quality consequences.

Summary – Although the title of this section indicates that major issues are to be considered, water quality other than salinity is barely mentioned (line 2542). For example, lines 2530-2533 describe a major hypothesis about salinity, but should also mention another major hypothesis about interactions between nutrient enrichment and salinity in causing algal blooms, seagrass decline, and other ecosystem impacts. Even lines 2534-2536, describing hurricane disturbance, water management, and highway construction as interactive causes of a major cyanobacterial bloom, mention nothing about the pivotal role of phosphorus enrichment that is known to have been a key factor. The writing should be altered.

Figure 12-47 – Needs also to show the locations of Mud Creek, West Highway Creek, Manatee Bay, Twin Key Basin, the eastern boundary of Florida Bay, and Peterson Key (line 2577, pp. 132-135), or these locations should be shown on another map. (Should Taylor River be Taylor Creek? – line 2564)

Lines 2548-2553 – As mentioned, a supporting table of this information would be very helpful.

Figures 12-54, 12-61 – Error bars should be added.

Line 2743 – Brief explanation should be added to explain this statement.

Line 2753 – *Thalassia* recovery, in fact, is not evident (writing should be altered).

Lines 2849-2850 – Explanation should be added as to why the most important documentation is diel DO dynamics.

Line 2867 – The sources of the P increase should be mentioned.

Figure 12-62 – Last box under Current Status mentions nothing about the decline in *Thalassia*; the “green light” should also be altered accordingly. Box for abundance, 2-year prospects – again, the major algal bloom of most concern has been strongly linked to nutrient (P) enrichment; the area is not only prone to hypersalinity. The writing should be altered.

Line 2931 – Information should be added about when the water quality components of the hydrodynamic model will be fully completed.

### **Editorial Changes**

To help readers, scientific names should be given along with common names for SAV when first used in each section, since in some sections common names only are used in text but figures have scientific names, and other such switching back and forth occurs.

Lines 142-143 - ...These programs are designed... ; Line 177 - ...for the estuaries...

Line 242 – Three major... ; Figure 12-4 – The phytoplankton bioassay sites should be shown.

Figures – all should be checked to enlarge labels and keys where needed to make them readable. Some figures are very clear, while others (e.g. Figures 12-8, 12-15 key, Figure 12-34) are very difficult to read.

Line 332 – underway ; Figure 12-11 – needs a key for the colors and a scale.

Figure 12-12 legend, line 1 - ...to the North Fork...

Figure 12-14 – should not be sited on p.12-31 but, rather, on p.12-33.

Throughout – salinity should not have units ; Line 529 – state the years

Line 666 (vs. line 676) – were initiated... ; Lines 714-715 – these dates seem incorrect.

Lines 757-758 - ...Bridge were created primarily considering tolerable...

Line 933 – Figure 12-16 is of Charlotte Harbor, not the CRE, and SAV for the CRE are not shown.

Lines 958-962 – Brief explanation should be added about how the drought affected turtlegrass (little effect based upon Figure 12-18).

Figure 12-16 – Fort Meyers should be added to help readers understand the SAV information.

Figure 12-19 – the station names should be included (lines 1038-1040) ; Line 1136 – WY2008

Table 12-10 – Legend needs to better describe the table contents. The way that the stations are reported is somewhat confusing to readers, and needs to match the stations described in the text.

Lines 1300-1301 – Table 12-11 does not seem to contain information about how much DON in the downstream estuary can be remineralized.

Figure 12-22 – The location of the Franklin lock and dam should be added ; Line 1475 – load targets

Line 1923 -...water have been... ; Line 2089 vs. line 12-99 - 2005 or 2003?

Figure 12-40 – Legend should clarify the entity that is maintaining these monitoring sites. It would be helpful to add a lower-magnification map. This figure should follow p.12-105. It should also show the locations of BISC101 (p.12-105) and the stations (or designations) mentioned on p.12-106.

Line 2242 - ...nearshore were related...

Lines 2291-2293 – Sentence should be altered – a monthly sampling frequency has been shown in many studies to be inadequate for characterizing salinity changes.

Line 2301 – should be  $\mu\text{g/L}$  ; Line 2303 – shouldn't this be lower rather than upper?

Figure 12-42 – needs to show Dollar Bay and Rookery Bay. Some words are cut off.

Figure 12-45 – it would be helpful to show population centers.

Figure 12-46 should follow after p.12-119 ; Line 2416 – DIN rather than DON?

Lines 2420-2426 – “SAV”, if including macroalgae, should not be used interchangeably with “seagrass”.