Appendix 1A-2: Peer-Review Panel Comments on the *2007 South Florida Environmental Report – Volume I*

These comments were provided to the public on the District's WebBoard. 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 on the District's WebBoard.

Panel's Response to the District Comments - » Panel Responses

Subject: **Panel Responses [Jeff Jordan]**

Panel responses to the draft report will be incorporated into the Final version to be posted on October 20, 2006.

Posted: 19 Oct 2006 11:37 AM

Subject: **Joanna Burger; OVERALL COMMENTS**

I think it might be useful to have a table or appendix that lists the places (or Consolidated Reports) where the public can go to find the restoration goals for each region. The inclusion of a climate change (variability) section was an excellent idea (and one some other authors would do well to consider).

Posted: 12 Sep 2006 12:46 PM

Chapter 1A: Introduction to the 2007 South Florida Environmental Report – Volume I

Subject: **Review by Burkholder**

This streamlined introductory chapter was a pleasure to read, both from accountability and integrative standpoints. The map of the major features was clear and helpful.

Tables - The summary tables of Major Features and Key District Programs were a very valuable addition, and a great help to readers considering any subsequent chapter. It is suggested that for Table 1A-1, under Everglades Protection Area (EPA), a subheading should be added for the Loxahatchee National Wildlife Refuge, with accompanying brief description.

It is recommended that a third table should be added which outlines major issues that historically have been targeted. A fourth table should be added which summarizes major issues and progress addressed during 2006 (and for the year in future reports) for each of the Major Features.

Lines 14-15, 211 – state that a more comprehensive update will be completed every five years, but elsewhere (line 91) states that such a review is expected to be conducted. Can it be clarified for certain whether a comprehensive review will be conducted every five years?

Posted: 04 Sep 2006 01:10 PM

Subject: **Review by Armstrong**

Page 1A-2 The first page of this chapter introduces the report and its contents nicely, but then there is a rather abrupt introduction to the key aspects of the study area overview in the two tables and one figure presented. The reader is referred to Chapter 1A of the 2006 report for an overview of the geographical features of the entire South Florida environmental resource, but much is lost by not having at least an abbreviated description of this resource to go with the tables and figure presented. I suggest adding a one or two page description of the geographical features of the entire South Florida environmental resource -- enough so that the material presented in the tables and figure can be put into context.

Table 1A-1 It needs to be noted that the Loxahatchee National Wildlife Refuge is part of WCA-1. The areas of the WCAs and ENP do not add to the totals given for the EPA; in the square kilometers column the numbers sum to 9,011 km^2 while in the square miles column the number sum to 3,478 mi^2.

In the Coastal Ecosystems portion of the table, I suggest including the major urban area(s) that are part of the estuarine system such as is done for the Loxahatchee River and Estuary to help the reader get a sense of location of the system.

Naples Bay is not listed in the table even though it appears in the figure and was included in the 2006 report material.

Posted: 09 Sep 2006 11:39 AM

Subject: **Joanna Burger; COMMENT ON CHAPTER 1A**

I found Table 1A-2 particularly useful.

Posted: 12 Sep 2006 12:43 PM

Subject: **Review by Meganck**

I do not have any specific questions regarding this chapter. I will however, prepare a short supporting text on the importance of this chapter as part of my overall comments on the 2007 SFER.

Posted: 12 Sep 2006 04:17 PM

Subject: **Review by Jordan**

This chapter has been substantially reduced in size through the use of tables to note the context of the SFER in terms of the physical description of the Everglades system as well as the restoration efforts being undertaken. The use of tables 1A-1 and 1A-2 are an improvement over previous reports. The information is helpful and compact. Along with the map in Figure 1A-1 this is an excellent introduction to the SFER. Further, as usual, this chapter does a good job of accomplishing its stated purpose of providing the reader "with a basic understanding of the governmental, scientific, and legal context behind the 2007 SFER." Unless required by legislation regarding,the material on the panel's SOW as well as the biographies could be in an appendix. It is not clear to me that a general reader will get much from that section.

Posted: 14 Sep 2006 11:35 AM

Chapter 1B: Cross-Cutting Issues in the 2007 South Florida Environmental Report - South Florida Water Quality

Subject: **Review by Meganck**

1. Is there actually a dividing line of impact (regardless of the parameters being measured) between the north and south regions of South Florida as a result of the series of hurricanes studied as the text seems to indicate (natural areas "suffering" less)? If so, is this really related to any measurable degree to the more natural state of the southern region of the State being able to absorb more impact from such an event? The chapter noted that "Everglades marshes showed little change in water quality or ecosystem health" associated with hurricanes (line 231), but lines 246-248 noted the "massive physical disturbance over large areas of native vegetation." Are these statements compatible?

2. Is there any known correlation between hurricane direction and the impact to the EPA (given any number of parameters such as TP releases, DO levels, etc.)? In other words, do hurricanes running across the State (either from the east or west) at the level of the EAA tend to cause a greater impact to downstream areas than a storm approaching from the south or south east? The reasons I raise this issue relates to the mention of water depth and absorptive capacity to storms and that it seems like a rich area for research.

3. Are there any particular BMPs that mitigate the impacts of hurricanes on natural habitats in South Florida? For example, will deeper STAs sequester P at deeper levels and thereby reduce the churning and re-suspension effects of P in downstream areas?

4. Are sewage treatment systems in communities adjacent to the WCAs and the EPA able to handle the surge of runoff during extreme storm events or is there by necessity a large release of untreated sewage or runoff to these areas?

Posted: 12 Sep 2006 04:18 PM

Subject: **Review by Jordan**

At this date (Sept. 14) the material on-line for Chapter 1B is not available.

Posted: 14 Sep 2006 11:28 AM

Chapter 2: Hydrology of the South Florida Environment

Subject: **Joanna Burger; COMMENTS ON CHAPTER 2**

The regional overview of water management is excellent, and provides a useful introduction to the chapter. Similarly, this reviewer appreciated the provision of general statements within each section that set the context for the discussion. Likewise, the section on the 2005 Hurricane season was both informative and interesting in light of water management. A discussion of the potential effect of continued "high hurricane" years on South Florida would be interesting.

1. Page 2-7: I found it interesting that greatest rainfall is along the east coast, which is the most heavily populated, and that the runoff is into the ocean. What consideration has been given to attempts to capture some of the rainfall?
2. Page 2-9. Table 2.4 is very interesting.
3. Page 2-10: What is potential evapotransporation?
4. Page 2-11:Line 216. A word seems to be left out; you refer to a range but give only one number for the index.
5. Page 2-13, line 229. It might help to define a "drought"
6. Page 2-13: The information in fig. 2-9 and 2-10 was very useful in evaluating natural variations.
7. Page 2-16: What is the district position on wildfires, and what management is done?
8. Page 2-10 and 2-20: The description of the management is too brief. Who exactly makes the recommendations, and who decides exactly what will be done?
9. Page 2-20,lines 423- can you give an example of a deviation?
10. Page 2-25. Hurricane Wilma passed over the STAs as a hurricane 2. What would happen if the STAs were hit with a higher level one?
11. Page 2-28. Table 2-5 is not clear to me: are the data a comparison with the overall rainfall for the region, or are the data compared within a region. That is, did you have historical data for each of the five regions to compare with 2006? Presumably, Table 2-6 presents these data, but what are the SEs?
12. Page 2-51. The statement of purpose for water management in Lake Okeechobee was very useful, and I wonder how the different purposes are integrated, and by whom? How are the needs of wildlife,fish and recreation integrated on a weekly basis?

Posted: 12 Sep 2006 12:30 PM

Chapter 2 – Hydrology of the South Florida Environment

Comment by Robert Ward, Posted: 18 Sep 2006 02:00 PM

Chapter 2 provides a readable, thorough, and informative overview of the physical water features and flows of the South Florida environment. Given the fact that the South Florida Water Management District "is charged with managing and protecting water resources of the region by balancing and improving water quality, flood control, natural systems and water supply" (from the District's webpage), it is appropriate to begin the 2007 South Florida Environment Report by providing the reader with a excellent understanding of the District's hydrology and related management goals, operations, and accomplishments (e.g. meeting target water levels and flows). (Previous reports presented the hydrology of the system in Chapter 5 of the annual report.)

Chapter 2, while describing the hydrology of the region, also updates the reader on the data and analysis for water year 2006 as well as providing additional detail on the South Florida Hydrologic Monitoring Network and an overview of the potential role of long-term climatic variation on District planning and operations. In the 2006 report there was an expanded discussion of the impact of hurricanes on District planning and operations. The basic template for the hydrology chapter is developing into an hydrologic/management overview of the District with an annual water year update and an elaboration on emerging issues facing the District in its efforts to balance the hydrology of the system with multiple, often competing, objectives (template is not necessarily in this order of topics). The hydrologic overview, from year-to-year does not change substantially as it describes the physical setting (e.g. page 2-9 in the 2006 report is almost exactly the same as page 5-9 in the 2006 report and Figures 2-4, 2-5, and 2-6 are the same as Figures 5-3, 5-4, and 5-5). Depending upon the communication purposes of the report, it may be possible to place information that does not change year-to-year in an appendix as background information on the District's water supply and flood control goals within a complex and highly variable hydrology.

Exploration of the history of hurricane impacts on South Florida, in the 2006 report, combined with assessing knowledge about long-term climatic variability in the 2007 report (Appendix 2-2) is to be commended. Examining science in this manner helps insure that the District is making use of the latest in scientific knowledge to keep its management plans and operations in tune with what history has to teach us as well as what science has to offer as we peer into the future.

A key improvement in the 2007 report, over the 2006 report, is the change in graphic presentation of water levels for each of the lakes. The 2007 report plots average daily water levels against the regulation schedule for each lake. The 2006 report plotted historical average instead of regulation schedule. This change permits the reader to quickly compare District operations to regulation goals (as established by the U.S. Army Corps of Engineers). The narrative provides explanations where there are differences between operations and goals.

The arrangement of material presented in Chapter 2 begs several questions. To discuss the flow of information across Chapter 2, the subtitles for Chapter 2 are listed below, using the size of type to indicate the subtitle breakdown. (Why do the chapters not have a Table of Contents?) Structural and content questions for the Chapter emerge when looking at the flow of topics (i.e. a Table of Contents) in the chapter.

a. Summary
b. Introduction
    i. The South Florida Regional Water Management System: A Regional overview
    ii. Hydrologic Variation in South Florida
        1. Hydrologic Variation Indicators
        2. Water Management and Hydrologic Variation
    iii. Long-Term Climatic Variability
        1. Stage-Storage Relationships of Lakes and Impoundments and Nominal Hydraulic Residence Time
    iv. The South Florida Hydrologic Monitoring System (2/3 of a page)
    v. Water Management
        1. Purpose of Water Management
        2. Use of Regulation Schedules for Water Management
        3. Elements of Water Management
        4. Operation of Water Control Structures
        5. Tools Used for Operations and Water Management
        6. Use of Data and Decision Making for Operations
        7. Management and Operations of Lake Okeechobee Water Levels
c. The 2005 Hurricane Season in South Florida
    i. Hurricane Dennis
    ii. Hurricane Katrina
    iii. Hurricane Rita
    iv. Hurricane Wilma
d. Water Year 2006 Hydrology
    i. Rainfall and Evapotranspiration
    ii. Evapotranspiration
    iii. Water Levels and Water Management
        1. (list of 11 lakes follows)
        2. The Caloosahatchee Canal and Estuary
        3. The Everglades Agricultural Area
        4. The Everglades Protection Area
    iv. The Lower East Coast
    v. Surface Water Inflows and Outflows
        1. (list of 6 lakes and estuary flows)

There are four main subtitles, beginning with a 'Summary' followed by an 'Introduction', which describes the hydrology and management provided by the District. Also included in the 'Introduction' section are two special focus topics: climate variation and

monitoring. Would it not be more helpful to describe the water management system (in part b-v) before introducing stage-storage relationships (in part b-iii) and the hydrologic monitoring system (in part b-iv)? Is 'Introduction' the most appropriate term to subtitle emerging topics?

Why are the water levels and water management presented (in part d-iii) separately from surface water inflows and outflows (in part d-v). They are related as water moves throughout the control flow system. Why does 'Evapotranspiration' appear in both the d-i and d-ii subtitles? Can the subtitles be combined since both address ET and the second subtitle is only ½ page long (could move this description to front of d-i where ET is introduced). Why is there no conclusion section as there was in the 2006 report?

The less than two-page section on climatic variability appears to be based on one reference - a draft paper presented in Appendix 2-2. Is this to be submitted to a peer reviewed journal for publication? Why is there one subtitle in this short section? – normally we do not subtitle if there is only one subtitle.

The panel greatly appreciates the efforts of the District to document its hydrological monitoring system (summarized on page 2-19 and presented in detail in Appendix 2.4). It is critical that all environmental data used in South Florida Environmental Report be transparent and consistent over both time and space, especially if long-term trends or spatial comparisons are to be scientifically sound. Without such documentation it is impossible to check if the data supports the analyses and interpretations made in the report.

Regarding Appendix 2.4, documentation of the current water quantity measurement system is provided. The following comments focus on the need for consistency and comparability over time and space. The comments also raise questions about the ability of the current documentation to insure that data analysis is not skewed by not knowing the impacts of equipment changes on the data consistency and comparability. The Appendix does not indicate what equipment was used when, thus it is not possible to check if changes in sampling equipment resulted in changes in the data. The Appendix does document current monitoring networks, equipment, and operations well. Is it possible to know what equipment was used in past measurements? Is it possible to note equipment changes in the DBHYDRO database? On page 59 there is an indication that the longest consistent measurements is from 1995 to 2005. If a longer analysis is needed, is it possible (e.g. via knowing specs of equipment used in the past) to adjust data to account for differences in measurement technology so that the data are comparable over 20 or 30 years? Given that several of the networks are under going evaluation, how will future sampling locations be 'optimized'? What criteria will be used to determine sampling locations? In the current monitoring design studies, is the need for long-term consistent and comparable data and information being considered? For example, will a subset of sampling sites being denoted long-term sampling sites where the emphasis of sampling is on consistency over long periods of time? There are a number of indications that the networks are constantly changing. How does such constant change impact the ability of the District to examine long-term hydrological trends, such as those associated

with climate change? On page 40, there is a discussion about the loss of data due to equipment malfunction. Is it possible to estimate the percentage of data lost to equipment malfunction?

What is the connection between the hydrologic monitoring, reported on page 2-19 and the water quality monitoring used in Chapter 3? Is there any connection? Is there an overall water information strategy for the District that could explain such connections and how consistency and comparability are insured over time and space (and agencies)? Could the District achieve economies of scale if the hydrological and water quality monitoring efforts were coordinated to the point where staff could work on both networks in an integrated manner?

Additional Questions:

1. Are the widths of the arrows in Figure 2.1 representative of the volume of flow moving at each point where an arrow appears? They appear to have some relationship, but it is not stated. The box provides the exact flows, which is very helpful in gaining an overview of the South Florida hydrology.
2. On page 2-5, it is noted that the District's database, DBHYDRO, stores data from other agencies. How does the District insure that data collected, and placed in a common database, by a variety of agencies are comparable when the data are analyzed jointly? The reference at this point is to a draft report that will explain the District's hydrometeorologic monitoring program which should help answer the above question.
3. Why has Figure 2.11 not been updated since 2002?
4. Why was the reporting on wildfires, as an indicator of hydrologic variation on page 2-16, shifted from acres burned in the 2006 report to number of fires in the 2007 report? It would seem that acres burned are more indicative of the impact of fire on the South Florida ecosystem.
5. The ¾-page monitoring section appears to be based on one report that is not listed in the Reference section. Is the cited reference the one listed under SFWMD (2006)?
6. The section on 'Water Management' beginning on page 2-19, provides an excellent overview of the District's purpose/function within the highly variable hydrology described earlier – could this management description follow immediately after the hydrologic description? Is it possible to tabulate how much water the public demands in South Florida to further connect human water needs with flow and water level controls and management?
7. Are the eight stations listed in lines 690 and 691 the same from year-to-year? In other words, are the ENP rainfall estimates consistently computed from year to year? How can the reader be assured that this will always be the case? Are the procedures employed to estimate ENP rainfall documented and is there a check to insure that the procedures are followed each year?
8. I could not find the years included in the historical average reported in Table 2-6.

9. Did the definition of rainfall areas change from 2006 to 2007? Their presentation order in Figure 2-14, in the 2007 report, is different from that presented in Figure 5-30 in the 2006 report. Why this change?
10. The text in referring to Figure 2-31 states that the stage exceeded the regulation in June but the plot does not show this. Is there an error in the plot or the text?
11. In Figure 2-35, the caption should refer to EAST Tohopekaliga, I believe.
12. Chapter 2 provides information on Lake Okeechobee, the coastal bays, and the Kissimmee Lakes. To continue to integrate the reporting, why do each continue to have separate chapters?
13. On page 2-59 it is indicated that the regulation schedule for WCA-2B is not used. Same for WCA-3B. Why not update the regulation schedule to establish a realistic management goal rather than ignore a schedule?
14. Did the flows into the ENP, discussed on page 2-61, meet the IOP water delivery goal? As was done further up the system, it would be useful to have the ENP water delivery goals connected to the water levels presented in Figures 2-48 and 2-49.
15. No information is provided on the Lower East Coast system performance. Why? Are there performance metrics for this system?
16. The data presented regarding inflows and outflows to Lake Okeechobee (pages 2-64 and 2-65) indicates that the lake gained 669,189 ac.ft. in 2005 and lost 326,683 ac.ft. in 2006. With 2005 and 2006 being "two of the largest annual inflows to Lake Okeechobee since 1972", why the difference in storage change? Was it operations, ET, or ?

Subject: **Hsieh's review**

Chapter 2 Hydrology

This chapter has been a continuous improvement over the years in that it provides information readily useful to a spectrum of users. The challenge to the authors is how to present the data in a form that benefits a wide spectrum of users. The inclusion of stage-storage and stage-area relationship of reservoirs is a good example. The information benefits many users who require calculating mass-balanced properties and water mean residence times of the system. The hurricane season of WY2006 adds challenges as well as valuable data on pulsed hydrological events on the system.

While surface flow data has been relatively adequate for WCAs, that of the ENP is generally lacking. Except the inflow data, there is no data provided for ENP that one can use to calculate the mean water depth, volume and water mean residence time of the system. This information is quite essential for completing the understanding of the SF ecosystems. Rain has to be a very significant contributor to the surface water flow in the all parts of the ENA. Could the contribution of rain to surface water in various parts of ENA be available? Better yet, can the effects of rain, ET and ground water, respectively, to the surface water flow and storage of the systems be included in the report? The water mass-balance relationship of surface water in various parts of the WCAs and ENP is essential to the CERP in my opinion.

Posted: 21 Sep 2006 05:55 PM

Chapter 3A – Status of Water Quality in the Everglades Protection Area

Comment by Robert Ward, Posted: 18 Sep 2006 02:01 PM

Chapter 3A in the 2007 report was numbered 2A in the 2006 South Florida Environment Report. As noted in previous year's reviews, Chapter 3A, within the constraints of the monitoring system, provides a thorough assessment of water quality criteria compliance in the Everglades Protection Area. The assessment focuses only on violations of criteria and attempts to explain why violations occur and what is being done to reduce future violations. The assessment is based on data currently available in DBHYDRO and which past a QA/QC screening. Thus, the data used in the water quality compliance assessment are not collected for the purpose of assessing water quality criteria assessment, but rather are data collected for a variety of management purposes and then examined to determine which data, from a data quality perspective, can be used for criteria compliance assessment purposes. This situation, while quite common in water quality management efforts today, is not ideal from a sound science perspective. The situation is the classic 'found' data, or 'secondary information product', problem – a problem that was addressed by the U.S. Environmental Protection Agency (2003). Chapter 3A follows most of the recommendation in this report. A key feature of the recommendations is to carefully document procedures and Chapter 3A, with its explanations, appendices and citations, provides considerable insight into the methods used to produce the criteria compliance information.

The 2007 edition of the chapter, as has been the case for a number of years, is an evaluation of water quality standard compliance in the Everglades Protection Area (EPA) only. The status of mercury is reported in Chapter 3B for South Florida while phosphorus and nitrogen are reported, for the EPA, in Chapter 3C. Water quality conditions for other areas of South Florida are reported in Chapters 10, 11, and 12.

With the limited scope and purpose of chapter 3A, the wording and content are quite routine. In fact, there are many pages of the 2007 chapter that are worded almost exactly the same as the wording in 2006 chapter, even to the same explanations for standard violations. Because of this, the first two pages of the Chapter 3A 2006 review are valid for the 2007 chapter and will not be repeated it here.

As was discussed in the 2006 review, the routine nature of the reporting contained in this chapter begs the question of streamlining the reporting. Instead of simply calling up the electronic text of the previous year's chapter and converting WY 2005 to WY 2006, it appears that this chapter could use a complete redesign to condense its findings. This type of streamlining, as reported in Chapter 1A, was to be included in this report, but there has been no change in Chapter 3A. Why?

Lines 43-46, on page 3A-2, note increases in WY 2006 conductivity. The WY 2006 excursion frequency was noted as being significantly greater than the WY 1978-WY2004 historical period of 10.3. In checking the 2006 South Florida Environmental Report for the historical period, the WY 1978-WY2003 excursion frequency is 15.8. Adding one year to the historical period decreases the excursion frequency by 35%! How meaningful

is the historical period since it changes each year and is not a constant baseline for comparison purposes?

In comparing the number of sampling sites in the Everglades National Park in Figure 3A-1 of the 2007 report with the corresponding number of sampling sites in the Everglades National Park in Figure 2A-1 in the 2006 report, there are 11 stations included in the analysis for 2007 and 13 (perhaps 14 as the plot appears to have two sites very close together) included in the analysis for 2006. How can the results for 2006 be comparable to the results for 2007 if the number of sampling sites included in the analysis are not the same? This observation, again, points out a consistency problem in the 'found' data strategy used to support the water quality assessments in Chapter 3A and 3C. While there are standard protocols to analyze the data, the database contains data that were not collected (or even organized) for the purpose of evaluating standard compliance. Thus, the database, when searched for data meeting a given set of criteria, will select different stations to include in different years (due to a large number of factors over which the data analysts have no control). This situation is the result of using 'found' data to conduct water quality standard compliance assessments – the database can change from year-to-year through no fault of those doing the assessment. The panel has pointed out this issue before and it needs attention. The 2007 report contains many examples of inconsistencies between the 2006 and 2007 reports due to using 'found' data to conduct water quality assessments. To illustrate how the situation might be approached, are there a subset of sampling sites that can consistently serve as the basis for standard compliance assessments and for these sites extra effort will be devoted to obtaining the number of samples needed to conduct the assessment? In other words, there will be a 'network' of sampling sites identified and consistently employed to perform the water quality criteria assessments – sites that have 'information' reasons for being included and for which the sample size will be consisent each year.

In line 392 there is reference to observed change in alkalinity excursions most likely being the result of added sample sites. This is another example of the major information flaw in using 'found' data to perform standard compliance assessments over time and then trying to explain detected changes. Is the change due to a change in water quality or a change in the monitoring system (i.e. added sites in this case). The monitoring network, for standard compliance purposes, needs to be clearly specified and held constant from year-to-year to avoid this type of uncertainty creeping into the assessment.

In Table 3A-3 for inflow to the Refuge, the 1978-2004 period uses 134 samples to assess DO standard compliance. For 2005 and 2006 the sample numbers of 5 and 4, respectively. Is it meaningful to compare the percent excursions from the 1978-2004 period with that of 2005 and 2006, both because different methods were used to compute the findings AND the number of samples is so different? Is Table 3A-3 referred to in the text of the 2007 report?

In Table 3A-4 of the 2007 report, in the Refuge inflow row for 1978-2004, 59 samples are shown to be included in the sulfate concentration computations. In the corresponding table in the 2006 report, Table 2A-4, 836 samples are shown to be included in the sulfate

concentration computations for 1978-2003. This is a huge difference in the number of samples, why? The mean in the 2006 report is 58 mg/l while it is 42 mg/l in the 2007 report. Given that 'found' data is being used for the assessment, again, either the data selection criteria changed and/or the database changed. In either case, the numbers do not indicate consistency in the analysis from year-to-year. Similar sample size differences exist elsewhere in the table.

The reporting on pesticide detections does not provide information on how detections have changed over the years. When attempting to make such a comparison between the 2006 report and the 2007 report, it was noted that the time period for the analysis is not constant. Why did the time period for reporting pesticide detection, in Table 3A-5, change, in the 2007 report, to December 2004 to February 2006, when the time period for pesticide detection reporting in the 2006 report, in Table 2A-5, was October 2003 to December 2004? Was December 2004 included in both assessments? With unequal time periods it is difficult to compare the 2006 findings with the 2007 findings, particularly in search of a trend in pesticide detections.

Chapter 3A has been expanded for 2007 to include an overview of water quality monitoring for the non-ECP structures. Table 3A-7 reports TP concentrations and loads associated with non-ECP basins. Why does the table use both English and metric units? Given the mixed units, concern develops as to how the loads were computed.

Table 3A-6 contains a list of the non-ECP permit reporting requirements. The list does not appear to specify how the data are to be analyzed. Is there a standard protocol for data analysis for the non-EDP basins or is this a judgment call on the part of the analyst each year?

In the above discussion, several references have been made to differences in the data included in the 2006 and 2007 reports. The panel wants to emphasize a major concern about the consistency of the data employed in producing the two reports?

Additional Questions:

1. What is the meaning of the letters (fatal qualifier) listed in line 155 page 3A-10? Is the '?' signifying that there are other fatal qualifiers that are unknown?
2. The paragraph explaining the confidence interval (CI) interpretation was left out of the 2007 report (on page 3A-12 which corresponds to page 2A-13 in the 2006 report). Why was it left out since the CI is included in the results?
3. On lines 700-701 there is a statement indicating a reduction in TP load from North New River Canal and the North Spring Improvement District. Figure 3A-7 indicates no flow from these basins. What is the basis for the statements in lines 700-701?

Subject: **Armstrong Comments**

Chapter 3A – Status of Water Quality in the Everglades Protection Area
Date of Chapter Draft: 8/17/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: B
Level of Panel Review:
Primary: Accountability
X: Integrative

Specific comments are as follows:

Page 3A-18, lines 370-389: Alkalinity levels may vary diurnally in areas of high productivity caused by the uptake of carbon dioxide during photosynthesis and its release during respiration. Lower levels of alkalinity would be observed during the day as carbon dioxide is taken up during photosynthesis and higher levels at night through respiration. This phenomenon could account for the excursions of alkalinity below 20 mg/L. Water sources with different alkalinities can of course also account for the low alkalinity levels, but the excursions noticed in the interior of the Refuge (Table 3A-2) are more likely from diurnal variations. It is suggested that diurnal measurements of alkalinity be made at several located in the Refuge to document this phenomenon if it is occurring.

Page 3A-20, lines 405-437: There needs to be a distinction between conductivity changes caused by ionized substance concentrations vs. changes in ionized substances mixture. Conductivity instrument calibration standards are made up of particular mixtures of ionized substances, and when these mixtures do not compare favorably those of the waters being tested, then some error will occur. It is recommended that it be determined that conductivity measurements are being made accurately and whether they are being influenced by ionized substance mixtures in the waters being tested.

Page 3C-22, lines 609-619: The language used to describe the values used for the annual network geometric mean and the five-year network geometric mean in Appendix 3C does not match well with the statements on this page. The appendix clearly calls for an arithmetic mean of the station annual geometric means over one year or over five years. Please verify that the values presented on this page have been calculated using the methodology described in the appendix.

Posted: 21 Sep 2006 03:12 PM
Originally Posted: 21 Sep 2006 03:11 PM

. **Chapter 3B: Mercury Monitoring, Research and Environmental Assessment in South Florida**

Subject: **Joanna Burger; REVIEW OF CHAPTER 3B**

This year's Mercury Monitoring, Research and Environmental Assessment chapter (3B) is an excellent overview of the mercury problem in the Everglades, how mercury interacts with other nutrients, how the SFWMD has addressed concerns about environmental problems in the Everglades, on-going research with biota and mercury, the role of sulfur, and the new initiatives to understand mercury cycling. It clearly delineates the major problems, and what new research is needed to understand how to reduce mercury levels further, particularly in fish. The data, models and conclusions in chapter 3B reflect the complex problem faced by many agencies dealing with mercury in freshwater ecosystems. The data generated by the SFWMD are proving useful for other aquatic ecosystems throughout the United States. In many areas, the mercury research program is a leader that is providing testable paradigms for other aquatic systems. 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 in the Everglades ecosystem continues to be a productive collaboration between different agencies in understanding the complex issues.

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, and have one of the longest running such data sets in the country from one region. The chapter accurately and fairly reflects the state of the knowledge about mercury fate and effects in wildlife.

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 "previous findings" section of the summary is particularly useful to provide an overview of the past mercury cycling and effects research conducted as part of the SFWMD work and reports. It highlights the critical issues and findings, especially noting the role of new atmospheric depositional mercury, the role of drying events, and the long-term trends of mercury in bass and wading birds. This section could be improved by noting the primary previous documents for each bullet item.

The summary section on new findings is helpful to a wide range of stakeholders, from the scientist to the general public, and highlights key issues of concern for the rest of the report. The experiments with wading bird, particularly the White Ibis, are extremely important in identifying possible effects of mercury. Similarly, further understandings of the effect of drydowns will contribute markedly to management goals. The high mercury levels in Everglades National Park continue to be a problem, and requires additional, targeted research. This clearly illustrates the importance of continued mercury biomonitoring throughout critical areas of the Everglades system. The continued high levels of mercury in bass suggest the importance of toxicokinetic modeling of mercury bioaccumulation in the fish themselves, including uptake and bioavailability.

Key issues for the mercury research program continue to be understanding the spatial pattern of mercury deposition and methylation, along with the failure of mercury levels to drop in Largemouth Bass, and the role of sulfur within the system. This problem is a more general one to aquatic systems, and every attempt should be made to further understand this pattern. The main research topics are:

1) Trends in Atmospheric Deposition of Mercury
2) Concentrations of Mercury in the Everglades
3) Sources of Sulfur and Effects

These summaries are followed by sections on Future Mercury Program and Conclusions. The addition of in-depth appendices dealing with some of the critical issues with mercury is an excellent idea.

RESEARCH PROGRESS

The inclusion this year of an initial section responding to research needs identified in previous Everglades Consolidated Reports is an excellent addition. It also serves as a reminder of unanswered questions, and provides an update of progress and future work. The major outstanding issues include effects of environmentally-relevant mercury on wading birds, relative relationship of

global versus local mercury, revision of the Everglades Mercury Cycling Model, geochemical controls on mercury methylation, and sulfur sources. The comparison, using the SAMS approach, between mercury dynamics in the Everglades and in other regions (Hawaii and Ohio) will be extremely useful. Further, the continued finding of the effect of new versus old mercury is significant.

TRENDS IN ATMOSPHERIC DEPOSITION OF MERCURY

Understanding of the atmospheric deposition of mercury is particularly important given the role of "new" versus "old" mercury in the cycles of mercury. Further, understanding mercury dynamics within the system (as opposed to from external sources) continues to be a critical component of understanding mercury in biota. The finding that declines in mercury within the Everglades could not be accounted for by input sources is extremely important, and leads to the importance of further understanding dynamics within the Everglades itself. The recent increases, however, appear to be reversing the previous declines, a significant and important finding that requires further examination, continued monitoring, and effects studies of biota within the Everglades.

CONCENTRATIONS OF MERCURY IN THE EVERGLADES

Understanding mercury trends in Everglades fish is one of the key bioindicators for the Everglades, and continues to be particularly important for understanding risk to the food chain. Such information is necessary not only for understanding (and managing) the risk to fish consumers (both people and other wildlife), but to the fish themselves, as well as ecosystem dynamics. The group is to be commended on continuing this program. The trends data from 1988 to the present are invaluable, and this indicator clearly needs to be continued.

The trend of declining mercury levels in bass (refer to fig.3B-9) seems to have ceased in 2001, with higher levels since then. Further, there has been a clear increase in individuals with Hg levels higher than reported in 2000 and 2001. This is disturbing and suggests cause for concern. By comparing the current years data with the maximum year, as in Table 3B-1, hides the more recent increases. In any case, the age-standardized mercury concentrations have at best stabilized (figs.3B-11 and 12), and in other cases have increased (figs.3B-14 and 15). The increases in age-standardized Hg concentrations, while disturbing, should be examined in terms of size to eliminate the possibility that it is growth that is affected.

SOURCES OF SULFUR AND EFFECTS

The examination of the importance of sulfur pollution in the Everglades is an important addition. Since this dynamic is influencing mercury levels within the ecosystem,

it should be highlighted with a series of studies to understand fully the dynamics. Since this problem affects nearly 30% of the Everglades, it requires additional study, including the development of a criterion and management goals to reach safe levels. The problem of sulfate-induced eutrophication of the Everglades has risen to the fore only because many of the more pressing problems have been addressed. Yet sulfur pollution appears to be affecting internal mercury cycling, and contributing to overall eutrophication of the Everglades. It is one of the critical biogeochemical cycling issues within the Everglades. The role of sulfur in phosphorus releases should be integrated into the modelling efforts for the Everglades. Sulfate contamination affects as much as one-third of the freshwater Everglades, making it a serious concern. The report states that, without sulfate, the mercury problem would not exist, a statement that requires further explanation and justification, and is not fully documented in Appendix 3B-3. While the sulfate problem has been identified, there is still controversy about the sources, which must be resolved as a key management goal. Whether the sulfate comes from agricultural use, from soil subsidence, or from Lake Okeechobee is critical to both understanding biogeochemical cycles and to management and restoration. Further, the possible effect of sulfur on sawgrass, by favoring the replacement by cattails, is an important finding that requires extensive study.

FUTURE RESEARCH AND ACTIVITIES

An important component of any research program aimed at improving management and restoration is the ability to examine the past, current, and future research needs and goals. The Everglades mercury group is embarking on an ambitious program with several projects and agencies, including EPA, Broward County, ENP, and the University of Michigan to better understand mercury methylation and sulfur chemistry, a laudatory goal. These extremely important programs need to be more clearly defined and described with respect to objective, goals, first-year goals and brief methods (each project described similarly). Examining mercury in coastal waters is particularly important because of the overall coastal ecosystem and human use of these waters.

Overall, the authors of this chapter should be congratulated for writing a clear,concise description of the past, current and future research on understanding mercury dynamics and effects in the Everglades. The three major problems remain the levels of methylmercury in biota (particularly fish and the potential effects on fish-eating birds and people), the very high levels of mercury in the ENP, and the role of sulfur in the Everglades overall and in mercury methylation. The program is addressing these problems.

QUESTIONS

1. Page 3B-3, line 24; you might actually give the percent decline.
2. Page 3b-3,lines 42+: you might comment on the levels of mercury in the water column and in fish.
3. Page 3B-3,lines 53:I thought the periphyton turned out to be far less important in methylation than once thought!
4. Page 3B-5,line 146+; Has there been any attempt to quantify the effect of rebounding from 2 - 18 medical waste incinerators?
5. Page 3B-6, line 151 +; Are the trends similar for mercury in other fish in the Everglades?
6.Page 3B-6, line 158+: any idea why Hg in rainfall was elevated?
7.Page 3B-6, line 173+: Any speculation on why Hg continues to increase in the ENP?
8.Page 3B-7, line 221-223; This bullet is less clear.
9.Page 3B-14, lines 478-482. The increase in wet deposition of Hg in the Everglades is cause for concern; any idea why since this trend was not evident at other US sites?
10.Page 3b-20: what has been the effect of the anomalous increase in wet Hg deposition on levels in fish?
11. Fig 3B-11-15; What do you attribute the increase in age-specific Hg levels? Are the fish growing more slowly, thus accumulating higher apparent Hg loads?
12. Page 3B-28, lines 679+.: Have the specific inputs of sulfates from the EAA been identified?
13. Page 3B-28, lines 695+;What controls the populations of sulfate-reducing bacteria?
14. Page 3B-28, lines 699; Attributing all the Everglades mercury problem to sulfate seems a little extreme. More justification and documentation is required. What is the relationship between sulfates and mercury, for example, in the ENP (where there is the worst Hg problem)?
15. Page 3B-32 top and middle; it seems that it is not clear exactly how the sulfate comes from the northern regions and EAA - could this be clarified further?
16.Page 3B-33: Will the experiments with sulfur and Cladium and Typha be continued? It seems this should be replicated, and perhaps the mesocosm studies designed to examine this in more detail.

RECOMMENDATIONS
1. Add a reference to the bullet items in the overall summary so readers could find a more complete analysis of each item.
2. Try to get a handle on the possible effect of going from 2 to 18 medical waste incinerators.

3. Understanding why mercury levels are high, and continue to increase, in the ENP. This problem seems to be increasing.
4. Examine the mass balance for sulfur in the Everglades.
5. The possible effect of sulphur on sawgrass, allowing replacement by cattails is an important finding that requires extensive study.
6. That the new SAMS site be within the ENP because it is critical to begin to get a handle on mercury dynamics within the ENP.
7. The wet deposition of Hg studies are extremely important, and must be continued, especially since they seem to be indicating a disturbing increase in wet Hg deposition.
8. Continue the sulfur studies in terms of both sources and effects.
9. Conduct a detailed analysis of the sources of sulfate from the EAA. This is required to identify the sources of sulfate. This includes clarification of whether the sulfate comes from the EAA amendments,or from inputs from Lake Okeechobee.
10.Continue the experiments with the relative effects of sulfates on plant growth, particularly of Sawgrass and Typha.

Posted: 15 Sep 2006 10:12 AM
Originally Posted: 15 Sep 2006 10:13 AM

Subject: **Hg by Hsieh**

L44-45.. "Relationship between inorganic Hg and MeHg concentrations in surface sediments is weak." Do you know what forms of inorganic Hg are in the surface sediments? Do you have a technique to determine inorganic forms of Hg?

L 58-61 Old Hg vs new Hg. Again, do you know what inorganic forms of old and new Hg?

L 63 "Methylation is genrally highest at 2-10 mg/L sulfate levels." Then why do you worry about sulfate level above 10 mg/L, which appears in the north of ENP?

L 80-85. What does it happen to soil Hg when dry out? How does prior agriculture use of the constructed wetlands help to produce Hg-sulfides? Can you take advantage of that to prevent methylation from happening?

L146 Does state regulation allow medical waste incinerators to "rebound"? If so, why?

L 206-212 This statement indicates that the role of sulfate on methylation is still not clear yet. More investigation into what forms of old Hg that are not available to methylation is needed. Also iron chemistry in everglades may help to understand the S chemistry.

L 217-220 Isn't this statement contradictory to the 2-10 mg/L optimal methaylation rule?

L667 Sources and effects of sulfur: I think chloride may be a simple and convenient tracer for the transformation and transportation of sulfate, in addition to other tracing techniques that you are using. If you can identify signature of chloride concentration and SO4/Cl ratios in source waters (e.g., deep ground water, EAA discharge and rain water), you may be able to clarify some of the questions pertaining to the sources and transportation of sulfate in the Everglades.

Posted: 18 Sep 2006 11:43 AM
Originally Posted: 18 Sep 2006 11:44 AM

Chapter 3C – Status of Phosphorus and Nitrogen in the Everglades Protection Area

Comment by Robert Ward, Posted: 18 Sep 2006 01:57 PM

Nutrients in South Florida ecosystems are assessed in a separate part of Chapter 3 due to the large impact elevated levels have on the Everglades biology . The first part of the Chapter is devoted to updating an overview of the status of phosphorus in the Everglades Protection Area. In addition, new rules for phosphorus criterion assessment have recently been implemented, requiring elaboration in the 2007 edition of this chapter. The organization of Chapter 3C provides an overview of nutrients in the Everglades Protection Area before then focusing on criterion compliance. This permits the regulatory aspects of compliance to be better understood within a broader context (which was suggested for Chapter 2A). In fact, it could be a chapter template for examining water quality in all of South Florida.

When Comparing Table 2C-1 of the 2006 report with Table 3C-1 in the 2007 report (as well as Tables 2C-2 with 3C-2), and examining WY 2005 results, which appears in all tables, questions as to consistency of data analysis and reporting arise. Why are the WY 2005 data different in the two tables (i.e. the number of samples employed in the analyses are different in all cases, which in turn results, in some cases, in the geometric means being different and the max/min being different). While the geometric mean differences are not great, the differences are quite disturbing from a scientific consistency point-of-view. Are the data for analysis selected each year using new QA/QC criteria? If the data included in the analysis can vary from year-to-year, how can consistent and comparable results be obtained over time and space? The situation noted in comparing the two tables is an artifact, in this reviewer's mind, of the need to always select the data for analysis from a large data based where the purpose is to store all data - not to support a consistent production of criterion compliance information. The TP criterion compliance effort must make use of available data and that availability is, obviously, changing over time. This, in turn, makes it extremely difficult to produce information over the years that is consistent and comparable, in spite of a huge effort on the part of data analysts to carefully document their methods and use the methods in a consistent manner over the years. The database is, apparently, not consistent.

Statistics of the 1978-2004 period, against which annual comparisons are made, changes from year-to-year as the record lengthens. What is the purpose of the 'historical' period comparisons? Would it not be more meaningful to put the 1979-1988 baseline period concentrations in Table 3C-1? Hopefully, the 1979-1988 sample size and statistics are constant over time (or are they recomputed each year after another search of DBHYDRO?). The absence of a firm, constant, baseline, in Table 3C-1 (and similar Tables) make it difficult to discern trends in TP concentration over the years? In other words, the 1978-1988 period statistics are trending either up or down as the annual geometric means are trending up or down. Figure 3C-1 is designed to help the reader understand how the TP concentrations are changing over time, thus it is not clear why the base line period is changed every year. The Panel realizes that there is a section

comparing TP loads across structures, but there is Table or Figure comparing TP loads across years. Why?

In attempting to explain high TP readings in the data set, there is reference to potential problems with the sampling methodology. For examples, on page 3C-14, lines 385-386, the following statement is made:

> "As noted, this unusually high measurement was made during a low water period and may not be representative of ambient conditions."

The same type of statement is made in lines 638-640. The implication of the above statements is that the staff collecting the samples are not guided in how to measure low water conditions in a manner such that the samples are representative of prevailing conditions. This observation, in turn, raises concerns about the thoroughness of the monitoring system design. Do the sampling protocols not define how to approach sampling in a low flow situation? If a representative sample can not be obtained, how is this fact reflected in DBHYDRO? Is there a qualifier that could highlight, with certainty, the problem with the sample, rather than speculating about a possible problem with the monitoring system?

Are the TP loads at individual water control structures within the EPA not updated each year? The sentence in lines 394-395 imply that they were not updated as the reader is referred to last year's report to view the calculated TP loads at the structures within the EPA. Table 3C-3 provides a summary of flow and TP load by basin

There are a number of comparisons of TP concentration between years and there is concern that the inconsistency in the data may introduce differences that are also part of the monitoring program itself. For example, the paragraph in lines 396-401 provides percentages of samples below given levels of TP. Is there sufficient control over the samples and sample sites to give meaning to comparisons of percentages between years? This might occur when sufficient samples are not taken at a particular sampling site and its data are excluded from the analysis that year, while during another year the number of samples might result in it being included. Without more consistent control of sample size and sampling locations (i.e. the data used to support this analysis), there is concern that such statements as presented in this paragraph, and others in the Chapter, may not be accurate. In other words, would it be possible that the percentages reported may be more an artifact of annual differences in available data than differences in TP concentrations? Has the potential impact of changing available data on resulting information been studied?

On page C-14, last paragraph, there is a discussion of the 'abnormal' conditions of WY 2005 increasing TP concentrations and how the data for WY 2006 indicates TP concentrations have returned to normal. As a multiple line of evidence, the TP loadings from the basins should reflect a similar 'return' to normal. By examining the TP loadings in the 2006 report and comparing them to those in the 2007 report (in Table 3C-3), the trends indicates that 'From WCA1' the loadings were considerably less than 2005, but

the 'From WCA2' indicates more loading in 2006. It is not clear that the loadings confirm the conclusions stated on page C014. However, it should be pointed out that there is not sufficient time series of the loadings available in the report to know what 'normal' TP loading is relative to the discussion on page C-14. Is a time series of TP loadings (plot or bar chart) at key structures relevant to the purposes of Chapter 3C?

It is assumed that the atmospheric deposition was computed from rainfall volumes and TP concentration in the rainfall. How accurate is this number (193 mt)? Particularly, what is the spatial distribution and frequency of sampling of rainfall TP concentration across the Everglades Protection Area? Is it possible to place a confidence interval around this estimate?

With respect to next year's report, would it be possible to develop a map showing TP loads moving over South Florida using arrows at key transition points? The width of the arrow could indicate the size of the load and its color could indicate change from either a baseline or established historical average, that does not change every year (but perhaps is update ever five years). The overall look of the Figure would be similar to Figure 2-1 for the hydrology.

During the review of the 2006 South Florida Environmental Report, there were statements about a special monitoring network being designed to assess compliance with the TP criteria. There is no mention of a special monitoring network for phosphorus criterion compliance in the 2007 report. Is the design not complete?

From reading Chapter 3C, the data available to perform the assessment are, again, that which is available from DBHYDRO (line 178). There are also statements, on lines 596-598, which indicate that the network employed to monitor TP is not firmly established such that consistent data is used across the years to track TP criteria compliance. Lines 651-652 express a desire for more robust datasets in the future, rather than a more robust monitoring program. As has been noted earlier in this Review, the focus on 'found' data may create inconsistencies in criteria compliance assessments over time and space.

In light of the above concerns about the monitoring program not being adequate to insure consistency in the phosphorus criterion compliance assessment, a very important qualification of the assessment is provided in lines 598-600. The Panel whole heartedly agrees with this qualification, especially given the fluid nature of the data employed in each year's evaluation.

In reviewing the results of the phosphorus criterion compliance assessment, were the sampling sites employed in the assessment the same ones identified in Figure 3C-3? While the phosphorus compliance assessment results presented in Appendix 3C-3 are welcomed for exploring the detail, Chapter 3C needs a summary table or figure of the findings (as is the practice in many parts of the South Florida Environmental Report). The discussion of the findings are appropriate, but it is difficult take the raw data and discussion and relate it to the Everglades Protection Area.

With the insight presented above, the Panel hopes that refinement of the 'template' (mentioned in lines 588-589) for assessing and reporting phosphorus criterion compliance will carefully consider the data issues that must be addressed to obtain the consistency sought.

Regarding the nitrogen concentration status update, why is arithmetic mean used for TN while geometric mean is used for TP? It appears that the data screening required for the TN evaluation requires rejecting many more samples. In comparing the number of samples employed Refuge inflow calculations in Table 3C-1 with those employed in Table 3C-4 for TN, There is a 44 % loss in sample numbers (133 for TN and 74 for TN). The situation is similar for the other regions. Is this a concern to the analysts?

Subject: Armstrong Comments

Chapter 3C – Status of Phosphorus and Nitrogen in the Everglades Protection Area
Date of Chapter Draft: 9/8/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: B
Level of Panel Review:
Primary: Accountability
X: Integrative

This chapter describes the nutrient levels in the EPA measured during WY2006 and compares those levels to previous monitoring periods as well as the limits set forth in the four-part TP criterion compliance test. The text in the chapter could be tightened considerably. There is seeming duplication of material, and text describing the details of compliance placed currently in the latter part of the chapter should be moved forward when compliance is first introduced.

Specific comments are as follows:

Page 3C-5, lines 196-203: The District's website for water quality monitoring has no information about analytical methods used and MDLs for those methods. Methods used, MDLs, and PQLs need to be available on the website and/or in an appendix.

Page 3C-6, lines 233-246: The four-part test is not explained in the text until much later in the chapter (page 3C-22). That material should be moved so it appears here when compliance is being discussed for the first time. Appendix 3C-1 does not give the TP concentrations that go with each test shown on page 3C-22.

Page 3C-11, lines 349-356: On the average, what portion of TP is made up of orthophosphorus? Is this proportion fairly consistent across the study area?

Page 3C-17, Table 3C-3: A comparison of TP loads into and out of STA1 indicates only 1.2% removal of TP. This is far lower than the data presented in Chapter 5. Why the difference?

These tables with flows and loadings into and out of the WCAs and the ENP represent a nice tabular accounting of the flows and loads, but cannot this information be put into graphical form as was requested at the 2006 SFER Public Hearing? Interestingly, the ENP removes 71.4% of the TP load to it, but the TP concentrations increase three-fold from inflow to outflow while the flows are reduced over 90%. Presumably, the significant portion of the inflow is lost to evaporation, but is the evaporation of the water in the ENP causing the increase of the TP in the outflow?

Posted: 21 Sep 2006 03:13 PM

Chapter 4: Phosphorus Source Controls for the Basins Tributary to the Everglades Protection Area

Subject: **Review by Armstrong**

Chapter: 4 Phosphorus Source Controls for the Basins Tributary to the Everglades Protection Area
Date of Chapter Draft: 9/5/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: AA
Level of Panel Review:
Primary: Accountability
X: Integrative

Chapter 4 of the 2007 SFER provides an update of the phosphorus control strategies for the STA's during WY2006. The required source control strategy is a 25% reduction in total phosphorus for the EAA basin in any given water year when compared to a pre-BMP baseline period. As noted in the chapter, a 44% reduction was achieved in WY2006, the eleventh straight year – an excellent record of compliance. However, the C-139 basin did not meet its phosphorus reduction requirements, and further actions to reduce the phosphorus load will be required of the District. For the non-ECP basins, voluntary phosphorus load reduction is expected and a variety of WQIPs undertaken to achieve such.

Examination of Chapter 4 has led to a number of specific questions and comments. They are as follows:

Pages 4-11 and 4-30, Tables 4-3 and 4-8: The rainfall and runoff data given in these two tables are related in the graphs attached, and it appears that annual rainfalls of about 25 in/yr or less will not produce any runoff from the EAA basin while annual rainfalls of 32 in/yr or less will not produce any runoff from the C-139 basin. Are these threshold annual rainfalls considered to be drought levels? Have annual rainfalls of these magnitudes occurred before? If so, what were the consequences to the area?

Page 4-12, lines 244-246: still not clear how the load is rainfall adjusted. Can an appendix be added that will explain this adjustment and the rationale for it?

Page 4-12, lines 252-255: The predicted TP loads in the compliance period appear to be higher than in the Baseline period. Is this true, and if so, does this make the EAA performance appear to be better than it really is?

Page 4-15, line 276. Does the conversion of land to STA's affect the Pre-BMP Implementation baseline? If so, does the correction affect compliance of the EAA?

Page 4-16, lines 323-337: The inflows and outflows described in Tables 4-4 and 4-5 are confusing. When structures (e.g., S-5AW, S-352) are considered both inflows and outflows, the reader is left confused about the nature of the system. Perhaps a note could

be added to the table's footnotes indicating under what conditions the inflows act as outflows.

Page 4-16, lines 330-332: Is there a table or graph showing this increasing trend? Is this upward trend related to phosphorus concentrations in Lake Okeechobee or some other source? If to Lake Okeechobee, is there a part of Chapter 10 that should be referenced for more information?

Page 4-18, Table 4-5b: S7 and S8 are not shown on Fig. 4-2. Can this figure be extended further south so that these structures can be shown on the map? Also, on the last line of the table should not "S2/S8" be "S3/S8"?

Page 4-19, lines 402-404: Here and elsewhere in this chapter, TP loads are related to rainfall, winds, or some other disturbance that could cause erosion and sediment resuspension. Because TP is strongly sorbed to sediment, would it not make sense to note that the elevated TP concentrations are probably caused by such erosion?

Page 4-19, lines 405-413: A fourth item could be the relationship of TP concentrations to suspended sediment, the sorption-desorption characteristics of TP on sediment, and the possible inverse relationship of the phosphorus partition coefficient and suspended solids which would cause phosphorus to desorb from sediments eroded and suspended in the water column and to increase the TP concentrations in the water.

Page 4-24, lines 529-531: What kind of statistical analyses are anticipated? The Daroub et al (2006) Executive Summary provides the following description of the statistical analyses to be performed on a dataset derived from five existing ones.

> *An exploratory analysis will be conducted to check datasets for consistency and derive standard statistical metrics. Depending on the statistical method we will test for normality and if necessary use transformations to approximate normal distributions. Environmental datasets are usually complex and unbalanced with non-linear relationships that vary in space and time. Therefore, linear regression models often fail to effectively describe landscape pattern such as the effect of different environmental variables on BMP performance. To assess the effect of multiple environmental factors on BMP performance and off-site P loads from farms or basins requires employing advanced multivariate techniques that can handle non-linear relationships. The techniques we are considering employing include Principal Component Analysis (PCA) and Classification and Regression Trees (CART).*

This is a fairly general description of what is proposed to be done. Has the detailed plan of study for this statistic work been submitted by IFAS? If so, what is the scope of work for the planned study? What work if any is focused on developing design criteria for constructing and operating BMPs and on enhancing farm management to control

nutrients? Is there any statistical work to be done that is specifically geared for statistical analysis of spatial data?
[Daroub, S.H., T. Lang, O. Diaz, and M. Chen. 2006. Implementation and Verification of BMPs for Reducing P Loading from the Everglades Agricultural Area – 2006 Annual Report. Submitted to the Everglades Agricultural Area Environmental Protection District and the South Florida Water Management District.]

Page 4-25, lines 573-574: Clarify the phrase "expectations associated with EAA farm discharges that had previously been assumed and not based on actual review of data." As described in the chapter, the statistical analyses performed on EAA farm water quality data (see reference below) seemed to yield few results. Load seasonality and detection of spike loadings were positive results, but apparently data limitations prevented an understanding of the causes of load seasonality and other findings.

What is the scope of work for WY2007 and what are the prospects that results from that work will provide additional understanding? Have the data gaps identified in the WY2006 work been filled so that subsequent statistical work will be more productive?
[Stanley Consultants, Inc. and ZFI Engineering and Construction Inc. 2006. Statistical Analysis on EAA Farm Water Quality Data. Prepared for SFWMD, March.]

Page 4-26, lines 525-635: Are environmental engineering simulation principles being considered as "relationships are developed between Lake Okeechobee inflows, EAA basin runoff, and downstream points of entry into STAs and the factors that govern their relationships"? Mass balanced based models should be developed and used to simulate the phosphorus loads from the various sources that reach the STA's to complement the statistical relationships developed and to provide a more rational basis for any design criteria that need to be developed. Because eventually methods will be needed to relate phosphorus loads to the STAs, it is important that models of flow and phosphorous concentration be available.

Page 4-34, lines 820-829: How will the District obtain the temporal and spatial rainfall data it needs to gain this better understanding of C-139 hydrology?

Page 4-37, lines 870-872, 877: While the District recognizes that a "thorough understanding of basin hydrology and water quality within the basin [are] essential for an effective source control program ...", the objectives for the study for which the Phase I work is cited does not include any language that speaks to the development of design and/or system operation criteria. Providing the District information that will enable it to design and/or operate BMPs in these basins in ways that will lead to phosphorus control should be part of any work of this nature.
[See pp. vi and vii of A.D.A. Engineering, Inc. 2006. C-139 Basin Phosphorus Water Quality and Hydrology Analysis. Deliverable 5.4 – Phase I Report prepared for the South Florida Water Management District, West Palm Beach, FL.]

Page 4-38, lines 912-924: As discussed earlier, here and elsewhere whenever phosphorus transport is mentioned, the probable relationship between solids transport and phosphorus

transport is not discussed. The two are typically strongly linked, and the District needs to establish whether solids control would result in phosphorus control. Further, the sorption-desorption characteristics of phosphorus and the possible inverse relationship of the phosphorus partition coefficient with solids concentration should be investigated to determine if such characteristics should be included in understanding phosphorus dynamics.

Page 4-39, lines 949-957: As noted above, there is a need for the District to include work that would characterize the hydrologic and constituent loading characteristics of BMPs and other features within C-139 and compare those to both typical design loading characteristics for systems of this type as well as the design loading characteristics for C-139 itself.

Page 4-39, lines 973-979: Does the scope of work for this project include the kinds of work described in the previous comment? If not, it should.

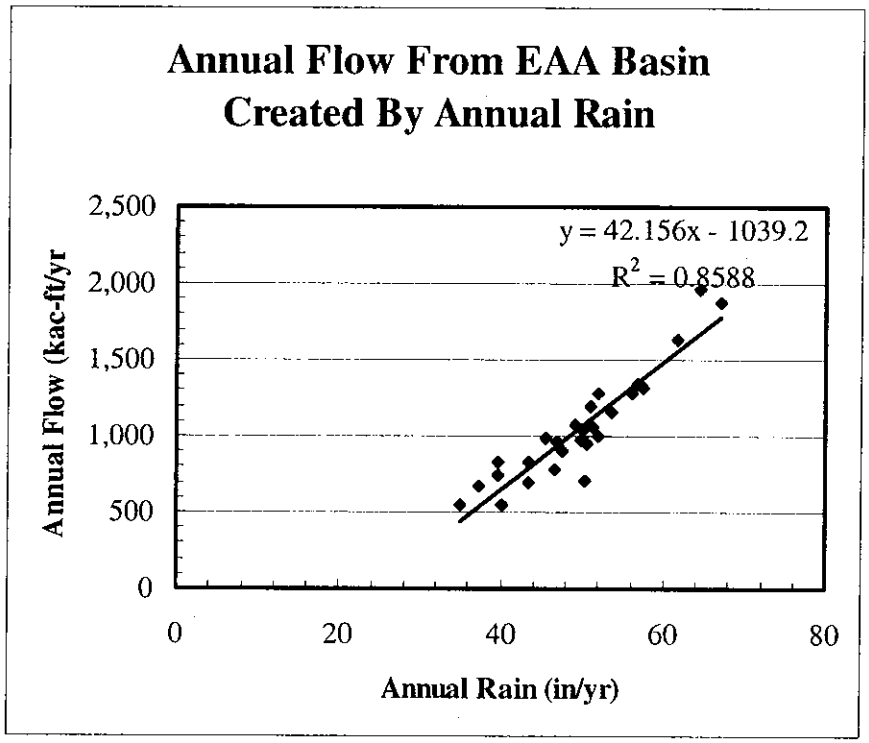
Page 4-41, lines 1014 to end of chapter: A summary table of activities in the various non-ECP basins would give the reader a quick but comprehensive overview of the projects being carried out in these STA's. Categories of these activities could include: BMPs and other controls, monitoring, public education, and perhaps others. It may even make sense to put much of this material into an appendix.

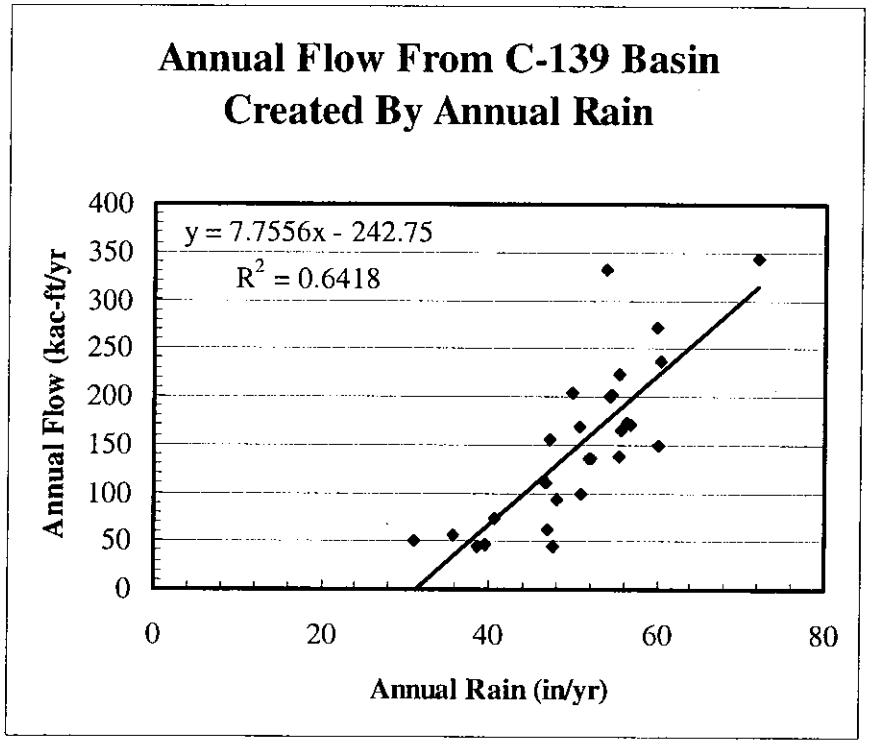
Chapter 4 Phosphorus Source Controls Graphs.doc
Ch 4 Review Graphs

Posted: 18 Sep 2006 12:46 PM
Originally Posted: 18 Sep 2006 12:37 PM

Chapter 4 Phosphorus Source Controls for the Basins Tributary to the Everglades Protection Area

Pages 4-11 and 4-30, Tables 4-3 and 4-8: Below are the two graphs referred to in this comment.





Chapter 4 – Phosphorus Source Controls .....

Comment provided by Robert Ward, Posted: 18 Sep 2006 01:58 PM

The Chapter provides an update on the operations and accomplishments in controlling the discharge of phosphorus into the Everglades Protection Area (EPA). The chapter reports on accomplishments via three main categories of discharges: (1) the Everglades Agricultural Area (EAA); (2) the C-139 basin; and (3) the Non-ECP basins. Each category of discharges has a different management goal in reference to reduction of phosphorus discharges: (1) the EAA must achieve a 25 percent reduction in total phosphorus (TP) in any given water year (since WY 1996) when compared to a projected pre-BMP baseline period; (2) the C-139 basin must maintain TP loads leaving the basin in any given water year (since WY 2003) at or below pre-BMP baseline period levels (without projections); and (3) the non-ECP basins must install BMPs to reduce TP loads until future CERP projects either impound or diver discharges away from the EPA.

The EAA's goals are developed from a model of future loading, without BMPs; the C-139 goal does not involve a model, but rather a direct comparison with previous loads; and the non-ECP goal is ultimately total removal from the EPA. The EAA has always met its goals while the C-139 Basin has not met its goals in the four years of the goals being in existence. If the BMP effort in both the EAA and C-139 basins are similar, is it possible to compare the two efforts when the determination of their goals are so different?

Chapter 5: STA Performance, Compliance and Optimization

Subject: **Hsieh**

STA is an essential part of CERP, its report certainly is important to many users in government, legislature, organizations and general public. As the STAs entering their stabilizing phases, the format of this chapter may also be adjusted accordingly. I found the WY2006 highlights section of this chapter very efficient in communicating facts and data of the STAs to the audients. The side-by-side description and comparisons of the STAs with text and tables give excellent overview of the subject at a glance. Perhaps the entire chapter should follow the same format and be organized into the sections of performance, compliance and optimization, respectively. Presentation of all available STAs under the same heading reduces redundancy and increases clarity of the report. In fact, the Analysis and Interpretation section (p. 103-165) has already done so.

Vegetation management seems to be emphasized in the report. What are the goals of vegetation management in STAs? Does each STA has its own vegetation management goal or all have the same goal? What is the justification for goal(s) of vegetation management?

PSTA cells were scraped down to caprock. What is the purpose of that? Does the scraped bottom need to be maintained all the time?

Wildlife and recreation activities are reported. Those activities are also excellent opportunities for public education of environmental protection and resource management. Is there any public education component incorporated into the program?

The impact of hurricanes is significant because the event may become frequent in the future. Other than loss of power and power related operations and damages to SAV, increased turbidity has been identified as a problem. P. 11 says that increased turbidity also increased TP concentration. Is it a general phenomenon observed in all STAs, or just special cases? How does turbidity affect water quality parameters?

The Analysis and Interpretation section contains a lot of data. If there is not much interpretation, the section should be moved to the appendix.

Posted: 18 Sep 2006 11:48 PM
Originally Posted: 18 Sep 2006 11:19 PM

Subject: **Armstrong Comments**

Chapter 5 – STA Performance, Compliance, and Optimization
Date of Chapter Draft: 9/12/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: A
Level of Panel Review:
Primary: Accountability
X: Technical

This chapter documents the performance of the STAs from the time of the construction to the present and provides a significant amount of information about STA operations and the data on TP removal gathered from them. From their conception in the early 1990's

and early design basis, the STAs have been put into operation to remove organics and particularly nutrients, and the record of progress documented in this chapter demonstrates the success achieved. Clearly, the District has focused on how best to operate the STAs to accomplish the levels of nutrient removal needed to meet regulatory requirements, and it has been remarkably successful utilizing a natural system relying primarily on submerged aquatic vegetation and periphyton communities on a very large scale. A significant amount of effort has gone into learning how to operate the natural treatment systems starting with the very basic design criteria utilized in the mid-1990s to first design these systems, to learn appropriate operating depths, and measuring hydraulic loading rates, nutrient loading rates, hydraulic retention times, etc. anticipating that these would be important design parameters.

For the past few reviews of the STAs, recommendations have been made to the District that engineering design approaches and criteria be applied to these natural treatment systems so that these STAs may be operated within certain hydraulic and nutrient loadings so they will remove TP at high levels with confidence. The original engineering basis for STA design described in Burns and McDonnell (1994) which was based on work by Walker (1993 and 1995) needs to be recognized as the starting point, and it is time for more sophisticated engineering analyses to be applied to these STAs. It is gratifying to see efforts along these lines noted as part of the adaptive management approach the District is taking, an example being the 2006 "Stormwater Treatment Area 1-West Lessons Learned" document, but there is more that can be done. Certainly one can consult with standard wastewater treatment (including stormwater) texts like the classic Metcalf & Eddy, Inc. book with the third edition including a chapter on natural treatment systems and get some insights. [Metcalf & Eddy, Inc., G. Tchobanoglous, and F.L. Burton. 1991. Wastewater Engineering Treatment, Disposal, and Reuse. McGraw-Hill Publishing Company, New York. Third Edition.] More instructive is to examine the growing list of references focused on natural treatment systems alone such as the following:

Kadlec, R.H. and R. Knight. 1996. Treatment Wetlands. Lewis Publishers, Boca Raton, FL.

Reed, S.C., R.W. Crites, and E.J. Middlebrooks. 1995. Natural Systems for Waste Management and Treatment – Second Edition. McGraw-Hill Co., New York, NY.

U.S. EPA. 2000. Free Water Surface Wetlands for Wastewater Treatment: A Technology Assessment. U.S. EPA, OWM, Washington, D.C.

U.S. EPA. 2000. Design Manual Constructed Wetlands for Municipal Wastewater Treatment. U.S. EPA. CERI, Cincinnati, OH.

Water Environment Federation. 2000. Natural Systems for Wastewater Treatment. MOP FD-16, Alexandria, VA.

It is recommended that the District examine the approaches described in these publications and others to determine where conceptual models and mass-balanced based approaches to describing the nutrient removal processes may be helpful to advancing the knowledge of the natural systems incorporated into the STAs. Even more important, are there mathematical models and design criteria and approaches already available that can aid the District in its operation of the current STAs and design of future ones.

For example, there are simple relationships that can be developed from the STA operational data given in Table 5-59 that are described in the chapter on natural systems in the Metcalf & Eddy text. These are shown in the attached graphs in which effluent TP concentrations and TP removal are related to nutrient loading and hydraulic retention time. Expected increases in effluent TP concentration with increasing TP loading and expected decreases in TP removal with increasing TP loading are evident although with more variability than would be expected in systems that had been in operation for awhile and had stabilized. Expected increases in TP removal and decreases in TP effluent concentrations with increasing hydraulic residence times are also evident but again with significant variability. These complement Figures 5-62 and 5-63 in this chapter which clearly indicate that the District is moving this direction in its adaptive management program. Envelopes of nutrient loading coupled with similar envelopes of hydraulic loading and water depths used in the past provide a growing list of design criteria that can be used to guide STA operation and design of future STAs. The District is breaking new ground with these STAs, particularly with respect to nutrient removal, and it can be at the forefront of guiding future applications of STA-like systems if it performs the right kind of analyses and gathers the right kind of data. It is the latter work that should be the focus of future editions of this chapter while a good deal of this information like the permit status and operations could be placed in an appendix.

In this reviewer's opinion, the District needs to engage in much more environmental engineering analysis of the STAs and the data being gathered from them. Such engineers need to be involved in the design of sampling programs for the STAs to be sure that adequate and appropriate data are being gathered which will support the development of further design criteria for the STAs.

[Walker, W.W. 1993. A mass-balance model for estimating phosphorus settling rate in Everglades water conservation areas-2A. Prepared for the U.S. Department of Justice, March 8.

Walker, W.W. 1995. Design basis for Everglades stormwater treatment areas. Water Resources Bulletin 31:671-685.

Burns & McDonnell. 1994. Everglades Protection Project – Conceptual Design. 92-166-1-002. Report prepared for the South Florida Water Management District, West Palm Beach, FL.]

Specific comments on this chapter are given below:

Page 5-3, lines 81-82: Reference is apparently being made to Table 5-3 rather than Table 5-1. Also, the nutrient loading rate is presumed to be total phosphorus.

Page 5-3, line 94: "Draw-down" instead of "dry-down"?

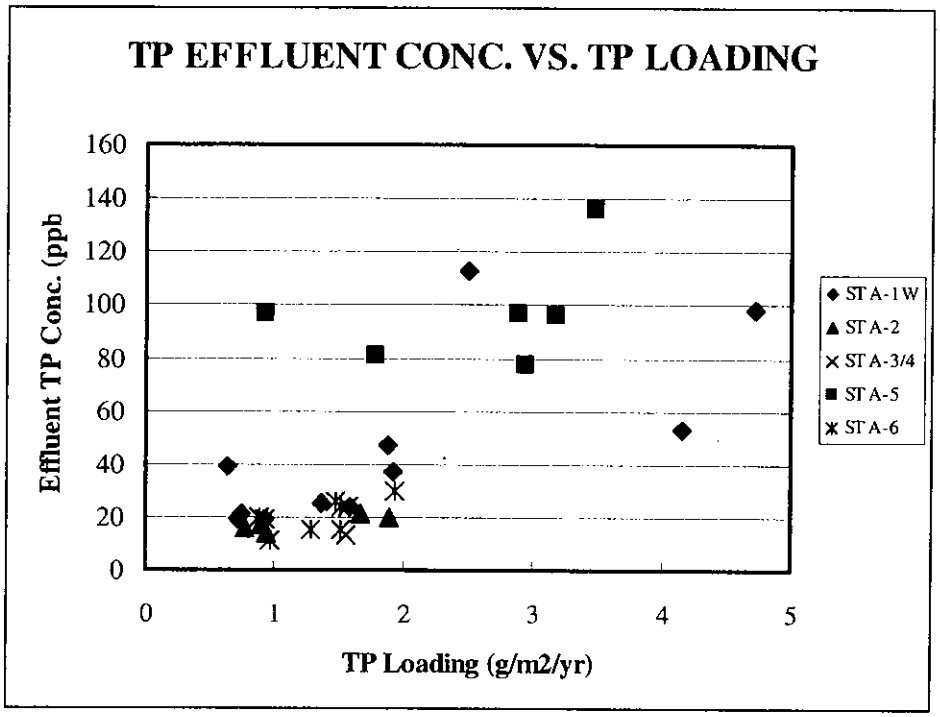
Page 5-11, lines 185-192: Is depth management taking into account the growth characteristics of SAVs in the sense that SAVs typically grow until they reach the surface? Can water depth be increased over time to enhance the density of the SAVs, for example, rather than keeping it at a single target depth? Greater depths can decrease the turbidity producing effects of wave action.

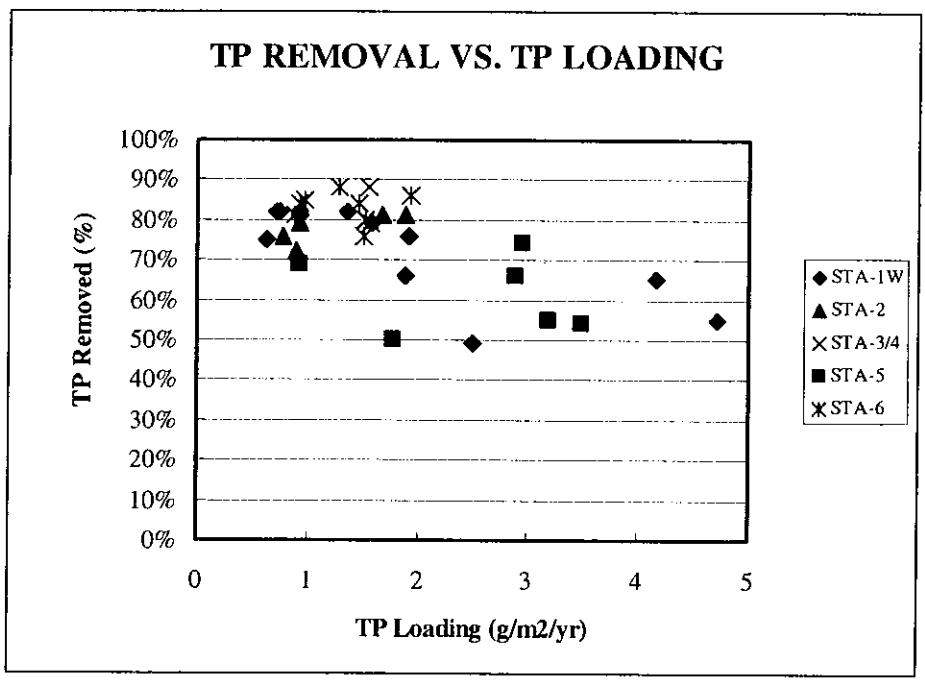
Page 5-35, Table 5-11: Unionized ammonia is listed in this table for STA-1W and in similar tables for the other STAs, yet the appendices containing water quality data available to the reviewer do not include any analyses for ammonia-N on which the unionized ammonia concentrations would be based. Where are the ammonia-N data?

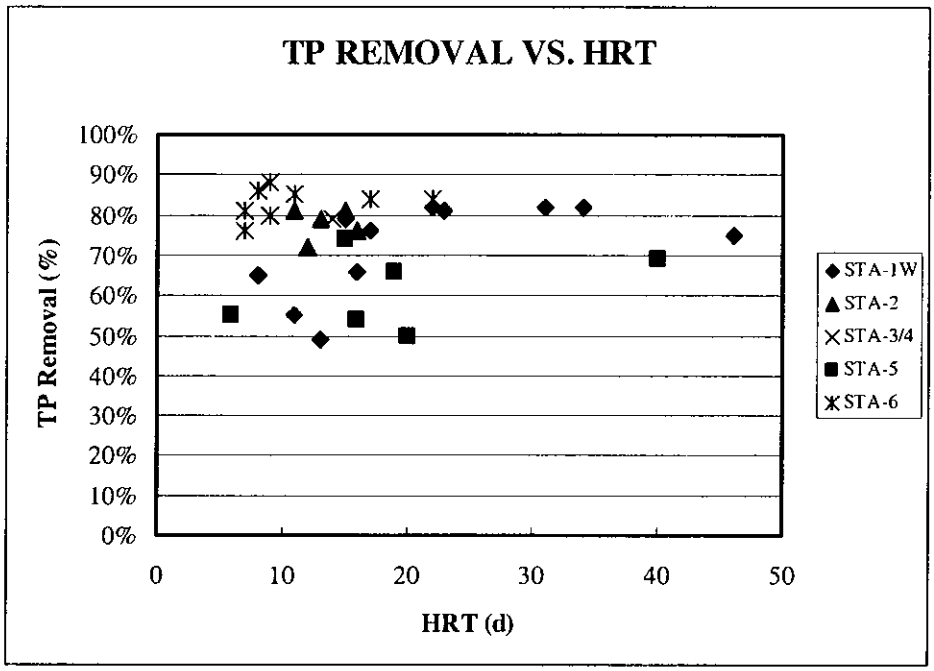
Page 5-149, line 2613: The *Analysis and Interpretation* section of the chapter could not be found.

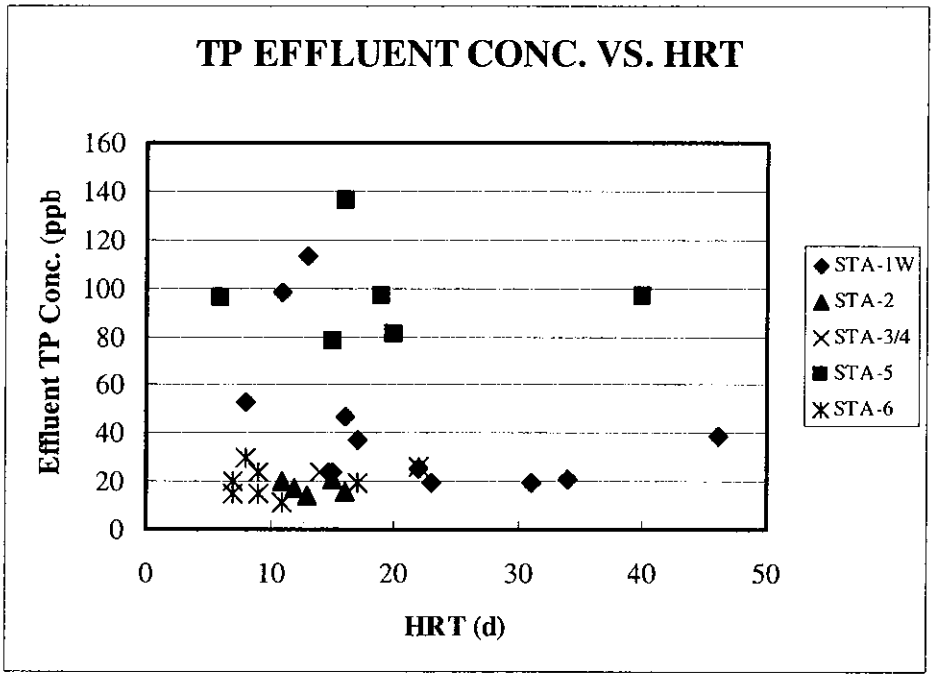
Chapter 5 NEA Graphs.doc
Graphs of STA TP removal performance

Posted: 19 Sep 2006 11:39 AM
Originally Posted: 19 Sep 2006 11:37 AM


TP EFFLUENT CONC. VS. TP LOADING
Effluent TP Conc. (ppb
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
TP Loading (g/m2/yr)
STA-1W
STA-2
STA-3/4
STA-5
STA-6


TP REMOVAL VS. TP LOADING
TP Removed (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
TP Loading (g/m2/yr)
STA-1W
STA-2
STA-3/4
STA-5
STA-6


TP REMOVAL VS. HRT
TP Removal (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
10
20
30
40
50
HRT (d)
STA-1W
STA-2
STA-3/4
STA-5
STA-6


TP EFFLUENT CONC. VS. HRT
Effluent TP Conc. (ppb
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
HRT (d)
STA-1W
STA-2
STA-3/4
STA-5
STA-6

Chapter 6: Ecology of the Everglades Protection Area

Subject: **Joanna Burger; REVIEW OF CHAPTER 6**

This is an extremely useful chapter in placing ecological research within the Everglades context, and the authors are to be commended. It could be improved by making the connections to the CERP clearer for each project, and making the connections between the topics clearer. Overall the report is clear and concise, and addresses some of the concerns raised in the 06 report. There remains a number of areas where citations to previous work would both aid the reader and put the work in context. There is still a need to relate the specific research to the goals of CERP - how are the data used in short and long-term goals? how are the data used in the "weekly" management meetings? what operations depend on ecological data? While the altered water conditions of the Everglades clearly in the major contributor to altered plant and animal communities, at all biological levels, these connections could be clearer.

The restoration of the Everglades has as a primary objective the establishment of an ecosystem with appropriate structure and functions. One goal of restoration was to restore, to the extent possible, the natural hydrology of the Everglades, which in turn would restore appropriate structure and function. The SFWMD operations, regulations, monitoring, and science are directed toward restoring the Everglades within the human-dominated South Florida ecosystem, including understanding and managing the hydrology, ecology, nutrient and contaminant patterns. The ecology research group conducts studies on wildlife ecology, plant ecology, ecosystem ecology, and landscape ecology within a framework of the hydrology of the Everglades. The organization of the last several reports around these four topics has resulted in continuity and allowed building on previous studies to understand the Florida Everglades. It is perhaps time to integrate these four ecology areas and produce a discussion of how they, and the measures used to evaluate ecology of the Everglades, are inter-related. In addition, the relationship of the ecological studies to assessment measures could be clearer: for example, how do phosphorus and mercury findings and measurements affect the ecological components of the ecosystem that are studied and reported in this chapter?

This chapter summarizes their on-going work in these disciplines. The overall research program is excellent, and the studies are key to improving understanding of the function and structure of the Everglades, although more attention could be directed at the ecosystem level. The authors are to be congratulated on an excellent series of studies, and on their attention to all levels of biological organization from individuals to landscape issues. Understanding the natural ecological processes in the

Everglades is an extremely important aspect of the overall work, particularly since so many of the chapters address contaminants and other human-induced changes, or management aimed at correcting anthropogenic forces. Basic ecological work is now essential to understanding the structure and function in its pristine form.

Further, their continued interest in designing experiments within each discipline to move the science and management further along is to be commended. This scientific strategy leads to adaptive management whereby experiments move the science forward at the same time as answering mechanistic questions that can be used for planning and management. Hopefully many of these can contribute directly to on-going assessment programs. ??The addition of 31 benchmarkers is an important step forward and will provide a method of examining a whole range of ecological questions that should be explored more fully now, at the beginning.

Ecology by its very nature involves involved and complex relationships, making it difficult to demonstrate clear-cut cause and effect relationships, which is noted in the introduction. Thus the SFWMD approach of addressing particular indicators of the health of the system is appropriate, although a full description of this rationale would help (this information is in previous reports, but difficult for someone to find as it is in several places). I might suggest a table with some of this basic information to aid the reader. Since it is not possible to examine all species, species assemblages, and processes, indicators must be selected for examination and monitoring. ??Five key indicators are examined in some detail in this chapter: hydrological patterns for 2005, wading birds, food limitation on wading bird reproduction, a food web pilot study, Lila tree seedling experiment, invasive exotic species research, sediment flux, tree islands, and cattail habitat improvement, the EFA long-term plan, accelerated recovery, the Rotenberger Wildlife Management Area.

Since hydrology is the underlying driver for many of the ecological processes in the Everglades, it is described in some detail at the beginning of the chapter, and sets the stage for the ecological studies. Wading birds were selected because they are top level predators, are visible and of interest to the public, and can be observed and studied in the field and in the laboratory. Further, a long-term data set for the Everglades provides the opportunity to evaluate long term effects of hydrology. Experiments and data collection to understand the prey base for wading birds provide another level of understanding of the effects of hydrology on them. Seedling tolerance to flooding is a key factor for ecosystem management, and the Lila tree seedling experiment addresses the key restoration issue: how is growth and survival of tree seedlings affected by seasonal changes in water levels. Tree islands are important features of the Everglades that must be preserved and re-established, and further examination of elevation and hydrology will help

predict future tree island presence and ecology: developing biomarkers of wading bird guano is an interesting advancement to further understand Everglades community dynamics. Finally, understanding of soil types is a critical component of the hydrology and ecology.

The chapter examines four key areas:

Wildlife Ecology
Plant Ecology
Ecosystem Ecology
Landscape Ecology

SUMMARY AND INTRODUCTION

The summary of the research conducted under ecology of the Everglades is clearly and concisely described in the summary, and a firm background is provided in the introduction. However, it is still unclear how the research relates to SFWMD operations, regulations, permitting, environmental monitoring, Everglades Forever mandates, CERP, it is not clear how. This information could be provided in a summary table. It would be useful to know how the data from the ecology group is used in the "weekly" management meetings and decision-making. While the new research is both important and laudable, the rationale for some of the studies (e.g. DNA of cattails) is unclear.

The summary clearly describes the overall research areas, and the authors are to be commended for presenting the chapter and research in context. Some summary statements of how the research will be used in both the short-term long-term for both management of the Everglades, and future monitoring would be helpful (perhaps in a table format). The introduction, however, does not provide a clear statement of why the overall research areas or specific research topics were chosen. While this information could be gleaned from reading of several previous reports, it would be useful to have this in one place. While much of the research goes directly to understanding the overall ecology and functioning of the Everglades system, the information also contributes to management of the Everglades and to the development of bioindicators. The latter positive benefit should be described briefly.

Description of the overall hydrological patterns for the water year were extremely useful in placing the research results in context. The use of tolerances and good/bad evaluations is reasonable, but the presentation is unclear. Such snapshot evaluations are an important method of communicating to both managers and the public, but need to be more clearly explained. Further, the attempt to relate hydrological conditions to biological measures (e.g.wading bird foraging) is extremely important and useful, and the authors are to be commended.

The overall format for reporting the research (introduction, scientific details, results and discussion) is much improved over previous reports. The consistency across research studies makes the material more accessible. This format should be followed throughout this chapter, and might work well for other chapters as well. Further, some of the studies reported clearly indicate the hypotheses being examined, while others do not. The formation of clear hypotheses (and their statement) allow for an adaptive management approach to Everglades restoration.

WILDLIFE ECOLOGY

The Everglades has historically had an abundant and diverse wildlife community which was threatened by changed in hydrology. Wading birds, as intermediate and top trophic-level predators, are a useful and important bioindicator of Everglades health and well-being. The District is correct in focusing on understanding wading bird numbers, distribution, and reproductive success, and in using wading birds as indicators of Everglades health. The District continues to use wading birds as indicators, while conducting studies to understand the factors that contribute to success of foraging and reproduction. These studies include an examination of the role of food availability (food limitation hypothesis) and hydrology on wading bird breeding success, prey availability, and food web studies.

Since Wading Bird Monitoring is an important and key measure of Everglades health, these studies are critical to both evaluating restoration and determining future management. This section would be improved by more tables and figures that show the numbers for this season (not just 3 year averages), especially for key species, such as Snowy Egret and Wood Stork. It is difficult for the reader to understand the details of population changes, and thus the effect of restoration on wading bird numbers. Such graphics and numbers are essential, particularly since wading birds are a key indicator for the Everglades.

The supplemental food study with white ibises is excellent, and long overdue. It will answer a number of questions, and it is essential to have it be multi-year. A multi-year study is required because any one year could be "good food" year for the birds, obscuring general differences. When data are presented, normal reproduction and growth parameters should be provided for other, non-optimal food years. Mercury should be measured in the birds as well, especially since blood will be collected.

The food web pilot study is also critical for understanding how periphyton ultimately affects the food web of the Everglades. Again, it is essential that this study be multi-year. Future studies might involve larger mesocosms, and those with more complex food webs. This approach, however, is essential to understand the functioning of the ecosystem.

PLANT ECOLOGY

The introduction sets the stage for the plant ecology studies, both presented in this and previous Consolidated reports. References to the Invasive Species Summit were intriguing, and deserve further mention, if only in a brief paragraph. How, for example, is the work of that committee going to impact the general ecological studies in the Everglades?

The Lila Tree seedling experiment continues to be an important component of plant ecology studies for the Everglades. This type of experimental work can ultimately lead to understanding not only how to restore damaged tree islands, and how to construct new tree islands, but as a predictive tool for continued health of existing islands. Again, it is important for this to be a multi-year study because of the variability in hydrology and environmental conditions. The continued tree island work is important to evaluating not only the effect of Hurricane Wilma, but other future hurricanes or disturbances.

Invasive species research is extremely important, both in describing the extent of distribution, but also in documenting effects on native species. The District is to be commended on making us of recent DNA technology to understand the complexities of invasive species and hybridizations.

ECOSYSTEM ECOLOGY

One of the unique aspects of the Everglades work is its emphasis on both ecosystem and landscape scale issues. Over the years this section will increase in importance as the interactions among components and ecotypes are more clearly identified and studied. This years studies focused on flume studies, and management of cattail habitats.

Understanding the transportation of nutrients, including Phosphorus, through the Everglades system is critical to management, and the sediment flux studies are aimed at this objective. Both pilot studies are important, and should form the basis for more in-depth work.

The biomarkers for tree islands, developed to understand the changes in P as a result of wading bird guano, are important for an overall understanding of P dynamics within the Everglades. It is not clear, however, how this biomarker will be used, particularly with respect to wading bird performance measures. Further, while so many other compounds are being measured, some attention should be devoted to mercury. The wading bird biomarkers should be examined not only in marsh cores, but also in other tree islands that have NEVER served as wading bird colony sites.

The cattail habitat improvement project is extremely important to elucidating the factors that control cattail sands, and to an understanding of how to restore sawgrass and improve existing cattail stands. A detailed summary of the

performance measures should be included with the project description.

Along with understanding of the factors that control distribution of cattails, the Accelerating Recovery Project will explore ways to decrease the recovery time for the eutrophic systems. This is an extremely important goal since other species assemblages and communities cannot recover without overall improvement. Exploring methods of accelerating recovery is critical, and the potential use of fire is laudable. I wonder whether sufficient information exists on the spatial, temporal and seasonal effects of fire to experiment, and this aspect should be further described in the report.

LANDSCAPE ECOLOGY

As studies of the Everglades mature, considerably more attention is understandably being devoted to ecosystem and landscape studies. This reflects an increase in our knowledge at the individual and population level, and is an indication of a maturing research program. Major topics of this section include tree island elevation studies and historical tree island changes. Tree islands are an extremely important component of the mosaic of habitats in the Everglades. Therefore, the emphasis on tree islands in many of the ecological sections is not only warranted, but essential to providing the basic biological studies necessary for a full restoration of the Everglades. The full results are extremely important for overall understanding of Everglades ecology, and a fuller description (with graphics) will prove extremely valuable. The information on historical changes to tree island coverage is extremely important in trying to understand anthropogenic effects.

RECOMMENDATIONS FOR CHAPTER 6

1. Include a short statement in the summary of how the four research areas relate and inform one another.
2. Provide in a summary table how the research relates to SFWMD operations, regulations, permitting, environmental monitoring, Everglades Forever mandates, and CERP.
3. Provide a clear statement of the agencies involved in all research areas, both in the summary and in each research section.
4. Provide a clear description of why each research area was chosen in the introduction (this could be easily and quickly accomplished with a table that listed the research project, the biological justification, and the management goals or uses.
5. Provide another table that gives wading bird numbers for Everglades areas in addition to WCAs and ENP.
6. Provide a table of all the wading bird targets (not just numbers, but distribution and timing ones as well, page 6-10).

7. The supplemental feeding study with White Ibis should include analysis of contaminants, particularly mercury.
8. Use the same overall format for reporting the research (introduction, scientific details, results and discussion) studies throughout the report. As is, it was mainly used in the wildlife section.
9. Future food web studies might involve larger mesocosms, and those with more complex food webs.
10. All studies presented in this chapter should have clear hypotheses stated in their respective introductory sections.
11. The effects of fire, particularly with respect to temporal and spatial patterns, should be explored and described more fully.

QUESTIONS FOR CHAPTER 6

1. Specifically how does the research relates to SFWMD operations, regulations, permitting, environmental monitoring, Everglades Forever mandates, and CERP?
2. A little more information on what is meant by the Long-term and Short-term goals would be useful in the introduction.
3. Who (what agencies, and universities) are involved in the studies in the research areas other than wading bird nesting success?
4. Page 6-3,line 108;surely you should add animals to the invasion of non-indigenous species.
5. Page 6-5, fig. 6-1. Some additional legend is needed for this figure as it is unclear how wading birds fit into this (and subsequent similar) figure. While the evaluation of good and bad seems key, it is still not clear.
6. Page 6-8,line 216; This sentence would be improved by finishing it with why the district focuses on wading birds.
7. Page 6-9. It might be useful to list the agencies involved in monitoring, particularly for the data presented in Table 6-2.
8. Page 6-10, lines 296-301. Targets are stated as met, but the paragraph seems to suggest there are other targets that have not been met. Perhaps it would be useful to add a table of the targets (not just the numerical targets).
9. Page 6-14. When data are presented on growth and survival for White Ibis in the experimental and control birds, normal reproduction and growth parameters should be provided for other, non-optimal food years.
10. Page 6-15. What was the rationale for the length of the periphyton study?
11. Page 6-17. More details on the Invasive Species Summit should be given, particularly concerning the relationship between future ecological studies and invasive species.
12. Page 6-17,lines 494. Some quantification of the uniqueness of the tree islands would be helpful (or at least a reference to past work.

13. Page 6-20, line 539. It would be helpful to the reader if the particular Consolidate report was referenced for previous research findings.
14. While the tree island research is obviously critical, no clear objectives were stated, making it difficult to evaluate.
15. Page 6-25. How will the biomarkers be used to refine wading bird performance measures?
15. Page 6-26. As long as so many compounds are being measured, it would be useful to measure mercury as well.
16. Page 6-27, line 777: Are there control tree islands, as well as marsh controls?
17. Page 6-29,lines 827+; exactly what are the measures of ecosystem structure and function that will be used?
18. Page 6-38. This section would benefit from more explanation about what is know experimentally about fire in the Everglades, both temporally, seasonally, and spatially.
19. Page 6-41. Are there different levels and depths of fire?
20. Page 6-42-43; A fuller description of the results of the tree island elevations studies should be included.
21.Page 6-46. I found this figure hard to follow, and would have appreciated some summary statistics in a table.

Posted: 12 Sep 2006 12:36 PM

Chapter 6: Ecology of the Everglades Protection Area

Subject: **Review by Burkholder**

This Chapter's broad focus includes the wildlife ecology, plant ecology, ecosystem ecology and landscape ecology of the Everglades Protection Area (EPA). Building nicely upon the foundation of 2004-2006 SFERs, the authors update impressive progress in 16 major District activities completed in WY 2006, including initiation of several hypothesis-driven experiments. The Chapter is well-written – as examples, hydraulic patterns and their influence on wading bird foraging and nesting are nicely explained with excellent graphics; excellent points are made about the potential importance of wading bird guano deposited in tree islands rather than adjacent marshes, and about management struggles with invasive cattail; innovative studies are described which accurately assess tree island elevation and, for the first time, track tree island habitats on a scale of decadal time changes.

Wildlife ecology – The District continued its focus on wading birds and their prey, with three major activities: (1) Field data showed that WY2006 was a "banner year" for wading bird nests, with more than 60,000 conservatively estimated, up nearly 90% from WY2005. (2) A three-year field experiment was initiated to evaluate how supplementary feeding of white ibis nestlings (age 6-25 days) effects fitness, behavior and parental responses, and to work toward establishing a causal relationship between hydrology, food supply and breeding success. Supplemental feeding did not favorably influence the nestlings in comparison to control nestlings, as WY2006 represented highly favorable hydrologic conditions for prey availability and parental foraging. Importantly, the data also offer hope that it will be possible to restore wading bird populations to historic levels if suitable hydrologic conditions can be re-established. (3) A pilot stable isotope study (^{13}C, ^{15}N) was also initiated in an attempt to better track carbon and nitrogen from periphyton through the food web up to herbivorous and omnivorous fish.

Plant ecology – Four major activities in WY2006 were highlighted: (1) A seedling experiment on two artificial tree islands at LILA was completed (7 species, 2,800 seedlings). Three species (pond apple, dahoon holly and willow) were found to be resistant to both drought and flooding. (2) Impacts of Hurricane Wilma on the District's five long-term study tree islands in WCA-3A, comparing data on basal area and density in permanent 10x10 m plots from 2002 vs. six months post-hurricane. Impacts were much worse on the heads of tree islands; *Salix* was a highly resilient species in tail areas. (3,4) The second year of a new program focused on invasive (cattail) and exotic (*Lygodium*) species was completed. Two studies were conducted on *Lygodium microphyllum*, to examine its distribution on tree islands in WCA-3A, and to assess environmental factors influencing its growth and spread in its native range vs. invaded Florida habitats. Some provocative data from a genetic study of cattail species were generated, suggesting the presence of a hybrid population of the invasive species *Typha domingensis.* An encouraging note included in this Chapter was mention of a comprehensive research plan for exotic invasive species that is being developed by the District and a large group of partner agencies/entities.

Ecosystem ecology – Six major projects included (1) Initiation of a two-year study to develop a benthic annular flume, coupled with duo-signature (fluorescent, magnetic) particles hydraulically matched to Everglades floc (i.e. with the same settling velocity), to adequately measure floc transport. Nine deployments have been completed in several areas, thus far devoid of vegetation (but, in one trial, with bioturbation from an alligator). The underlying rationale is that improved understanding of floc fate and transport will assist in establishing appropriate flow velocity in Everglades restoration efforts. (2) A very interesting analysis of tree island cores was conducted to assess the contribution of phosphorus from wading bird guano, and to attempt to develop biomarkers from the guano. The data thus far indicate that uric acid (as urate anion) may be useful as a biomarker to indicate historical changes in bird populations. (3,4) Two large-scale, 4-year experiments were also initiated in WCA-2A. In the Fire Project, multiple controlled burns (1 completed in WY2006, and at least 3 more planned through WY 2009) are being used to test long-term effects of fire as a tool for accelerating recovery of P over-enriched wetlands from cattail back to sawgrass. The Cattail Habitat

Improvement Project (CHIP), on the other hand, is applying herbicides to open and maintain slough-like areas in dense cattail growth, toward the goal of increasing utilization of the habitat by wildlife. This large-scale field study will provide insights about the prospects for rehabilitating invasive cattail areas. (5) Changes in macrophyte communities were assessed downstream from a STA that began operation in 2001. The data suggest that phosphorus accumulation in the sediments is an important factor making sites conducive to cattail invasions. (6) Three models are being developed or refined to improve prediction of ecosystem responses to reduced nutrient loading.

Landscape ecology - In additional very impressive work during WY 2006, the District (1) updated the spatial analysis of the upper 30 cm of soil across the entire Everglades, (2) developed a grid-based vegetation mapping project in WCA-2A, and (3) constructed 31 new benchmarks in WCA-3 interior areas, which are being used to reliably estimate tree island elevations (thus far, 133 tree islands evaluated, with all 600 islands in WCA-3 planned for inclusion) and to use aerial photos to assess, for the first time, tree island occurrence over decadal-scale landscape changes (55-year period, 1940-1995).

Specific comments

General - Please include a map of the areas and structures mentioned throughout the Chapter.

Line 39 - It is difficult to determine how accurately nutrient turnover was measured, based on the information provided. Suggest omitting accurately.

Line 240 - It would be helpful to explain why cattle egrets were excluded from the count.

Lines 343-366 - The authors did not mention that control nestlings were handled similarly (I assume?) - please clarify.

Lines 359-360 - Please briefly explain why these physiological parameters are useful.

P.6-15 to 6-17 - The authors raise the interesting point that periphyton (considered the base of the Everglades food web) are abundant, invertebrate and fish populations in the Everglades are sparse. They report previous difficulties in using traditional "carbon flow" methods to track relationships among trophic levels, and the results of a pilot study applying stable isotopes toward this goal. They should refer to supporting methods literature, and should describe their methodology. It would also be helpful to describe the floc in more detail. Line 431 - please explain "isotope type". Line 435 is confusing, since algae are often microbial - please clarify. Lines 457-459, The pathway... - sentence should be omitted. Emergent macrophytes obtain carbon from the water column through their underwater tissues much as submersed macrophytes do. The mechanisms have been well worked out.

P.6-17, first paragraph - rapid, relative to other studies? (add supporting literature). Lines 463-467 - These two statements seem to overstate the data. This is only a promising first-step pilot study, a "proof of concept"; careful examination/modification of the methods and careful interpretation of the data are warranted.

Line 602 vs. line 614 - Seem to conflict, as the origin of the possible hybrid is, as yet, unknown?

Editorial Suggestions

Throughout - change submerged (aquatic vegetation) to submersed; and (line 400 on) change 13C to ^{13}C, 15N to ^{15}N, and 31P to ^{31}P.

Line 20 - change to conservatively estimated. Lines 48, 512-513 - write out genus names.

Line 53 - meters. Line 60 - *Lygodium microphyllum*. Line 83 - define floc. Line 228 - established.

Line 287 - change may to also. Figure 6-5 - fix upper graph. Line 407: $NaH^{13}CO_3$, $^{15}NH_4Cl$.

Lines 411, 419 - periphyton do not have tissue; change to biofilm, mat, or other appropriate word.

Line 412 - omnivorous. Line 449 - per milliliter. Line 573 - decrease.

Lines 625-626 - more clarification is needed for (3) here, considering that it seems in conflict with (2).

Line 686 - suspended. Line 981 - omit *Pers.* Line 996 - change may have to were.

Posted: 19 Sep 2006 06:44 AM

Subject: **Hsieh**

Chapter 6 Ecology

This chapter covers a broad range of ecological studies designed to understand the underlying principles that provide guideline for the management of CERP. Some of those studies are relatively straightforward observation and interpretation suitable for the format of this reporting. But some are more technical requiring the format of a technical journal in order to be technically reviewed. I think some of the studies require more rigorous description and interpretation than it is in this report.

The wading bird monitoring study:

1. It says that wading birds are excellent indicators of wetland ecosystem health (L232) and WCA-3 supported the largest number of nests (55 %) whereas ENP supported much less nests (22%). Does it mean WCA-3 is healthier than ENP?
2. What are the criteria that determine the number of species target nests?

Food limitation on wading bird reproductive success

This study looks good and in progress.

An isotopic pulse-chase experiment: a food web pilot study.

I do not quite follow the experimental design, results and interpretation of this study. First, did the authors use C13 tracer the way people use C14 tracer? Or they use the C13/C12 ratio signature as most people do in C13 tracer studies? Second, what is the "excess umol C13/g" unit in the figures? Usually the C13 enrichment is expressed as delta C13 in ppt. Then L448 reports a 1100 ppt delta C13 value. How can this value possibly be greater than the delta C13 value of pure Na bicarbonate (980 ppt)? The authors say that the results indicate very fast turnover of the C in the system and I do not see any basis for that interpretation. I think this study may need more rigorous experimental design and interpretation.

Lila tree seeding experiment

This experiment is interesting. The results are applicable to seedlings.

Tree islands

Tree islands are important feature of the Everglades. We need to know much more about its function in nutrient cycling (especially P), sediment trapping and landscape ecology.

Sediment flux

I do not understand the application of this study.

Biomarkers on tree islands
This study is quite interesting. The synchronization of organic C and N storage in sediments is expected. The unexpected is the maximum of P at 8-10 cm depth in Fig. 6-11. Also, it is hard to believe that ortho-P consists of 75% of the total P in the sediment while organic P consists only 10-15 %. Orthophosphate is hardly available to plants. Only organic P is available to plants. The uric acid in soil seems an indicator of bird population in tree islands but how long can uric acid persist in the soil?

Posted: 21 Sep 2006 11:44 PM

Chapter 7A: Comprehensive Everglades Restoration Plan Annual Report

Subject: **Review by Meganck**

1. A comment on the quality of the overall chapter. The addition of the background is a welcome development (starting with line 138) and in particular, the section describing the overall restoration effort (lines 159-167). The panel feels that the words choice ("Everglades – type," "such characteristics," and the frank admission that the Everglades will not recover many of its defining characteristics, etc.) in the 2007 SFER present a much more accurate picture of the outcome of the CERP process. The authors deserve to be commended for this treatment.

2. The statement in lines 11-15 of this chapter state the obvious need to reduce uncertainty during project planning and design. I think it should also be made explicit in the early part of the chapter that, even after implementation, adaptations to future plans will be forthcoming, if for no other reason than the results of the ongoing monitoring programs referred-to as the overall CERP implementation process continues.

3. Lines 20-57. There is some confusion in the text as to the interim period after the ten "early restoration projects" were authorized and the Acceler8 initiative with the reauthorization bill passed in August 2006. Is it true that neither the original authorization in 2000 and the August authorization, no funding was available to begin work on the Acceler8 projects? I was under the impression reading the 2006 SFER that a number of projects had been initiated with State funding (200 SFER lines 39-40) but that this would be supplanted by Federal funding. Please clarify.

4. My question from last year remains. Is there currently a sufficient level of coordination of the activities of CERP, RECOVER, Acceler8, etc., particularly considering the number of individual actions being undertaken by the State, the District, the various Federal agencies, and private sector stakeholders? What, if any, actions could be undertaken to improve the existing interagency decision/ management situation for the CERP priority actions and the subset of the Acceler8 projects?

5. Are the LOER projects noted in lines 42-50 part of the 60 CERP projects or the 10 priority CERP projects? If it is the former, why has the State decided to fund that project over the Acceler8 projects? If it is the former as the text mentions in lines 51-52, will the implementation of the LOER delay other priority restoration projects LOER program given funding considerations?

6. Lines 35-37 seem to conflict with what is stated in lines 59-60, or are the "critical" projects referred to distinct from ten projects authorized for early restoration or those in the Acceleer8 program. Perhaps these efforts were all funded (or pre-financed) with State money awaiting the release of the Federal funds for the CERP program. Some clarification may be necessary in this regard.

7. Are there CERP projects that have a higher overall priority than the Acceler8 projects in terms of financing and potential impact on the overall CERP goals? (reference line 800, 805-812)

8. Will the District meet the 31 December 2006 deadline mentioned in lines 1351-1353 for the Loxahatchee Wildlife Refuge? If not, is an extension appeal contemplated?

Posted: 12 Sep 2006 04:19 PM

Subject: **Review by Jordan**

In terms of a accountability review, Chapter 7A provides a good example of a chapter that describes the progress in the District's programs and projects. The background material is clear and the map in figure 7A-1 gives a good picture of the CERP components. The material on causes of environmental decline in South Florida, taken from previous reports, is helpful. However, the certainty that CERP will restore the Everglades is perhaps a bit overstated. Yet, this is a good accounting of the scope and goals of CERP.

Posted: 14 Sep 2006 11:52 AM

Chapter 7B: Update on RECOVER Implementation and Monitoring for the Comprehensive Everglades Restoration Plan

Subject: **Review by Meganck**

1. I know that the overall goal of CERP has not been more narrowly interpreted from the 2006 SFER to the 2007 SFER. Yet the way it is stated in the 2007 SFER may cause confusion on the part of the general public. In lines 45-48 of the 2006 SFER both natural and urban/agricultural systems are noted. In lines 34-35 of the 2007 SFER the term "human systems" is referred to. This term obviously refers to both natural and urban/agricultural systems. Perhaps the old statement is a bit clearer.

2. The authors note in lines 65-68 that more work has to be done before the performance measures can be "fully applied" for prediction and assessment. "Fully applied" is a somewhat misleading phrase as it can imply some sort of finality in the development of the models and is contrary to the changing science and technology statements in line 53. Apart from this issue, how would you categorize the status of the "predictive tools" referred to in line 67? I feel that the District is using the best tools at its disposal at any given point in time and does not need to qualify that reality except to say that as science improves, new tools will be developed and used in the restoration process.

3. How is the term "system" defined in line 71? Are you referring to the impact of a data set on another data set or the model for assessing performance measures, or the impact of a data set on the ecological system as is noted in line 61 of the chapter? I believe it to be the latter, but it is not clarified in the paragraph.

4. In lines 72-74, reference is made to the need for consistent metrics, etc. of the predictive and assessment tools. Given the wide range of categories and performance measures (noted on the CERP website) how do you propose to be able to accomplish that goal? Are you actually implying that all studies undertaken in the Everglades system use consistent metrics, targets etc. such that comparability is possible any place in the region and in reporting for the CERP, or am I misinterpreting the breadth of your statement?

5. Lines 78-88, reference is made to "make the performance measures applicable to RECOVER's efforts..." Are you referring to the same performance measures as noted on the CERP website (line 63)?

6. As you continue to use the adaptive management program, I am curious about the reaction from the general public. It seems that an understanding of this program would help build support when changes in specific actions are warranted by new information, yet I am not clear about any specific efforts to educate the public on this tool/methodology.

7. It may be helpful to provide a short explanation of the ecosystem benefit quantification methodology referred to in lines 170-173 as it could be confused with the performance measures referred to earlier.

8. Is the RECOVER team still relying on interim goals and targets referred to in line 114 of the 2006 SFER given the use of the adaptive management program (AMP) and the implementation of two pilots (Decompartmentalization and Two Mile Creed)? Is this what is being referred to in lines 176-178 as data from the "Initial CERP Update model" as opposed to the "CERP model (termed D13R)"?

Posted: 12 Sep 2006 04:20 PM

Ch. 7B

Subject: **Review by Jordan**

This chapter on implementing and monitoring CERP is also a good example of accountability. Since this material is on-going, and often does not change year-to-year, having links to items such as performance measures is appropriate. The tables provide an easy-to-use map of programs and progress.

Posted: 14 Sep 2006 03:11 PM

Chapter 8: Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area

Subject: Joanna Burger; COMMENTS ON CHAPTER 8

1. Table 8.1 is a fine addition to the report, and along with the map, makes it easier for the reader to follow.
2. Page 8-1, line 23: It would be helpful to have a statement here that summarizes the progress toward reaching the goal.
3. Page 8-6,line 51. For readers it would be useful to give the criterion.
4. Page 8-8, line 138. Could you give some estimate of what contribution (in %) Lake Okeechobee will contribute?

Posted: 12 Sep 2006 12:37 PM
Originally Posted: 12 Sep 2006 12:35 PM

Subject: Review by Meganck

1. A reference substantiating the statement in line 27 that "additional measures are necessary to achieve the Everglades water quality goal" is needed. This statement needs to be qualified. How much progress has been made to date? The public will logically ask for some relative explanation in terms of dollars expended and results attained.

2. The only reference to the point noted above in this chapter is found in line 54 "exceeded expectations" as related to total P removal. Is it logical to include a table or some text noting the progress made by year/investment, basin, BMP or some other criteria? Perhaps the results of the meeting referred in lines 73-78 would provide sufficient information for this end.

3. It is not clear if the updates presented in this chapter beginning on line 85 are directly related to the above-mentioned meeting?

4. Is it correct that the data sets noted in lines 114-117 refer to inflow data/water quality criteria or do they also included other measures?

5. As questioned in the 2006 SFER, a reading of the short summaries of the activities undertaken in 2006 and reported in the 2007 SFER seems to imply that criteria will be used to assess specific recovery actions (source controls). Does the experience of the District indicate that you can actually determine the effect of specific measures given the physical and biological variance and the overall complexity of any basin where a water quality problem appears?

6. In line 142 the author refers to "the selected alternative..." Is that what is actually meant – single alternative or a suite of activities addressing in combination a given problem or set of problems?

7. It is not clear why, as noted in lines 262-263 "no improved phosphorus removal performance with the levees ..." Can you provide a short statement to clarify this statement?

8. The Everglades Forever Act called for meeting the overall water quality goal by 31 December 2006. How will the district respond to this mandate? Perhaps I am recalling an outdated goal by the Everglades Forever Act. Does the revised 2016 date noted in chapter 7A, line 1345-1346 apply system wide?

Posted: 12 Sep 2006 04:22 PM

Subject: **Review by Jordan**

Fire 8-1: this map is not easy to read as others in the report. Suggest going to color map like in chapter 1.

Table 8-1 is an excellent intregrative tool.

Posted: 14 Sep 2006 03:26 PM

Chapter 8: Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area

Subject: **Armstrong Comments**

Chapter 8 – Long-Term Plan
Date of Chapter Draft: 8/29/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: B
Level of Panel Review:
Primary: Accountability
X: Integrative

Overall, this chapter provides an excellent summary of the EPA Long-Term Plan to meet nutrient water quality standards in the EPA. Presented in the chapter are sections on the Plan and its elements and activities, revisions to the Plan, and challenges in achieving long-term water quality goals.

Specific comments are as follows:

Page 8-2, Figure 8-1: This is an excellent overview figure. As recommended at the 2006 SFER public hearing, it would be helpful if similar figures could be added showing with arrows the direction and magnitude of water flows from basin to basin and the direction and magnitude of nutrient loading. A conceptual example of what is envisioned is slide 27 of William Walker's 2002 PowerPoint presentation titled "Long-Term Watershed Monitoring Statistical Models and Examples" which can be found at http://www.wwwalker.net/#Selected%20Publications.

Page 8-7, lines 96-98: The reference to the 2002 Walker and Kadlec dynamic model for STAs (DMSTA) provides access to the Walker website and a description of the mathematical model developed to model future phosphorus performance of the STAs. It is not clear from the model's description that the source of nutrients for the submerged rooted aquatic vegetation has been fully characterized nor that the Michaelis Constants (Half-Saturation Constants) are correct for this type of vegetation. Documentation of the sources of such information was not readily found but may be available on Walker's website.

Posted: 22 Sep 2006 04:09 PM

Chapter 9: The Status of Nonindigenous Species in the South Florida Environment

Subject: **Joanna Burger; COMMENTS ON CHAPTER 9**

Overall, the authors of this chapter have made major strides in putting together information about indigenous species, and the authors are to be commended. The tables and module approach are making the information accessible and usable to a wide range of stakeholders. This was an excellent chapter, and I enjoyed reading it.

The stoplight approach developed last year is excellent, and quickly provides a lot of information. It eventual use with animals will be a great step forward.

** I would suggest that in addition to the colors, the authors use a pattern so that when this information is printed in black and white (as it WILL be), the categories can be distinguished. This is very important (and could be done with lines in one of the colors.

I find it curious that the Monk Parakeet is shown as an example, but then no module mentioned it as a problem. I wonder if it would be useful to have one section or table that lists the complex-wide problem species of both plants and animals.

1. Page 9-1,line 20: might want to define "all taxa" for the audience.
2. Page 9-3: Integration of invasive species into the restoration process is critical, and co-ordination is an important aspect.
3. Page 9-11. What is being done to have a GPS data base of problem exotic species? A coordinated database is essential.
4. The question of approach may need some comment on page 9-8. That is, is it better to attack both ends of the problem? The invasive species that are just getting started may be easier to control, while those at the "in every module" may require the bulk of the funds.
5. Table 9-1 is extremely useful, and the writers are to be commended.
6. Page 9-15: Exotic species seem indeed to be a negative measure of recovery.
7. Page 9-15. How are "new" exotic species and "new" locations defined? Is there a year or number involved?
8. Page 9-17. I wonder whether feral dog and cat deserve special consideration since they are so much more human-induced.
9. Page 9-17. What is the relationship between public and private land with respect to control of indigenous plant species?
10. ** Page 9-20 and thereafter - might help to give some references to the adverse effects of particular species.
11. Page 9-23: Is there any attempt to ban Green Iguanas and other nuisance exotic species from the pet trade?

12. Page 9-28 and elsewhere. I wonder if it might help to have a short paragraph that lists the major animals that are NUISANCE exotics in a large number of the modules? One is left wondering whether a species mentioned in only one or two modules is actually a problem in others.
13. Page 9-61 - How is the jellyfish a threat to fisheries? Where specific effects are noted, a description of the effect would be useful.
14. Page 9-68. The sections on other nonindigenous fishes and animals was extremely useful because it provided a context not available for some of the other modules.

Posted: 12 Sep 2006 12:39 PM

Subject: **Review by Burkholder**

Chapter 9: Status of Nonindigenous Species in the South Florida Environment

Question – As the authors wrote, the green mussel seems a particularly problematic threat, on both coasts of Florida, to the success of the District's restoration efforts regarding the eastern oyster performance measure (e.g. lines 1603 and p.9-57, p.9-61). How does the District plan to consider the invasion of this species in its restoration models? (lines 1624-1628)

Review

This Chapter contributes an impressive, fascinating, and disturbing evaluation of the status of progress in understanding and controlling terrestrial, wetland and aquatic nonindigenous species throughout the eight ecological regions recognized by RECOVER, including the Florida Keys, Florida Bay and the Southern Estuaries, the Greater Everglades, Western Big Cypress, Lake Okeechobee, the Northern Estuaries East, the Northern Estuaries West, and the Kissimmee River Basin. The authors' identified goal (p.9-1) is to "review the broad issues involving nonindigenous species in South Florida and their relationship to restoration, management, planning and funding". The Chapter provides a complete listing, insofar as known, of species that are serious or potentially serious threats to Everglades restoration (Table 9-1 is excellent). The authors also consider each geographic module separately, attempting to use an across-taxa or "all taxa" (lines 20,290, etc.; perhaps more aptly termed "multiple taxa") format. The color-coded progress assessment ("stop light") technique remains an innovative, excellent tool for evaluating status and projected conditions, species by species, within each module over the next 1-2 years. Funding, emphasized more in the 2006 SFER Chapter 9, is only briefly mentioned in this Chapter, mostly in reference to previous management actions or impediments to improved management (e.g. lines 79-81: "Most resources for nonindigenous animals have focused on agricultural pests, with little investigation of species that threaten natural areas"). In addition, a summary of expenditures by the District for FY 2005 is provided by species and module (six species included, p.9-16; the tally for FY 2006 is not yet available but will be added to the final report).

The authors responded well to the 2006 Review Panel's suggestions: They built upon information included in the 2006 SFER about funding issues; the labyrinth of the many agencies, plans, control programs, interactions, and sometimes-conflicting management efforts to control nonindigenous species; and management tools used in attempts to control bioinvasive species. They also do the best that, I think, can be done to indicate where the many management efforts/entities are integrated.

This Chapter makes a compelling case for six major overarching needs to strengthen nonindigenous species management in South Florida (p.9-75): (1) Centralized, improved coordination of nonindigenous plant management, including a coordinated database that spans taxa; (2) Funding and centralized coordination for a comprehensive nonindigenous animal management plan, including a coordinated database; (3) Establishment of priorities for nonindigenous animal management; (4) Creation of an "applied monitoring" program and a project tracking system for nonindigenous plant and animal species before, during and after control operations; (5) Use of an EDRR (early detection and rapid response) program - recognition and control of nonindigenous species during the early incipient phase of their invasions; and (6) Direct consideration of the impacts of nonindigenous species in models for the District's-and-partners' long-term restoration efforts, beyond the conceptual ecological models (p.9-8).

Specific comments

Section, Biological Monitoring (p.9-6) – Would be clearer with an accompanying table of the chronology, of the agencies/entities, targeted species, locations, and major directed activities

General – Several species were indicated as serious threats, e.g. the lobate lac scale (lines 936-937), the green iguana (p.9-40), the monitor lizard (pp.9-54-9-55), the black spiny-tailed iguana (lines 1572-1577), torpedograss (St. Lucie system) and shoebutton ardisia (p.9-57), *Caulerpa brachypus* (Table 9-8), West Indian marshgrass in Lake Okeechobee (Table 9-9), limpograss and Chinese tallow in the Kissimmee Basin (Table 9-10), and channeled apple snail in the Kissimmee Basin (p.9-74). Please clarify whether

the District (or other entities, if knowledge is available) is planning actions toward their control in the near future.

Table 9-1 – Minor point, but is the red fox really a nonindigenous species?

P.9-8, line 328 - The authors suggest (line 328) that the distribution information provided in Table 9-1 might be useful in the future to help agencies begin to prioritize animal species for control and management in the region. However, the District has prioritized certain animals (p.9-17). This point should be clarified on p.9-8.

P.9-17 – Please clarify how the District plans to utilize the prioritized noninvasive animal species in its future restoration plans and efforts.

Table 9-3 and similar tables throughout – Mentions the "three module-level questions" but I could not find where they were stated.

P.9-34 - The overall evaluation of the Greater Everglades Module as yellow-to-green over the next 1-2 years seems optimistic, considering the situation with shoebutton ardisia, old world climbing fern and Brazilian pepper. Please clarify the basis for this evaluation.

Table 9-6 – Lists several species (Australian pine, air potato, cogon grass, downy rose-myrtle, Brazilian pepper, tropical soda apple) that were not mentioned in the accompanying text. Given the status (yellow-to-red over the next 1-2 years) for downy rose-myrtle and tropical soda apple, brief discussion/ explanation about those two species would be helpful.

Lines 1014-1015 – Please clarify, if known, when a decision is expected on the request to stop the import of Burmese pythons.

Lines 1220-1221, lines 1914-1916 - It would be helpful to comment on the District's plans to conduct such a survey of nonindigenous fish in the Everglades in the near future, and plans to examine potential linkages between invasive fishes and declining habitat/native fish populations in Lake Okeechobee.

Table 9-7 – Air potato, Burma reed, half-flower, and para grass were not mentioned in the accompanying text; given their status (yellow-to-red over the next 1-2 years), it would be helpful to add brief discussion/explanation about them.

Lines 1471-1472 – Please briefly explain the basis for the evaluation of marine fisheries monitoring as adequate.

Table 9-8, *Caulerpa*, last column – It should be noted that two species of this genus are problematic (many are regarded as beneficial).

P.9-69 – Please include (as for hydrilla) the number of acres affected by water hyacinth and water lettuce in the Kissimmee Basin, and the number treated.

Editorial suggestions

Glossary – A glossary of acronyms would be very helpful, with brief explanations of relationships (e.g. between SFERTF and SFERWG). In this Chapter, aside from the many acronyms used repeatedly, NEWTT was not defined (line 322).

Table 9-1 – Sailfin catfish should be added.

Line 1115 – Should be swamphens

Line 1479 – Please change natural to bio- (it isn't natural).

P.9-57, first para. – Please add the thermal limits for the green mussel.

P.9-57, lines 1630-1631 – It would be helpful to state which major coastal estuaries are included.

Lines 1668, 1964 – Should be macroalgal. Line 1742 – Should be ...a threat to this.... Line 1774 – Should be ...100 invasive animal species in and...

Line 1867 – Should be ...reported along

Line 1881 – Please clarify - is there more than one species of sailfin catfish?

Posted: 18 Sep 2006 08:19 AM
Originally Posted: 17 Sep 2006 07:00 PM

Subject: **Chapter 9 [Ping Hsieh]**

Chapter 9: The status of nonindigenous species in the South Florida Environment

This year's report is yet the best among what I have seen over the years. Several key comments recommended by the review panel have been properly addressed. For example, the overview of programs, management and restoration efforts, planning, organization and funding have been much more clearly presented. The cross reference to websites and cited literature has been extensive in this year's report. Cross referencing is extremely important for those who are interested in following up the subject in detail. The report also provides the information and tables (for priority plant species) pertaining to the status and efforts on what control or managements have been initiated. The stoplight tables give readers a clear picture of what has been done and what will look like in the future. The pictures of species (animals) are particularly useful because it is indeed "a picture is worth a thousand words." The tremendous effort invested in reporting this complicated and important issue would be worthwhile only if it is truly useful to the users, including government agencies, legislation, public and private organizations and general public. I congratulate the authors for their tremendous effort in making this years report informative and user-friendly.

Following are several suggestions for improving this report:

First, the involvement of general public in the effort of nonindigenous species control. Since most nonindigenous species problems started with the general public, it is natural that their solutions involve the general public. Is there any public education program specifically designed for this purpose? Public education from K-12, advertisement in media and public workshops would all be very cost-effective means to get public involved in the effort. Volunteers of general public would be a powerful force in the effort. This is especially true when it comes to nonindigenous species control in private lands.

Second, there should have a concluding remark at the end of the chapter that may include comments on the gap of the current efforts, special notes of problems, future needs in management, planning, research and funding.

Pictures of nonindigenous species are good in the report. Currently only animals are included. Pictures of priority plant species should also be included. Hand drawing illustration of species, particularly plant species, may be needed.

Several places say that insufficient funding is a problem. Is it still a problem? Or it was a problem. The report lists FY05 and FY06 funding at a level exceeding $8.4 M. Is it still inadequate? If so, what has been requested and what has been budgeted?

Some minor editorials:

L190 Wunderlin, et. al., 1995.
L249 "complete"
L503 "Gambian"
L2346 Citation was not found in the text

L2371 Citation was not found in the text.

Posted: 17 Sep 2006 08:48 PM
Originally Posted: 17 Sep 2006 08:48 PM

Chapter 10: Lake Okeechobee Protection Program – State of the Lake and Watershed

Subject: several comments [ellen van donk]

- Page 10-7: line 213. What is an algal turf scrubber??????
- Page 10-7 line 220. Why is there another program announced again in 2005??? What is extra in the LOER compared to all the other restoration programs??? Are there not already enough plans and programs for the restoration of Lake Okeechobee???
- Page 10-16: line 346. What does CNMP's mean????
- Page 10-24: line 567. removal and not removalr
- Page 10-24: line 574. What is PIR????
- Page 10-28: line 637. What do you mean with "a more aggressive BMP". Formulate more exact what "aggressive" will mean in practice.
- Page 10-28 (line 645) and page 10-29 table 10-6: Why are in table 10-6 only given the phosphorus and not the nitrogen en suspended solid monitoring data????
- Page 10-31 (line 735): Here more connection can be made with chapter 11. In this chapter more data are given on the Kissimmee River as a major source of water and materials to the lake.
- Page 10-31 (line 748): Is the lower P discharge from the watersheds in WY2006 due to restoration measures???
- Page 10-32. Give in this table also the time (period) in which the goal for the given P load and concentration must be reached.
- Page 10-32. Table 10-7. Describe on page 10-35 why the ratio pelagic TN:TP is important for the appearance of (toxic) cyanobacteria.
- One major technical comment about the chapter (also made in the previous report) is that water quality is virtually synonymous with phosphorus only. In Lake Okeechobee (not true for other parts of the Everglades, though), phosphorus does appear to be the major water quality issue. What about nitrogen? Why is there no monitoring program for N? Except for nitrogen, other potential water quality issues are essentially ignored in this chapter. For example, what about organic contaminants (herbicides and pesticides) and their impacts on lake aquatic organisms? How high are the sulfate concentrations in the lake? It may not only influence the phosphorus release from the sediments but also the trace metal micronutrient cycling and the methylmercury production in the lake Increased sulfur loads originating from polluted surface water and groundwater, and from enhanced atmospheric input, are a major threat to the biogeochemical functioning and biodiversity of freshwater wetlands.
- Page 10-35 Lines 757-761. Here more connection can be made with other chapters
- Page 10-35 Line 780. Why is there a reduction in external calcium loads and when calcium is important in sequestration of phosphorus in the sediment of the lake, why is it not an option to add calcium to the lake sediment?
- Page 10-35 Lines 792-795. Here also more connection need to be made with other chapters
- Page 10-36 Fig. 10-10. Figure not very clear what is chlorophyll and what is microcystin. Is there a relationship with the ratio TN:TP????
- Page 10-37. Line 856. Is it possible to give some references here??

Posted: 06 Sep 2006 08:56 AM

Subject: **Review by Burkholder - Chapter 10** 9-17-06

Chapter 10: Lake Okeechobee

I. *Questions for the authors in preparation for the workshop*

Please clarify: How long is it projected that it will take to collectively implement the LOER components? (lines 237-238).

Please clarify: Voluntary BMPs and other voluntary approaches are frequently mentioned and discussed (administrative Rule 5M-3 is also voluntary), while mandatory BMPs are seldom mentioned. Will mandatory BMPs for nutrient management be applied? If so, regarding what issues and when? (e.g. p.10-15 - many agencies/entities involved)

Have the plans, design and completion of the four dairies followed schedule? (p.10-16, lines 339-340) How many dairies are there in total? How many will be in this program and, given the cost, how long is it projected that it will take to achieve the goals of whole-farm nutrient balance and an edge-of-farm P discharge concentration of 150 ppb?

Is there as yet an estimate for how much the Public-Private Partnership program will contribute to P reductions? (p.10-22 - such information was included for the other two efforts mentioned on that page)

How serious/widespread is the problem with residual soil P described for portions of the watershed? (p.10-30)

Is the District developing a concerted plan for controlling urban/suburban runoff? If so, please describe the plan (some efforts were briefly mentioned on p.10-30).

II. *Review of Chapter 10*

The goals of this Chapter are to provide the WY2006 status of Lake Okeechobee and its surrounding watershed, summarize the major issues impacting the Lake's flora and fauna, and describe associated ongoing projects. The three long-term major impacts to the Lake were nicely identified as excessive P loads, unnatural hydrology, and rapid spread of exotic plants in the littoral zone. The authors' excellent writing succinctly conveys the devastating impacts of the WY2004-2005 hurricanes, especially Frances, upon the water quality and aquatic life of the Lake. The dramatic reductions in littoral zone vegetation (e.g. TSS concentrations up to 200 mg/L, the extreme hydrological conditions confronted by bulrush populations), the striking decrease in the sedimentation coefficients suggesting an increased role of internal P loading, the decline in habitat quality indicated for desirable fish and Macroinvertebrate populations, and the struggle to control phosphorus loading are all clear. This Chapter also describes many ongoing efforts to improve Lake Okeechobee water quality, and some successes at reducing P loads from various tributaries in the northern watershed, countered by increased watershed urbanization which would be expected to elevate the P loading. Accordingly, an additional "challenge and unresolved issue" has been identified this year - development and implementation of urban BMPs.

The authors were very responsive to the 2006 SFER Review Panel in both content and style; they also presented both English and metric units throughout. The numerous figures (maps, data graphics) and tables are excellent in quality, and very helpful. The writing is also excellent in content and quality; about the only additional information that would be helpful to include is more about the exotic species problem in this

Chapter (notwithstanding the coverage in Chapter 9), limited to some summary maps that enable comparison of WY2006 data with previous efforts (both for plants and for *Corbicula*, if available). One question that remains from last year is the potential influences of the herbicide/pesticide applications on desirable flora and fauna. The authors provided encouraging information to the effect that native plants (e.g. *Nymphaea*, spikerush) have become established in some treatment sites once the exotic plant species (e.g. torpedograss) are pushed back by the herbicides (p.10-55). As they also acknowledge, it's a question of balance - floating-leaved plants such as *Nymphaea* can become problematic if they proliferate to the point that they cover the surface of the water and cut light and oxygen for the aquatic life below.

Although little technical information (methods etc.) was presented in this year's Chapter, the descriptions of monitoring efforts and supporting studies appear to be backed by technologically sound approaches and data - for example, continuous flow monitoring and weekly TP measurements at key watershed stations (p.10-10). The authors also considered various parameters (chloride, sulfate, inorganic N, TSS) as well as P in their assessment of water quality in the Lake during WY2006. Of course, in years such as WY 2005 and WY 2006, it surely is far beyond a major challenge just to try to track (much less control) P. Although co-management of P and inorganic N might be an ultimate goal, the present focus on P is understandable in light of the dramatic destructive circumstances created for the Lake by the hurricanes.

Other Comments (in addition to those described the Questions)

Lines 120-121 - Supporting reference needed.

Lines 140-144 - It would be helpful to mention more about the herbicides being applied/schedule.

P.10-4 - This section needs a final "conclusions" paragraph - it might be instructive to add brief discussion about challenges and unresolved issues, nicely presented on p.10-30.

Lines 603-616 - Please clarify for this effort the sampling frequency, number of stations and parameters. Please clarify - is this effort the same as the effort described in lines 656-664.

Table 10-7 - Please add the total inorganic N load, if known.

Lines 1027-1032 - It would be helpful to show maps from the 1970s, 1996 and 2005 studies for comparison.

Lines 1065-1078 - A map illustrating these changes would also be of help here.

Editorial Suggestions

Glossary - It would be a great help to add a glossary of acronyms at the beginning of the Chapter.

Throughout - Need to be consistent in the spelling of phosphorus (e.g. on p.10-16 and p.10-27, both the old form, phosphorous, and "new" form are used) and submersed in submersed aquatic vegetation (e.g. on p.10-47, both submersed (preferred) and submerged are used.

Figure 10-4 - Helpful to clarify in the Key: Improved Pastures (mostly cattle). Also, the color-codings for improved pastures vs. tree plantations cannot be differentiated.

Line 513 - Omit period after project. Line 563 - Omit second comma after removal. Line 652 - Need space between District and can. Line 684 - change on to in. Line 692 - Should be sub-basin. Line 914 - omit and. Line 970 - Should be: ...will have been determined. Line 971 - Was this *Potamogeton* (note spelling) *illinoiensis* as in the 2006 SFER? Add species name as for the other plants mentioned (and check common name?). Line 1046 - Should be elevations. Line 1073 - Include the scientific name for Corbicula. Line 1071 - should be: expedited with.

Posted: 17 Sep 2006 12:20 PM
Originally Posted: 16 Sep 2006 08:45 PM

Chapter 10 – Lake Okeechobee Protection Program

Comment provided by Robert Ward, Posted: 18 Sep 2006 01:59 PM

While designed to "rehabilitate the lake", the phosphorus controls in the Lake Okeechobee Protection Program are not working: goal is 140 metric tons per year while annual average phosphorus loading over past five years is 714 metric tons per year. Why is there such a huge difference between the performance of the BMPs in the EAA and those in the watershed above Lake Okeechobee in terms of achieving success?

Is the comprehensive monitoring program for the lake and watershed, mentioned in lines using available data from DBHYDRO or is there a concerted effort to collect data from a well defined and targeted network of sampling sites with set sampling frequencies? Is the monitoring program's strategy and design documented, including describing what data will be used and how if will be analyzed?

How can variation in success of achieving TP reduction be so large across South Florida: the EAA has met its phosphorus reduction goals every year while the C-139 basin and the Lake Okeechobee watershed have not come close to meeting their goals. Why such a large difference? Are the goals comparable? Are the TP reduction programs funded at different levels? What is the difference? Can we learn from the EAA and apply the lessons to the C-139 basin and Lake Okeechobee watershed?

Chapter 11: Kissimmee River Restoration and Upper Basin Initiatives

Subject: **comments on chapter 11 [ellen van donk]**

- Pages are numbered with 9 instead of 11
- As recommended last year by the peer review in the final report of 2006 an outline of the chapter's contents at the beginning has been inserted. This helps a lot to read the chapter. However in the draft of 2007 an outline is not present anymore. I recommend adding it again because the chapter consists of many paragraphs and it is therefore difficult to get an overview.
- It is still not clear from this chapter how the management of the Kissimmee relates to management of the rest of the Everglades system, and this should be addressed early on. In what ways are the management options coordinated, and how do the actions in the Kissimmee affect the rest of the Everglades?
- How does the low DO influence the phosphorus release from the sediments? Have there been some measurements on the possible higher release of P?
- Like previous year it is also now recommended to add a map of the DO continuous monitoring sites. Also, additional explanation is needed: How deep were the sites (mean depth, ranges)? Why was DO monitored at only one depth (1 m)? Depth profilers are strongly recommended, or at least additional monitoring of bottom-water DO. Also, what time of day were the DO measurements taken? A sampling frequency is needed that will allow the District to detect DO sags.
- In this report, in contrast with last year report, I can not find anymore information about the interactions between water-level management and *Hydrilla* control in the lakes. Is the abundance of *Hydrilla* not a problem anymore?
- Table 11-1 (page 23). What is the time period for these restoration expectations???
- Page 49 (line 1320-1321) Why is there expectation for TP?

Posted: 08 Sep 2006 09:01 AM

Subject: **Joanna Burger; COMMENTS ON CHAPTER 11**

Overall: Explanation of the water cycles is excellent; some further explanation of the biological effect seems required. What vegetation was suppressed or changed, with what effect on the ecosystem. While generalities for biological effects are given, the magnitudes are not. Further, are there any mercury problems in the system? The measures of success of restoration are excellent, and help the reader put the work in perspective. The use of birds as one of the indicators is excellent because, in this case, they are an integrator of ecological conditions.

1. Page 11-1 (for some reason, mine printed out as 9-1; but I'll use 11 for these comments): The authors are to be commended for clearly stating their overall objectives, and what restoration of a flood plain means.
2. Page 9-7: the historical description of conditions was very useful
3. Page 9-9: What can be done with Hurricane waters to lessen the overall effect?
4. Page 9-13 top, line 326: What is the effect on the system of continuous water flow from the Upper Basin?

5. Page 9-17, lines 433-434 - which vegetation has it altered?
6. Page 9-17, while generalities for biological effects are given, the magnitudes are not.
7. Page 9-17,last section: need more details of the biological effects to evaluate them in relation to other parts of the overall Everglades system.
8. Page 9-18, line 471: What is "natural for the region>" Is this spelled out anywhere, if so, the reader should be so directed.
9. Page 9-18, lines 498-: Are there any plans for biological restoration?
10. Page 9-22-9-23. While the goals for restoration are clearly stated, there is no indication of how this could be done, or some reference to how it could be done?
11. Fig.11-11: Again, here it would be useful to have the graphs with symbols that would be readable in black and white.
12.Page 9-5 Bottom: It would be useful to have some evaluation or statement about the measure: how is the restoration going?
13. Page 9-31: It is quite useful that pre-channelization conditions are described.
14. Fig. 11-13: This is an excellent figure because it can be read in black and white, and is quite clear, and shows the trends nicely.
15. Page 9-34: lines 856: I would be interested in the verification data for aerial and ground counts of wading birds.
16. The bird data are presented well, AND suggest the restoration is proceeding well, at least for foraging waders. Colony occupation will follow, but are there appropriate nesting sites?
17. The conceptual models (fig. 11-17) are also excellent.

Posted: 12 Sep 2006 12:41 PM

Subject: **Review by Burkholder - Chapter 11**

Chapter 11

I. ***Questions for the authors in preparation for the workshop***

Can the "Zone B" experiment be extended? My concern is that one year may not be sufficient to assess effects on the snail kite, which is a goal of the study. [lines 310-323]

Why were flows only through 2000 considered in the *UKISS* model? [Appendix 11-1, p.3]

For carry-over and water supply - How was a 50% probability level selected? (explain rationale - Appendix 11-1))

Although carry-over was described as a minimal problem, Appendix 11-1, Table 2 indicates that Alternative 12 failed (i.e. the state was not within 0.5 ft of the Target Stage) for Lake Kissimee (2.5 ft lower than the Target Stage) and East Lake Toho (0.9 ft lower than the Target Stage). Regarding the water supply PM, for Lake Kissimmee there would be an increase in stage of 0.6 ft considering the water supply PM, close to but failing to achieve the 0.5-ft limit (p.6). What is the authors' assessment as to how serious could ecological impacts from Alternative 12 be in these lakes (fish nesting/fish production, waterfowl etc.) versus the BASE condition?

Why are dissolved oxygen sags (concentrations in dark periods) not considered as a PM of the KRREP, in favor of mean daytime concentrations? Is the District planning to measure nighttime concentrations to improve this PM? (Table 11-1, and lines 632-637).

In Table 11-3, three of the reference streams appear to have "failed" in their function; maximal values of 58 or 416-987 mg TSS/L must be abnormal - don't such concentrations reflect human activity-associated perturbations? Should they be subjected to outlier tests (and likely omitted)?

What steps are being taken to identify the sources for increased P levels at the southern end of Lake Kissimmee (lines 782-783, 798-800)?

II. ***Review of Chapter 11***

The overall goal of the District's and partners' efforts in the Kissimmee River Basin (p.11-4) is to restore ecological integrity to ~40 square miles (104 square kilometers) of the river floodplain system, evaluated through a comprehensive ecological modeling program. Although familiar with the dramatic alteration/ channelization of the Kissimmee River (1962-1971), I found the historical summary information (p.11-7) still hard-hitting and sobering - clearly the massive previous alterations represent a

major challenge to restoration of ecological integrity. This chapter focuses on three major topics:

First, it summarizes major initiatives of the District's Kissimmee Division in the Kissimmee watershed. The major goal of the District under the Kissimmee River Restoration Project (KRRP) is identified as restoring ecological integrity to the Kissimmee River and floodplain ecosystem and developing a long-term management plan (by 2007) for the Kissimmee Chain of Lakes (KCOL), while retaining the existing level of flood control in the Kissimmee watershed as a whole. The major initiatives under KRRP (KRREP, KBMOS, KRHRP, KCOL LTMP) and initiative goals are clearly described.

Second, the Chapter nicely summarizes the historic and present hydrology of the Kissimmee watershed, including consideration during WY2006 of operational modifications of the Zone B regulation schedules (pertinent especially to Lake Tohopekaliga and East Lake Tohopekaliga) to supplement releases from S-65 and replace some of the water being released from Lakes Cypress, Hatchineha and Kissimmee, and to improve nesting success of the federally endangered Everglades snail kite in the Upper Basin. The operational modifications were imposed on a one-year experimental basis. Efforts are proceeding to consistently achieve a desired (slow) rate of stage recession; three recession events occurred in WY2006, but this was a year of extreme wet vs. extreme dry conditions, and only one event approached the criteria for a recession event that would create desirable hydroperiods for floodplain wetland vegetation. The authors point out that these findings demonstrate the importance of implementing a planned headwaters revitalization effort, which will include a new schedule to raise the high pool stage 1.5 ft and create considerable additional water storage, thereby reducing the need for release of extremely high discharges during/after flood events and enabling maintained releases during dry seasons.

Third, the Chapter summarizes a subset of evaluation projects that was monitored in WY2006, and ongoing development of an excellent Conceptual Ecological Model (CEM) of a "generalized KCOL lake" with performance measures and indicators that are being developed to, in turn, guide development of the KCOL LTMP. An accompanying comprehensive data collection and monitoring plan is also being developed.

Other Comments (in addition to those described in the Questions section)

General

Accountability - The authors have responded to the 2006 Review Panel's previous recommendations. The chapter was well written and informative, and focuses mainly upon activities during WY 2006, as recommended. The main objectives of this year's writing are to describe the historical vs. current status of the Kissimmee watershed, and provide an update of key Kissimmee Division initiatives (progress on the KRRP, KRHRP, KBMOS, and KCOL LTMP). Helpful, informative tables and explanatory diagrams are included, e.g. Tables 11-5 and 11-6, Figures 11-17 and 11-8.

Technical - The authors have responded to various concerns from the 2006 Panel Review, for example, with inclusion of metric as well as English units (very nice addition), and inclusion of tables of draft PMs and Indicators with accompanying, generally well-explained rationale. In addition, a detailed assessment was provided of modifications to Zone B discharges in Lakes Toho (Tohopekaliga) and East Toho (nice summary information on pp.11-12 to 11-16 [typo error - pages were numbered in the draft as Chapter 9] and Appendix 11-1). Definitions for some key terms such as ecological integrity, and clarification of others (e.g. the difference between PMs and Indicators, and underlying rationale) are helpfully provided.

Specific

Lines 28-31 - Suggest modifying this sentence to reflect the fact that restoration of ecological integrity will require achieving the five goals under the KCOL LTMP (not only hydrologic management, but also habitat preservation/enhancement, aquatic plant management, water quality improvement, and recreation/public use (p.11-4; also in consideration of the activities listed in lines 21-23).

Line 204 - Please add the Lower Basin rainfall in June.

Figure 11-4A - What was the event on 1 August? - not previously mentioned?

P.11-17, KRRP vs. pp.11-18 to 11-20, p.11-49 - It would be helpful to provide a table outlining the activities for the various project phases with goals, major activities and scheduled initiation and completion dates.

Table 11-1 - The water quality PMs remain problematic, with similar concerns as were expressed by the 2006 Panel Review: Mean daytime dissolved oxygen provides little meaningful information about the periods when dissolved oxygen is of most concern. The variation in DO, especially the DO sags during darkness, are far more important data from the standpoint of determining whether a river system can sustain aquatic life. What is the average channel depth?

Lines 624-625 vs. line 628 - Discrepancy regarding the depth where DO was measured (should probably be given as a range, as in Table 11-1?). Also, please compare with lines 646-655 - DO profiles evidently were taken? The data in Figure 11-11 are encouraging, although the 2.9 mg/L mean daily DO concentration value is still hypoxic, and much lower than the reference stream value of 4.8 mg/L. The authors aptly point out that conditions have already improved as a result of Phase I achievements, and that continued improvement is anticipated as the KRRP moves forward.

Pp.11-24 to 11-30, reference streams - Is a scientifically solid approach, since no DO or turbidity data are available pre-channelization of the Kissimmee River. A commonly used method in APHA et al.'s Standard Methods for the Examination of Water and Wastewater has a detection limit (practical quantitation limit) of 1 mg TSS/L; a detection limit of 3 mg/L seems high.

Lines 712-714 - Not necessarily; levels of 2 mg TSS/L have been found to alter survival and phosphorus uptake of suspended algae in run-of-river impoundments (e.g. Burkholder 1992, *Limnology and Oceanography* 37:974-988).

Table 11-2, 11-3 - It would be instructive to split these data into wet and dry seasons. In Table 11-2, what might have caused the high (25 mg TSS/L) value at Schoolhouse Run - Pool A?

PP.11-34 to 11-36 - Results from KRRP are very encouraging for wading birds - also, nice approach and explanation in the writing.

Lines 1066-1071 - Please clarify - how will the other lakes in the study area be considered.

Table 11-6 - Which pesticides and trace metals are being considered? Is mercury a problem in this study area?

Lines 1206-1211 - It seems incongruous that TP concentrations in the five lakes and three tributaries being sampled have remained stable, despite continuing development. Can the authors provide further explanation? - frequency of sampling, other factors?

Editorial suggestions

Line 38 - Should be 2012 (not 2102! - realizing that the District is excellent overall in its planning endeavors, it seems, however, that no person or entity has managed to be quite that visionary!).

Figure 11-1 - Nice map - please add the other six structural components (and add symbol for S-68). It would also be helpful to add other sites mentioned in the Chapter, e.g. the Rolling Meadows Ranch property, Packingham and Buttermilk Sloughs, and Fort Kissimmee.

Figure 11-6 - The print in this figure is difficult to read.

Figure 11-7 - Needs a key.

III. *Review of Appendix 11-1*

This Appendix describes modifications proposed for Operation Rules of the S-61 structure and the S-59 structure, which control water levels in Lake Toho and East Lake Toho, respectively, to create more natural lake-stage hydrology in those lakes. The modifications would allow environmental ("Zone B") releases from Lakes Toho and East Toho to substitute for a proportion of the present environmental releases from Lakes Kissimmee, Hatchineha and Cypress. An identified potential risk was undesirable releases of water to Lake Okeechobee; another would seem to be reduced drawdown fluctuation in Lake Kissimmee. Four performance measures were considered for lake recession (carry-over effect), flood protection, water release to Lake Okeechobee, and water supply. Among 16 Alternatives tested using the UKISS model, the authors selected Alternative 12 as most effective in achieving the desired goal with minimal adverse environmental impacts on Lake Kissimmee. It was concluded that modest releases would allow the desired lake recession in spring and would slightly reduce peak stages in Lake Toho and East Lake Toho. The text clearly describes the steps taken, with accompanying helpful tables and graphs.

A map of the area evaluated would be helpful, including the lakes, the Kissimmee River, and the seven major water control structures (p.2).

Further explanation/clarification of Figures 5d and 6d would be helpful.

Please define HESM (p.2).

Posted: 16 Sep 2006 07:27 PM
Originally Posted: 1st Sep 2006 09:29 PM

Chapter 11 – Kissimmee River Restoration

Comment provided by Robert Ward, Posted: 18 Sep 2006 01:59 PM

The Kissimmee River Restoration Program (KRRP) is designed to resorts ecological integrity of the river's flood plain. The chapter provides a hydrologic operations/environmental ramification overview.

Page numbers in Chapter 11 begin with the number '9' while those in Chapter 9 also begin with a '9'. To be consistent with the rest of the report, the page numbers in Chapter 11 should begin with the number '11'.

How do the objectives of water supply and flood control interface with KRRP? Are these relationships to be defined in the KBMOS? What metrics are being used to track success of KRRP, overall? Are these the same metrics being used in the model?

The discussion of KRRP suggests that data collected for other purposes is being used for KRRP evaluation purposes. Is this correct? Or is data collected directly for KRRP purposes? If the former is the case, the Panel is concerned about the consistency of data and information over time and space in tracking restoration progress.

Is it possible to incorporate the water quality improvement goals of KRRP with the water quality data and information presented in Chapter 3 via graphs/maps showing water quality changes over all of South Florida?

Figure 11-9 (on page 9-19) shows from the current time to the end. There is great value in showing the entire record, from the beginning to the end, with the current time highlighted. Figure 11-10 needs to have its axes labeled.

On page 9-21, there is a discussion of 'adaptive management' implying, in many ways, a moving management target. How can the public judge progress of management toward goals if the goal changes? How will accountability of KRRP be judged?

What baseline data will be collected? What data will be collected after the project is initiated? (line 563) In lines 568-569 there is an uncertainty expressed in future data collection" "... continue data collection, at least intermittently..." while construction is underway and then five years afterward. Why five years? Why intermittently? Is there a monitoring network/operations design for KRRP, from sample collection, to database management, to data analysis and interpretation to reporting? Has the design been peer reviewed? The Panel has concerns about potential ambiguity in monitoring that can lead to inconsistency in assessing goal attainment.

Can the monitoring effort presented beginning on page 9-47 be rolled into the water quality reporting in Chapter 3 to develop an integrated picture of water quality picture for all of South Florida?

Chapter 12: Management and Restoration of Coastal Ecosystems

Subject: **Review by Burkholder - Chapter 12 and Appendix 12-2**

Chapter 12: Management and Restoration of Coastal Ecosystems

I. Questions for the authors in preparation for the workshop

A. ***Chapter 12***

Can a salinity recorder(s) be added to seagrass areas near the mouth of the St. Lucie Estuary? [p.12-5, last paragraph] When will the Sanibel recorder be replaced? [Caloosahatchee Estuary - p.12-42, Figure 12-25]

Please clarify the monitoring frequency and number of sites for oysters during WY2006 (as was done for seagrasses) - same sites as last year? Can the sites be added to Figure 12-7 to help readers? [St. Lucie Estuary - p.12-9, 1st paragraph]

It appears that the most extensive oyster bed is on the southern portion of the central island. Why is there no monitoring station at that location? It would also seem advantageous considering the District's plan to add oyster rock a little farther down-estuary. [Loxahatchee Estuary - p.12-15, Figure 12-13]

Was the cyanobacteria (*Synechocystis*) bloom tested for toxins? (e.g. see reference given below) [Biscayne Bay / Florida Bay - lines 622-623]

Considering that the model calculates nutrient flows, are nutrient flows factored into predicting seagrass abundance? The writing indicates that the model only focuses upon predicting effects of salinity on seagrasses. How are interactive effects of salinity and other variables considered? [please clarify lines 882-893 - it seems that the experiment described on lines 934-935 considers factor interactions]

Why is there such an apparently large distance gap between Stations 4 and 5? Can another station be added? [p.12-45, Figure 12-27]

Was hydroacoustic sampling of SAV conducted at site 4? If not, why not? [Caloosahatchee Estuary - please clarify line 1105]

B. ***Appendix 12-2*** *(an understanding of this Appendix was necessary for evaluation of Chapter 12)*

Kitching Creek is described as the least developed tributary, yet it is also described as being on the Verified List of Impaired Waterbodies for Biology. Please clarify? [p.2-11 vs. p.2-16]

The Northwest Fork watershed of the Loxahatchee system has been divided into 12 sub-drainage basins. There do not appear to be flow gauges in 7 of the 12 sub-basins, including the Wild and Scenic sub-basin. This seems to be a serious problem that would limit the planning and modeling described throughout much of the rest of the document. Please clarify: how does the District plan to resolve this problem? [p.2-5 to p.2-8]

Bimonthly monitoring (or 2x per year at 2 stations – e.g. p.2-14, 1st para.) is inadequate to provide critically needed information, considering that the Northwest Fork and most other systems within the Loxahatchee have been described as degraded by nutrient pollution and other pollutants (see 2005 SFER). How does the District plan to strengthen the water quality database?

Are there any other potential reasons for the loss of the cypress seedlings (e.g. predation effects)? [p.3-29, 1st 4 lines]

The authors wrote, "Mangroves can survive in freshwater environments (Odum et al. 1982). Therefore, no declines in the number of mangroves would be expected..." How much stress would be expected for mangroves in freshwaters? [p.4-10, 2nd para., last sentence]

Regarding effects of various parameters on larval fish density and species composition, in this analysis what factors were considered besides changing water levels and salinities? [p.4-20, 1st-2nd lines]

The District plans to collect water quality data to evaluate potential linkages with seagrass and macroalgal abundance. Will nutrients be included? [p.4-39, 1st line; also pertains to p.8-25, 3rd para., last sentence, and p.10-4, 1.b.]

10 ppt appears to be a harmful level for eggs and larvae, and stressful for juveniles and adults – should the desired salinity range be set slightly higher? [p.4-30, Table 4-3]

Chapter 12 – Appendix 1 states that the Loxahatchee River Floodplain Digital Elevation Model (DEM) is being established based on the processed 5-ft LIDAR data of the floodplain. The DEM is expected to provide details of micro-relief data that are described as critical for determining water inundation in the floodplain area, but the project is described as still in an early phase. How do the authors expect that this model will alter their conclusions about optimal flows (e.g. bottom of p.5-28 – p.5-30)?

Why were the wet and dry periods considered on p.8-6, Figure 8-1 different from those defined for the analyses in Tables 7-4, 7-6 and 8-1? Why were mean flows used in Chapter 7 rather than median flows (used in Chapter 8)?

How well do the authors feel that the selected flow regime (p.8-20, last sentence) will approach the critical flow of 230 cfs needed for oysters at RM 4.13 (p.7-54)?

II. Comments *(in addition to those in Questions section)*

A. *Content*

P.12-1, line 26 – Please formally define priority coastal water bodies; P.12-15, line 359 – Define LRD; P.12-16, line 405 – define RMA.

P.12-1, lines 28-29 (Integration) - Sentence is vague; it would be helpful to provide a table clarifying the priorities for the nine ecosysetms reflected in the District's Strategic Plan. This table could also clarify certain information mentioned in the Chapter, such as projections as to when VECs will be identified for Naples Bay (p.12-15, lines 1158-1159).

General comment - For each coastal ecosystem, the continuing projects should be listed in a table; readers can then be referred to the 2006 SFER for further information. It does not seem sufficient to state, in the present form of the Chapter, "For continuing projects, see the 2006 SFER" - e.g. p.12-55, lines 1213-1214 - it would be more helpful to provide brief information as a list of which projects continued in each coastal ecosystem as part of WY2006 activities, considering that for many of the projects, information on the project initiation / ending dates is difficult to find or unclear in previous documents or, for some projects, continuation was to be contingent upon performance evaluation. This comment pertains to p.12-19, line 507, p.12-25, p.12-26; p.12-49, line 1144 to p.12-50, p.12-51; and p.12-55 to p.12-56.

P.12-9, 1st para. - Please clarify the monitoring frequency and number of sites for oysters during WY 2006 (as was done for seagrasses) - same sites as last year? Suggest that the sites be added to Figure 12-7 to help readers.

P.12-13, Figure 12-11 legend - Please clarify the year of last sampling upon which the map is based.

P.12-18 - Summarizes briefly and somewhat confusingly an enormous amount of elegant work that was clearly, logically presented in Appendix 12-2. Given the quality of Appendix 12-2, and its significance to the District's efforts in the coastal ecosystems during WY 2006, it is important for the authors to add a detailed flow chart with 1-2 supporting figures and tables that clearly summarize the efforts and supporting logic of Appendix 12-2. This should be required for Chapter 12 especially considering that

the District's major emphasis in WY 2006, among the nine coastal ecosystems, was the Loxahatchee River and Estuary. It will also greatly help readers to understand the logic and context of the chapters in Appendix 12-2.

P.12-19, Lake Worth Lagoon, Introduction - The important muck problem and associated pollutants should be briefly described here (2-3 sentences).

P.12-19, line 514; p.12-28, line 683 - The websites could not be accessed.

P.12-13, line 605 - What was the exception and possible reason for its occurrence? (please briefly clarify)

P.12-23, lines 622-623 - Please change to ...composed of cyanobacteria (blue-green algae), especially .... Regarding the next sentence, (a) *Synechocystis* spp. (and *Synechococcus*) are also found in freshwaters, and (b) Some strains within each genus have been shown to make toxins (e.g. see Cox et al., 2005, *Proceedings of the National Academy of Sciences* 102, pp. 5074-5078).

P.12-28, lines 693-694 - It appears that these websites were last updated in 1999 and 2003?

Lines 624-626 – Please add brief information about the maximal chlorophyll *a* concentrations.

P.12-31, Figure 12-18; p.12-35, Figure 12-20; p.12-48, Figure 12-30 - Please clarify the number of samples per date in figure legends, and add SEs.

P.12-36, lines 841-856 - Please provide more information (including supporting references) for the techniques used to measure DOM and bioavailability in this WY 2006 study. Line 852 - was the artificial sediment control autoclaved?

P.12-37, line 896 - Identify/clarify what is meant by secondary biogeochemical factors.

P.12-54 - On p.12-18, line 483 and in Appendix 12-2, oysters are described (Loxahatchee system) as having an optimal salinity range of 10-20 ppt. On p.12-54, oysters are described to have an optimal salinity range of 15-25 ppt (Estero Bay). Is this accurate? (differs by system?)

P.12-54, line 1189 - Please change American to eastern.

P.12-54, lines 1204-1205 – Briefly clarify the seagrass species present/ dominant.

B. *Editorial suggestions*

This Chapter and its supporting Appendices continue to mix English and Metric units (even on the same page!). Also, parameter units were sometimes inconsistent (e.g. salinity units ppt, psu were mixed in various parts of the report; µg/L was mixed with ppb in the Algal Bloom section; many sections give distances in miles, yet other sections such as the Caloosahatchee River give distances in kilometers; in Appendix 2, acres are mixed with hectares [e.g. Chapter 3], etc.). Please alter for consistency.

It would be helpful for the authors to clarify when the provisional data mentioned in various parts of the Chapter will be finalized.

P.12-1, line 22 - Change to: Nine major ecosystems...

P.12-5, 1st para. - Should refer to Figure 2.

P.12-5, line 133 - Please clarify the seagrass species (common names, scientific names) and change oysters to eastern oysters (Crassostrea virginica).

P.12-7, Figure 4 - Add Okeechobee to the key.

P.12-10, Figures 12-8, 12-9 - The second arrow for hurricanes is inconsistent in placement; please alter.

P.12-14, lines 350-353 - Need to refer to Appendix 12-2.

P.12-15, Figure 12-13 - It would help to indicate the river miles.

P.12-19, line 511 - Change is to are.

P.12-23, lines 620, 623, 764, 765, 826 and throughout Appendix 12-3 - Algae bloom should be algal bloom.

P.12-23 to p.12-24, Algal Bloom, and p.12-29 to p.12-36 - Only one description of the bloom should be presented in the Chapter; if the bloom mostly occurred in Florida Bay, the Biscayne Bay section should briefly mention it and refer to the Florida Bay section, and vice versa. Also, Appendix 12-3 contains much overlap with this section; suggest that the small amount of extra information in Appendix 3 could be moved to the Chapter and the Appendix be eliminated. Pp.12-30 to 12-36 contain a nice description of the bloom, including excellent timeline and hypothesis tables.

P.12-27, line 667 - Should be 2005-2006?

P.12-28, lines 700-702, sentence beginning "This section..." - Should be moved to line 671, or omitted.

Bottom of p.12-29 to 12-30 - Should be combined with p.12-23 - p.12-24 (redundant).
P.12-32, Figure 12-19 - The green colors designating varoius categories of higher chlorophyll concentrations cannot be discerned.
P.12-37, line 894 - Omit may be
P.12-38, line 907; Figure 12-29 key - Change submerged to submersed.
P.12-39, line 937 - Explain Fv/Fm for readers.
P.12-42, p.12-43 - Are out of order; should follow p.12-44.
P.12-45, line 1062 - Include the scientific name for tape grass here where first mentioned, rather than on p.12-46.
P.12-46, line 1081 - Change to observed since 2001.
P.12-49, line 1117 - Change to oyster health.
P.12-51, line 1165 - Omit in.

III. Review of Appendix 12-2

A. *Overview*

Because Chapter 12 – Loxahatchee River and Estuary section referred frequently to this Appendix, this reviewer felt that evaluation of Chapter 12 required examination of this important supporting document. The Plan was developed by the District, FDEP and FPS District 5, and the Loxahatchee River District. The overall goal was to develop a practical restoration goal and plan that provides restorative flows to the ecosystem of the Northwest Fork. The overall goal is to balance water supply, flood protection, water quality, and ecosystem health. The Plan is designed to (a) maintain or improve the riverine floodplain hydroperiod; (b) increase growth and recruitment of beneficial freshwater vegetation while controlling or discouraging growth of mangroves (which, though normally considered beneficial species, have encroached up-river because of freshwater withdrawals, closing of the Jupiter Inlet, and saltwater intrusion) in (former) riverine floodplain areas; and (c) minimize impacts on downstream estuarine communities.

Appendix 12-2 summarizes what obviously has been an enormous amount of work. Introductory information (Chapters 1-2) is followed by vegetation surveys and division of the NW Fork into five areas, each represented by a valued ecosystem component (VEC, a species or group of species used to indicate overall ecosystem health): (1) Bald cypress swamp and hydric hammock in the freshwater riverine floodplain (RMs 16-9.5), (2,3) Cypress swamp in the tidal floodplain and fish larvae in the low-salinity zone (RMs 9.5-5.5), (4) Oysters in the mesohaline estuary (RMs 6.0-4.0) and (5) seagrasses in the polyhaline (higher salinity) zone (RMs 4-0). Corresponding performance measures (PMs) were also determined for each VEC, based on carefully explained and sound logic. Three hydrologic/salinity models (WaSh, RMA, and LSMM) were developed, using a 39-year period of record (1965-2003), to evaluate restoration alternatives (Chapters 5-6), considering the hydroperiod/ flow requirements of the VECs. Analysis of constant and, more realistically, variable-flow scenarios enabled selection of a Preferred Restoration Flow Scenario (PRFS) (Chapters 7-8). The recommended PRFS to achieve the targeted PMs was determined to be a variable dry season flow of 50-110 cfs, with a mean monthly flow of 69 cfs over Lainhart dam while providing an additional 30 cfs of flow from the downstream tributaries. The PRFS, simulated by the LV90-TV60 model run, incorporates both dry and wet season hydrologic flow patterns and also considers the transition periods. Of the various flow scenarios examined, it provides the greatest ecological benefit to freshwater riverine and tidal floodplain VECs, with minimal impact on the estuarine VECs (oysters would benefit the least).

The means to achieve the proposed PRFS are still being developed. Importantly, the analysis in this Plan did not consider water availability – rather, its focus was to develop restoration flow alternatives and a PRFS, and a basic (major) assumption was that additional water needed will be possible to deliver through the G-92 structure, and from tributaries downstream of the Lainhart Dam. The PRFS, if adopted, will surely improve the freshwater riverine and tidal floodplain communities as a major step in the restoration of the NW Fork, but achieving this goal will require many actions (e.g. list on p.iv). Next steps (p.11-5) are for CERP NPBC Projects to examine the feasibility of the proposed PRFS, estimate the amount of supplemental water that will have to be supplied to the NW Fork and tributaries, determine the amount and location of storage facilities that will be needed, and identify projects that can meet these needs. The authors also point out The authors realistically acknowledge that additional flow adjustments may be needed as more knowledge and experience are gained (p.11-3); for example, further analyses are needed to

improve estimates of water deliveries from tributaries downstream of Lainhart Dam. It is hoped that once the PRFS can be achieved, additional efforts can target improving the estuarine ecosystem.

Overall, the work represented by this Appendix is extensive, innovative, of excellent quality, and nicely presented – well written with many helpful tables and figures. The conclusions are justified by the data and the analyses. Carefully considered analyses (e.g. p.4-15, p.4-24, p.7-28, p.7-45, p.8-4, p.10-17 – many other examples), well-clarified assumptions of modeling approaches and limitations (e.g. p.7-32) are also characteristic of the writing. As the authors point out (p.11-6), the flow restoration targets developed in this Plan provide a foundation for determining how any "new" water captured or delivered in the watershed should be allocated for consumptive uses versus environmental resource protection.

B. *Comments* *(in addition to those in the Questions section)*

Glossary - A nice feature for readers! LNWR and LWL could be added (also please define LNWR on p.1-4).

Chapter 1

P.1-9, 8 lines from bottom – Please also define "significant harm".

P.1-11, para. Under FDEP, lines 3 and 5 – Please clarify "north" and "south" (does this mean upstream and downstream?).

Chapter 2

P.2-11 – Kitching Creek – please clarify as per Question section.

P.2-5 to p.2-8 – There do not appear to be flow gauges in 7 of the 12 sub-basins. Please clarify how the District plans to resolve this problem (briefly addressed in Chapter 10; helpful to address here).

P.2-11, Water Quality; p.2-14; Chapter 10; and Appendix D – See Question section; please add clarification about the District's plans for strengthening the water quality database to Chapter 10.

P.2-13, Figure 2-6 – Please add error bars or SDs?

P.2-14, Figure 2-7 – Is the trend for TP significant?

P.2-15, last bullet – Should this be total coliforms, or fecal coliforms (mentioned earlier)?

Chapter 3

P.3-10, 1st para. – It would be helpful to add the total areal coverage in 1940 vs. 1980.

P.3-10, 2nd para., line 7 – Please change was to were.

P.3-12, Table 3-1 – The various abbreviations need to be explained here (have not been defined yet).

P.3-14, Line 3 – Please change to: together in 16 recognizable communities…

P.3-15 – Prior to Table 3-2, need to add a table of genus/species names and common names for these plants (they are referred to by their common names throughout the text, yet suddenly referred to by their scientific names in Table 3-2).

P.3-23, Transect #4; and p.3-28, Transect #6 – Please provide information on the number of plots, as for the other Transects.

P.3-28, 2nd para., 6 lines from bottom – m should be meters

P.3-28, 2nd para., 2nd to last line – please clarify "appear to have" – are the soil types uncertain?

P.3-32, 1st para. – It should be clarified here that fish larvae, oysters and seagrasses are the VECs.

P.3-35, 2nd – 4th paras. – It would be helpful to put this information into table form. Also, please add the genus and species names next to each common name in the 3rd para.

P.3-38, last line – Please change The dominant to Abundant.

Chapter 4

P.4-14, 1st para. – Please define salinity event.

P.4-14, last para., 1st sentence – Would it be better to say: Bald cypress is historically the dominant…

P.4-23, last line – Omit in.

P.4-24, 7 lines from bottom – Please clarify where the Pautuxent River is located (I know of two rivers with that name, one in RI and one in MD).
P.4-29, 3rd para., 3 lines from bottom – Add year to the Wilson reference.
P.4-33, last sentence – I cannot discern this from the Figure (?).
P.4-39, 1st line – It is recommended that nutrients be added to the data collection.
P.4-40, Table 4-5, Manatee grass salinity threshold for no stress – should this be ≥ 24 ppt? (see p.3-35). Should the level for potential stress be 16-23?
P.4-41, Table 4-6, Turtle grass – Please clarify why this threshold is given? (see p.3-35).

Chapter 5

P.5-7 to p.5-9 – The basis for the scores in the Tables is unclear – please further clarify.
Figures 5-17, 5-18, 5-21, 5-26 – the small photos are not very clear. Please also refer to a better map of the transect locations.

Chapter 6

This year's writing is easier to read, addressed the Panel's suggestions from 2005, and also includes some new information (e.g. statistics, more sites up-river etc.). Nicely done, and a strong contribution.

Chapter 7

P.7-31, Evaluation Methods, 1st line – Should be: predominantly
P.7-45, 1st para. – It is recommended that nutrients should also be considered.
P.7-53, 3rd line – Shouldn't this say five to seven flow scenarios?
P.7-53, last para., 2nd line – the VEC is fish larvae (ichthyoplankton), not zooplankton (microcrustaceans etc.); use of zooplankton here is confusing/seems misleading.

Chapter 8

P.8-18, Figure 8-11 – Point(s) associated with hydric hammocks should be added (?).
P.8-18, para., halfway down – How recent were the field and GIS data? (please clarify)
P.8-25, 3rd para. – This important point should also be added as a footnote to Table 8-4.
P.8-25, 3rd para., last sentence – What type of data? (please clarify)

Chapter 9

P.9-10, Figure 9-3 – X axis label should be: Julian day.
P.9-21 – Suggest adding supporting references to be consistent with other Chapters in this Appendix.

Chapter 10

P.10-4, 1.b – Please clarify – what other constituents?
P.10-4, Water Quality – Please see 3rd comment for Chapter 2, above; strongly suggest that the recommendation be altered accordingly.
P.10-5, Table 10-1 – The basis for each of these values should be briefly explained, with supporting references. Also:
Is this surface DO? Is bottom-water DO also considered? (strongly recommended).
What is meant by ammonia nitrate? Shouldn't these variables be separated?
The fecal coliform target values for the riverine floodplain seem high (e.g. for recreational activities such as fishing) – again, it would be very helpful to explain the basis for these values.
P.10-10, Riverine Floodplain Vegetation – Shouldn't riverine freshwater submersed vegetation also be monitored?
P.10-13, 1st para. – Please omit (repetitious with preceding page).
P.10-13, line 7 – please briefly clarify the environmental parameters recommended for monitoring.

P.10-14 – Suggest changing the heading to: Estuarine Macroinvertebrate Monitoring.

P.10-14, 2nd recommendation – New technologies hopefully would also enhance accuracy.

P.10-15, Table 10-4, Water Quality – Again, bimonthly monitoring is inadequate to provide adequate information about water quality; this should be altered.

Chapter 11

P.11-3, 2nd para., 2nd to last line – Should be ...experience are gained

P.11-6, Regulatory Implementation, 1st line – Suggest changing to: ...targets must be defined...

P.11-6, Minimum Flows and Levels Rule – Please clarify what is meant by "over time" (how many years estimated?).

P.11-7, 1st para. – 2nd e) should be f); f) should be g).

P.11-8, Monitoring..., 2nd para. to top of p.11-9 – The District should be encouraged to strengthen water quality monitoring of the Loxahatchee system. For example, the aquatic preserves and JDSP are Outstanding Florida Waters (p.11-11), and have the highest standards for protection of water quality. Yet, monitoring for various standard parameters (e.g. nutrients) presently is sparse (more than 40 locations according to p.2-12, but low frequency – bimonthly or less, depending upon the station). As another example, sediment loading to Cypress Creek and the NW Fork were identified as one of four major water resource problems (bottom of p.11-13; also described as a problem in Appendix 1, p.65) – there was no mention as to whether suspended sediments are monitored (and which stations) more frequently than bimonthly.

Appendix 2-D

P.D-2, Table D-1 –

Are these parameters all monitored bimonthly? At which stations? – Please clarify in Table legend.

Why is chlorophyll a not corrected for pheophytin? This is important for obtaining accurate estimates of chlorophyll *a* in riverine and estuarine systems where pheophytin typically is high, and can cause spuriously high estimates.

Is DO monitored near the bottom as well as near/at the surface? DO deficits are usually most pronounced in bottom water where sessile fauna can be most adversely affects.

P.D-5, Table D-6 – Please clarify whether DO is monitored near the bottom as well as at/near the surface.

Appendix 2-F – Labels are needed for the axes of Figures F1 to F7.

Appendix 2-G – Suggest adding a figure similar to Figure 12 in Appendix 1.

Appendix 2-H

Title – Suggest changing to: Fish Larvae and Zooplankton Studies

General comments – fish larvae seems to be used interchangeably with zooplankton (?) in places – e.g. on p.H-2, the reader is referred to Fig. H-1 for locations of fish larvae collections, yet the figure legend says "zooplankton". Please clarify throughout. It would also be helpful to add supporting references for some of the methodology and statements.

IV. Overall Assessment and Recommendations

This Chapter targeted progress in District programs and projects for nine coastal ecosystems. The authors responded to counsel by the 2005 Review Panel to completely restructure the writing so as to focus in depth on one of the nine ecosystems per year, with a more comprehensive review planned every five years. The authors greatly reduced the information provided on the coastal ecosystems, but did this - within the chapter - for all nine of them. Rather than including more detailed information on one of the ecosystems within the chapter itself, they referred readers to ca. 600 pages of appendices that focused on the Loxahatchee. It is recommended that the authors continue to move toward inclusion of detailed information on one of the nine coastal ecosystems within the body of Chapter 12. That having been said, it is difficult to

conceive as to how the authors might best have condensed and summarized portions of Appendix 12-2 to be fit into Chapter 12 (with more detail than the basically outline framework that was included), without losing the flow of logic in that Appendix - it is a masterful, elegant work that provides a great example of the kind of careful, detailed science that the District, over time and with sufficient resources, plans to and hopefully can bring to bear on all nine coastal ecosystems. As restoration goals for the floodplain vegetation and freshwater sections can be met, over time restoration of the estuaries can also receive more emphasis.

For each coastal ecosystem, the major issues should be briefly identified at the beginning of each section.

The authors should also add more information on new projects / progress for each coastal ecosystem.

The Chapter and Appendix 12-2, overall, were excellent in technical merit - innovative, sound science, clearly and logically presented. An area that should be strengthened is consideration of water quality (parameters and frequency of sampling).

The Chapter text regarding the algal bloom that developed in Biscayne Bay / Florida Bay is superior to the coverage of the same material in Appendix 3. The information about the algal bloom in the Chapter stands out as more detailed than most other information/ topic coverage in the Chapter. If it is retained in the Chapter, Appendix 3 should be omitted; or, it could be used in place of most of the information in Appendix 3.

Missing from the Loxahatchee section of Chapter 12 was much by way of identification and discussion, beyond the Northwest Fork, of how the District plans to address major issues for this Ecosystem - the important "next steps". In Appendix 12-1 (reviewed separately), major enhancement/restoration issues were identified (p.85) and included (1) minimal post-development inundation of the floodplain swamp community, (2) insufficient inundation to discourage encroachment of transitional, upland and exotic plant species, (3) displacement of younger canopy species into multiple forest types, and (4) insufficient inundation to enable aquatic life to use floodplain swamp habitats. Appendix 12-2 elegantly addressed how the District pland to resolve these issues for the Northwest Fork. It is recommended that, within Chapter 12, the authors clarify the District's plans (next year to several year) to address major issues for the rest of the Loxahatchee.

While recognizing that this information overlaps with Chapter 9, it is recommended that exotic species (major taxa and issues) in the Loxahatchee ecosystem (as this year's ecosystem of focus) be addressed in more detail within Chapter 12.

Finally, because of the uniqueness of the (nine separate) coastal ecosystems in comparison to systems reviewed in other Chapters, and because of the abbreviated structure of Chapter 12, it is difficult to determine whether management actions for the coastal ecosystems are integrated - likely not thus far, beyond the overall restoration goal, as this program is "young" in comparison to others. What is clear is that the coastal ecosystems that have been emphasized thus far (based upon SFER 2006) in the District's actions / projects have been approached analogously, with most focus on hydrology and salinity. Appendix 12-2 provided clear rationale for connections between initiated and planned research and projects. The Chapter and Appendix also contained valuable informaton about the various programs/entities involved in management of the coastal ecosystems, but integration of these programs and entities was sometimes unclear. Following the example set in Chapter 1A, it is recommended that Chapter 12 contain tables (and diagrams where appropriate) summarizing the main programs / entities and integrative efforts involved in the Loxahatchee restoration effort.

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Chapter 12 – Management and Restoration of Coastal Ecosystems
Date of Chapter Draft: 9/1/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: A
Level of Panel Review:
Primary: Accountability
X: Integrative

This chapter on coastal ecosystems is a good update of the chapter that appeared in the 2006 SFER. It focuses on progress made during the last water year and a few specific issues within a few of the estuaries.

Specific comments are given below:

Page 12-2, lines 41-43 and page 12-57: Cooperation and consultation with scientists from other agencies is noted, and apparently these agencies are primarily those in Florida. Also, the literature consulted and referenced in the Literature Cited section is all Florida related, and while the literature cited in the various appendices is certainly broader it is still missing significant work that could be of assistance to the coastal ecosystem work. It has been recommended before that the District staff take advantage of the extensive work in other states that border the Gulf of Mexico and the Atlantic on work that deals with freshwater inflow requirements for commercial and other valued finfish and shellfish. Technical information such as salinity tolerance and preference limits, water quality modeling to determine freshwater inflow requirements to meet such limits, upstream reservoir operation to provide such inflows, and so forth spanning many decades is available. In addition, responsiveness to legislative mandates to determine freshwater inflow requirements into the future in the face of competing municipal, industrial, and irrigation uses of water has also been demonstrated. Finally, coastal zone management methodologies have been developed, implemented, and evaluated. This reviewer believes it is terribly unfortunate that such information is not being utilized in the adaptive management approach being used in these coastal ecosystems. It is clear that the District is making significant contributions in the knowledge base of its coastal ecosystems. Ultimately, it needs to be able to utilize this information in regulatory and accountability contexts, and to that end it needs to take advantage of work that has already been done.

Page 12-4, Figure 12-1: The text in lines 22-24 and the figure title indicate that this figure shows the nine coastal ecosystems with the District, but it is not clear that the ecosystem is being defined as what appears to be the drainage basin plus the estuary itself. In the case of Southern Charlotte Harbor, the northern boundary appears to be arbitrary and perhaps that is because of the District's boundary being close by; for Biscayne Bay and Florida Bay, the ecosystems seem to overlap. Perhaps the authors can clarify what the boundaries to the ecosystems are indicating.

Page 12-5, line 132: The District seems to be using the term Valued Ecosystem Component (VEC) in ways similar to the term Key Species was used in the past. What is the definition of VEC as the District is using it?

Page 12-5, lines 136-138: What are the salinity tolerance values the District is using and what published and gray literature has been referenced? Please provide this information in the chapter or in a separate appendix. There have been significant compilations of such information by various institutions in the past, and those references should be included in the literature the District is using.

Page 12-7, Figures 12-3 and 12-4: These figures need to be on separate pages so that the detail shown in each is more visible. The four lines in Figure 12-3 are in some places almost indistinguishable at the current scale.

Page 12-8, Figures 12-5 and 12-6: These two figures should also be on separate pages for the same reason as the previous two. More importantly, the preferred salinity envelope for oysters is shown to range from 8 to 25 ppt in Figure 12-5 and from 20 to 32 ppt in Figure 12-6. Why are these different? How is "preferred salinity" being used compared to "salinity tolerance"?

Page 12-10, Figures 12-8 and 12-9: The salinity graphs indicate significant summer freshwater inflows (and hence lowered salinities) in 2003 and 2004 but not in 2005. What happened in 2005 to reduce freshwater inflows so significantly?

Page 12-18 and 12-19, lines 478-488: The impacts on the estuarine ecosystems as described here and in Appendix 12-2 are based on salinity tolerance information for finfish, oysters, and seagrasses. Chapter 4 of Appendix 12-2 provides the salinity tolerance information used for each of these organisms or organism groups with some sense of the temporal variability needed to accommodate some larval forms. A calibration process was then used to relate salinities to existing oyster densities at different locations in the Loxahatchee Estuary, and the relationship that resulted from that calibration process was then used to assess long-term simulations of oyster distribution and densities. This calibration process is not clear.

In addition, in Chapter 4 of Appendix 12-2, there is a Ds/Db ratio that integrates salinity exposure duration, magnitude, and recovery time between salinity events. Please provide more detail re the calculation of this ratio.

Page 12-21, lines 562-567: What are the salinity tolerances of the organisms used to determine freshwater inflow requirements?

Page 12-24, Tables 12-2 through 12-5: Does "target volume" actually refer to "target flow" so there is a relationship to Table 12-1? If not, what does "target volume" refer to in this context?

Page 12-29, Section on Florida Bay Water Quality Dynamics – WY2006 Algal Bloom Assessment: This is an interesting situation in that the growth of blue-green algae in late 2005 and early 2006 is termed an algal bloom. Compared to background levels of chlorophyll a, there is a significant increase in chlorophyll a, but in terms of the concentration of chlorophyll a compared to criteria for defining eutrophic conditions, the levels observed are in the oligotrophic to lower mesotrophic range and even then only temporary.

This section discusses the relative impact of road construction vs. hurricanes on total phosphorus and chlorophyll a concentrations. The total phosphorus concentration data provided can be used for further analysis which this reviewer recommends to the authors. The first question to address is what is the mass (volume times concentration) of total phosphorus in the Sounds during the elevated total phosphorus concentrations? The second question is the source of total phosphorus: (1) what is the mass of total phosphorus that could be derived from the cutting and mulching of mangrove trees and soil tilling and soil stabilization in the period immediately following the operation (the soil and agricultural scientists should be able to help estimate the amount of leaching that might occur); and (2) what is the mass of total phosphorus that could be released by the top 2 to 5 cm of the Sounds' sediments being resuspended and stirred by the waves in these shallow water systems created by the three hurricanes moving through? The third question is which estimated total phosphorus mass better approximates the mass of total phosphorus in the Sounds during the elevated total phosphorus concentrations? Take into account the temporal nature of the event.

Page 12-37, lines 874-876: What are the assumptions made about the growth kinetics of the seagrasses in the simulation model (i.e., Michaelis-Menton kinetics? Michaelis constants for nitrogen and phosphorus?), and what is the source of the nutrients – the water column or the sediments?

Page 12-49, lines 1132-1136: What are the results to date of the phytoplankton growth studies with nutrient limitation and how do those results match literature values?

Posted: 20 Sep 2006 03:53 PM

App 2-2: Consideration of Long-Term Climatic Variability in Regional Modeling for SFWMD Planning & Operations

Subject: **Review by Jordan**

This is an interesting addition to the SFER in that it introduces an important and complex issue to the water resource planning agenda. The technical aspects of most of this appendix have been reviewed by past panels as well as outside experts. Consequently, it appears the technical aspects of this appendix have been addressed. A few editing changes are needed:

Line 218 and 224 are unclear, line 231: the index idea for AMO has been introduced---should the makeup of the index also be introduced here? How is the index calculated?

The seven questions posed by reviewers on page 5 are the major issues that need to be addressed. This appendix does a good job of summarizing complex and uncertain information. The use of sensitivity analysis is crucial to the application of this material.The final sections of the appendix on the role of adaptive management and how climate information is used is helpful. Overall, this is a good introduction to the subject.

Posted: 18 Sep 2006 02:46 PM

Subject: **Armstrong Comments**

Appendix 2-2: Consideration of Long-Term Climatic Variability in Regional Modeling for SFWMD Planning & Operations
Date of Chapter Draft: 9/1/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level: A
Level of Panel Review:
Primary: Technical
X:

This is an impressive piece of work. The problem has been defined as have the variables of interest, and the possible shortcomings identified. For example, they looked primarily at ENSO, AMO, and PDO as their variables. And variables they are; events that occur with a variable period, and at least in the last two, periods that can extend over decades. In spite of this, the authors have approached the problem with care, and as the predictability of their variables improve, their predictions for South Florida will improve. The fact that positive and potentially useful results are being obtained is gratifying.

It would help the reader if a graph of the 1965 to 2000 period of record rainfall could be displayed along with the changes that might be imposed by considering these long-term trends in dry and wet periods.

It is suggested that this work be related to the seagrass die-off problem in Florida Bay. When this reviewer served on an oversight panel for Florida Bay, the issue of long-term variability in environmental forcing functions did not arise outside of the ocean currents from the west bathing the Bay and water flow constrictions through the keys on the east

caused by the construction of the Flagler railroad in the early 1900s. Seagrass die-off that had occurred in the mid-Atlantic estuaries several decades ago was never fully explained, and similarly the die-off of seagrasses in Florida Bay while studied extensively could not be explained by eutrophication phenomena or hypersaline conditions that formed in the northeast corner of the Bay during the summer period. While this reviewer considered long-term variations such as El Niño that might impact Florida Bay, it was not pursued. However, long-term warming and cooling trends may indeed affect the seagrasses in Florida Bay, and this work could prove very useful to explaining seagrass "health" trends in Florida Bay.

One specific error is noted here:
Page 44, line 1180: The phrase "...climatic shifts..." is probably intended rather than what is written.

Posted: 19 Sep 2006 12:26 PM
Originally Posted: 19 Sep 2006 12:24 PM

App 3B-2: Status Report on ACME Studies on the Control of Hg Methylation and Bioaccumulation in the Everglades

Subject: **Joanna Burger; COMMENTS ON App 3B-2**

This long-term study of the factors leading to the formation of methylmercury in the Everglades is extremely important, is ground-breaking, and will affect both restoration of the Everglades and inform ecosystem management elsewhere. The possible factors identified, sulfur, organic matter, iron, and wet/dry cycles are critical for understanding methylation. The long-term mesocosm studies, which have indicated, among other things, that sulfate acts on new mercury inputs was ground-breaking. Their 2005 study of the negative effects of iron on mercury methylation is equally ground-breaking, and requires additional study and confirmation. These studies should certainly continue, with the possible addition of larger mesocosms, operating for a longer time-period.

While the conclusions (that sulfate increases methylation and iron decreases it) are thought-provoking, considerably more research is necessary before iron addition can be considered a viable, even larger scale study. What, for example, are the effects of iron on other components of the system, including the food chain? What are the effects of iron-addition on the species composition and relative numbers of other bacterial, which in turn affects higher trophic levels?

In terms of format, this chapter is clear, concise, and it is easy to find the past results, a context for this study, and the results of this study. It is extremely helpful to have the objectives, design, and findings so clearly laid out. The authors are to be commended. However, it would help to have line numbers on the pages.

1. What is the large variation shown (among days) in Fig. 2 due to?
2. Could some summary graphs and statistics be presented for the individual replicate studies shown? (pages 9-19)
3. Page 2-19: How many (or what percentage) of bacteria might be expected to have an iron effect?
4. The photographs really help.
5. Page 2-24. Are there ways to selectively affect population levels of species of bacteria, in a management sense?
6. Fig 17. How robust are the data? How many studies or replicates?
7. For some reason, I did not find the DOC section as clear, or the findings as clear.
8. A summary graph or table showing the conflicting results of the overall results of this series of studies might be helpful.

9/15

App 3B-3: Preliminary Assessment of Sulfur Sources, Trends and Effects in the Everglades

Subject: **Joanna Burger; COMMENTS ON App 3B-3**

The role of sulfur as a contaminant in the Everglades ecosystem is only just beginning to be identified and explored. However, the potential for sulfur to have far-reaching effects appears large, making this a high priority research area. In the future a number of experiments should be designed to examine the effects of sulfate on both plants and animals within the Everglades.

The data compiled to date indicate extensive sulfur contamination in the Everglades, highly sulfate enrichment in the northern Everglades, increased microbial sulfate reduction, and differential effects on plants. The format of the presentation is clear and easy to follow, with the major findings clearly stated.

INFLUENCE OF SULFATE ON HG

One of the most important issues in the Everglades is determining the effect of a number of factors on Hg methylation and concentrations. Thus, determining the influence of sulfate on Hg distribution and effects is an important question. It is critical to investigate the potential effect of changes in sulfate on methylation and the accumulation of methylmercury in fish and other components of the ecosystem. The potential effect of lowering sulfate levels on methylation should be explored in a number of experiments. The restoration goal of moving more and more water southward in the Everglades provides the potential for higher Hg problems.

TEMPORAL TRENDS IN SULFATE CONCENTRATIONS

This section describes the trends in sulfate concentrations at different structures within the Everglades. Generally sulfate concentrations trended upward for half of the structures on the southern and eastern edge of the EAA, while water flows declined at the northern structures. The canal-born sulfate loads come from the structures on the eastern and southern side. Generally there was no clear seasonal trend. The trends data to date indicate a need for verification of the trends in other years, and examining the underlying drivers the trends.

Trends analysis for sulfate concentrations are extremely important not only for examining changes over time and space, but for beginning to understand potential pathways and exposure routes. Understanding the relationships between mercury in fish and the sulfate/sulfide ratios should prove important.

SOURCES OF SULFUR

If the relationship between sulfate levels and Hg methylation holds, then the question of sulfur sources

becomes more important for management. The surface water data indicate that sulfates originate in the EAA, although there is some question about the role of Lake Okeechobee.

The key methodological issue is how to define and distinguish the different sources of sulfur in the Everglades. Identifying the sources (or at least the movement) of sulfur is being accomplished using stable isotopes of sulfur. The sources examined were the EAA, rainwater, and groundwater, with the goal being to construct a conceptual model of sulfate movement in the northern Everglades.

EFFECTS OF SULFUR CONTAMINATION

Sulfate stimulates the activity of sulfate reducing bacteria (under anoxic conditions), in the presence of organic matter, and these bacteria are important mediators of methylation of mercury. In contrast, sulfide inhibits this methylation. Since maximum methylation occurs between 10 and 100 mg/l of sulfate, this provides a management goal. The areas of maximum methylation are thus going to occur where sulfides are low and sulfates are high. High sulfate levels can affect plant growth and thereby community structure, result in internal eutrophication, and can possibly affect benthic communities.

QUESTIONS

1. Page 3B-3-15. Any idea what the drivers are for trends in sulfate distribution?
2. How will you be able to distinguish between agricultural use and any effect from Lake Okeechobee?
3. Page 3b-3-58. How much of the conceptual model are you confident of? It seems a quantitative budget is necessary.
4. Page 3b-3-59. Is there a potential for even larger mesocosms or other experimental units? Are there problems with small mesocosms with respect to these biogeochemical studies?

RECOMMENDATIONS

1. Devote experimental time to determining the drivers for differences in sulfate distribution throughout the Everglades.
2. Continue mesocosm experiments to determine the relative effects of sulfides and sulfates.

Posted: 15 Sep 2006 10:01 AM

9/17

Subject: **Sulfur [Ping Hsieh]**

1. Sulfur biogeochemistry and Hg bioavailability are closely related. Study of sulfur in SF is warranted.

2. Sulfur in SF is not a limiting nutrient, so it is not expected to be removed through plant uptake as P did in the STAs. Microbial sulfate reduction, which produces sulfide as the end product, is probably the major pathway to remove sulfate from water column (I was surprised that net sulfate reduction did not occur in the STAs). Study sulfides, therefore, is essential in the understanding of sulfur budget in SF. Porewater sulfide is only part (usually small part) of the total sulfide in the system. Future study may need to include other sulfide forms (such as acid volatile sulfide and Cr-reducible sulfide) as well as iron to complete the picture of S budget in SF.

3. Increase in sulfate concentration may or may not be the reason for increased Hg in fish. For example, Hg in fish is high in ENP but the sulfate concentration is low..

4. Sulfur isotopic ratio is not a good tracer for sulfur source in SF, because of the large fractionation involved during sulfate reduction (Fig. 16). Cl concentration SO4/Cl ratio and mass balance calculation of sulfur among consecutive reservoirs of everglades may provide useful information about the sulfur budget.

5. Fig. 17. The diagram and figure legend do not match.

6. I can not see how Fig. 18 and 19 can tell the effect of sulfate loading on the growth of typha and cladium since they are all averages over five levels of sulfate doses?

Posted: 17 Sep 2006 11:40 PM
Originally Posted: 17 Sep 2006 11:41 PM

9/18

Subject: **Review by Burkholder - Appendix 3B-3**

Appendix 3B-3: Preliminary Assessment of Sulfur Sources, Trends and Effects in the Everglades

A. *Overview*

This Appendix presents a compelling case, as preliminary findings, for increased contamination of the Everglades Protection Area (EPA) by agricultural sulfate fertilizer applications in the Everglades Agricultural Area (EAA). The authors compiled and graphed available surface water sulfate data for the EPA (from the District's DBHydro dataset and the USGS ACME); estimated sulfate loads at major inflow/outflow structures; conducted trend analyses in an attempt to examine changes in sulfate concentrations, flow, and sulfate loading over time; and used both spatial trends for sulfur and stable S isotope data (ä ^{34}S) to gain preliminary information about the sources of

sulfur to the Everglades. The study included surface water (at ca. 50 sites), rainwater (at 15 sites), and sediment porewater (at a limited number of sites sampled by the USGS). They also provided preliminary results from an ongoing mesocosm study (since Nov. 2003) of the potential impacts of sulfate additions on cattail and sawgrass productivity and plant height. The Appendix is well written and generally clear in presenting the authors' step-by-step approach. The explanatory information given in the Introduction is backed by strong supporting literature. The complexities influencing the relationship between sulfate, sulfide and methylmercury were nicely conveyed, and the maps compiled by Tetra Tech are very helpful.

The findings to date suggest that there is extensive sulfate contamination in the Everglades; that there is a gradient of lower sulfate in Lake Okeechobee, then high sulfate in canals draining from the EAA, then with large sulfate-contaminated areas of the Everglades; and that the major source of this sulfate contamination is agricultural fertilizer applications in the EAA (rainwater and groundwater thus far do not appear to be major sources, based upon stable isotope analyses). The stable isotope methods are sound, and the data are compelling (both field data and the data from fertilizers that were analyzed over several years). They point to the EAA, via canals, as a major sulfate source to "downstream" areas such as the WCA-2 (site F1). But the authors should point out that the sulfur isotopic ratio approach is somewhat problematic because of the large fractionation that occurs during sulfate reduction. Have the authors considered using sulfate/chloride ratio information?

Sulfate concentrations and flow tended to trend in opposite directions (linked to restoration efforts) for many of the structures that contribute significantly to the sulfate load (p.47); thus, despite increasing concentrations at key source sites, sulfate loadings apparently have not changed over time. Although sulfate is highest along canals, even in interior sites within the marshes the data thus far (based upon relatively few sites) suggest that there is an overall north-to-south gradient in sulfate concentrations. Limited porewater data show very high sulfate concentrations in northern, more sulfate-contaminated areas. The authors suggest that the "good news/bad news" from the data so far (e.g. lines 221-229) is that concomitant declines in sulfate and mercury in fish in WCA 2 and WCA 3A suggest that sulfate reductions could reduce mercury concentrations in fish as a widespread effect in the EPA but, on the other hand, sulfate levels in some canals draining the EAA seem to be increasing. In addition, Everglades restoration efforts may be exacerbating the sulfate problem – sulfate-contaminated waters are being rerouted and transported further into the EPA as more water is moved south for restoration. To err on the side of caution (conservatism), though, it would be good to point out that increased sulfate may be one of several reasons for increased methylmercury in fish.

While continuous flow data were available for ca. 50 structures in the EPA, there were low-frequency data for sulfate (collected only quarterly), extreme variation in the data (e.g. shown by Table G), and few samples collected at some sites. As Tables D-F indicate that the valid entries were considerably above 3 for each station included in the analysis, on line 754 did the authors must mean 3 valid data values per year? Overall, the authors

found that sulfate concentrations increased at about half of the major flow structures along the southern and eastern edge of the EAA (lines 834-836). It would be helpful to clarify here for readers, why only half? – i.e., why such variability (specifics of the sites, flow differences etc. likely contributed).

The authors identified a long-term goal, to quantify insofar as possible the ultimate sources of S to the EPA and trends in S loading over time, and to construct a quantitative budget for sulfur contamination to the Everglades. Next steps planned will (a) target soil and groundwater data collections; and (b) complete an intensive field collection of data on sulfate and sulfide concentrations and stable isotope values (adding oxygen stable isotopes, a good idea that will help in interpreting the role of potential sources). The latter effort is designed to track sulfate sources/transport during storm events and through agricultural fertilizer application cycles. It should be noted, though, that efforts to create a S budget may also need to consider other sulfide forms along with porewater sulfide (e.g. acid-volatile sulfide), and complications from iron and organic matter. (c) The ongoing field mesocosm experiment will also be continued. The experimental design seems sound, and the experiment is yielding interesting and valuable information about influences of a gradient of elevated sulfate concentrations on porewater sulfide, ammonium and phosphate. The authors also hope to obtain further insights about influences of elevated sulfide on the sediment microbial consortium and emergent macrophyte populations.

B. *Specific comments*

Maps – For this Appendix to "stand alone," it would be extremely helpful to include a map showing the major areas and structures referenced (especially label the WCAs, and need to show the L67 canal, the Miami Canal, the head of Taylor Slough, Taylor Creek, Canal L-28, WCA-2B, S5A, S6, S7, S8, S150, STAs 2,5,6).
Maps #2, #3 – The authors state several times in the writing (e.g. lines 514-517, 994) that sulfate concentrations in Lake Okeechobee are lower than concentrations in the EAA, but unfortunately the stations apparently are so close together that the maps seem to show higher concentrations coming from the Lake. This created a troubling question until I finally reached Figure 15. It is suggested that clarification be provided on this point in the Map legends.
Map #2 – I may have missed it, but could not find explanation for the high concentrations of sulfate along western Florida. Please clarify. (Also for sulfide concentrations shown in Map #6).
Line 139 – Please specify, here, the dates for the entire period of record.
Lines 174-175 – A little more clarification is needed.
Lines 230-234 – More explanation would be helpful; it should also be clarified that thus far, there has been no apparent effect on the productivity and growth of the two important emergent macrophytes being tested.
Data used (pp.20-21, lines 414-419, pp.26-27) – This information was somewhat confusing and clarification is needed – it would be helpful to add a table summarizing the major datasets used, the duration/frequency of sampling, and number of stations (~50 flow structures, 6 interior marsh sites, 15 rainfall sites, x porewater sites).

Planned work for 2007 – Will tree islands be included in the intensive measurements? The hypothesized impacts presented on p.20 (lines 391-396), considered together with the known value of these areas, suggest that tree islands merit close examination.
Lines 453-454 – This overall gradient (interior sites within the marshes) does not seem clear from the Map referenced. Please clarify.
Figure 1 – Are these "global average" values?
Lines 555-557 – Are rainwater concentrations of sulfate statistically significantly higher than in pristine areas of the inner marshes?
Lines 579-580 – Was there inter-calibration to ensure comparability of the data from the different methods used? This point should be clarified.
Figure 3 – It should be noted that since these data are from the top 5 cm of sediment, they could significantly underestimate the sulfide concentrations, since maxima can occur down to a sediment depth of 20 cm (Figure 2 and lines 590-591).
Figures 4-6, 9 – It would be very helpful to include the P values, trend line, confidence intervals, and the overall percent change.
Map #9 – Please explain the significant upward trend in sulfate loading along the western shore of Lake Okeechobee?
Figures 11-13 – Please add the P values and r values. Would a polynomial fit better than a linear fit for the data in Figure 13?
Pp.61-62 – These figures do not seem to convey the results of the study very well – it would be more instructive, perhaps, to show Pn and shoot elongation rates for the two species across the sulfate concentration gradient. Also, the authors should comment on the potential for "container effects" over such a long-term experimental period.

C. *Editorial Suggestions*

Line 22 – Should be pollutants. Line 27 – Change to: ...are poorly understood.
Lines 60, 407 – It seems somewhat over-described to state that a wider range of S species was examined; actually, two S species were examined (sulfate, sulfide) rather than one (sulfate) considered by the U.S. EPA's REMAP study.
Line 84 – Should be: ...and 2B, and were... Line 428 – Define MDL.
Lines 489-491 – Sentence is incomplete. Line 493 – change is to are.
Line 880 – Change extremely to highly.
Figure 17 legend - seems to go with Figure 19?

Posted: 18 Sep 2006 12:54 AM

Appendix 3C-1 – Calculation of Annual and Five-Year Geometric Mean Total Phosphorus Concentrations....

Comments from Robert Ward, Posted: 18 Sep 2006 01:58 PM

Appendix 3C-1 is, in many ways, a data analysis protocol that describes precisely how data will be analyzed to determine compliance with phosphorus standards (or 'criterion rule' in the wording of Chapter 62-303 of the Florida Administrative Code) applicable to the Everglades Protection Area. As with other standard compliance determinations in South Florida, it appears that the data used in the calculations will be that available as a result of monitoring for a variety of purposes. In other words, the data used in the computations are not collected by a statistically designed monitoring program dedicated to the purpose of standard compliance (acknowledgement of this fact is noted in the reference to uncertainty as to how many samples will be available each year – a fact that can lead to inconsistency and incomparability in statistical findings). In light of this situation, the method presented fits well with the U.S. Environmental Protection Agency's (2003) recommendations regarding secondary information products (e.g. the data are checked for quality assurance, the rules for use of data are spelled out, the calculations are described, and the range of interpretations of the results discussed). A study, currently underway by the Water Environment Federation Research Foundation, provides similar insight into the methodologies employed to assess standard compliance (the final report for this study will be published at the end of 2006).

It is not clear how many samples will be used to compute the annual individual geometric mean. Are there 12 monthly TP values (one per month) or is all the data collected each month averaged (how?) to create one observation per month. Is there any control over the number of samples employed in the calculations or is the number dependent upon available samples that clear the QA/QC filter? The statement in lines 69-71 indicates there is no control, which has the potential to lead to inconsistent calculations, making year-to-year comparisons difficult, if not impossible from a sound science perspective. Furthermore, the computed annual individual site geometric means, when there is adequate samples for computations, may be based on quite different sample sizes. Will this sample size difference cause further comparison problems?

Is the calculation of the five-year network geometric mean based on the arithmetic mean of all the annual individual site geometric means computed over a five year period? Why is the six-sample exclusion added when the five-year network geometric mean computed, but not when the annual individual site geometric mean is computed?

The reason for designating monitoring sites either 'impacted' or 'unimpacted' is not clear. One can infer from the desire to so designate monitoring sites stems from a desire to determine, in some fashion, how much of the Everglades can be declared 'recovered'. In Chapter 3-C (page 3C-11, lines 368-370) there is a statement that counters the ability to identify the percentage of the Everglades exceeding the TP criterion:

> "...as the monitoring sites are unevenly distributed across the EPA, it is impractical to estimate accurately the percentage of the marsh exceeding a TP concentration of 10 μg/L based on these results."

Thus, the question arises, what is the purpose of designating sites 'impacted' or 'unimpacted' if the design of the monitoring system does not permit this designation to have scientifically sound spatial meaning?

Does the methodology described in Appendix 3C-1 apply to phosphorus standard computations in all areas of South Florida (in the spirit of an integrated report on South Florida's environment)? If not, what methods are used elsewhere and why are different methods being employed in different regions of South Florida?

App 3C-1: Calculation of Annual and Five-Year Geometric Mean Total Phosphorus Concentrations to Assess Achievement of the Phosphorus Criteria for the Everglades Protection Area

Subject: **Review by Burkholder - Appendix 3C-1**

In this succinct Appendix, some fundamental information should be added:

- Define geometric mean, and explain how it differs from arithmetic means.
- Explain why geometric means were selected for use, including appropriate references.
- Include the four-part test (methodology) specified by the phosphorus criterion rule (62-302.540, FL Admin. Code). This is mentioned several times, and readers should be provided with this information rather than having to look up the rule and dig it out).

The calculation procedures are sound. Also on the positive side, the Data Precision and Criterion Compliance Assessment are straightforward and conservative (e.g. if the calculated values for any water body segment exceeds any one of the limits established in the four-part assessment methodology, the P criterion will not be achieved in that segment for that assessment period). On the other hand, it seems unfortunate that the rule (which has been approved by both the ERC and U.S. EPA), based upon the brief description in the Appendix, accepts a minimum annual data requirement of six valid temporally independent TP measurements per year (p.2, para. 1 - thus allowing a weakening of a monthly data set to a bimonthly data set, and substantial loss of information), and more unfortunate that the rule accepts as adequate collection of just 1 sample during the wet or dry season. Thus, hypothetically, 5 samples could be collected during a dry season, giving a potentially and artificially skewed (favorably low) picture of TP concentrations in the general absence of most non-point inputs, along with only 1 sample in the wet season. Also, the rule does not allow sites designated as unimpacted to be converted to impacted sites - only conversions of impacted to unimpacted are considered. The District and partners are working to restore ecological integrity in South Florida, within constraints imposed by increasing, rapid urbanization in or adjacent to many parts of the area and associated impacts on water quality. While the major trend hopefully will be from impacted to unimpacted, the reality is that the opposite will occur/is occurring, as well, in some waters. As a footnote in further explanation, it would be helpful to clarify if/how the unimpacted-to-impacted situations are to be accounted for.

Posted: 18 Sep 2006 06:51 PM

Originally Posted: 18 Sep 2006 01:21 PM

App 3C-2: Annual Summary of Phosphorus Concentrations at Everglades Protection Area Monitoring Stations during Water Year 2006

Subject: **Hsieh**

The table gives a clear glance of the statistics of the P concentration monitoring in WY2006. Because the highly hydrological mediated processes in the EPA, the table would be more valuable, if the information can be split into two parts corresponding to dry and wet seasons, respectively.

Posted: 21 Sep 2006 01:42 PM

App 4-1: Annual Monitoring Data Summary for ECP and Non-ECP Basin Discharge Structures

Subject: **Armstrong Comments**

Appendix 4-1: Annual Monitoring Data Summary for ECP and Non-ECP Basin Discharge Structures
Date of Chapter Draft: 9/13/2006
Reviewer: Neal E. Armstrong
Chapter-Specific Review Level:
Level of Panel Review:
Primary:
X:

Page 4-1-5, Table 1: Please explain the heading "Number Used" in this table. The interpretation this reviewer has of this heading is that it is the number of usable values from the number of samples taken. This apparently is incorrect because for the S-3 Complex and Sampling Point S3 on this page there were 19 samples taken and zero used but an average of 0.231 ppm is used in Table 2.

Posted: 19 Sep 2006 12:27 PM

App 12-1: Riverine and Tidal Floodplain Vegetation of the Loxahatchee River and its Major Tributaries

Subject: **No Topic [ellen van donk]**

Some general comments

- Nice and well written appendix. Gives a good overview of the changes and expansion of the riverine and tidal floodplain vegetation of the Loxahatchee River and its major tributaries.
- Is it not possible to distinguish the direct effects of hurricanes and the impact of the extremely dry conditions on the species richness?
- Due to more rain during the hurricanes the impact of the salt water intrusion will change. How will this influence the species richness?
- Is it not yet clear, from all the data gathered until now, whether the storms will lead to more expansion of exotics?

Posted: 08 Sep 2006 10:45 AM

Subject: **Review by Burkholder - Appendix 12-1**

Appendix 12-1

I. Questions for the authors in preparation for the workshop

What is the basis for the planned sampling frequency (6-year intervals for canopy communities, 3-year intervals for groundcover/shrubs)?

The authors mentioned (line 605) that the District plans to conduct PC ORD analysis, which would be helpful to further understanding about species inter-relationships. Will Principle Components Analysis be conducted as well? Are these planned next steps?

How were ranks and importance values calculated? (e.g. lines 1049-1051)

Of the 10 transects and 138 plots, about half of the plots were in the Riverine reach (R), 37% in the Upper Tidal (UT), and 14% in the lower tidal (LT); moreover, only 1 transect was LT (p.36). This is an unbalanced design, particularly from the standpoint of obtaining information about the LT communities. Are additional UT and LT transects going to be added?

When was the DEM modeling effort initiated, and when is the projected completion date? (p.11).

Throughout this document, there is no mention of freshwater SAV. Has freshwater SAV been previously abundant in the Northwest Fork? What is its status at present? Does the District plan to include freshwater SAV in its future efforts?

II. Comments (in addition to those indicated above)

A. Content

The purpose of this Appendix (p.7) was to provide a description of the baseline/long-term floodplain vegetation monitoring program that the District (working with the FDEP Park Service District) established in 2003 for the Loxahatchee River and major tributaries. Additional data are to be collected at 6-year intervals for canopy communities, and at 3-year intervals for groundcover/shrubs. The program is important; it has provided valuable informtion on the floodplain communities of the Loxahatchee. Figure 11 nicely depicts the overall conceptual framework. The Appendix should be restructured somewhat, however, to help readers understand what was done, in particular regarding methods.

Major enhancement/restoration issues identified (Executive summary and p.85) included (1) minimal post- development inundation of the floodplain swamp community, (2) insufficient inundation to discourage encroachment/intrusion of transitional, upland and exotic plant species, (3) displacement of younger canopy species into the forest types, and (4) insufficient

inundation for aquatic life to use floodplain swamp habitat. Appendix 12-1 directly involves the first three of these issues, and should clarify more about how this survey will be used to address them in the Loxahatchee ecosystem.

Organization - The Introduction, Background and Results sections contained much of the actual methodology; should be moved to Methods. Examples:

P.22 - Is study area description, not Results (better placed after p.3). Lines 690-760 are not really part of this vegetation study but, rather, background information on the study area covered in detail in Appendix 12-2.

Methods - It might be helpful for this section to begin with a subsection on Environmental Conditions (include portions of p.21 - eliminate redundancies with previous Related Projects section; and add pp.23-26). Move pp. 28-35, lines 942-947 and 955-960, and lines 1049-1051 to Plant and Forest Type Identification and Enumeration subsection. In addition, more explanation is needed of the species rankings and overall importance methodology. Tables 5-7 seem to belong in Methods, not Results - these were the tools developed in order to evaluate the Loxahatchee vegetation.

Executive Summary - Should provide more information about how the vegetation study was actually conducted, since this Appendix primarily describes a technical study - should mention major reaches considered, major vegetation types, and brief explanation about ranks and importance values. It should also be clarified that the study basically consisted of two components: in 2000, a comparison of aerial photos taken in 1940 vs. 1985; and in 2003, a transect study with comparison to some transects that were also analyzed in 1983-4 and 1993-4.

The chronology of the presentation in the Executive Summary was confusing, beginning with 2003 (para., "Staff of…"; the year should be added, and the transect length should be included), describing effort in 2006, then going back to explain climatic conditions in 2004, and more work in 2005. Also, the Executive Summary appears to end with the major concerns that prompted the study in the first place (?); the last paragraph should be moved up toward the beginning.

Figure 2 - It would be helpful to show the Wild/Scenic River portion (7.5 miles) and the Aquatic Preserve Outstanding Florida Waters area mentioned on the previous page.

Lines 232-239 - Points (4) and (5) do not seem to match the contents of Appendix 12-1. Point 4 should be changed to: to examine the occurrence of exotic plants in this system (their impacts were not rigorously assessed). Point 5 was done in Appendix 2.

Background history of studies - Please check for consistency - number of plots, plot size, number of transects should be mentioned for each study (a table of this information for each study would be helpful; it would also help readers conceptualize the information presented in the 2nd para. on p.81). Also, it seems confusing that the study described in lines 365-380 does not provide similar summary information (size of sites; brief explanation of semi-quantitative vs. quantitative, etc.). Line 377 - negatively correlated (statistically significant?),,,

Table 1 - Should be altered to also include the following information: Northwest Fork or tributary; if T1-1 and T1-2 are retained (pp.44-46), information about them needs to be included; same for T2-1 and T2-2 (called T2-A, T2-B on p.36 - please alter; also lines 1760, 1761, 1781) and T6-1, T6-2 (p.60). Or (better), please omit these sub-transect distinctions (data graphics combine them anyway).

Additional tables - In addition to Figures 24-31, a table is needed that summarizes information for the five most abundant species: percent abundance and frequency of occurrence of each species overall and in each reach. A table with information on

the occurrence of exotic species overall and within each Reach is also needed.

Lines 404-441 - Is the Groundwater Fluxes/Water Quality study being conducted at the same 12 wells as the Loxahatchee Floodplain Groundwater Monitoring Network? - please clarify. Line 426 - additional information is needed on the "isotope technique".

Line 454 - Please add explanation: why were these two transects selected?

Lines 652-686 - What are the characteristics of these systems with respect to DOC and water color (humics/tannins)?

Page 27 - Not Results; should be moved in back of the historic information under Background.

Additional information - A section is needed in the Results summarizing what was found about exotic plants, with accompanying table (example of table contents: Riverine Reach, Transect number, previous logging +/-, Fire +/-, Exotics [list species]).

P.46, and line 1201, etc. - In some cases, only one to a few individuals of a species were measured for dbh. Such information is not statistically viable - please clarify the value of such data.

Line 1443 - Are there supporting data for this in the published literature?

Lines 1463-1464 - Are data on water quality for this area available, and/or plans to collect such data?

Lines 1508-1513 - Great quote!

Line 1533-1536 - Should also mention impacts from canals (p.76). The comment about selective logging/ lightning strikes seems tenuous, based upon only one tree (?).

B. Editorial Suggestions

Lines 417,425,735 - Should be data are or were.
General - Please change regards to regard throughout
Line 431 - Should be NH_4^+; Line 457 - Change on to vs.; Line 675 - Change man's to human.

Table 5 - Under Determination of Forest Types: - need to add 1. to 1st line.

Lines 742-745 - Should refer to Tables 5, 6 before Table 7 (out of place).

Lines 734-736,744-745 - Move color-coding informtion to table legends.

Lines 729-750 - Please refer to Appendix 12-2.

Line 743 - Change to: ...a baseline of the number... Lines 892-896 - Last sentence seems to disagree with previous text? Lines 982-985 - Descriptions for Figures 26 and 27 are reversed.

Line 991 - Change accurate to accurately; change ...as we know them... to ...as of 2003.

Figure 24 legend - should define the key here, at least in this first figure, rather than referring readers to an appendix (better format to use is shown in Figure 38).

Figures 26,27 - Legends are reversed: Figure 26 - lower tidal reach; Figure 27 - upper tidal reach.

Figures 29,31 - Wrong color was used for cabbage palm.

Table 8 legend - Change to: ...species in the overall study area.

Line 1077 - Change to: T-1 on the south [better: east?] side of the Northwest Fork…
Figures 37,41,44,47,52,55,58,65,72,77 - Please format consistently: labeled axes, use similar heading as for Fig. 41; use key format shown in Figure 38.
Figures 14,15 - Labels on the maps and keys can barely be discerned; please enlarge.
Figures 36,39,40,43,46,54,57,63,69,76 - Please format consistently: use the same heading as in Fig. 36, and the same legend, and include the RM.
Figure 39, data from 1980 - please include comparative graph with 2003 data?
Figure 49 - Key difficult to read.
Figure 50 - Not certain what the map means by "impacted" vs. "historic" Cypress Creek - please clarify; Figures 50,51 - cannot discern between historic Cypress Creek and Cypress Creek (key unclear). Also, these figures should be combined into one (repetitious).
Line 1340 - Seminole War?
Line 1342 - This information about Transect 4 is confusing; it was described as within the freshwater Riverine reach, and was not mentioned as tidally influenced in Appendix 1 p.52 (or in Appendix 2, Ch. 3). Yet, here it is described as strongly tidally influenced (?). Please clarify.
Line 1404 - Change 15 to 16.
Lines 1406-1407 - Change to: to be included within the 5 cm dbh canopy size class.
Figure 62 - Cannot read the labels in the key or map. Figure 68 - Needs scale
Line 1616 - Change to: The North Fork tributary of the Loxahatchee River, where Transect 10 is located,...
Line 1630 - Change ...noted for its home to,,, to ...is habitat for...
Line 1646 - Change meet up to converge.
Lines 1651-1660 - This information should also be mentioned in section on Transect 8 (Kitching Creek).
Figure 74 - Significance of Bridge Road, Park Drive or County Line Road?
Figure 75 - Needs scale. Large white round structure? Line 1837 - Change darkest to most stressed.
Lines 1850, 1851 - Change a year to per year. Line 1870 - Change to drier.
Pp.85-86 - This section needs a summary paragraph.
Line 1778 - Change to: ..except that the number...
Line 1787 - Change to: ...from comparison with the SFWMD Dewey...

C. **Appendices**

Appendices 1-A through 1-C
The timeline is a nice addition, interesting and helpful to readers. Appendices 1-B and 1-C also provide helpful supporting information.

Appendix 1-D
The authors provide a detailed comparison in table form of the 1993-1994 (Ward and Roberts), 2003 (District) and 2006 (District) transect studies. It would be instructive to also add the 1983-1984 study, since six of the same transects were examined. The legend of the table should also note which some of the same transects were examined in 1983-4 and 1993-4.

Appendix 1-E
This is a nice synopsis of hurricane damage on the Loxahatchee floodplain forest canopy tree species, with good supporting figures and tables. I have only some minor editorial corrections/suggestions:

Line 2011 - Should be re-colonized.
Line 2012 - Should be …environments have not allowed…
Line 2014 - Should be hurricane eye.

Line 2032 - Should be … major hurricanes in one season.
Line 2070 - Change to: transects 10 m wide were...
Line 2082 - Omit sentence beginning Each one...
Line 2083 - Change to: ..,(dbh) within plots were measured...
Line 2092 - Change 15 to 16.
Line 2104 - Change was to were.
Lines 2108 - 2119, lines 2123-2128 - move to Introduction.
Lines 2120-2122 - Omit (the authors earlier noted that Hurricane Ivan did not impact the Loxahatchee).
Line 2176 - Should be Table E-2.
Line 2181 - Should be: cypress had the...
Lines 2192-2196 - This information might better be added to the introductory section of Appendix 1.
Discussion, 1st para. - Omit all but the first sentence (not germane to study, or repetitive).

Posted: 14 Sep 2006 10:52 AM
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